Maryland's Phase II Watershed Implementation Plan for the Chesapeake Bay TMDL

October 2012

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APPENDICES

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EXECUTIVE SUMMARY

On December 31, 2010 the U.S. Environmental Protection Agency (EPA) set limits on the amount of nutrients and sediment that can enter the Chesapeake Bay. In addition to setting these limits, known as Total Maximum Daily Loads (TMDLs), EPA required the Bay watershed jurisdictions to develop statewide Watershed Implementation Plans (WIPs). WIPs are the first phase of a major initiative to create a road map and accountability framework that will lead to the restoration of the Chesapeake Bay and clean local streams. Maryland's Phase I WIP, completed in December 2010, allocates allowable loads of nitrogen, phosphorus and sediment among different sources and identifies statewide strategies for reducing the levels of these pollutants that are impairing the Chesapeake Bay. The Executive Summary of Maryland's Phase I WIP further explains the rationale for the plan.

Maryland's Phase II WIP is the second part of a three-phased planning process that extends to 2017, with a final implementation target date of 2025. The Phase II WIP is intended to provide more geographic detail to the implementation. EPA guidance for Phase II places a strong emphasis on working with key local partners to ensure that they are aware of their roles and responsibilities in contributing to the planning and implementation process. To that end, Maryland developed the Phase II WIP in a year-long collaboration with local partners at the county-geographic scale, including county and municipal government staff, soil conservation managers and other local decision makers, as well as a variety of stakeholder organizations and business interests. Federal and State agency partners also participated to incorporate their contributions toward meeting Maryland's Phase II WIP goals.

In August 2011, EPA provided revised nutrient and sediment target loads to Maryland and other Bay jurisdictions, based on the updated Chesapeake Bay Program (CBP) Phase 5.3.2 Watershed Model. The Final Targets were provided at the scale of the five major basins in Maryland, which are the Potomac River basin, Eastern Shore, Western Shore, the Patuxent River basin and Maryland's portion of the Susquehanna River basin as shown in the table below.

Final Target Loads for Maryland's Major Basins*
(Million pounds per year)

Maryland Major Basin	Nitrogen	Phosphorus	Sediment
Susquehanna	**1.19**	**0.06**	**64**
Eastern Shore	**11.82**	**1.02**	**189**
Western Shore	**9.77**	**0.55**	**243**
Patuxent	**3.10**	**0.24**	**123**
Potomac	**15.29**	**0.94**	**731**
Total	**41.17**	**2.81**	**1,350**

* Maryland's basin allocations differ slightly from these due to the equitable allocation method used to partition loads among local areas and source sectors. This approach was used in Phase I, which met the necessary water quality response.

Total Nitrogen

	2010 Progress	Final Target	% Reduction from 2010
Source Sector	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	19.95	15.22	23.7%
Forest	5.29	5.31	(0.2%)
Non-Tidal Atm[a]	0.66	0.66	NA
Septic	3.00	1.85	38.2%
Stormwater	9.48	7.55	20.3%
Wastewater	14.37	10.58	26.4%
Total	***52.76***	***41.17***	***22.0%***

Total Phosphorus

	2010 Progress	Final Target	% Reduction from 2010
Source Sector	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	1.64	1.45	11.5%
Forest	0.15	0.15	(0.1%)
Non-Tidal Atm[a]	0.04	0.04	NA
Septic	NA	NA	NA
Stormwater	0.72	0.50	30.3%
Wastewater	0.75	0.67	11.2%
Total	***3.30***	***2.81***	***14.9%***

Total Suspended Solids

	2010 Progress	Final Target[b]	% Reduction from 2010
Source Sector	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	696	-	-
Forest	126	-	-
Non-Tidal Atm	NA	NA	NA
Septic	NA	NA	NA
Stormwater	543	-	-
Wastewater	11	-	-
Total	***1,376***	***1,350***	***1.9%***

a. This air deposition is only direct deposition to non-tidal waters, a very small component of the total air deposition and is included solely for completeness. Since the larger overall deposition of atmospheric nitrogen will be reduced by national programs, EPA did not allocate or assign that to the States.

b. Maryland did not set individual sector targets for sediment.

Maryland further sub-allocated the Final Target loads by county-geographic area and by source sector using an equity-based allocation process consistent with the process used in the Phase I WIP[1]. The primary source sector categories addressed in the WIP are waste water treatment plants (point sources), agricultural sources, stormwater and septic systems. Atmospheric

[1] See Appendix A of Maryland's Phase I WIP.

sources, which contribute a significant fraction of the nitrogen load to the Bay, will be reduced by existing State and federal programs and thus are not addressed in detail in this plan. A statewide summary of the Final Target allocations for nitrogen and phosphorus by major source sector are provided in the tables above.

The Phase II WIP provides implementation strategies for the five major basins in Maryland. Originally, the WIP was intended to be developed at the county geographic scale; however, EPA decided in October 2011 to scale back its expectations for geographic specificity due to current data and model limitations. Although the plans are documented at the major basin scale, most local partners provided the State information at a county scale that formed the basis of the basin scale plans. The county analyses were supported by the State's further sub-allocation of the stormwater source sector to a finer level than is available in the EPA Bay watershed model (See "Target Loads" subsection in Section 2.6). Analysis at that finer scale was supported by a load reduction analysis model called the Maryland Assessment and Scenario Tool (MAST), which mimics the results of the Bay watershed model. Because the MAST analyses must be validated by the Bay model, the stormwater results provided in this report are at a coarser scale consistent with the Bay model. The underlying county scale of planning provides further assurance of implementation beyond that of the Phase I WIP, because many of the implementation actions will be conducted by county governments and soil conservation district offices, which operate at that scale.

For the point source, stormwater, and septic components of the plan, the State organized local teams, led in most cases by local government partners and coordinated by State agency liaisons. The State liaisons facilitated the local teams through a series of steps leading to the development of three key planning products:

- The first are quantitative reduction strategies to meet the Interim Target and Final Target loads. The Interim Target, set at 60% of Final Target statewide, is to be achieved by 2017. The Final Target is to be achieved by 2025. These strategies describe *what* can be implemented to achieve the reduction targets.
- The second are narrative strategies describing *how* the implementation actions will be achieved. This addresses issues like new local ordinances and revenue sources.
- The third are two-year milestones that reflect near-term implementation actions and program enhancement steps to be taken between July 1, 2011 and June 30, 2013.

In parallel with the local teams, agricultural work groups organized for each soil conservation district developed implementation strategies. These plans reflect the highly specialized nature of agricultural natural resource practices and the close operational relationship with the Maryland Department of Agriculture (MDA). These plans were combined with the local team plans by staff at the Maryland Department of Environment (MDE) to create the final plan. For more information about the agricultural plan development process, please see Section 2.4.

In cases where local team strategies were not submitted, or fell short of the Final Target, the State supplemented the plans. In addition, some elements of the WIP reflect existing State policies that will be implemented through permitting processes, such as reductions from various industrial point sources, and the long-standing upgrades of major municipal waste water

treatment plants using enhance nutrient removal (ENR) technology. Finally, the State has included stormwater management reduction strategies on behalf of federal and state facilities, as well as a number of small municipalities, that are covered by federal NPDES stormwater permits. These generic plans, which mirror urban stormwater strategies the State provided for Phase I MS4 jurisdictions that did not submit strategies, are subject to refinement in the future.

Maryland's 2017 Interim Target strategy is projected to achieve the following levels of implementation statewide:

- Nitrogen: 89% of the Final Target
- Phosphorus: 119% of the Final Target
- Sediment: 409% of the Final Target

The progress is not the same for each pollutant because they may be reduced at different rates by each sector. Wastewater, for example, is making extraordinary reductions in nitrogen due to the Bay Restoration Funds for upgrades to enhanced nutrient removal (ENR). Septic systems control only nitrogen, as phosphorus is trapped in the soil around the septic field. Fortunately, rapid progress in the wastewater sector will balance a slower start in the other sectors.

Maryland's 2025 Final Target strategy is expected to meet water quality standards. To reach this conclusion MDE conducted an evaluation using an analytical framework provided by EPA. This analysis predicts the Bay's expected water quality response to load reductions and accounts for different levels of nitrogen and phosphorus reductions. The evaluation shows that, although Maryland's basin target loads differ slightly from those provided by EPA, the Final Target strategy is meets water quality standards, as confirmed by EPA's models. The evaluation is described in the Introduction, which references a technical memorandum in Appendix H.

In addition to the technical challenges of the Bay restoration effort are the challenges of funding the restoration. One commitment identified in the Phase I WIP was to refine the cost estimates for adding stormwater controls to previously developed land with little or no controls. During 2011 the State commissioned a study to refine the unit costs of various types of controls. Also during 2011, the Governor of Maryland established the Task Force on Sustainable Growth and Wastewater Disposal to study legislation that was tabled during the 2010 State General Assembly session. The Task Force broadened its mandate to evaluate options for funding key elements of the WIP and produced recommendations that have great promise. The recommendations provide a road map for fully funding the remaining upgrade of major waste water treatment plants, funding a substantial portion of the septic system upgrades, and funding a substantial portion of stormwater retrofits. The recommendations would establish a cost-sharing arrangement between the State and local governments, thereby leveraging the establishment of new local revenue sources.

The Maryland General Assembly adopted legislation in 2012 reflecting several of the Task Force's key recommendations. With passage of the Water Protection and Restoration Program Act of 2012, and other legislative actions (see Section 1.9), local teams had a strong incentive to revisit and refine their plans during the spring and early summer of 2012. Refinements made by local WIP teams to their county-scale plans during this period were submitted to MDE in July

2012 and have been incorporated into this revised final Maryland Phase II WIP, an update of the previous March 30, 2012 version.

Submission of this plan to EPA is the beginning of a complex process to be implemented between now and 2025, which will continue in "maintenance mode" beyond 2025. Even when we achieve our reductions, we will need to maintain those caps on loads permanently. Maryland's commitment to establish an offset strategy, described in Section 1.8, addresses this critical aspect of the plan.

The two-year milestones incorporated into the watershed plan will also be critical to establishing the near-term accountability necessary to ensure implementation progress. The most important aspect of the 2013 Milestones will be the establishment of the necessary sources of revenue to enable future acceleration of implementation.

Continuing communication between federal, state and local governments is an essential component of the new accountability framework. While the plan is complete in that it details the implementation practices necessary to achieve water quality standards, there are still many issues to resolve including funding, staffing, development and adoption of innovative practices, identifying and crediting voluntary practices, developing better accounting and tracking processes, and refining the analytical tools by which we evaluate our progress and adapt as needed.

Restoring the Chesapeake Bay is vital to our economy, public and environmental health and the quality of life for future Marylanders. The benefits to Marylanders that come as a result of this implementation plan include local jobs generated by environmental restoration projects, improvements to our neighborhood streams, protection and recharge of our drinking water sources, increased tourism, more abundant and healthy crabs, oysters and fish, improved property values, better public understanding of environmental issues, and most importantly, a proud legacy for our grandchildren.

INTRODUCTION

Background

The federal Clean Water Act requires limits to be placed on pollutant loads that are impairing water quality. The federal Environmental Protection Agency (EPA) led a multi-year process to determine the limits on the amount of impairing pollutants from all sources entering the Chesapeake Bay. This culminated in Total Maximum Daily Loads (TMDL) for nitrogen, phosphorus and sediments in 2010. TMDLs are an *objective*, scientific estimate of the maximum allowable amount of pollutant loads to a water body.

Because the current loads are too high, allowable loads must be allocated to various sources of pollution, which implies that reductions must be made to meet the TMDL limit. Determining this split among sources, and how to achieve the necessary reductions, is a more *subjective* process, which is the responsibility of the states. Thus, as part of the TMDL development process, EPA called upon states to develop Watershed Implementation Plans (WIPs). The Phase I WIPs, part of a three-phase adaptive planning process between 2010 and 2017, served to allocate loads among various source sectors like waste water treatment plants (point sources), various agricultural sources, urban and suburban stormwater and septic systems (nonpoint sources).

TMDLs are required to provide "reasonable assurance" that any reductions expected from non-regulated sources will actually be implemented. The Phase II WIP enhances the reasonable assurance established in the Phase I WIP by refining the accountability both geographically and through the identification of expectations for more specific sources. This assurance is further "back-stopped" by EPA's commitment to impose "consequences" on states that do not meet a variety of specific benchmarks[2].

Due to uncertainties inherent in long-term planning, the WIP addresses two load reduction targets:

- Interim Target: Achieve 60% of the Best Management Practice (BMP) implementation needed to attain the Final Target load reductions by 2017.
- Final Target: Achieve full implementation needed for load reductions consistent with meeting the Bay TMDLs by 2025[3].

Key Phase II WIP Development Outcomes

The Phase II WIP is intended to refine the geographic specificity of the Phase I WIP and provide greater involvement of local partners than was possible in Phase I.

[2] See EPA's December 29, 2009 Consequences Letter (PDF) that outlines federal actions to be taken if benchmarks are not achieved by Bay states.

[3] Maryland's Phase I WIP was developed to achieve the Final Target by 2020, which was five years earlier than the date agreed to by other Bay states. However, after considering the views of local partners, recommendations of Maryland's Task Force on Sustainable Growth and Wastewater Disposal, and others, Maryland's Phase II WIP adopts the Final Target date of 2025.

The Phase II WIP development process results in three key outcomes:

- **Load Reduction Strategies:** These describe *what* can be done to achieve load reductions. These technical analyses identify implementation actions, often called best management practices (BMPs).
- **Narrative Strategies:** These describe *how* the implementation of BMPs can be achieved, addressing things like new local ordinances, management programs and revenue sources.
- **2-Year Milestones:** These are near-term implementation actions and program enhancement steps to be taken between July 1, 2011 and June 30, 2013.

These outcomes are described statewide and for the five major basins[4] in Section I of this document. Local contributions are documented in Section III.

Meeting the Required Water Quality Response

The ultimate purpose of the WIP is to identify a set of actions that, if implemented, are predicted to restore the Chesapeake Bay's water quality. The EPA Chesapeake Bay water quality and sediment transport model used to confirm that, collectively, the states' WIPs reduce nutrients and sediments enough to meet the Bay water quality criteria.

EPA set their major basin targets to meet the water quality criteria in all 92 Bay segments. Most states have directly adopted EPA's major basin targets for their WIPs. In doing so, their WIPs are expected to meet the water quality criteria. However, Maryland's major basin targets differ slightly from EPA's basin targets. This difference was necessary to accommodate the equitable allocation method used to partition loads among the various source sectors, which was also done in the Phase I WIP. In order to provide confidence that Maryland's slightly altered basin allocations are expected to meet the required water quality response, MDE has conducted an analysis using an analytical framework provided by the EPA.

EPA's analytical framework has two analytical tools. The first tool predicts how the Bay water quality responds, in terms of dissolved oxygen (DO) concentrations, to nutrient reductions from different geographic areas in the watershed. This tool is used to determine the effect of exchanging loads geographically. The second tool estimates the effect of exchanging total nitrogen (TN) and total phosphorus (TP) within a basin. EPA developed both tools by using the Bay watershed and water quality models to run a range of load reduction and geographic isolation scenarios. The model runs used to develop the analytical tools provide information that accounts for nutrient transport losses as loads are delivered from the land to the tidal rivers and as the nutrients travel through the tidal rivers to the central Bay and the tradeoff between TN and TP. The result is set of tools that can be used to estimate expected water quality responses, given load reductions from different geographic locations, and exchanges between TN and TP within a specific geographic region.

[4] Maryland's five major basins addressed in the Phase II WIP are the Potomac River basin, the Eastern Shore, the Western Shore, the Patuxent River basin and the Susquehanna River basin.

Maryland has evaluated the expected water quality response of the proposed 2025 Final Target strategy using EPA's framework. When evaluating the geographic changes in basin loads, the results demonstrate the Maryland's 2025 scenario produces a statewide water quality response (increase in dissolved oxygen), for both total nitrogen and total phosphorus, that is equal to or better then the EPA requirements for Maryland. This analysis indicates the revised Maryland basin targets meet the required water quality response and are expected to meet water quality standards.

Although the water quality response is achieved statewide the results also demonstrate that when considering TN and TP exchange only, Maryland's 2025 scenario also meets EPA's basin targets in critical areas such as the Eastern Shore, Western Shore and Patuxent. In particular, the Eastern Shore is an important case due to its strong influence on the Chester River and Eastern Bay, two areas that are predicted to be difficult to meet standards. However, the Eastern Shore basin target load can be met by exchanging TN and TP, when applying EPA's exchange coefficients, while still maintaining a surplus of TP.

In summary, Maryland's 2025 strategy meets the EPA required statewide water quality response (improvement in dissolved oxygen), and further analysis indicates that when accounting for the TN to TP exchange, the scenario meets, and in some cases is lower than, EPA basin targets in critical areas. These combined results provide confidence that Maryland's 2025 Scenario will achieve water quality standards as specified by EPA's Phase II basin targets.

Maryland's analysis is provided in a technical memorandum to EPA dated March 30, 2012 (See Appendix H).

A Note on Geographic scales for the WIP Analysis and Documentation

The Phase II WIP was originally intended to be developed at the county geographic scale; however, EPA decided in October 2011 to scale back its expectations for geographic specificity due to current data and model limitations. Although the plans are documented at the major basin scale, most local partners provided the State information at a county scale, which formed the basis of the basin scale plans. County scale planning was supported by load targets provided by the State at the county scale. The underlying county scale of planning provides further assurance of implementation beyond that of the Phase I WIP, because many of the implementation actions will be conducted by local governments and soil conservation district offices, which operate at that scale.

Local Involvement

EPA's expectations for Phase II place a strong emphasis on describing and documenting how the State worked with its key partners to "a) raise awareness of the level of effort that is expected to meet Bay TMDL allocations; b) define local partners' roles in implementing WIP strategies; and c) document the process by which local partners contributed to the development and will contribute to the implementation of WIPs."[5] There were approximately 110 outreach events

[5] "Guide for Chesapeake Bay Jurisdictions for the Development of Phase II Watershed Implementation Plans," U.S. EPA, March 30, 2011.

involving State staff members that were held during the development of the WIP (see Section II.)

Maryland began the Phase II WIP process in 2010, while developing the Phase I WIP, by conducting two "Phase II Pilot" initiatives involving Anne Arundel and Caroline Counties. The lessons from these pilots helped inform Maryland's Phase II process.

Phase II local involvement, which Maryland initiated in earnest with regional meetings during January and February 2011, involved the organization of local teams at the county geographic scale. The local teams, which were led in most cases by local government partners, were coordinated by State agency liaisons. The State liaisons facilitated the local teams through a series of steps leading to the development of their contributions to Maryland's Phase II WIP.

In parallel with the local teams, which focused mainly on local government actions, agricultural work groups for each soil conservation district developed implementation strategies for that sector. The agricultural plans reflect the highly specialized nature of agricultural natural resource practices and the close operational relationship with the Maryland Department of Agriculture (MDA). These plans were combined with the local team plans by staff at the Maryland Department of Environment (MDE), and supplemented as needed, to create Maryland's final plan.

Maryland also engaged federal partners during the Phase II process, including U.S. agency staff and federal facility managers, to garner their support for and incorporate their contributions toward meeting the State's Phase II WIP goals. Although the Phase II WIP provides broad levels of effort for implementation on federal lands to meet aggregate reduction targets, Maryland provided more detailed planning targets to federal agencies. These detailed targets were intended to support the development of federal facility implementation plans (FFIPs) and 2-year milestone commitments that either are or will be incorporated by reference into the Phase II WIP documentation as they are completed. Appendix D provides federal facility and agency plans in support of Maryland's Phase II WIP.

To facilitate local involvement and planning, the Maryland Department of the Environment developed the Maryland Assessment and Scenario Tool (MAST). MAST is a simplified version of the Chesapeake Bay Program watershed model, which allows alternative reductions scenarios to be explored. MAST also allows for the consolidation of a huge amount of locally generated information in a systematic way and provides for documentation of the process. That complex process is reflected in the Figure 1 below, which shows twenty-four jurisdictions, each having four major source sectors, feeding information to the State and then on to EPA.

MAST also generates specially formatted output that facilitates the development of complicated "input decks" that are fed into the Bay watershed model. It enables local planners, decision-makers and stakeholders to assemble nutrient and sediment load reduction strategies in the form of quantified assemblages of best management practices to meet the pollution reduction goals of the Chesapeake Bay TMDL and the State's Phase II WIP. The tool brings transparency to this process by opening up what for the lay person is the "black box" of the EPA models through the practical application of these complex modeling systems. Using MAST to develop local Phase II WIP strategies has illustrated the practicality and transparency of modeling. It has empowered

stakeholders by enabling them ability to see the underlying input information and quickly predict the results of their proposed load reduction strategies, key objectives in complex environmental decision making. The process of utilizing the MAST tool to mimic the EPA watershed model has also led to some further refinements in the EPA model.

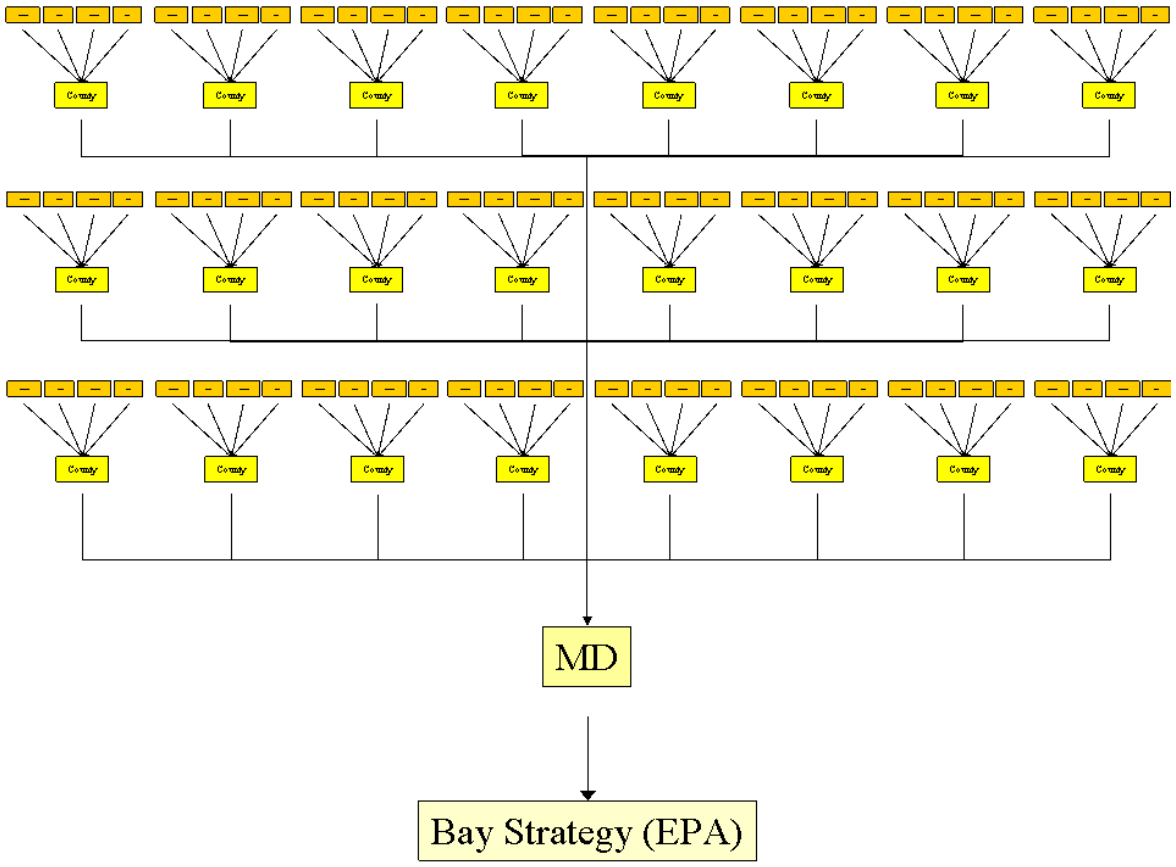


Figure 1: Depiction of information flow from four major source sectors to each county and on to the State and EPA enabled by MAST

An Adaptive Process with Accountability

EPA has recognized the need for "adaptive management" in WIP development and implementation, which is reflected in the three-phase process. The concept of adaptive management requires making an informed projection of what is required to achieve a management goal. As implementation proceeds, in this case specifically in 2017, goal achievement will be evaluated and the management plan modified in accord with improved modeling tools, a better understanding of BMP effectiveness and the underlying science of water quality.

For Maryland, this adaptive process has continued immediately following the March 30, 2012 submittal of the Phase II WIP to EPA through July 2012 by providing local partners the opportunity to revise their contributions to the WIP. This opportunity for refinement is

particularly meaningful in view of the State's recent decision to adopt the 2025 deadline for meeting the Final Target load, which was made after local WIP plans were submitted on November 18, 2011.

The new accountability process embodied in this new era of Chesapeake Bay Restoration, which includes the Bay TMDL, WIPs, milestones, public and local participation, and back stops, is critical to the successful restoration of the Bay. Moving forward, Maryland anticipates that evaluation of the first two-year milestones in 2013 will be a key indicator for the success of this effort. In many cases, the 2013 Milestones represent steps to build additional funding and programmatic capacity needed to accelerate implementation in future years. The State will be tracking and providing oversight of key local programmatic milestones. Meeting the local 2013 programmatic milestones is critical to meeting longer term targets, because falling short on securing greater capacity in the near-term will lower the prospects for medium-term acceleration of implementation and place the attainment of long-term goals at risk.

