Phase I National Pollutant Discharge Elimination System
Permit No. 99-DP-3313 MD0068276

Permit Term October 2005 to October 2010

Annual Report Update
October 21, 2011

Submitted to:
Water Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Submitted by:
Highway Hydraulics Division
Maryland State Highway Administration
707 North Calvert Street, C-201
Baltimore, MD 21202

SHA
State Highway Administration

Martin O'Malley, *Governor*
Anthony G. Brown, *Lt. Governor*

State Highway Administration

Beverley K. Swaim-Staley, *Secretary*
Darrell B. Mobley, *Acting Administrator*

MARYLAND DEPARTMENT OF TRANSPORTATION

Date: October 21, 2011

RE: Annual NPDES MS 4 Phase I Report Update
Permit term 10/2005 to 10/2010
Permit No. 99-DP-3313 MD0068276
Continuation

Mr. Ray Bahr
Sediment, Stormwater and Dam Safety Program
Water Management Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 440
Baltimore, MD 21230

Dear Mr. Bahr: Ray

We are pleased to submit this updated report for the NPDES Phase I MS4 permit as a continuation of coverage under expired permit. The updated report covers the time period of October 1, 2010 to October 21, 2011. SHA remains committed to the environmental compliance and stewardship even in this difficult budgetary time for furthering the goals of this state towards the preservation and restoration of the Chesapeake Bay. We hope that you find this report presenting the hard work of many individuals throughout the organization and the work achieved through the commitment and leadership at much higher levels. We submitted a re-application for the NPDES Phase I Municipal Separate Storm Sewer System (MS4) permit on October 21 2009. We are awaiting a draft permit from MDE. SHA will continue to comply with the existing permit until the new permit is received from MDE.

SHA has made much progress this past year in fulfilling the requirements and the purposes of this permit. SHA has worked closely with the MDE over the last year to coordinate efforts with the Bay TMDL and Maryland Watershed Improvement Plan development.

As the State of Maryland has recognized the value in source control of stormwater by implementing the requirements of Environmental Site Design, SHA has realized the value of numerous stormwater credits built over the years for which no accounting exists. SHA will continue its efforts to account for those non-structural practices in truly quantifying the impervious surface that is not treated by any management practice. SHA is in the process of quantifying for current capacity for pollutant load reductions by structural, non-structural BMPs and other strategies.

10/21/2011

An electronic file of the report and the MDE database tables is be supplied on a CD and included with this report. We look forward to the coming year and continued growth of our program as well as partnership between our agencies. If you have any questions or need any additional information regarding the SHA NPDES MS 4 program, please contact me at 410-545-8390.

Sincerely

Karuna Pujara

Attachment

CC: Karen Coffman
Dana Havlik
Kirk McClelland
Sonal Sanghavi

Phase I National Pollutant Discharge Elimination System
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Updated Annual Report
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PART TWO

Executive Summary

The Maryland State Highway Administration (SHA) is submitting this updated annual report for the NPDES Phase I Municipal Separate Storm Sewer System (MS4) permit that was issued in October 2005 by the Maryland Department of the Environment (MDE) Water Management Administration (WMA). This annual report covers the time period October 2010 to October 2011.

A summary of the permit conditions and our work toward meeting them is provided below as a general overview of SHA permit activities for this report period.

Source Identification

Source identification efforts were completed as reported in the 2008 annual report. Updates to the databases for each NPDES county are on-going. Work has begun to incorporate NPDES related data in the overall SHA workflows. The impervious accounting condition has been completed for the nine Phase I counties, however the SHA is reexamining impervious related data and accounting procedures. Updates to the impervious layers will be preformed on an as needed basis.

Discharge Characterization

We continue to investigate and research topics in order to maximize water quality in our construction methods, permanent stormwater runoff controls, decisions in design, and location of roadways and maintenance techniques. Previous reports have included completed research projects. One study seeks to optimize our bioretention soil media and the second seeks to evaluate the function of infiltration facilities that have transitioned to wetlands in terms of quality and quantity stormwater treatment.

Management Program

Our program continues to effectively incorporate all permit components. While we have kept our sights on the development of the environmental site design (ESD) regulations, we have continued to measure our performance in the areas of erosion and sediment control during construction, illicit discharge detection and our internal business goal of maximizing the number of functionally adequate stormwater facilities statewide.

The ESC Program developed and implemented the ESC Quality Assurance Toolkit (QA Toolkit). This tool allows field inspectors to enter inspection results directly into a field that is connected to the general ESC inspection database through the internet. This improves efficiency, accuracy of data entry and reporting.

The *One Million Tree Initiative* was achieved in the Spring 2011. SHA has partnered with MD DNR, FHWA and the Maryland Department of Safety and Correctional Services to plant a million trees in Maryland as part of Governor O'Malley's *Smart, Green and Growing* initiative.

