10.0 Permit Requirements

E. Total Maximum Daily Loads

Section 402(p)(3)(B)(iii) of the Clean Water Act (CWA) states that municipal storm sewer permits must require stormwater controls to reduce the discharge of pollutants to the MEP. By regulation at 40 CFR §122.44, EPA further requires that BMPs and programs implemented pursuant to this permit must be consistent with applicable waste load allocations (WLAs) developed under EPA approved TMDLs (see list of impaired waters attached and incorporated as Attachment B). The goals of Maryland's NPDES municipal stormwater permit program are to control stormwater pollutant discharges by implementing the BMPs and programs required by this permit, show progress toward meeting WLAs, and contribute to the attainment of water quality standards according to the CWA

In pursuit of these goals, Baltimore County shall annually provide watershed assessments, restoration plans, opportunities for public participation, and TMDL compliance status. A systematic assessment shall be conducted and a detailed restoration plan developed for all watersheds within Baltimore County. As required below, watershed assessments and restoration plans shall include a thorough water quality analysis, identification of water quality improvement opportunities, and a schedule for BMP and programmatic implementation to meet stormwater WLAs included in EPA approved TMDLs.

1. Watershed Assessments

   a. By the end of the permit term, Baltimore County shall complete detailed watershed assessments for the entire County. Watershed assessments conducted during previous permit cycles may be used to comply with this requirement, provided the assessments include all the items listed in Part III.E.1.b. below. Assessments shall be performed at an appropriate watershed scale (e.g., Maryland's hierarchical eight or twelve-digit sub-basins) and be based on MDEs TMDL analysis or an equivalent and comparable County water quality analysis;

   b. Watershed assessments by the County shall:

      i. Determine current water quality conditions;

      ii. Include the results of a visual watershed inspection;

      iii. Identify and rank water quality problems;

      iv. Prioritize all structural and nonstructural water quality improvement projects; and

      v. Specify pollutant load reduction benchmarks and deadlines that demonstrate progress toward meeting all applicable stormwater WLAs.

2. Restoration Plans

a. Within one year of permit issuance, Baltimore County shall submit an impervious surface assessment consistent with the methods described the MDE document "Accounting for Stormwater Wasteload Allocations and Impervious Area Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits (MDE 2011 or subsequent versions). Upon approval by MDE, this impervious surface area assessment shall serve as the baseline for the restoration efforts required in this permit.

b. By the end of the permit term, Baltimore County shall commence and complete the implementation of restoration efforts for twenty percent of the County's impervious surface area consistent with the methodology described in the MDE document cited in paragraph a. that is not already restored to the MEP;

c. Within one year of permit issuance, Baltimore County shall submit to MDE a restoration plan for each stormwater WLA approved by EPA prior to the effective date of the permit. The County shall submit restoration plans for subsequent TMDL WLAs within one year of EPA approval. Upon approval by MDE, these restoration plans will be enforceable under this permit. As part of the restoration plans, Baltimore County shall:

i. Include a detailed schedule for implementing all stormwater structural and nonstructural water quality improvement projects, enhanced stormwater management programs, and alternative stormwater control initiatives necessary for meeting applicable stormwater WLAs;

ii. Provide detailed cost estimates for individual projects, programs, controls, and plan implementation;

iii. Evaluate and track implementation of watershed restoration plans through monitoring or modeling to document progress toward meeting established benchmarks, deadlines, and stormwater WLAs; and

iv. Develop an ongoing, iterative process that continuously implements structural and nonstructural restoration projects, stormwater program enhancements, and alternative BMPs where EPA approved TMDL WLAs are not being met according to the benchmarks and deadlines established as part of the County's watershed assessments.

3. Public Participation

Baltimore County shall provide continual outreach to the public regarding the development of its watershed assessments and restoration plans. Additionally, the County shall allow for public participation in the TMDL process, solicit input, and incorporate any relevant ideas and program

improvements that can aid in achieving TMDLs and water quality standards. Baltimore County shall provide:

a. Notice in a local newspaper and the County's web site outlining how the public may obtain information on the development of the watershed assessments and watershed restoration plans and opportunities for comment;

b. Procedures for providing watershed assessments and watershed restoration plans to interested parties upon request;

c. A minimum 30 day comment period before finalizing watershed assessments and watershed restoration plans; and

d. A summary in each annual report of how the County addressed or will address any material comment received from the public.

4. TMDL Compliance

Baltimore County shall evaluate and document progress toward meeting all applicable WLAs included in EPA approved TMDLs. An annual TMDL assessment report with tables shall be submitted to MDE. This assessment shall include complete descriptions of the analytical methodology used to evaluate the effectiveness of the County's stormwater restoration plans and how these plans are working to achieve compliance with EPA approved TMDLs. Baltimore County shall provide:

a. Estimated net change in pollutant load reductions from all completed structural and nonstructural water quality improvement projects, enhanced stormwater management programs, and alternative stormwater control initiatives;

b. A comparison of the net change in pollutant load reductions detailed above with the established benchmarks, deadlines, and applicable stormwater WLAs;

c. Itemized costs for completed projects, programs, and initiatives to meet established pollutant reduction benchmarks and deadlines;

d. Cost estimates for completing all project, programs, and alternatives necessary for meeting applicable WLAs; and

e. A description of a plan for implementing additional watershed restoration actions that can be enforced when benchmarks, deadlines, and applicable stormwater WLAs are not being met or when projected funding is inadequate.

10.1 Introduction

This section covers watershed management planning activities and status of TMDL development (10.2), pollution load reduction calculations (10.3), restoration progress (10.4), and progress in meeting the impervious cover restoration targets (10.5) and TMDL reduction allocations (10.6). Section 10.2 discusses the development of Small Watershed Action Plans, the status of TMDL development and the development of TMDL Implementation Plans. These plans meet the

requirements for development of watershed assessment and restoration plans. The plans are intended to provide the road map for meeting TMDL reduction requirements, protecting our Tier II waters, and meeting locally developed water quality goals.

Section 10.3 clearly lays out the process used in determining the pollutant load reduction attributable to the various types of restoration conducted to meet water quality objectives. The information for the calculations is derived from the latest Chesapeake Bay Program spreadsheet on BMP efficiencies, CBP expert panel reports on various BMP practices (as they are available), and the draft document entitled *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE August, 2014).

Section 10.4 details the restoration progress made to date due to capital program restoration projects, community reforestation program efforts, and restoration efforts by the various local watershed associations. The information is presented by program and by watershed.

Section 10.5 details progress made in meeting the impervious cover treatment acres required as a tracking mechanism in the stormwater permit. An impervious cover analysis has been conducted to determine the amount of impervious cover in 2002 (the base year) in Baltimore County. The current target is 20% of the impervious cover in Baltimore County. With the issuance of the next NPDES – MS4 permit the impervious cover target is anticipated to increase to 40%. Section 10.6 details progress made in meeting the local TMDL reduction allocations and the Chesapeake Bay TMDL for the reduction of nutrients and sediment.

10.2 Status of Watershed Management Plans

10.2.1 Water Quality Management Plans

Water quality management plans have been completed for ten of the fourteen major watersheds in Baltimore County. The four remaining watersheds have limited urban development and therefore are not required by the NPDES – Municipal Stormwater Discharge Permit to have water quality management plans. However, recognizing the benefits of a watershed management plan, Baltimore County has completed the development of a Prettyboy Watershed Plan under the State's Watershed Restoration Action Strategy (WRAS) process. Harford County in conjunction with stakeholders has also completed the WRAS process to develop a watershed plan for Deer Creek watershed.

10.2.2 Small Watershed Action Plans (SWAPs)

In 2005, Baltimore County initiated a new round of watershed planning, entitled Small Watershed Action Plans (SWAPs). The SWAP planning process is meant to bring together the many mandates that the County is charged to meet in each individual watershed, including the requirements of the NPDES – Municipal Stormwater Discharge Permit, Total Maximum Daily Loads (TMDLs), both local and the Bay TMDL, and the Reservoir Management Program. The Chesapeake Bay TMDL is being addressed in SWAPs currently under development and will be addressed in future SWAPs. The small watershed action planning process is designed to bring all these individual mandates together at a subwatershed level that will help residents understand the intent of each program, how to most efficiently meet the goals, and define the roles of the partners. The SWAPs build on the previously completed technical Water Quality Management Plans.

Stakeholders are invited to participate in the development of each SWAP. A series of two to three public stakeholder meetings are held over the course of the development of each SWAP.

The first introduces the stakeholders to the process and solicits their input on the characterization of the planning area and goals. The second meeting presents the final characterization document and solicits input on preferred restoration options. The third meeting presents the SWAP, which includes not only County actions and projects, but also citizen based and business based restoration activities and options. For some SWAPs the agendas of the second and third meetings are combined into one meeting. The SWAP steering committee includes local stakeholders as representatives from the watersheds being studied. Planning areas were selected on similarity of impacts within each area, allowing focus on specific issues related to the stakeholders that live and work within each planning area. Twenty-three planning areas have been delineated. Since the reissuing of the MS4 permit, newly completed SWAPs have and will continue to be posted for a 30-day comment period prior to finalization.

When the SWAPs have been completed the Steering Committee becomes the Implementation Committee, which will meet twice each year to determine progress being made, barriers to making progress, and the need for any revisions.

Since the last NPDES Annual Report the following SWAPs have been completed:

- Loch Raven North SWAP (Area X) – May 2015
- Liberty Reservoir SWAP (Area S) – May 2015

Previously completed SWAPs include:

- Prettyboy WRAS (Area T) – January 2008
- Spring Branch SWAP – March 2008 (will be included in the larger Area O SWAP)
- Lower Jones Falls SWAP (Area H) – October 2008
- Upper Back River SWAP (Area L) – November 2008
- Tidal Back River SWAP (Area E)– February 2010
- Upper Gwynns Falls SWAP (Area V) – May 2011
- Beaver Dam Run, Baisman Run, and Oregon Branch SWAP (Area I) – November 2011
- Middle River and Tidal Gunpowder SWAP (Area F) – February 2012
- Lower Patapsco SWAP (Area A) – May 2012
- Northeastern Jones Falls SWAP (Area M) – December 2012
- Bear Creek/Old Road Bay SWAP (Area D) – December 2012
- Middle Gwynns Falls SWAP (Area C) – September 2013
- Loch Raven East SWAP (Area R)– February 2014
- Bird River SWAP (Area K)– April 2014

An additional six SWAPs are currently under development with an expected completion date within the next year, except Area O which is being done in-house, and on an independent time schedule:

- Southeastern Loch Raven Reservoir SWAP (Area O)
- Urban Lower Gunpowder SWAP (Area N)
- Rural Jones Falls SWAP (Area G)
- Rural Patapsco SWAP (Area B)
- Little Gunpowder Falls SWAP (Area P)
- Loch Raven West SWAP (Area W)

All study areas that have yet to receive a SWAP have either had their studies initiated already or are scheduled to be underway by 2017. Moreover, all SWAPs will be completed by the end of the term of the permit, as required. Figure 10-1 shows the planning areas and schedule, while Table 10-1 shows the status, schedule, and the acres for each planning area. The completed SWAPs are posted on the County web site:
http://www.baltimorecountymd.gov/Agencies/environment/watersheds/swap.html

Table 10-1: SWAP Schedule

Watershed	SWAP Area	Acres	Completed By:	Anticipated Completion
Patapsco	A	17,569	Consultant	Complete
Patapsco	B	15,761	Consultant	Underway – 2016
Gwynns Falls	C	14,884	Consultant	Complete
Balt Harbor	D	11,484	Consultant	Complete
Back River	E	7,858	Consultant	Complete
Gunpowder/Middle R.	F	6,520	Consultant	Complete
Jones Falls	G	13,187	Consultant	Underway – 2015
Jones Falls	H	5,777	EPS/Consultant	Complete
Loch Raven	I	8,350	Consultant	Complete
Bird River	K	22,528	Consultant	Complete
Back River	L	15,385	EPS	Complete
Jones Falls	M	6,957	EPS	Complete
Lower Gunpowder	N	10,553	Consultant	Underway – 2015
Loch Raven	O	17,523	EPS	Underway – 2016
Little Gunpowder	P	17,217	Consultant	Underway – 2016
Lower Gunpowder	Q	18,931	Consultant	2017
Loch Raven	R	11,466	Consultant	Complete
Liberty Reservoir	S	16,449	Consultant	Complete
Prettyboy Reservoir	T	24,027	EPS	Complete
Deer Creek	U	7,132	Harford County	Complete
Gwynns Falls	V	13,618	Consultant	Complete
Loch Raven	W	38,515	Consultant	Underway – 2016
Loch Raven	X	61,436	Consultant	Complete

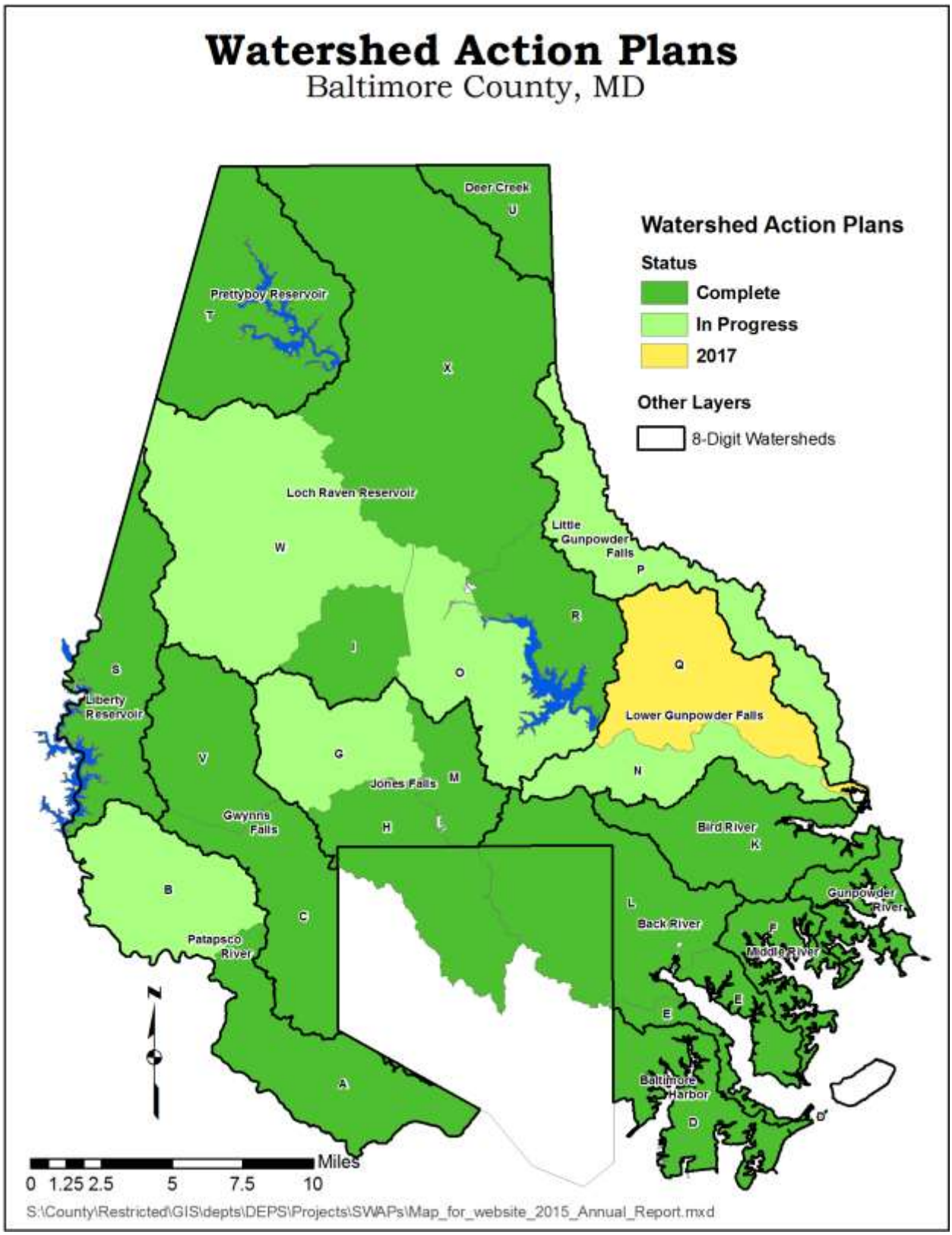

Figure 10-1: Baltimore County SWAP Status

10.2.3 Total Maximum Daily Load (TMDL) Implementation Plans

The Baltimore County NPDES – MS4 Permit was renewed December 23, 2013. A new provision of the permit was a requirement to develop a TMDL Implementation Plan for each EPA approved local TMDL within one year of permit issuance, or within one year of EPA approval for those local TMDLs that were not approved at the time of the permit renewal. Baltimore County has developed 25 local TMDL Implementation Plans. One additional plan is currently in development (Trash in Gwynns and Jones Falls), and is expected to be completed by the end of the calendar year. The completed plans include the following pollutants:

- Bacteria – 7 plans
- Sediment – 5 plans (3 stream based, 2 reservoir based)
- Phosphorus – 3 plans
- Nutrients – 2 plans
- Mercury – 3 plans
- Chlordane – 2 plans
- PCBs – 3 plans.

The County EPS developed the TMDL Implementation Plans in-house (with exception to the plans for Liberty Reservoir, which were developed in tandem with the SWAP for that area), after meeting with other Baltimore County agencies and local watershed associations for input. Prior to posting for public comment, the draft plans were distributed to Baltimore County agencies, Maryland Department of the Environment, and local watershed association to solicit comments. The comments provided were used to improve the plans prior to posting for public comment. The documents were then revised based on the comments as appropriate and a comment response document was prepared.

After final submission, MDE has provided additional feedback which will be addressed. Once the edits resulting from additional feedback have been made, the documents will be posted on the County website, along with the comment response document.

Two additional TMDLs were approved by EPA after the issuance of the Baltimore County NPDES – MS4 permit; the Liberty Reservoir Phosphorus and Sediment TMDL (approved by EPA May 4, 2014), and the Baltimore Harbor Trash TMDL (approved by EPA January 5, 2015). The Implementation Plan for the Liberty Reservoir have been completed in tandem with the SWAP for that area, and the Trash Implementation Plan is currently under development.

TMDLs are developed by the State for waters listed as impaired on the 303(d) list. The 303(d) list is updated during the course of the development of the Integrated Report. The Integrated Report is required by federal law to be submitted to EPA every two years. The Integrated Report and further information on the Report can be found on the MDE web page: http://www.mde.maryland.gov/programs/Water/TMDL/Integrated303dReports/Pages/Programs/WaterPrograms/TMDL/Maryland%20303%20dlist/index.aspx . The most recent Integrated Report was developed in 2014; it was approved by EPA – Region 3 on October, 16, 2015 (see-http://www.mde.maryland.gov/programs/Water/TMDL/Integrated303dReports/Pages/2014IR.aspx). Table 10-2 presents the status of TMDL development for watersheds within Baltimore County and impairment status as reported in the 2014 Integrated Report. Those waters listed as impaired will have a TMDL developed in future years. For review of the TDMLs, see MDE webpage:
http://www.mde.maryland.gov/programs/Water/TMDL/CurrentStatus/Pages/Programs/WaterPro

grams/TMDL/Sumittals/index.aspx The TMDLs and the Water Quality Assessments (WQAs) are listed by watershed with links to the TMDL or WQA document and supporting information. Water Quality Assessments are performed when there is limited data for the impairing substance. It is often found that the substance is not causing an impairment in the water body, so the impairment listing will be removed in the next Integrated Report. A number of assessment methodologies have been developed for determining impairments (see - http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/Programs/WaterPrograms/TMDL/maryland%20303%20dlist/ir_listing_methodologies.aspx). For aquatic biological community impairments, the impairment listing is removed once the cause of the impairment is determined and the waterbodies are listed for the impairing substances. For streams the assessment methodology *Maryland Biological Stressor Identification Process (http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Documents/www.mde.state.md.us/assets/document/BSID_Methodology_Final.pdf).*

The impairment listings can be based on water body type, typically they are listed based on streams, impoundments (reservoirs) or tidal water receiving waters.

Table 10-2: TMDL, WQA, and Impairment Listing Status by Watershed and Tidal Segment

Watershed	Nutrients	Sediment	Bacteria	Toxics Organics	Toxics Metals	Other
Deer Creek	Not Impaired	Not Impaired	Not Impaired	Not Impaired	Not Impaired	Not Impaired
Prettyboy Reservoir Streams	Not Impaired	Not Impaired	TMDL - 2009	Not Impaired	WQA - 2003	Not Impaired
Prettyboy Reservoir Impoundment	Phosphorus TMDL – 2008	Not Impaired	Not Impaired	Impaired – PCBs -	TMDL - Hg in fish tissue – 2006 WQA – Zn, Ni, Pb, Cu, Cr, Cd, AS - 2006	Not Impaired
Loch Raven Reservoir Streams	Not Impaired	Not Impaired	TMDL - 2009	Not Impaired	WQA- 2003	Biological Community Impaired – Sulfates, Chlorides, Temperature (water)
Loch Raven Reservoir Impoundment	Phosphorus TMDL – 2008	TMDL – 2008	Not Impaired	Impaired – PCBs	TMDL - Hg in fish tissue – 2006 WQA – Ni, Pb, Cu, Cr, Cd, As - 2004	Not Impaired
Lower Gunpowder	Impaired - Phosphorus	Impaired	Not Impaired	Not Impaired	WQA – As, Hg, Zn, Ni, Pb, Cr, Cd - 2004	Impaired – Sulfates, Chlorides, Stream Alteration
Little Gunpowder	WQA - 2009	Not Impaired	Not Impaired	Not Impaired	WQA – Hg – 2004 WQA – Zn, Ni, Pb, Cu, Cr, Cd, As - 2004	Impaired – Temperature (water)
Bird River	WQA - 2005	Not Impaired	Not Impaired	Not Impaired	Not Impaired	Impaired – Cause unknown Biological Community – Insufficient Data
Gunpowder River	Not Impaired	Not Impaired	Not Impaired	Not Impaired	Not Impaired	Not Impaired

Watershed	Nutrients	Sediment	Bacteria	Toxics Organics	Toxics Metals	Other
Middle River	Not Impaired	Not Impaired	Not Impaired	Not Impaired	WQA – Pb, Cd - 2003	Not Impaired
Liberty Reservoir - Streams	Not Impaired	Not Impaired	TMDL - 2009	Not Impaired	Not Impaired	Impaired – Chlorides, Temperature (water)
Liberty Reservoir - Impoundment	Phosphorus – TMDL – 2014	Sediment – TMDL – 2014	Not Impaired	Not Impaired	WQA - Hg - Pending WQA – Cr, Pb – 2003	Not Impaired
Lower North Branch Patapsco River	WQA - 2009	TMDL - 2011	TMDL - 2009	Not Impaired	WQA – As, Zn, Pb, Hg, Cu, Cr, Cd - 2006	Impaired – Sulfates, Chlorides, Stream Alteration
Gwynns Falls	WQA - 2010	TMDL - 2010	TMDL - 2008	Not Impaired	Not Impaired	Impaired – Chlorides, Temperature (water), Stream Alteration
Jones Falls	WQA – 2010	TMDL - 2011	TMDL – 2008	Lake Roland – PCBs- TMDL - 2014 Chlordane – TMDL - 2001 (Delisted: 2012)	WQA – Zn, Pb, Cu - 2004	Impaired – Sulfates, Chlorides, Stream Alteration, Temperature (water)
Back River	TMDL - 2005	Impaired	TMDL – Herring Run only - 2008	See tidal segments below	Not Impaired	Impaired – Sulfates, Chlorides, Stream Alteration
Baltimore Harbor	TMDL - 2007	Impaired	Not Impaired	See tidal segments below	Not Impaired	Biological Community Impaired – Chlorides, Sulfates
GUNOH	TMDL - 2010	TMDL - 2010	Not Impaired	Impaired	Impaired -Hg in fish tissue	Not Impaired
MIDOH	TMDL - 2010	TMDL - 2010	Not Impaired	Impaired	Impaired -Hg in fish tissue; WQA – Pb, Cd - 2004	Biological Community – Insufficient Data
CB2OH	TMDL - 2010	TMDL - 2010	Not Impaired	Not Impaired	Not Impaired	Not Impaired
BACOH	TMDL – 2005, 2010	TMDL - 2010	Not Impaired	PCBs – TMDL - 2012 Chlordane – TMDL - 1999	Impaired – Hg in fish tissue WQA – Zn 2006	Biological Community – Insufficient Data
CB3MH	TMDL - 2010	TMDL - 2010	Not Impaired	Not Impaired	Not Impaired	Impaired -Biological Community
PATMH	TMDL – 2005, 2010	TMDL - 2010	Not Impaired	PCBs – TMDL -2012 Chlordane – TMDL - 2001	Impaired – Cr, Zn Sediments	Impaired – Trash – Middle Branch, Northwest Harbor, Biological Community (TMDL 2015)
Total TMDLs[1]	**6 (5)**	**6 (5)**	**7 (7)**	**5 (5)**	**2 (2)**	**1 (0)**
Total Impaired – Need TMDL[1]	**1 (1)**	**2 (2)**	**0 (0)**	**4 (2)**	**4 (0)**	**33 (28)**

1. Including Chesapeake Bay TMDL (Not including Chesapeake Bay TMDL/local only).

A total of 25 local TMDLs have been developed for Baltimore County waters, not counting the Chesapeake Bay TMDLs. The Chesapeake Bay can be considered as a single TMDL; although it includes nitrogen, phosphorus, and sediment pollutants for 53 Maryland tidal segments and could be considered as 159 TMDLs. There are an additional 33 impairment listings that will require TMDLs in Baltimore County in the future, and an unknown number of additional impairment listings that will be developed once the causes of the biological community impairments are determined. Each one of these current and future TMDLs will require the development of a TMDL Implementation Plan in the future. For existing TMDLs, within one-year of the permit reissuance, for future TMDLs, within one year of EPA approval of the TMDL. The Chesapeake Bay TMDL has been addressed through the development of the Baltimore County Phase II Watershed Implementation Plan (http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/WIPPhaseIICountyDocuments.aspx). The categories of TMDLs are discussed below (all Chesapeake Bay related TMDLs are counted as a single TMDL, e.g. Back River Nutrients and Baltimore Harbor Nutrients fall under the same Bay TMDL).

Nutrient TMDLs: There are four nutrient TMDLs for Baltimore County waters. The three drinking water reservoirs (Prettyboy, Loch Raven, and Liberty) located in Baltimore County have TMDLs completed for phosphorus. Each reservoir exceeds the water quality standards for epilimnion chlorophyll *a* and hypolimnion for dissolved oxygen. The two standards are linked through algal production, which in turn is related to the amount of phosphorus delivered to the reservoir, changes in nitrogen have been found through modeling to not have an effect on the amount of algal production within the reservoirs. This follows the general ecological principle that fresh waters are phosphorus limited and not nitrogen limited in terms of production. The increase in algal biomass can cause problems in the final drinking water product. High amounts of algae can cause taste issues with the drinking water and the algal organic matter can react with the chlorination to produce trihalomethanes in the finished water (http://water.epa.gov/drink/contaminants/basicinformation/disinfectionbyproducts.cfm). When the algal biomass dies it drifts through the thermocline to the hypolimnion where bacteria break down the organic matter and in the process reduce the oxygen in the hypolimnion (for further information http://www.ourlake.org/html/dissolved_oxygen.html or http://pubs.usgs.gov/sir/2011/5090/pdf/sir2011-5090.pdf). This in turn impacts the biological community's ability to survive.

For the Chesapeake Bay TMDL both nitrogen and phosphorus lead to increased algal growth. This has the effect in tidal water of decreasing the dissolved oxygen levels when the algae die and the algal biomass also has an effect on water clarity by intercepting the sunlight and causing shading of submerged aquatic vegetation (http://www.chesapeakebay.net/issues/issue/nutrients). These algae blooms may also have health effects for both the aquatic biological communities and humans (http://www.dnr.state.md.us/bay/hab/index.html). The Bay TMDL applies to Back River and Baltimore Harbor watersheds.