The development or enhancement of local tracking and reporting capabilities for BMPs is also vital. Credit can only be given for actions that are tracked, reported and are verifiable. Although the WIP is documented at the basin scale, local teams were provided load targets at the county scale for various source sectors. These targets provide a metric by which to gauge local incremental progress between now and 2017. Many of the State BMP milestones are the statewide sum of local programs. These statewide milestones are reported to the public through BayStat. If the State is falling short on BayStat targets, it will be apparent and can be tracked back to localities that are falling short. Regulated sources that fall short risk the consequences of greater scrutiny, loss of program flexibility and the possibly of formal permit violations. Non-regulated sources that fall short risk the prospect of future regulation or pressure to require further reductions from regulated sources within the same jurisdiction to make up for failures of non-regulated sources.

Organization of Maryland's Phase II Watershed Implementation Plan Report

Maryland's Phase II WIP main report is organized into four main sections described below. Appendix A is a lengthy description of the strategies proposed to meet the 2017 Interim Target Strategy. Appendix B provides numerous tables and graphs that detail the results of the Interim and Final strategies. Appendix C provides supplemental information in support of Section 1.10 on costs and funding. Appendices D and E provide contributions from federal and State agency partners. Appendix F provides the target loads assigned to individual major point sources. Appendix G is a list of all federally regulated sources in Maryland. Appendix H is a technical memorandum from MDE to EPA demonstrating that Maryland's 2025 Final Target strategy meets water quality criteria.

Section I: Maryland's Phase II Watershed Implementation Plan Strategies

Section I provides Maryland's Phase II WIP target loads and implementation strategies at the scale of the five major river basins. These are based on the updated EPA Chesapeake Bay Program Phase 5.3.2 Watershed Model.

An explanation of the approach and methodology Maryland used to develop the final reduction strategy is provided. As the description of this approach makes clear, the State's final target strategy has been informed by and developed using local load reduction scenarios. Section I concludes with documentation of State legislative and initiatives, Maryland's plan for offsetting future loads and estimates of the costs and current thinking on funding the plan.

Section II: Maryland's Phase II Watershed Implementation Plan Development Process

Section II documents Maryland's year-long and ongoing engagement of its local and federal partners, describing in detail the State's involvement with and support for 24 county-area WIP teams in a collaborative process to develop the State's Phase II WIP.

Section III: Local Area Phase II Watershed Implementation Plan Contributions

Local area contributions to Maryland's Phase II WIP are documented in Section III of the report. Due to the length of these contributions, this section references web-based copies of the local plans, one for each Maryland county geographic area and for Baltimore City. Section III provides substantial demonstration that the State's local area partners have played a central role in the development of the Phase II WIP, and that they clearly understand their responsibilities in contributing to the implementation of pollutant reduction practices and controls that will achieve the State's goals for the Bay TMDL. Although the Agricultural sector strategies were developed by workgroups at a local scale, they are reflected in the State and major-basin strategies provided in Section I and Appendix A of this report.

Section IV: Future Steps

Section IV, describes the continuation of an interactive process between the federal, State and local partners. It identifies and describes various issues that will need to be addressed between the completion of the WIP and 2017.

SECTION I: Maryland's Phase II Watershed Implementation Plan Strategies

1.1 Revision of the Bay Watershed Model and Phase I WIP Major Basin Targets

The EPA Chesapeake Bay Program's Watershed Model has been revised since the Bay TMDL and Maryland's Phase I WIP in December, 2010 were completed. In addition, new water quality standards variances for parts of the Bay affect the 2010 Bay TMDL. These model and standards revisions resulted in changes to loads allocated by EPA to the states and subsequently affect the WIP.

The revised target loads for nitrogen, phosphorus and sediment to Maryland's major basins, set by EPA on August 1, 2011, are shown in the following table.

Table 1: Final Target Loads for Maryland's Major Basins

(Million pounds per year)

Maryland Major Basin	Nitrogen	Phosphorus	Sediment
Susquehanna	**1.19**	**0.06**	**64**
Eastern Shore	**11.82**	**1.02**	**189**
Western Shore	**9.77**	**0.55**	**243**
Patuxent	**3.10**	**0.24**	**123**
Potomac	**15.29**	**0.94**	**731**
Total	**41.17**	**2.81**	**1,350**

* Maryland's basin allocations differ slightly from these due to the equitable allocation method used to partition loads among local areas and source sectors. A similar approach was used in Phase I, which met the necessary water quality response. Appendix H provides a comparison of EPA and Maryland basin targets.

The reductions implied by these revised basin target loads are not directly comparable those in the Phase I WIP, because the new model also produced revised 2009 Progress loads.

1.2 Final Target Loads and Reductions by Source Sector

Table 2 presents the statewide summary of 2010 Progress loads and Final Target load, which effectively represent TMDL allocations by source sector. These loads reflect losses during transport from the source to the Bay and are referred to as "delivered loads." This compares with edge-of-stream (EOS) loads, which reflect loads transported from the source to the nearest stream and are generally either the same as or larger than delivered loads. Delivered loads are used throughout this report unless otherwise noted.

Table 2: Statewide Current Loads and Final Target Loads by Pollutant and Source Sector

Total Nitrogen (million lbs/year)[a]

	2010 Progress	Final Target	% Reduction from 2010
Source Sector	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	19.95	15.22	23.7%
Forest	5.29	5.31	(0.2%)
Non-Tidal Atmospheric[b]	0.66	0.66	NA
Septic	3.00	1.85	38.2%
Stormwater	9.48	7.55	20.3%
Wastewater	14.37	10.58	26.4%
Total	***52.76***	***41.17***	***22.0%***

Total Phosphorus (million lbs/year) [a]

	2010 Progress	Final Target	% Reduction from 2010
Source Sector	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	1.64	1.45	11.5%
Forest	0.15	0.15	(0.1%)
Non-Tidal Atmospheric[b]	0.04	0.04	NA
Septic	NA	NA	NA
Stormwater	0.72	0.50	30.3%
Wastewater	0.75	0.67	11.2%
Total	***3.30***	***2.81***	***14.9%***

Total Suspended Solids (million lbs/year) [a]

	2010 Progress	Final Target[c]	% Reduction from 2010
Source Sector	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	696	-	-
Forest	126	-	-
Non-Tidal Atmospheric	NA	NA	NA
Septic	NA	NA	NA
Stormwater	543	-	-
Wastewater	11	-	-
Total	***1,376***	***1,350***	***1.9%***

a. Loads are delivered to the tidal waters and reflect transport losses.
b. This air deposition is only direct deposition to non-tidal waters, a very small component of the total air deposition and is included solely for completeness. Since the larger overall deposition of atmospheric nitrogen will be reduced by national programs, EPA did not allocate or assign that to the States.
c. Maryland did not set individual sector targets for sediment.

The Final Target loads for the five major basins, presented in Table 1, were allocated to each source sector by the State as depicted in the statewide summaries in Table 2. The Phase II Final Targets were allocated to source sectors using the same methodology developed for the Phase I WIP. The methodology is as follows:

- Given the statewide target load provided by EPA, a portion of the load was assigned to traditional point sources (e.g., WWTPs) based primarily on Maryland's point source cap policy that was adopted as part of the 2004 Tributary Strategy[6]. This policy requires what is generally considered the "limit of technology," and achieves very significant reductions from major sources, enforced through NPDES permits.

- Forests were assigned their current loading, i.e., no reductions, as forests have the lowest per acre loading rate of any land use. Although forest loading rates are low, there are still many acres of forest in Maryland, so they generate a significant, but not reducible load. There will be a slight increase in forest loads because as we use forested buffers or forestation to decrease loads, we increase forest acres.

- The remaining load is then allocated to the nonpoint source sectors (urban, agriculture, and septic systems) using the following equity rules:

  - Equal percent reductions of the reducible load by nonpoint source sectors. The reducible load is defined as the difference between the load assuming no BMPs (No Action load) and the load assuming all technically feasible reductions are made for each given sector (the E3 Scenario – Everyone, doing Everything, Everywhere)[7].
  - Credit given for reduction practices reported to date.
  - Consideration of geographic proximity and relative impacts of local area load reductions on Bay water quality. Basically, areas that are more effective (i.e., closer to the Bay) do more than areas further away.

Consideration of geographic proximity addresses cost-effectiveness by targeting more effective areas. It also addresses another aspect of equity by recognizing that people in areas closer to the Bay have a greater stake in the Bay than those living further from the Bay.

A constraint on the allocation objective is to distribute the loads so that they closely match the basin targets provided by EPA. This helps ensure that water quality standards in the Bay will be achieved, because the basin load targets were set by EPA with this in mind[8].

[6] Some refinements to the Tributary Strategy point sources were necessary to account for new information about minor industrial sources, dredged material placement facilities, and a number of changes at individual plants, e.g., consolidation of plants, corrections of past errors, etc..

[7] This allocation approach places fairness, or equity, over cost effectiveness with the understanding that sectors having load reduction responsibilities that are costly may elect to seek and pay for less costly reductions from other sectors.

[8] See Appendix H for a technical memorandum from MDE to EPA that addresses differences between target allocations set by EPA and those set by MDE.

1.3 Interim 2017 Target Reduction Strategy

EPA's expectation for Interim Target strategies is to achieve levels of BMP implementation consistent with meeting 60% of the Final Target for nutrients and sediment by 2017. Maryland's Interim Target strategy is projected to achieve the following levels of implementation statewide by 2017:

- Nitrogen: 89% of the Final Target
- Phosphorus: 119% of the Final Target
- Sediment: 409% of the Final Target

Before elaborating on the results, the following is an overview of Maryland's Interim 2017 Target strategy:

- Point Sources:
  - Complete upgrades of major industrial and municipal treatment plants consistent with Maryland's Tributary Strategy caps.
  - Upgrade five large minor municipal plants to enhanced nutrient removal (ENR).
  - Take steps to achieve about a 15.6% reduction in 2009 loads from minor industrial plants.
- Stormwater and Septic Systems:
  - For local teams that provided urban stormwater and septic system strategies, the strategies were adopted as-is.
  - For local teams that did not submit strategies the following practices have been included:
    - Septic Systems: Upgrade 60% of the septic systems in the Critical Area (1,000 ft from tidal waters)
    - Stormwater:
      - Non-Regulated (LAs): 6% of pervious land in urban stream buffers and 60% of pervious land under urban nutrient management, both of which reflect 60% of the E3 final target levels for these two practices[9].
      - NPDES-Regulated (WLAs): Same as Non-Regulated for urban stream buffers and urban nutrient management, plus stormwater retrofits of developed lands with little or no management using urban filtering practices and impervious surface removal (30% for Phase I MS4 NPDES permits, 20% for Phase II MS4 NPDES permits).
- Agriculture:
  - Annual agricultural BMPs are set at about the same level as Final Target strategy[10]
  - Many management practices make up the agricultural strategy. Some of the key practices are Cover Crops, Enhanced Nutrient Management, Decision Agriculture,

[9] E3 refers to a theoretically maximum feasible implementation strategy developed by the Chesapeake Bay Program partners and is shorthand for "Everything implemented by Everyone Everywhere." E3 level of implementation for urban stream buffers is 10% of all pervious developed land and for urban nutrient management is 100% of all pervious developed land.

[10] Annual practices are activities, like cover crops, that have to be implemented each year. Cumulative practices are activities that are more permanent, like forested stream buffers and waste storage structures.

Land Retirement to hay without nutrients, Poultry Litter Incorporation, and Soil Conservation and Water Quality Plans. The levels of BMPs were developed by Soil Conservation Districts, which reflect local conditions and are summed to statewide and basin aggregations.

- Urban Nutrient Management on about 220,000 acres/year through the existing regulation of commercial lawn care companies and an additional 187,000 acres based on local plans for a total of about 407,000 acres/year. These acres to not explicitly account for the 2010 Fertilizer Act; however, they approximate the effect of the nutrient management education and outreach that is a part of the Act.

Further detailed narrative descriptions of the elements comprising the Interim Strategy, including discussion of how Maryland currently envisions the implementation actions to be achieved, is presented in Appendix A.

1.3.1 Interim 2017 Strategy Results Summary

The following summary of the Interim Strategy results are organized by pollutant. This summary focuses on which actions are anticipated to result in the greatest pollutant reductions. Currently, the EPA Bay watershed model has not been used to isolate the effects of individual best management practices (BMPs) on nonpoint source loads. Although this is technically possible, it has not been done by EPA due to time constraints. At this time, the model only provides reduction results by broad source categories such as regulated and non-regulated stormwater, septic systems, cropland, nurseries, and pasture.

Tables 3 - 5 summarize the statewide results of Maryland's Interim Target strategies for nitrogen phosphorus and sediments. Specifically, the tables show the estimated 2010 annual loading rate, the loading rate that is expected to be achieved as a result of the Interim Strategy[11], the amount of reduction from 2010[12] and the total percentage reduction from the estimated 2010 loads. Similar tables for the five major basins are provided in Appendix B.

Nitrogen

In total, the Interim Target strategy is expected to result in the implementation of various control practices by 2017 that will eventually result in the reduction of about 10.4 million pounds/year of nitrogen from the 2010 baseline. This represents achieving about 90% of the Final Target loading rate of 41.17 million pounds per year. The rapid progress due to point source upgrades helps to balance the more gradual progress from stormwater and septic reductions, which need to build more revenue and programmatic capacity before their pace of implementation can accelerate.

[11] Although Interim Target strategy pollution reduction practices are expected to be implemented by 2017, the reductions associated with those practices might not be realized until some years later. For example, lag-times associated with impacting shallow ground water that must be flushed and time needed for forest stream buffers to mature.

[12] Maryland has made significant reductions between 1985 and 2009 that are not represented here. This is elaborated on in Section 1.6, Final Target Reduction Strategy and Results.

Table 3: Nitrogen Results for 2017 Interim Strategy by Source Sector
(delivered)

		2010 Progress	Final Target	2017 Interim Strategy Load	Amount of Reduction from 2010	% Reduction from 2010
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	AFO	0.423	0.248	0.176	0.248	
	CAFO	0.346	0.371	0.349	-0.004	
	Crop	17.059	12.871	13.908	3.151	
	Nursery	0.891	0.843	0.659	0.232	
	Pasture	1.230	0.882	0.989	0.241	
	Subtotal	***19.949***	***15.215***	***16.081***	***3.868***	***19.4%***
Forest	Harvested	0.256	0.298	0.256	0.000	
	Natural	5.037	5.008	5.156	-0.119	
	Subtotal	***5.293***	***5.306***	***5.412***	***-0.119***	***(2.2%)***
Non-Tidal Atm	Non-Tidal Atm	0.665	0.665	0.665	NA	
	Subtotal	***0.665***	***0.665***	***0.665***	***NA***	***NA***
Septic	Septic	2.997	1.852	2.676	0.320	
	Subtotal	***2.997***	***1.852***	***2.676***	***0.320***	***10.7%***
Stormwater	CSS	0.000	-	0.000	0.000	
	Construction	0.553	0.578	0.558	-0.005	
	Extractive	0.102	0.087	0.094	0.008	
	Non-Regulated Developed	1.513	1.093	1.334	0.179	
	Regulated Developed	7.312	5.793	6.655	0.657	
	Subtotal	***9.479***	***7.551***	***8.641***	***0.838***	***8.8%***
Wastewater	CSO	0.066	0.043	0.029	0.037	
	Industrial	1.823	1.626	1.900	-0.077	
	Municipal	12.484	8.911	6.991	5.493	
	Subtotal	***14.373***	***10.581***	***8.921***	***5.452***	***37.9%***
	Total	***52.756***	***41.170***	***42.396***	***10.360***	***19.6%***

The largest nitrogen load reductions from any sector, about 5.5 million pounds/year, are attributed to the point source sector. Of that amount, the greatest reductions will be achieved by upgrading major municipal waste water treatment plants. These plants, defined as having

discharge flows of 0.5 million gallons per day or greater, make up about 95 percent of the municipal waste water flow.

The agricultural sector is credited in the Interim Target strategy with achieving the next largest load reductions amounting to 3.9 million pounds/year of nitrogen. The vast majority of reductions of about 3.2 million pounds are from cropland. The remaining reductions are nearly equally distributed among AFOs, nurseries and pasture land. Benefits of pollution controls on pasture land are masked somewhat by increases in pasture land acres due to retirement of erodible cropland.

The stormwater sector is projected to reduce about 838,000 pounds/year of nitrogen as a result of implementing the Interim Target Strategy. About 78% of that reduction is anticipated to occur from sources regulated under federal NPDES stormwater permits. The primary Interim Target strategy for reducing loads from urban stormwater is to accelerate the treatment of land that was developed in the past with little or no stormwater controls. In general terms this is referred to as stormwater retrofitting; however, the controls can take many forms including conversion of dry stormwater ponds to wet ponds or extended detention ponds, stream restoration, street sweeping, stream buffers and tree planting. Specifically, the strategy calls for requiring, in renewed federal NPDES stormwater permits, the retrofitting of 20% of previously developed impervious land with little or no controls within the next five year permit term. This strategy will apply to both Phase I and Phase II municipal separate storm sewer system (MS4) permits. Previous Phase I MS4 permit terms set a goal of retrofitting 10% of impervious area not controlled to the maximum extent practical, bringing the total retrofit target to 30% by 2017. MDE will submit all draft Phase I and Phase II MS4 permits to EPA in 2012. For additional information on the stormwater strategies see Appendix A, Section 2. Urban Stormwater Loads.

In addition to stormwater retrofits in jurisdictions that are regulated by MS4 permits, nitrogen reductions will be achieved through the control of fertilizer applications and stream forest buffers in both regulated and non-regulated jurisdictions. This will include both current regulation of commercial lawn care companies and new local government initiatives totaling about 407,000 acres.

The slight increase in forest loads is due to an increase in forest land associated with BMPs that convert the current land cover to forest land cover. The 2017 strategy is built upon 2010 land use and therefore does not reflect changes in land use due to future land development.

The primary Interim Target strategy for reducing loads from septic systems is to target about 60% of the systems within 1,000 feet of tidal waters (Critical Area) for either upgrading to nitrogen removal technology or connection to an advanced waste water treatment plant. Local plans were adopted as-is, with the State assigning a 60% rate of upgrades in the critical area for jurisdictions that did not submit a plan. This resulted in an Interim Strategy that increases septic system connections by 7,895 and septic system upgrades by 43,181 between 2010 and 2017. In addition, the Interim Strategy calls for septic pumping of about 25,325 systems. The estimated reduction is about 320,000 pounds/year when fully implemented.

1.3.2 Atmospheric Sources of Nitrogen

MDE's Air and Radiation Management Administration (ARMA) continues to implement aggressive nitrogen oxide (NOx) emission reduction programs in Maryland to help the State meet Clean Air Act Requirements and to reduce air deposition to the Bay. ARMA research shows that states upwind of Maryland are responsible for about 70% of Maryland's air quality problem. Because of this ARMA has also pushed EPA to adopt federal rules to reduce NOx emissions from these upwind states. ARMA is also working with other states to use other tools in the Clean Air Act (Sections 126, 110, 176A and 184) to ensure that these reductions in upwind states become effective.

The total NOx reductions in 2020, from both the Maryland rules and the potential federal rules will be almost twice as large as the NOx reductions currently used to determine air benefits as part of the Bay allocation process. Examples of State NOx reduction efforts include the Maryland Healthy Air Act, one of the countries most aggressive power plant control programs, the Clean Cars Program, which requires that cars sold in Maryland meet the toughest NOx emission standards allowed by law and several consent orders that reduce NOx emissions.

Federal rules that are in the works that will dramatically reduce NOx emissions east of the Mississippi include the Cross State Air Pollution Rule # 1 (a power plant rule to meet older standards), the Cross State Air Pollution Rule #2 (a second federal rule - needed to meet the new ozone standard - it will include additional NOx reductions in the 2020 time frame from power plants, industrial and commercial boilers and cement kilns) and the Tier 3 Vehicle/Low Sulfur Fuel program (a mobile source rule that will dramatically reduce NOx emissions in the 2017 time frame).

Phosphorus

In total, the Interim Target strategy is expected to result in the implementation of various control practices by 2017 that will eventually result in the reduction of about 582,000 pounds/year of phosphorus from 2010 levels. This represents achieving about 117% of the Final Target load of 2.81 million pounds/year.

The largest reduction in phosphorus loading rate from any sector, about 318,000 pounds/year, is attributed to the agricultural sector. Of that amount, the greatest reductions will be achieved by BMPs on cropland followed by reductions from nurseries attributed mostly to water recycling.

The next largest source of phosphorus reductions, about 178,000 pound/years, is anticipated from industrial and municipal waste water treatment plants. These reductions are divided in about equal amounts between municipal and industrial sources.

Reductions of about 90,000 pounds/year are anticipated from the urban stormwater sector. The majority of the reductions, about 80%, are anticipated from sources under federal NPDES stormwater permits.

Table 4: Phosphorus Results for 2017 Interim Strategy by Source Sector
(delivered)

		2010 Progress	Final Target	2017 Interim Strategy Load	Amount of Reduction from 2010	% Reduction from 2010
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	AFO	0.067	0.037	0.026	0.041	
	CAFO	0.057	0.053	0.051	0.006	
	Crop	1.131	1.028	0.952	0.178	
	Nursery	0.269	0.242	0.191	0.078	
	Pasture	0.116	0.091	0.102	0.014	
	Subtotal	***1.640***	***1.451***	***1.323***	***0.318***	***19.4%***
Forest	Harvested	0.007	0.008	0.007	-0.000	
	Natural	0.145	0.144	0.148	-0.003	
	Subtotal	***0.152***	***0.152***	***0.155***	***-0.004***	***(2.4%)***
Non-Tidal Atm	Non-Tidal Atm	0.040	0.040	0.040	NA	
	Subtotal	***0.040***	***0.040***	***0.040***	***NA***	***NA***
Septic	Septic	NA	NA	NA	NA	
	Subtotal	***NA***	***NA***	***NA***	***NA***	***NA***
Stormwater	CSS	0.000	-	0.000	0.000	
	Construction	0.095	0.106	0.097	-0.002	
	Extractive	0.033	0.026	0.029	0.004	
	Non-Regulated Developed	0.115	0.066	0.099	0.016	
	Regulated Developed	0.476	0.304	0.403	0.072	
	Subtotal	***0.718***	***0.501***	***0.628***	***0.090***	***12.5%***
Wastewater	CSO	0.012	0.009	0.007	0.005	
	Industrial	0.197	0.097	0.122	0.075	
	Municipal	0.542	0.560	0.444	0.098	
	Subtotal	***0.750***	***0.667***	***0.573***	***0.178***	***23.7%***
	Total	***3.300***	***2.810***	***2.719***	***0.582***	***17.6%***

Septic system loads of phosphorus are not strongly influenced by the proposed strategies. Septic systems generally do not discharge phosphorus because it binds to soil and is not transported via ground water the way that nitrogen is transported. Phosphorus loads associated with connections of septic systems to upgraded treatment plans and septic pumping will be transferred to waste

water facilities. This might affect specific plant operations and plant capacity; however, the municipal treatment plant caps for phosphorus remain unchanged.

The slight increase in forest loads is due to an increase in forest land associated with BMPs that convert the current land cover to forest land cover and not a change in land use due to development. The Interim Target strategy is built upon 2010 acres of land and therefore does not reflect any attempt to project the change in land use in 2017.

Sediment

In total, the Interim Target strategy is expected to result in the implementation of various control practices by 2017 that will eventually result in the reduction of over 105 million pounds/year of sediment. This represents over-achieving the Final Target loading rate of 1,350 million pounds per year by about 80 million pounds.

The reduction in the loading rate from the agricultural sector is shown to be over 55 million pounds/year. The vast majority of these reductions are attributed to practices on cropland, with about 3.2 million pounds/year from pasture. Benefits of pollution controls on pasture land are masked somewhat by increases in pasture land acres due to retirement of erodible cropland.

The reduction in the loading rate of sediment for the urban and suburban stormwater sector is expected to be about 91 million pounds/year. Consistent with nutrient reductions, the majority of these reductions are anticipated from sources under federal NPDES stormwater permits (regulated urban).

The change in loads for municipal and industrial waste water loads reflect a difference in the way that the 2010 baseline and the final strategy loads are generated. The Interim Target loads are based on allowable loading limits in permits, whereas, the estimated 2010 loads are based on actual discharge monitoring data. The differences reflect the fact that treatment plants generally discharge sediments well below the allowable permit limits. It is anticipated that the point source loads in 2017 will be significantly below the final target strategy loads summarized in Table 5.

The increase in forest loads is due to an increase in forest land associated with BMPs that convert the current land cover to forest land cover.

Table 5: Sediment Results for 2017 Interim Strategy by Source Sector
(delivered)[a]

		2010 Progress	2017 Interim Strategy Load	Amount of Reduction from 2010	% Reduction from 2010
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	AFO	2.256	1.971	0.285	
	CAFO	0.205	0.172	0.033	
	Crop	639.576	588.919	50.658	
	Nursery	9.626	8.472	1.154	
	Pasture	44.649	41.405	3.244	
	Subtotal	***696.312***	***640.940***	***55.373***	***8.0%***
Forest	Harvested	7.248	7.969	-0.721	
	Natural	118.257	121.090	-2.833	
	Subtotal	***125.504***	***129.059***	***-3.555***	***(2.8%)***
Non-Tidal Atm	Non-Tidal Atm	NA	NA	NA	
	Subtotal	***NA***	***NA***	***NA***	***NA***
Septic	Septic	NA	NA	NA	
	Subtotal	***NA***	***NA***	***NA***	***NA***
Stormwater	CSS	0.000	0.000	0.000	
	Construction	110.921	113.139	-2.218	
	Extractive	31.653	27.583	4.070	
	Non-Regulated Developed	46.764	40.156	6.609	
	Regulated Developed	353.466	271.029	82.437	
	Subtotal	***542.805***	***451.906***	***90.898***	***16.7%***
Wastewater	CSO	2.103	1.461	0.642	
	Industrial	3.382	8.342	-4.960	
	Municipal	5.709	38.457	-32.748	
	Subtotal	***11.194***	***48.260***	***-37.066***	***(331.1%)***
	Total	***1,375.816***	***1,270.165***	***105.651***	***7.7%***

a. Maryland did not set individual sector targets for sediment. Rather, based on experience in the Phase I WIP, it was expected that reductions in phosphorus would produce sufficient reductions to meet the overall sediment targets. This is borne out by the results.