The Design Build Operate and Maintain (DBOM) pilot to place the operations and maintenance responsibilities for permanent stormwater management facilities with a private company continues. The contract is in its last year and SHA plans use this contracting format in the near future.

Watershed Assessment

Coordination with local NPDES jurisdictions continues. We are also moving forward with watershed restoration sites within the Patuxent River Watershed. With the EPA Green Highway grant, SHA is nearing the completion of

formalizing an implementation framework for watershed-based stormwater design within SHA which could be applicable to any transportation agency.

Watershed Restoration

SHA continues to implement watershed restoration projects and increase the treated imperviousness within selected watershed. Additional studies are underway to improve the existing accounting processes. Policy and organizational changes will improve SHA's ability to meet the Chesapeake Bay TMDL and Maryland Watershed Implementation Plan.

Assessment of Controls

The Long Draught Branch stream restoration project has been resurrected but with delayed funding until 2014. We will continue the project with the post-construction monitoring when the project is completed. The Wet Infiltration Basin Transitional Performance Study will augment data on assessment of controls.

Program Funding

In this tough economic climate, the NDPES remains a top funding priority. Our NPDES program remains fully funded.

Total Maximum Daily Loads

SHA has worked closely with the MDE over the last year to coordinate efforts with the Bay TMDL and Maryland Watershed Implementation Plan development. We have developed a strategic plan and dedicated funding and engineering resources. We face these fiscal and organizational challenges of compliance with the desire to improve the Bay water quality and demonstrate the SHA commitment to our natural resource preservation and Bay restoration.

PART ONE

Standard Permit Conditions and Responses

Introduction

The Maryland State Highway Administration (SHA) is committed to continuing our National Pollutant Discharge Elimination System (NPDES) Program efforts and is pleased to partner with the Maryland Department of the Environment (MDE), the Environmental Protection Agency (EPA) and other NPDES jurisdictions in order to achieve the program goals.

The original NPDES phase one permit guided SHA through establishing our NPDES program. (The permit, MS-SH-99-011, was issued on January 8, 1999 and expired in 2004.) The current permit (99-DP-3313, MD0068276, issued October 21, 2005 and recently expired on October 21, 2010) focused on improving water quality benefits, developing impervious accounting database and developing a watershed-based outlook for stormwater management and NPDES program elements. We submitted a re-application for the NPDES Phase I Municipal Separate Storm Sewer System (MS4) permit on October 21 2009. We are awaiting a draft permit from MDE. SHA will continue to comply with the existing permit until the new permit is received from MDE.

This is the update annual report for the recently expired permit. The report covers a reporting period of October 1, 2010 through October 1, 2011. Part One of the reports lists the permit conditions and explains SHA activities over the last year in compliance with each condition. Wherever possible, future activities and schedules for completion are provided. In depth discussions for some of the major program components follow this section. Part Two of this report discusses the SHA Stormwater Facility Program in depth. A number of appendices are included at the end of the report that contain research reports, examples of data and other detailed information.

A CD is also included that contains portable document format (PDF) files of the entire report and delivery of database updates for new data collected over the last year. We have included updated Table A and Table F. The impervious surfaces geodatabases are not delivered this year as the data delivered last year is the most current.

A Administration of Permit

Administration responsibilities of the NPDES MS4 permit for SHA is listed below and an organizational chart is attached as Figure 1-1.

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NPDES Industrial Permits and associated activities are coordinated by:

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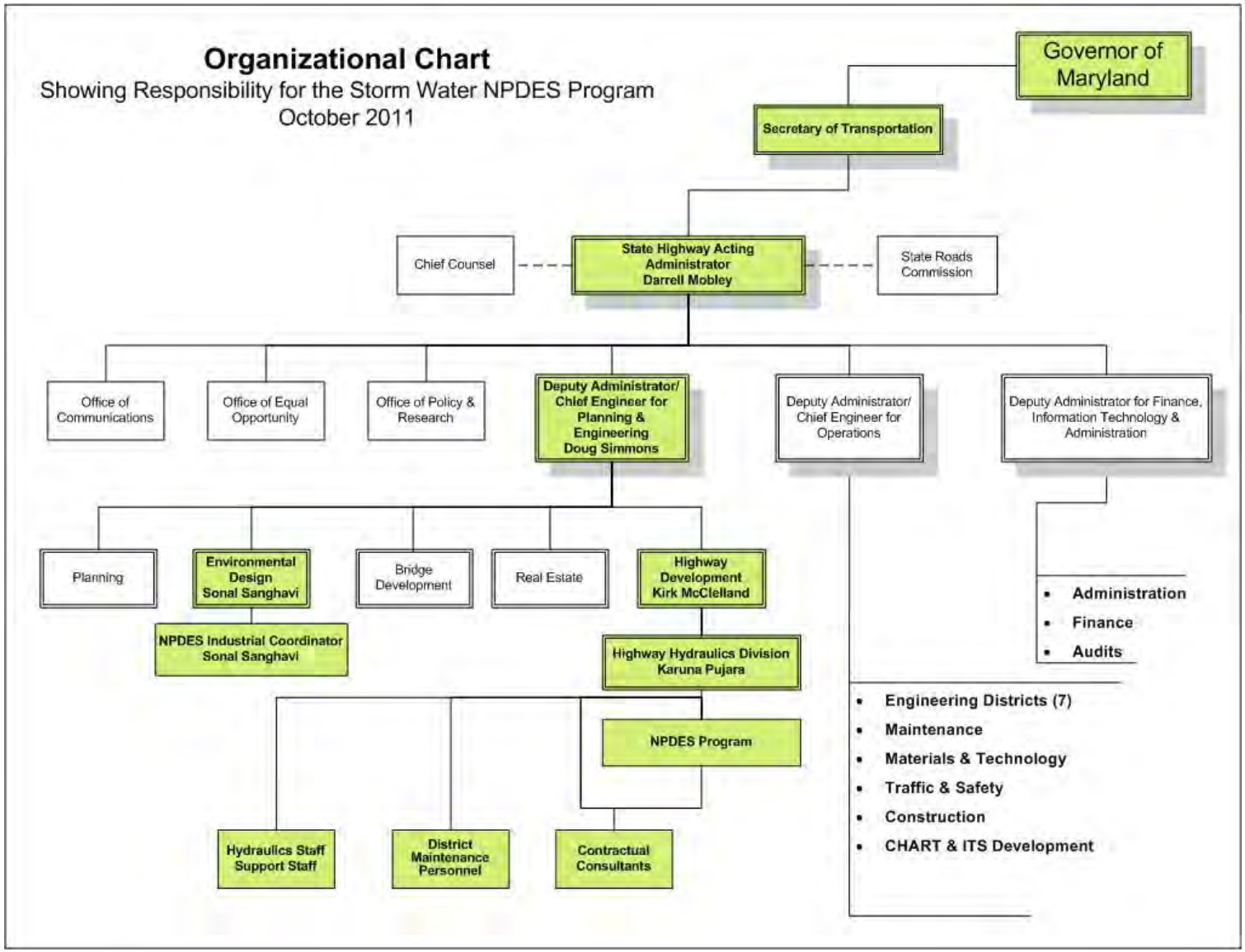

Figure 1-1: Organizational Chart for NPDES Permit Administration

B Legal Authority

A description of the legal authority maintained by SHA was restated in the fourth annual report dated October 21, 2009 and remains unchanged.

C Source Identification

Source identification deals with identifying sources of pollutants and linking those sources to specific water quality impacts on a highway. Source identification is tied to impervious surfaces and land uses.

For this permit term, MDE has defined the source identification effort as completing the description of the SHA storm drain and BMP system, submitting BMP data to MDE and creating an impervious surface account.

Maryland SHA has successfully completed the GIS development of SHA storm drain systems within the nine Phase I MS4 counties. We are utilizing advances in technology and software improvements to more effectively and efficiently collect and maintain data sets. These process improvements will enhance communication between offices regarding the goals and needs for NPDES.

C.1 Describe Storm Drain System

Requirements under this condition include:

Complete Source identification requirements by October 21, 2009; Address source identification data compatibility issues with each jurisdiction where data are collected. Data shall be organized and stored in formats compatible for use by all governmental entities involved; continually update its source identification data for new projects and from data gathered during routine inspection and repair of its municipal separate storm sewer system; and submit an example of source identification for each jurisdiction where source identification is being compiled.

C.1.a Complete Source Identification

SHA completed the identification and GIS development for our storm drain systems and stormwater management facilities in 2008, well before the October 21, 2009 deadline. Our focus has shifted to updating our source identification information for all nine counties. Information on source identification updates is included under section C.1.c, Update Source ID Data.

C.1.b Data Compatibility

SHA continues to provide data to the other NPDES jurisdictions and MDE as well as acquire data from them. The NPDES data generated by SHA is in standard ESRI Geodatabase format. The geospatial database is deployed using the ESRI Geodatabase data format in an ArcSDE enterprise environment.

Geospatial Database Development

SHA has developed a geospatial database for our source identification and inspection data. This database will be expanded to include other components of the program as they are brought together and as we update our standard procedures and inspection manuals. All of the SHA NPDES data including source identification, BMP inspections, outfall screening, outfall inspections, and impervious area are currently housed in the database.

eGIS is a web based application that was developed to display content themes for decision making purposes. Content themes allow the user to overlay datasets without extensive knowledge of the ESRI tools sets. NPDES data has been included as a content theme. See Figure 1-2 for an example of data displayed in eGIS.

Descriptions of the database development used in the administration and the compliance of the SHA's NPDES program were included in the 2010 Report. All application updates are based on available resources and new technological advances. Table 1-3 represents the upgrade status.