Sediment TMDLs: There are six sediment TMDLs for Baltimore County waters, two are related to drinking water reservoirs, three are related to stream biological community impacts, and one final sediment TMDL is related to water clarity in the Chesapeake Bay. Sediment TMDLs come from a variety of impacts. Sediment TMDLs for reservoirs are typically based on increasing the longevity of the drinking water supply (http://www.eolss.net/Sample-Chapters/C07/E2-12-02-05.pdf), while those for streams are based on impacts on the aquatic community (http://www.csu.edu.au/__data/assets/pdf_file/0011/749936/Harrison_Evan_139.pdf). The

sediment TMDL for the Chesapeake Bay is based on water clarity standards for the support of submerged aquatic vegetation (SAV) that provides nursery habitat for a variety of fish and crabs in support of aquatic wildlife (http://chesapeake.usgs.gov/SedimentBay605.pdf or http://www.chesapeakebay.net/indicators/indicator/reducing_sediment_pollution). The Bay TMDL applies to the stream based sediment TMDLs for Jones Falls, Gwynns Falls, and Patapsco River watersheds.

Bacteria TMDLs: The seven bacteria TMDLs developed to date have all focused on bacteria impairments in streams, with no impairments indicated for the drinking water reservoirs, and none currently to tidal water segments (although this may change for Baltimore Harbor). High levels of bacteria are an indicator of potential human health impacts for people using the waters for recreational purposes. The bacteria TMDLs present some unique challenges, due mainly to the input of wildlife and the current state of knowledge on bacteria dynamics in streams and effectiveness of various treatment options. Meeting the Consent Decree to eliminate Sanitary Sewer Overflows (SSOs) is expected to provide a majority of the reduction to bacteria counts in affected areas.

Toxics-Organics: This class of pollutants includes all those with a hydrocarbon based molecular structure and includes a variety of pesticides, polychlorinated biphenyls (PCBs), and a variety of petroleum products and their derivatives. There are two in this class that currently have TMDLs, the pesticide chlordane, and PCBs; both of these have been banned for use for several decades. The listings are typically based on presence in fish tissue and therefore available for human consumption.

Toxics-Metals: To date this category has been limited to mercury (Hg) in fish tissue related to human health. The balance of the various types of metals have not been determined to be impairing biological communities to date.

Temperature: While no TMDLs have been developed, at the time of this document's writing, temperature impairments in streams have been noted in various Baltimore County waterways. The County is currently collecting data and partnering with consultants to research possible causes of high temperature within select watersheds.

Other Impairing Substances: This is a catchall category that includes trash, and ions, such as, chlorides and sulfates. The trash impairment listing for Baltimore Harbor has resulted in a TMDL that has recently completed the public comment period. The ions, chloride and sulfate have been identified as impairing the stream biological community in a number of watersheds. No TMDLs for these two pollutants have been developed as yet. An additional category of impairment has been identified as impairing the stream communities in a number of watersheds. This is stream channel alterations. Since stream alterations are not a pollutant, TMDLs will not be developed for these types of impairments.

10.3 Pollutant Load Reduction Calculations and Crediting Actions

In order to conduct consistent pollutant load and pollutant load reduction calculations, Baltimore County has opted to use the loading rates from the Chesapeake Bay Program Phase 5.3 Watershed Model, as expressed in the Maryland Assessment Scenario Tool (MAST). The loading rates are based on the land/river segment in MAST. Some 8-digit watersheds have multiple land/river segments within their boundaries. Since data is expressed on an 8-digit watershed basis, mean weighted edge-of-stream (EOS) loading rates were calculated for each of

the fourteen 8-digit watersheds that are entirely or partially within Baltimore County. Only the loading rates for urban impervious, urban pervious, and forest are given in Table 9-3.

Table 10-3: Edge-of-Stream (EOS) Pollutant Loading Rates by Watershed

Watershed	Total Nitrogen/Acre			Total Phosphorus/Acre			Total Sediment/Acre		
	Urban Imp.	Urban Per.	Forest	Urban Imp.	Urban Per.	Forest	Urban Imp.	Urba n Per.	Forest
Deer Creek	17.36	11.55	2.77	1.51	0.30	0.04	2,158.7	294.8	89.7
Prettyboy Reservoir	17.36	11.55	2.77	1.51	0.30	0.04	1,644.3	224.6	76.1
Loch Raven Reservoir	17.36	11.55	2.77	1.51	0.30	0.04	1,601.5	220.6	64.4
Lower Gunpowder Falls	17.36	11.55	2.78	1.51	0.30	0.04	1,946.9	265.9	76.6
Little Gunpowder Falls	17.36	11.55	2.77	1.51	0.30	0.04	2,128.5	260.7	99.0
Bird River	9.64	6.39	1.53	1.48	0.28	0.04	631.0	86.4	22.0
Gunpowder River	9.64	6.39	1.53	1.48	0.28	0.04	766.7	104.7	24.0
Middle River	9.64	6.39	1.53	1.48	0.28	0.04	716.2	97.8	26.4
Liberty Reservoir	17.36	11.56	2.79	1.51	0.30	0.04	1,704.8	232.8	70.9
Patapsco River	14.49	9.73	2.78	1.26	0.25	0.04	1,549.8	208.1	88.0
Gwynns Falls	17.34	11.55	2.78	1.51	0.30	0.04	2,057.0	280.4	82.2
Jones Falls	17.36	11.55	2.77	1.51	0.30	0.04	968.4	132.3	29.7
Back River	9.64	6.39	1.53	1.48	0.28	0.04	558.9	76.9	24.7
Baltimore Harbor	9.64	6.40	1.53	1.48	0.28	0.04	675.9	92.3	31.05

There are several types of restoration programs and projects completed by EPS and the local EPS funded watershed associations that result in quantifiable pollution reduction. This section details how these numbers are obtained.

10.3.1 Stream Restoration

In September of 2014 the expert panel report on defining removal rates for stream restoration projects was completed. Baltimore County will begin using the protocols outlined in this report to calculate pollutant reductions starting with the Kelly Branch stream restoration project, which is scheduled to be completed in October of 2015. All projects completed prior to Kelly Branch will use the interim rates defined in the expert panel report. These new interim rates are available for use in WIP planning by all Bay states and localities. These interim rates are shown below:

- Total Nitrogen – 0.075 pounds per linear foot of stream restoration
- Total Phosphorus – 0.068 pounds per linear foot of stream restoration
- Total Suspended Solids (coastal plain) – 15.13 pounds per linear foot of stream restoration
- Total Suspended Solids (non-coastal plain) – 44.88 pounds per linear foot of stream

10.3.2 Shoreline Enhancement

To obtain nutrient reduction numbers associated with shoreline enhancement projects, it must be determined how much sediment the project is theoretically preventing from entering a waterway. To calculate an estimate of annual erosion at a given shoreline site, the equation V=LEB is used, where ‘V’ is volume eroded, ‘L’ is length of shoreline, ‘E’ is erosion rate and ‘B’ is bank height. This equation yields a volume expressed in cubic feet per year. Cubic feet are converted to pounds using a soil bulk density of 93.6 lb/ft^3. Pounds are then converted to tons using a factor of 0.0005. Lengths of shoreline and bank heights are taken from engineering and project plans prepared by consultants for Baltimore County and erosion rates from Department of Natural Resources website, http://shorelines.dnr.state.md.us are used.

Nitrogen and Phosphorus loading rates for shorelines are taken from *Eroding Bank Nutrient Verification Study for the Lower Chesapeake Bay* (Ibison, 92). The mean total N and total P loading concentrations in the study are 0.73 lb/ton and 0.48 lb/ton respectively (p. 44).

An expert panel report on urban shoreline erosion control is currently under review by the Chesapeake Bay Program's Watershed Technical Workgroup. Once this report is finalized Baltimore County will begin using the protocols for pollution reduction crediting outlined in the report.

10.3.3 Stormwater Management Facilities and Retrofits

Drainage areas for stormwater management facilities and retrofits are delineated to determine the acreage on which to apply the pollution reduction efficiencies shown in Table 9-4. Efficiencies are applied to pollutant loads based on land use of these drainage areas. Efficiencies used are taken from the Maryland Assessment and Scenario Tool (MAST).

Table 10-4: Percent Removal Efficiency of BMPs

BMP	Pollutants		
	TN	TP	TSS
Detention Facilities	5	10	10
Extended Detention Facilities	20	20	60
Wet Ponds and Wetlands	20	45	60
Infiltration Practices	80	85	95
Filtration Practices	40	60	80
Bioretention Practices	70	75	80
ESD Practices	50	60	90

Detention Facilities = Detention Pond and Hydrodynamic Devices
Extended Detention Facilities = Dry Extended Detention Ponds
Wet Ponds and Wetlands = Wet Pond and Shallow Marsh
Infiltration Practices = Infiltration Trench and Infiltration Basins, Porous Paving, and Dry Wells
Filtration Practices = Sand filters

Section 10.6.2 describes the calculation of pollutant loads for individual watersheds. The pollutant load reductions for stormwater management facility retrofits and conversions use the loads calculated in accordance with Section 10.6.2 and the pollutant removal efficiencies based on facility type found in Table 10-4.

Need a paragraph on the new method for calculating SWM removal, if we do not get the Guidance document written. If we do get it written, then we need to remove the material from this section and simply refer to the document.

10.3.4 Tree Planting

Tree planting occurs on public and private land, in 100' stream buffers and open areas. Nutrient reductions associated with stream buffer and tidal buffer plantings are obtained using the sum of a reduction efficiency and a land use change. For stream buffers, a reduction efficiency of 25% for Nitrogen, 50% for Phosphorus and 50% for sediment is applied to the area planted using the blended loading rate for the entire watershed in which the buffer planting is done. This blended loading rate is used because this efficiency is meant to apply to areas upland of the buffer that drain to the stream where the buffer is located. Efficiencies of 19% for N, 45% for P and 60% for sediment are used for tidal buffers. The land use change is from a pervious urban nutrient load to a forested nutrient load, using loading rates from the Phase 5.3 Chesapeake Bay Program

(CBP) Model. Table 9-3 shows these loading rates. Open area plantings (non-buffer) use only the land use change to calculate load reductions. When an area planted is not known, the ratio of 100 trees = 1 acre is used for calculations as per the MDE guidance document *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE June, 2011).

10.3.5 Downspout Disconnections, Rain Barrels and Rain Gardens

Individual downspouts that are directly connected to the storm drain system, either through piping or by discharging to impervious surfaces that lead to storm drains, can be disconnected from the system. Pollutant reductions are associated with the following types of disconnections using loading rates and reduction efficiencies from the Phase 5.3 CBP Watershed Model:

- Downspout Disconnection & Rain Barrels - Rooftop area disconnected is estimated and the impervious urban pollutant-loading rate for the respective watershed (see Table 10-3) is calculated for this estimated area. A default rooftop area of 250 sq. ft. is used when actual area is not available. Pollutant reduction efficiencies are then applied to the estimated pollutant load from the rooftop. Reduction efficiencies are taken from the MDE Guidance Document (June 2011) and are shown in Table 9-5.

- Rain Gardens - Rain gardens drain specific areas of pervious and/or impervious surface. By applying the watershed specific pollutant loading rates from Table 9-3 to the drainage area of the rain garden and applying the reduction efficiencies from Table 9-5 to these loads, pollutant reduction numbers for rain gardens can be determined. Reduction efficiencies for rain gardens are taken from MAST.

Table 10-5: Percent Removal Efficiency of BMPs

BMP	Pollutants		
	TN	TP	TSS
Downspout Disconnections	50	60	90
Rain Barrels	50	60	90
Rain Gardens	70	75	80

10.4 Restoration Progress

This section presents information on the restoration progress not cover elsewhere (Section 7 street sweeping and storm drain cleaning, Section 5 Illicit Connection Program) in the report. The Department of Environmental Protection and Sustainability (EPS) through a variety of programs is responsible for the bulk of the restoration activity within the County. These activities are reported in section 10.4.1. The Baltimore County Department of Public Works (DPW restoration activities are reported in section 10.4.2. The citizen based restoration actions of the local watershed associations supported by the Baltimore County Watershed Restoration Planning and Implementation grants are summarized in Section 10.4.3. Redevelopment/revitalization projects that have resulted in water quality improvements are reported in Section 10.4.4. All actions that result in water quality improvement are summarized by watershed in Section 10.4.5.

10.4.1 EPS Restoration Programs

EPS restoration programs are administered by various sections within the department. The restoration progress is reported of the EPS programs are reported by the Section administering the program. The Watershed Restoration Section administers the Capital Restoration Program (also called the Waterway Improvement Program). Watershed Restoration is responsible for the

oversight of the design and construction of capital projects that include; stream restoration, shoreline erosion control, conversion of existing stormwater facilities for enhanced water quality treatment, and stormwater retrofits. The Forest Management and Sustainability Section is responsible for programs related to reforestation and tree canopy planting. These activities are detailed in Section 10.4.1.2. The Groundwater Management Section has responsibility for administration of the Bay Restoration Fund grants to Baltimore County that result in connections of existing on-site disposal systems (OSDS) to the sanitary sewer and upgrades of existing OSDS to denitrifying systems, both resulting in the reduction of nutrients discharged to the environment. These activities along with OSDS pump-out information are presented in Section 10.4.1.3

10.4.1.1 Watershed Restoration Section - Capital Restoration Projects

Capital Restoration Projects are reported by watershed below and include both completed projects and projects under design or construction with a table for each watershed. Each table includes columns for project name, project type, either linear feet or acres of the project depending on project type, cost for completed projects or estimated costs for projects under design or construction, year of completion (fiscal year after 2011), calculated pollutant removal for nitrogen, phosphorus, and sediment for competed projects (estimated for projects under design or construction), and the impervious surface restoration credit for each completed project (estimated for projects under design or construction).

10.4.1.1.1 Deer Creek Watershed

Due to the rural nature of this watershed, a watershed management plan is not required by previous NPDES – Municipal Stormwater Discharge Permits, but is required by the latest permit. Baltimore County participated in the Harford County sponsored Deer Creek Watershed Restoration Action Strategy development, and considers this document as meeting the requirement to assess all of the County waters by the end of the current permit. Baltimore County's portion of this watershed is approximately eleven square miles. There are no capital improvement projects existing in or currently planned for this watershed. Deer Creek is part of the Susquehanna River Basin. The predominate land use in the watershed is agriculture.

10.4.1.1.2 Prettyboy Reservoir Watershed

There have not been any capital improvement projects completed by Baltimore County EPS – Watershed Restoration Section in the Prettyboy watershed to date.

10.4.1.1.3 Loch Raven Reservoir Watershed

Capital Improvement projects completed by Baltimore County EPS in the Loch Raven watershed are shown in Table 10-6. At the end of fiscal year 2015, nine stream restoration projects had been completed resulting in the restoration of 4.5 miles of stream channel. An additional 2.4 miles of stream restoration are either in design or construction and are anticipated to be completed within the next two years. Five existing stormwater management facilities representing 69.5 acres of urban land have been converted to provide better water quality treatment, while an additional 183.5 acres of urban land have been retrofitted with new stormwater management facilities to provide water quality treatment.

Table 10-6: CPO Projects in the Loch Raven Reservoir Watershed

Capital Improvement Projects Through FY15 Loch Raven Reservoir Watershed								
Project	**Facility Type**	**DA (LF)**	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Spring Branch Retrofit (#2880)	NWET	49.5	276,473	97	128.4	5.9	16,640.2	7.9
Spring Branch SR	SR	(10,000)	1,868,380	97	750.0	680.0	448,800.0	100.0
Long Quarter Branch Ret (#2879)	NWET	134.0	150,000	99	198.5	20.3	26,170.4	11.1
Long Quarter Branch SR	SR	(2,300)	564,581	99	172.5	156.4	103,224.0	23.0
Dulaney Valley Branch SR	SR	(1,700)	220,000	98	127.5	115.6	76,296.0	17.0
East Beaver Dam Run I	SR	(2,000)	372,000	00	150.0	136.0	89,760.0	20.0
Goodwin Run @ Padonia	SR	(700)	491,000	02	52.5	47.6	31,416.0	7.0
Hampton Branch	SR	(2,500)	630,000	04	187.5	170.0	112,200.0	25.0
Western Run@Ashland Ch	SR	(500)	365,675	04	37.5	34.0	22,440.0	5.0
Spring Branch II SR	SR	(2,500)	1,080,495	08	187.5	170.0	112,200.0	25.0
East Beaver Dam Run II	SR	(1,600)	765,846	15	120.0	108.8	71,808	16.0
Industry Lane Pond 2 (#578)	CNV	5.5	67,217	15	15.6	2.3	1,071.27	6.05
Mays Chapel Pond 3 (#85)	CNV	18.0	39,860	15	69.4	6.4	8,560.5	8.64
Warren Manor (#115)	CNV	9.9	32,347	15	7.4	0.4	424.2	3.91
Willowbrook (#1868)	CNV	14.5	32,144	15	30.2	3.1	1,003.8	5.78
Mayfair Pond 2 (#1064)	CNV	21.6	39,478	15	30.3	1.2	1,406.6	6.29
TOTALS		**(23,800) 253.0**	**6,995,496**		**2,264.8**	**1,658.0**	**1,123,421.0**	**287.7**
Projects Under Design or Construction								
Kelly Branch @ Dulny Vly	SR	(3,500)	949,870		262.5	238.0	157,080.0	35.0
Long Quarter @ Shetland Hills	SR	(1,500)	1,058,000		112.5	102.0	67,320.0	15.0
Dulaney Valley Branch @ Windmere	SR	(7,500)	?		562.5	510.0	336,600.0	75.0
Estimated Totals		**(12,500)**	**2,007,870+**		**937.5**	**850.0**	**561,000.0**	**125.0**

Abbreviations
NWET: New Wet Pond RET: Retrofit SR: Stream Restoration

10.4.1.1.4 Lower Gunpowder Watershed

Capital Improvement projects completed by Baltimore County EPS in the Lower Gunpowder River watershed are shown below in Table 10-7. In the Lower Gunpowder Falls 6 stream restoration projects addressing 4 miles of degraded stream channel have been completed. An addition 2 projects are under design to address a further 1.23 miles of degraded stream channel. Eleven existing stormwater management facilities serving 101 urban acres have been converted to provide better water quality, with an additional four ponds currently under design that will provide better water quality for 50.7 acres or urban land within the next two years..

Table 10-7: CPO Projects in the Lower Gunpowder Falls Watershed

Capital Improvement Projects Through FY15 Lower Gunpowder River Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Minebank Run I	SR	(7,000)	1,189,684	00	525.0	476.0	314,160.0	70.0
Northwind @ Simms	REP	23.8	8,000	04	na	na	na	na
Minebank Run II Minebank LRHS Trib Retro	SR	(10,000)	4,400,000	05	750.0	680.0	448,800.0	100.0
Minebank Run Trib @Waller	SR	(482)	258,958	08	36.2	32.8	21,632.2	4.8
Gunpowder Falls @ Cromwell (DPW)	SR	(1,500)	2,500,000	09	112.5	102.0	67,320.0	15.0
Jennifer Branch	SR	(6,100)	3,449,803	13	457.5	414.8	273,768.0	61.0
Lower Minebank	SR	(3,000)	1,275,100	15	225.0	204.0	134,640.0	30.0
St Isaac Jogues (#279)	CNV	11.1	72,904	15	20.9	2.5	922.5	5.41
Cedarside Farm (#393)	CNV	15.4	47,061	15	36.4	4.2	1,940.1	7.24
Doncaster Village Pond 2 (#452)	CNV	4.6	51,937	15	21.1	1.7	2,696.9	3.11
Doncaster Village Sec 6 (#453)	CNV	7.75	76,996	15	42.6	2.8	4,057.5	3.62
Erd Manor (#473)	CNV	8.6	82,463	15	34.8	2.3	3,467.5	4.29
Fullerton Farms (#517)	CNV	8.8	57,890	15	20.5	1.4	2,269.7	1.44
Glen Mill Estates Pond 2 (#525)	CNV	6.5	72,089	15	21.4	1.4	2,027.4	1.75
Robin Ridge Pond 1 (#815)	CNV	7.0	52,155	15	29.6	2.0	2,990.1	3.66
Satyr Woods (#845)	CNV	22.0	62,278	15	88.9	6.2	9,417.7	8.41
Satyr Woods South (#846)	CNV	3.2	44,580	15	13.1	1.0	1,539.7	1.24
Robin Ridge 2 (#1764)	CNV	6.2	41,590	15	26.0	1.9	3,002.0	2.58
TOTALS		**(28,082) 125.0**	**13,743,488**		**2,461.5**	**1,937.0**	**1,294,651.3**	**323.6**
Projects Under Design or Construction								
Lower Gun @ Proctor	SR	(2,000)	1,446,872		150.0	136.0	89,760.0	20.0
Lower Gun @ 7 Courts	SR	(4,500)	1,062,714		337.5	306.0	201,960.0	45.0
Glen Mill Estates Pond 1 (#524)	CNV	10.3	51,520		36.2	2.8	3,495.9	3.78
Scott's Haven (#850)	CNV	19.2	57,910		67.4	5.2	6,516.6	9.6
Minte Homes (#631)	CNV	4.5	?		15.8	1.2	1,527.3	3.57
Perry Hall Courts Section 2 (#1744)	CNV	16.7	?		58.7	4.5	5,668.1	6.82
Estimated Totals		**(6,500) 50.7**	**2,619,016+**		**665.6**	**455.7**	**308,927.9**	**88.77**

Abbreviations:
REP: Repair SR: Stream Restoration CNV: SWM Pond Conversion

10.4.1.1.5 Little Gunpowder Falls Watershed

No capital restoration projects have been completed or are planned in the Little Gunpowder Falls watershed.

10.4.1.1.6 Bird River Watershed

Capital Improvement projects completed by Baltimore County EPS in the Bird River watershed are shown below in Table 10-8. Ten completed stream restoration projects have resulted in the

restoration of 4.8 miles of degraded stream channel by the end of fiscal year 2015. An additional 3.7 miles of stream channel restoration are under design or construction. Six stormwater management facilities serving 253.7 acres of urban land have been converted to provide better water quality, while 4 stormwater retrofit projects have provided new facilities to provide water quality for a further 236 acres of urban land.

Table 10-8: Bird River Watershed – CIP Status

Capital Improvement Projects Through FY15 Bird River Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Impervious Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Burnam Woods (#348)	CNV	31.7	11,687	95	50.4	6.9	3,695.5	0.1
Featherhill (#493)	CNV	77.5	18,013	95	82.1	15.5	8,485.1	0.0
Lawrence Hill (#650)	CNV	52.5	102,091	96	99.8	11.1	5,636.3	2.9
S Fork WMR SR	SR	(1,900)	391,803	98	142.5	129.2	85,272.0	19.0
N Fork WMR @ Perryvale	SR	(800)	120,000	99	60.0	54.4	35,904.0	8.0
Perryvale Retrofit (#754)	CNV	42.8	120,000	99	66.2	8.4	4,433.2	0.0
S Fork @ Franklin Square (#2057)	NWET	46.0	935,416	99	95.1	16.1	8,325.1	13.9
White Marsh Mall Retrofit (#2878)	RET	129.6	435,838	99	241.4	33.3	16,605.0	18.1
White Marsh Bus. Comm.* (#4994)	RET	53.9	235,597	99	na	na	na	na
N Fork WMR @ Slvr Mdw	SR	(400)	128,945	99	30.0	27.2	17,952.0	4.0
White Marsh Run SR	SR	(4,000)	982,387	00	300.0	272.0	179,520.0	40.0
WMR @ Woodcroft	SR	(2,000)	700,000	00	150.0	136.0	89,760.0	20.0
Evergreen Pond Retrofit (#478)	CNV	22.2	40,828	02	35.9	4.7	2,518.6	0.0
N. Fork White Marsh Run	SR	(7,000)	1,239,140	04	525.0	476.0	314,160.0	70.0
East Br. Honeygo Run	SR	(4,000)	1,330,000	04	300.0	272.0	179,520.0	40.0
S Fork @ Franklin Sq SR	SR	(2,600)	600,000	04	195.0	176.8	116,688.0	26.0
S Fork WMR@ Kings Ave.	SR	(2,500)	800,000	10	187.5	170.0	112,200.0	25.0
WMR @ Orbitan	SR	(300)	175,000	10	22.5	20.4	13,464.0	3.0
Southfield Pond 2 (#978)	CNV	27.0	86,764	14	31.3	6.7	806.6	11.4
Magnolia	RET	6.5	574,845	15	30.5	3.2	1,341.8	2.2
TOTALS		**(25,500) 489.7**	**9,028,354**		**2,645.2**	**1,839.9**	**1,196,287.2**	**241.6**
Projects Under Design or Construction								
WMR @ WM Rd	SR	(10,000)	13,064,171		750.0	680.0	151,300.0	100.0
N. Fork II West Branch	SR	(8,000)	1,948,250		600.0	544.0	121,040.0	80.0
WMR @ Upton Rd	SR	(1,350)	**?**		101.3	91.8	20,425.5	13.5
Estimated Totals		**(19,350)**	**15,012,421+**		**1,451.3**	**1,315.8**	**292,765.5**	**193.5**

Abbreviations
CNV: SWM Pond Conversion
SR: Stream Restoration
NWET: New Wet Pond
RET : Retrofit
*This project is no longer there due to I-95 expansion

10.4.1.1.7 Gunpowder River Watershed

Capital Improvement projects completed by Baltimore County EPS in the Gunpowder River watershed are shown below in Table 10-9. Due to the limited amount of urban land in the Gunpowder River watershed, little restoration effort has been completed to date, that effort consisted of a single shoreline erosion control project addressing 140 feet of shoreline, a single stormwater retrofit addressing 52.9 acres of urban land and the conversion of an existing stormwater management facility serving 4.7 acres of urban land to provide better water quality treatment.

Table 10-9: Gunpowder River Watershed – CIP Status

Capital Improvement Projects Through FY15 Gunpowder River Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Impervious Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Carrollwood Shoreline	SE	(140)	150,000	93	20.5	13.5	56,160.0	5.6
Carrollwood Park (#1422)	RET	52.9	350,000	95	148.1	22.2	13,666.5	19.0
Carrollwood Shoreline Replacement	REP	na	207,645	13	na	na	na	na
Chase Manor Pond (#1167)	CNV	4.7	68,834	14	7.0	1.6	335.1	0.0
TOTALS		**(140) 57.6**	**776,479**		**175.6**	**37.3**	**70,161.6**	**24.6**
Projects Under Design or Construction								

Abbreviations
REP: Repair SE: Shoreline Enhancement RET: Retrofit
CNV : SWM Pond Conversion

10.4.1.1.8 Middle River Watershed

Capital Improvement projects completed by Baltimore County EPS in the Middle River watershed are shown below in Table 10-10. Five shoreline erosion control projects have been completed in Middle River addressing 0.94 miles of eroding shoreline. A single stream restoration project has restored 1,000 feet of degraded stream channel, and 4 stormwater retrofit projects have provided water quality for 343.7 acres of urban land and one conversion of an

existing stormwater facility provides better water quality treatment for an additional 15.9 acres of urban land.

Table 10-10: Middle River Watershed – CIP Status

Capital Improvement Projects Through FY15 Middle River Watershed								
Project	**Facility Type**	**DA** (ft)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Dark Head Park	SE	(780)	168,000	90	426.2	280.2	1,167,600	31.2
Rocky Point Beach	SE	(1,110)	324,945	93	1,319.7	867.7	3,615,600	44.4
Pottery Farm Park	SE	(1700)	351,000	95	190.5	125.3	521,914	68.0
Hawthorne Park	SE	(350)	64,000	95	39.1	25.7	107172	14.0
Norman Creek (#4993)	STWET	25.3	131,151	95	39.6	4.6	2,531.7	2.8
Turkey Point	SE	(1,000)	127,539	97	112.7	74.1	308,880	40.0
Sue Creek (#4992)	STWET	6.4	93,274	97	12.5	1.8	1,014.3	1.5
Dark Head Park II (repair)	REP	na	15,094	99	na	na	na	na
Tall Trees	SR	(1,000)	1,100,000 combined	06	75.0	68.0	15,130.0	10.0
Tall Trees (#4254)	RET	183.1		06	329.6	46.0	25,129.7	56.7
Frog Mortar (#4208)	RET	128.9	82,000	08	160.6	22.1	12,599.8	22.8
Middleborough Rd. (#711)	CNV	15.9	65,558	14	17.7	2.8	555.8	5.99
TOTALS		**(5,940) 359.6**	**2,522,561**		**2,723.2**	**1,518.3**	**5,778,127**	**291.4**

Abbreviations:
SR: Stream Restoration
RET: Retrofit
REP: Repair
SE: Shoreline Enhancement
STWET: Stormwater Wetland
CNV : SWM Pond Conversion

10.4.1.1.9 Liberty Reservoir Watershed

No capital restoration projects have been completed or are planned in the Liberty Reservoir watershed.