Best Management Practices for the 2017 Interim Strategy

Table 6 is a statewide summary of the best management practices (BMPs) that make up the 2017 Interim Strategy. It shows the 2010 BMP implementation progress, the level of BMPs in 2017 and the incremental difference between 2010 and 2017. BMPs for which the incremental difference is negative usually denotes the replacement of less effective BMPs by more effective BMPs. For example, the stormwater sector, dry extended detention ponds are anticipated to be replaced by more efficient practices. Similarly, some stormwater management practices that were implemented in earlier eras, when State regulations were less advanced than they are today, will be upgraded. Blank cells indicate none of that type of BMP is included.

More detailed descriptions and additional information about the BMPs can be found in the document "Estimates of County-Level Nitrogen and Phosphorus Data for Use in Modeling Pollutant Reduction - Documentation For Scenario Builder Version 2.2" on the Chesapeake Bay Program web site.

Table 6: BMPs for Maryland's 2017 Interim Target Strategy

Agriculture - Nutrient Management/Annual Practice		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Decision Agriculture	Acres/Year	-	358,944	358,944
Enhanced Nutrient Management	Acres/Year	88,838	116,941	28,103
Nutrient Management	Acres/Year	735,891	808,617	72,726
	Total	***824,729***	***1,284,502***	***459,773***

Agriculture - Other Annual Practices		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Conservation Tillage	Acres/Year	696,307	761,659	65,352
Cover Crop	Acres/Year	196,552	417,012	220,460
Cropland Irrigation Management	Acres/Year	-	119,727	119,727
Dairy Manure Incorporation	Acres/Year	-	16,702	16,702
Poultry Litter Incorporation	Acres/Year	-	100,294	100,294
Soil Conservation and Water Quality Plans	Acres/Year	769,462	1,026,413	256,951

Agriculture - Additional BMPs		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Alternative Crops	Acres	-	498	498
Barnyard Runoff Control	Acres	893	1,331	438
Forest Buffers	Acres	20,926	21,853	928
Grass Buffers / Vegetated Open Channel	Acres	46,265	48,524	2,259

Agriculture - Additional BMPs		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Heavy Use Poultry Area Concrete Pads	Acres	-	74	74
Irrigation Water Capture Reuse	Acres	-	1,937	1,937
Land Retirement	Acres	19,118	40,699	21,580
Loafing Lot Management	Acres	-	119	119
Sorbing Materials in Ag Ditches	Acres	-	3,097	3,097
Tree Planting / Vegetative Environmental Buffers	Acres	17,484	17,983	500
Water Control Structures	Acres	404	10,314	9,910
Wetland Restoration	Acres	8,218	10,928	2,710
Non Urban Stream Restoration / Shoreline Erosion Control	Linear Feet	-	44,385	44,385

Agriculture - Pasture BMPs		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Horse Pasture Management	Acres	-	2,993	2,993
Off Stream Watering Without Fencing	Acres	35,474	40,283	4,809
Precision Intensive Rotational Grazing	Acres	-	1,671	1,671
Prescribed Grazing	Acres	946	10,984	10,038
Stream Access Control with Fencing	Acres	488	803	315

The above tables represent Land BMPs and do not show those BMPs that are based on percentages such as Animal Waste Storage and Poultry Litter Treatment (Alum). Manure Transport is also not represented in these tables.

Developed Land BMPs		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Abandoned Mine Reclamation	Acres	-	1,242	1,242
Bioretention / Raingardens	Acres	-	19,028	19,028
Bioswale	Acres	-	13,919	13,919
Dry Detention Ponds and Hydrodynamic Structures	Acres	48,294	49,283	990
Dry Extended Detention Ponds	Acres	25,901	20,780	-5,122
Impervious Urban Surface Reduction	Acres	4	4,333	4,328
MS4 Permit Stormwater Retrofit	Acres	44,266	59,314	15,048
Permeable Pavement	Acres	-	300	300
Stormwater Management Generic BMP (1985 to 2002)	Acres	131,252	110,469	-20,783
Stormwater Management Generic BMP (2002 to 2010)	Acres	78,979	77,888	-1,092
Urban Filtering Practices	Acres	3,552	72,900	69,348
Urban Forest Buffers	Acres	340	10,059	9,719
Urban Infiltration Practices	Acres	14,458	26,795	12,337
Urban Tree Planting / Urban Tree Canopy	Acres	-	9,033	9,033

Developed Land BMPs		2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Unit**			
Vegetated Open Channels	Acres	-	8,307	8,307
Wet Ponds and Wetlands	Acres	54,077	70,351	16,273
Erosion and Sediment Control on Construction	Acres/Year	29,023	29,023	0
Erosion and Sediment Control on Extractive	Acres/Year	-	593	593
Forest Conservation	Acres/Year	93,350	90,469	-2,881
Street Sweeping Mechanical Monthly	Acres/Year	-	7,053	7,053
Urban Nutrient Management	Acres/Year	218,071	406,330	188,259
Street Sweeping Pounds*	Lbs/Year	-	9,628,448	9,628,448
Urban Stream Restoration (interim)	Linear Feet	-	430,883	430,883
Urban Stream Restoration / Shoreline Erosion Control	Linear Feet	-	605,116	605,116

* These are total pounds of material collected of which nutrients are a small fraction.

Septic System BMPs			2010 Progress	2017 Interim Strategy	Change from 2010
BMP Name	**Zone**	**Unit**			
Septic Connection	Critical Area	Systems	14	1,432	1,418
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	350	6,381	6,032
	Within 1000 ft of a perennial stream	Systems	173	619	446
	Septic Connection Total		***536***	***8,431***	***7,895***
Septic Denitrification	Critical Area	Systems	721	15,862	15,141
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	1,395	13,937	12,542
	Within 1000 ft of a perennial stream	Systems	732	16,230	15,498
	Septic Denitrification Total		***2,848***	***46,029***	***43,181***
Septic Pumping	Critical Area	Systems	-	2,764	2,764
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	-	14,426	14,426
	Within 1000 ft of a perennial stream	Systems	-	8,135	8,135
	Septic Pumping Total		***-***	***25,325***	***25,325***

1.4 Maryland 2013 Milestones

To promote incremental progress, EPA's accountability framework for restoring the Chesapeake Bay calls on states to identify milestones to be reached in two-year increments. The two-year milestones are also are tracked closely by Maryland's BayStat performance management system established by Governor O'Malley.

There are two broad categories of milestones: 1) *Implementation actions* that result in pollution reduction, and 2) *Program Enhancement actions* that are investments toward accelerating implementation in the future. The 2013 Milestones for BMPs cover the period July 1, 2011 – June 30, 2013 to be consistent with the long-standing annual progress reporting period. The 2013 Programmatic Milestones cover the calendar years 2012 – 2013. Progress on all milestones is to be reported to EPA at the end of the calendar year 2013.

Maryland's 2013 Milestones were submitted to EPA January 6, 2012. EPA provided comments on the Programmatic Milestones and requested final refinements be submitted March 30, 2012. Due to time constraints, the State has been compelled to develop statewide 2013 Milestones for each major pollution source sector ahead of when local milestones will be completed. Therefore, the 2013 Milestone commitments provided by the local teams are not expected to be identical to the statewide commitments made by the State to EPA. Nevertheless, local milestones complement the State's 2013 Milestone commitments.

State 2013 Milestones are available through the Maryland Department of Environment's Milestones Website. The local milestones are documented in Section III of this report.

1.5 Developing the Final 2025 Target Reduction Strategy

Below are highlights of Maryland's Final Target reduction strategy.

- Waste Water:
  - The upgrade of major municipal and industrial treatment plants is expected to be completed as part of the Interim Target strategy.
  - The upgrade of five large minor municipal plants is expected to be completed as part of the Interim Target strategy.
  - Minor industrial plants will continue load reductions from the 15% reduction by 2017 to nearly 33% reduction by 2025.

For nonpoint sources, the Final Strategy builds upon county scale strategies provided by local WIP teams and the local agricultural workgroups. Local strategies that met county targets were adopted as-is. The State supplemented local strategies that fell short of the county targets, or were not provided, using the following systematic approach:

- Stormwater: Use the set of BMPs included in the EPA Bay Program E3 strategy[13] at a level necessary to close the load reduction gap for each county[14]. These were applied to both non-regulated and NPDES permitted stormwater. These include the following:
  - Filtering Practices
  - Forest Buffers
  - Impervious Surface Reduction
  - Urban Nutrient Management

- Septic Systems: Use BMPs included in the EPA Bay Program E3 watershed model scenario at a level necessary to close the load reduction gap for each county, as follows:
  - Septic Upgrades: Upgrades are first applied in the order of systems in the critical area (within 1,000 feet of tidal waters) for applicable counties, then to systems within 1,000 feet of a perennial stream and then to remaining systems.
  - Septic Connections: Although septic connections are included in the E3 scenario, it was deemed impractical to attempt to use that practice as a gap-filler given the limited time frame. Septic connections would need to be considered on a case by case basis where it is cost effective to do so and where sprawl growth would not be encouraged.

- Agriculture: Many management practices make up the agricultural strategy. Some of the key practices are Cover Crops, Enhanced Nutrient Management, Decision Agriculture, Land Retirement to hay without nutrients, Poultry Litter Incorporation, and Soil Conservation and Water Quality Plans.

An example of how the State filled the gap using a proportion of the E3 scenario follows.

Consider a county that did not submit a plan and that the county's allocation implies achieving 65% of their maximum feasible reducible load for urban stormwater, that is, achieving reductions equal to 65% of E3. For the urban stormwater BMP "filtering practices" we have the following information:

Given

- County Stormwater Reduction Needed = 65% of Reducible Load (65% of E3)
- E3 Filtering Practices = 90% applied to pervious urban (Bay Program Definition)

We then perform the following calculation:

- 65% of Reducible Load * 90% Filtering practice = 59% Filtering Practices in 2025 scenario

Similar calculations are then performed for each of the county's other stormwater practices that are included in the Bay Program's E3 scenario. When summed up the combined load reductions meet the urban stormwater load reduction associated with the allocation for the county. The

[13] The E3 scenario is an estimate of the maximum technically feasible implementation, which gets its name from the notion of Everyone doing Everything they can Everywhere (E3).
[14] In some cases, BMPs submitted in local plans had to be replaced with more efficient BMPs in order to meet the Final Target.

reason this works is that the stormwater allocation for the county is defined as a percentage of E3; in this example, 65% of E3. The BMPs assigned to the county for the 2025 Final Target strategy is simply the underlying set of BMPs representing 65% of E3.

For septic systems, plans received from local teams were compared to the Final Target loads. If the plan met the target it was adopted as is. If the plan did not meet, or a plan for septic systems was not submitted, the approach as described above was used (i.e., additional implementation in the Critical Area zone, then within 1,000 feet zone) until the proposed pollution controls were estimated to meet the Final Target loads.

The State also addressed federal strategies, municipal strategies and State agency strategies by county, which almost exclusively involved addressing stormwater controls. The BMPs selected for these sources mirror urban stormwater strategies the State provided for Phase I MS4 jurisdictions that did not submit strategies at a level of 20% retrofit of untreated developed land. After all the gaps remaining in local team strategies were addressed, the local strategies were combined with agricultural strategies at the county scale. Then the strategies were aggregated up to the major basin scale, accounting for plans that targeted BMPs to more effective geographic areas, and otherwise distributing the BMPs from each county to the intersecting major basins proportionally to the land area for which the BMPs apply.

1.6 Final 2025 Target Reduction Strategy and Results

Before presenting the results of the Final Target Strategy it is important to consider the historical context. To illustrate this, Figure 2 shows estimated nitrogen load reductions by the primary source categories since 1985. The year1985 is used by the EPA Chesapeake Bay Program as a long-term baseline by which to gauge progress on Chesapeake Bay restoration. Although the changes in loads between 1985 and 2010 are presented as simplified straight line reductions, rather than showing the natural ups and downs, they clearly demonstrate significant progress of the past.

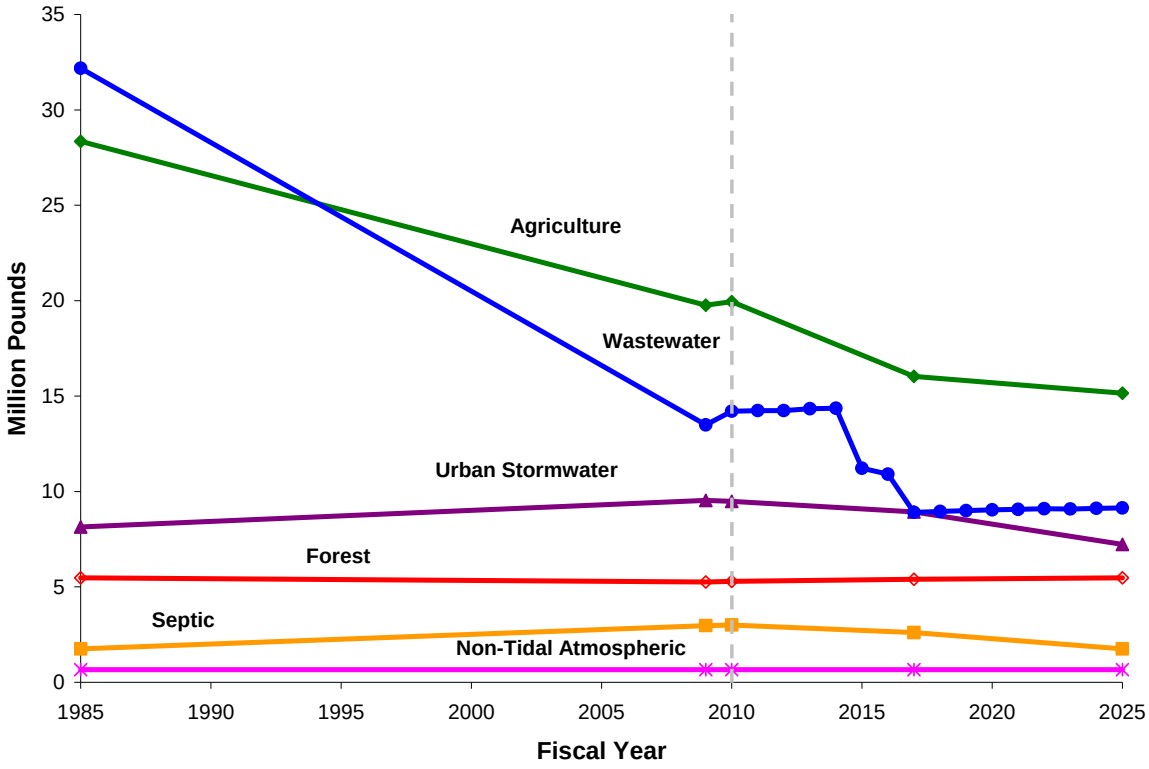


Figure 2: Past Trend in Nitrogen Compared to Future Final Target Strategy Trend

Clearly notable in Figure 2 are the reductions from point sources and the agricultural sector. Urban Stormwater has demonstrated slight reductions in the face of significant land development. Past reductions in forest and atmospheric (Air) sources[15] are due to air pollution reduction and loss of forest cover. The upward trend in the future is due to an increase in forested land due to BMP implementation that results in land conversion[16]. The future forest load does not take into account expected decreases in forest cover as a result of future development. Contrasting past progress in other sectors with the past upward trend in septic system loads suggests that the time has arrived to address the loads from septic systems. It is important to keep this historical context in mind is when comparing the future reductions being call on from the septic system sector relative to the other sectors. Figure 3 is an analogous graph for phosphorus.

[15] The air sources referenced in this table are the small contributions associated with deposition to non-tidal streams and not the major contributions of deposition to the land and directly to the surface of the Bay. Therefore, the trends are due almost exclusively to changes in forest cover.

[16] This change in forest land is relative to 2010 land use acres and results solely from BMP implementation. It does not reflect projected land use change in future years. The Maryland Department of Planning projects net reduction in forest cover due to development, which is not reflected in this analysis, because, aside from BMP changes to land cover, the EPA Bay model reflects a static 2010 land use in both the 2017 and 2025 strategies.

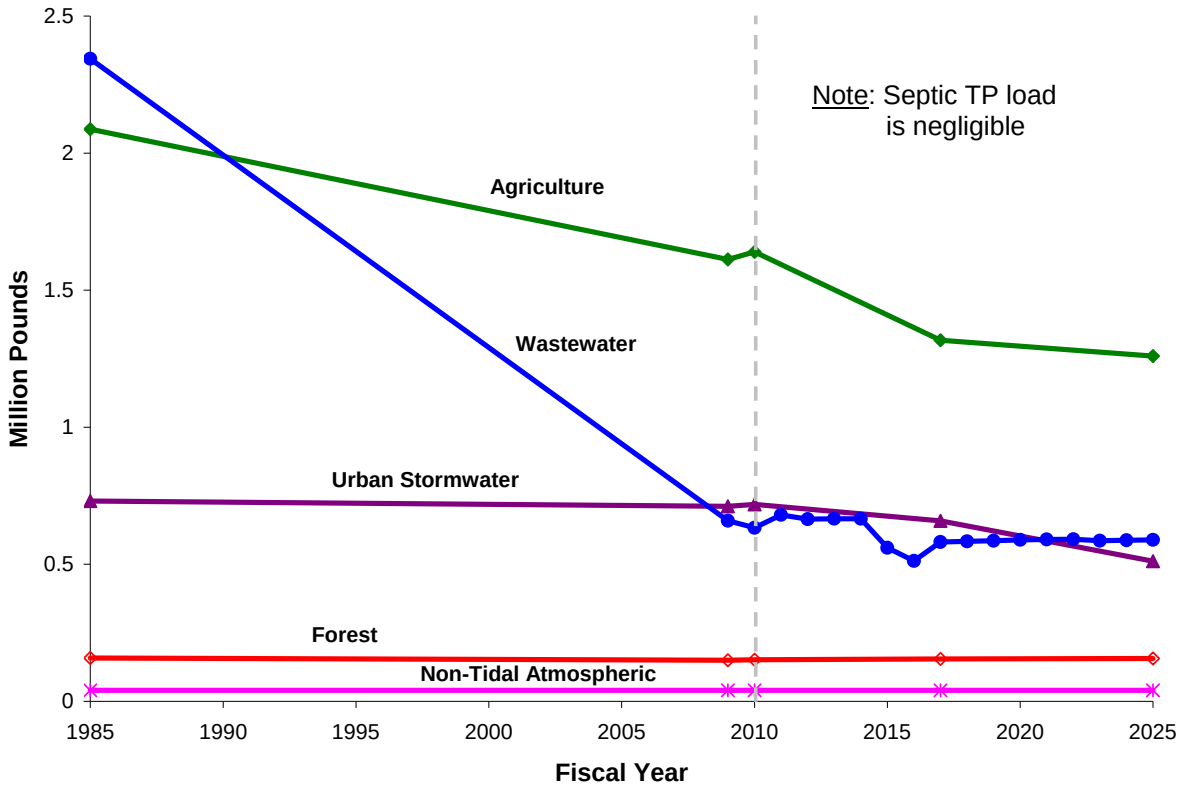


Figure 3: Past Trend in Phosphorus Compared to Future Final Target Strategy Trend

Agricultural Sector Strategy Development

To develop the Final Target strategy for the agriculture sector, the Maryland Department of Agriculture facilitated a series of local Agricultural Workgroup meetings in the summer and again in the fall of 2011 within each of the twenty-three counties of Maryland. The Agricultural Workgroups were modeled after the Tributary Strategy Workgroups and included a broad spectrum of stakeholders that represented and specialized in working with the agricultural community. These special teams were led by the local Soil Conservation Districts and focused on pollution reduction plans at the county level. The participants included farmers, Soil Conservation District planners, engineers, technicians, NRCS, FSA, University of Maryland Extension, County Agricultural Coordinators, agro-business, representatives from local watershed organizations, Chesapeake Bay Foundation, Sierra Club, River Keepers, Maryland Farm Bureau, Delmarva Poultry Institute, Dairy Industry, county planning staff, DPW staff, and Health Department staff. Over 1,000 people participated in the meetings.

Because of the compressed time frame to develop a Phase II WIP, the preliminary meetings in all twenty-three counties were held in June and July prior to EPA providing the state the final loading reduction targets. Workgroup members began with information on current agricultural practices installed and discussed opportunities for further implementation with existing farm

management practices and programs. The meetings also focused on local capacity to provide further reductions and the commitment of the participants to implement and develop a workable local strategy.

In September, 2011, EPA and MDE released the final reduction targets for all source sectors. The Agricultural load estimates changed with the new model and required the Agricultural Workgroups to reconvene and re-examine the individual local strategies. Meetings were scheduled from mid-September to the end of October in all twenty-three counties. The Maryland Department of Environment had developed a new tool, the Maryland Assessment and Scenario Tool (MAST), to assist all sectors with developing the WIP II by allowing test runs of management options to determine nutrient reductions. This tool facilitated direct access to critical information, such as landuse acres, BMPs available for each type of land and also provided preliminary load reduction estimates from various input strategies.

At the time of the Agricultural Workgroups meetings, MAST was in its initial development stage and the complete simulation of animal and manure BMPs was unavailable. However, MAST was still used to guide reduction strategies and create a consistent input format for strategy input. It was recognized that without the full simulation of animal BMPs resulting load reduction strategies may change and would need to be evaluated through the updated MAST and ultimately using the EPA Phase 5.3.2 watershed model. The first iteration of load reduction strategies fell short of agricultural load targets, and subsequently, workgroup members were asked to develop a new set of plans that would require increased technical assistance and increased support for existing programs to achieve greater load reductions. The plans provided the basis for the Agricultural sector strategies included in Maryland's overall implementation scenario to meet the state-basin reduction targets, as described in Section I of this report. A complete list of the Agricultural Workgroup and stakeholder meetings for the Phase II WIP is provided in Section II.

1.6.1 Final Strategy Results Summary

The following summary of the Final Strategy results are organized by pollutant. This summary focuses on which actions are anticipated to result in the greatest pollutant reductions. Currently, the EPA Bay watershed model has not been used to isolate the effects of individual control practices. Although this is technically possible, it has not been done due to time constraints. At this time, the model only provides reduction results by broad source categories such as regulated and non-regulated stormwater, septic systems, cropland, nurseries, and pasture. Benefits of pollution controls on pasture land are masked somewhat by increases in pasture land acres due to retirement of erodible cropland.

Tables 7 - 9 summarize the results of Maryland's Final Target strategies for nitrogen, phosphorus and sediments. Specifically, the tables show the estimated 2010 load, the load that is expected to be achieved as a result of the Final Strategy[17], the amount of reduction from 2010 and the total

[17] Although Final Target strategy pollution reduction practices are expected to be implemented by 2025, the reductions associated with those practices might not be realized until some years later. For example, lag-times associated with impacting shallow ground water that must be flushed and time needed for forest stream buffers to mature.

percentage reduction from the estimated 2010 baseline. Similar tables for the five major basins are provided in Appendix B.

Although the statewide nitrogen and phosphorus reductions more than meet the statewide Final Targets, the results are uneven regionally (See Appendix B). In several of the major basins, nitrogen targets are not met and phosphorus targets are over achieved[18]. MDE has conducted an evaluation using an analytical framework provided by EPA that predicts the Bay's expected water quality response to load reductions. It also accounts for different levels of nitrogen and phosphorus reductions. As described in the Introduction of this report, and shown in a technical memorandum to EPA in Appendix H, the load reductions by major basin from Maryland's 2025 Final Target strategy, as confirmed by EPA's models, meet water quality standards.

Nitrogen

In total, Table 7 shows that the Final Target strategy is expected to result in the implementation of various control practices by 2025 that will eventually result in the reduction of about 11.83 million pounds of nitrogen from the 2010 baseline. This represents achieving about 101% of the Final Target load of 41.17 million pounds per year. A statewide summary of the nonpoint source BMPs used in this strategy are provided in Table 10.

The largest nitrogen load reductions from any sector, about 4.74 million pounds, are attributed to the agricultural sector. Of that amount the greatest reductions, about 3.9 million pounds, are associated with cropland practices. The remaining reductions are nearly equally distributed among AFOs, nurseries and pasture land. Benefits of pollution controls on pasture land are masked somewhat by increases in pasture land acres due to retirement of erodible cropland. Although the CAFO Final Target is higher than the 2010 load, the Final Strategy reflects the anticipated load.

Wastewater sources are anticipated to achieve a 3.8 million pound reduction. Note that this reduction is less than the 5.45 million pound load reduction projected for 2017. This is because the ENR upgrades to major municipal plants are scheduled to occur before 2017 and loads are projected to grow within their load caps thereafter.

The point source Final Target load of 10.55 million pounds in Table 7 reflects the load cap. These loads are higher than the loads are projected to be in 2025, because the vast majority of municipal plants are projected to still have capacity to accommodate additional development beyond 2025. In this regard the Final Target strategy is conservative, because it reflects higher loads from point sources than is anticipated occur in 2025.

Urban stormwater is anticipated to achieve a 2.2 million pound reduction by continuing the treatment of land that was developed in the past with little or no stormwater controls combined with reducing the use of lawn fertilizers. The majority of the reductions, about 1.66 million

[18] For a given basin the nitrogen and phosphorus targets differ. In addition, a given BMP typically reduces nitrogen and phosphorus at different rates. Therefore, it is nearly impossible to meet both the nitrogen and phosphorus targets exactly; one is almost certain to overshoot the goal if the other precisely meets the goal.

pounds, are anticipated from sources with NPDES Phase I and Phase II stormwater permits (regulated urban).