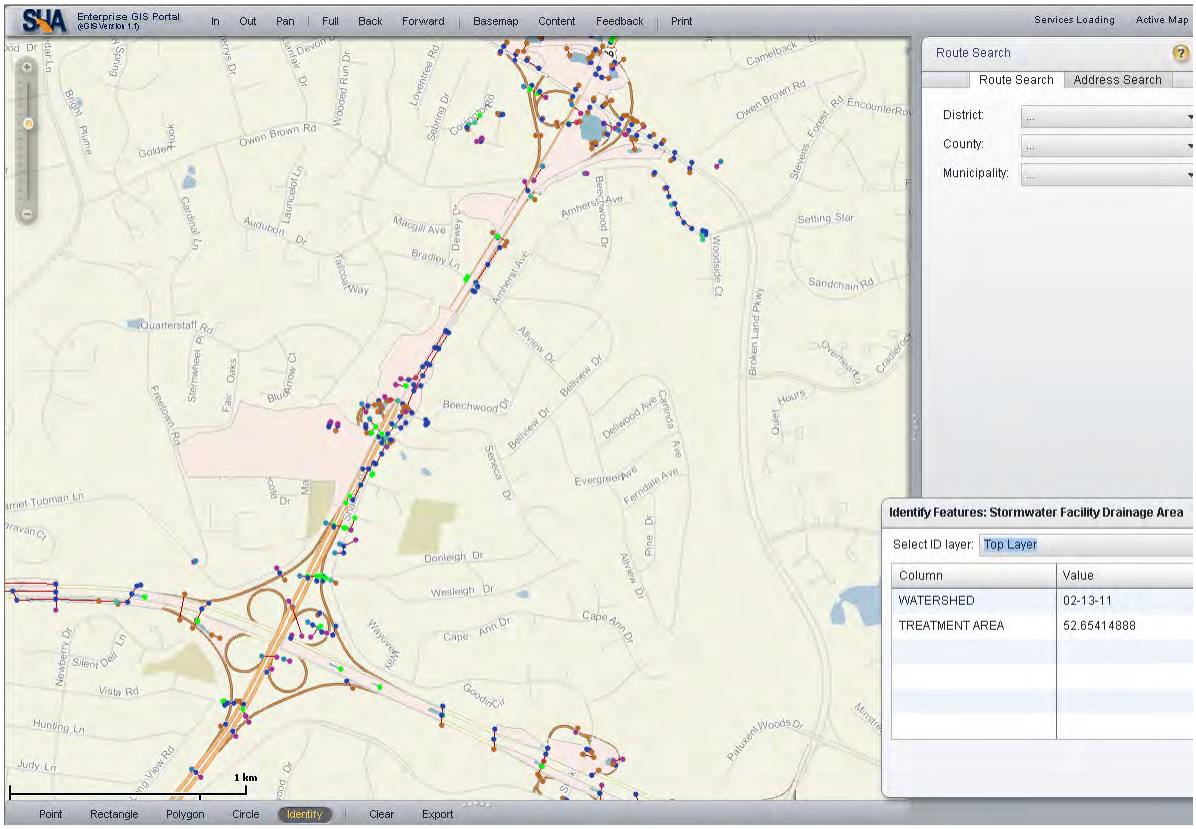

Figure 1-2: eGIS Viewer

Table 1-3: Status GIS Applications

Phase of Development	% Complete
SWM Program Module	90
BMP Numbering Module	50
WQ Bank/Imp. Accounting Module	65
Outfall Program Module	10
eGIS Integration	10

GIS Standard Procedures Manual

We are continuing to develop our standard procedures which document data collection, inspection and data management standards for our NPDES data.

Efforts to finalize the standard procedures continue and our goal is to publish a complete document this coming year.

C.1.c Update Source Identification Data

Since the initial source identification is complete for all the NPDES MS4 Phase I counties, the permit activity for this condition now focuses on updating the source data.

Source identification updates are performed every three years or once the maintenance and remediation efforts are complete for a particular county. Last year, we reduced our updates to meet reduced budget constraints. This year we have increased our efforts and initiated three additional counties, Frederick, Montgomery and Harford.

Also, we will be expanding efforts in Baltimore and Howard counties to complete the full MS4. Last year we reduced the scope to inventory and inspect only new BMPs including associated storm drains and screen 150 outfalls for illicit discharges. The reduced work is anticipated to be completed by February but we will expand efforts to inventory and inspect the remaining BMPs, storm drain and outfalls this coming year.

Future updates will be performed according to Table 1-4.