10.4.1.1.10 Lower North Branch Patapsco River Watershed

Capital Improvement projects completed by Baltimore County EPS in the Lower North Branch Patpasco watershed are shown in Table 10-11. Six stream restoration projects have been completed in the Lower North Branch of the Patapsco River watershed, however, one project does not count toward meeting either pollutant load reductions or impervious surface restoration credit as it was a required environmental project included in the Baltimore County Sanitary Sewer Concent Decree. We have left it in the table for informational purposes. The remaining 5 completed stream restoration projects have restored 0.6 miles of degraded channel. An additional 4 projects will triple the miles of stream channel restored by addressing an additional 1.8 miles of channel. Two completed stormwater retrofits have addressed water quality for 24.4 acres of urban land. An additional conversion of an existing stormwater management facility is in design and when constructed will provide enhanced water quality treatment for an additional 14.0 acres of urban land.

Table 10-11: Patapsco River Watershed – CIP Status

Capital Improvement Projects Through FY15 Patapsco River Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Bloomsbury (DPW) (#4256)	RET	10.3	unknown	90	27.7	1.9	2,551.6	2.0
Herbert Run@ Selma Ave.	SR	(550)	227,000	00	41.3	37.4	24,684.0	5.5
Herbert Run @ Leeds Ave	SR	(300)	78,144	03	22.5	20.4	13,464.0	3.0
2203 Sulphur Spring Rd	SR	(200)	111,000	03	15.0	13.6	8,976.0	2.0
Halethorpe Streambank	SR	(100)	61,500	03	7.5	6.8	4,488.0	1.0
Bens Run SR	SR	(2,000)	570,964	04	150.0	136.0	89,760.0	20.0
Bens Run Retrofit (#4390)	STWET	14.1		04	37.0	3.5	4,138.0	1.6
Herbert Run @ Paradise Ave. – cd	*SR*	*(1,000)*	*482,000*	*10*	*na*	*na*	*na*	*na*
TOTALS		**(4,150) 24.4**	**1,530,608**		**301.0**	**219.6**	**148,061.6**	**35.1**
Projects Under Design or Construction								
Catonsville Park Retrofit (#358)*	SR (& RET)	(2,100)	800,000		157.5	142.8	94,248.0	21.0
Crowin Property (#421)	CNV	14.0	58,874		49.2	3.8	4,751.7	6.49
Cooper Branch @ Oella	SR	(2,400)	1,250,000		180.0	163.2	107,712.0	24.0
Cedar Branch @ Inwood	SR	(3,320)	2,056,896		249.0	225.8	149,001.6	33.2
Sawmill Trib @ Patleigh	SR	(1,920)	?		144.0	130.6	86,169.6	19.2
Estimated Totals		**9,740**	**4,165,770+**		**779.7**	**666.2**	**441,882.9**	**103.89**

Abbreviations
SR: Stream Restoration STWET: Stormwater Wetland
RET: Retrofit *cd*: Consent Decree requirement D: Design C: Construction
* joint project w/DPW

10.4.1.1.11 Gwynns Falls Watershed

Capital Improvement projects completed by Baltimore County EPS in the Gwynns Falls watershed are shown in Table 10-12. By the end of FY2015, 7,758 linear feet (1.5 miles) of degraded stream channel had been restored, however, 2,500 linear feet (0.5 miles) of stream restoration were required for the sanitary sewer consent decree and therefore cannot be counted toward pollutant load reductions nor impervious surface restoration credit. Two hundred and fifty feet are also not counted toward pollutant load and impervious surface as the project listed is associated with a repair of a previous project. An additional 250 are also not counted as the project consisted of a buffer enhancement for which there is currently no crediting of pollution reduction nor impervious surface restoration. Ten existing stormwater management facilities serving 228.5 acres of urban land have been converted to facility types providing greater water quality benefits, while an additional 34.3 acres of urban land have been retrofitted with stormwater management facilities providing water quality improvement.

Table 10-12: CPO Projects in the Gwynns Falls Watershed

Capital Improvement Projects Through FY15 Gwynns Falls Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Year**	**Removal Rate (lb./year)**			**Impervious Acres**
					TN	**TP**	**TSS**	
Completed Projects								
GF Trib @ Greenshire Ct	SR	(135)	17,690	99	27.0	9.2	41,850	1.4
Dead Run @ Security/McD	BE	(250)	23,690	02	na			
Rutherford Business Ctr. (#841)	CNV	52.5	134,000	03	96.7	4.1	29,355.8	22.2
Dead R@ HS Ftbridge/wall	SR	(200)	141,000	03	40.0	13.6	62,000	2.0
Woodlawn HS retrofit (#3646)	RET/BE	10.3	206,000	03	79.7	5.1	6,804.9	4.8
Dead Run@ Whitehead 1	SCR	17.0	155,000	03	13.7	2.1	2,861.2	7.7
Dead Run@ Whitehead 2	SCR	7.0			5.5	0.8	1,116.8	5.2
DR @ Woodlawn Dr (Fox)	SR	(450)	232,594	04	90.0	30.6	139,500	4.5
GF @ Chartley SR	SR	(2,000)	970,000	06	400.0	136.0	620,000	20.0
Gwynns Falls @ Gwynnbrook – cd	*SR*	*(2,500)*	*470,000*	*09*	*NA*			
Upper Gwynns Falls 5 # 27	CNV	19.6	816,366	13	115.4	9.2	15,255.4	11.66
Upper Gwynns Falls 5 #26	CNV	19.4			75.5	5.3	8,699.7	8.16
Upper Gwynns Falls 5 #47	CNV	11.1			108.0	7.3	11,756.4	6.12
Upper Gwynns Falls 5 #33	CNV	21.4			95.5	6.9	11,151.8	11.61
Upper Gwynns Falls 5 #110	CNV	85.8			241.5	14.4	22,132.8	17.96
The Woods of Winands #996	CNV	3.7	47,738	14	16.2	1.0	1,605.2	1.2
Scott's Level @ McDonogh	SR/RET	(1,973)	2,013,059	14	148.0	134.2	88,548.2	19.7
Gwynns Falls @ Gwynnbrook Repair	REP	(250)	150,000	15	*NA*			
Rider Mill Pond 1 (#2090)	CNV	5.8	69,706	15	14.7	1.5	831.0	1.7
The Mills @ Owings Mills Pond 1 (#1687)	CNV	3.8	27,854	15	8.4	0.9	405.5	2.5
The Mills @ Owings Mills Pond 2 (#1688)	CNV	5.4	43,504	15	10.2	1.0	430.3	1.5
TOTALS		**(7,758) 262.8**	**5,518,201**		**1,586.0**	**383.2**	**1,064,305.0**	**149.9**
Projects Under Design or Construction								
DR @ West View Park	SR	(4,700)	1,540,312		352.5	319.6	210,936.0	47.0
Gwynns Falls @ Chartley II	SR	(2,000)	475,000		150.0	136.0	89,760.0	20.0
Discovery Acres 2 (#451)	CNV	23.5	102,868					5.17
Scott's Level @ Upper Scott's Level Park	SR	(2,900)	2,500,000		217.5	197.2	130,152.0	29.0
Scott's Level @ Marriottsville	SR	(1,500)	357,975		112.5	102.0	67,320.0	15.0
Holsan Prop Sec 1 #270	CNV	5.9	?		20.7	1.6	2,002.5	1.92
Church La #408	CNV	7.7	?		27.0	2.1	2,613.5	2.51
Courtland Manor #157	CNV	22.8	?		80.0	6.2	7,738.6	3.99
Sunset Ridge #1112	CNV	20.5	?		72.0	5.5	6,957.9	4.62

Pikeswood Village #1277	CNV	23.5	?		82.5	6.4	7,976.1	7.05
Estimated Totals		**(11,100) 103.9**	**4,873,287+**		**612.2**	**321.0**	**224,760.6**	**136.26**

Abbreviations:
CNV: SWM Pond Conversion
SR: Stream Restoration
RET: Retrofit
SCR: StormCeptor
HAB: Habitat improvement
BE: Buffer Enhancement
cd: Consent Decree requirement
REP: Repair

10.4.1.1.12 Jones Falls Watershed

Capital Improvement projects completed by Baltimore County EPS in the Jones Falls watershed are shown in Table 10-13. In the Jones Falls Watershed 9 stream restoration projects have been completed restoring 1.9 miles of degraded stream channel. Three stormwater retrofit projects have been completed provide water quality management for 195.9 acres of urban land. An additional 7 stream restoration projects are under design or construction and will restore an additional 4.6 miles of stream channel impacted by urban land use.

Table 10-13: Jones Falls Watershed – CIP Status

Capital Improvement Projects Through FY13 Jones Falls Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Lake Roland Ag BMPs	SR	(1500)	45,000	95	112.5	102.0	67,320.0	15.0
Moore's Branch @ Ltfoot	SR	(100)	25,000	96	7.5	6.8	4,488.0	1.0
Robin Hood Cr. minor outf	RET	12.5	307,359	98	27.1	2.8	2,141.4	2.6
Kenilworth Park	RET	97.5		98	284.9	42.4	35,439.0	54.0
Orchard Hills outfall #149	RET	85.9		98	206.7	22.3	17,211.4	21.7
Rol. Run - Essex farm Rd.	SR	(250)	479,488	98	18.8	17.0	11,220.0	2.5
Roland Run – Sem. Ave.	SR	(150)		98	11.3	10.2	6,732.0	1.5
Towson Run – VFW Hall	SR	(600)	349,869	00	45.0	40.8	26,928.0	6.0
Roland Run – Jeffers Rd.	SR	(1,550)	451,083	02	116.3	105.4	69,564.0	15.5
Wood Valley	SR	(2,000)	1,077,510	04	150.0	136.0	89,760.0	20.0
Roland Run-Riderwd. Hills	SR	(2,400)	1,100,000	07	180.0	163.2	107,712.0	24.0
Roland Run @ Kellogg	SR	(1,500)	823,642	12	112.5	102.0	67,320.0	15.0
TOTALS		**(10,050) 195.9**	**4,658,951**		**1,272.6**	**750.9**	**505,835.8**	**178.8**
Projects Under Design or Construction								
Rol Run @Gspring*	SR/RET	(3,500)	2,887,000		262.5	238.0	157,080.0	35.0
Towson Run @ Cloisters	SR	(3,000)	1,558,401		225.0	204.0	134,640.0	30.0
Deep Run @ Meadowood	SR	(3,000)	1,500,000		225.0	204.0	134,640.0	30.0
Moore's Branch @ Lightfoot	SR	(6,330)	2,700,000		474.8	430.4	284,090.4	63.3
Boyce Ave	SR	(1,500)	?		112.5	102.0	67,320.0	15.0
Slaughterhouse Run (Upper)	SR	(2,300)	1,000,000		172.5	156.4	103,224.0	23.0
Slaughterhouse Run (Middle)	SR	(4,700)	800,000		352.5	319.6	210,936.0	47.0
Estimated Totals		**(24,330)**	**10,445,401+**		**1,824.8**	**1,654.4**	**1,091,930.4**	**243.3**

*reduction estimates are for SR only
Abbreviations
SR: Stream Restoration
RET:Retrofit
DET: Detention Pond

10.4.1.1.13 Back River Watershed

Capital Improvement projects completed by Baltimore County EPS in the Back River watershed are shown below in Table 10-14. A significant number of restoration projects have been completed in the Back River watershed, including:

- 10 stream restoration projects restoring 2.3 miles of stream channel,
- 6 shoreline erosion control projects restoring 2.1 miles of eroded shoreline,
- 9 stormwater management projects providing water quality improvement for 694.4 acres of urban land, and
- 11 stormwater facility conversion projects providing additional water quality for 114.9 acres of urban land.

An additional 2.0 miles of stream channel restoration are currently under construction and the conversion of an additional 5 stormwater management facilities serving 56.8 acres of urban land to provide enhanced water quality are being planned.

Table 10-14: CPO Projects in the Back River Watershed

Capital Improvement Projects Through FY13 Back River Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Coxs Point I	SE	(220)	45,000	91	113.5	74.6	311,200	8.8
Rocky Point Long Creek	SE	(1,370)	151,667	94	407.2	267.7	1,115,618	54.8
Coxs Point II	SE	(1,950)	295,000	95	1,388.2	912.8	3,803,352	78.0
Lynch Point Cove – SM (#1380)	RET	26.7	250,000	95	50.1	7.0	3,094.4	0.0
Rocky Point @ Ballestone	SE	(2,000)	389,480	97	290.1	190.8	794,851.0	80.0
Stemmers Run@ Dbl Rock	SR	(1,881)	362,905	97	141.1	127.9	84,419.3	18.8
Stemmers Run VFW (#2240)	SCR	15.4	121,000	98	6.1	1.3	474.3	0.0
Stemmers Run Garnet (#2241)	SCR	13.0			4.9	0.9	309.8	0.0
Stemmers Run BIO	RET	1.0			3.4	0.6	282.7	0.6
Redhouse E.S. Retrofit (#4202)	RET	56.2	136,794	98	103.8	12.9	5,585.7	6.5
Greenhill WQ Retrofit (#2112)	SCR	3.5	35,273	98	1.4	0.3	97.7	0.0
Redhouse Run Md-7 (#1933)	SCR	1.9	49,925	99	0.9	0.3	105.5	0.0
Briens Run @ Rossville Industrial Park (#820)	RET	158.8	184,210	99	252.5	39.6	19,056.6	33.1
Herring Run (Wiltondale)	SR	(1,400)	295,860	99	105.0	95.2	62,832.0	14.0
Hart Miller Island	SE	(3,000)	338,000	99	353.0	232.1	967,075.0	120.0
Herring Run (Goucher)	SR	(300)	158,538	00	22.5	20.4	13,464.0	3.0
Redhouse Run @ Overlea Trib C	SR	(2,600)	529,260	01	195.0	176.8	116,688.0	26.0
Linover Park	SR	(1,000)	206,745	02	75.0	68.0	44,880.0	10.0
Rocky Pt. Habitat Creation	HAB	(690)	519,505	02	78.0	51.3	213,670.0	27.6
BR @ Martin Blvd Interchange (#3420 & 3421)	NEXT	417.9	629,144	04	515.1	75.2	34,322.6	57.7
Linwood Avenue	SR	(500)	283,968	04	37.5	34.0	22,440.0	5.0
Glenwest	SR	(500)	203,220	04	37.5	34.0	22,440.0	5.0

Capital Improvement Projects Through FY13 Back River Watershed								
Project	**Facility Type**	**DA** (LF)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Golden Tree Sec I	CNV	23.0	Dev paid	04	33.5	2.9	2,503.0	6.8
Golden Tree Sec III	CNV	15.7	Dev paid	04	22.7	1.9	1,598.6	4.1
Herring Run Bank Sta @ Weatherbee	SR	(100)	30,000	07	7.5	6.8	4,488.0	1.0
Herring Run @ Sussex Rd.	Srepair	na	96,572	07	na	na	na	
BR Trash Boom	TRA	na	80,000	10	na	na	na	
Her Run @Collinsdale-cd	*SR*	*(2,000)*	*661,395*	*10*	*na*	*na*	*na*	
Rdhse Rn@ St. Pat Rd	SR	(2,000)	943,361	11	400.0	136.0	620,000	20.0
BR Trash Boom Maintenance	TRA	na	70,000	11	na	na	na	
Essex Skypark	SE	(2,610)	1,267,588	12	596.3	392.1	1,633,647.6	104.4
BR Trash Boom Maintenance	TRA	na	70,000	12	na	na	na	
SWAP SWM Conv #1829	CNV	10.7	15,526	13	16.6	2.5	1,226.8	4.59
SWAP SWM Conv #553	CNV	8.3	27,687	13	19.9	2.5	1,166.1	4.18
SWAP SWM Conv #932	CNV	7.8	29,229	13	10.9	1.9	288.3	7.36
SWAP SWM Conv #305	CNV	6.7	23,441	13	8.5	2.8	248.1	4.86
BR Trash Boom Maintenance	TRA	na	88,100	13	na	na	na	
Urbanwood (#381)	CNV	4.19	48,701	14	8.9	0.9	417.3	1.83
Woodward Square Pond 1 (#164)	CNV	12.1	115,531	14	13.1	2.4	281.0	3.11
Woodward Square Pond 2 (#170)	CNV	7.4	69,354	14	8.7	1.5	219.2	2.32
Perring Woods Court (#181)	CNV	8.5	75,613	14	11.1	2.0	277.6	4.28
Kahler Property (#624)	CNV	10.5	19,327	15	11.1	2.6	213.1	3.55
TOTALS		**(24,121) 809.3**	**8,916,919**		**5,350.6**	**2,982.5**	**9,902,833.3**	**721.3**
Projects Under Design or Construction								
Tidal Back River Greening*	multiple		1,207,388		68.6	9.4	4,775.0	unk
HR @ Overlook	SR	(9,000)	3,500,000		675.0	612.0	403,920.0	90.0
Bread & Ch	SR	(1,523)	1,000,000		114.2	103.6	23,043.0	15.2
Goldentree Sec 2 Pond 2 (#534)	CNV	7.5	48,651		26.3	2.0	2,545.6	3.63
Goldentree Sec 1 (#532)	CNV	25.2	68,734		88.5	6.8	8,553.1	11.87
Goldeentree Sec 2 Pond 1 (#533)	CNV	3.76	44,067		13.2	1.0	1,276.2	2.34
Goldentree Sec. 3 (#535)	CNV	15.9	39,381		55.9	4.3	5,396.6	7.35
Rustic Ridge (#832)	CNV	4.43	37,748		15.6	1.2	1,503.6	1.77
Cox's Point	SE	?						
Estimated Totals		**(10,523) 56.79**	**5,945,969**		**1,057.3**	**740.3**	**451,013.1**	**132.16**

*waiting for as-builts, will require recalculating reductions
Abbreviations
CNV: SWM Pond Conversion
NWET: New Wet Pond
RET: Retrofit
SE : Shoreline Enhancement
cd-consent decree
ENH: Enhancement
SCR: StormCeptor
SR: Stream Restoration
HAB : Habitat improvement
TP: Tree Planting
TRA: Trash Removal

10.4.1.1.14 Baltimore Harbor Watershed

Capital Improvement projects completed by Baltimore County EPS in the Baltimore Harbor watershed are shown in Table 10-15. In the Baltimore Harbor watershed 12 shoreline erosion control project addressing 2.0 miles of eroded shoreline have been completed and 10 retrofit projects addressing 866.3 acres of urban land have been completed. An additional 4 shoreline control projects currently under design will address ~1.7 miles of additional eroded shoreline.

Table 10-15: CPO Projects in the Baltimore Harbor Watershed

Capital Improvement Projects Through FY13 Baltimore Harbor Watershed								
Project	**Facility Type**	**DA** (ft.)	**Cost**	**Date**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Concrete Homes	SE	(430)	65,000	90	133.4	87.7	365,452	17.2
Watersedge Park	SE	(480)	92,000	90	72.8	47.9	199,400	19.2
Merritt Point Park	SE	(1880)	175,000	90	128.5	84.5	352,000	75.2
Bear Creek I	SE	(475)	66,000	90	112.6	74.1	308,599	19.0
West Inverness	SE	(230)	19,000	90	14.1	9.3	38,800	9.2
Geise Ave. (#1365)	SCR	1.5	unk	89	0.6	0.1	61.1	0.0
Chink Creek (#4618)	RET	93.3	unk	90	186.3	28.3	15,367.9	16.7
Hughes Ave (#1965)	SCR	9.8	unk	90	3.4	0.6	255.1	0.0
Charlesmont Park	SE	(750)	47,000	93	76.9	50.5	210,600	30.0
Sandy Plains Elem.	SE	(380)	108,000	98	82.7	54.4	226,568	15.2
Tabasco Cove (#2917)	STWET	161.3	128,209	96	313.2	55.3	28,960.9	46.1
Battle Grove Park	SE	(420)	82,000	95	153.2	100.8	419,852	16.8
North Point Creek (#3575)	NEXT	83.6	117,277	98	154.2	20.2	10,688.1	10.3
Schoolhouse Cove 8 SCRs (#1934)	SCR	4.7	419,133	98	1.8	0.4	166.3	0.0
Schoolhouse Cove 8 SCRs (#1935)	SCR	7.4			2.9	0.6	270.1	0.0
Schoolhouse Cove 8 SCRs (#1936)	SCR	8.4			3.3	0.7	290.2	0.0
Schoolhouse Cove 8 SCRs (#1937)	SCR	7.5			3.0	0.7	281.1	0.0
Schoolhouse Cove 8 SCRs (#1938)	SCR	9.0			3.4	0.7	293.8	0.0
Schoolhouse Cove 8 SCRs (#1939)	SCR	10.3			4.2	1.0	419.3	0.0
Schoolhouse Cove 8 SCRs (#1940)	SCR	11.7			2.8	0.6	264.7	0.0
Schoolhouse Cove 8 SCRs (#1941)	SCR	11.9			4.18	1.2	514.0	0.0
Bear Creek II Shore	SE	(700)	138,558	99	83.2	54.7	228,010	28.0
Bear Creek II SD Retrofit (#4644)	NWET	10.1	93,026	99	20.8	3.4	1,867.5	2.3
Watersedge Park II (repair)	SE	(90)	21,062	99	na	na	na	
Lynch Cove Retrofit site-I	STWET	240.0	500,000 combined	03	366.1	77.6	43,904.3	87.3
Lynch Cove Retrofit site-II	STWET	188.9		03	197.7	45.7	27,565.4	56.07
Fleming Park	SE	(1,767)	540,303	07	25.6	16.9	70,228	70.7
Pleasure Island	SE	(3,100)	4,200,000	11	407.3	267.8	1,116,000	124.0
Schoolhouse Cove SCR & RET (#1942)	SCR/ STWET	6.9	146,000	11	2.6	0.5	217.4	0.0
TOTALS		**(10,702) 866.3**	**6,957,568**		**2,560.8**	**1,086.2**	**3,666,896.2**	**643.3**

Projects Under Design or Construction								
Stansbury Park (Rec and Parks Project)	SE	(317)	198,400		50.7	34.9	142,967	12.68
Fort Howard Park	SE	(4,000)			640.0	440.0	1,804,000	160.00
Inverness Park	SE	(2,600)			416.0	286.0	1,172,600	104.00
Watersedge Park	SE	(2,000)			320.0	220.0	902,000	80.00
Estimated Totals		**(8,917)**	**198,400+**		**1,426.7**	**980.9**	**4,021,567**	**356.68**

Abbreviations
CNV: SWM Pond Conversion
NEXT: New Extended Detention Pond
NWET: New Wet Pond
SCR: StormCeptor
SR: Stream Restoration
SE: Shoreline Enhancement
STWET: Stormwater Wetland

10.4.1.2 Forest Management and Sustainability - Reforestation and Urban Tree Planting

The Forest Management and Sustainability Section administers a number of present and past programs that provide restoration credits for meeting nutrient and sediment reductions. These include; the Community Reforestation Program (CRP) – Section 10.4.1.2.1, Cool Trees Project – Section 10.4.1.2.2, the Growing Home Campaign – Section 10.4.1.2.3, and the Big Tree Sale Program – Section 10.4.1.2.4. The Cool Trees Project and the Growing Home Campaign are no longer in existence.

10.4.1.2.1 Community Reforestation Program

The Community Reforestation Program (CRP) was established by the Department of Environmental Protection and Sustainability to provide a dedicated workforce for planting, monitoring, and maintaining forest mitigation projects. The Program is funded primarily through fees-in-lieu of mitigation for forests removed as a result of public and private land development, as required by the implementation of the County's Forest Conservation Act and Chesapeake Bay Critical Area Regulations. The plantings conducted with mitigation monies will not be given nutrient reduction credits due to the fact that these tree plantings are offsetting deforestation. The CRP is the only full-time countywide reforestation mitigation program among Maryland's counties.

The CRP includes a four-person reforestation crew that carries out year-round reforestation operations. The crew is based at a 1-acre site in eastern Baltimore County that is provided by the Department of Recreation and Parks. This home base houses a growing out nursery for 10,000 tree seedlings; equipment and machinery needed for planting, monitoring, and maintaining the reforestation projects; and office space for the reforestation team.

In the past, the CRP would occasionally undertake special grant-funded projects to improve water quality and groundwater recharge, as well as wildlife habitat. Unlike the plantings conducted with fee-in-lieu monies, grant funded projects will be given nutrient reduction credit. The most recent example is the expansion of forest buffers and the reforestation of fields on private rural properties in 2009. Recently, the county has hired contractors to supplement the County reforestation efforts. Table 10-16 shows these projects by watershed. In FY14 the CRP began planting trees to meet Watershed Implementation Plan (WIP) goals and these plantings are also eligible for nutrient reduction credits. The reforestation efforts are also part of the nutrient and sediment reduction strategy for meeting local TMDLs. These plantings are shown in Tables 10-17 and 10-18. The method for calculating pollutant reduction involves a land use conversion from urban pervious to forest. Additional reduction efficiency is applied for trees planted within a riparian buffer. These methods are described in Section 10.3.4.

Table 10-16: Baltimore County Non-Mitigation Reforestation Projects by Watershed Through FY13

Watershed	Acres Planted With Non-Mitigation Funds	N Reduction from Non-Mitigation Projects (lbs/yr)	P Reduction From Non-Mitigation Projects (lbs/yr)	Sed Reduction From Non-Mitigation Projects (lbs/yr	Impervious Acre Equivalent
Prettyboy	11.5	120.7	5.0	3,272.6	4.4
Loch Raven	28.1	279.6	10.7	7,320.1	10.7
Grand Totals	**39.6**	**400.3**	**15.7**	**10,592.7**	**15.0**

Table 10-17: Baltimore County Non-Mitigation Reforestation Projects by Watershed FY14

Watershed	Planting Type	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Impervious Acre Equivalent
Loch Raven	Upland	10.68	93.66	2.78	1,669.1	4.06
Middle River	Upland	12.80	62.21	3.07	913.7	4.86
Bird River	Upland	2.60	12.64	0.62	167.4	0.99
Patapsco	Buffer	0.12	1.11	0.04	46.7	0.05
Gwynns Falls	Upland	0.10	0.88	0.03	19.8	0.04
Total Upland		**26.18**	**170.49**	**6.54**	**2,816.7**	**9.99**
Total Buffer		**0.12**	**1.11**	**0.04**	**46.7**	**0.05**
Grand Totals		**26.3**	**170.5**	**6.54**	**2,816.7**	**10.04**

Table 10-18: Baltimore County Non-Mitigation Reforestation Projects by Watershed FY15

Watershed	Planting Type	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Impervious Acre Equivalent
Prettyboy	Upland	3.50	30.73	0.91	519.6	1.33
Loch Raven	Upland	42.16	369.74	10.96	6,588.8	16.02
	Buffer	10.68	119.14	4.03	2,511.78	4.06
Lower Gunpowder	Upland	1.70	14.93	0.44	321.8	0.65
	Buffer	1.79	20.22	0.67	816.02	0.68
Bird River	Upland	2.51	12.20	0.60	161.6	0.95
Liberty Reservoir	Buffer	0.60	6.48	0.21	200.3	0.23
Patapsco	Buffer	1.78	16.40	0.58	692.8	0.68
Gwynns Falls	Upland	1.32	11.58	0.34	261.7	0.5
Jones Falls	Upland	2.28	20.02	0.59	234.0	0.87
	Buffer	0.13	1.45	0.05	30.6	0.05
Back River	Buffer	1.24	8.12	1.98	209.1	0.47
Baltimore Harbor	Upland	1.67	8.13	0.40	102.2	0.63
	Buffer	4.70	31.41	1.88	1,034.63	1.79
Total Upland		**55.14**	**467.33**	**14.25**	**8,189.7**	**20.95**
Total Buffer		**20.92**	**203.22**	**9.41**	**4,495.2**	**7.95**
Grand Totals		**76.06**	**670.54**	**23.66**	**13,684.9**	**28.90**

Table 10-19: Baltimore County Non-Mitigation Proposed Reforestation Projects

Watershed	Planting Type	Acres	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Impervious Acre Equivalent
Deer Creek	Upland	0.60	5.27	0.16	123.09	0.23
Prettyboy	Upland	8.80	77.26	2.29	1,306.45	3.34
Loch Raven	Upland	10.84	95.18	2.82	1,694.08	4.12
	Buffer	14.85	140.94	4.38	3,304.52	5.64
Lower Gunpowder	Upland	5.86	51.39	1.52	1,109.30	5.86
	Buffer	11.30	127.66	4.38	5,151.39	4.29
Bird River	Upland	2.71	13.17	0.65	174.52	1.03
Middle River	Buffer	0.77	4.93	0.29	148.22	0.29
Liberty Reservoir	Upland	10.00	87.70	2.60	1,619.40	3.80
	Buffer	2.00	21.61	0.72	667.60	0.76
Patapsco	Upland	4.25	29.54	0.89	510.55	1.62
	Buffer	0.59	5.44	0.19	229.63	0.22
Gwynns Falls	Buffer	5.79	68.86	2.46	3,659.89	2.20
Jones Falls	Upland	1.93	16.95	0.50	198.04	0.73
Back River	Upland	1.42	6.90	0.34	74.11	0.54
	Buffer	0.09	0.59	0.04	15.18	0.03
Total Upland		**46.41**	**383.36**	**11.77**	**6,809.54**	**21.27**
Total Buffer		**35.39**	**370.03**	**12.46**	**13,176.43**	**13.43**
Grand Totals		**81.80**	**753.39**	**24.23**	**19,985.97**	**34.70**

10.4.1.2.2 Energy Trees

Refer to the 2014 NPDES report for a description of the Cool Trees project. Table 10-20 below shows the watersheds and nutrient reductions that result from this project. This program was grant funded and with the end of the grant funding period is no longer in operation.