Table 7: Nitrogen - Statewide Results for Final Strategy by Source Sector
(delivered)

		2010 Progress	Final Target	Final Strategy Load	Amount of Reduction from 2010	% Reduction from 2010
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	AFO	0.423	0.248	0.170	0.253	
	CAFO	0.346	0.371	0.338	0.008	
	Crop	17.059	12.871	13.120	3.939	
	Nursery	0.891	0.843	0.579	0.312	
	Pasture	1.230	0.882	0.998	0.232	
	Subtotal	***19.949***	***15.215***	***15.206***	***4.743***	***23.8%***
Forest	Harvested	0.256	0.298	0.256	0.000	
	Natural	5.037	5.008	5.209	-0.172	
	Subtotal	***5.293***	***5.306***	***5.465***	***-0.171***	***(3.2%)***
Non-Tidal Atm	Non-Tidal Atm	0.665	0.665	0.665	NA	
	Subtotal	***0.665***	***0.665***	***0.665***	***NA***	***NA***
Septic	Septic	2.997	1.852	1.756	1.240	
	Subtotal	***2.997***	***1.852***	***1.756***	***1.240***	***41.4%***
Stormwater	CSS	0.000	-	0.000	0.000	
	Construction	0.553	0.578	0.517	0.036	
	Extractive	0.102	0.087	0.083	0.019	
	Non-Regulated Developed	1.513	1.093	1.024	0.489	
	Regulated Developed	7.312	5.793	5.654	1.657	
	Subtotal	***9.479***	***7.551***	***7.279***	***2.201***	***23.2%***
Wastewater	CSO	0.066	0.043	0.002	0.064	
	Industrial	1.823	1.626	1.632	0.191	
	Municipal	12.484	8.911	8.921	3.563	
	Subtotal	***14.373***	***10.581***	***10.555***	***3.818***	***26.6%***
	Total	***52.756***	***41.170***	***40.925***	***11.831***	***22.4%***

Septic system reductions of about 1.24 million pounds are estimated from the proposed Final Target strategy. The Final Strategy increases septic system connections by 42,442 and septic

system upgrades by 181,366 between 2010 and 2025. In addition, the Final Strategy calls for septic pumping of about 58,496 systems.

Phosphorus

Table 8 summarizes the results for phosphorus. In total, the Final Target strategy is expected to result in the implementation of various control practices by 2025 that will eventually result in the reduction of about 692,000 pounds/year of phosphorus from the 2010 baseline. The Final Strategy loading rate of 2.609 million pounds/year overshoots the Final Target load of 2.810 million pounds/year. As noted elsewhere in this report, a given BMP typically reduces nitrogen and phosphorus at different rates. Therefore, it is nearly impossible to meet both the nitrogen and phosphorus targets exactly; one is almost certain to overshoot the goal if the other precisely meets the goal. Furthermore, overshooting on phosphorus in some geographic regions makes up for undershooting on nitrogen (see Appendix H).

A Reduction in the annual loading rate of about 91,000 pounds/year is anticipated from industrial and municipal waste water treatment plants. Note that this reduction is less than the 170,000 pound load reduction projected for 2017. This is because loads are projected to grow after 2017. As with nitrogen, the point source Final Target loads in Table 8 reflect the point source loading cap rather than the projected loads in 2025, which will be below the point source cap. In this regard the Final Target strategy is conservative, because it reflects higher loads from point sources than is anticipated to occur in 2025.

Reductions from the agricultural sector are shown to be about 374,000 pounds/year. The majority, 212,000 pounds/year, is anticipated from cropland. Another significant portion of the loading rate reduction, 102,000 pounds/year, is anticipated from nurseries. Benefits of pollution controls on pasture land are masked somewhat by increases in pasture land acres due to retirement of erodible cropland.

Reductions of about 232,000 pounds/year are anticipated from the urban stormwater sector. About 170,000 pounds/year of that reduction are anticipated from sources regulated by federal NPDES stormwater permits and 44,000 pounds/year are from non-regulated sources.

Table 8: Phosphorus - Statewide Results for Final Strategy by Source Sector
(delivered)

		2010 Progress	Final Target	Final Strategy Load	Amount of Reduction from 2010	% Reduction from 2010
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	AFO	0.067	0.037	0.025	0.042	
	CAFO	0.057	0.053	0.049	0.007	
	Crop	1.131	1.028	0.918	0.212	
	Nursery	0.269	0.242	0.167	0.102	
	Pasture	0.116	0.091	0.106	0.010	
	Subtotal	***1.640***	***1.451***	***1.266***	***0.374***	***22.8%***
Forest	Harvested	0.007	0.008	0.007	-0.000	
	Natural	0.145	0.144	0.150	-0.005	
	Subtotal	***0.152***	***0.152***	***0.157***	***-0.005***	***(3.3%)***
Non-Tidal Atm	Non-Tidal Atm	0.040	0.040	0.040	NA	
	Subtotal	***0.040***	***0.040***	***0.040***	***NA***	***NA***
Septic	Septic	NA	NA	NA	NA	
	Subtotal	***NA***	***NA***	***NA***	***NA***	***NA***
Stormwater	CSS	0.000	-	0.000	0.000	
	Construction	0.095	0.106	0.088	0.007	
	Extractive	0.033	0.026	0.023	0.010	
	Non-Regulated Developed	0.115	0.066	0.070	0.044	
	Regulated Developed	0.476	0.304	0.305	0.170	
	Subtotal	***0.718***	***0.501***	***0.487***	***0.232***	***32.3%***
Wastewater	CSO	0.012	0.009	0.000	0.012	
	Industrial	0.197	0.097	0.098	0.099	
	Municipal	0.542	0.560	0.561	-0.019	
	Subtotal	***0.750***	***0.667***	***0.659***	***0.091***	***12.2%***
	Total	***3.300***	***2.810***	***2.609***	***0.692***	***21.0%***

Sediment

Table 9: Sediment - Statewide Results for Final Strategy by Source Sector (delivered)[a]

		2010 Progress	Final Strategy Load	Amount of Reduction from 2010	% Reduction from 2010
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**%**
Agriculture	AFO	2.256	1.831	0.425	
	CAFO	0.205	0.160	0.046	
	Crop	639.576	569.951	69.625	
	Nursery	9.626	8.338	1.288	
	Pasture	44.649	41.816	2.833	
	Subtotal	***696.312***	***622.096***	***74.216***	***10.7%***
Forest	Harvested	7.248	7.969	-0.721	
	Natural	118.257	122.632	-4.376	
	Subtotal	***125.504***	***130.601***	***-5.097***	***(4.1%)***
Non-Tidal Atm	Non-Tidal Atm	NA	NA	NA	
	Subtotal	***NA***	***NA***	***NA***	***NA***
Septic	Septic	NA	NA	NA	
	Subtotal	***NA***	***NA***	***NA***	***NA***
Stormwater	CSS	0.000	0.000	0.000	
	Construction	110.921	98.648	12.273	
	Extractive	31.653	22.311	9.342	
	Non-Regulated Developed	46.764	27.231	19.534	
	Regulated Developed	353.466	189.875	163.591	
	Subtotal	***542.805***	***338.065***	***204.739***	***37.7%***
Wastewater	CSO	2.103	0.090	2.013	
	Industrial	3.382	12.158	-8.776	
	Municipal	5.709	50.644	-44.935	
	Subtotal	***11.194***	***62.892***	***-51.698***	***(461.8%)***
	Total	***1,375.816***	***1,153.655***	***222.161***	***16.1%***

a. Maryland did not set individual sector targets for sediment. Rather, based on experience in Phase I, it is expected that reductions in phosphorus produce sufficient reductions to meet the sediment targets. Adjustments will be made if this is not borne out by EPA Bay watershed model results

Table 9 summarizes the results for sediment. In total, the Final Target strategy is expected to result in the implementation of various control practices between 2010 and 2025 that will eventually result in the reduction of about 222 million pounds/year of sediment. This represents over-achieving about the Final Target loading rate of 1,350 million pounds/year by about 197 million pounds/year.

Agricultural controls proposed in the Final Target Strategy between 2010 and 2025 are projected to reduce over 74 million pounds/year of sediment to the Chesapeake Bay. The vast majority of the reductions, about 70 million pounds/year, are anticipated from cropland. Overall the agricultural sector is anticipated to achieve about an 11% reduction in sediments delivered to the Bay.

The urban and suburban stormwater controls proposed in the Final Target strategy are projected to achieve nearly 205 million pound/year reduction in sediments delivered to the Chesapeake Bay. Overall the stormwater sector is anticipated to achieve about a 38% reduction in sediments to the Bay. These reductions to the Bay will be mirrored by local sediment reductions that will have significant positive impacts on local stream habitat and the fish and other wildlife the local streams support.

The change in loads from municipal and industrial waste water loads, presented in Table 9, reflect a difference in the way that the 2010 baseline and the final strategy loads are generated. The Final Target loads are based on allowable loading limits in permits, whereas, the estimated loads in the 2010 baseline are based on actual discharge monitoring data. The differences reflect the fact that treatment plants generally discharge well below the allowable permit limits. It is anticipated that the point source loads in 2025 will be significantly below the final target strategy loads summarized in Table 9.

Best Management Practices for the 2025 Final Strategy

Table 10 is a statewide summary of the best management practices (BMPs) that make up the 2025 Final Strategy. It shows the 2010 BMP implementation progress, the level of BMPs in 2025 and the incremental difference between the two years. BMPs for which the incremental difference is negative usually denotes the replacement of less effective BMPs by more effective BMPs. For example, in the agriculture sector, traditional nutrient management is replaced by decision agriculture to reflect the current adoption rate by farmers of newer technologies. In the stormwater sector, dry extended detention ponds are anticipated to be replaced by more efficient practices. Similarly, some stormwater management practices that were implemented in earlier eras, when State regulations were less advanced than they are today, will be upgraded. Blank cells indicate none of that type of BMP is included.

More detailed descriptions and additional information about the BMPs can be found in the document "Estimates of County-Level Nitrogen and Phosphorus Data for Use in Modeling Pollutant Reduction - Documentation For Scenario Builder Version 2.2" on the Chesapeake Bay Program web site.

Table 10: BMPs for Maryland's 2025 Final Target Strategy

Agriculture - Nutrient Management/Annual Practice		2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Unit**			
Decision Agriculture	Acres/Year	-	598,240	598,240
Enhanced Nutrient Management	Acres/Year	88,838	192,002	103,163
Nutrient Management	Acres/Year	735,891	518,902	-216,989
	Total	***824,729***	***1,309,144***	***484,414***

Agriculture - Other Annual Practices		2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Unit**			
Conservation Tillage	Acres/Year	696,307	756,251	59,944
Cover Crop	Acres/Year	196,552	424,085	227,534
Cropland Irrigation Management	Acres/Year	-	119,727	119,727
Dairy Manure Incorporation	Acres/Year	-	27,838	27,838
Poultry Litter Incorporation	Acres/Year	-	167,135	167,135
Soil Conservation and Water Quality Plans	Acres/Year	769,462	1,145,319	375,857

Agriculture - Additional BMPs		2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Unit**			
Alternative Crops	Acres	-	830	830
Barnyard Runoff Control	Acres	893	1,570	677
Forest Buffers	Acres	20,926	22,471	1,546
Grass Buffers / Vegetated Open Channel	Acres	46,265	50,028	3,763
Heavy Use Poultry Area Concrete Pads	Acres	-	81	81
Irrigation Water Capture Reuse	Acres	-	2,651	2,651
Land Retirement	Acres	19,118	57,186	38,068
Loafing Lot Management	Acres	-	121	121
Sorbing Materials in Ag Ditches	Acres	-	5,162	5,162
Tree Planting / Vegetative Environmental Buffers	Acres	17,484	18,313	829
Water Control Structures	Acres	404	17,198	16,794
Wetland Restoration	Acres	8,218	12,734	4,517
Non Urban Stream Restoration / Shoreline Erosion Control	Linear Feet	-	73,975	73,975

Agriculture - Pasture BMPs		2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Unit**			
Horse Pasture Management	Acres	-	4,990	4,990
Off Stream Watering Without Fencing	Acres	35,474	43,488	8,014

Agriculture - Pasture BMPs		2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Unit**			
Precision Intensive Rotational Grazing	Acres	-	2,787	2,787
Prescribed Grazing	Acres	946	18,301	17,355
Stream Access Control with Fencing	Acres	488	803	315

The above tables represent Land BMPs and do not show those BMPs that are based on percentages such as Animal Waste Storage and Poultry Litter Treatment (Alum). Manure Transport is also not represented in these tables.

Forest BMPs			2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Zone**	**Unit**			
Forest Harvesting Practices	harvested forest	Acres	23,087	23,935	848

Developed Land BMPs		2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Unit**			
Abandoned Mine Reclamation	Acres	-	1,843	1,843
Bioretention / Raingardens	Acres	-	34,716	34,716
Bioswale	Acres	-	15,518	15,518
Dry Detention Ponds and Hydrodynamic Structures	Acres	48,294	53,259	4,965
Dry Extended Detention Ponds	Acres	25,901	27,544	1,643
Impervious Urban Surface Reduction	Acres	4	31,003	30,998
MS4 Permit Stormwater Retrofit	Acres	44,266	68,473	24,207
Permeable Pavement	Acres	-	350	350
Stormwater Management Generic BMP (1985 to 2002)	Acres	131,252	97,707	-33,545
Stormwater Management Generic BMP (2002 to 2010)	Acres	78,979	66,449	-12,530
Urban Filtering Practices	Acres	3,552	322,842	319,290
Urban Forest Buffers	Acres	340	26,430	26,090
Urban Infiltration Practices	Acres	14,458	33,872	19,414
Urban Tree Planting / Urban Tree Canopy	Acres	-	15,000	15,000
Vegetated Open Channels	Acres	-	28,290	28,290
Wet Ponds and Wetlands	Acres	54,077	73,504	19,427
Erosion and Sediment Control on Construction	Acres/Year	29,023	34,903	5,880
Erosion and Sediment Control on Extractive	Acres/Year	-	7,739	7,739
Forest Conservation	Acres/Year	93,350	91,111	-2,238
Street Sweeping Mechanical Monthly	Acres/Year	-	9,033	9,033
Urban Nutrient Management	Acres/Year	218,071	504,053	285,982
Street Sweeping Pounds*	Lbs/Year	-	9,628,448	9,628,448
Urban Stream Restoration (interim)	Linear Feet	-	818,473	818,473
Urban Stream Restoration / Shoreline Erosion Control	Linear Feet	-	1,273,852	1,273,852

* These are total pounds of material collected of which nutrients are a small fraction.

Septic System BMPs			2010 Progress	2025 Final Strategy	Change from 2010
BMP Name	**Zone**	**Unit**			
Septic Connection	Critical Area	Systems	14	16,481	16,468
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	350	15,925	15,575
	Within 1000 ft of a perennial stream	Systems	173	10,572	10,399
	Septic Connection Total		***536***	***42,978***	***42,442***
Septic Denitrification	Critical Area	Systems	721	27,442	26,721
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	1,395	50,004	48,608
	Within 1000 ft of a perennial stream	Systems	732	106,768	106,036
	Septic Denitrification Total		***2,848***	***184,214***	***181,366***
Septic Pumping	Critical Area	Systems	-	9,885	9,885
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	-	30,385	30,385
	Within 1000 ft of a perennial stream	Systems	-	18,226	18,226
	Septic Pumping Total		***-***	***58,496***	***58,496***

1.7 Statewide Comparison of Interim and Final Strategies

The following graphs and tables present much of the same information provided in the previous sections; however, by presenting the 2017 and 2025 strategy results side-by-side these graphs and tables are intended to aid the reader in comparing the two strategies. Similar graphs for the five major basins are provided in Appendix B.

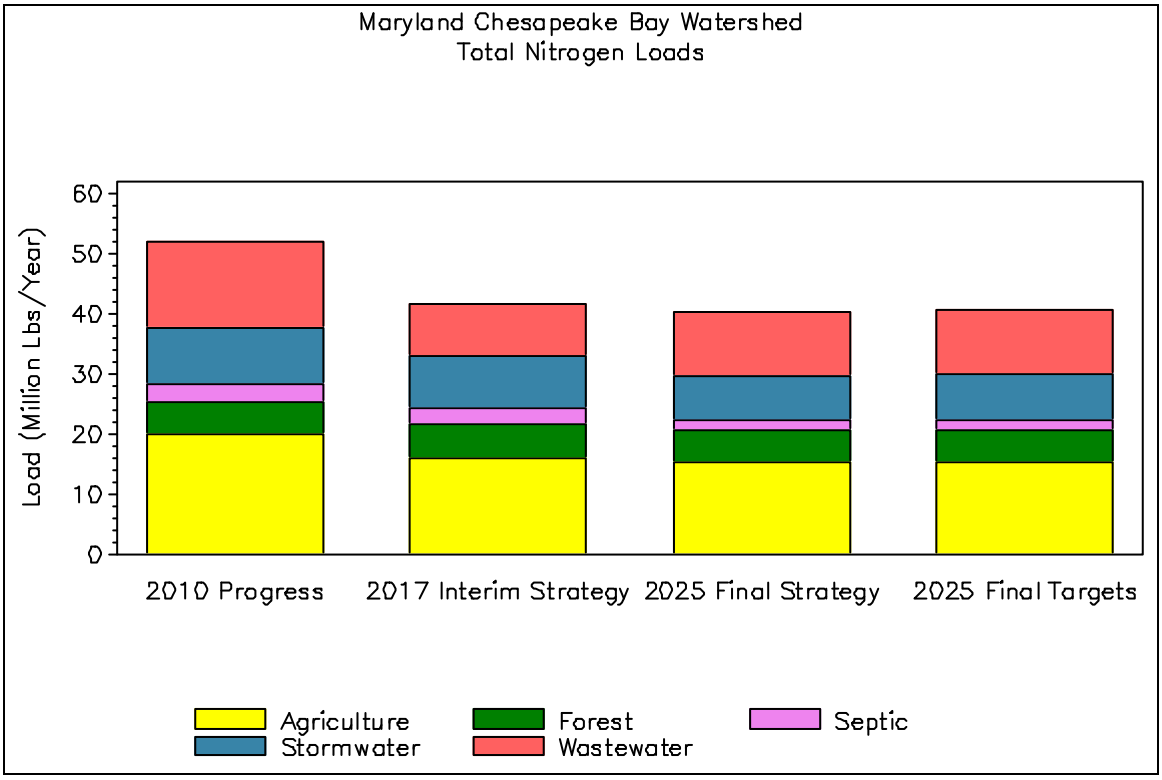


Figure 3: Nitrogen Statewide Comparison of Interim and Final Target Strategy Results

Table 11: Nitrogen Statewide Comparison of Interim and Final Target Strategy Results

		2010 Progress	2017 Interim Strategy	2025 Final Strategy	2025 Final Targets
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**
Agriculture	AFO	0.423	0.176	0.170	0.248
	CAFO	0.346	0.349	0.338	0.371
	Crop	17.059	13.908	13.120	12.871
	Nursery	0.891	0.659	0.579	0.843
	Pasture	1.230	0.989	0.998	0.882
	Subtotal	***19.949***	***16.081***	***15.206***	***15.215***
Forest	Harvested	0.256	0.256	0.256	0.298
	Natural	5.037	5.156	5.209	5.008
	Subtotal	***5.293***	***5.412***	***5.465***	***5.306***
Non-Tidal Atm	Non-Tidal Atm	0.665	0.665	0.665	0.665
	Subtotal	***0.665***	***0.665***	***0.665***	***0.665***
Septic	Septic	2.997	2.676	1.756	1.852
	Subtotal	***2.997***	***2.676***	***1.756***	***1.852***
Stormwater	CSS	0.000	0.000	0.000	-
	Construction	0.553	0.558	0.517	0.578
	Extractive	0.102	0.094	0.083	0.087
	Non-Regulated Developed	1.513	1.334	1.024	1.093
	Regulated Developed	7.312	6.655	5.654	5.793
	Subtotal	***9.479***	***8.641***	***7.279***	***7.551***
Wastewater	CSO	0.066	0.029	0.002	0.043
	Industrial	1.823	1.900	1.632	1.626
	Municipal	12.484	6.991	8.921	8.911
	Subtotal	***14.373***	***8.921***	***10.555***	***10.581***
	Total	***52.756***	***42.396***	***40.925***	***41.170***

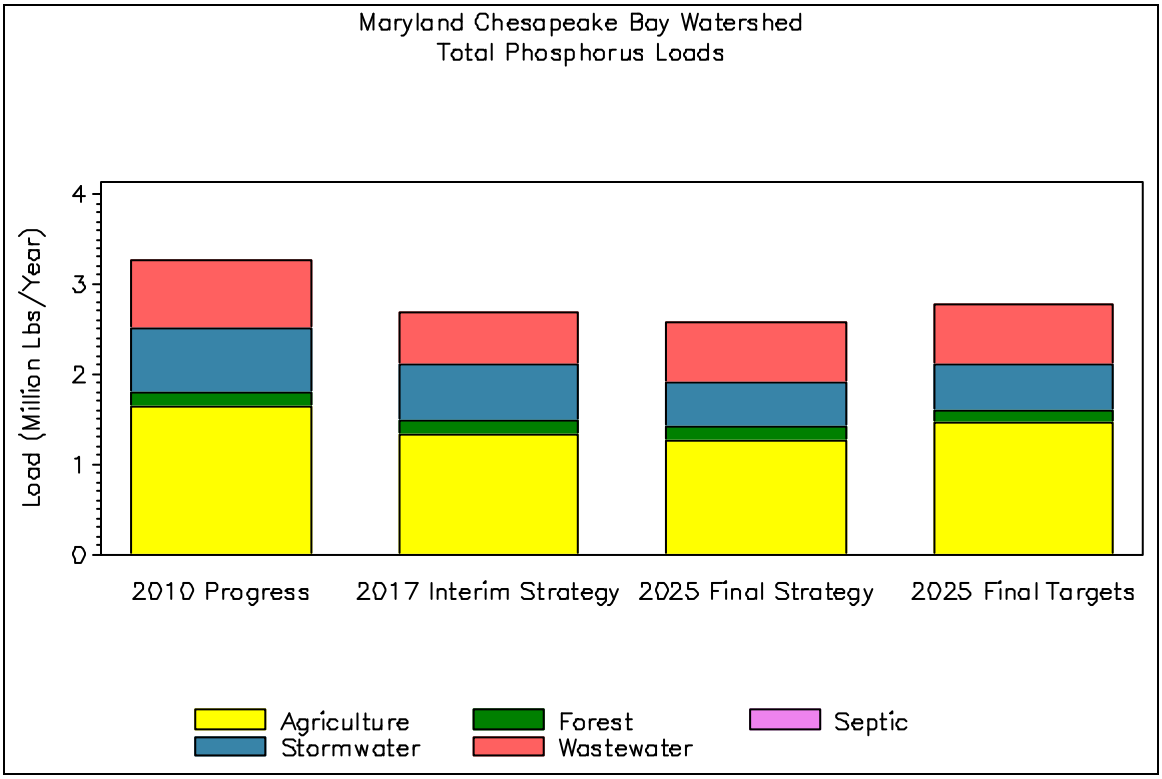


Figure 4: Phosphorus Statewide Comparison of Interim and Final Target Strategy Results

Table 12: Phosphorus Statewide Comparison of Interim and Final Target Strategy Results

		2010 Progress	2017 Interim Strategy	2025 Final Strategy	2025 Final Targets
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**
Agriculture	AFO	0.067	0.026	0.025	0.037
	CAFO	0.057	0.051	0.049	0.053
	Crop	1.131	0.952	0.918	1.028
	Nursery	0.269	0.191	0.167	0.242
	Pasture	0.116	0.102	0.106	0.091
	Subtotal	***1.640***	***1.323***	***1.266***	***1.451***
Forest	Harvested	0.007	0.007	0.007	0.008
	Natural	0.145	0.148	0.150	0.144
	Subtotal	***0.152***	***0.155***	***0.157***	***0.152***
Non-Tidal Atm	Non-Tidal Atm	0.040	0.040	0.040	0.040
	Subtotal	***0.040***	***0.040***	***0.040***	***0.040***
Septic	Septic	NA	NA	NA	NA
	Subtotal	***NA***	***NA***	***NA***	***NA***
Stormwater	CSS	0.000	0.000	0.000	-
	Construction	0.095	0.097	0.088	0.106
	Extractive	0.033	0.029	0.023	0.026
	Non-Regulated Developed	0.115	0.099	0.070	0.066
	Regulated Developed	0.476	0.403	0.305	0.304
	Subtotal	***0.718***	***0.628***	***0.487***	***0.501***
Wastewater	CSO	0.012	0.007	0.000	0.009
	Industrial	0.197	0.122	0.098	0.097
	Municipal	0.542	0.444	0.561	0.560
	Subtotal	***0.750***	***0.573***	***0.659***	***0.667***
	Total	***3.300***	***2.719***	***2.609***	***2.810***