Table 1-4: Source ID Schedule

County	Source ID Complete	1st Update	2nd Update
Howard	1/2001-C	1/2005-C	6/2011–G
Montgomery	1/2001 - C	9/2006-C	5/2011 - C
Anne Arundel	8/2003 - C	8/2012 - A	10/2015-A
Prince George's	3/2003 - C	6/2011 - C	6/2014-A
Baltimore	3/2004 - C	6/2011 - G	2/2015-A
Harford	8/2005 - C	2/2011 - C	1/2014 - A
Frederick	9/2006 - C	1/2011- C	5/2014 - A
Carroll	5/2008 - C	12/2012-A	7/2015 - A
Charles	6/2008 - C	8/2011- P	9/2015 - A

Note:
C = Completion date
P = Project Initiation date
A = Anticipated Completion Date
G = Partial Update Completed

Anne Arundel County – Identifications of the separate storm water system that were not included in the previous inspections are underway. Routine inspections are continuing and on-going

Baltimore County – Identifications of the separate storm water system that were not included in the previous inspections are underway. Routine inspections are continuing and on-going. Identifications were included as a part of the 2010 report.

Carroll County – Identifications of the separate storm water system that were included as part of the 2009 and report and SHA is preparing to update this data.

Charles County – Identifications of the separate storm water system is being planned.

Frederick County – Identifications of the separate storm water system as a part of this report. Tables are included on the CD.

Harford County – Identifications of the separate storm water system as a part of this report. Tables are included on the CD.

Howard County – Identifications of the separate storm water system that were not included in the previous inspections are underway. Routine inspections are continuing and on-going. Identifications that was included as a part of the 2010 report.

Montgomery County – Identifications of the separate storm water system as a part of this report. Tables are included on the CD.

Prince George's County – Identifications of the separate storm water system that were not included in the previous inspections are underway. Routine inspections are continuing and on-going. Identifications were included as a part of the 2010 report.

C.1.d Submit Example of Source Identification Data

Below is an example of the Source Identifcatoin Data

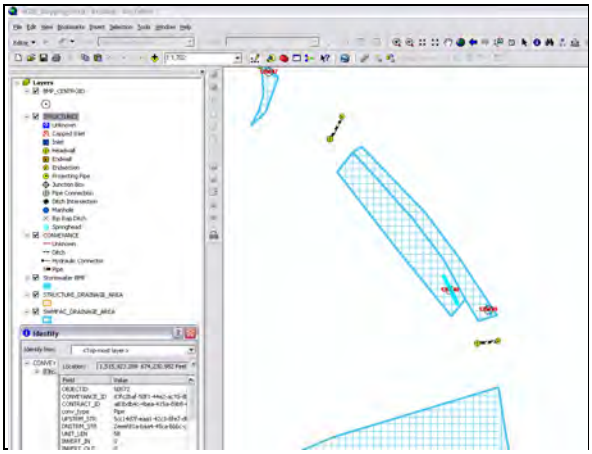

Figure1-5: Example of Data

C.2 Submit BMP Data

Database tables are included on the enclosed CD for the data that has not been delivered previously. We have delivered the latest database Table A, and Table F. This includes Phase I, Phase II, and Non-NPDES counties. Datasets in Non-NPDES are not completed.

C.3 Create Impervious Surface Account

This condition requires that SHA provide a detailed account of impervious surfaces owned by SHA and an account of those acres of impervious surface controlled by stormwater

management, broken out by SHA engineering district. This account will be used to identify potential areas for implementing restoration activities.

We completed the impervious accounting requirement. The baseline accounting numbers are reflected in the 2010 report.

Newer right-of-way layers were developed over the last year for SHA and will be used for updates to the impervious layers in the future.

We have also proceeded to develop impervious layers for the Phase II MS4 areas and the non-MS4 counties in Maryland in anticipation of Chesapeake Bay TMDL and Maryland Watershed Implementation Plan compliance. Figure 1-6 shows as an example of the impervious accounting that was provided in the 2010 Report. Figure 1-7 restates SHA's treated and untreated impervious accounting.