Table 10-20: Energy Trees Planting Projects by Watershed Through FY13

Watershed	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Impervious Acre Equivalent
Upper Western Shore					
Loch Raven	0.43	3.8	0.1	67.2	0.2
Lower Gunpowder	0.64	5.6	0.2	121.2	0.2
Bird River	0.76	3.7	0.2	48.9	0.3
Gunpowder River	0.19	0.9	0.1	15.33	0.1
Middle River	0.16	0.8	0.0	11.4	0.1
Patapsco/Back River					
Patapsco	2.21	15.4	0.5	265.5	0.8
Gwynns Falls	1.78	15.6	0.5	352.9	0.7
Jones Falls	0.19	1.7	0.0	19.5	0.1
Back River	1.28	6.2	0.3	66.8	0.5
Baltimore Harbor	1.91	9.3	0.5	116.9	0.7
Grand Totals	**9.6**	**62.9**	**2.3**	**1,085.6**	**3.6**

10.4.1.2.3 Growing Home Campaign

Refer to the 2014 NPDES report for a description of the Growing Home campaign. Table 10-21 shows Growing Home data for the Upper western Shore and Patapsco/Back Basin watersheds.

This program is no longer operated through Baltimore County, but has been supplanted by the Maryland Department of Natural Resources – Marylanders Plant Trees Program.

Table 10-21: Growing Home Trees Planted by Watershed Through FY13

Watershed	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Impervious Acre Equivalent
Upper Western Shore					
Deer Creek	0.65	5.7	0.2	133.3	0.2
Prettyboy Reservoir	0.52	4.6	0.1	77.2	0.2
Loch Raven	10.48	91.9	2.7	1,637.8	4.0
Lower Gunpowder	3.94	34.6	1.0	745.8	1.5
Little Gunpowder	1.79	15.7	0.5	343.2	0.7
Bird River	3.16	15.4	0.8	203.5	1.2
Gunpowder River	1.30	6.2	0.3	104.9	0.5
Middle River	2.03	9.9	0.5	144.9	0.8
Patapsco/Back River					
Liberty Reservoir	0.39	3.4	0.1	63.2	0.1
Patapsco	2.42	16.8	0.5	290.7	0.9
Gwynns Falls	2.32	20.3	0.6	460.0	0.9
Jones Falls	4.61	40.5	1.2	473.0	1.8
Back River	4.70	22.8	1.1	245.3	1.8
Baltimore Harbor	1.08	5.3	0.3	66.1	0.4
Grand Totals	**39.39**	**293.1**	**9.9**	**4,988.9**	**15.0**

10.4.1.2.4 Big Tree Sale

EPS hosted its first Big Tree Sale in 2009. In FY15, Big Tree Sales were held on October 18, 2014 and May 9, 2015. There were 780 total trees sold at the sales in FY15 to address in Baltimore County. Watershed locations for all trees sold are not available, but nutrient reductions for those with location data that are located within Baltimore County are shown in Table 10-22 for FY13 and in Table 10-23 for FY14. Table 10-24 shows the most recent data for sales in FY15. For the sake of producing conservative nutrient reduction estimates, trees are presumed planted in upland areas and not in stream buffers.

Table 10-22: Big Tree Sale #s and Associated Nutrient Reductions Through FY13

8 Digit Watershed	# Trees	N Red	P Red	Sed Red	Imp Ac Eq
Deer Creek	**18**	1.6	0.0	36.9	0.1
Prettyboy	**36**	3.2	0.1	53.4	0.1
Loch Raven	**691**	60.6	1.8	1,079.9	2.6
Lower Gun	**45**	4.0	0.1	85.2	0.2
Little Gun	**34**	3.0	0.1	65.2	0.1
Bird River	**35**	1.7	0.1	22.5	0.1
Gunpowder River	**6**	0.3	0.0	4.8	0.0
Middle River	**17**	0.8	0.0	12.1	0.1
Liberty	**17**	1.5	0.0	27.5	0.1
Patapsco	**46**	3.2	0.1	55.3	0.2
Gwynns Falls	**19**	1.7	0.0	37.7	0.1
Jones Falls	**212**	18.6	0.6	217.5	0.8
Back River	**35**	1.7	0.1	18.3	0.1
Baltimore Harbor	**107**	5.2	0.3	65.5	0.4
Totals	**1,318**	**107.0**	**3.4**	**1,781.9**	**5.0**

Table 10-23: Big Tree Sale #s FY14 by 8 Digit Watershed and Associated Nutrient Reductions

8 Digit Watershed	# Trees	N Red	P Red	Sed Red	Imp Ac Eq
Deer Creek	14	1.2	0.0	28.7	0.1
Prettyboy	0	0.0	0.0	0.0	0.0
Loch Raven	317	27.8	0.8	495.4	1.2
Lower Gun	27	2.4	0.1	51.1	0.1
Little Gun	13	1.1	0.0	24.9	0.0
Bird River	18	0.9	0.0	11.6	0.1
Gunpowder River	0	0.0	0.0	0.0	0.0
Middle River	11	0.5	0.0	7.9	0.0
Liberty	13	1.1	0.0	24.9	0.0
Patapsco	39	2.7	0.1	46.9	0.1
Gwynns Falls	23	2.0	0.1	45.6	0.1
Jones Falls	119	10.4	0.3	122.1	0.5
Back River	43	2.1	0.1	22.4	0.2
Baltimore Harbor	15	0.7	0.0	9.2	0.1
Totals	**652**	**53.1**	**1.7**	**886.8**	**2.5**

Table 10-24: Big Tree Sale #s FY15 by 8 Digit Watershed and Associated Nutrient Reductions

8 Digit Watershed	# Trees	N Red	P Red	Sed Red	Imp Ac Eq
Deer Creek	0	0.0	0.0	0.0	0.0
Prettyboy	12	1.1	0.0	17.8	0.0
Loch Raven	257	22.5	0.7	401.6	1.0
Lower Gun	52	4.6	0.1	98.4	0.2
Little Gun	43	3.8	0.1	82.4	0.2
Bird River	44	2.1	0.1	28..3	0.2
Gunpowder River	24	1.1	0.1	19.4	0.1
Middle River	15	0.7	0.0	10.7	0.1
Liberty	8	0.7	0.0	13.0	0.0
Patapsco	63	4.4	0.1	75.7	0.2
Gwynns Falls	28	2.5	0.1	55.5	0.1
Jones Falls	73	6.4	0.2	74.9	0.3
Back River	36	1.7	0.1	18.8	0.1
Baltimore Harbor	125	6.1	0.3	76.5	0.5
Totals	**780**	**57.7**	**1.9**	**973.1**	**3.0**

10.4.1.3 Groundwater Management Section - Septic System Related Programs

The OSDS Strategy for meeting the OSDS nitrogen reduction target for 2025 is presented in Table 10-25. This translates into 20 upgrades per year of existing OSDS to denitrifying systems, 14 hook-ups to the sanitary sewer system per year of existing OSDS, and 7,800 pump-outs per year.

Table 10-25: OSDS Strategy for Meeting Nitrogen Reductions Targets by 2025

Strategy	# of Systems	Nitrogen Reduction	Remaining Nitrogen Load	Remaining to Meet Target
2009 Progress from MAST			166,285	60,148
Health Projects	1,537	-24,201	142,084	35,947
Growth Area Adjustments	7,805	-33,649	108,435	2,298
De-nitrifying Systems	220	-897	107,538	1,401
Future Health Projects	200	*	*	*

OSDS Pump-outs	7,800/yr	-464	106,469	332

The installation of OSDS denitrifying systems is supported by the Bay Restoration Fund (see: http://www.mde.maryland.gov/programs/Water/BayRestorationFund/OnsiteDisposalSystems/Pages/Water/cbwrf/index.aspx for further information). Maryland Department of the Environment provides assessment of the nitrogen removal efficiencies for the various denitrifying systems available through the Maryland Verification Process. There are seven different types of systems installed in Baltimore County during the reporting period.

Only BAT systems installed to replace existing septic systems count as credit toward meeting our septic system reduction allocation for nitrogen and are reported below. Please note this process is new this reporting period but we have updated the data from FY2012-2013 and FY 2014 to reflect this change.

Table 10-26 indicates the number of systems installed by type, location, and the MDE reported pollutant removal efficiencies for FY 2012 and FY 2013, the first 2-yr milestone. Table 10-27 presents the same data for the first reporting year of the FY 2014-2015 2-year milestone along with the impervious surface equivalent. Table 10-28 presents the same data for FY 2015.

Table 10-26: FY 2012 and FY 2013 - Number of Denitrifying Systems Installed by Type and Removal Efficiency for Replacement Systems Only

System Type	Number Installed			Removal Efficiency
	CBCA	>1,000	<1,000	
Hoot	4	7	4	64%
Singular	6	4	4	55%
Biomicrobics – Microfast/Retrofast	0	0	1	57%
Adventex	1	0	0	71%
Septi-Tech	0	0	2	67%
Waterloo	0	0	1	55%
Total Installations	**11**	**11**	**12**	

Table 10-27: FY 2014 - Number of Denitrifying Systems Installed by Type and Removal Efficiency for Replacement Systems Only

System Type	Number Installed			Removal Efficiency
	CBCA	>1,000	<1,000	
Hoot	1	7	8	64%
Singular	0	1	2	55%
Adventex	0	2	0	71%
Septi-Tech	0	1	1	67%
Bionest	0	0	1	unknown
Total Installations	**1**	**11**	**12**	

Table 10-28: FY 2015 - Number of Denitrifying Systems Installed by Type and Removal Efficiency for Replacement Systems Only

System Type	Number Installed			Removal Efficiency
	CBCA	>1,000	<1,000	
Advantex AX20	0	1	0	71%
Advantex RT	1	1	0	76%
Biomicrobics – Microfast/Retrofast	1	0	0	57%
Hoot	2	1	6	64%
Septi-Tech	1	1	1	67%
Singulair	0	3	4	55%
Singulair Green	0	1	0	55%
Total Installations	**5**	**8**	**11**	

The amount of nitrogen delivered to the Chesapeake Bay from OSDS is the result of the landscape location of the system and the delivery ratio of the watershed for nitrogen. There are three landscape position factors that relate to the delivery of nitrogen from OSDS to the edge-of-stream:

- Chesapeake Bay Critical Area (CBCA) – 16.44 pounds nitrogen per OSDS
- Less than 1,000 feet from a perennial stream (<1,000) – 10.27 pounds nitrogen per OSDS
- Greater than 1,000 feet from a perennial stream (>1,000) – 6.16 pounds nitrogen per OSDS.

The numbers above are derived from Maryland Assessment Scenario Tool (MAST) by dividing the number of MAST derived septic systems into the Edge-of-Stream nitrogen load. Using this information and the geographical location of the installed denitrifying systems, the edge-of-stream (EOS) nitrogen load, the EOS nitrogen reduction and delivered load (based on the watershed specific nitrogen delivery ratio) can be calculated. The impervious acre equivalent multiplier comes from *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated: Guidance for the National Pollutant Discharge Elimination System Stormwater Permits (August 2014)*. The impervious surface equivalent credits are as follows:

- Septic Pumping – 0.03 per pumpout
- Septic Denitrification – 0.26 per installation
- Septic connection to WWTP – 0.39 per connection

The results of the calculations are presented in Table 10-29 for first 2-year milestone period and in Table 10-30 for the first year of the FY 2014-2015 septic 2-year milestone and Table 10-31 for the second year of the current 2-year milestone.

Table 10-29: OSDS Upgrades to Denitrifying Systems July 1, 2011 Through June 30, 2013 (FY12 - FY13) by Watershed for Replacement Systems Only

Watershed	OSDS Location			EOS Total Nitrogen	EOS Total Reduction	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet					
Deer Creek	0	0	0	0.00	0.00	57.40%	0.00	0.00
Prettyboy	0	0	0	0.00	0.00	5.50%	0.00	0.00
Loch Raven	0	4	3	59.56	35.90	25.90%	9.30	1.82
Lower Gunpowder	0	5	6	88.31	54.24	88.80%	48.16	2.86
Little Gunpowder	0	2	0	20.54	12.22	70.80%	8.65	0.52
Bird River	7	0	0	115.08	71.84	87.50%	62.86	1.82
Gunpowder River	3	0	0	49.32	27.13	100.00%	27.13	0.78
Middle River	0	0	0	0.00	0.00	100.00%	0.00	0.00
Liberty	0	0	1	6.16	3.39	0.00%	0.00	0.26
Patapsco River	0	0	0	0.00	0.00	53.20%	0.00	0.00
Gwynns Falls	0	0	0	0.00	0.00	33.70%	0.00	0.00
Jones Falls	0	0	2	12.32	7.02	18.60%	1.31	0.52
Back River	1	0	0	16.44	9.04	96.20%	8.70	0.26
Baltimore Harbor	0	0	0	0.00	0.00	100.00%	0.00	0.00
Totals	**11**	**11**	**12**	**367.73**	**220.78**		**166.11**	**8.84**

Table 10-30: OSDS Upgrades to Denitrifying Systems July 1, 2013 Through June 30, 2014 (FY14) by Watershed for Replacement Systems Only

Watershed	OSDS Location			EOS Total Nitrogen	EOS Total Reduction	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet					
Deer Creek	0	0	0	0.00	0.00	57.40%	0.00	0.00
Prettyboy	0	0	0	0.00	0.00	5.50%	0.00	0.00
Loch Raven	0	3	5	61.61	39.59	25.90%	10.26	2.08
Lower Gunpowder	0	4	1	47.24	29.93	88.80%	26.57	1.30
Little Gunpowder	0	0	1	6.16	4.13	70.80%	2.92	0.26
Bird River	0	0	1	6.16	3.94	87.50%	3.45	0.26
Gunpowder River	0	0	0	0.00	0.00	100.00%	0.00	0.00
Middle River	0	0	0	0.00	0.00	100.00%	0.00	0.00
Liberty	0	0	0	0.00	0.00	0.00%	0.00	0.00
Patapsco River	0	3	1	36.97	24.38	53.20%	12.97	1.04
Gwynns Falls	0	0	0	0.00	0.00	33.70%	0.00	0.00
Jones Falls	0	2	3	39.02	23.56	18.60%	4.38	1.30
Back River	1	0	0	16.44	10.52	96.20%	10.12	0.26
Baltimore Harbor	0	0	0	0.00	0.00	100.00%	0.00	0.00
Totals	**1**	**12**	**12**	**213.60**	**136.05**		**70.67**	**6.50**

Table 10-31: OSDS Upgrades to Denitrifying Systems July 1, 2014 Through June 30, 2015 (FY15) by Watershed for Replacement Systems Only

Watershed	OSDS Location			EOS Total Nitrogen	EOS Total Reduction	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet					
Deer Creek	0	0	0	0.00	0.00	57.40%	0.00	0.00
Prettyboy	0	0	0	0.00	0.00	5.50%	0.00	0.00
Loch Raven	0	0	3	18.48	11.83	25.90%	3.06	0.78
Lower Gunpowder	0	4	2	53.40	31.03	88.80%	27.56	1.56
Little Gunpowder	0	1	2	22.59	14.77	70.80%	10.45	0.78
Bird River	5	0	0	82.20	53.92	87.50%	47.18	1.30
Gunpowder River	0	0	0	0.00	0.00	100.00%	0.00	0.00
Middle River	0	0	0	0.00	0.00	100.00%	0.00	0.00
Liberty	0	0	0	0.00	0.00	0.00%	0.00	0.00
Patapsco River	0	2	2	32.86	21.87	53.20%	11.64	1.04
Gwynns Falls	0	0	0	0.00	0.00	33.70%	0.00	0.00
Jones Falls	0	1	1	16.43	9.04	18.60%	1.68	0.52
Back River	0	0	1	6.16	3.94	96.20%	3.79	0.26
Baltimore Harbor	0	0	0	0.00	0.00	100.00%	0.00	0.00
Totals	**5**	**8**	**11**	**232.12**	**146.40**		**105.37**	**6.24**

The installation of thirty-four denitrifying systems during the first 2-year milestone period resulted in 166 pounds of nitrogen reduction. During the first year of the second 2-year milestone period (FY2014), an additional 25 denitrifying systems were installed for an additional 71 pounds of reduction, while 24 denitrifying systems were install in FY2015 for a further reduction of 105 pounds. The lower reduction for FY2014 and FY 2015 is the result of the distribution of the installed systems, both in relation to the tidal water and the streams, and with a greater number in watersheds that have lower delivery ratio to the Bay. The target of the 2-year milestones was 40 denitrifying systems and 163.2 pounds of nitrogen reduction (an average of 4.08 pounds nitrogen reduction per system times 40 systems). This target was met for both the first 2-year milestone period and for the current 2-year milestone period.

The OSDS pump out information for fiscal year 2014 is presented in Table 10-32 and Table 10-33 shows data for fiscal year 2015.

Table 10-32: OSDS Pump-outs July 1, 2013 Through June 30, 2014 by Watershed (FY2014)

Watershed	OSDS Location			EOS Total Nitrogen	EOS Total Reduction	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CB CA	<1,000 feet	>1,000 feet					
Deer Creek	0	5	17	156.07	7.80	57.4%	1.98	0.66
Prettyboy	0	5	35	266.95	13.34	5.5%	.73	1.20
Loch Raven	0	339	709	7,848.97	392.24	25.9%	101.59	31.44
Lower Gunpowder	0	158	152	2,558.98	127.93	88.8%	113.60	9.30
Little Gunpowder	0	69	148	1,620.31	81.00	70.8%	57.35	6.51
Bird River	4	11	18	289.61	14.49	87.5%	12.68	0.99
Gunpowder River	3	1	1	65.75	3.29	100%	3.29	0.15
Middle River	2	0	0	32.88	1.64	100%	1.64	0.06
Liberty	0	32	92	895.36	44.76	0.0%	0.00	3.72
Patapsco River	0	38	128	1,178.74	58.93	53.2%	31.35	4.98
Gwynns Falls	0	41	82	926.19	46.30	33.7%	15.60	3.69
Jones Falls	0	108	228	2,513.64	125.66	18.6%	23.37	10.08
Back River	0	1	2	22.59	1.13	96.2%	21.73	0.09
Baltimore Harbor	1	0	1	22.30	1.30	100%	1.30	0.06
Totals	**10**	**808**	**1,613**	**18,398.64**	**919.81**		**386.21**	**72.93**

Table 10-33: OSDS Pump-outs July 1, 2014 Through June 30, 2015 by Watershed (FY2015)

Watershed	OSDS Location			EOS Total Nitrogen	EOS Total Reduction	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet					
Deer Creek	0	0	10	61.60	3.08	57.40%	1.77	0.30
Prettyboy	0	7	53	398.37	19.92	5.50%	1.10	1.80
Loch Raven	0	168	318	3,684.24	184.21	25.90%	47.71	14.58
Lower Gunpowder	0	36	69	794.76	39.74	88.80%	35.29	3.15
Little Gunpowder	0	17	40	420.99	21.05	70.80%	14.90	1.71
Bird River	1	1	7	69.83	3.49	87.50%	3.06	0.27
Gunpowder River	0	1	1	16.43	0.82	100%	0.82	0.06
Middle River	2	0	0	32.88	1.64	100%	1.64	0.06
Liberty	0	32	74	784.48	39.22	0.00%	0.00	3.18
Patapsco River	0	46	125	1,242.42	62.12	53.20%	33.05	5.13
Gwynns Falls	0	24	56	591.44	29.57	33.70%	9.97	2.40
Jones Falls	0	72	144	1,626.48	81.32	18.60%	15.13	6.48
Back River	0	2	3	39.02	1.95	96.20%	1.88	0.15
Baltimore Harbor	1	0	1	22.60	1.13	100%	1.13	0.06
Totals	**4**	**406**	**901**	**9,785.54**	**489.28**		**167.43**	**39.33**

The number of OSDS pump-outs still runs below the target of 7,800 systems per year (FY2014 – 2,431 and FY2015 – 1,311) and the target reduction of 464 pound of nitrogen (FY2014 – 386 pounds and FY2015 – 167 pounds). The credits for OSDS pump-outs are annual, so only the most recent year counts.

Connection to the sanitary sewer system and abandonment of OSDS systems (AKA septic hook-ups) reduce nitrogen discharges from the OSDS source sector. Year-over-year comparison of Bay Restoration Fund billing files, with quality control provided by review of plumbing permits, enables Baltimore County to track the number and location of septic hookups, and estimate the associated nitrogen load reductions.

Baltimore County learns the number of and location of septic to sewer connections through year-over-year comparison of Bay Restoration Fund (BRF) billing files. Any connections identified by BRF comparison is quality controlled through review against a separate sewer benefit assessment database from DPW Metro Finance, and by review by Groundwater Management section staff against a list of connections paid for via BRF funds and another list of connections made pursuant to extension of sewer service for sanitary health purposes. If the quality control results are favorable, we assume the change in the BRF represents a real septic to sewer connection. The connection is assigned the date of the earliest BRF file showing public sewer service instead of private septic system.

Note that the BRF billing file is not updated between May and August, to free up staff time for the annual tax bill season. Changes during those months are reflected in the BRF billing file by August. To best approximate the fiscal year, comparisons are made August to August. Note also that this mechanism for tracking septic to sewer connections began in 2014. Before then, BRF billing files were capture as-needed. We have grouped the available BRF billing file comparisons in a way that approximates fiscal years as closely as possible. Table 10-34 shows the septic to sewer connections completed for FY2012 and 2013; Table 10-35 shows connections for FY2014 and Table 10-36 shows connections for FY2015. Hook-ups of 179 septic systems resulted in a 2,427.7 pound reduction in nitrogen delivered to the Bay since October 2011.

Table 10-34: Septic to Sewer Connections completed between 10/18/2011 and 1/23/2014 (approx.FY2012 - FY2013)

Watershed	OSDS Location			EOS Total Nitrogen	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet				
Deer Creek	0	0	0	0.00	57.40%	0.00	0.00
Prettyboy	0	0	0	0.00	5.50%	0.00	0.00
Loch Raven	0	0	1	6.16	25.90%	1.60	0.39
Lower Gunpowder	0	0	0	0.00	88.80%	0.00	0.00
Little Gunpowder	0	0	0	0.00	70.80%	0.00	0.00
Bird River	1	2	4	61.62	87.50%	53.92	2.73
Gunpowder River	0	0	0	0.00	100.00%	0.00	0.00
Middle River	3	0	0	49.32	100.00%	49.32	1.17
Liberty	0	0	0	0.00	0.00%	0.00	0.00
Patapsco River	0	3	1	36.97	53.20%	19.67	1.56
Gwynns Falls	0	1	0	10.27	33.70%	3.46	0.39
Jones Falls	0	2	0	20.54	18.60%	3.82	2.78
Back River	21	0	0	345.24	96.20%	332.12	8.19
Baltimore Harbor	0	0	0	0.00	100.00%	0.00	0.00
Totals	**25**	**8**	**6**	**530.12**		**463.90**	**17.21**

Table 10-35: Septic to Sewer Connections completed between 1/23/2014 and 8/20/2014 (approx. FY2014)

Watershed	OSDS Location			EOS Total Nitrogen	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet				
Deer Creek	0	0	0	0.00	57.40%	0.00	0.00
Prettyboy	0	0	0	0.00	5.50%	0.00	0.00
Loch Raven	0	0	0	0.00	25.90%	0.00	0.00
Lower Gunpowder	0	0	0	0.00	88.80%	0.00	0.00
Little Gunpowder	0	0	0	0.00	70.80%	0.00	0.00
Bird River	0	0	2	12.32	87.50%	10.78	0.78
Gunpowder River	2	0	0	32.88	100.00%	32.88	0.78
Middle River	0	0	0	0.00	100.00%	0.00	0.00
Liberty	0	0	0	0.00	0.00%	0.00	0.00
Patapsco River	0	0	0	0.00	53.20%	0.00	0.00
Gwynns Falls	0	0	2	12.32	33.70%	4.15	0.78
Jones Falls	0	0	0	0.00	18.60%	0.00	0.00
Back River	1	0	0	16.44	96.20%	15.82	0.39
Baltimore Harbor	104	0	0	1,709.76	100.00%	1,709.76	40.56
Totals	**107**	**0**	**4**	**1,783.72**		**1,773.39**	**43.29**

Table 10-36: Septic to Sewer Connections completed between 8/20/2014 and 8/20/2015 (approx. FY2015)

Watershed	OSDS Location			EOS Total Nitrogen	Delivery Ratio	Delivered Load Reduction	Equiv. Imperv. Acres
	CBCA	<1,000 feet	>1,000 feet				
Deer Creek	0	0	0	0.00	57.40%	0.00	0.00
Prettyboy	0	0	0	0.00	5.50%	0.00	0.00
Loch Raven	0	1	0	10.27	25.90%	2.66	0.39
Lower Gunpowder	0	0	1	6.16	88.80%	5.47	0.39
Little Gunpowder	0	0	0	0.00	70.80%	0.00	0.00
Bird River	1	4	17	162.24	87.50%	141.96	8.58
Gunpowder River	0	0	0	0.00	100.00%	0.00	0.00
Middle River	2	0	0	32.88	100.00%	32.88	0.78
Liberty	0	0	0	0.00	0.00%	0.00	0.00
Patapsco River	0	0	1	6.16	53.20%	3.28	0.39
Gwynns Falls	0	0	2	12.32	33.70%	4.15	0.78
Jones Falls	0	0	0	0.00	18.60%	0.00	0.00
Back River	0	0	0	0.00	96.20%	0.00	0.00
Baltimore Harbor	0	0	0	0.00	100.00%	0.00	0.00
Totals	**3**	**5**	**21**	**230.03**		**190.40**	**11.31**

The target number of OSDS hook-ups to the sanitary sewer system is 14 per year. Baltimore County continues to exceed that number (FY2012-2013 – average 19.5 per year, FY2014 – 111 and FY2015 – 29). Over the four year period of the first two 2-year milestone timeframe greater than 2,400 pounds of nitrogen have been removed due to hook-ups of existing OSDS to the sanitary sewer system.