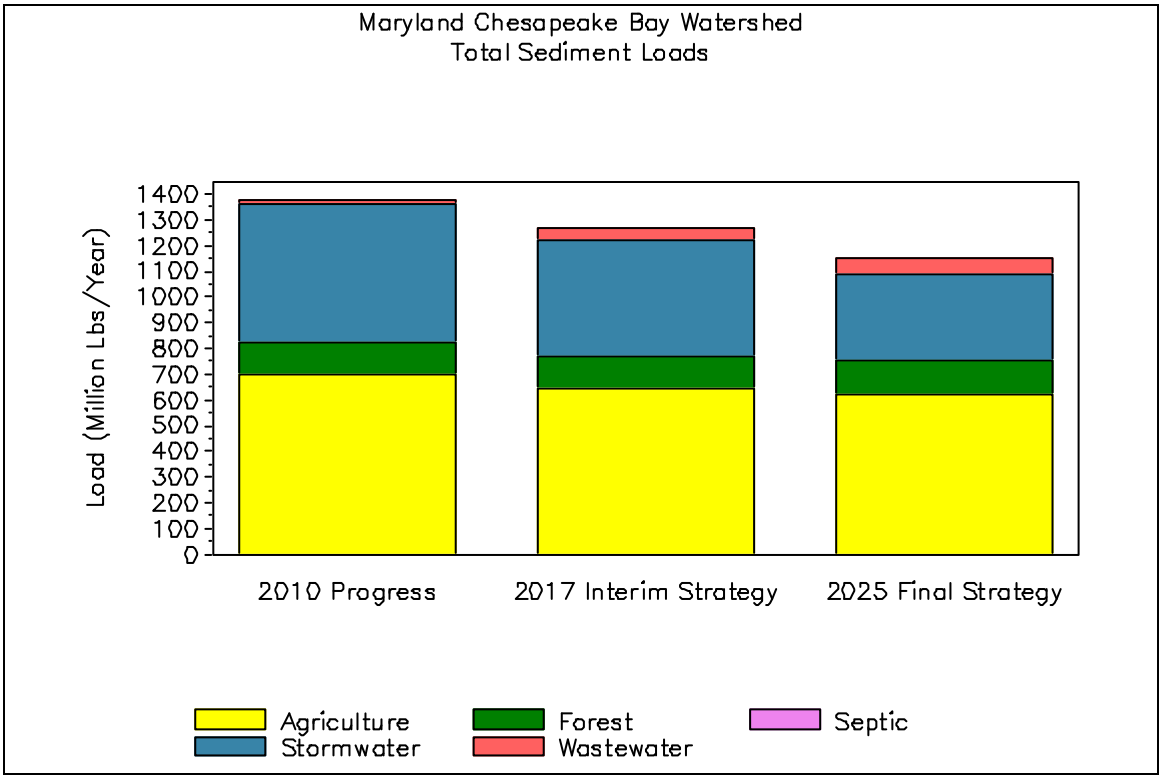
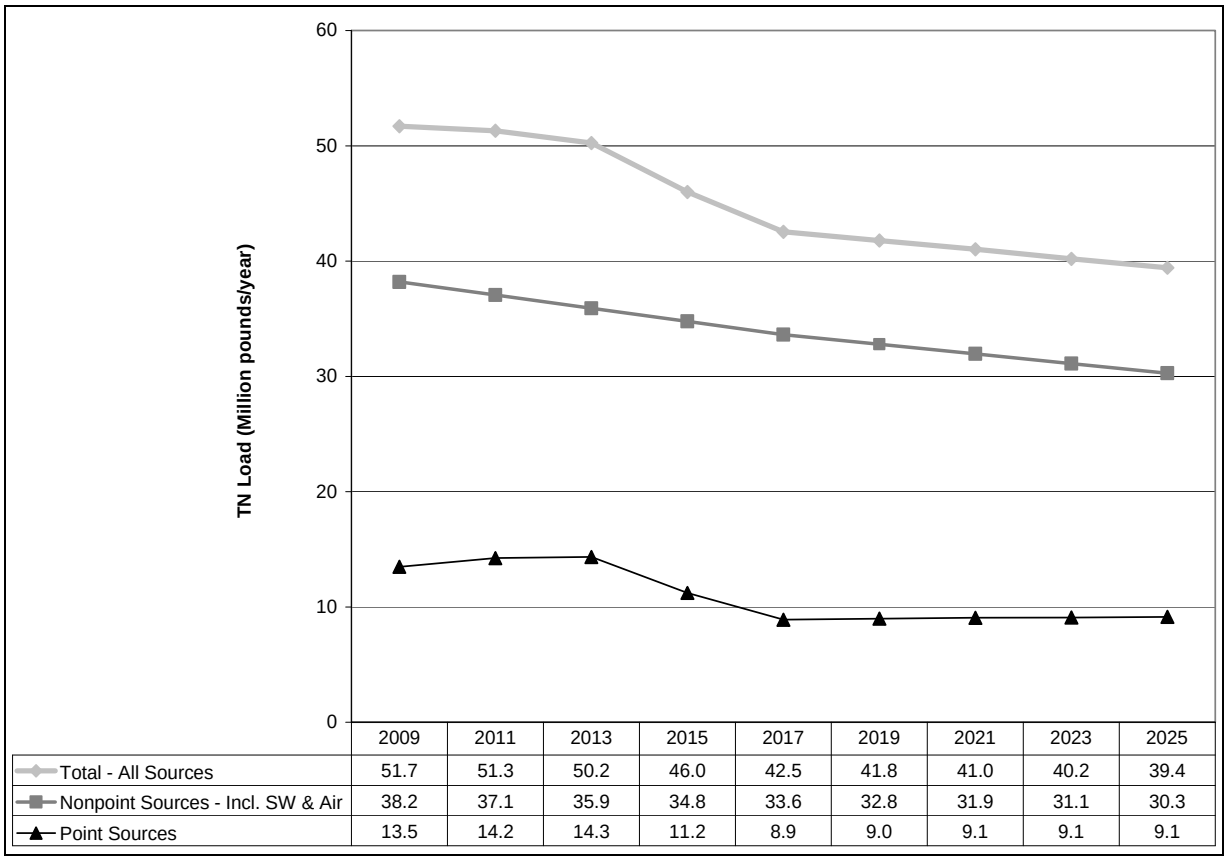


Figure 5: Sediment Statewide Comparison of Interim and Final Target Strategy Results

Table 13: Sediment Statewide Comparison of Interim and Final Target Strategy Results

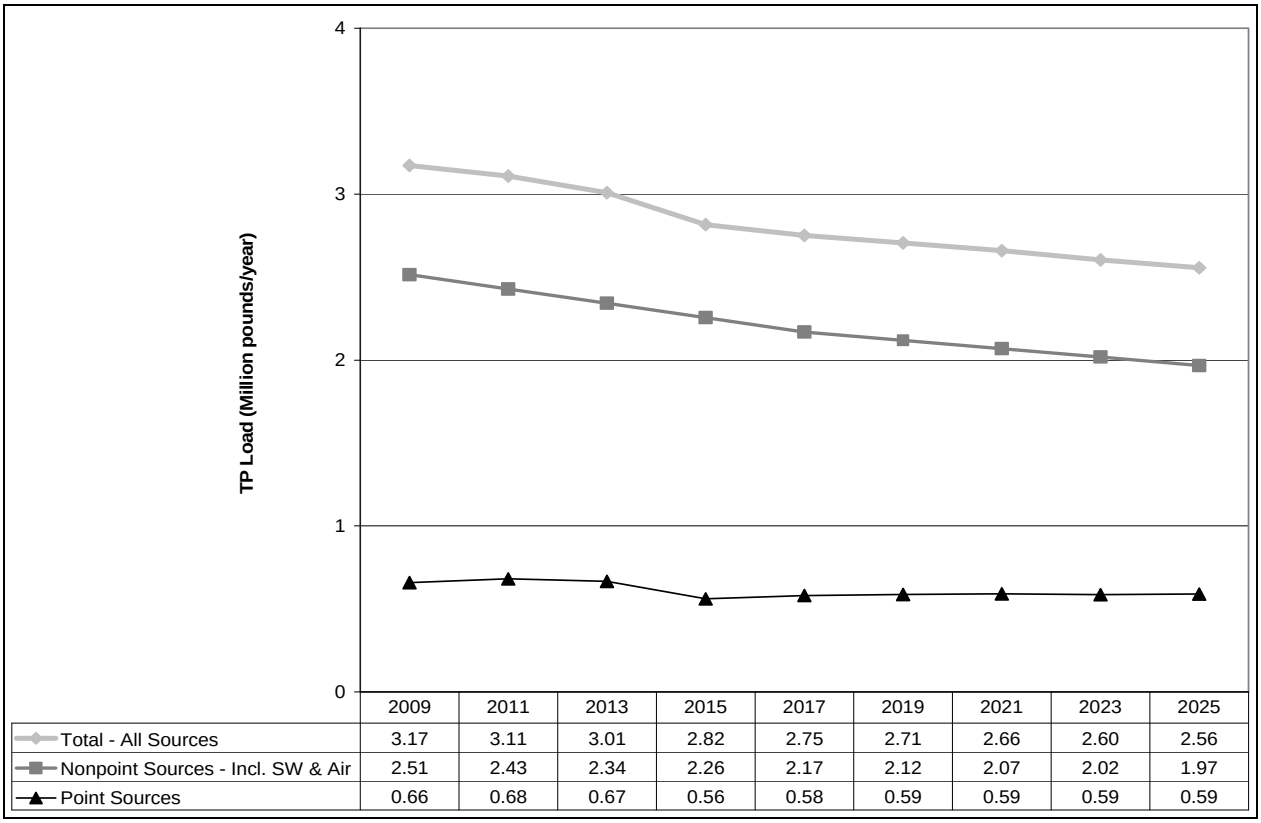
		2010 Progress	2017 Interim Strategy	2025 Final Strategy
Source Sector	**Landuse**	**Million Lbs/Yr**	**Million Lbs/Yr**	**Million Lbs/Yr**
Agriculture	AFO	2.256	1.971	1.831
	CAFO	0.205	0.172	0.160
	Crop	639.576	588.919	569.951
	Nursery	9.626	8.472	8.338
	Pasture	44.649	41.405	41.816
	Subtotal	***696.312***	***640.940***	***622.096***
Forest	Harvested	7.248	7.969	7.969
	Natural	118.257	121.090	122.632
	Subtotal	***125.504***	***129.059***	***130.601***
Non-Tidal Atm	Non-Tidal Atm	NA	NA	NA
	Subtotal	***NA***	***NA***	***NA***
Septic	Septic	NA	NA	NA
	Subtotal	***NA***	***NA***	***NA***
Stormwater	CSS	0.000	0.000	0.000
	Construction	110.921	113.139	98.648
	Extractive	31.653	27.583	22.311
	Non-Regulated Developed	46.764	40.156	27.231
	Regulated Developed	353.466	271.029	189.875
	Subtotal	***542.805***	***451.906***	***338.065***
Wastewater	CSO	2.103	1.461	0.090
	Industrial	3.382	8.342	12.158
	Municipal	5.709	38.457	50.644
	Subtotal	***11.194***	***48.260***	***62.892***
	Total	***1,375.816***	***1,270.165***	***1,153.655***

Figures 6 – 8 below show the projected nitrogen, phosphorus and sediment load reduction timelines for point sources, nonpoint sources and all sources combined, from Fiscal Year (FY) 2009 through FY 2025, the Final Target year.



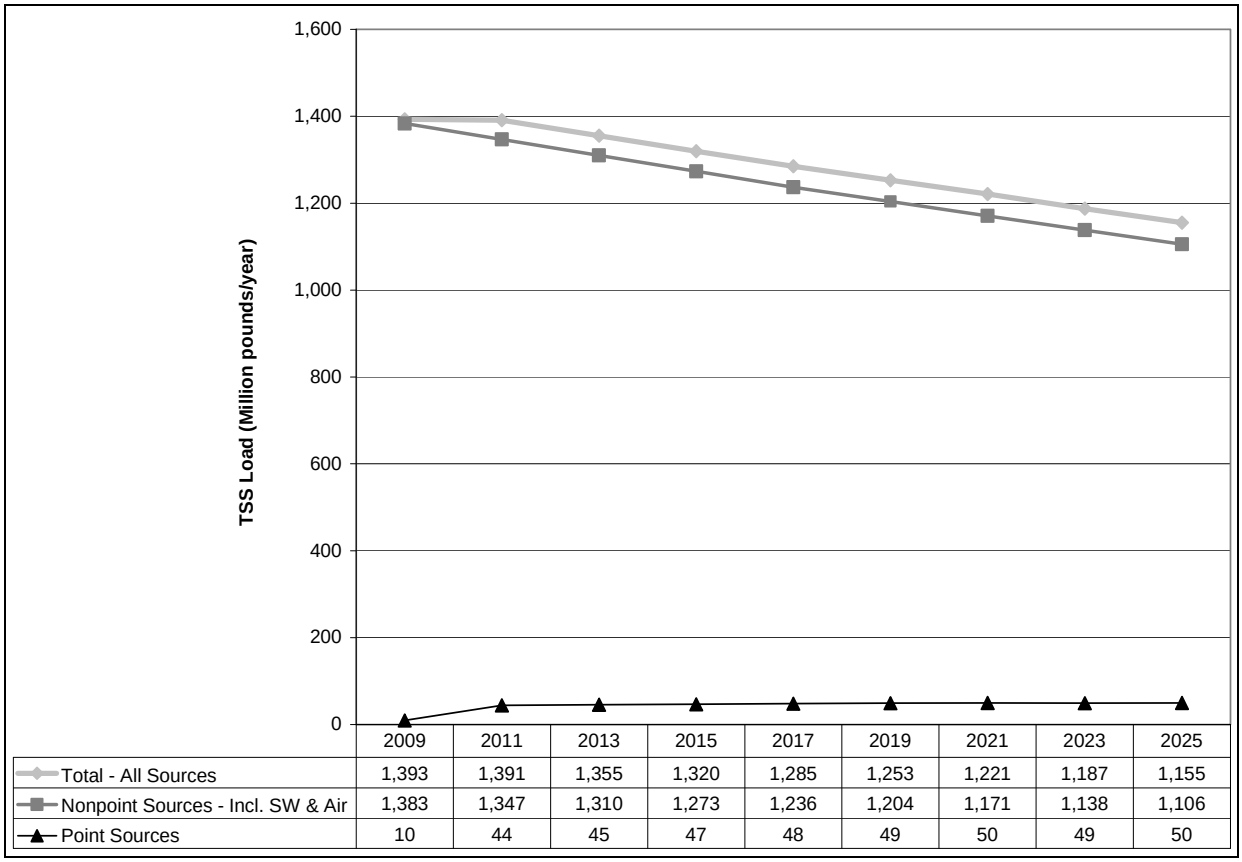
	2009	2011	2013	2015	2017	2019	2021	2023	2025
Total - All Sources	51.7	51.3	50.2	46.0	42.5	41.8	41.0	40.2	39.4
Nonpoint Sources - Incl. SW & Air	38.2	37.1	35.9	34.8	33.6	32.8	31.9	31.1	30.3
Point Sources	13.5	14.2	14.3	11.2	8.9	9.0	9.1	9.1	9.1

Figure 6: Maryland Total Nitrogen (TN) Delivered Loads - FY 2009 to 2025



	2009	2011	2013	2015	2017	2019	2021	2023	2025
Total - All Sources	3.17	3.11	3.01	2.82	2.75	2.71	2.66	2.60	2.56
Nonpoint Sources - Incl. SW & Air	2.51	2.43	2.34	2.26	2.17	2.12	2.07	2.02	1.97
Point Sources	0.66	0.68	0.67	0.56	0.58	0.59	0.59	0.59	0.59

Figure 7: Maryland Total Phosphorus (TP) Delivered Loads - FY 2009 to 2025



	2009	2011	2013	2015	2017	2019	2021	2023	2025
Total - All Sources	1,393	1,391	1,355	1,320	1,285	1,253	1,221	1,187	1,155
Nonpoint Sources - Incl. SW & Air	1,383	1,347	1,310	1,273	1,236	1,204	1,171	1,138	1,106
Point Sources	10	44	45	47	48	49	50	49	50

Figure 8: Maryland Total Suspended Solids (TSS) Delivered Loads -FY 2009 to 2025

1.8 Accounting for Growth in Loads

Editor's Note*: The policies and procedures to account for growth are under active development as of October 2012. The information in this section might be superseded as a result of the on-going policy development process. For up-to-date information on Maryland's Accounting for Growth policy See:* http://tinyurl.com/MD-Act4Growth

Development of a strategy to account for growth per EPA's guidelines is proceeding as planned in Maryland's Phase I Watershed Implementation Plan. Loads from new development will be accounted for in two ways. First, MDE has in place an Enhanced Nutrient Removal (ENR) Cap Strategy that allows flow increases at major sewage treatment plants to design capacity, while establishing a nutrient loading cap and wasteload allocations (WLAs) in NPDES permits. The interim and target point source loads were set to allow growth up to the permitted WLAs. Second, Maryland's strategy to account for growth, when completed by the end of 2013, will outline a policy and an implementation strategy to offset new loads.

In 2011, the Task Force on Sustainable Growth and Wastewater Disposal presented recommendations relevant to accounting for growth. Further development of the accounting for growth strategy will evaluate the 2012 legislative response to those recommendations before

finalizing the strategy and beginning the public process. The overall plan for completing a fully implementable growth offset program in Maryland by the end of 2013 is as follows:

1. **Spring to Fall 2012**
    a. Complete research and develop more detailed approaches for offsets
    b. Public process and stakeholder review of draft growth offset policy and implementation strategy

2. **Remainder of 2012**
    a. Review results from the public process and make recommended edits to the strategy
    b. Finalize the development of the offset policies and procedures
    c. Evaluate current State tracking/accounting for growth process
    d. Begin development of the comprehensive tracking/accounting for growth and offsets system
    e. Evaluate the need for statutory and/or regulatory changes
    f. Develop next steps needed for initiating the offset policy and implementation strategy
3. **Beginning of 2013**
    a. Legislation if needed
    b. Continue to work with EPA/Bay Program Water Quality Implementation Team Trading and Offset workgroup to discuss/address, where needed, EPA recommendations common to all jurisdictions by the end of 2013
4. **Remainder of 2013**
    a. Regulations if needed
    b. Outreach to local governments to advance implementation of effective offset program for sectors with planned new or increased loadings
    c. Finalize development of the comprehensive State tracking/accounting for growth and offsets system
    d. Alternative - Demonstrate that a specific sector will not experience growth in loading

1.8.1 Growth Offset Objectives

Minimizing loads from new development is essential to the success of the strategy to offset growth. It reduces the need for offsets and helps preserve offsets for physical and economic development that is vital to the State and local jurisdictions. Maryland's Accounting for Growth strategy will encourage growth where pollutant loading is low by easing offset requirements in those areas, and will increase offset requirements where loadings are high or sensitive areas need to be protected.

1.8.2 Offset Policy Considerations

Maryland's Phase I WIP described and illustrated some of the important factors affecting per capita loading contributions from development. These include the presence or absence of sewer service, zoning and other land use management plans and programs, density of residents and jobs, stormwater management, and the effectiveness of wastewater treatment. All play important roles and affect the nature of development, the amount of land developed per capita, and the amount of impervious surface.

The goal of Maryland's Offset Policy will be to offset new loads in a way that is not just load neutral, but begins to address the need to reduce current loadings and is supportive and consistent with the State's Smart Growth policies and approaches consistent with the Phase I WIP. In addition to establishment of offset requirements that vary among areas commensurate with the loading implications of development in those areas, we anticipate that Maryland's policy will include the following:

New development shall meet all applicable Maryland law and regulations and offset post-development nonpoint source loads.

Redevelopment as defined in State Stormwater Management Regulations, regardless of the Offset Category, must satisfy applicable stormwater regulations, but will not be required to offset post-development nonpoint source loads.

New Septic Systems shall meet all applicable Maryland law and regulations and fully offset the post-development septic load.

Point sources: New point source loads, and increased loads from existing point sources above their WLA, shall be offset according to the procedures established in Maryland nutrient trading policies.[19]

1.8.3 Safety Margin for Offsets

This offset policy provides two factors contributing to a safety margin:

- Maryland's nutrient trading policies provide a safety margin by requiring those acquiring nutrient offsets to purchase slightly more credits than they will receive.
- The offset requirements established under this policy are based solely on nonpoint source post-development loads in relation to forested conditions, and do not consider net changes in loads that may be associated with land use change. Over time, we believe that changes in loads as a function of land use will also contribute to a safety margin for Maryland's Offset Policy

[19] http://www.mde.maryland.gov/programs/water/pages/water/nutrientcap.aspx

1.9 Maryland Legislative and Policy Initiatives in Support of Bay TMDL

The following are 2012 legislative and policy initiatives that support Maryland's efforts to meet the goals of the Chesapeake Bay TMDL and the State's Watershed Implementation Plan, including key pieces of legislation enacted into law by the 2012 Maryland General Assembly:

Bay Restoration Fund (SB 240/HB446) – This legislation doubles the Bay Restoration Fund fee, making it possible to dramatically reduce levels of nitrogen and phosphorus entering Maryland waterways by funding upgrades to the 67 major wastewater treatment plants, upgrades to septic systems with best available technology for nitrogen removal and the planting of cover crops. The legislation also allows for grants to local jurisdictions for cost-efficient stormwater management projects such as tree planting and stream buffers if the jurisdiction has implemented a stormwater utility fee.

The Sustainable Growth and Agricultural Preservation Act of 2012 (SB 236/HB 445) – Encourages jurisdictions to set up four growth tiers based on a framework that encourages growth in existing communities and preserve large tracts of agricultural and forest land in Maryland. The legislation allows for major subdivisions on septic systems in some circumstances if the local jurisdiction plans for that growth. Local jurisdictions will be required to hold public hearings on their growth plans when their plans differ from the framework established by the Act. The law will help to preserve rural lands, reduce pollution, and better manage development.

Amendments to Regulations Where a Public Sewage Disposal System is Not Available: In April 2012, MDE proposed amendments to the Code of Maryland Regulations (COMAR) Section 26.04.02 to require nitrogen-removal technology for all septic systems serving new construction on land draining to the Chesapeake Bay and Atlantic Coastal Bays or in other areas where bodies of water are impaired by nitrogen. Existing regulations require nitrogen removal technology for all new and replacement septic systems in the Critical Area. The regulation was adopted and a notice of final action was printed in the September 21, 2012 edition of the Maryland Register. The new regulation takes effect on January 1, 2013.

Watershed Protection & Restoration Program Act of 2012 (HB 987/SB 614) – This legislation requires the largest jurisdictions to implement a fee to fund efforts to reduce polluted stormwater runoff. Stormwater pollution from urban and suburban communities is the source of about one-fifth of the nitrogen and phosphorus polluting the Chesapeake Bay.

The Budget Reconciliation and Financing Act of 2011: This legislation supports the Administration's operating budget. It designates $25 million for the Chesapeake and Coastal Bays Trust Fund for State Fiscal Year 2013, exceeding FY 2012 spending by $1.5 million. The Trust fund is helping to pay for urban storm water and agricultural cover crops and technical support staff, all of which creates jobs and will help Maryland reach TMDL goals.

The 2012 Maryland legislative and policy initiatives described above build upon 2011's successful actions in support of achieving the State's Bay restoration goals, including:

The Fertilizer Use Act of 2011: The Fertilizer Use Act of 2011 (Act) amends several parts of Agriculture Article of Maryland State law. It alters specialty fertilizer labeling requirements to include information on nitrogen content, a statement directing applicators when and where to apply and not to apply the product, and the environmental hazard statement recommended by EPA for that product. The Act also removes an exemption for contractors, salespersons, employees, and other agents from a prohibition on sale and distribution of any fertilizer unless it is low phosphorus fertilizer. The Act also requires the Department of Agriculture, in consultation with the University of Maryland, to establish a professional fertilizer applicator certification program; publish and maintain a list of certified professional applicators; develop a public education program; identify certain laboratories; and revise guidelines every three years.

The Act enables a pollution prevention (source reduction) approach for controlling phosphorus and nitrogen from nonpoint source discharges. It is comprehensive, science-based and balanced and, most importantly, will have a beneficial effect on water quality by reducing the quantity of nutrients entering the Bay. Introduced as House Bill 573, and cross filed with Senate Bill 487, additional information on the Fertilizer Use Act of 2011 is available on the Maryland General Assembly website.

The Budget Reconciliation and Financing Act of 2011: This legislation supports the Administration's operating budget. It designated $23.5 million for the Chesapeake and Coastal Bays Trust Fund for State Fiscal Year 2012.

Bay Restoration Fund: The bill entitled "Bay Restoration Fund – Authorized Uses" was adopted that amends several parts of the Environment Article of Maryland State law. In particular it authorizes revenue collected for the Bay Restoration Fund to be used to pay the cost of connecting properties served by onsite sewage disposal systems (OSDS) to an existing municipal wastewater facility that is achieving enhanced nutrient removal level treatment. It also sets conditions for the connection, including being more cost-effective at nitrogen removal than upgrading the OSDS and demonstrating consistency with a local land use plan and sewer master plan. Introduced as Senate Bill 539, and cross filed with House Bill 57, additional information on this bill is available on the Maryland General Assembly website maintained by the Maryland Department of Legislative Services

Dishwashing Detergent Legislation: A bill entitled "Dishwashing Detergent Containing Phosphorus – Penalties" was adopted that amends the Environment Article of Maryland State law. It establishes a penalty for knowingly selling or distributing for use or sale within the State any detergent for use in a household dishwashing machine that contains more than 0.5 percent phosphorus by weight. Introduced as Senate Bill 751, additional information on this bill is available on the Maryland General Assembly website maintained by the Maryland Department of Legislative Services

Following the end of the 2011 General Assembly session, Governor O'Malley signed an Executive Order to establish the Task Force on Sustainable Growth and Wastewater Disposal

(also known as the "Septics Task Force") to look at this issue and make recommendations to prevent continued water quality deterioration resulting from construction of new large housing developments served by septic systems. Background and proceedings of the Task Force are available on the Septics Task Force Website maintained by the Maryland Department of Planning.

The Task Force expanded its charter to consider issues regarding the funding of Maryland's Chesapeake Bay Watershed Restoration Initiative. This subject was addressed by a Funding Workgroup to the Task Force.

The "Final Report of the Task Force on Sustainable Growth and Wastewater Disposal," which includes a table of the final approved recommendations, was released on December 20, 2011. As a result of these recommendations, the Administration introduced SB 236, the Sustainable Growth and Agricultural Preservation Act of 2012. This legislation, enacted by the 2012 General Assembly, encourages growth in existing communities on central sewer to minimize the harmful effects of septic system pollution.