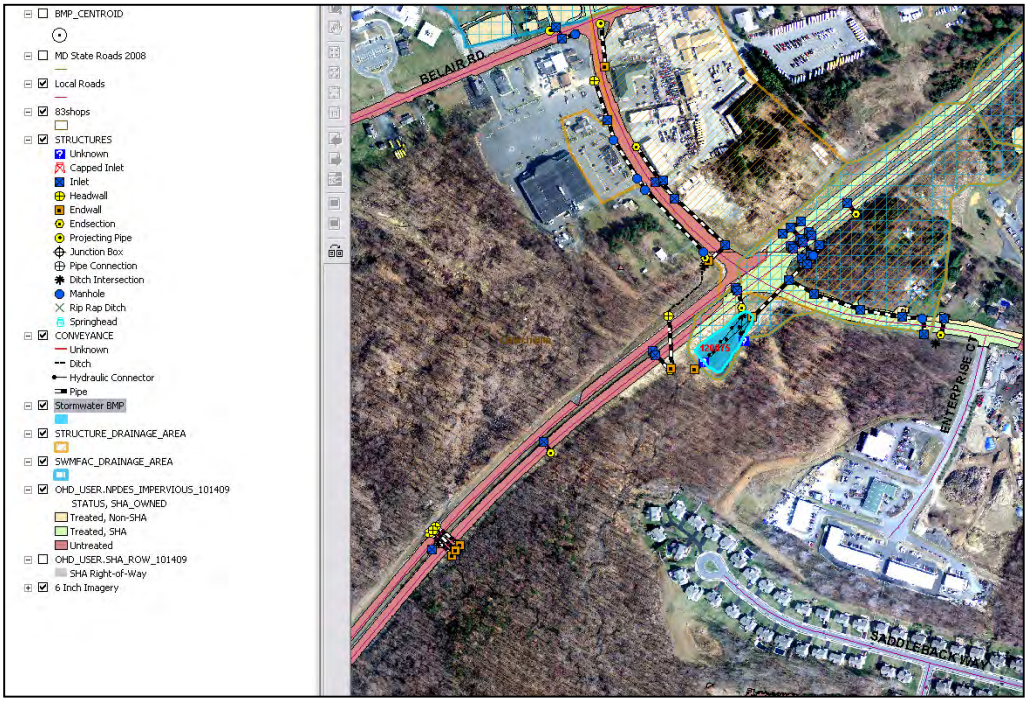

Figure 1-6 Example of Impervious Layer

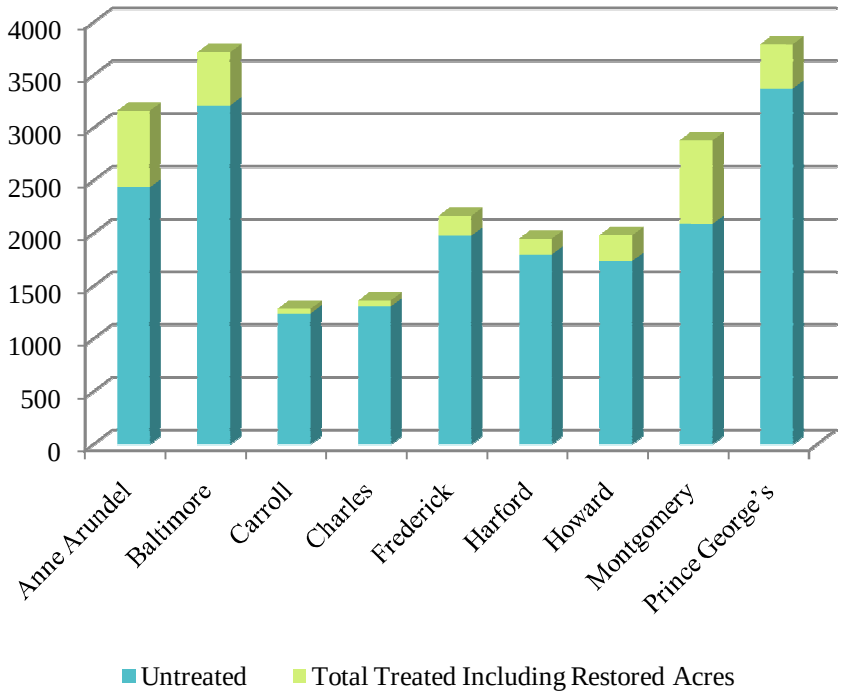

Figure 1-7: SHA-Owned Impervious Surface Treatment in Phase I Counties

D Discharge Characterization

This current permit term looks at scrutinizing the available MDE dataset compiled from eleven NPDES jurisdictions and other research performed nationally to improve stormwater management programs and develop watershed restoration projects. We are continuing our efforts to understand stormwater runoff associated with highways by reviewing available literature and studies on the subject and by conducting studies to further our understanding.

The following studies have been sponsored by SHA and were included in previous annual reports or reporting periods:

Field Evaluation of Water Quality Benefits of Grass Swale for Managing Highway Runoff

Nutrient Removal Optimization of Bioretention Soil Media.

Grassed Swale Pollutant Removal Efficiency Studies, Part II.

Literature Review: BMP Efficiencies for Highway and Urban Stormwater Runoff.

Low Impact Development Implementation Studies at Mt. Rainier, MD, October 2006.

Grass Swale Study – Part II, October 2006.

Annual Report: Pindell School Road Storm Sampling, KCI, March 7, 2000;

National Highway Runoff Study: Comparison to MSHA Sampling Results, KCI, December 2001;

Dulaney Valley Road I-695 Interchange Stream Monitoring at the Tributary to Hampton Branch, KCI, Annual Reports dating 2000 to 2003.

Methods for Detection of Inappropriate Discharges to Storm Drainage Systems, Robert Pitt, University of Alabama, November 2001

Illicit Discharge, Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection, October 2004

Water Quality Analyses for NEPA Documents: Selecting Appropriate Methodologies, AASHTO & NCHRP, July 2008

A User's Guide to Watershed Planning in Maryland, Center for Watershed Protection, December 2005.

Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, Metropolitan Washington Council of Governments, July 1987.