10.4.2 DPW Restoration Programs

Several programs under Baltimore County's Department of Public Works result in the pollutant reductions. These programs are listed below. For information on street sweeping, storm drain cleaning and sanitary sewer projects please see Section 7 of this report. Retrofits of the County facilities that fall under the General Industrial Stormwater Permit with the exception of the Public School and Community College sites are being coordinated by DPW (Section 10.4.2.1).

The Storm Drain Engineering Section is addressing problems related to storm drain outfalls, of which some of the corrections will result in nutrient and sediment reductions (Section 10.4.2.2). Finally, DPW is the lead in organizing the annual rain barrel sale that Baltimore County offers for citizens (Section 10.4.2.3)

10.4.2.1 County Facility Retrofits Under the General Industrial Stormwater Permit

The Department of Public Works (DPW) has assumed responsibility for ensuring that regulated general government facilities comply with the new permit requirements. Consultants were hired to conduct stormwater assessments on industrial sites, develop Stormwater Pollution Prevention Plans (SWPPPs) (see Section 7 of this report for the status of plan development), and to design restoration plans to address untreated impervious surface area. Municipal facilities were specifically exempted from the restoration requirement in the final version of the General Industrial Stormwater Permit based on the fact that the MS4 permit would have a restoration requirement. Further clarification of this requirement revealed that industrial sites impervious areas can be addressed through the general stormwater permit impervious reduction requirements. Table 10-37 shows the completed and planned projects associated with this effort. The pollutant reduction and impervious surface credits for the planned projects are based on the per acre reductions and impervious surface credits for the completed projects. The calculated per acre reductions and impervious surface credits are:

- Nitrogen – 5.1189 pounds per acre
- Phosphorus – 0.4343 pounds per acre
- TSS – 446.97 pound per acre
- Impervious Acre Credit – 0.7653 acres of impervious credit per restored acre.

When the project are constructed the actual amount of pollutant reduction and impervious surface credit will be calculated and reported.

Table 10-37: DPW Stormwater Projects Associated With the Industrial Permit

Projects Through FY15								
Project	**Facility Type**	**DA**	**Watershed**	**FY**	**Removal Rate (lb./year)**			**Imp Acres**
					TN	**TP**	**TSS**	
Completed Projects								
Longview Highway Shop (#5416)	BS	0.27	Loch Raven Reservoir	15	2.1	0.1	121.3	1.6
Essex Utility Yard (#5400)	ESD	0.91	Back River	15	4.2	0.6	239.0	0.8
Double Rock Maintenance Facility (#5412)	MB	0.28		15	2.5	0.4	166.9	0.2
Clarks Lane Highway Shop 3 (#5405)	BS	2.28	Liberty Reservoir	15	14.8	0.8	851.8	0.9
Windsor Mill Highway Shop Phase 1 (#5403)	MB	4.43	Gwynns Falls	15	19.5	1.9	2,754.1	2.4
Chesterwood Park (#5404)	SFB	1.50	Baltimore Harbor	15	6.4	0.4	189.1	1.5
Totals		**9.67**			**49.5**	**4.2**	**4,322.2**	**7.4**

Projects Through FY15								
Project	Facility Type	DA	Watershed	FY	Removal Rate (lb./year)			Imp Acres
					TN	TP	TSS	
Projects Under Design or Construction								
Middletown Rd Highway Shop Improvements (#5406)	GS	0.25	Prettyboy Reservoir		1.3	0.1	111.7	0.2
Ridge Road Highway Shop (#5401)	MB	0.46	Loch Raven Reservoir		2.4	0.2	205.6	0.4
Industry Lane Salt Dome (#5402)	MB	0.52			2.7	0.2	232.4	0.4
Public Works Training Facility (#5397)	RB	12.00			61.4	5.2	5,363.6	9.2
White Hall Highway Shop 4-3 (#5407)	BS	0.52			2.7	0.2	232.4	0.4
Special Forces (#5486)	ESD	1.60			7.7	0.7	715.2	1.2
Brady Ave Highway and Utility Yard (#5398)	BS	0.65	Patapsco River		3.3	0.3	290.5	0.5
Emala Ave Highway Shop Improvements (#5396)	SGW	2.80	Middle River		14.3	1.2	1,251.5	2.1
Essex VOM Facility (#5399)	PPAV	0.42	Back River		2.1	0.2	187.7	0.3
Perry Rd Highway Shop Improvements (#5410)	ESD	1.02			5.2	0.4	455.9	0.8
Estimated Totals		**20.24**			**103.1**	**8.7**	**9,046.5**	**15.5**

Abbreviations
BS: Bioswale MB: Micro-bioretention SGW: Submerged gravel wetland
SFB: Sheet flow to buffer ESD: Environmental Site Design RB: Rain barrel
PPAV: Porous pavement GS: Grass swale SFB: Sheet flow buffer

10.4.2.2 DPW Storm Drain System Restoration Program

In addition to projects completed for industrial permit compliance, DPW also has other restoration projects planned related to the storm drain system that will contribute to nutrient reductions. These projects are shown in Table 10-38. Insufficient information has been provided at this time to be able to assess the amount of nutrient reduction and impervious surface credit for each of the project listed in the table. As these projects move forward the information will be acquired and the reductions and credits will be calculated.

Table 10-38: DPW Planned Stormwater Restoration Projects

Project	Facility Type	DA (LF)	Watershed	Cost
Stags Head Rd (2 locations)	OUT	UNK	Loch Raven Reservoir	UNK
Freeland Rd.	STRE	UNK		UNK
Dogwood Hill Rd TMDL Drainage Retrofits	OUT	UNK		UNK
Clubhouse Rd	OUT	UNK		UNK
Valewood Rd (2 outfalls)	OUT	UNK		UNK
Beach Rd	OUT	UNK	Bird River	UNK
Chapel Rd TMDL Drainage Retrofits	OUT/STRE	UNK		UNK
Clarks Point Rd Drainage Remediation	MB	UNK	Gunpowder River	UNK

Bayside Drive SD	SCR	UNK	Patapsco River	UNK
Alabama Ave	OUT	UNK		UNK
Cherry Hill TMDL Drainage Retrofits	OUT	UNK	Gwynns Falls	UNK
North Forest Park TMDL Drainage Retrofits	OUT	UNK		UNK
Smith Ave TMDL Drainage Retrofits	OUT	UNK	Jones Falls	UNK
Millridge Rd Drainage Retrofit	OUT	UNK		UNK
Branchwood Ct	OUT	UNK		UNK
Tributary 12 to Redhouse Run	STRE	UNK	Back River	UNK
6 Yew Rd.	OUT	UNK		UNK
Madeline and Linden Aves	STRE	UNK		UNK
Weyburn Rd	STRE	UNK		UNK
Sipple Ave	UNK	UNK		UNK
Karl Ave	OUT	UNK		UNK
Todds Lane		UNK		UNK
6000 Block Radecke Ave Pavement Reduction for TMDL	IMPP	UNK		UNK
Chesapeake Ave (Millers Island) SDs (4)	UNK	UNK	Baltimore Harbor	UNK
Maple Ave	BS	UNK		UNK

Abbreviations
OUT: Outfall Stabilization MB: Micro-bioretention STRE: Stream Restoration
IMPP: Impervious Surface Removal BS: Bioswale UNK: Unknown
SCR: Stormceptor

10.4.2.3 Annual County Rain Barrel Sale

Starting in 2010, Baltimore County DPW began collaborating with EPS and offering 55 gallon rain barrels for sale at their annual compost bin sale. This paired well with the compost bins because, as the bins help to reduce material sent to county landfills, rain barrels help reduce stormwater flowing to local streams.

In the future, Baltimore County will implement an audit program to determine the rate of installation of the rain barrels and the rate at which those installed are emptied prior to storm events. This program will be designed to meet the validation requirements that are currently being prepared by Maryland. This will improve the accuracy of the pollutant reduction estimates attributed to the sale. For the purposes of this report, 100% of barrels sold are assumed to have been installed and frequently emptied, maximizing the effectiveness of storm water benefits.

Table 10-39 shows the number of barrels sold per year with a Baltimore County address. Table 10-40a shows the number of rain barrels and the amount of pollutants reduced and the impervious surface equivalents by watershed from 2011-FY13 for tracking WIP 2-year milestones. Table 10-40b displays the same information for FY2014 and Table 10-40c shows the information for FY2015. Locations are based on addresses given on the receipts from the rain barrel sales. Each rain barrel is estimated to drain 250 sq ft of rooftop for pollution reduction calculation purposes. Note that this analysis of the receipts showed lower numbers sold for each year then reported by the vendor, especially for 2010. This will need to be addressed and possibly re-analyzed in future reports. Pollutant reductions are calculated as described in section 10.3.5.

Table 10-39: Baltimore County Rain Barrel Sales by Fiscal Year

Year	# Barrels Sold to Baltimore County Addresses
FY10	469
FY11	894
FY12	620
FY13	536
FY14	505
FY15	523
Totals	**3,547**

Table 10-40a: Baltimore County Rain Barrel Total Sales Through FY13 by 8 Digit Watershed and Associated Nutrient Reductions

Watershed	# Barrels Sold	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Equivalent Impervious Acres Treated
Lower Susquehanna					
Deer Creek	4	0.14	0.01	22.17	0.01
Upper Western Shore					
Loch Raven	445	15.89	1.61	1,830.02	0.89
Lower Gunpowder	339	12.11	1.23	1,694.76	0.68
Bird River	262	5.20	0.93	424.55	0.53
Little Gunpowder	64	2.29	0.23	349.80	0.13
Gunpowder	29	0.58	0.10	57.09	0.06
Middle River	71	1.43	0.26	132.42	0.14
Patapsco/Back River					
Liberty	9	0.32	0.03	39.40	0.02
Patapsco	214	6.38	0.65	851.62	0.43
Gwynns Falls	148	5.28	0.54	781.72	0.30
Jones Falls	206	7.36	0.75	512.26	0.41
Back River	573	11.42	2.04	826.64	1.16
Baltimore Harbor	131	2.60	0.46	227.35	0.26
Prettyboy	20	0.71	0.07	84.44	0.04
Totals	**2,519**	**71.70**	**8.91**	**7,834.22**	**5.06**

Table 10-40b: Baltimore County Rain Barrel Sales FY14 by 8 Digit Watershed and Associated Nutrient Reductions

Watershed	# Barrels Sold	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Equivalent Impervious Acres Treated
Lower Susquehanna					
Deer Creek	0	0.0	0.0	0.0	0.00
Upper Western Shore					
Prettyboy	1	0.03	0.0	3.98	0.00
Loch Raven	66	2.36	0.24	360.73	0.13
Lower Gunpowder	79	2.82	0.29	324.88	0.16
Bird River	68	1.35	0.24	110.19	0.14
Little Gunpowder	13	0.46	0.05	56.91	0.03
Gunpowder	17	0.61	0.06	94.24	0.03
Middle River	10	0.36	0.04	49.99	0.02
Patapsco/Back River					
Liberty	1	0.04	0.00	2.49	0.00
Patapsco	49	0.97	0.17	90.12	0.10
Gwynns Falls	36	0.71	0.13	70.87	0.07
Jones Falls	30	1.07	0.11	158.46	0.06
Back River	117	2.32	0.42	167.91	0.24
Baltimore Harbor	18	0.36	0.06	31.24	0.04
Totals	**505**	**13.45**	**1.81**	**1,521.99**	**1.01**

Table 10-40c: Baltimore County Rain Barrel Sales FY15 by 8 Digit Watershed and Associated Nutrient Reductions

Watershed	# Barrels Sold	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)	Equivalent Impervious Acres Treated
Lower Susquehanna					
Deer Creek	3	0.11	0.01	16.63	0.01
Upper Western Shore					
Prettyboy	5	0.18	0.02	21.11	0.01
Loch Raven	56	2.00	0.20	230.29	0.11
Lower Gunpowder	55	1.96	0.20	274.96	0.11
Bird River	42	0.83	0.15	68.06	0.08
Little Gunpowder	12	0.43	0.04	65.59	0.02
Gunpowder	4	0.08	0.01	7.87	0.01
Middle River	11	0.22	0.04	20.23	0.02
Patapsco/Back River					
Liberty	2	0.07	0.01	8.76	0.00
Patapsco	75	2.24	0.23	298.46	0.15
Gwynns Falls	69	2.46	0.25	364.45	0.14
Jones Falls	55	1.96	0.20	136.77	0.11
Back River	109	2.16	0.39	156.43	0.22
Baltimore Harbor	25	0.50	0.09	43.39	0.05
Totals	**523**	**15.20**	**1.83**	**1,713.00**	**1.05**

10.4.3 Local Watershed Associations Restoration Efforts

Baltimore County has several active volunteer organizations whose mission is focused on enhancement of environmental resources. In an effort to expand their ability to organize and conduct restoration activities, EPS developed a grant program entitled the *Watershed Association Restoration Planning and Implementation Grant* program. This grant program was developed to

keep permanent staff with the county's local Watershed Associations. The groups implement restoration projects and educational activities, participate in County restoration planning and support the Stream Watch program. The funds can be used by the groups to leverage additional grant funding. The grant program captures an accounting of the group's efforts and then adds these restoration activities into the County's totals for meeting nutrient reduction goals. Table 10-41 below is the nutrient reductions by group through FY13. For the purposes of tracking progress in meeting the Baltimore County Watershed Implementation Plan (WIP) 2-year milestones for addressing the reduction requirements of the Chesapeake Bay TMDL, FY14 and FY15 data are presented in Tables 10-42 and 10-43.

Table 10-41: Watershed Groups' Projects Through FY13

Watershed Group	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)
Gunpowder Valley Conservancy (GVC)	905.1	30.8	21,814.8
Blue Water Baltimore (BWB)	403.7	17.2	9,211.1
Patapsco Heritage Greenway (PHG)	39.7	1.5	1,704.4
Prettyboy Watershed Association (PWA)	171.4	5.8	4,919.0
Back River Restoration Committee (BRRC)	25.5	2.1	368.7
Dundalk Renaissance Corporation (DRC)	16.3	0.9	332.7
TOTALS	**1,561.7**	**58.3**	**38,350.8**

Table 10-42: Watershed Groups' Projects Pollutant Reductions FY14

Watershed Group	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)
GVC	100.2	3.6	1,845.5
BWB	13.8	0.5	191.7
PHG	3.5	0.1	60.1
PWA	34.2	1.0	576.2
BRRC	12.8	0.6	152.3
DRC	29.5	1.9	651.7
TOTALS	**194.1**	**7.6**	**3,477.5**

Table 10-43: Watershed Groups' Projects Pollutant Reductions FY15

Watershed Group	N Reduction (lbs/yr)	P Reduction (lbs/yr)	Sed Reduction (lbs/yr)
GVC	107.5	4.0	1,762.2
BWB	39.2	1.3	629.8
PHG	0.0	0.0	0.0
PWA	7.3	0.2	100.3
BRRC	0.5	0.0	13.9
DRC	0.1	0.0	12.2
TOTALS	**154.6**	**5.6**	**2,518.5**

Tables 10-44 through 10-46 show the pollutant reductions achieved by the watershed groups by watershed.

Table 10-44: Watershed Group Projects Pollutant Reductions Through FY13 by Watershed

Watershed	N Red	P Red	Sed Red	Imp Acres
Prettyboy	166.9	5.7	4,825.0	5.8
Loch Raven	648.8	21.2	11,736.6	24.2
Lower Gunpowder	227.5	7.7	9,420.5	8.7
Little Gunpowder	0.4	0.0	18.6	0.0
Bird River	0.4	0.0	9.4	1.1
Gunpowder River	42.1	2.1	711.3	3.3
Middle River	0.9	0.2	78.4	0.1
Liberty	1.1	0.0	19.4	0.1
Patapsco River	45.7	1.7	1,876.2	2.2
Gwynns Falls	93.4	3.0	3,192.0	3.7
Jones Falls	224.2	8.5	4,767.7	9.7
Back River	94.8	7.3	1,364.0	16.2
Baltimore Harbor	15.5	0.9	331.6	1.1
Totals	**1,561.7**	**58.3**	**38,350.7**	**76.2**

Table 10-45: Watershed Group Projects Pollutant Reductions FY14 by Watershed

Watershed	N Red	P Red	Sed Red	Imp Acres
Prettyboy	33.7	1.0	570.1	1.5
Loch Raven	94.2	3.0	1,617.8	3.6
Lower Gunpowder	0.8	0.0	22.1	0.0
Little Gunpowder	0.0	0.0	0.0	0.0
Bird River	0.4	0.0	5.2	0.0
Gunpowder River	7.0	0.4	131.5	0.6
Middle River	3.3	0.3	145.9	0.3
Liberty	0.0	0.0	0.0	0.0
Patapsco River	3.6	0.1	67.5	0.2
Gwynns Falls	0.1	0.0	8.1	0.0
Jones Falls	11.9	0.4	155.3	0.6
Back River	11.2	0.6	129.7	0.9
Baltimore Harbor	27.8	1.8	624.3	2.1
Totals	**194.0**	**7.6**	**3,477.5**	**9.8**

Table 10-46 Watershed Group Projects Pollutant Reductions FY15 by Watershed

Watershed	N Red	P Red	Sed Red	Imp Acres
Prettyboy	2.9	0.1	49.0	0.1
Loch Raven	94.5	2.9	1,391.4	4.0
Lower Gunpowder	2.5	0.1	80.2	0.1
Little Gunpowder	0.2	0.0	3.8	0.2
Bird River	10.8	0.6	195.1	0.9
Gunpowder River	3.9	0.2	67.3	0.3
Middle River	8.9	0.6	204.4	0.8
Liberty	0.2	0.0	3.2	0.6
Patapsco River	0.6	0.0	10.8	0.0
Gwynns Falls	12.2	0.4	278.1	0.5
Jones Falls	10.2	0.3	127.0	0.5
Back River	7.7	0.4	96.0	0.7
Baltimore Harbor	0.1	0.0	12.2	0.0
Totals	**154.7**	**5.6**	**2,518.5**	**8.7**

10.4.4 Redevelopment/Revitalization Pollutant Load Reductions

A process has been developed for tracking redevelopment/revitalization projects and the calculation of the pollutant load reductions due to these projects. Baltimore County has identified redevelopment/revitalization as one of the restoration actions to meet the Chesapeake Bay TMDL and local nutrient and sediment TMDLS. Redevelopment has also been identified as an action for meeting the 20% impervious surface treatment requirements of the NPDES – MS4 permit.

Redevelopment is defined as a pre-development site impervious cover >40% as per the stormwater management regulations. Revitalization, for purposes of calculating pollutant load reductions, is defined as pre-development impervious cover that ranges from 20% to 40%. Both redevelopment and revitalization projects are already accounted for in the Chesapeake Bay Watershed Model as urban land, and therefore included in the load reduction allocation for Baltimore County. For the identified projects, pollutant load calculations were performed to calculate the pre-development load and the post development load, using the watershed specific Edge-of-Stream loading rates and the efficiencies of the various Best Management Practices. The differential between the pre-development load and the post-development load is then calculated to determine the pollutant load reduction on a project by project basis. The pre and post impervious cover is also calculated.

The crediting of redevelopment/revitalization is based on different time scales. For the Chesapeake Bay TMDL, credits are based on any project completed after 2011. As the reduction allocations are based on the 2010 progress run of the Watershed Model. For the local TMDLs and the impervious surface treatment credits the time period is based on the re-issuance of the MS4 permit and the development of the local TMDL Implementation Plans. That time period is from the beginning of fiscal year 2014. Table 10-47 provides information from the time period of January 1, 2011 through June 30, 2013. Table 10-48 provides information from the time period of July 1, 2013 through June 30, 2015. The load reductions from both tables is used for crediting nutrient load reductions for the Chesapeake Bay TMDL, while only the information from Table 10-48 is used for crediting nutrient and sediment load reductions for the local TMDLs and impervious surface treatment credits.

Table 10-47: Pollutant Load Reduction as a Result of Redevelopment/Revitalization Projects (January 1, 2011 through June 30, 2013)

Project Name	Pre-development			Type*	Post Development Impervious	Pollutant Load Change			As-built Date	Fiscal Year	Watershed
	Site Acres	Impervious Acres	% Impervious			N	P	TSS			
Towson Manor	19.3	5.5	28.4	Rev	8.9	-43.5	-1.5	-1,323	6/20/2013	13	JF
1400 Taylor Avenue PUD	13.6	6.7	49.4	Red	11.6	13.5	3.7	831	11/10/2011	12	BR
Landsdowne Station	40.2	17.9	44.6	Red	26.6	-96.0	-9.6	-16,934	1/12/2011	11	PA
Walgreens – Rt. 40	1.7	1.5	88.6	Red	1.4	-2.0	-0.3	-440	4/11/2011	11	PA
Minis of Owings Mills	3.9	2.0	52.6	Red	3.2	-35.2	-2.5	-3,758	2/28/2011	11	GF
Hillcrest Elementary School	11.1	2.3	21.0	Rev	3.4	0.3	0.5	609	4/11/2011	11	PA
McDonalds – Dundalk	1.0	0.7	73.7	Red	0.8	-7.4	-1.0	-479	8/30/2011	12	BH
Traget – Whitemarsh	1.0	0.9	86.4	Red	0.9	-9.3	-0.9	-1,394	10/6/2011	12	BI
York Road 1209	5.7	4.7	82.3	Red	4.8	-92.0	-7.2	-9,847	10/18/2011	12	LR
Sonic - Pulaski Highway	1.1	0.7	61.9	Red	0.5	-1.9	-0.5	-203	3/23/2012	12	BR
Oella Mill Property	3.4	1.9	57.3	Red	2.2	-12.7	-1.4	-2,279	4/28/2012	12	PA
Cardiff Hall Apt.	3.6	1.5	40.5	Red	2.7	-3.9	0.6	887	5/15/2012	12	JF
YMCA – Chesapeake Ave.	1.4	0.8	57.0	Red	1.0	-5.63	-0.44	-641	5/25/2012	12	JF
Patient First – Catonsville	0.8	0.7	85.2	Red	0.5	-4.2	-0.6	-822	8/7/2012	13	PA
WAWA – 516 Main Street	2.2	0.9	39.5	Red	1.6	-29.8	-1.7	-2,146	3/7/2013	13	GF
Lord Property	0.3	0.2	75.7	Red	0.2	-0.9	-0.2	-95	10/26/2012	13	BR
Walmart Golden Ring	1.9	1.9	100	Red	1.9	-2.2	-0.5	-256	1/2/2013	13	BR
Franklin Woods	10.6	2.3	22.0	Rev	2.8	-8.7	-0.1	40	1/9/2013	13	BI
Loh Property	0.8	0.5	65.4	Red	0.5	-0.6	-0.2	-83	6/24/2013	13	BR
Hunt Valley Town Center – Main Street and Loop Road	3.1	2.8	88.7	Red	2.6	-52.0	-4.3	-5,882	1/11/2013	13	LR
NDX Archives	3.5	3.0	83.9	Red	3.0	-1.9	-0.2	-324	3/27/2013	13	GF
Royal Farms Store #181	1.4	1.4	100	Red	1.3	-10.6	-0.9	-1,278	7/24/2013	13	BI
Hereford United Methodist Church	1.8	1.2	66.9	Red	1.6	-27.5	-2.0	-2,659	9/10/2013	13	LR
Totals	**133.4**	**62.0**			**84.0**	**-434.1**	**-31.2**	**-48,480**			

- **Red = Redevelopment, Rev = Revitalization**

Table 10-48: Pollutant Load Reduction as a Result of Redevelopment/Revitalization Projects (July 1, 2013 through June 30, 2015)

Project Name	Pre-development			Type*	Post Development Impervious	Pollutant Load Change			Imp. Surface Credit	As-built Date	Fiscal Year	Watershed
	Site Acres	Impervious Acres	% Impervious			N	P	TSS				
Easter Seals	1.6	0.7	40.8	Red	0.7	-5.59	-0.44	-652	0.48	3/11/2015	15	GF
Mr. Tire	1.0	0.5	50.0	Red	0.6	-5.78	-0.59	-871	0.57	3/19/2015	15	BI
Sheppard Prat Gatehouse	0.7	0.6	82.6	Red	0.7	-4.1	-0.4	-517	0.30	4/2/2015	15	JF
McDonalds – Putty Hill	0.4	0.2	52.2	Red	0.4	-0.92	-0.12	-108	0.22	4/2/2015	15	BR
Osprey at Pikeswood Apts.	0.4	0.2	57.1	Red	0.3	-4.23	-0.36	-472	0.23	6/9/2014	14	GF
Holly Hill Nursing Facility	2.0	0.6	27.1	Rev	0.6	-1.51	-0.10	-101	0.22	6/26/2014		
Maryland Food Bank	6.6	3.7	55.4	Red	4.8	-9.76	0.01	90	1.16	12/8/2014	15	PA
Valley Center Lot 3	3.1	2.2	72.7	Red	2.2	-12.01	-1.17	-1,717	1.16	1/5/2015	15	GF
Hunt Valley Town Center – Marshalls and Pier One	2.4	2.4	100	Red	0.5	-10.92	-2.27	-3,412	1.16	Imp Surface Removal	15	LR
McDonalds – Bel Air Road	0.4	0.4	90.5	Red	0.4	-1.34	-0.24	-97	.23	3/11/2014	14	BR
Villa Julie Front Parking	15.7	7.3	46.6	Red	9.8	-112.0	-7.44	-10,592	10.67	5/22/2014	14	GF
Dulaney Valley Apts. – Ph II	7.20	2.6	36.7	Rev	4.6	-31.88	-2.05	-3,115	4.32	6/12/2015	15	LR
The Greens at Logan Field	3.07	3.02	98.4	Red	1.8	-5.95	-1.82	-886	1.57	1/20/2015	15	BH
Totals	**41.5**	**21.4**			**25.6**	**-200.0**	**-15.2**	**-21,563**	**20.72**			

A number of redevelopment/revitalization projects are currently in the project planning or construction phase. These projects and the anticipated pollutant load reductions and impervious surface credits are presented in Table 10-49. When these projects are completed and the as-builts are approved, the calculation of the pollutant load reductions and the impervious surface credits will be verified and if necessary changed to reflect the built condition.

Table 10-49: Future Pollutant Load Reduction as a Result of Redevelopment/Revitalization Projects (Currently in the Planning or Construction Phase)

Project Name	Pre-development			Type*	Post Development Impervious	Pollutant Load Change			Est. Imp. Surface Credit	Status	Watershed
	Site Acres	Impervious Acres	% Impervious			N	P	TSS			
Towson Square	4.6	3.4	74.5	Red	3.9	-11.2	-1.1	-924.9	1.89	Const.	JF
Metro Center – North	13. 8	9.4	68.3	Red	9.4	-27.3	-3.0	-5,262.5	5.30	Const.	GF
Metro Center – South	30.2	24.7	81.9	Red	23.2	-94.7	-8.5	-12,209.6	6.14	Const.	GF
Galloway Creek PUD	3.9	3.0	77.9	Red	1.0	-13.5	-5.0	-2,560.1	2.07	Plan	MR
Shelter Harbor PUD	5.5	4.5	81.8	Red	4.2	-1.7	-1.0	-588.8	0.39	Const.	BH
The Townes at North Point	16.3	12.7	77.8	Red	12.2	-36.8	-7.8	-4,643.2	7.28	Const.	BH
Totals	**121.7**	**77.8**			**84.1**	**-399.3**	**-51.4**	**-68,215.6**	**23.07**		

10.4.5 Restoration Summary

The information on the pollutant load reductions and the impervious surface credits is summarized in the section by watershed. This will provide a convenient reference for the following sections on meeting the impervious surface restoration requirements and the load reductions associated with the nutrient and sediment TMDLs.

In order to provide tracking for the current permit and the 2-year milestones, data on pollutant removal and impervious surface restoration credits are presented below in three separate tables,

Table 10-50 for progress through FY2013, Table 10-51 for projects completed in FY2014, and Table 10-52 for projects completed in FY2015. Subsequent reports will provide additional tables to summarize the pollutant load reductions and impervious surface credits for each successive fiscal year.