Proposed Revision of the Phosphorus (P) Site Index: Maryland is engaged in research to support revisions to the P Site Index that will improve the ability to rank fields in a relative manner according to their potential for P loss to surface waters. The revisions include new science evaluating the contributing P sources, including the soil P saturation ratio as a measure of potentially water-soluble P in the soil and management decisions regarding manure or fertilizer P application methods.

In addition, the evaluation of potential P transport has been streamlined to include only the most relevant factors. Most importantly, P Site Index calculation accurately represents the critical source area concept, allowing the P loss potential a single physical transport pathway to drive the final risk assessment score thereby governing the allowable application of phosphorus. Previously, unimportant P transport factors reduced the final risk assessment scores because the off-site P transport risk from all possible transport pathways were averaged in the overall risk calculation.

University of Maryland staff have worked with regional and national experts in P transport to develop the revised P Site Index and incorporated relevant published science. Beginning in 2011 the P Site Index's authors also conducted a state-wide field based evaluation. While not ideal, the authors used 400 soil tests to compare the original P Site Index to the revised P Site Index. Because of time and funding constraints, soil test information does not statistically represent all of Maryland's physiographic regions and is based in large part on information available. The data required to perform the ideal state-wide assessment should be collected from farm fields that collectively represent the physiographic regions, landscapes, soils, farm types (livestock, poultry, grain, vegetable, etc.), and management histories that capture the totality of Maryland's diverse agricultural production systems.

Information is being incorporated into the Maryland nutrient management planning software, Numan Pro, and outreach and training for nutrient management professionals will be conducted through the remainder of 2012 and into 2013 as needed. A revised P-Site Index will be ready for

inclusion in the nutrient management regulations in 2013 and be required for use during the 2013/2014 nutrient management planning cycle, providing updated guidance on phosphorus management for the 2014 crop season.

Revised Nutrient Management Regulations: In 2011, the Maryland Department of Agriculture (MDA) proposed revisions to regulations governing Maryland's Nutrient Management Program. While introduced for publication near the end of 2011, various stakeholder concerns resulted in the postponement of publication to provide opportunity for additional stakeholder discussion as well as input from the Governor's BayStat Scientific Panel.

The regulations were revised and published in the Maryland Register on June 29, 2012. MDA then held a series of four public meetings across the state in July to provide information to farmers, environmental interests, local governments and other stakeholders on the proposed changes to Maryland's Nutrient Management Regulations and offer an opportunity for public comment. On September 25, 2012, the Secretary of Agriculture adopted the amendment to Regulation .02 under COMAR 15.20.07 Agricultural Operation Nutrient Management Plan Requirements. Final notice of MDA's adoption of its revised nutrient management regulations was published in the October 5, 2012 issue of the Maryland Register.

The regulations, which went into effect on Monday, October 15, 2012, are designed to achieve consistency in the way all sources of nutrients are managed and help Maryland meet nitrogen and phosphorus reduction goals to protect and restore the Chesapeake Bay.

In general, the changes to MDA's Maryland Nutrient Management Manual include:

- for certain crop types and crop nutrients; changing rates of application, timing of application, and method of application of crop nutrients
- defining additional management practices that may be required related to crop production, and the storage and handling of organic sources of nutrients;
- prohibiting the application of organic sources of nutrients in winter months;
- requiring certain setback requirements for the application of crop nutrients, including measures to ensure stream health and water quality protection where livestock are involved;
- establishing guidance for the use of soil amendments and soil conditioners on agricultural land, and other measures modifying the implementation of MDA's Nutrient Management Program.

A copy of the final regulations is available on MDA's website:
www.mda.maryland.gov/pdf/finalnmregs.pdf.

1.10 Costs and Funding

1.10.1 Economics and the Non-Commercial Value of Restoring the Bay

Before presenting the costs it is important to consider the broader perspective of these costs on several levels. The magnitude of the costs suggests that the economic impacts should be considered. One popular economic argument against having the government raise and invest the capital necessary to take on an initiative, like restoring the Chesapeake Bay, is that those dollars could have remained in the hands of people who would otherwise have spent that money and generated economic activity, as if restoring the Bay, or a restored Bay won't generate economic activity. Others make a more honest argument that the economic activity of the Bay restoration isn't new activity; it is simply a transfer from one type to another type of economic activity, say jobs. This can be refuted.

Although it is not the purpose of this report to make a technical economic argument, one view appeals to common sense. If instead of aggregating money to pay for restoring the Bay, much of the relatively small amounts of money remains spread among the populace would be spent on retail products; however, in today's world economy, many of the jobs created making our retail products would occur overseas. That same money spent on restoring the Chesapeake Bay is far more likely to support local jobs. Using an industry standard economic model[20], it has been estimated that 13 jobs are supported (direct, indirect and induced) for every $1 million dollars expended on upgrading waste water treatment plants.

According to economist Dennis King, "Stream restoration projects tend to be more labor intensive than upgrades to waste water treatment plants and therefore generate more direct jobs per dollar spent. Because they also involve purchases of more local inputs in the form of earth moving, stones, plant material etc. they also tend to generate more indirect jobs per dollar spent. Besides providing more ancillary ecosystem service benefits using stream restoration to achieve water quality goals will generate more local and regional jobs."[21] "Four separate studies (GOMC–NOAA 2011; Gordon 2011; USDI 2009; WS 2010) prepared recently estimate that coastal restoration projects generate 20, 28, 30, and 32 direct and indirect jobs per million in direct spending compared with 5, 7, and 17 direct and indirect jobs created per $ 1 million spent, respectively, on oil and gas projects, road construction projects, and green building retrofits."[22]

Another common refrain is that a cost/benefit analysis is required before we can invest in restoring the Chesapeake Bay. However, certain things have such intrinsic value that if they are affordable, then cost should not be a consideration. Restoring the Bay, which is central to Maryland's heritage and identity, transcends clinical cost/benefit analyses. This issue of values aside, a cost/benefit analysis is required for regulations, but the Bay TMDL and WIP are not regulations, so a cost/benefit analysis is not required. Although economic impacts and funding feasibility should be considered, we should not loose sight of non-commercial value including

[20] Estimations were developed using IMPLAN (**IM**pact analysis for **PLAN**ning) economic impact modeling system. This proprietary software, provided by MIG, Inc., is an outgrowth of work initiated at the University of Minnesota, which began in 1984. For more information See: The IMPLAN Website.
[21] Personal communications, Dr. Dennis King, Maryland Center for Environmental Sciences.
[22] Personal communications, Dr. Dennis King, Maryland Center for Environmental Sciences.

our current generation's responsibility to posterity, a responsibility stated clearly in the founding documents of our Nation.

1.10.2 Costs of Restoring the Bay

This section presents broad cost estimates. Section 1.10.3 discusses how some of those costs can be funded. Additional discussion of funding strategies for particular sub-elements of the WIP, such as the funding of additional staff for expanding programs and the funding of particular implementation practices, are presented in Appendix A. In addition, some of the local plans presented in Section III discuss costs and funding approaches. Finally, Appendix C presents some of the technical and supporting documentation for this section.

Determining the costs of an endeavor as far-ranging and complex as restoring and maintaining the health of the Chesapeake Bay is not simple. Is Maryland's cost limited to the revenues generated and spent by governments or is it the cost to everyone in the State? If it is the cost to everyone in the State, should the profits that some people in the State receive in the form of business opportunities and jobs generated by the restoration be subtracted? Should the cost account for interest on loans? Should inflation be considered in the cost? Should we consider the costs of *not* restoring the Bay? If these more nuanced issues are considered, several technical volumes could be filled to document the costs of restoring and maintaining the health of the Bay.

People interested in some of these deeper cost issues are referred to the Website of the Task Force on Sustainable Growth and Wastewater Disposal. It includes a variety of presentations that show costs associated with financing considerations. Although these complexities are acknowledged, they are beyond the scope of the cost estimates provided in this section.

It is *extremely important* to properly interpret the following costs with an understanding that the strategy is designed to allow market forces, and other societal decisions, to drive costs lower in the future. It would be irresponsible to cite the restoration strategy costs without the following context.

The necessary pollution reductions and costs for each pollution source category[23] are directly related to the allocations of maximum allowable load for each source. The State's allocation of the maximum allowable load for each source is based on *equity* (fairness) rather than on *efficiency* (cost)[24]. That is, the allocations are based on the "polluter pays" principle in which everyone contributing to the problem must contribute to the solution. An alternative allocation approach, which was not used, would be to set allocations on the basis of least cost, that is, on the basis of efficiency rather than equity. However, it would not be fair to make the least cost sources do all of the restoration work.

[23]The primary sources include waste water treatment plants, septic systems, agricultural sources and urban and suburban stormwater.

[24] Some degree of cost-effectiveness was built into the allocation by accounting for the impact of pollutant loads on water quality due to different geographic locations; in simple terms, sources closer to the Bay were assigned more responsibility for reductions than sources far from the Bay. However, within a given geographic area, the allocations among sources were based on equitable sharing of pollution reduction responsibility.

The phenomenon of not being able to achieve both least cost and fairness for the same solution to a problem is illustrated with a hypothetical trade-off curve in Figure 9. The cost (efficiency) is on the horizontal axis and fairness (equity) is on the vertical axis. Each point on the trade-off curve represents one of the countless possible restoration strategies. Two hypothetical alternative strategies are identified as Option A and Option B. Option A is more fair than Option B, but it also costs more. Where as Option B costs less, but it is not as fair as Option A.

To give some tangible insight to this, it is well established that reducing a pound of nitrogen from a septic system costs more than reducing a pound from the agricultural sector. However, it would not be fair for the restoration strategy to place most of the restoration burden on the farming community and little or no responsibility on those who own septic systems.

As a result, the initial restoration strategy is, by design, not the least cost way of reaching the Chesapeake Bay nutrient reduction goal; however, the State has left open the option for costly sources, like septic system owners, to identify and pay for reductions from less costly sources. It is expected that, over time, alternative lesser cost agreements will be identified and sorted out.

This sorting out process will take a variety of forms, both in the commercial market and through public processes. It is already beginning to occur through preferences reflected in local plans[25] and recommendations of the Task Force on Sustainable Growth and Wastewater Disposal. The mechanisms for offsetting future loads, described in Section 1.8, will also enable lower cost strategies to evolve in the future.

In summary, the underlying strategy assigns equitable responsibility for reductions, which is not the least cost approach; however, sectors facing higher costs may pay for reductions from other sectors that have lower costs. Therefore, the following cost estimates reflect the higher cost of the equitable allocations. Costs are expected to decrease when market forces, and other strategy refinements, come into play in the future.

[25] Some local plans are shifting the balance of reduction actions between urban stormwater and septic systems, due as much or more to local needs as to cost considerations.

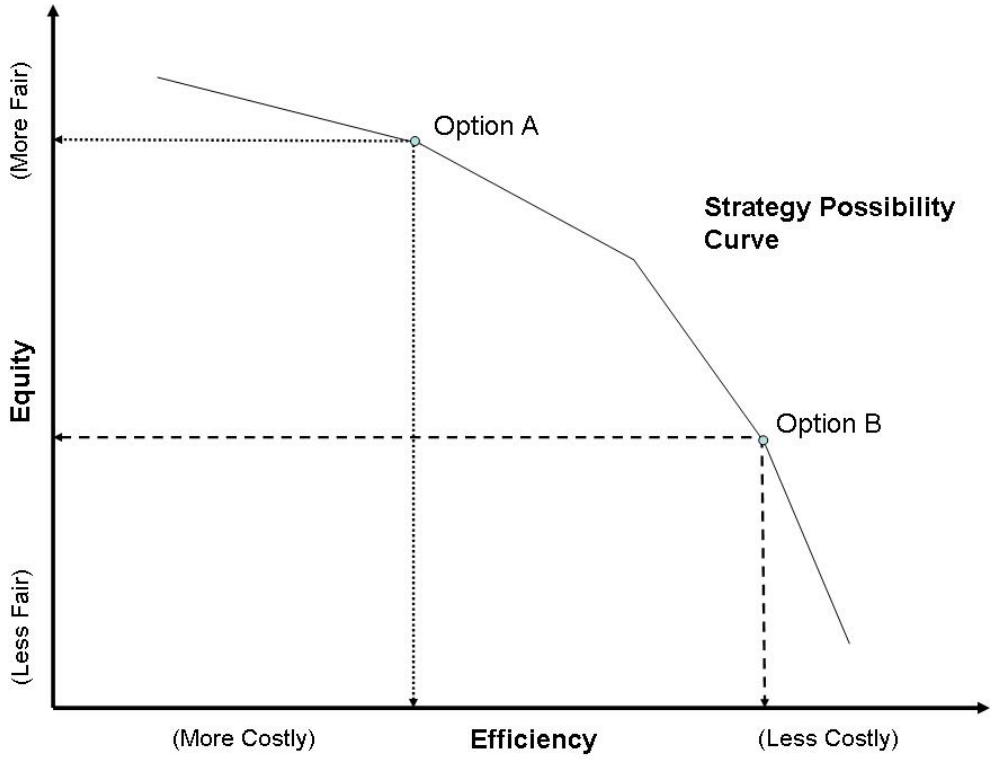


Figure 9: Tradeoff between Efficiency and Equity

Table 14 presents a summary of the costs for Maryland's Interim (2017) and Final (2025) Chesapeake Bay restoration strategies from the end of 2009 forward. The 2025 costs are the cumulative total. Unless otherwise noted, the costs cover pre-construction and construction activities, where pre-construction includes things like planning, and design and construction includes things like labor, materials and overhead costs.

The total cost for the 2017 Interim Target strategy is estimated to be about $6.24 billion, not counting costs associated with controlling combined sewer and sanitary sewer overflows (CSOs and SSOs) and Maryland's Healthy Air Act (HAA) implementation.

The total cost for the 2025 Final Target strategy is estimated to be about $14.40 billion, again not counting the CSOs, SSOs and HAA.

As elaborated on at the beginning of this chapter, these costs also do not attempt to account for financing costs, inflation, and various other costs. Some of these other costs, such as costs to enhance State and local Soil Conservation District programs, are noted in Appendix A.

Agriculture: The costs reflect state, local, federal and farmers share of the capital expenditures to implement all of the BMPs

Table 14: Summary of Costs for Maryland's Interim (2017) and Final (2025) Chesapeake Bay Restoration Strategies

Source Sector	Cost of 2017 Strategy 2010 - 2017 (Millions)	Cost of 2025 Strategy[a] 2010 - 2025 (Millions)
Agriculture	**$498**	**$928**
Municipal Wastewater	**$2,368**	**$2,368**
Major Municipal Plants	$2,306	$2,306
Minor Municipal Plants	$62	$62
Stormwater	**$2,546**	**$7,388**
MDOT[c]	$467	$1,500
Local Government	$2,079	$5,888
Septic Systems	**$824**	**$3,719**
Septic System Upgrades	$562	$2,358
Septic System Connections	$237	$1,273
Septic System Pumping	$25	$88
TOTAL	**$6,236**	**$14,403**

a. Cumulative total.
b. Costs are in 2011 dollars unless otherwise noted in Appendix C.
c. Maryland Department of Transportation (MDOT) costs are segregated from other stormwater costs due to their non-standard cost structure. Cost estimates were provided by MDOT.

Waste Water: The $2.37 billion cost for upgrading major and minor municipal waste water treatment plants represents the costs to be incurred between 2009 and 2017 to finish upgrading 42 major municipal plants and 5 minor municipal plants. No additional costs for upgrades are envisioned in the Final Target strategy after 2017. These cost estimates do not include operations and maintenance costs. They also do not count costs incurred for private and federal plants that are required to upgrade to ENR. Additional details of these costs are provided in Appendix C.

Stormwater: The estimated cost of the Interim Strategy is $2.55 billion, with about $2.08 billion attributed to local governments and $467 million attributed to State Highway Administration (SHA). The estimated cost of the Final Strategy is $7.39 billion with $5.89 billion attributed to local governments and $1.5 billion attributed to the SHA. Further discussion of the cost estimates are provided in Appendix C.

Septic Systems: The estimated cost for the Interim Target strategy is $824 million consisting primarily of septic upgrade costs ($562 million) and septic connection costs ($237 million). The estimated cost for the Final Target strategy is approximately $3.72 billion consisting, again consisting primarily of septic upgrade costs ($2.36 billion) and septic connection costs ($1.27 billion). The septic system costs reflect the following unit costs of $13,000/system for upgrades, $30,000/system for connections and $500/system/pumpout.

1.10.3 Funding the Bay Restoration

Maryland's Phase I WIP committed to explore ways to fund the Bay restoration costs during 2011. This charge was taken up by the Task Force on Sustainable Growth and Wastewater Disposal (Task Force) established by Executive Order and described in Section 1.9. The full Task Force's final approved recommendations are provided in the "Final Report of the Task Force on Sustainable Growth and Wastewater Disposal," which was released on December 20, 2011. Some key Task Force recommendations on funding the Bay Restoration are summarized immediately below:

- Extend Maryland's timeframe for meeting its TMDL obligations to 2025 as required by EPA with additional accountability measures.

- Increase Bay Restoration Fund (BRF) revenue as follows in order to cover existing shortfall in major WWTP ENR upgrades and essentially close the funding gap for implementing other WIP requirements from developed lands:

  – Increase average annual residential fee rate to $60/year/dwelling unit beginning in SFY13 and $90/year/dwelling unit beginning in SFY15. Increase average non-residential fee rates and cap accordingly. Include a sunset clause beginning in 2030 if obligations are met.

  – Allow up to 10% of total BRF revenue to go to ENR WWTP operations and maintenance, with a cap of $5 million per year.

  – Use expanded BRF funding to include the state's 50% share of BNR upgrade costs for 10 major-minor plants

  – Conduct a thorough evaluation of progress to date in 2017 and restructure the fee rates accordingly if progress to meet our TMDL obligations by 2025 is not being met.

- Revise authorized uses of BRF funding to better meet needs of developed lands:

  – Amend BRF enabling statute to permit funding of stormwater retrofits as an authorized use of the BRF funds. State should provide up to 50% cost share for stormwater retrofit projects.

- Use targeting and competitive awards to maximize cost effectiveness of the funds, including competitive grants for 10 of the largest minor WWTPs upgrades to ENR prioritized to promote smart growth.

- Change the current 100% BRF funding requirement for failing septic systems in the Critical Area to match the income based scale currently used for septic systems outside of the Critical Area. The State should continue to provide $13,000 (average cost of a BAT upgrade) toward connection of a failing septic system to an ENR WWTP.

- In addition to competitive grants, local governments would be guaranteed grants from the increased BRF to implement stormwater BMPs.

  – Beginning in FY13, local governments will annually receive 15% of the gross BRF revenue generated in their jurisdiction for implementation of approved stormwater BMPs.

  – Beginning in FY18, and subject to recommendations of the BRF Advisory Committee in 2017, the percentage that local governments will annually receive will increase to 25% of the gross BRF revenue.

Several of the Task Force's key recommendations were adopted by Maryland's General Assembly 2012 legislative session. These are highlighted in Section 1.9.

SECTION II: Maryland's Phase II WIP Development Process

2.1 Overview

Maryland has a very strong county government system. Counties make many decisions regarding land use, zoning and development, implementation of stormwater permits, and construction and operation of wastewater treatment plants that are critical to water quality in general and to the Bay Restoration. Farm planning also occurs through Soil Conservation Districts that are county-based. Even though the WIP is documented at the scale of Maryland's five major basins, the WIP development process included quantitative goals at a local scale so that the shared responsibility for implementing the Bay TMDL in Maryland is clear to everyone. The local area reduction targets included information about the relative levels of effort that will be needed from each source sector, such as agriculture, urban and suburban stormwater, septic systems and municipal and industrial waste water. Although the Phase II WIP is a State document, required by EPA, Maryland strongly encouraged local partners to participate in a collaborative effort. Initial local contributions to the WIP were accepted by the State in November 2011. The State also offered the opportunity for local partners to provide refinements in July 2012 and will continue to work with local jurisdictions in the future on implementing and refining the WIP in an adaptive management process.

2.2 Engaging Our Local Partners

In November and December of 2010, as the Phase I WIP was being finalized for submittal to EPA, Maryland agency staff began meeting to develop a framework for the State's Phase II planning efforts. In these meetings, an inter-agency "WIP Action Team" was formed to establish a Phase II WIP work plan and schedule, identify goals and objectives, and frame the essential structure of the Phase II process.

A key decision in shaping the Maryland Phase II WIP process concerned the determination of the "local area" scale of implementation planning that EPA made clear was the central purpose of Phase II: identifying more detailed, geographic-specific pollution reduction targets, as well as the level and location of implementation practices that will achieve those reductions. The State determined that in Maryland, the appropriate local area for Phase II planning should be set at the county geographic scale.

Maryland chose this scale because two of the primary parties with authority to conduct implementation actions, the county governments and most soil conservation districts, operate at that scale. Within each of Maryland's 23 counties and Baltimore City, representatives of the entities with responsibility and authority to control nutrient and sediment loads from all sources could be identified, including county and municipal governments, soil conservation districts, federal and State agencies, among others. These local and federal partners were asked to engage in a partnership effort with the State to build on and refine the Phase I WIP in developing this second phase of implementation planning to meet Maryland's Bay TMDL restoration goals.

The Bay model works best at larger scales as it is designed for a 64,000 square mile watershed so Maryland decided to continue to work with local Soil Conservation Districts at the county scale, but to aggregate up to the basin scale for final implementation plans for submission to EPA. At this scale the inconsistencies that were problematic at finer scales disappeared and the plan could move forward. In a letter to the Bay partners dated October 5, 2011, EPA responded to these and other modeling concerns raised by the Bay jurisdictions by relaxing their Phase II WIP expectation that states identify detailed local area BMP implementation levels that meet local-scale reduction targets, acknowledging the limitations of applying the CBP Watershed Model at a finer scale in some areas of the Bay watershed. In response, Maryland chose to develop basin-scale strategies for its Phase II WIP to meet the quantitative goals of the Bay TMDL, an optional approach that EPA proposed in its October 5 letter.[26] However, Maryland's State-basin strategies incorporate and are informed by the county area implementation planning and analysis conducted by the State's local partners over the course of 2011.

During January and February 2011, Maryland hosted five regional workshops with the assistance of the Harry Hughes Center for AgroEcology, and funding support from the Chesapeake Bay Trust and Town Creek Foundation. Invitees included local elected officials; government departmental staff from all Maryland counties and Baltimore City, as well as numerous municipalities; soil conservation district staff; and stakeholders from the wastewater and stormwater sectors, environmental organizations, builders and developers, poultry and other agricultural industries, etc. The day-long meetings introduced participants to general background on the Bay TMDL and Phase I WIP development, and the proposed Phase II WIP process. During afternoon break-out sessions, State agency staff initiated the process of establishing local county-area teams to work as partners with the State and federal governments to develop the Phase II WIP.

The following is a list of the regional Phase II WIP workshop locations, dates, and participating counties:

Western Maryland: Allegany, Frederick, Garrett and Washington Counties.
January 19, 2011 - Williamsport
Central Maryland: Baltimore City, Baltimore, Carroll, Harford, Howard and Montgomery Counties. January 21, 2011- Cockeysville
Lower Western Shore: Anne Arundel, Calvert, Charles, Prince George's and St. Mary's Counties. February 3, 2011- Upper Marlboro
Lower Eastern Shore: Dorchester, Somerset, Wicomico and Worcester Counties.
February 7, 2011 - Salisbury
Upper Eastern Shore: Caroline, Cecil, Kent, Queen Anne's and Talbot Counties.
February 9, 2011 - Easton

Following these initial "start-up" workshops, the State worked closely with the newly formed local teams throughout the rest of 2011 to develop the Phase II WIP. State staff volunteers, who had been introduced at the regional workshops, served as ongoing State "liaisons" to the teams and their designated leaders, coordinating meetings and facilitating communications with subject

[26] See EPA letter dated October 5, 2011 (PDF) from EPA Region III Administrator Shawn Garvin to Maryland Department of the Environment Secretary Robert Summers.

area experts and technical support from the State. Maryland's key local Phase II WIP partners are identified in each of the sub-sections that comprise Section III of this report, by governmental departments, source sector authorities and other entities represented on the county-scale teams who have engaged in partnership with the State to develop nutrient and sediment reduction strategies, and set milestone goals for making incremental progress toward achieving Maryland's Phase II WIP interim and final targets..

A slate of monthly local team meetings in each county was planned and promoted by the State, with parallel liaison training sessions conducted by agency staff to prepare the liaisons for each meeting's agenda topics. The monthly meeting agendas were designed to lead the teams through a systematic series of steps to address key elements of the WIP on a time line consistent with EPA's schedule for the Phase II Plan. The State liaisons also shared information on their teams' progress and problems on monthly liaison conference calls. Liaisons regularly relayed technical and policy related questions from the local teams to State staff for timely responses. As substantive questions were answered, they were documented and posted to a newly created Phase II WIP Development Support web page on the Maryland Department of the Environment web site.

Information Sharing: During the spring and summer months of 2011, State technical staff generated a series of support documents for the local teams' orientation, including Phase I WIP loads and targets at the county geographic scale, reported BMP data, CBP Watershed Model land use data, etc. These various components of the information used in developing the Bay TMDL and Maryland's Phase I WIP were explained and discussed in team meetings and webinar presentations to enhance understanding of the key elements of the Chesapeake Bay Program Model and the metrics by which progress toward pollutant load reduction targets is evaluated. In addition, State agency staff produced, and the liaisons distributed to their teams, a sequence of guidance, fact sheets, and templates intended to inform the teams of the proposed format for providing local information needed for documentation in the State's Phase II WIP report that the key elements of the Plan were addressed. All of the above documentation is available on MDE's Phase II WIP web page.