Pollutant Loadings and Impacts from Highway Stormwater Runoff, Volumes I-IV: Design Procedures, FHWA/RD-88-0006-9, Driscoll & Strecker, Federal Highway Administration, 1990.

Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance, Environmental Protection Agency, December 2003

Guidelines for Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts, NCHRP Report 577.

Assessing the Role of Road Salt Run-off on the Critical Ecological interactions that Regulate Carbon Processing in Small, Headwter Streams in the Chesapeake Bay Watershed, Chris Swann, MWRRC, 2006.

Pollutant Mass Flushing Characterization of Highway Stormwater Runoff from an Ultra-Urban Area, Flint and Davis, June 2007.

Choosing Appropriate Vegetation for Salt-Impacted Roadways, Center for Watershed Protection Technical Note # 56.

Rating Deicing Agents: Road Salt Stands Firm, Center for Watershed Protection Technical Note # 55.

Increased Salinization of Fresh Water in the Northeastern United States, Kaushal, Groffman, Likens, Belt, Stack, Kelly, Band and Fisher, August 2005.

Pollutant Loadings and Impacts from Highway Stormwater Runoff, Volumes I-IV: Design Procedures, FHWA/RD-88-0006-9, Driscoll & Strecker, Federal Highway Administration, 1990

The following studies are currently under progress by the University of Maryland, Department of Civil Engineering, and progress reports were included as a part of the 2010 Report.

Field Evaluation of Water Quality Benefits of Grass Swale for Managing Highway Runoff – This study looks at the affect of installing check dams that are composed of native warm season grasses into the previously studied swales. We are interested in the concept of grassed check dams because of the safety and maintenance implication. They can be run over without much injury or damage to the motorist or vehicle, and only require growth to re-establish the check dam. Because native grasses have extensive root systems and encourage other soil processes, it was deemed useful to analyze the affects these grasses would have on our study swales and pollutant removal. A progress report is provided as a part of the 2010 report; however the results are not conclusive. We will pursue other studies in this vein.

Nutrient Removal Optimization of Bioretention Soil Media – This study was initiated in August 2008. Although new research continues to address arising challenges, bioretention is still a very immature technology and a number of problems and questions remain. One focal point of several questions concerns the media employed in the bioretention facility. The media controls many of the critical performance functions in bioretention (filtration, infiltration, adsorption, microbial substrate, vegetative support), yet we are far from having a good understanding about the critical design and operation components of the media and the resulting performance.

Optimization of media design was investigated for pollutant capture, with a focus on the nutrients phosphorus and nitrogen. A review of current literature and critical analysis of amendment options based on treatment capacity, cost, and local availability led to the selection of aluminum water treatment residual (WTR) as an ideal BSM amendment for phosphorus capture and retention.

This, coupled with other measures such as vigorous facility vegetative cover, is hypothesized to be ideal for nutrient removal from stormwater in bioretention facilities. A copy of the final progress report is included as a part of the 2010 Report.

Wet Infiltration Basin Transitional Performance Studies – This study was initiated in August 2008. One particular practice of interest to SHA is the infiltration basin. Over the past few decades, a multitude of infiltration basins have been constructed for stormwater management. Inspections have shown that these infiltration basins are no longer functioning as originally intended and designed. These practices have gradually transformed into wetland-like practices that appear to have both water quality and hydrologic management functions. Therefore, rather than a failure, these sites should be classified as functioning stormwater management practices and this study seeks to develop evidence to this end.

Target pollutants to be monitored include total suspended solids (TSS), nitrate, nitrite, total Kjeldahl nitrogen (TKN), total phosphorus, copper, lead, zinc, and chloride. These pollutants are of the greatest concern in roadway runoff because their concentrations often exceed the limits set by anticipated total maximum daily loads (TMDL) requirements.

Figure 1-8: View of BMP 130348 at Outflow Point

Figure 1-9: Instrumentation at Failed Infiltration Basin No. 130348

A total of 31 storms have been assessed and the hydrologic response to these storm events has been monitored. The results indicate that the stormwater control measure (SCM) is effective in managing the runoff flows overall. The SCM assimilated the entire inflow volume without producing any outflow for 52% of the monitored events. The mean volume reduction achieved through the SCM for the monitored events was 67%. Flow delays and peak attenuation (mean peak reduction= 56%) were observed during events with outflow.

Water samples were taken for nine storm events as well as eleven dry-weather periods to determine the water quality provided by the SCM. The event mean concentrations (EMCs) of the target pollutants found in the outflow have been consistently lower than those found in the inflow for all sampled events. Results of the computed efficiencies may be found in Table 1-10. In addition, with the exception for total phosphorus, the outflow EMCs of TSS, oxidized nitrogen (nitrite and nitrate), and heavy metals (copper, lead, and zinc) meet the selected water quality criteria for the majority of the events monitored. For example, pollutant removal efficiencies for eight sampled storm events have been found to be as follows:

Table 1-10: Pollutant Removal Efficiency

Pollutant	Removal Efficiency
TSS	91-100%
Oxidized nitrogen (nitrate and nitrite	76-100%
TKN	(38-100%)
Total Phosphorus	60-100%
Copper	64-100%
Lead	29-100%
Zinc	18-100%

Enhancements for Nitrogen and Phosphorus Removal from Existing Stormwater Management Facilities

A proposal has been submitted and approved for a research endeavor to examine ways to improve performance of nitrogen and phosphorus removal

in existing stormwater management facilities. The first type of facility to be examined is surface sand filters.