Table 10-50: Progress Made in Pollutant Load Reductions and Impervious Area Treated Through FY13

Deer Creek Watershed Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
All WR Projects	0.0	0.0	0.0	0.0
Growing Home Campaign	5.7	0.2	133.3	0.2
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Energy Trees	0.0	0.0	0.0	0.0
Watershed Association Projects	0.0	0.0	0.0	0.0
EPS Big Tree Sale	1.6	0.0	36.9	0.1
BC Rain Barrel Sale	0.1	0.0	22.2	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress through FY13	**7.4**	**0.2**	**192.4**	**0.3**
Prettyboy Watershed Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
All WR Projects	0.0	0.0	0.0	0.0
Growing Home Campaign	4.6	0.1	77.2	0.2
EPS Rural Reforestation	120.7	5.0	3,272.6	4.4
Energy Trees	0.0	0.0	0.0	0.0
Watershed Association Projects	166.9	5.7	4,825.0	5.8
EPS Big Tree Sale	3.2	0.1	53.4	0.1
BC Rain Barrel Sale	0.7	0.1	84.44	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress through FY13	**296.1**	**11.0**	**8,312.6**	**10.5**

Loch Raven Watershed Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	1,665.0	1,510.0	996,336.0	222.0
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	326.9	26.2	42,810.6	19.0
Growing Home Campaign	91.9	2.7	1,637.8	4.0
EPS Rural Residential Reforestation	279.6	10.7	7320.1	10.7
Energy Trees	3.8	0.1	67.2	0.2
Watershed Association Projects	648.8	21.2	11,736.6	24.2
EPS Big Tree Sale	60.6	1.8	1,079.9	2.6
BC Rain Barrel Sale	15.9	1.6	1,830.0	0.9
Redevelopment/Revitalization	109.0	10.1	15,373.6	0.0
Restoration Progress through FY13	**3,201.5**	**1,584.4**	**1,078,191.8**	**283.6**

Lower Gunpowder Falls Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	1,881.2	1,706.0	1,125,680.2	250.8
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
Growing Home Campaign	34.6	1.0	745.8	1.5
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	5.6	0.2	121.2	0.2
Watershed Association Projects	227.5	7.7	9,420.5	8.7
EPS Big Tree Sale	4.0	0.1	85.2	0.2
BC Rain Barrel Sale	12.1	1.2	1,694.8	0.7
Redevelopment/Revitalization	0.0	0.0	0.0	
Restoration Progress through FY13	**2,165.0**	**1,716.2**	**1,137,747.7**	**262.1**

Restoration in the Little Gunpowder Watershed FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
Growing Home Campaign	15.7	0.5	343.2	0.7
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.4	0.0	18.6	0.0
EPS Big Tree Sale	0.49	0.02	5.22	0.04
BC Rain Barrel Sale	2.3	0.2	349.8	0.1
Redevelopment/Revitalization	0.0	0.0	0.0	
Restoration Progress through FY13	**18.9**	**0.7**	**716.8**	**0.8**

Bird River Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	1,912.5	1,734.0	1,144,440.0	255.0
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	670.9	96.0	49,698.8	35.0
Growing Home Campaign	15.4	0.8	203.5	1.2
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	3.7	0.2	48.9	0.3
Watershed Association Projects	0.4	0.0	9.4	1.1
EPS Big Tree Sale	1.7	0.1	22.5	0.1
BC Rain Barrel Sale	5.2	0.9	424.6	0.5
Redevelopment/Revitalization	26.6	1.7	2,554.0	
Restoration Progress through FY13	**2,636.4**	**1,833.7**	**1,197,401.7** **1,194,847.7**	**293.2**

Gunpowder River Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Erosion Control	20.5	13.5	56,160.0	5.6
SWM Retrofit/Conversions	148.1	22.2	13,666.5	19.0
Growing Home Campaign	6.2	0.3	104.9	0.5
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	0.9	0.1	15.3	0.1
Watershed Association Projects	42.1	2.1	711.3	3.3
EPS Big Tree Sale	0.3	0.0	4.8	0.0
BC Rain Barrel Sale	0.6	0.1	57.1	0.1
Redevelopment/Revitalization	0.0	0.0	0.0	
Restoration Progress through FY13	**218.7**	**38.3**	**70,719.9**	**28.6**

Middle River Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	75.0	68.0	15,130.0	10.0
Shoreline Erosion Control	2,088.2	1,373.0	5,721,116.0	197.6
SWM Retrofit/Conversions	542.3	74.5	41,275.5	83.3
Growing Home Campaign	9.9	0.5	144.9	0.8
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	0.8	0.0	11.4	0.1
Watershed Association Projects	0.9	0.2	78.4	0.1
EPS Big Tree Sale	0.8	0.0	12.1	0.1
BC Rain Barrel Sale	1.4	0.3	132.4	0.1
Redevelopment/Revitalization	0.0	0.0	0.0	
Restoration Progress through FY13	**2,719.3**	**1,516.5**	**5,777,900.7**	**292.1**

Liberty Reservoir Through FY13				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
Growing Home Campaign	3.4	0.1	63.2	0.1
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Energy Trees	0.0	0.0	0.0	0.0
Watershed Association Projects	1.1	0.0	19.4	0.1
EPS Big Tree Sale	1.5	0.0	27.5	0.1
BC Rain Barrel Sale	0.3	0.0	39.4	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	
Restoration Progress through FY13	**6.5**	**0.1**	**149.5**	**0.3**

Lower North Branch Patapsco River Through FY13				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	236.3	214.2	141,372.0	31.5
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	64.7	5.4	6,689.6	3.6
Growing Home Campaign	16.8	0.5	290.7	0.9
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	15.4	0.5	265.5	0.8
Watershed Association Projects	45.7	1.7	1,876.2	2.2
EPS Big Tree Sale	3.2	0.1	55.3	0.2
BC Rain Barrel Sale	6.4	0.7	851.6	0.4
Redevelopment/Revitalization	114.6	11.3	19,868.0	
Restoration Progress through FY13	**503.1**	**234.4**	**171,268.9**	**39.6**

Gwynns Falls Through FY13				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	557.0	189.4	863,350.0	27.9
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	831.5	55.2	109,134.8	89.0
Growing Home Campaign	20.3	0.6	460.0	0.9
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	15.6	0.5	352.9	0.7
Watershed Association Projects	93.4	3.0	3,192.0	3.7
EPS Big Tree Sale	1.7	0.0	37.7	0.1
BC Rain Barrel Sale	5.3	0.5	781.7	0.3
Redevelopment/Revitalization	66.8	4.4	6228.6	
Restoration Progress through FY13	**1591.6**	**253.6**	**983,537.7**	**122.6**

Jones Falls Through FY13				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	753.9	683.4	451,044.0	100.5
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	518.7	67.5	54,791.8	78.3
Growing Home Campaign	40.5	1.2	473.0	1.8
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	1.7	0.0	19.5	0.1
Watershed Association Projects	224.2	8.5	4,767.7	9.7
EPS Big Tree Sale	18.6	0.6	217.5	0.8
BC Rain Barrel Sale	7.4	0.8	512.3	0.4
Redevelopment/Revitalization	53.1	1.4	1,078.2	
Restoration Progress through FY13	**1618.1**	**763.4**	**512,904**	**191.6**

Back River Through FY13				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	1,021.1	699.1	991,651.3	102.8
Shoreline Management	3,394.0	2,232.3	9,300,186.0	473.6
SWM Retrofit/Conversions	1,050.3	152.6	70,360.2	120.2
Growing Home Campaign	22.8	1.1	245.3	1.8
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	6.2	0.3	66.8	0.5
Watershed Association Projects	94.8	7.3	1,364.0	16.2
EPS Big Tree Sale	1.7	0.1	18.3	0.1
BC Rain Barrel Sale	11.4	2.0	826.6	1.2
Redevelopment/Revitalization	7.1	2.3	187.4	
Restoration Progress through FY13	**5,609.4**	**3,097.1**	**10,364,905.9**	**716.4**
Baltimore Harbor Through FY13				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	1,290.3	848.6	3,535,509.0	424.5
SWM Retrofit/Conversions	1,270.5	237.6	131,387.2	218.8
Growing Home Campaign	5.3	0.3	66.1	0.4
EPS Rural Reforestation	0.0	0.0	0.0	0.0
Energy Trees	9.3	0.5	116.9	0.7
Watershed Association Projects	15.5	0.9	331.6	1.1
EPS Big Tree Sale	5.2	0.3	65.5	0.4
BC Rain Barrel Sale	2.6	0.5	227.4	0.3
Redevelopment/Revitalization	7.4	1.0	479.0	
Restoration Progress through FY13	**2,606.1**	**1089.7**	**3,668,182.7**	**646.2**

Table 10-51: Progress Made in Pollutant Load Reductions and Impervious Area Treated – July 1, 2013 through June 30, 2014 (FY14)

Restoration In Deer Creek Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.0	0.0	0.0	0.0
EPS Big Tree Sale	1.2	0.0	28.7	0.1
BC Rain Barrel Sale	0.0	0.0	0.0	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**1.2**	**0.0**	**28.7**	**0.1**

Restoration In Prettyboy Watershed FY14				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Erosion Control	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	33.7	1.0	570.1	1.5
EPS Big Tree Sale	0.0	0.0	0.0	0.0
BC Rain Barrel Sale	0.0	0.0	4.0	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**33.7**	**1.0**	**574.1**	**1.5**

Restoration in the Loch Raven Watershed FY14				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	93.7	2.8	1,669.1	4.1
Watershed Association Projects	94.2	3.0	1,617.8	3.6
EPS Big Tree Sale	27.8	0.8	495.4	1.2
BC Rain Barrel Sale	2.4	0.2	360.7	0.1
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	10.3	0.0	0.0	2.1
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**228.4**	**6.8**	**4,143**	**11.1**

Restoration in the Lower Gunpowder Watershed FY14				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.8	0.0	22.1	0.0
EPS Big Tree Sale	2.4	0.1	51.1	0.1
BC Rain Barrel Sale	2.8	0.3	324.9	0.2
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	26.6	0.0	0.0	1.3
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**32.6**	**0.4**	**398.1**	**1.6**

Restoration in the Little Gunpowder Watershed FY14				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.0	0.0	0.0	0.0
EPS Big Tree Sale	1.1	0.0	24.9	0.0
BC Rain Barrel Sale	0.5	0.1	56.9	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	2.9	0.0	0.0	0.3
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**4.5**	**0.1**	**81.8**	**0.3**

Restoration in the Bird River Watershed FY14				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	31.3	6.7	806.6	0.0
EPS Community Reforestation Program	12.6	0.6	167.4	1.0
Watershed Association Projects	0.4	0.0	5.2	0.0
EPS Big Tree Sale	0.9	0.0	11.6	0.1
BC Rain Barrel Sale	1.4	0.2	110.2	0.1
Septic Connections	10.8	0.0	0.0	0.8
Septic Denitrification Systems	3.5	0.0	0.0	0.3
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**60.9**	**7.5**	**1,101**	**2.3**

Restoration in the Gunpowder River Watershed FY14				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	7.0	1.6	335.1	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	7.0	0.4	131.5	0.6
EPS Big Tree Sale	0.0	0.0	0.0	0.0
BC Rain Barrel Sale	0.6	0.1	94.2	0.0
Septic Connections	32.9	0.0	0.0	0.8
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**47.5**	**2.1**	**560.8**	**1.4**

All Restoration in the Middle River Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	17.7	2.8	555.8	7.5
EPS Community Reforestation Program	62.2	3.1	913.7	4.9
Watershed Association Projects	3.3	0.3	145.9	0.3
EPS Big Tree Sale	0.5	0.0	7.9	0.0
BC Rain Barrel Sale	0.4	0.0	50.0	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**84.1**	**6.2**	**1,673.3**	**12.7**

All Restoration in the Liberty Reservoir Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.0	0.0	0.0	0.0
EPS Big Tree Sale	1.1	0.0	24.9	0.0
BC Rain Barrel Sale	0.0	0.0	2.5	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**1.1**	**0.0**	**27.4**	**0.0**

All Restoration in the Lower North Branch Patapsco Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	1.1	0.0	46.7	0.0
Watershed Association Projects	3.6	0.1	67.5	0.2
EPS Big Tree Sale	2.7	0.1	46.9	0.1
BC Rain Barrel Sale	1.0	0.2	90.1	0.1
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	13.0	0.0	0.0	1.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**21.4**	**0.4**	**251.2**	**1.4**

Restoration in the Gwynns Falls Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	148.0	134.2	88,548.2	19.7
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	16.2	1.0	1,605.2	1.2
EPS Community Reforestation Program	0.9	0.0	19.8	0.0
Watershed Association Projects	0.1	0.0	8.1	0.0
EPS Big Tree Sale	2.0	0.1	45.6	0.1
BC Rain Barrel Sale	0.7	0.1	70.9	0.1
Septic Connections	4.2	0.0	0.0	0.8
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	64.4	5.6	10,039.4	10.9
Restoration Progress FY14	**236.5**	**141.0**	**100,337.2**	**32.8**

Restoration in the Jones Falls Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	11.9	0.4	155.3	0.6
EPS Big Tree Sale	10.4	0.3	122.1	0.5
BC Rain Barrel Sale	1.1	0.1	158.5	0.1
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	4.4	0.0	0.0	1.3
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**27.8**	**0.8**	**435.9**	**2.5**

Restoration in the Back River Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	41.8	6.8	1,195.1	3.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	11.2	0.6	129.7	0.9
EPS Big Tree Sale	2.1	0.1	22.4	0.2
BC Rain Barrel Sale	2.3	0.4	167.9	0.2
Septic Connections	15.8	0.0	0.0	0.4
Septic Denitrification Systems	10.1	0.0	0.0	0.0
Redevelopment/Revitalization	2.9	0.3	197.5	0.5
Restoration Progress FY14	**86.2**	**8.2**	**1,712.6**	**5.2**

Restoration in the Baltimore Harbor Watershed FY14				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	27.8	1.8	624.3	2.1
EPS Big Tree Sale	0.7	0.0	9.2	0.1
BC Rain Barrel Sale	0.4	0.1	31.2	0.0
Septic Connections	1,709.8	0.0	0.0	40.6
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
Restoration Progress FY14	**1,738.7**	**1.9**	**664.7**	**42.8**

Table 10-52: Progress Made in Pollutant Load Reductions and Impervious Area Treated – July 1, 2014 through June 30, 2015 (FY15)

Restoration In Deer Creek Watershed FY15				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.0	0.0	0.0	0.0
EPS Big Tree Sale	0.0	0.0	0.0	0.0
BC Rain Barrel Sale	0.1	0.0	16.6	0.0
Street Sweeping	0.0	0.0	0.0	0.0
Inlet Cleaning	0.0	0.0	0.0	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	1.8	0.0	0.0	0.3
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**1.9**	**0.0**	**16.6**	**0.3**
Restoration In Prettyboy Watershed FY15				
Program	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	30.7	0.9	519.6	1.3
Watershed Association Projects	2.9	0.1	49.0	0.1
EPS Big Tree Sale	1.1	0.0	17.8	0.0
BC Rain Barrel Sale	0.2	0.0	21.1	0.0
Street Sweeping	0.0	0.0	0.0	0.0
Inlet Cleaning	0.0	0.0	0.0	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	1.1	0.0	0.0	1.8
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**36.0**	**1.0**	**607.5**	**3.2**

Restoration in the Loch Raven Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	120.0	108.8	71,808.0	16.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	152.9	13.4	12,466.4	22.6
EPS Community Reforestation Program	488.9	15.0	9,100.5	20.1
Watershed Association Projects	94.5	2.9	1,391.4	4.0
EPS Big Tree Sale	22.5	0.7	401.6	1.0
BC Rain Barrel Sale	2.0	0.2	230.3	0.1
Street Sweeping	704.3	281.7	84,517.0	56.3
Inlet Cleaning	26.8	10.7	3,215.5	2.1
Septic Connections	2.7	0.0	0.0	0.4
Septic Denitrification Systems	3.1	0.0	0.0	0.0
Septic Pumpouts	47.7	0.0	0.0	14.6
Redevelopment/Revitalization	26.3	3.5	6,143.4	6.2
DPW Projects	2.1	0.1	121.3	1.6
Restoration Progress FY15	**1,693.8**	**437.0**	**189,395.4**	**145.0**

Restoration in the Lower Gunpowder Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	225.0	204.0	134,640.0	30.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	355.3	27.4	34,331.1	16.1
EPS Community Reforestation Program	35.1	1.1	1,137.8	1.3
Watershed Association Projects	2.5	0.1	80.2	0.1
EPS Big Tree Sale	4.6	0.1	98.4	0.2
BC Rain Barrel Sale	2.0	0.2	275.0	0.1
Street Sweeping	410.0	164.0	49,201.5	32.8
Inlet Cleaning	28.7	11.5	3,447.2	2.3
Septic Connections	5.5	0.0	0.0	0.0
Septic Denitrification Systems	27.6	0.0	0.0	1.6
Septic Pumpouts	35.3	0.0	0.0	3.2
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**1,131.6**	**408.4**	**223,211.2**	**87.7**

Restoration in the Little Gunpowder Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	0.2	0.0	3.8	0.2
EPS Big Tree Sale	3.8	0.1	82.4	0.2
BC Rain Barrel Sale	0.4	0.0	65.6	0.0
Street Sweeping	62.4	25.0	7,485.3	5.0
Inlet Cleaning	2.4	0.9	283.5	0.2
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	10.5	0.0	0.0	0.8
Septic Pumpouts	35.3	0.0	0.0	3.2
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**115.0**	**26.0**	**7,920.6**	**9.6**

Restoration in the Bird River Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	30.5	3.2	1,341.8	2.2
EPS Community Reforestation Program	12.2	0.6	161.6	1.0
Watershed Association Projects	10.8	0.6	195.1	0.9
EPS Big Tree Sale	2.1	0.1	28.3	0.2
BC Rain Barrel Sale	0.8	0.2	68.1	0.1
Street Sweeping	559.1	223.6	67,093.4	44.7
Inlet Cleaning	18.2	7.3	2,183.2	1.5
Septic Connections	142.0	0.0	0.0	8.6
Septic Denitrification Systems	47.2	0.0	0.0	1.3
Septic Pumpouts	3.1	0.0	0.0	0.3
Redevelopment/Revitalization	5.8	0.6	870.8	0.6
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**831.8**	**236.2**	**71,942.3**	**61.4**

Restoration in the Gunpowder River Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	3.9	0.2	67.3	0.3
EPS Big Tree Sale	1.1	0.1	19.4	0.1
BC Rain Barrel Sale	0.1	0.0	7.9	0.0
Street Sweeping	125.6	50.2	15,074.9	10.0
Inlet Cleaning	19.8	7.9	2,377.6	1.6
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	0.8	0.0	0.0	0.1
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**151.3**	**58.4**	**17,547.1**	**12.1**

All Restoration in the Middle River Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	0.0	0.0	0.0	0.0
Watershed Association Projects	8.9	0.6	204.4	0.8
EPS Big Tree Sale	0.7	0.0	10.7	0.1
BC Rain Barrel Sale	0.2	0.0	20.2	0.0
Street Sweeping	349.4	139.8	41,931.6	28.0
Inlet Cleaning	26.8	10.7	3,209.6	2.1
Septic Connections	32.9	0.0	0.0	0.8
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	1.6	0.0	0.0	0.1
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**420.5**	**151.1**	**45,376.5**	**31.9**

All Restoration in the Liberty Reservoir Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	6.5	0.2	200.3	0.2
Watershed Association Projects	0.2	0.0	3.2	0.6
EPS Big Tree Sale	0.7	0.0	13.0	0.0
BC Rain Barrel Sale	0.1	0.0	8.8	0.0
Street Sweeping	15.3	6.1	1,839.0	1.2
Inlet Cleaning	0.3	0.1	40.0	0.0
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	0.0	0.0	0.0	0.0
Redevelopment/Revitalization	0.0	0.0	0.0	0.0
DPW Projects	14.8	0.8	851.8	0.9
Restoration Progress FY15	**37.9**	**7.2**	**2,956.1**	**2.9**

All Restoration in the Lower North Branch Patapsco Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	16.4	0.6	692.8	0.7
Watershed Association Projects	0.6	0.0	10.8	0.0
EPS Big Tree Sale	4.4	0.1	75.7	0.2
BC Rain Barrel Sale	2.2	0.2	298.5	0.2
Street Sweeping	433.0	173.2	51,957.2	34.6
Inlet Cleaning	69.1	27.6	8,293.0	5.5
Septic Connections	3.3	0.0	0.0	0.4
Septic Denitrification Systems	11.6	0.0	0.0	1.0
Septic Pumpouts	33.1	0.0	0.0	5.1
Redevelopment/Revitalization	9.8	0.0	90.4	1.2
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**583.5**	**201.7**	**61,418.4**	**48.9**

Restoration in the Gwynns Falls Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	33.3	3.4	1,666.8	5.7
EPS Community Reforestation Program	11.6	0.3	261.7	0.5
Watershed Association Projects	12.2	0.4	278.1	0.5
EPS Big Tree Sale	2.5	0.1	55.5	0.1
BC Rain Barrel Sale	2.5	0.3	364.5	0.1
Street Sweeping	901.4	360.5	108,162.4	72.1
Inlet Cleaning	108.4	43.4	13,004.7	8.7
Septic Connections	4.2	0.0	0.0	0.8
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	10.0	0.0	0.0	2.4
Redevelopment/Revitalization	26.3	1.8	2,504.1	2.5
DPW Projects	19.5	1.9	2,754.1	2.4
Restoration Progress FY15	**1,131.9**	**412.1**	**129,051.9**	**95.8**

Restoration in the Jones Falls Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	21.5	0.6	264.5	0.9
Watershed Association Projects	10.2	0.3	127.0	0.5
EPS Big Tree Sale	2.5	0.1	55.5	0.1
BC Rain Barrel Sale	2.0	0.2	136.8	0.1
Street Sweeping	466.2	186.5	55,943.1	37.3
Inlet Cleaning	61.3	24.5	7,360.3	4.9
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	1.7	0.0	0.0	0.5
Septic Pumpouts	15.1	0.0	0.0	6.5
Redevelopment/Revitalization	4.1	0.4	517.2	0.3
DPW Projects	0.0	0.0	0.0	0.0
Restoration Progress FY15	**584.6**	**212.6**	**64,404.4**	**51.1**

Restoration in the Back River Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	11.1	2.6	213.1	4.3
EPS Community Reforestation Program	8.1	2.0	209.1	0.5
Watershed Association Projects	7.7	0.4	96.0	0.7
EPS Big Tree Sale	1.7	0.1	18.8	0.1
BC Rain Barrel Sale	2.2	0.4	156.4	0.2
Street Sweeping	1,520.7	608.3	182,485.3	121.7
Inlet Cleaning	138.9	55.6	16,672.1	11.1
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	3.8	0.0	0.0	0.3
Septic Pumpouts	1.9	0.0	0.0	0.2
Redevelopment/Revitalization	0.9	0.1	107.5	0.2
DPW Projects	6.7	1.0	405.9	1.0
Restoration Progress FY15	**1,703.7**	**670.5**	**200,364.2**	**140.3**

Restoration in the Baltimore Harbor Watershed FY15				
Program	**Removal Rate (lb./year)**			**Equivalent Impervious Acres**
	TN	**TP**	**TSS**	
Stream Restoration	0.0	0.0	0.0	0.0
Shoreline Management	0.0	0.0	0.0	0.0
SWM Retrofit/Conversions	0.0	0.0	0.0	0.0
EPS Community Reforestation Program	39.5	2.3	1,136.9	2.4
Watershed Association Projects	0.1	0.0	12.2	0.0
EPS Big Tree Sale	6.1	0.3	76.5	0.5
BC Rain Barrel Sale	0.5	0.1	43.4	0.1
Street Sweeping	943.0	377.2	113,165.9	75.4
Inlet Cleaning	56.1	22.4	6,731.2	4.5
Septic Connections	0.0	0.0	0.0	0.0
Septic Denitrification Systems	0.0	0.0	0.0	0.0
Septic Pumpouts	1.1	0.0	0.0	0.1
Redevelopment/Revitalization	6.0	1.8	886.5	1.6
DPW Projects	6.4	0.4	189.1	1.5
Restoration Progress FY15	**1,058.8**	**404.5**	**122,241.7**	**86.1**

Table 10-53 summarizes the data from Table 10-50 by watershed, while Table 10-54 summarizes the data from Table 10-51 by watershed. Table 10-55 summarizes the impervious cover treated during FY2015 by watershed.

Table 10-53: Pollutant load Reductions and Impervious Area Treated by Watershed Through FY2013

Watershed	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Deer Creek	7.4	0.2	192.4	0.3
Prettyboy	296.1	11.0	8,312.6	10.5
Loch Raven Reservoir	3,092.5	1,574.3	1,062,818.2	283.6
Lower Gunpowder Falls	2,165.0	1,716.2	1,137,747.7	262.1
Little Gunpowder Falls	18.9	0.7	716.8	0.8
Bird River	2,609.8	1,832.0	1,194,847.7	293.2
Gunpowder River	218.7	38.3	70,719.9	28.6
Middle River	2,719.3	1,516.5	5,777,900.7	292.1
Liberty Reservoir	6.3	0.1	149.5	0.3
Patapsco River	388.5	223.1	151,400.9	39.6
Gwynns Falls	1,524.8	249.2	977,309.1	122.6
Jones Falls	1,565.0	762.0	511,825.8	191.6
Back River	5,602.3	3,094.8	10,364,718.5	716.4
Baltimore Harbor	2,598.7	1,088.7	3,667,703.7	646.2
Restoration Progress through FY2013	**22,813.3**	**12,107.1**	**24,926,363.5**	**2,887.9**

Table 10-54: Pollutant load Reductions and Impervious Area Treated by Watershed FY2014

Watershed	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Deer Creek	1.2	0.0	28.7	0.1
Prettyboy	33.7	1.0	574.1	1.5
Loch Raven Reservoir	228.4	6.8	4,143.0	11.1
Lower Gunpowder Falls	32.6	0.4	398.1	1.6
Little Gunpowder Falls	4.5	0.1	81.8	0.3
Bird River	60.9	7.5	1,101.0	2.3
Gunpowder River	47.5	2.1	560.8	1.4
Middle River	84.1	6.2	1,673.3	12.7
Liberty Reservoir	1.1	0.0	27.4	0.0
Patapsco River	21.4	0.4	251.2	1.4
Gwynns Falls	236.5	141.0	100,337.2	32.8
Jones Falls	27.8	0.8	435.9	2.5
Back River	86.2	8.2	1,712.6	5.2
Baltimore Harbor	1,738.7	1.9	664.7	42.8
Total FY2014	**2,604.6**	**176.4**	**111,989.8**	**115.7**

Table 10-55: Pollutant load Reductions and Impervious Area Treated by Watershed FY2015

Watershed	Removal Rate (lb./year)			Equivalent Impervious Acres
	TN	TP	TSS	
Deer Creek	1.9	0.0	16.6	0.3
Prettyboy	36.0	1.0	607.5	3.2
Loch Raven Reservoir	1,693.8	437.0	189,395.4	145.0
Lower Gunpowder Falls	1,131.6	408.4	223,211.2	87.7
Little Gunpowder Falls	115.0	26.0	7,920.6	9.6
Bird River	831.8	236.2	71,942.3	61.4
Gunpowder River	151.3	58.4	17,547.1	12.1
Middle River	420.5	151.1	45,376.5	31.9
Liberty Reservoir	37.9	7.2	2,956.1	2.9
Patapsco River	583.5	201.7	61,418.4	48.9
Gwynns Falls	1,131.9	412.1	129,051.9	95.8
Jones Falls	584.6	212.6	64,404.4	51.1
Back River	1,703.7	670.5	200,364.2	140.3
Baltimore Harbor	1,058.8	404.5	122,241.7	86.1
Total FY2014	**9,482.3**	**3226.7**	**1,136,453.9**	**776.3**

10.5 Progress in Meeting Impervious Surface Restoration Requirements

The amount of impervious cover that needs to be addressed in Baltimore County was calculated based on the guidelines provided in the document *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated (MDE, 2014)*. In order to assure consistency between MS4 regulated jurisdictions MDE has determined that the base year of 2002 impervious cover be used to determine how many acres of impervious cover will need to be addressed. The implementation of the MDE 2000 Stormwater Design Manual was initiated in 2002 by local jurisdictions. The revised Design Manual required management of the 1st inch of runoff for quantity control and included groundwater recharge volume and water quality volume reductions. Chapter 5 of the manual included many Environmental Site Design (ESD) practices that are now required for new development and redevelopment projects. MDE considers that any approvals of stormwater plans for development approved in 2002 and thereafter will meet the highest required stormwater management requirements.