Cost and Funding Analyses: Following publication of Maryland's Phase I Watershed Implementation Plan (WIP) in December 2010, MDE began investigating information on the cost of local stormwater implementation in early Spring 2011. At the regional workshops hosted by MDE to share information about the WIP process, several members of the public inquired if cost data was readily available related to stormwater costs. Cost data would be essential to assist local governments prioritize their restoration efforts and optimize their strategies to implement Phase II of the WIP. To answer these questions, MDE commissioned a study working with economists from the University of Maryland Center for Environmental Science (UMCES) and the Johns Hopkins University. The primary purpose of the report was to examine, evaluate and quantify costs related to stormwater best management practices (BMP) and assess revenue generating options for counties in Maryland. The study was completed in October 2011 by Dr. Dennis King and Mr. Patrick Hagan of UMCES (see Appendix C).

The report developed and presented planning level unit cost estimates, expressed as costs per acre of impervious area treated, for each of the stormwater best management practices that are

specified in MDE's Maryland Assessment and Scenario Tool (MAST). In order to make the report widely available and allow the public to discuss the findings in the report, MDE conducted five regional meetings across Maryland in September 2011 at which the authors and MDE staff presented the economic analysis (see section 2.3 below).

Spreadsheet programs that accompanied the report were provided as a useful, standard framework for more detailed cost analysis. The spreadsheets contained default values for some particularly difficult to estimate components of county stormwater BMP costs. Both the paper and the spreadsheets have been posted on MDE's Phase II WIP Technical Support webpage.

Briefings to local elected officials: Considerable outreach efforts by senior State agency staff were made to increase local government awareness of and support for the Phase II WIP effort. For example, in March 2011 alone, MDE's Science Services Administration provided briefings to the Boards of Commissioners of St. Mary's, Charles, Carroll, Dorchester, and Somerset Counties, as well as the Town of La Plata, and answered numerous questions about the WIP process during discussions that followed. Since then, ongoing communication with local government officials, regional councils, associations, and stakeholder groups has continued apace, as the table below indicates.

Date	Attendees
4-1-11	Western MD Local Government Exchange - Hagerstown
4-5-11	Harford Co. and Municipal Public Works Directors and staff, Health Dept. & SCD staff
4-7-11	Prince George's County Planning Board
4-28-11	Commission on Environmental Justice
5-9-11	Agro-Ecology Center Board
5-10-11	County Engineers Association
5-11-11	Environmental Coordination Forum – SHA invitees – Transportation Planning
5-25-11	Prince George's County senior environmental managers and Administrator
5-26-11	Joint meeting Frederick County Council and municipalities; Delegates, Sen. Brinkley present
6-2-11	Lower Eastern Shore Tri-County Council
6-6-11	SHA: Interagency Managers Meeting
6-9-11	Patapsco/Back River Tributary Team
6-16-11	Metropolitan Washington Council of Governments Water Resources Panel
6-20-11	Stakeholder Advisory Committee
6-21-11	Civilian federal facilities; with EPA and DOD
6-23-11	Maryland Association of Counties (MACO) Board of Directors Retreat
6-24-11	Home Builders Association (NAIOP)
6-27-11	Maryland Municipal League Summer Conference
6-28-11	Potomac Watershed Partnership
7-21-11	Wicomico County WIP Team, Local Officials, SCD Staff
8-10-11	Chesapeake Beach
8-11-11	Maryland Streams Symposium
9-12 – 9-29-11	Second round of five regional meetings on WIP development

2.3 Regional Meetings and Public Involvement

Two rounds of five regional meetings bracketed the Phase II development process. Both rounds were set up and facilitated by the Agro-Ecology Center with funding provided by the Town Creek Foundation. The first round served to introduce the concepts, process and schedule for the Phase II WIP. The teams and liaisons were also introduced and initial and individual team processes and approaches discussed.

The second round was scheduled for September 2011, shortly after final numbers for Phase II were expected. The meetings were productive with a presentation by Dr. Dennis King discussing the development of stormwater costs and the availability and use of the spreadsheets with local input. A report entitled *Costs of Stormwater Management Practices in Maryland Counties* by Dr. King and Patrick Hagan of the University of Maryland Center for Environmental Science is available in Appendix C of this report.

Special note needs to be made of the voluntary participation by the University of Maryland's Environmental Finance Center. This presentation discussed key considerations in developing a funding strategy with illustrations from the Center's experience (see Appendix C). It was well-received and several jurisdictions later contacted the Center.

Because it was perceived as essential that those involved in the WIP development process have opportunities to have their specific questions answered, the regional meetings were supplemented by meetings with County Commissions and Town Council upon their invitation.

The dates and locations of the second round of regional meetings are provided below:

Western Maryland (Allegany, Frederick, Garrett, and Washington Counties) September 14, 2011 - Williamsport
Upper Eastern Shore (Caroline, Cecil, Kent, Queen Anne's, and Talbot Counties) - September 16, 2011 - Easton
Lower Western Shore (Anne Arundel, Calvert, Charles, Montgomery, Prince George's, and St. Mary's Counties) - September 22, 2011 - Mechanicsville
Central Maryland (Baltimore City, Baltimore, Carroll, Harford, and Howard Counties) - September 23, 2011 – Baltimore City
Lower Eastern Shore (Dorchester, Somerset, Wicomico, and Worcester Counties) - September 30, 2011 - Salisbury

Maryland's Phase II WIP Development Support Web Page: The Phase II WIP web page was designed to support the local teams' development efforts for the Phase II WIP and to serve as a central location for accessible information on the collaborative Phase II process, as part of the State's ongoing public outreach and participation efforts.

The Phase II web page provides a wealth of information in the form of State and federal guidance documents, slide presentations, recorded webinars, FAQs, static and interactive on-line maps, individual county pages with team meeting notes, liaison and team leader contacts, and web links to many other WIP related documents. The web page was regularly updated to announce news and upcoming events, document the ongoing local team meetings, as well as

briefings State agency staff to local elected officials and various stakeholder groups, including the WIP Stakeholder Advisory Committee. Meetings with federal facility managers and federal agency staff are also documented. As a record of a collaborative process, Maryland's Phase II WIP Development Support web page is itself documentation of the extent of the State's commitment to fully engage both our local partners and our federal partners throughout this year-long effort.

The Maryland WIP Stakeholder Advisory Committee: Maryland established a WIP Stakeholder Advisory Committee in August 2010. The Committee was appointed by the Governor's Chesapeake Bay Cabinet and is composed of representatives from stakeholder organizations including watershed groups, agricultural interests, homebuilding and development community, local governments, and point source and public utility interests, and the Chesapeake Bay Commission.

The purpose of the Committee is to provide a venue for communication between its member organizations and the State regarding the development of the WIP Phase I and Phase II. This has included providing comments and feedback to state agencies on the Phase I document, providing input into the Phase II development, and participating as appropriate on the local (county level) WIP Teams. Areas of focus have included the Phase II process for Maryland; understanding and providing input to the development of the Off-set Strategy; developing recommendations for addressing nutrients from existing septic systems; understanding the outcomes of the WIP pilot projects; the development of the local allocations; and using the MAST scenario tool. The Committee has been meeting bimonthly and individual members have participated in regional workshops and provided their expertise in the WIP process to local WIP teams.

Maryland's Monthly Webinar Series on Phase II WIP Technical and Policy Issues: In April 2011, Maryland launched a monthly Phase II WIP Webinar Series to expand its support of the local teams' WIP development efforts. Each webinar was designed to focus on a specific aspect of the WIP process, along with providing more detailed examination of related issues that had been identified by the teams at their monthly meetings and communicated back to the State agencies through the team liaisons. The webinars featured Power Point slide presentations given by State agency staff, followed by a Question and Answer period during which the presenters provided responses to the many questions sent in electronically during the course of the webcast. Each monthly webinar was then posted to MDE's Phase II WIP web page, along with the slide presentations and a transcription of the "Q & A" session.

The webinars also introduced Maryland's Assessment and Scenario Tool (MAST) and each webcast featured presentations on the Phase 5.3.2 Watershed Model inputs, like land use acreage and best management practice (BMP) data, to provide familiarity with the information used consistently in both MAST and the Bay Model to set current "progress" loads as well as the load reduction targets that need to be achieved in order to attain the water quality goals of the Bay TMDL. More information on the development of MAST, and the key role it played in developing the Phase II WIP local area implementation strategies, is provided below in this section.

2.4 Engaging the Agricultural Sector

To develop the Phase II Watershed Plan for Agriculture, the Maryland Department of Agriculture facilitated a series of local Agricultural workgroup meetings in the summer and again in the fall of 2011 within each of the twenty-three counties of Maryland. The Agricultural Workgroups were modeled after the Tributary Strategy Workgroups and included a broad spectrum of stakeholders that represented and specialized in working with the agricultural community. These special teams were led by the local Soil Conservation Districts and focused on pollution reduction plans at the county level. The participants included farmers, Soil Conservation District planners, engineers, technicians, NRCS, FSA, University of Maryland Extension, County Agricultural Coordinators, agro-business, representatives from local watershed organizations, Chesapeake Bay Foundation, Sierra Club, River Keepers, Maryland Farm Bureau, Delmarva Poultry Institute, Dairy Industry, county planning staff, DPW staff, and Health Department staff. Over 1,000 people participated in the meetings.

Because of the compressed time frame to develop a Phase II WIP, the preliminary meetings in all twenty-three counties were held in June and July prior to EPA providing the state the final loading reduction targets. Workgroup members began with information on current agricultural practices installed and discussed opportunities for further implementation with existing farm management practices and programs. The meetings also focused on local capacity to provide further reductions and the commitment of the participants to implement and develop a workable local strategy.

In September, 2011, EPA and MDE released the final reduction targets for all source sectors. The Agricultural load estimates changed with the new model and required the Agricultural Workgroups to reconvene and re-examine the individual local strategies. Meetings were scheduled from mid September to the end of October in all twenty-three counties. The Maryland Department of Environment had developed a new tool to assist all sectors with developing the WIPII by allowing test runs of management options to determine nutrient reductions. This tool, the Maryland Assessment and Scenario Tool (MAST) was first utilized by the Agricultural Workgroups. However, at the time, two of the three agricultural modules were not functioning and the tool was never calibrated so the results were of limited value.

Because the new model estimates required agricultural load reductions beyond the workable strategies developed in the first meetings, workgroup members were asked to develop a new set of plans that would require increased technical assistance and increased support for existing programs to achieve a greater load reductions. The plans provided the basis for the Agricultural sector strategies included in Maryland's overall implementation scenario to meet the state-basin reduction targets, as described in Section I of this report. A complete list of the Agricultural Workgroup and stakeholder meetings for the Phase II WIP is provided below.

Agricultural Watershed Implementation Plan Meetings

Allegany Soil Conservation District 6/21/11
Allegany County Office Building Cumberland MD 21502 ..... 10/4/11
Anne Arundel Soil Conservation District 6/10/11
Maryland Department of Agriculture Annapolis MD 21401 ..... 10/14/11
Baltimore County Soil Conservation District 7/1/11
Baltimore County Ag Center Cockeysville MD 21030 ..... 10/6/11
Calvert Soil Conservation District 7/26/11
County Services Plaza Prince Frederick MD 20678 ..... 10/11/11
Caroline Soil Conservation District ..... pilot
Caroline County 4-H Park Denton MD 21629 ..... 9/28/11
Carroll Soil Conservation District 7/25/11
University of Maryland Extension Westminster MD 21157 ..... 10/7/11
Catoctin Soil Conservation District 7/6/11
Frederick County Public Safety Training Facility Frederick MD 21702 ..... 10/12/11
Cecil Soil Conservation District 7/13/11
Cecil County Administration Building Elkton MD 21921 ..... 10/17/11
Charles Soil Conservation District 7/26/11
La Plata Town Hall La Plata MD 20646
University of Maryland Extension La Plata MD 20646 ..... 10/11/11
Dorchester Soil Conservation District 6/8/11
Dorchester County Library Cambridge MD 21613
Dorchester County Office Building Cambridge MD 21613 ..... 9/20/11
Frederick Soil Conservation District 7/6/11
Frederick County Public Safety Training Facility Frederick MD 21702 ..... 10/12/11
Garrett Soil Conservation District 6/20/11
Bittinger Fire Hall Bittinger MD 21522 ..... 10/19/11
Harford Soil Conservation District 7/8/11
University of Maryland Extension Forest Hill MD 21050 ..... 10/20/11
Howard Soil Conservation District 6/30/11
Lisbon Volunteer Fire Company Woodbine MD 21797 ..... 9/22/11
Kent Soil Conservation District 6/27/11
Kent County Community Center Worton MD 21678 ..... 10/18/11
Montgomery Soil Conservation District 7/7/11
Montgomery County Ag Activity Center Derwood MD 20855 ..... 10/13/11
Prince George's Soil Conservation District 6/23/11
Prince George's Soil Conservation District Upper Marlboro MD 20772 ..... 10/5/11
Queen Anne's Soil Conservation District 6/1/11
Queen Anne's County Planning and Zoning Centreville MD 21617 ..... 9/21/11
St. Mary's Soil Conservation District 6/7/11
St. Mary's Soil Conservation District Leonardtown MD 20650 ..... 9/27/11
Somerset Soil Conservation District 6/28/11
Somerset Soil Conservation District Princess Anne MD 21853 ..... 9/29/11
Talbot Soil Conservation District 6/17/11
Talbot Soil Conservation District Easton MD 21601 ..... 9/26/11
Washington County Soil Conservation District 7/11/11
Washington County Division of Environmental Management Water Quality Williamsport MD 10/19/11
Wicomico Soil Conservation District 6/29/11
Wicomico Soil Conservation District Salisbury MD 21801 ..... 10/3/11
Worcester Soil Conservation District 6/28/11
Worcester Soil Conservation District Snow Hill MD 21863 ..... 9/29/11

Maryland Association of Soil Conservation Districts Administrative Committee and District Managers meeting Towson MD 21204 7/20/11
Maryland Association of Soil Conservation Districts Board of Directors meeting Annapolis MD 21401 1/25/11, 10/25/11 Upper Marlboro 20772
Maryland Agricultural Commission 2/9/11, 5/11/11, 8/10/11 Annapolis MD 21401
Young Farmers Advisory Committee 10/19/11 Annapolis MD 21401

Phase II WIP Workshop - Western Maryland
Allegany, Frederick, Garrett and Washington counties
January 19, 2011 Williamsport, MD
Phase II WIP Workshop – Central Maryland
Baltimore City, Baltimore, Carroll, Harford, Howard and Montgomery counties
January 21, 2011 Cockeysville, MD
Phase II WIP Workshop – Lower Western Shore
Anne Arundel, Calvert, Charles, Prince George's and St. Mary's counties
February 3, 2011 Upper Marlboro, MD
Phase II WIP Workshop – Lower Eastern Shore
Dorchester, Somerset, Wicomico and Worcester counties
February 7, 2011 Salisbury, MD
Phase II WIP Workshop – Upper Eastern Shore
Caroline, Cecil, Kent, Queen Anne's and Talbot counties
February 9, 2011Easton, MD

Fall 2011 Phase II WIP Workshop – Western Maryland
Allegany, Frederick, Garrett, and Washington counties
September 14, 2011Williamsport, Maryland
Fall 2011 Phase II WIP Workshop – Upper Eastern Shore
Caroline, Cecil, Kent, Queen Anne's, and Talbot counties
September 16, 2011Easton, Maryland
Fall 2011 Phase II WIP Workshop – Lower Western Shore
Anne Arundel, Calvert, Charles, Montgomery, Prince George's, and St. Mary's counties
September 22, 2011Mechanicsville, Maryland
Fall 2011 Phase II WIP Workshop – Central Maryland
Baltimore City, Baltimore, Carroll, Harford, and Howard counties
September 23 Baltimore, Maryland
Fall 2011 Phase II WIP Workshop – Lower Eastern Shore
Dorchester, Somerset, Wicomico, and Worcester counties
Friday, September 30 Salisbury, Maryland

Gunpowder Farmers Club Cockeysville MD 7/28/11
Gunpowder Farmers Club White Hall MD 10/27/11
State Soil Conservation Committee 1/20/11, 9/15/11, 11/17/11 Annapolis MD
MD Farm Bureau, Farm Credit, DPI, Soil Conservation and the Texas Farm Bureau 8/24/11 Vienna MD
MDE, Soil Conservation, Farm Credit, DPI 11/3/11 Hurlock MD
Annual Southern Maryland Soil Conservation Districts Dinner Meeting 10/27/11 Great Mills MD
DPI Environmental Committee 10/21/11@ Delmarva Poultry Industry, Inc. (DPI) offices near Georgetown, Delaware
Meeting with NRCS Chief Dave White and representatives of agriculture
9/2711 @ University of Maryland Wye Research and Education Center
DPI Environmental Committee meeting 7/14/11 @ DPI offices

3/17/11 @ DPI offices DPI Environmental Committee on collection of non-cost share data for Chesapeake Bay Model
Senior staff has met with a variety of agriculture concerns over the course of the year to provide briefings on the Phase II Agricultural Watershed Implementation Plan.

2.5 Engaging Our Federal Partners

At the August 25, 2010 Maryland Chesapeake Bay Base Commanders' Conference, Governor Martin O'Malley met with U.S. Navy Secretary Ray Mabus, EPA Administrator Lisa Jackson, and Maryland's Military Base Commanders to explore strategies to better engage Maryland's military installations as full partners in the State's Bay Restoration efforts. At the meeting, held on the grounds of the U.S. Naval Academy in Annapolis, Governor O'Malley outlined his vision for enhancing collaboration, tracking military efforts through BayStat, and making technical assistance from the State available to the bases. In an August 25, 2010 press release, Governor O'Malley is quoted addressing a group of State and federal stakeholders saying, "We are encouraged by President Obama's new Executive Order Strategy, which calls for an unprecedented level of federal cooperation and leadership for the Chesapeake Bay, and significantly raises expectations for success," said Governor O'Malley, addressing a group of State and federal stakeholders.

On October 20, 2010 EPA, MDE and DNR attended a meeting of the existing Maryland Pollution Prevention Partnership (MP3) at APG; DNR and the Navy worked to ensure that each major Maryland installation was represented. EPA and MDE gave an overview of the WIP process (Phase I under development at that time).

Early in the year-long Maryland Phase II process, certain federal facility managers and federal agency staff began to participate in the monthly meetings of some of the local WIP teams, and this involvement grew as the partnership effort intensified over the summer months of 2011, and the timeline for the development of local area strategies that included State and federal commitments approached.

On June 21, 2011 EPA, MDE and DNR attended a special Federal Facilities WIP meeting held at the Patuxent Wildlife Research Center. MDE provided an overview of the Phase II WIP process. Federal representatives were strongly encouraged to work with local 'host' jurisdictions. Two options are 1) to submit a Federal Facility Implementation Plan (FFIP) to the local host or 2) to submit directly to MDE. In either case, MDE will be making Maryland's final draft submission to EPA in December 2011, after which there will be a period of public review with the final plan going to EPA early in 2012. A Phase III WIP is anticipated to further refine implementation strategies throughout Maryland's Bay region. The importance of two-year milestones was noted as well as a new federal "stat" tool based on MD's BayStat.

June 28, 2011 - Next regular meeting of MP3; MDE provided information on Phase II WIP development, along with a commitment to explore increasing the agency's level of assistance as requested. As a result, internal discussion has occurred regarding holding a technical session targeting federal facilities. In addition, MP3 was made aware of a July 19th MAST webinar and informed that MDE plans to issue allocations to all major federal facilities by August 15th (aggregating small facilities into a single set of reduction targets). The Department of Defense

(DoD) raised concerns about IT security, stating that its use of MAST may not be possible. The US Army Corps of Engineers indicated it is working on a Best Management Practice Database to provide a tracking and reporting mechanism that can be used to determine the efficiency ratings of the BMPs selected for installation. The information contained in MAST is used as the basis for development of the BMP Database efficiency rates. DoD prepared minutes which were reviewed by MDE; MDE also prepared and submitted a separate addendum addressing various federal questions including one regarding WIP stormwater requirements.

Following these meetings and further discussions with federal agency contacts, Maryland arranged and provided a MAST training webinar for federal facility managers and agency staff on August 16, 2011, followed by a hands-on MAST training session at MDE's computer training room on August 24.

September 20, 2011 – MDE staff provided an update on the Phase II WIP development and engaged in a discussion with federal agency staff on incorporating federal contributions to the State's Phase II WIP. While broad implementation levels of effort will be provided for federal lands within each county-area strategy, MDE provided, at the request of its federal partners, technical information and estimated planning targets for major facilities so that federal agencies could continue developing detailed implementation plans and 2-year milestone commitments. Specific federal agency or facility strategies will be incorporated by reference in the Phase II IP as they become available.

Coordinating Federal Resources in Agriculture

The Maryland Department of Agriculture is coordinating with USDA, Natural Resources Conservation Service to maximize the application of federal resources toward WIP achievement. Beginning in FY 11, NRCS in Maryland approached MDA to request a list of practices that were part of the existing Two Year Milestones. Through this effort, MD NRCS committed to focus programmatic resources available to Maryland farmers, providing prioritized funding to those practices that were part of the Maryland goals. This effort continues through the Environmental Quality Incentive Program and the Chesapeake Bay Watershed Initiative. The Maryland Agricultural Water Quality Cost Share (MACS) Program leverages state funding by co-cost sharing the implementation of individual Best Management Practices funded through federal programs.

In addition, the Conservation Reserve Enhancement Program, first instituted in Maryland 1997, seeks to treat 100,000 acres of sensitive agricultural land in the State. Currently, approximately 70,000 acres are under CREP agreements in Maryland. CREP will play an integral role incentivizing the implementation of forest and grass buffers, wetland restoration and treating Highly Erodible Land (HEL) acres. These correlations of effort with USDA will enhance Maryland's ability to meet WIP targets.

Appendices D and E of this report present federal facility and State agency plans submitted to date in support of Maryland's Phase II WIP.

2.6 Components of Maryland's Phase II WIP Development Process

State agency staff leading Maryland's Phase II WIP effort developed a work plan and schedule to guide the newly-formed local teams in the timely development of the key components of the Phase II WIP, using information from local area source sectors collected and assembled by the teams. The information was then submitted to the State for incorporation in, or as local documentation in support of, Maryland's Phase II WIP report. Each county-area team thus determined what would constitute its contribution to meeting State-basin and Bay TMDL goals through local implementation efforts. The key WIP elements are described below, with an explanation of the State's guidance to the local teams on a recommended approach to address these aspects of the Phase II Plan.

Target Loads: The Phase I WIP included final target loads, predicted to meet water quality standards, which are to be achieved by 2025. Interim target loads that meet 60% of the final targets state-wide are to be achieved by 2017. Because EPA's watershed model was revised as part of the Phase II process, these target loads have changed, and consequently the levels of implementation required to meet the revised targets have also changed. In addition to this overall shift, the State further divided the revised interim and final target loads among smaller, county-geographic areas by types of sources, like waste water treatment plants, urban stormwater, septic systems and various agricultural sources, at the following levels of detail:

Agriculture	AFO
	CAFO
	Crop
	Nursery
	Pasture
Forest	Forest
	Harvested Forest
Septic	Septic
Stormwater	Combined Sewer Systems
	Construction
	County Phase I/II MS4
	Extractive
	Federal Developed
	Municipal Phase II MS4
	Non-regulated
	Regulated Industrial Facilities
	SHA Phase I/II MS4
	State Phase II MS4
Wastewater	Industrial Minor
	Industrial Major
	Municipal Minor
	Municipal Major

The county analyses were supported by the State's further sub-allocation of the stormwater source sector to a finer level than is available in the EPA Bay watershed model, which is presented in the table above. Analysis at that finer scale was supported by MAST. Because the MAST analyses must be validated by the Bay model, the stormwater results provided in this report are at a coarser scale consistent with the Bay model.

The intent of this more detailed distribution of loads was to provide estimated goals at a local scale so that the shared responsibility for reducing pollutant levels in the Bay is clearer to everyone. The underlying county scale of planning provides further assurance of implementation beyond that of the Phase I WIP, because many of the implementation actions will be conducted by county governments and soil conservation district offices, which operate at that scale.

Current Capacity Analysis: A template for documenting local area current capacity by source sector was distributed to each WIP Team in April 2011, to provide the local teams with a means to assess recent levels of effort and progress, and what they can achieve with current resources, staff, and programmatic capacity. The analysis allowed the teams to take inventory and document ongoing local water quality protection and restoration efforts, and to better understand their resource limitations and needs with regard to extending and accelerating their efforts to meet Bay TMDL and Maryland's WIP nutrient and sediment reduction goals. Thus, these analyses provided a starting point for the development of achievable local implementation strategies and 2-year milestone commitments for 2012-2013. Because the analyses were conducted with this intent, they are not included in the Phase II WIP documentation.

Strategies to Achieve Interim and Final Targets: The State worked closely with the local WIP teams to assist them in developing strategies for achieving needed pollution reductions in support of Maryland's State-Basin strategy for the Phase II WIP. These 24 local area strategies build upon the capacity analyses and program descriptions noted above. As needed, the plans describe enhancements to policies, programs, authorities and regulations needed to increase capacity. The strategies include a schedule by which key steps will be taken, including capacity-enhancement steps.

Contingency Strategies: The Phase II WIP includes the State basin-scale strategy that will serve to provide back-up options for those local area strategies that are delayed or cannot be implemented for some reason.

2-Year Milestone Commitments for 2012-2013: Local area near-term implementation and program development goals for this first 2-year milestone period will inform the statewide 2-year milestones for 2012-2013.

Tracking & Reporting: The Phase II WIP includes descriptions of local procedures, currently underway or planned, for tracking and reporting the kinds of implementation addressed by the strategies. The descriptions are included in each local area's plan as provided in Section Three of this report.