Baltimore County did not have an impervious surface area (ISA) delineated specifically for 2002 as a starting point. The County had to compile an impervious surface from previous years and county permits in order to create the 2002 ISA baseline. Planimetric data including roads and building footprints were compiled for the years 1996, 1997, and 2001 into one surface. Using the Counties permit data, 2003 aerial photography, and the Counties ISA from 2005, the new surface layer was refined by adding or subtracting impervious area based on the permit data and verified by the 2005 ISA and the 2003 photography.

Not all impervious surface areas fall under the jurisdiction of the county. Impervious areas which the County is not responsible for are areas associated with land that is owned and managed by the State of Maryland, Federal government, and the City of Baltimore. In addition to these areas, agricultural lands and its associated impervious surface do not fall under the counties responsibility. It was necessary to determine the amount of impervious controlled by each sector listed above and subtract that amount of impervious cover from the total impervious cover in the county. The detail of the calculations will be described in the Baltimore County Impervious

Cover Analysis that will be submitted to MDE once the final quality assurance/quality control is completed and the Baltimore County NPDES – MS4 permit is re-issued. The results of the analysis are presented in Table 10-56.

Table 10-56: Baltimore County Impervious Area by Watershed – Calculated for 2002

Watershed	Total Imp. Cover	Ag Imp. Cover	Federal Imp. Cover	State Imp. Cover	City Imp. Cover	SWM Imp. Cover	County Imp. Cover
Deer Creek	166.2	49.8	0.0	25.3	0.0	0.0	91.1
Prettyboy Reservoir	460.7	121.3	0.0	26.6	2.9	0.0	309.9
Loch Raven Reservoir	6257.1	588.8	5.1	643.7	25.1	55.5	4939.0
Lower Gunpowder Falls	2277.2	139.0	0.0	207.8	1.7	33.3	1895.3
Little Gunpowder Falls	614.8	80.8	0.0	95.3	0.0	4.2	434.5
Bird River	2508.9	32.4	0.0	289.8	6.2	123.6	2057.0
Gunpowder River	359.8	12.4	0.0	35.4	0.0	9.8	302.2
Middle River	1328.9	3.9	0.0	287.6	0.0	9.2	1028.2
Upper Western Shore	**13973.6**	**1028.4**	**5.1**	**1611.5**	**35.9**	**235.5**	**11057.2**
Liberty Reservoir	524.4	38.4	0.0	117.8	20.1	0.5	347.6
Patapsco River	4112.8	29.8	18.6	691.1	2.1	51.3	3320.0
Gwynns Falls	6138.5	0.7	80.4	729.7	0.9	73.6	5253.2
Jones Falls	3508.8	28.8	3.6	495.8	3.3	30.9	2946.4
Back River	5526.0	9.2	3.3	617.0	5.6	95.8	4795.0
Baltimore Harbor	3000.8	0.0	0.6	355.6	0.0	3.1	2641.6
Patapsco/ Back River Totals	**22811.3**	**106.9**	**106.5**	**3006.9**	**32.1**	**255.1**	**19303.8**
County-Wide Totals	**36784.9**	**1135.3**	**111.6**	**4618.3**	**68.0**	**490.6**	**30361.0**
% of Total Imp. Cover		**3.1**	**0.3**	**12.6**	**0.2**	**1.3**	**82.5**

To meet the current NPDES permit requirement Baltimore County must provide restoration for impervious land areas that are equal to or greater than 20% of the County's urban impervious cover. Twenty percent of 30,361. acres is 6,072 acres.

Using the guidance provided by *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, August 2014) the impervious area treated was calculated for each restoration program. The results are presented in Table 10-50 for progress made through fiscal year 2013, along with the pound of nitrogen, phosphorus and sediment reduced, by watershed, by restoration program. The same information is presented in Table 10-51 for fiscal year 2014 (July 1, 2013 – June 30, 2014). Note that programs that receive only annual credit are presented in table that summarizes the most recent reporting year, in this case FY2015 (Table 10-52).

Table 10-57 shows that Baltimore County has addressed 3,779.9 acres of impervious surface or 12.4% of the impervious surface for which Baltimore County has responsibility through FY2015. In FY2015 the county addressed 776.3 acres of impervious surface. This includes the annual practices of street sweeping, storm drain cleaning, and OSDS pump-outs. In FY 2014 115.7 acres of impervious surface were addressed, excluding the annual practices. This results in a total of 892 acres of impervious surface being addressed during the first two years of the MS4

permit or 14.8% of the required amount of impervious surface to be addressed (3,036 acres of impervious surface). This would indicate that the county is lagging in meeting the 20% impervious surface restoration requirement. Table 10-58 indicates the amount of impervious surface that will be addressed through projects that are either in design or construction and expected to be completed prior to the end of the permit along with the projected annual programs that will be conducted in the final reporting year for the permit.

Table 10-57: Impervious Area Treated Through June 30, 2015

Watershed	BC Impervious	Through 2013	Equivalent Impervious Acres Addressed Under Current Permit				All Imp. Restoration	
			FY 2014	FY 2015	Total	%	Total	Percent
Deer Creek	91.1	0.3	0.1	0.3	0.4	0.4%	0.7	0.8%
Prettyboy	309.9	10.5	1.5	3.2	4.7	1.5%	15.2	4.9%
Loch Raven Reservoir	4,939.0	283.6	11.1	145.0	156.1	3.2%	439.7	8.9%
Lower Gunpowder Falls	1,895.3	262.1	1.6	87.7	89.3	4.7%	351.4	18.5%
Little Gunpowder Falls	434.5	0.8	0.3	9.6	9.9	2.3%	10.7	2.5%
Bird River	2,057.0	293.2	2.3	61.4	63.7	3.1%	356.9	17.4%
Gunpowder River	302.2	28.6	1.4	12.1	13.5	4.5%	42.1	13.9%
Middle River	1,028.2	292.1	12.7	31.9	44.6	4.3%	336.7	32.7%
Liberty Reservoir	347.6	0.3	0.0	2.9	2.9	0.8%	3.2	0.9%
Patapsco River	3,320.0	39.6	1.4	48.9	50.6	1.5%	90.2	2.7%
Gwynns Falls	5,253.2	122.6	32.8	95.8	128.6	2.4%	251.2	4.8%
Jones Falls	2,946.4	191.6	2.5	51.1	53.6	1.8%	245.2	8.3%
Back River	4,795.0	716.4	5.2	140.3	145.5	3.0%	861.9	18.0%
Baltimore Harbor	2,641.6	646.2	42.8	86.1	128.9	4.9%	775.1	29.3%
Restoration Progress through June 30, 2015	**30,361.0**	**2,887.9**	**115.7**	**776.3**	**892.0**	**2.9%**	**3,779.9**	**12.4%**

Table 10-58: Projection of Impervious Surface Addressed for Cumulative Projects Over the Remaining Three Years of the MS4 Permit.

Watershed	Capital Projects!	Reforestation!	OSDS*	DPW!	Redevelopment! &	Watershed A$		Big Tree & Rain Barrel Sales $		Total	
						Annual	3 years	Annual	3 years	Annual	3 years
Deer Creek	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.03	0.09	0.26	0.32
Prettyboy	0.00	3.34	0.00	0.20	0.00	0.80	2.40	0.00	0.00	4.34	5.94
Loch Raven	125.00	9.76	0.81	11.60	0.00	3.80	11.40	0.61	1.83	151.58	160.4
Lower Gunpowder	88.77	10.15	0.81	0.00	0.00	0.05	0.15	0.14	0.42	99.92	100.3
Little Gunpowder	193.50	0.00	0.26	0.00	0.00	0.10	0.30	0.11	0.11	193.97	194.2
Bird River	0.00	1.03	2.73	0.00	0.00	0.45	1.35	0.09	0.09	4.3	5.20
Gunpowder River	0.00	0.00	0.20	0.00	0.00	0.45	1.35	0.04	0.04	0.69	1.59
Middle River	0.00	0.29	0.20	2.10	2.07	0.55	1.65	0.04	0.04	5.25	6.35
Liberty	0.00	4.56	0.00	0.00	0.00	0.30	0.90	0.00	0.00	4.86	5.46
Patapsco River	103.89	1.84	0.62	0.50	0.00	0.10	0.30	0.14	0.14	107.09	107.29
Gwynns Falls	136.26	2.20	0.39	0.00	11.44	0.25	0.75	0.10	0.10	150.64	151.14
Jones Falls	243.30	0.73	0.46	0.00	1.89	0.55	1.65	0.24	0.24	247.17	248.27
Back River	132.16	0.57	0.23	1.10	0.00	0.80	2.40	0.19	0.19	135.05	136.65
Baltimore Harbor	256.68	0.00	10.14	0.00	7.67	1.05	3.15	0.17	0.17	275.71	277.81
Total	**1,279.56**	**34.70**	**16.85**	**15.5**	**23.07**	**9.25**	**27.75**	**1.9**	**3.46**	**1,380.8**	**1,400.9**

! Based on projects under design or construction
* Projected sanitary sewer hook-ups and denitrifying system installation based on FY14 and FY15 progress
& There are likely to be more redevelopment projects than are currently accounted for
$ Based on the average of FY14 and FY15 progress

Based on cumulative restoration projects that are in the either design or construction, and the three year projections for Watershed Association projects and the Big Tree and Rain Barrel Sales programs, the County will achieve an additional 1,400 acres of impervious surface restoration. Other programs that are only credited on an annual basis with only the last year counting for imperious surface restoration, are projected to provide 790 acres of impervious surface restoration credit (Table 10-59).

Table 10-59: Annual Practice Impervious Surface Restoration Credit Projected for the Last Year of the MS4 Permit.

Watershed	Street Sweeping	Storm Drain Cleaning	OSDS Pump-Outs	Total
Deer Creek	0.00	0.00	0.48	0.48
Prettyboy	0.00	0.00	1.50	1.5
Loch Raven	75.25	1.94	23.01	100.2
Lower Gunpowder	43.60	2.23	6.23	52.06
Little Gunpowder	8.20	0.10	4.11	12.41
Bird River	50.05	1.88	0.63	52.56
Gunpowder River	9.00	0.90	0.11	10.01
Middle River	27.00	1.77	0.06	28.83
Liberty	3.35	0.02	3.45	6.82
Patapsco River	72.70	6.48	5.06	84.24
Gwynns Falls	141.95	7.97	3.05	152.97
Jones Falls	43.55	4.31	8.28	56.14
Back River	144.55	12.50	0.12	157.17
Baltimore Harbor	69.60	5.42	0.06	75.08
Total	**688.8**	**45.52**	**56.15**	**790.47**

It is clear, based on the forgoing analysis that Baltimore County will need to identify and implement additional restoration projects to meet the 20% impervious surface restoration requirement of the NPDES – MS4 permit.

10.6 Progress in Meeting Local TMDLs and the Chesapeake Bay TMDL

10.6.1 Local TMDLs

The local TMDL Implementation Plans have now been developed and were submitted to MDE for review and approval with the 2014 annual report. A May 29th, 2015 letter included comments on not only the 2014 annual report, but also the 22 TMDL Implementation Plans submitted with the 2014 annual report. The comments were derived from the review of the plans by both the Water Management Administration and the Science Services Administration. Responses to these comments are provided separately. Revised TMDL Implementation Plans are submitted with this report as appropriate.

Starting with this report we will detail the progress made in meeting the load reductions and interim milestones for each of the local TMDLs. The local TMDL progress reporting will be grouped by broad pollutant type; bacteria (Section 10.6.1.1), nutrients and sediment (Section 10.6.1.2), and toxics (Section 10.6.1.3). The Trash TMDL Implementation Plan is being submitted to MDE for review and approval with this annual report. Future annual reports will report on progress in trash load reductions, however, the reporting will be in Section 6 which covers the trash and litter programs.

10.6.1.1 Bacteria TMDLs

Seven watersheds have Bacteria TMDLs (Prettyboy Reservoir, Loch Raven Reservoir, Liberty Reservoir, Lower North Branch of the Patapsco River, Gwynns Falls, Jones Falls, and Back River (only the Herring Run portion). The initial focus of each the Bacteria TMDL Implementation Plan is to provide monitoring for better resolution of subwatersheds with high bacteria counts, to continue monitoring at the Bacteria Trend Monitoring sites, to continue to implement the requirements of the sanitary sewer Consent Decree, and to develop education and outreach for pet waste bacteria sources. The bacteria monitoring is detailed in Section 9.4.2. The County has completed the first year of the subwatershed bacteria prioritization monitoring and will conduct another round of subwatershed monitoring in 2016. The results of the 2015 subwatershed prioritization monitoring will be presented in the next report and should provide an initial assessment of where bacteria concentrations are the highest.

The progress in meeting the sanitary sewer Consent Decree in relation to the bacteria monitoring is detailed in Section 7.6.2. Currently Baltimore County has a Request for Proposals published for the development of education and outreach materials with a closing date of December 16, 2015. The expectation is that a firm(s) will be selected and have a contract executed sometime in the late winter/early spring of 2016. One of the assignments will be the development of a pet waste education and outreach program. The consultant is also tasked with assessing the effectiveness of the education and outreach program and determining pollutant load reductions as a result of implementing the pet waste education and outreach program.

The trends in the bacteria concentrations for all of the Bacteria TMDL watershed are presented in relation to sanitary sewer repairs if applicable is presented in Table 10-60. The concentrations presented are the geometric means for the seasonal (May 1st – September 30th) dry weather flow. This data was selected for presentation as it represents the most likely condition under which

human recreational contact will occur. Most people will not enter the streams during the colder months nor during times of high water flow as occurs during and immediately after storm events. Section 10 presents the monitoring data for each site under all flow conditions.

Table 10-60: Seasonal Dry Weather Results and Sanitary Sewer System Repairs

Station	Geometric Mean (MPN)			Sanitary Sewer Project Status		% Change Relative to MDE Geometric Mean	
	MDE	2010-2014	2014	Completed	Future	2010-2014	2014
PRE-1	287	315	294	NA	NA	+9.8%	+2.4%
PRE-2	134	153	140	NA	NA	+14.2%	+4.5%
PRE-3	751	240	335	NA	NA	-98.0%	-55.4%
LOC-1	1,080	505	1,043	0	0*	-53.2%	-3.4%
LOC-2	611	384	334	0	2	-37.2%	-45.3%
LOC-3	491	350	258	0	0*	-28.7%	-47.5%
LOC-4	224	148	434	0	0*	-33.9%	-40.2%
LOC-5	168	126	121	NA	NA	-25.0%	-28.0%
LOC-6		85	167	NA	NA		
LIB-1	200	113	86	?	?	-43.5%	-57.0%
LIB-2	172	118	159	?	?	-31.4%	-7.6%
LIB-3	607	437	554	?	?	-28.0%	-8.7%
LIB-4	278	132	173	?	?	-52.5%	-37-8%
LIB-5	427	298	216	?	?	-30.2%	-49.4%
PAT-1	231	278	102	10	1,108	20.3%	-55.8%
PAT-2	117	97	33	9	624	-17.1%	-71.8%
PAT-3	119	107	27	4	361	-10.1%	-77.3%
PAT-4	93	64	33	3	1	-31.2%	-64.5%
PAT-5	134	97	34	NA	NA	-35.1%	-74.6%
GWY-1	35,290	1,526	855	75	150	-95.7%	-97.6%
GWY-2	373	349	314	5	2	-6.4%	-15.8%
GWY-5	636	313	175	75!	150!	-50.8%	-72.5%
GWY-6	743	304	298	1	0	-59.1%	-59.9%
GF-B-8#	NA	NA	NA	6	6		
GF-B-10#	NA	NA	NA	69	149		
JON-1	372	642	706	City	City	+72.6%	+89.8%
JON-2	139	87	113	27	234	-37.4%	-18.7%
JON-3	501	422	549	2	78	-15.8%	-9.6%
JON-4	872	378	305	1	13	-56.7%	-65.0%
JON-5	2,394	264	372	City	City	-89.0%	-84.5%
HER-1	591	503	426	2	265	-14.9%	-27.9%
Biddle	1,920	596	461	0	2	-69.0%	-76.0%
Pulaski	616	528	580	2	274	-14.3%	-5.8%

NA – There are no Baltimore County sanitary sewer systems upstream of the monitoring site
* - The sanitary sewer rehabilitation, repair, replacement plans are not complete yet

Only three stations of the 31 stations exhibited increases in the seasonal dry weather bacteria concentrations relative to the MDE monitoring that was used to develop the bacteria TMDLs.

These three were consistent for both the average over the 5 years of monitoring and in comparison with the monitoring results for 2014. One station exhibited mixed results with the long term average showing a decrease relative to MDE results, but the 2014 indicated an increase. The balance of the stations (27) showed a decrease in the bacteria concentrations by varying amounts; those showing greater than a 25% decrease are highlighted in green. Six of the stations (19%) displayed a geometric mean in the 2014 data that met the water quality standard of 126 MPN for *E. coli*.

10.6.1.2 Nutrient and Sediment TMDLs

Each of the Reservoir watersheds (Prettyboy, Loch Raven, and Liberty) have TMDLs for phosphorous based on the water quality standards for chlorophyll a and hypoliminion dissolved oxygen within the reservoirs. Loch Raven and Liberty reservoirs also have TMDLs for sediment based on the rate of in-filling of the reservoirs. It should be noted that while it is worthwhile to decrease the rate of reservoir infilling in order to preserve the drinking water supply; there is no water quality standard related to the sediment infill of reservoirs.

Three additional watersheds have sediment TMDLs (Lower North Branch of the Patapsco River, and Jones Falls) based on impacts to the aquatic biological community. In addition, Baltimore Harbor has a TMDL for nutrients (both nitrogen and phosphorus) that require nutrient reductions from the Lower North Branch of the Patapsco River, Gwynns Falls, Jones Falls, and Baltimore Harbor direct drainage watersheds. Back River also has a nutrient (nitrogen and phosphorus) TMDL. A summary of the local TMDLs and percent reduction is presented in Table 10:61.

Table 10-61: TMDL Reduction Requirements for Nutrient and Sediment TMDLs

Watershed	Phosphorus		Sediment		Nitrogen	
	#s	%	#s	%	#s	%
Prettyboy	286.1	15%	NA	NA	NA	NA
Loch Raven	2,946.1	15%	716,600		NA	NA
Liberty	3,971.0	49%	2,662,886	38%	NA	NA
LNB Patapsco River	4,633		1,491,236	21.2%	13,843	
Gwynns Falls	5,938		5,539,803	36.4%	33,757	
Jones Falls	7,508		4,378,000	21.9%	14,479	
Baltimore Harbor	1,370		NA	NA	4,615	
Total Baltimore Harbor	19,449	15%	NA	NA	66,694	15%
Back River	653.3	15%	NA	NA	17,821.3	15%

The Baltimore Harbor nutrient TMDL has an overall 15% reductions for nitrogen and phosphorus from urban stormwater sources. To achieve these reductions, the restoration actions are spread over four watersheds. Since three of these watersheds have reductions associated with sediment impacts to the aquatic community and since most restoration actions that reduce sediment also reduce nitrogen and phosphorus, Baltimore County used the sediment TMDL Implementation Plans to determine how much nitrogen and phosphorus would be reduced and adjusted from that baseline if additional reductions were needed.

TMDL Implementation Plans were submitted for each of these TMDLs December 23, 2014. Implementations actions to achieve these local TMDL pollutant reductions, with the exception of Liberty Reservoir, are directly applicable to meeting the Chesapeake Bay TMDL after accounting for delivery factors. Restoration actions with the Liberty Reservoir do not count toward meeting the Bay TMDL as the Watershed Model for the Bay TMDL indicates zero

delivery of pollutants from within Liberty watershed to the bay based on the lack of flow over the Liberty reservoir dam.

The TMDL Implementation Plans accounted for the changes in the amount of urban load due to development, and the amount of restoration actions since the development of each TMDL and adjusted the loads based on the Chesapeake Bay Program loading rates to determine new baseline load reductions needed. These loads are reflected in Table 10-61. The new baseline date for all plans was July 1, 2013. Therefore restoration actions and other reductions that have occurred since that date can be credited toward meeting the reductions needed (ie. fiscal years 2014 and 2015). Load reductions have been summarized by watershed for Fiscal Years 2014 and 2015 in tables 10-51 and 10-52, above respectively. Since the timeline for meeting the reductions for nutrients and sediment were set to coincide with meeting the Bay TMDL reduction targets for nutrients and sediment in 2025, there are 11 fiscal years prior to meeting the deadline, we assumed a steady pace target rate of 9% reduction per year, therefore the target for this second year is 18%. Table 10-62 below summarized Baltimore County's progress in meeting the local nutrient and sediment TMDLs. Those watershed pollutant reductions that are one or exceed the target of 18% reduction are highlighted in green, those that miss the target are highlighted in orange. In the case of Liberty Reservoir both the phosphorus and sediment are highlighted in red due to progress being less than 5%.

Table 10-62: Progress in Meeting the Local Nutrient and Sediment TMDLs to date

Watershed	Target Load Reduction	FY2014 Reductions	FY2015 Reductions	2011 Fert. Use Act	Total Reductions	% of Target
Phosphorus						
Prettyboy	286.1	1.0	1.0	106.9	108.9	38.1%
Loch Raven	2,946.1	6.8	437.0	1,644.1	2,087.9	70.9%
Liberty*	3,971	0.0	7.2	154.9	162.1	4.1%
LNB Patapsco	4,633	0.4	201.7	489.7	1,284.6	27.7%
Gwynns Falls	5,938	141.0	412.1	1,082.5	1,635.6	27.5%
Jones Falls	7,508	0.8	212.6	723.2	936.6	12.5%
Baltimore Harbor	1,370	1.9	404.5	47.5	453.9	33.1%
Total Baltimore Harbor	19,449	144.1	1,230.9	2,713	4,088	21.0%
Back River	653.3	8.2	670.5	857.2	1,535.9	235.1%
Nitrogen						
LNB Patapsco	13,843	21.4	583.5	3,430.2	4,035.1	29.4%
Gwynns Falls	33,757	236.5	1,131.9	7,582.2	8,950.6	26.5%
Jones Falls	14,479	27.8	584.6	5,065.9	5,678.3	39.2%
Baltimore Harbor	4,615	1,838.7	1,058.8	1,724.2	4,621.7	100.1%
Total Baltimore Harbor	66,694	2,124.2	3,358.8	17,802	23,285	34.9%

Back River	17,821.3	86.2	1,703.7	3,540.4	5,330.3	29.9%
Sediment						
Loch Raven	716,600	4,143	189,395	NA	193,538	27.0%
Liberty*	2,662,886	27	2,956	NA	2,983	0.2%
LNB Patapsco	1,491,236	251	61,418	NA	61,669	4.1%
Gwynns Falls	5,539,803	100,337	129,052	NA	229,389	4.1%
Jones Falls	4,378,000	436	64,405	NA	64,841	1.5%

* The Liberty Reservoir watershed nutrient and sediment TMDLs are on a different schedule for completion, as the Liberty Reservoir watershed has no effect on restoration of the Chesapeake Bay. The target for completion of the phosphorus and sediment reductions for the Liberty Reservoir watershed is 2030. This would be an annual target of 6.25% reduction.

Baltimore County is currently on target to meet the nutrient load reductions for meeting local TMDLs. The only watershed that missed the reduction target is Jones Falls for phosphorus, where only a12.5% reductions was achieved. In fact, the Jones Falls reductions are based on the Baltimore Harbor TMDL and based on the reductions achieved in the other watersheds draining to Baltimore Harbor from Baltimore County (21% reduction for phosphorus overall), we are on track to meet the Baltimore Harbor TMDL reductions by 2025.

For the sediment TMDLs, we are missing the targets for in the three watershed that have a sediment TMDL based on impacts to the biological community and in the Liberty Reservoir watershed for which the sediment TMDL is based on the rate of infill of the reservoir.

It should be noted that the higher reductions in in FY 2015 are due, in part, to the inclusion of annual practices, such as, street sweeping and inlet cleaning in the load reductions. These annual practices are anticipated to continue at the present rate of load reductions. Next years' report will include the actual reductions under FY 2016 achievements and the FY2015 will be modified to reflect only those practices that are cumulative in nature. The higher loads reductions in FY2015 are also reflective of the increased pace of restoration in Baltimore County.

Based on the project that are currently in design, under construction, or completed but have not yet had as-builts approved; Baltimore County has calculated the anticipated load reductions over the next two years. These load reductions are presented in Table 10-63 along with the anticipated percentage of necessary reductions achieved. The target reduction through the end of fiscal year 2017 is 36% for the local TMDLs. Those reductions that make the target are highlighted in green, while those that miss are highlighted in orange.

Table 10-63: Anticipated Pollutant Load Reductions for Local TMDLs through FY2017

Watershed	Target Reduction	Reduction through FY15	Projected Reductions FY16-FY17	Total Reductions through FY17	% Reduction
Phosphorus					
Prettyboy	286.1	108.9	3	111.9	39.1%
Loch Raven	2,946.1	2,087.9	892	2,979.9	101.1%
Liberty	3,971	162.1	5	167.1	4.2%
LNB Patapsco	4,633	1,284.6	724	2,008.6	43.4%
Gwynns Falls	5,938	1,635.6	855	2,490.6	41.9%
Jones Falls	7,508	936.6	1,697	2,633.6	35.1%

Baltimore Harbor	1,370	453.9	1,026	1,479.9	108.0%
Total Baltimore Harbor	19,449	4,088	4,301	8,389.0	43.1%
Back River	653.3	1,535.9	831	2,366.9	362.3%
Nitrogen					
LNB Patapsco	13,843	4,035.1	1,108	5,143.1	37.2%
Gwynns Falls	33,757	8,950.6	1,725	10,675.6	31.6%
Jones Falls	14,479	5,678.3	2,167	7,845.3	54.2%
Baltimore Harbor	4,615	4,621.7	1,542	6,163.7	133.6%
Total Baltimore Harbor	66,694	23,285	6,542	29,827.0	44.7%
Back River	17,821.3	5,330.3	1,263	6,593.3	37.0%
Sediment					
Loch Raven	716,600	193,538	774,648	968,186	135.1%
Liberty	2,662,886	2,983	3,153	6,136	0.2%
LNB Patapsco	1,491,236	61,669	924,295	985,964	66.1%
Gwynns Falls	5,539,803	229,389	1,469,035	1,698,424	30.7%
Jones Falls	4,378,000	64,841	1,285,877	1,350,718	30.9%

Over the next two years, restoration progress for nutrients and sediment should be expected to meet 36% of the targeted pollutant reduction goal. In most cases, Baltimore County will reach those goals. Liberty Reservoir watershed will still significantly miss the target. Loch Raven Reservoir watershed will meet and exceed the total target load reduction for phosphorus and sediment. Only future monitoring in the reservoir will determine if the water quality standards have been met.

10.6.1.3 Toxics TMDLs

Toxic local TMDLs include mercury (Prettyboy and Loch Raven Watersheds), chlordane (Back River and Baltimore Harbor) and PCBs (Back River, Baltimore Harbor, and Jones Falls (Lake Roland)). The initial focus of the toxics TMDL Implementation Plans is to conduct monitoring to better target efforts to identify sources.

Mercury: For the mercury TMDLs, Baltimore County is awaiting the results for the 2014 MDE fish tissue monitoring prior to developing monitoring plans. The results of previous fish tissue monitoring indicated that the levels of mercury are below the action level. In fact, Liberty Reservoir has been delisted. Baltimore County is waiting to see if the 2014 results confirm the earlier results. The Healthy Air Act passed by Maryland in 2007 placed stricter mercury air emissions, which have significantly reduced mercury deposition to the reservoir surface and to the watershed.

Chlordane: The TMDL Implementation Plans for Chlordane indicated working with MDE to develop a coordinated fish tissue and bioaccumulation monitoring plan. Baltimore County met once MDE in 2015 to discuss the value of a fish tissue monitoring plan and a bioaccumulation monitoring plan. Baltimore County is still exploring the value of this type of monitoring. The fish tissue monitoring will determine when the endpoint is reached, while the bioaccumulation studies would help target subwatersheds for additional evaluation of sources of chlordane.

Chlordane usage has been banned since 1987, so the monitoring would be looking for historic contamination sites.

PCBs: Similar to the chlordane, PCBs are a banned substance, however, unlike chlordane the use of PCBs may still be occurring through old electrical transformers, PCBs in hydraulic fluid, and in old building materials. PCBs continue to be deposited from the air throughout the world, which may currently be the major source of PCBs. As with chlordane, Baltimore County is exploring fish tissue and bioaccumulation monitoring to target remediation efforts. Based on the literature and the findings from MDE, the bioaccumulation monitoring may not give consistent results and needs to be further evaluated prior to developing a monitoring program.

Baltimore County has explored in situ remediation options that appear to have utility in remediation of sediments, which is the major repository of PCBs from historic contamination. The PCBs in sediment have not been assigned a load reduction, but remediation of sediment may be a more cost effective restoration mechanism than finding and treating PCBs in the watershed.

10.6.2 Chesapeake Bay TMDL

The Chesapeake Bay TMDL was developed in December 2010 and refined in July 2011. The CB TMDL is based on a series of interlinked models. The Watershed Model provides the pollutant loading input into the Chesapeake Bay from the various land uses, septic systems, and point sources. The agricultural sources of pollutant loads will not be addressed in this annual report, nor will actions taken by the State of Maryland or the federal government. For future reports an attempt will be made to include actions taken by the agriculture section, the State of Maryland, and the federal government.

Progress made in meeting the Chesapeake Bay TMDL may be viewed in two fashions; progress in meeting the 2-year milestones (Section 10.6.2.1) and overall load reductions (Section 10.6.2.2).

10.6.2.1 Progress in Meeting the 2-year Milestones

Baltimore County submitted its Phase II Watershed Implementation Plan (WIP) to MDE on July 2, 2012. To view the Baltimore County Phase II WIP, see:
http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/FINAL_PhaseII_Report_Docs/Final_County_WIP_Narratives/Baltimore_County_WIPII_2012.pdf

Urban Stormwater Load Reduction Progress – Restoration Milestones: The Baltimore County proposal for the first two sets of 2-year milestones for urban stormwater source nutrient reductions in the Phase II WIP are presented in Table 10-64. This table displays the individual strategies, by milestone years and the proposed amount of action to take place. The expected nitrogen and phosphorus reductions that will result from implementation are presented in Tables 10-65 and 10-66, respectively. The nitrogen and phosphorus reductions are expressed as delivered load.

Table 10-64: 2-year Milestone Targets for Each Restoration Strategy

Strategy	Type*	Units	July 1, 2011 – June 30, 2013 (1st 2-Year Milestones)	July 1, 2013 – June 30, 2015 (2nd 2-Year Milestones)	Total at end of the 2nd 2-year milestone
Stream Restoration	C	feet	63,174	25,800	88,974
Shoreline Erosion Control	C	feet	5,190t	13,067	18,257
SWM Retrofit/Conversions	C	acres	669	675	1,344
Street Sweeping	A	Pounds	Current Rate	Current Rate	Current Rate
Storm Drain Cleaning	A	Pounds	Current Rate	Current Rate	Current Rate
Nutrient Management 1998	A	acres	6,125	NA	
SSO Elimination	C	NA	20% reduction	20% Reduction	40% Reduction
Upland Reforestation	C	acres	20	144	164
Riparian Buffer Reforestation	C	acres	10	45	55
Urban Tree Canopy Planting	C	trees	1,400	1,100	1,500
Redevelopment	C	acres	200	200	400
Watershed Association Projects	C	Pounds	Current Rate	Current Rate	Current Rate

Table 10-65: Expected Nitrogen Reductions through the First 2-Year Milestones

		Nitrogen Reduction		
Strategy	**Type***	**July 1, 2011 – June 30, 2013**	**July 1, 2013 – June 30, 2015**	**Total at end of the 2nd 2-year milestone**
Stream Restoration (Interim Rate)	C	7,165	2,926	10,091
Shoreline Erosion Control	C	830	2,090	2,920
SWM Retrofit/Conversions	C	1,268	1,279	2,547
Street Sweeping	A	4,238	4,238	4,238
Storm Drain Cleaning	A	734	734	734
Nutrient Management 1998	A	4,565	0	4,565
SSO Elimination	C	230	230	460
Upland Reforestation	C	85	612	697
Riparian Buffer Reforestation	C	57	257	314
Urban Tree Canopy Planting	C	59	46	105
Redevelopment	C	915	915	1,830
Watershed Association Projects	C	155	155	310
Total Reductions		***20,301***	***13,511***	***28,811***

Table 10-66: Expected Phosphorus Reductions through the First 2-Year Milestones

		Phosphorus Reduction		
Strategy	**Type***	**July 1, 2011 – June 30, 2013**	**July 1, 2013 – June 30, 2015**	**Total at end of the 2nd 2-year milestone**
Stream Restoration (Interim Rate)	C	4,225	1,725	5,950
Shoreline Erosion Control	C	571	1,438	2,009
SWM Retrofit/Conversions	C	165	1,279	1,444
Street Sweeping	A	1,620	1,620	1,620
Storm Drain Cleaning	A	284	284	284
Nutrient Management 1998	A	204	204	204
SSO Elimination	C	76	76	152
Upland Reforestation	C	3	22	25
Riparian Buffer Reforestation	C	4	18	22
Urban Tree Canopy Planting	C	2	2	4
Redevelopment	C	106	106	212
Watershed Association Projects	C	15	15	30
Total Reductions		***7,275***	***6,789***	***11,956***

The actual implementation of the restoration strategies through FY2014 is presented in Table 10-67. Also included in this table is the percent of target achieved for each strategy. In a number of cases the tracking mechanism has not been developed, but actions have occurred. The table presents the actions completed in the first 2-year milestone period and those completed during the second 2-year milestone period. Included in the Table is the completed, the amount remaining, and the % of the target achieved.

Table 10-67: 2-year Milestone Progress on Restoration Strategies and Percent of Target Achieved

Strategy	Type*	Unit	Combined Target	First 2-year Milestone Complete	Second 2-year Milestone Complete	Total Completed	Remaining	% Target
Stream Restoration (Interim Rate)	C	Feet	88,974	9,600	6,573	16,173	72,801	18.2%
Shoreline Erosion Control	C	Feet	18,257	5,710	0	5,710	12,547	31.3%
SWM Retrofit/Conversions	C	Acres	1,344	305.4	326.9	632.3	711.7	47.0%
Street Sweeping	A	Pounds	Current Rate	Current Rate	Current Rate	NA	NA	NA
Storm Drain Cleaning	A	Pounds	Current Rate	Current Rate	Below Historic Rate	Below Historic Rate	NA	NA
Fertiliser Use Act of 2011	A	Acres	91,200	0	108,287	108,287	0	100.0%
SSO Elimination	C	Pounds	40% reduction	20% reduction	Need to develop tracking mechanism			
Upland Reforestation	C	Acres	164	39.6	74.9	114.5	49.5	69.8%
Riparian Buffer Reforestation	C	Acres	55	10	17.8	27.8	27.2	50.5%
Urban Tree Canopy Planting	C	Trees	1,500	2,046	1,426	3,472	-1,972	231.5%
Redevelopment	C	Acres	400	133.4	41.5	174.9	225.1	43.7%
Watershed Association Projects	C	Pounds	Current rate	> Current Rate	~ Same as Historic Rate	> 2010 Rate	> 2010 Rate	> 2010 Rate

** Not analyzed for FY2014, will be included in next years' report

Tables 10-68 and 10-69 show the progress made by strategy in reduction nitrogen and phosphorus delivered loads, respectively. The load reductions are expressed in delivered loads.

Table 10-68: Progress in the Reduction of Nitrogen by Strategy for the First Two Sets of 2-year Milestone Periods (Delivered Load, #s)

Strategy	Type*	Combined Target	First 2-year Milestone Complete	Second 2-year Milestone Complete	Total Completed	Remaining	% Target
Stream Restoration (Interim Rate)	C	10,091	1,660	250.3	1,910.3	8,180.7	18.9%
Shoreline Erosion Control	C	2,920	909.5	0.0	909.5	2,010.5	31.1%
SWM Retrofit/Conversions	C	2,547	1,725	695.0	2,420.0	127.0	95.0%
Street Sweeping&	A	4,238	0	4,511.4	4,511.4	-273.4	106.5%
Storm Drain Cleaning&	A	734	0	365.7	365.7	368.3	49.8%
Fertilizer Use Act of 2011*	A	4,565	0	23,345	23,345.0	-18,780.0	511.4%
SSO Elimination**	C	460	230	230	460.0	0.0	100.0%
Upland Reforestation	C	697	168	234.1	402.1	294.9	57.7%
Riparian Buffer Reforestation**	C	314	40.2	71.6	111.8	202.2	35.6%
Urban Tree Canopy Planting	C	105	87.7	48.1	135.8	-30.8	129.3%
Redevelopment***	C	1,830	434.1	200.0	634.1	1,195.9	34.7%
Watershed Association Projects	C	310	623.8	142.5	766.3	-456.3	247.2%
Total Reductions		***28,811***	***5,878.3***	***30,093.7***	***35,972.0***	***-7,161.0***	***124.9%***
2017 Reduction Target		***123,608***				***87,636***	***29.1%***

* Expert Panel Report for Urban Nutrient Management indicates a 4.5% reduction in nitrogen for urban pervious cover, effective with the full implementation of the Fertilizer Use Act of 2011.
** The Sanitary Sewer Consent Decree implementation is on track for completion within the timeframe specified by the Decree.
& Annual Practice, only most recent year counts

Table 10-69: Progress in the Reduction of Phosphorus Strategy for the First Two Sets of 2-year Milestone Periods (Delivered Load, #s)

Strategy	Type*	Combined Target	First 2-year Milestone Complete	Second 2-year Milestone Complete	Total Completed	Remaining	% Target
Stream Restoration (Interim Rate)	C	5,950	571.4	289.8	861.2	5,088.8	14.5%
Shoreline Erosion Control	C	2,009	571	0	571	1,438	28.4%
SWM Retrofit/Conversions	C	1,444	329	58.5	387.5	1,056.5	26.8%
Street Sweeping&	A	1,620	0	1,943.3	1,943.3	-323.3	120.0%
Storm Drain Cleaning&	A	284	0	157.3	157.3	126.7	55.4%
Fertiliser Use Act of 2011*	A	204	0	4,546	4,546	-4,342	2228.4%
SSO Elimination**	C	152	76	76	152.0	0.0	100.0%
Upland Reforestation	C	25	5.4	7.5	12.9	12.1	51.6%
Riparian Buffer Reforestation	C	22	5.6	10.0	15.6	6.4	70.9%
Urban Tree Canopy Planting	C	4	2.8	1.6	4.4	-0.4	110.0%
Redevelopment	C	212	51.4	31.2	82.6	129.4	39.0%
Watershed Association Projects	C	30	28.9	7.6	36.5	-6.5	121.7%
Total Reductions		***11,956***	***1641.5***	***7,128.8***	***8,770.3***	***3,185.7***	***73.4%***
2017 Reduction Target		***13,616***				***4,845.7***	***64.4%***

*Expert Panel Report for Urban Nutrient Management indicates a 25% reduction in phosphorus for urban pervious cover, effective with the full implementation of the Fertilizer Use Act of 2011.
** The Sanitary Sewer Consent Decree implementation is on track for completion within the timeframe specified by the Decree.
& Annual Practice, only most recent year counts

As can be seen from Table 10-68 and 10-69, Baltimore County has achieved 125% of the nitrogen target and 73% of the phosphorus target through the first two sets of 2-year milestones. See below for additional reductions that were not included in the original Baltimore County WIP, including difference in the Watershed Model projection of acres of disturbance from construction and the closure of several quarries. There are a significant number of projects that are currently in construction, in design, or ready for construction during the next year. A number of these projects will be used to address the shortfall in the first two sets of 2-year milestones, while the balance will be used to meet the next set of 2-year milestones.

Additional Pollutant Load Reductions Not Specified in the Baltimore County Watershed Implementation Plan or the 2-Year Milestones

While Baltimore County has not achieved its' 2-year milestone targets through the actions identified in the Baltimore County Watershed Implementation Plan, additional reductions have been achieved through other actions; specifically reductions through an overestimate of the amount of land development in the Chesapeake Bay Watershed Model as reflected in MAST and conversion of operating quarries to development with subsequent reductions due to the termination of the associated discharge permits and a lower land use load with stormwater treatment.

Reductions due to overestimate of the amount of land under development: The Chesapeake Bay Watershed Model predicts a certain number of acres to be under development on an annual basis. This data is reflected in the Maryland Assessment Scenario Tool (MAST) based on the July 2011 model run. The actual acres of disturbance is based on the grading permits issued by Baltimore County (acres of disturbance due to State projects are not captured). Table 10-70

displays the actual versus the predicted acres of disturbance, and the difference between the two by watershed.

Table 10-70: Actual Acres of Disturbance versus Predicted Acres of Disturbance (FY2015)

Watershed	Number of Permits	Acres of Disturbance	Model Acres of Disturbance	Difference
Upper Western Shore				
Deer Creek	0	0.0	9.34	-9.3
Prettyboy Reservoir	0	0.0	35.65	-35.7
Loch Raven Reservoir	21	70.2	415.87	-345.7
Lower Gunpowder Falls	10	25.2	212.18	-187.0
Little Gunpowder Falls	3	14.2	16.97	-2.8
Bird River	13	78.1	179.08	-101.0
Gunpowder River	1	1.8	8.57	-6.8
Middle River	10	25.8	0.00	25.8
UWS Totals	**58**	**215.3**	**877.66**	**-662.4**
Patapsco/Back River				
Liberty Reservoir	3	3.17	50.92	-47.8
Patapsco River	15	61.09	237.64	-176.6
Gwynns Falls	28	94.76	331.85	-237.1
Jones Falls	33	36.75	152.77	-116.0
Back River	21	14.3	95.90	-81.6
Baltimore Harbor	4	8.45	0.00	8.5
P/B Totals	**89**	**311.2**	**869.08**	**-650.6**
County Totals	**162**	**433.8**	**1,746.7**	**-1,312.9**

County-wide there were 1,313 fewer acres of disturbance than predicted by the Chesapeake Bay Watershed Model and reflected in MAST. Using the watershed specific per acre loading rates due to construction for nitrogen, phosphorus, and sediment the difference between the model loading and the actual loading was calculated. This difference reflects a reduction in the amount of nitrogen, phosphorus, and sediment loadings in Baltimore County. Tables 10-71 and 10-72 display the analysis for nitrogen and phosphorus, respectively.

Table 10-71: Difference between Modeled and Actual Nitrogen Loading Rates Due to Construction

Watershed	Acres of Disturbance	Model Acres of Disturbance	Difference	Model Load Rates N Delivered Load	Model N Load	FY15 Actual N Load	Difference
Upper Western Shore							
Deer Creek	0.0	9.34	-9.3	18.54	173.16	0.00	-173.16
Prettyboy Reservoir	0.0	35.65	-35.7	1.76	62.74	0.00	-62.74
Loch Raven Reservoir	70.2	415.87	-345.7	2.4	998.09	168.48	-829.61
Lower Gunpowder Falls	25.2	212.18	-187.0	9.02	1,913.86	227.30	-1,686.56
Little Gunpowder Falls	14.2	16.97	-2.8	22.88	388.27	324.90	-63.38
Bird River	78.1	179.08	-101.0	14.91	2,607.08	1,164.47	-1,505.61
Gunpowder River	1.8	8.57	-6.8	17.89	153.32	32.20	-121.12
Middle River	25.8	0.00	25.8	17.89	0.00	461.56	461.56
UWS Totals	**215.3**	**877.7**	**-662.4**		**6,359.53**	**2,378.92**	**-3,980.62**

Watershed	Acres of Disturbance	Model Acres of Disturbance	Difference	Model Load Rates N Delivered Load	Model N Load	FY15 Actual N Load	Difference
Patapsco/Back River							
Liberty Reservoir	3.17	50.92	-47.8	0.00	0.00	0.00	0.00
Patapsco River	61.09	237.64	-176.6	4.86	1,154.93	296.90	-858.03
Gwynns Falls	94.76	331.85	-237.1	4.41	1,463.46	417.89	-1,045.57
Jones Falls	36.75	152.77	-116.0	1.77	270.40	65.05	-205.36
Back River	14.3	95.90	-81.6	6.14	588.83	87.80	-501.02
Baltimore Harbor	8.45	0.00	8.5	17.89	0.00	151.17	151.17
P/B Totals	**218.5**	**869.1**	**-650.6**		**3,477.62**	**1,018.81**	**-2,458.81**
County Totals	**433.8**	**1,746.8**	**-1,313.0**		**9,837.15**	**3,397.72**	**-6,439.43**

Table 10-72: Difference between Modeled and Actual Phosphorus Loading Rates Due to Construction

Watershed	Acres of Disturbance	Model Acres of Disturbance	Difference	Model Load Rates P Delivered Load	Model P Load	FY14 Actual P Load	Difference
Upper Western Shore							
Deer Creek	0.0	9.34	-9.3	3.89	36.33	0.00	-36.33
Prettyboy Reservoir	0.0	35.65	-35.7	0.42	14.97	0.00	-14.97
Loch Raven Reservoir	70.2	415.87	-345.7	1.85	769.36	129.87	-639.49
Lower Gunpowder Falls	25.2	212.18	-187.0	4.09	867.82	103.07	-764.75
Little Gunpowder Falls	14.2	16.97	-2.8	4.31	73.14	51.20	-11.94
Bird River	78.1	179.08	-101.0	4.79	857.79	374.10	-483.69
Gunpowder River	1.8	8.57	-6.8	5.10	43.71	9.18	-34.53
Middle River	25.8	0.00	25.8	5.10	0.0	131.58	131.58
UWS Totals	**215.3**	**877.7**	**-662.4**		**2,663.12**	**809.00**	**1,854.12**
Patapsco/Back River							
Liberty Reservoir	3.17	50.92	-47.8	0.00	0.00	0.00	0.00
Patapsco River	61.09	237.64	-176.6	1.25	297.05	76.36	--220.69
Gwynns Falls	94.76	331.85	-237.1	3.43	1,138.52	325.03	--813.22
Jones Falls	36.75	152.77	-116.0	1.16	177.21	42.63	--134.58
Back River	14.3	95.90	-81.6	5.10	489.09	72.93	--416.16
Baltimore Harbor	8.45	0.00	8.5	5.10	0.00	43.10	43.10
P/B Totals	**218.5**	**869.1**	**-650.6**		**2,101.60**	**560.04**	**-1,541.55**
County Totals	**433.8**	**1,746.8**	**-1,313.0**		**4,764.72**	**1,369.04**	**-3,395.68**

As can be seen from the preceding tables, there were 6,400 fewer pounds of nitrogen, and 3,400 fewer pounds of phosphorus. .

Reductions due to closing of quarries and conversion to development: This information was presented in last years' report, but is applicable to the progress made to date in reducing nitrogen and phosphorus. Two quarries have recently closed and are in the process of being developed, this results in pollutant load reductions due to several factors; elimination of nutrients and sediment due to discharges from the quarry that reflect loads due to quarry operations and change in land use with differential nutrient and sediment loading rates. The two quarries are Greenspring Quarry in Jones Falls and Delight Quarry in Gwynns Falls. Information on the two quarries is provided in Table 10-73. Greenspring Quarry had already terminated its discharge

permit and this is reflected in the Chesapeake Bay Watershed Model, however, the discharge permit for Delight Quarry was still in effect at the time of model development.

Table 10-73: Load Reductions Due to Development of Quarries

Quarry	Discharge Permit			Land Use			Total		
	N	P	TSS	N	P	TSS	N	P	TSS
Quarry Loadings									
Greenspring	NA – not in the model			1,291	205	153,515	1,291	205	153,515
Delight	1,244	444	4,164	653	104	176,847	1,897	548	181,011
Development Loadings									
Greenspring	0	0	0	1,066	57	33,649	1,066	57	33,649
Delight	0	0	0	542	29	38,515	542	29	38,515
Difference									
Greenspring	NA – not in the model			-225	-148	-119,866	-225	-148	-119,866
Delight	-1,244	-444	-4,164	-111	-75	-138,332	-1,355	-519	-142,496
Totals	**-1,244**	**-444**	**-4,164**	**-336**	**-233**	**-258,198**	**-1,580**	**-667**	**-262,362**

The effect of changing land use and retirement of discharge permits for these two quarries results in a reduction of 1,580 pounds of nitrogen and 667 pounds of phosphorus. The reduction is actually greater, as these calculations do not take into account the installation of stormwater management on the development sites. Taking into account these two additional reductions Baltimore County will have exceeded its 2-year milestone targets for nitrogen and phosphorus as displayed in Table 10-74.

Table 10-74: Total Reductions in Relation to Target Reductions

Constituent	Target	Restoration	Reduced Grading	Quarry Development	Total Reductions	Remaining
Nitrogen	28,811	35,972	6,439	1,580	**43,911**	**-15,100**
Phosphorus	11,956	8,770	3,395	667	**12,832**	**-876**

Baltimore County has met and exceeded the nitrogen and phosphorus reduction targets for the first two sets of 2-year restoration milestones. The next set of 2-year restoration milestones (FY16-FY17) will be set based on meeting the 60% reduction for nitrogen and phosphorus from the urban stormwater sector. The milestones will be submitted to MDE by January 30, 2016.

Urban Stormwater Load Reduction Progress – Programmatic Milestones: In addition, to restoration 2-year milestones, programmatic milestones were developed as part of the Baltimore County Phase II WIP. The various programmatic milestones and their status are presented in Table 10-75.

Table 10-75: 2-Year Urban Stormwater Programmatic Milestones and Their Status

Target Date	Milestone	Deliverable	Lead Agency	Comments/Status Updates
Reforestation				
2014	Reforestation: Develop a geo-referenced database for planting project implementation and tracking	GIS data layers and project spreadsheets	EPS, SFM	All reforestation and tree planting projects are being tracked using a geo-referenced database. **Complete**
2014-2015	Rural Reforestation: Establish a new "turf-to-trees" planting program for rural residential subdivisions, following previous grant-funded pilot projects	List/maps of planting sites; right-of-entry agreements for landowners; education/outreach materials for discussion with rural landowner groups; updated project maintenance booklet and training workshop	EPS, SFM	This project type for WIP reforestation has been established. EPS has secured contractors, identified several project sites, coordinated with landowners, and awarded contracts for planting. Rural "turf-to-trees" planting is a continuing program and specific projects are developed for each spring and fall planting season. **Complete**
2014-2015	Urban Tree Planting: Develop a street tree planting program in cooperation with DPW	List/maps of approved street tree planting opportunities	EPS, SFM	The WIP planting program includes street tree projects, which require coordination with DPW if located on public road rights-of-way. EPS continues to identify sites and to work with communities on planting projects.
2014-2015	Urban Tree Planting: Develop a reforestation program for private urban "managed grounds"	List/maps of planting sites and agreements with private owners for planting managed grounds (apartments, condos, businesses, institutions)	EPS, SFM	This project type for WIP reforestation has been established. EPS has secured contractors, identified several project sites, coordinated with landowners, and awarded contracts for planting. Urban tree planting on managed grounds is a continuing program and specific projects are developed for each spring and fall planting season. **Complete**
On-Site Disposal Systems (OSDS)				
2014-2015	Investigate households within the URDL that are indicated as being on OSDS to determine the correctness of the designation	Changes in the Metro databases regarding the designation of type of facility on-site.	EPS, GWM	80% Complete
2014	Improve tracking of OSDS connections to the sanitary sewer	Tracking methodology for crediting connection of existing OSDS to sanitary sewer	EPS, GWM, WMM	With OIT assistance, query was developed to determine when existing properties on OSDS are connected to public sewer. **Complete**
Watershed Planning/Restoration Tracking and Reporting				

Target Date	Milestone	Deliverable	Lead Agency	Comments/Status Updates
2014	Develop TMDL Implementation Plans for local TMDLs	Completed TMDL Implementation Plans submitted to MDE	EPS, WMM	22 TMDL Implementation Plans were developed during 2014 with a public comment period from November 8, 2014 – December 8, 2014. Three public informational meetings were held. The plans were submitted to MDE for review and approval December 23, 2014. Two additional TMDL Implementation Plans were developed for Liberty Reservoir phosphorus and sediment. Trash TMDL Implementation currently under development **Complete**
2014	Develop a Trash Reduction Strategy	Completed Trash Reduction Strategy submitted to MDE	EPS, WMM	A Trash and Litter Reduction Strategy was developed after holding three citizen listening sessions and meeting with appropriate Baltimore County Agencies. A public comment period was held (see above) and the strategy was submitted to MDE for review and approval December 23, 2014 **Complete**
2014-2015	Complete 5 additional Small Watershed Action Plans	Completed SWAPs submitted to MDE	EPS, WMM	Two SWAPs were completed in 2014 (Middle Gwynns Falls and Bird River). Liberty Reservoir SWAP and Loch Raven North SWAP were completed in May 2015 Rural Jones Falls SWAP completed December 2015 **Complete**
2014	Complete Baltimore County's Manual on Pollutant Load Calculations, Pollutant Load Reduction Calculations, Tracking, Validation, and Reporting.	Completed manual to be update annually.	EPS, WMM	The manual is currently development to be completed in 2016
Street Sweep/Storm Drain Cleaning				
2014	Complete purchase of additional equipment	New equipment delivered	DPW, BHEM	3 Vacuum Leaf Loaders delivered March 2014 10 Roll-off containers delivered in March 2014 (storage and weighing of street sweeping debris) 3 Sewer Catch Basin Cleaners "Megawind" delivered Aug. 2014 6 Street Sweepers "Elgin Eagle" 3 delivered in March 2014, 3 in Sept. 2014 Began Leaf Vac. Program Oct. 2014

Target Date	Milestone	Deliverable	Lead Agency	Comments/Status Updates
				Operators received training and began Sewer Catch Basin Cleaning Program Nov. 2014 Street Sweeping Contract for Eastern Balto. Co. began May 2014 Enhanced sweeping county wide began Sept. 2014 **Completed**
Storm Drain Retrofits/Public Facility Restoration				
2014-2015	Continue to work with consultants to identify and prioritize storm drain repairs and retrofits	Completed consultants' reports on storm drain outfall conditions and retrofit opportunities.	DPW, BEC, SDDS	Initiated 11 outfall treatment and storm drains rehabilitation projects, in various locations throughout the County; continue with design and construction of rehabilitation work meant to curtail significant sediment pollution in receiving waterways. **On-going**
2014-2015	Continue to assess public facilities subject to the General Permit for Stormwater Discharges Associated with Industrial Activity	Completed assessment reports, restoration/retrofit designs.	DPW, BEC, SDDS	Installed ESD grade SWM at 17 sites and initiated 12SW facilities compliance program; continue with the 12SW permit mandated inspections and with installation of additional SWM BMP's, for assistance with the MS4 implementation countywide; regular monitoring and maintenance on the SWM facilities already in operation. **On-going**

Table 10-76 presents the progress in meeting the second 2-year milestone for onsite disposal systems.

Table 10-76: Progress in Meeting the First two sets of 2-Year Milestones for OSDS Remediation

Strategy	Target	2011-2013 Milestones	FY2014 – FY2015 Milestones	Total	% of Target
Denitrifying Systems #	80	34	59	93	103.8%
Denitrifying N Reduction (#s)	326	166	176	342	104.9%
Hook-ups to Sanitary Sewer	56	39	140	179	319.6%
Hook-up N Reduction (#s)	882	464	1,964	2,428	275.3%
OSDS Pump-outs	4,500	NA	1,311	1,311	29.1%
Pump-out N Reduction (#s)	268	NA	167	167	62.3%
Total Nitrogen Reduced	**1,476**	**630**	**2,307**	**2,937**	**199.0%**

While we have not achieved some of the OSDS implementation targets in terms of number of pump outs, we have exceeded the number of hook-ups of OSDS to the sanitary sewer and number of denitrifying systems installed. We have also far exceeded the amount of nitrogen reductions, mainly due to the locations of the various improvements being in zones of higher OSDS loading rates and the preponderance of sanitary sewer hook-ups.