2.7 Maryland's Local Area Nutrient and Sediment Targets for the Phase II WIP

In Section One of this report, the State provides a set of revised nutrient and sediment reduction targets by source sector, and basin-wide strategies to meet them, based on the revised state-major basin allocations issued by EPA in August 2011, the result of a series of revisions to the Phase 5.3 Watershed Model (now updated as Phase 5.3.2). A key task for the State (and a key expectation of EPA's initial Phase II WIP guidance) involved the distribution of these large scale allocations to a "local area" scale by source sector. Based on the sub-allocation methodology developed for the Phase I WIP[27], and maintaining the principles of equity in level of effort and the relative effectiveness of different geographic areas, Maryland generated 24 sets of nitrogen, phosphorus and sediment reduction targets by major source sector for each of the State's county-based local areas.

In an additional effort to provide more detailed planning targets, Maryland also disaggregated the overall NPDES-regulated stormwater reduction target for each local area into separate allocations by permit type, with individual targets for Phase I and Phase II MS4 counties and the State Highway Administration, and aggregate target loads for Phase II MS4 municipalities, Phase II MS4 State and federal facilities/lands, and industrial stormwater permittees. At the request of the federal agencies, the State further identified individual planning targets for a number of the largest federal facilities in Maryland that have Phase II MS4 permit requirements for stormwater management. Maryland also provided individual Phase II MS4 municipalities with similar planning targets. Through this process, the State provided its Phase II WIP partners with sufficiently detailed planning targets to guide them in developing more specific implementation strategies beyond what has been included in the State's broader Phase II WIP strategy. The information will enable each local and federal entity to define individual practices and actions that will be implemented, tracked, reported and credited as progress toward the State's WIP and Bay TMDL goals, through the 2-year milestone framework. Section Three of this report is divided into 24 parts that document each local area's Phase II WIP contribution. Each subsection includes an overview of the local team's process; narrative strategies and milestones; a description of tracking and reporting methods; optional description of any existing local watershed planning framework; and optional documentation of technical discrepancies such as data concerns, along with recommended future steps to address such concerns.

2.8 Development of Maryland's Assessment and Scenario Tool (MAST)

Environmental mathematical models can be applied to enhance understanding of complex physical phenomena and allow informed decision making, which when combined have significant policy, economic and accountability implications. Recent advancements in the EPA Chesapeake Bay Program Modeling System (Bay Model) have increased its complexity, improving accuracy and predictability, but this has resulted in less accessibility and transparency for local decision makers. Maryland recognized the need for and benefit of communicating this model, to provide greater accessibility to the EPA suite of models in a simple and transparent tool.

[27] See Appendix A "Sub-allocation Process for the Chesapeake Bay TMDL" (PDF) in Phase I WIP main report:

Maryland's Assessment and Scenario Tool (MAST) was developed by the State in 2011 to function as an on-line accessible scenario development and management tool. It enables local planners, decision-makers and stakeholders to assemble nutrient and sediment load reduction strategies in the form of quantified assemblages of best management practices to meet the pollution reduction goals of the Chesapeake Bay TMDL and the State's Phase II WIP. The tool brings transparency to this process by opening up what for the lay person is the "black box" of the EPA models through the practical application of these complex modeling systems.

Through extensive outreach, including webinars and hands-on MAST training sessions, Maryland's local and federal WIP development partners have learned that MAST makes the Bay Modeling inputs and results understandable and accessible. MAST is used to provide approximate scenario load results in several seconds, merge many scenarios together, and then directly link with the Bay Model, which takes several hours to run, to obtain more detailed results. The timely results of MAST allows it to function as a sensitivity analysis tool by isolating and assessing the benefit of different practices in specific geographic locations and also function as a decision management tool by quickly screening many initial management decisions across several source sectors. Ultimately MAST is able to directly link the narrowed-down management options to the Bay Model for final verification of water quality standards attainment through generation of an "input deck" to the model. Above all, using MAST to develop local Phase II WIP strategies has illustrated the practicality and transparency of modeling and in the process empowered stakeholders by providing them the ability to see the underlying input information and quickly predict the results of their proposed load reduction strategies, key objectives in complex environmental decision making.

The following table documents Maryland's MAST-related outreach to the State's local and federal partners:

04-13-11	Webinar for Local WIP Teams	MAST and Phase II WIP development
05-16-11	Webinar for Local WIP Teams	MAST and CBP Land use; Nutrient Trading; Milestone Guidance
06-13-11	Webinar for Local WIP Teams	WIP I Strategies, MAST Training Agenda
07-19-11	MAST Training Webinar	Introduction to using MAST for WIP Scenario development
07-21 – 08-2-11	4 MAST Training Sessions at MDE	Hands-on Training for Local WIP Team designees
07-19-11	MAST Training Webinar for Federal Facility Managers and Agency staff	Introduction to using MAST for WIP Scenario development
08-24-11	MAST Training Sessions at MDE for Federal Facility Managers and staff	Hands-on Training for Local WIP Team designees

Following the MAST webinars and training sessions, the local WIP teams began to work with the on-line assessment tool to develop local implementation scenarios and explore options for achieving reductions at the county scale by applying combinations of best management practices (BMPs) and land use conversions on various percentages of available acres. MAST allowed teams to compare results of multiple scenarios to determine the most feasible, efficient and cost-effective way to meet local load reduction goals. As explained above, the combined county-

scale MAST scenarios served as the basis for the State's implementation strategies to meet the revised major basin load reduction targets set by EPA in August 2011.

2.9 Public Review of the Draft Phase II WIP

Following the submission to EPA on December 15, 2011 of a preliminary draft of the Phase II WIP for their initial review, Maryland revised the draft documents in light of EPA's comments and posted the updated draft WIP report and appendices on the MDE web site for a public comment period that ran from January 25, 2012 through March 9, 2012. The availability of the revised draft documents for public review was announced by email notification to over 1,000 individuals and organizations across the State, including local elected officials of Maryland counties and municipalities, local government staff, the County WIP teams, federal and State agencies and facility managers, a host of stakeholders and other interested parties.

The general public and all those notified were invited to submit written comments on the draft Phase II WIP documents to MDE during the comment period, for consideration as the State prepared a finalized version of the WIP for submission to EPA on March 30, 2012. MDE received over 1,300 email messages from citizens who expressed their support for the WIP and for EPA's and Maryland's efforts to restore the Chesapeake Bay. The vast majority of these emails also urged the State to strengthen the WIP in the following manner:

1) Ensure that pollution from agriculture will be reduced and demonstrating how it will hold offenders accountable if it is not.

2) Hold local governments accountable for implementing the necessary steps to meet the Bay "pollution diet"; we cannot solely rely on EPA to impose consequences, since the agency won't play that role at the local level. Local leaders must be engaged in this process, because they will play a crucial role in achieving pollution reduction goals.

3) Provide clearly articulated "backstops" showing what the state will do to make sure both state and local governments actually meet their commitments – and detail what consequences the state or EPA will impose if they don't.

Maryland has expanded Section 4 of the WIP, in part to address these concerns related to accountability and ensuring that the implementation actions needed to achieve the Bay TMDL and WIP goals will be accomplished.

MDE also received over 80 sets of multiple comments on the draft WIP documents from a wide variety of organizations and individuals, including county governments, environmental organizations, river keepers and local watershed associations, advisory committees, stakeholder organizations, business groups, and State and federal agencies. All of these comments were reviewed and given full consideration as Maryland revised the draft Phase II WIP documents prior to submission of a finalized version to EPA on March 30, 2012. All of the written comments received by MDE were synthesized into subject categories and areas of concern, and addressed by the State's responses. The final Comment Response Document for the Draft Phase II WIP is now available on the MDE web site.

During the comment period, Maryland held a series of regional public informational meetings about the draft Phase II WIP, featuring presentations by staff from MDE and MDA, followed by Q & A discussions with the attendees. In total, over 270 individuals attended the series. The meetings, one of which was videoconferenced to three additional locations, took place at the following locations and dates:

Monday, February 6, 2012 - 1:30 – 3:30 pm
General Public Meeting for the Eastern Shore
Washington College - Chestertown

Tuesday, February 7, 2012 - 6:30 – 9:00 pm
General Public Meeting at the 4-H Center in College Park and videoconferenced to Frostburg University, Salisbury University, and the College of Southern Maryland (La Plata)

Wednesday, February 29, 2012 - 1:00 – 3:30 pm
General Public Meeting for Western Maryland
Hagerstown Community College - Hagerstown

Thursday, March 1, 2012 - 6:30 – 9:00 pm
General Public Meeting for Central Maryland
Baltimore County Agricultural Center - Cockeysville

Monday, March 5, 2012 - 2:00 – 4:00 pm
General Public Meeting for All
Maryland Department of Environment - Baltimore

The meetings were recorded by a reporting service and transcripts are available on the Agro-Ecology Center's web site at:
http://www.agroecol.umd.edu/WIP%20Phase%20II%20Workshops.cfm

The slide presentations are available on the MDE web site at:
http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/DRAFT_PhaseII_WIPDocument_Main.aspx

Maryland extends its thanks to the Agro-Ecology Center for organizing and facilitating the Phase II WIP public meetings, and to the Town Creek Foundation for providing funding support for the series.

SECTION III: Local Area Contributions to Maryland's Phase II WIP

Section III of this report is comprised of 24 sub-sections documenting each county area's Phase II WIP contributions, specifically for the source sectors of urban stormwater, wastewater treatment plants, and septic systems. The local contributions are available on the WIP Phase II County Documents page of the Maryland Department of the Environment's web site. The local WIP sub-sections are presented alphabetically by county (and Baltimore City), and include the following information:

- Overview of Local WIP Team process, description of team membership, and summary of Phase II WIP efforts
- Local area narrative strategies to achieve nutrient and sediment reductions from the specific source sectors of urban stormwater, wastewater treatment plants, and septic systems.
- Local area 2012-2013 Milestones
- Description of local area tracking and reporting methods
- Optional description of local watershed planning frameworks
- Optional documentation of technical discrepancies, recommended future steps to address concerns.

Following completion of Maryland's Phase II WIP on March 30, 2012, the Phase II development schedule was extended to mid-July to provide additional time for Maryland's local partners to continue refining their county-scale plans. Nine WIP Teams provided MDE with refined MAST scenarios that were incorporated in Maryland's revised Phase II WIP strategies, which were submitted to EPA in September 2012. Thirteen WIP Teams submitted updated local area WIP narrative reports to MDE in July 2012. These revised reports are now included in the updated final Phase II WIP documentation.

PLEASE NOTE: *Strategies for the Agricultural sector in each county are included in the State and major-basin strategies provided in Section I of this report. Implementation strategies for State and federal lands are also included in the State strategies in Section I, based on assigned levels of effort for these lands that are comparable to the implementation levels required from the source sectors generally across the Maryland Bay watershed. Although the Phase II WIP provides broad levels of effort for implementation on federal lands to meet aggregate reduction targets, Maryland provided more detailed planning targets to federal agencies in order to support the development of federal facility implementation plans (FFIPs) and 2-year milestone commitments that either are or will be incorporated by reference into the Phase II WIP documentation as they are completed. Appendix F of this report provides the federal facility and agency plans submitted to date in support of Maryland's Phase II WIP.*

SECTION IV: Future Steps

Development of the Phase II Watershed Implementation Plan (WIP) is just the first step in a series of planning and implementation activities necessary to restore and maintain the health of the Chesapeake Bay and local waters. Following the Phase II WIP submittal in March 2012, local partners were provided an opportunity to refine local contributions to Maryland's Phase II WIP by July 2012. Future activities will include implementation of practices; annual tracking and reporting of implementation for evaluation of milestone progress in 2013; completing a fully implementable growth offset program by the end of 2013; refinement of the Chesapeake Bay model during 2013 – 2016; and development of a Phase III WIP in 2017. Federal, State and local coordination and partnership in these activities is vital.

This section begins laying the groundwork for our future steps. It is organized in two broad time periods: the present to the end of the 2013 Milestone period and the period up to 2017 when progress will be evaluated and revised plans will be generated.

Present through 2013

The State submitted milestones to EPA in March, 2012.[28] These milestones will be tracked by Maryland's BayStat in addition to EPA's ChesapeakeStat. EPA will meet with the State on a quarterly basis to review progress and discuss other issues to avoid surprises at the 2013 milestone evaluation. The first major milestone assessment will be in 2013. This first milestone assessment will be critical as EPA will likely use it to either demonstrate progress and the success of the accountability framework for the Bay restoration, or use it to justify the imposition of "back stops." Similarly, the State will be evaluating local milestones in support of Statewide milestones and restoration progress.

<u>Refining local plans by July 2012</u>

The relatively short time allotted to completing the Phase II WIP encouraged the State to request additional time for submission of final Phase II WIPs. Although EPA was unable to grant this request due to timeframes developed through litigation, EPA was able to provide opportunities for revisions after March 30, 2012. EPA recognizes that time constraints and technical challenges made it difficult to produce the Phase II WIP strategies by the March 30 deadline and supports the continued refinement of local plans as being both appropriate and necessary.

Several developments early in 2012 made revisions to the WIPs desirable:

- The change in the implementation time horizon from 2020 to 2025 after local plans were created might motivate refinements to the plans.
- Results of the 2012 General Assembly session could provide new opportunities that will support refinements to local plans (see "Helpful Legislation" below).

[28] EPA comments on Maryland's milestones and WIP, and those of the other States, can be found at http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/RestorationUnderway.html .

- Ongoing evaluations in some jurisdictions and comments received during the public review could lead to revised plans, especially with respect to reducing costs.
- Corrections to the model, data revisions, MAST revisions, technical changes to strategy submissions.

The State assisted local jurisdictions in revising plans by providing county-level information to local teams in mid-April 2012. Local teams were offered the opportunity to use MAST to make refinements to their 2017 and 2025 strategies and to refine their narrative strategies and milestones.

Refining local plans after July 2012

The quarterly meetings between EPA and the State will also address changes that local governments wish to make to their plans or milestones after July 2012. For significant changes to either local milestones or WIP plans, the State would like notification, so that EPA can also be notified and expectations remain consistent across all levels of government. In general, changes will be accepted and supported by the State if:

- The nutrient reductions are consistent in time and amount with the previous plan,
- Funding is available or there is some other form of assurance that implementation will occur, and
- The new implementation is verifiable.
- Any shift in allocations between sectors must be enforceable or otherwise binding and all conditions be agreed to by authorities for both sectors such as the Department of Agriculture and the County Commission.

By late 2013 it is critical that localities develop and implement tracking and accounting systems that will allow them full credit for implementation when milestones are evaluated in 2013. The State will assist by providing guidance on the key information to report and the reporting process. Local Soil Conservation Districts will continue to utilize the Conservation Tracker system to account for all agricultural practices.

To address concerns about making progress sufficient to meet 2017 targets, and subsequent exposure to consequences if progress is not sufficient, Maryland will evaluate technical issues regarding the pace of implementation. Specifically, MDE in coordination with EPA, will reevaluate the maximum feasible restoration strategy (E3) used to generate allocations with a focus on the urban sector. MDE will use this and other information to evaluate feasible implementation rates and share this information with localities in advance of developing milestones for 2015 and beyond.

Cost and Funding

By late spring 2012, with direction on funding and implementation from the General Assembly now available, localities should begin planning how to address the Bay restoration responsibilities in their next budget in order to fully address upcoming milestone measures. Many localities will be in a "capacity building" phase in terms of defining the need for additional resources and funding, and beginning to address ways of generating or shifting revenue to

accelerate implementation in future years. It is anticipated as well that there will be increased efforts to creatively address how to reduce the cost of implementation while continuing to meet nutrient reduction targets. Continuing communication between the State and localities will be needed so that technical assistance can be provided.

We have heard many concerns about the total cost. The way to begin to address those concerns is to start making progress. In the current economic climate it may not be possible to fully fund all of the milestones necessary to assure that the 2017 goal is met. However, the more that is done, the easier it will be to address issues at the milestone evaluations in 2013, 2015 and 2017. The State recommendation to local governments is to try for incremental progress. Local governments should identify their high priority restoration activities as issues that are a high priority are more likely to be completed. If localities really need $500,000 for milestone implementation but that isn't available, budget $100,000 or $50,000 and demonstrate the willingness and intent to make progress. If immediate implementation is not possible, make progress on programmatic milestones such as securing new revenue sources. For example, consider establishing authorization for a stormwater utility fee, even if that fee isn't implemented immediately. Establish voluntary programs for reforestation, signup commitments to use less lawn fertilizer, subsidize rain barrels and rain gardens, and provide incentives for re-development that will use new stormwater controls.

Milestone Evaluations and Avoiding Consequences

Progress will be evaluated regularly, as noted. It is likely that some progress-evaluation issues will not become clear until the 2013 evaluation actually occurs and will be sensitive to context. For example, if a milestone was not met because of an unforeseen circumstance, but will be caught up in the future, the consequences will likely be different from a situation where no effort at all was made to meet a milestone.

Federal Oversight

As noted above, the State and EPA will be having quarterly meetings to discuss State progress. State progress will of course reflect local progress.

What happens if a jurisdiction isn't making satisfactory progress? If jurisdictions fail to make progress, the State might not meet its goals. If that occurs, EPA will establish relatively-short time lines (on the order of three months) to require a plan to catch up and begin implementation. If EPA brings consequences, we hope they will focus on the sectors that are lagging; however, EPA has made it clear that they have the greatest authority through federal funding and regulatory programs: municipal and industrial discharge permits, municipal separate storm sewer system permits (MS4), and CAFOs.

State Oversight

Maryland is very fortunate to have many local jurisdictions that have made significant commitments to the WIP process and to Bay restoration efforts. The State will continue to engage the local teams quarterly via webinars, conference calls and meetings to report progress

and challenges, and provide ample time to address problems. MDE looks forward to continuing to work with the teams to address funding issues and other obstacles and find cost-effective ways to meet Bay restoration goals. Over the long term, a cooperative partnership approach will be most effective.

At the same time, MDE recognizes the need to track and report progress, and to be prepared for the possibility that progress will be insufficient in some areas. If reporting shows that individual jurisdictions or sectors are not meeting their milestones, the State will work closely with the parties involved to help them overcome obstacles and get back on schedule. MDE would begin with discussions and negotiations, and would be compelled to impose escalating consequences only if progress remained stalled. Specific consequences will not be identified unless they are required, and will be appropriate to the nature and level of the insufficiency. Consequences could include the following:

- Establishing enforceable compliance schedules.
- Reviewing environmental regulatory authority delegated to the jurisdiction.
- Redirecting grants and loans.
- Reviewing Maryland's voluntary agricultural programs to determine their effectiveness in meeting the WIP commitments and to assess whether such programs should begin to include mandatory components.
- Refining requirements or eligibility criteria associated with construction general permits.
- Targeting use of individual construction permits.
- Bringing non-permitted stormwater jurisdictions under the federal NPDES program.
- Tightening permit requirements where appropriate.

EPA's response to submissions from Virginia and Pennsylvania, respectively, can also provide a better understanding of possible consequences: http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/Phase2WIPEvals/VAWIPMilestoneEvaluation21512_final.pdf and http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/Phase2WIPEvals/PAWIPMilestoneEvaluation21520 12_final.pdf . At this time, EPA has not indicated any consequences for Maryland (http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/Phase2WIPEvals/MDWIPMilestoneEvaluation21512_final.pdf).

Although Maryland will be reporting to EPA at the basin scale, consistent with necessity and EPA expectations, it will continue to track local milestones, or create such milestones if none are submitted. Local governments make many decisions that impact pollution loads, thus responsibility must accrue where there is authority. The model accuracy is sufficient for planning and for assigning responsibility for the interim implementation goal. There is no chance that jurisdictions will exceed required reductions, thus there is a very strong expectation that all jurisdictions and all sectors will make progress commensurate with their milestones, the interim reduction targets in the WIP, and the time frame allotted to achieve these goals.

Addressing Future Growth

Maryland's Accounting for Growth (AfG) strategy is being developed in response to EPA's requirement that new loads be addressed. As noted in Section I, Maryland has committed to both allocate for and offset new loads. This strategy is absolutely essential to meeting our goals as well as being required by EPA. However, it will have significant implications and will be complex in implementation; local jurisdictions should plan on allocating time to review and comment on the strategy when it is available.

Helpful Legislation

Regardless of whether funding or other bills passed in the 2012 session, it is clear that the General Assembly is aware of concerns about the need for more pollution controls and the costs of the restoration effort. The number and diversity of bills indicates that the Maryland General Assembly is seeking ways to provide additional funding and additional flexibility for existing funding or create a level playing field in competitive economic sectors.

The following bills submitted in the 2012 session of the General Assembly reflect the attention being given to the Bay Restoration.

- HB 412 requires that the timing of winter application of sludge is the same as for manure.
- HB 445 (cross file SB 236) Sustainable Growth and Agricultural Preservation Act of 2012 (aka Septics bill) prevents nitrogen loads from septic tanks, encourages Smart Growth and preserves agricultural land. [Adopted]
- HB 446 (cross file SB 240) increases the Bay Restoration Fund [Adopted]
- HB 486 (cross file SB 823) requires that MDE provide a ranked list of best management practices.
- HB 529 made state lands subject to local stormwater fees.
- HB 549 requires MDE to create alternate inspection methods to promote maintenance of stormwater practices.
- HB 1303 raised the maximum amount of cost share for agricultural projects. [Adopted]
- HB 1304 moved the Animal Waste Technology Fund from the Department of Business and Economic Development to the Department of Agriculture. [Adopted]
- HB 1309 provides an income tax deduction for agricultural management equipment.
- HB 1333 requires the Department to pay from 100% to 25% of the cost differential for on-site disposal systems with nitrogen removal technology.
- SB 118 adds sediment certification to the existing nutrient certification program. [Adopted]
- SB 152 (Budget Reconciliation and Financing Act of 2012) continues funding to the Chesapeake Bay 2010 Trust Fund [Adopted]
- SB 594 prohibits the winter application of biosolids and manure and requires injection or incorporation during the summer months.
- SB 614 (cross file HB 987) requires each county and municipality to adopt laws or ordinances to establish a watershed protection and restoration program that includes setting a stormwater remediation fee to fund implementation of local stormwater management plans and practices. [Adopted]

2013 to 2017

EPA has committed to re-evaluate the Bay watershed model for support of the Phase III WIP due in 2017. A key principle of the model evaluation is to provide greater geographic resolution to enable successful engagement of local partners. Many jurisdictions documented concerns with regard to land uses, number of septic systems or agricultural BMP implementation and processes in their WIP submissions. Those concerns will provide a basis for discussions with EPA on data and model revisions. Addressing these concerns is an ongoing process, but will likely be most active from 2013 to 2015.

EPA has provisionally decided to provide the revised model for State review in about 2015. This will allow any outstanding issues to be resolved and accepted by the Bay states before the model is used to confirm the TMDL allocations and for the Phase III WIP process.

Many concerns about the Bay watershed model were actually concerns about the BMPs input to the model, especially concerns about voluntarily implemented agricultural BMPs and new technologies that were not captured in the model input. It will be up to local jurisdictions, the State and conservation districts to work between now and 2015 to assure that all the implementation, both urban and agricultural, is accurately inventoried and reported so it can be credited properly.

In completing and submitting the Phase II WIP, Maryland has finished the sprint portion of this challenge. From March 2012 to 2017 we will all be in the marathon portion of the challenge. Maryland needs to demonstrate continuing, incremental progress from all sectors to meet the goal.

"Research and Development"

There are still a number of issues that remain to be addressed with additional work in the future – some long-term, some short, some technical, some policy. The time line for development of these issues will be specified as short-term (0.5 – 2 years), intermediate (2 – 5 years), and long-term (> 5 years). This list is not in priority order.

1. Urban nutrient management. There are still open questions as to exactly what comprises urban nutrient management, how it will be applied and credited, and how it will be counted and verified. The Fertilizer Use Act of 2011 and education and outreach are both components, but much more detail will be needed and will be provided. Short-term.
2. Innovative best management practices. There is a process set up for determining the pollutant reduction efficiencies of new practices. In large part, the time frame is determined by collecting sufficient data, either from the literature or field experiments to justify a pollutant reduction efficiency for the practice. There are review work groups for each sector to evaluate the available data and make recommendations for incorporating the BMP into the model. Intermediate to long-term.
3. Trading. The geographic scope for trading needs to be finally determined and nonpoint source trading other than agriculture needs to be detailed. Any inconsistencies between "trading in time" and long-term trading will also need to be addressed. Short-term.

4. Correcting local data. Correcting local land use data and septic system numbers will be incorporated into the model improvements efforts that will take place between 2012 and 2017. Those improvements and corrections will be incorporated into MAST as well. Intermediate.
5. Accounting for Growth. In July, 2012, the State agencies developed a discussion draft policy paper on Accounting for Growth (AfG) and followed by discussion draft regulations in August, 2012. These policy documents were provided as part of a series of outreach events to solicit stakeholder views on the issue. The AfG policy is being developed in coordination with legislatively mandated septic system offset requirements as part of Senate Bill 236 adopted in the 2012 General Assembly session. For more information on this process, see: http://tinyurl.com/MD-Act4Growth**.** Short-term.
6. Atmospheric deposition. Atmospheric deposition is a significant source of nitrogen to the watershed. EPA is responsible for achieving the atmospheric allocation through national air regulations. Maryland is working on earning more reduction credit by implementing reductions from mobile sources clean cars and clean gas legislation.
7. Alternative Uses for Manure. Changes in nutrient management will require Maryland to develop economically viable alternative uses for animal manures, biosolids and other organic wastes. Development of market-based solutions that include value-added or energy-related technologies is essential.
8. Midpoint Assessment. The EPA Chesapeake Bay Program is leading an initiative entitled the "Midpoint Assessment." This initiative addresses technical details about evaluating progress, e.g., milestones, and evaluation of the tools and data, e.g., the Bay watershed model. MDE will encourage and facilitate local involvement in the Midpoint Assessment process beginning in late 2012. A mile-marker for the process is tentatively set for late 2014 when local data is due to EPA for use in re-calibrating the watershed model.

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