We are aware that the next permit term will have greater TMDL involvement with waste load allocation requirements. By determining the most effective ways to improve nitrogen and phosphorus removal within existing facilities we can enhance our ability to meet TMDLs. Additional information will be included in the future annual report.

E Management Program

A management program is required to limit the discharge of stormwater pollutants to the maximum extent practicable. The idea is to eliminate pollutants before they enter the waterways. This program includes provisions for environmental design, erosion and sediment control, stormwater management, industrial facility maintenance, illicit connection detection and elimination, and personnel and citizen education concerning stormwater and pollutant minimization.

E.1 Environmental Design Practices

This permit condition requires that SHA take necessary steps to minimize adverse impacts to the environment through the roadway planning, design and construction process. Engaging the public in these processes is also required.

The Maryland State Highway Administration has a strong environmental commitment that has only increased as the new Stormwater Management Act of 2007 was implemented in May 2010. Through this legislation, emphasis was placed on the use of environmental site design (ESD) techniques. We are actively working ESD measures into roadway projects as part of the May 2010 implementation.

SHA also continues to adhere to processes that ensure that environmental and cultural resources are evaluated in the planning, design, construction and maintenance of our roadway network. This includes providing opportunity for public involvement and incorporating context sensitive design and solution principles. We also ensure that all environmental permitting requirements are met by providing training to our personnel (see E.6.b below) and creating and utilizing software to track permitting needs on projects as they move through the design, advertisement and construction processes.

NEPA/MEPA Process

Our National Environmental Policy Act/ Maryland Environmental Policy Act (NEPA/MEPA) design and planning process, includes environmental assessments for any project proposed within SHA right-of-way or utilizing state or federal funding. This includes projects granted Transportation Enhancement Program funds that are carried out by other jurisdictions. The environmental assessments determine the direction environmental documentation must take, whether Categorical Exclusion (CE), Finding of No Significant Impact (FONSI) or Environmental Impact Statement (EIS). Environmental assessments include land use considerations, water use considerations, air use considerations, plants and animals, socio-economic, and other considerations.

Increasingly, SHA is evaluating stormwater needs during the NEPA process. This movement to timing stormwater concepts in planning has affected our development process in several ways. Beginning the stormwater process earlier allows us to present more realistic concepts during public meetings and allows us to more accurately assess right-of-way needs. The drawback to this approach, however, can be that assumptions made in terms of the stormwater requirements may not be the final approved requirements. This last effect can have negative impacts on our permit approval process, public expectations, right-of-way acquisitions and design schedules. SHA encourages the stormwater regulatory reviewers to participate in the planning process by attending interagency meetings, reviewing concept plans and providing valid comments and concept approvals at the planning stage in the design.

It should be noted, however, that the planning process for major projects and the project development timeline can be greater than cycles of regulatory changes for water quality. This further introduces complexity in decision making

and public perception of accuracies of SHA projects and processes.

Effort is made to avoid or minimize environmental impacts. If impacts are unavoidable, however, mitigation is provided and monitored per regulatory requirements.

Environmental Research

In addition to the research studies mentioned above in Section D, Discharge Characterization, SHA has also pursued research and development studies to improve our understanding of the impacts certain BMPs have on the environment. Past studies include:

Thermal Impact of Underground Stormwater Management Storage Facilities on Highway Stormwater Runoff – The goal of the study was to identify and document the thermal reduction effects on stormwater in underground storage facilities. The reasons cited include low residency time, limited thermal transfer potential, principal thermal reduction due to reduction in direct solar radiation. No further studies on underground storage and thermal reduction are planned at this time. The final report was included as Appendix F in the 2008 annual report.

Mosquito Surveillance/Control Program – This three-year study conducted by Millersville University for Maryland SHA, investigated the connection between West Nile Virus (WNV) transmission and stormwater management facilities. West Nile viral encephalitis is a zoonosis in which people and horses are incidentally infected by mosquitoes that feed on both bird and mammalian hosts. No further work on mosquito issues is planned at this time as we are referencing the MD Department of Agriculture site for additional information and have consulted with them for eradication efforts. The final report was included as Appendix E of the 2006 annual report.

Prediction of Temperature at the Outlet of Stormwater Sand Filters – This study was begun in 2003 and the intent was to create a computer model of a sand filter BMP that will allow prediction of outlet temperature as a function of time. The approach is physics based, depending on energy and mass balances, and heat and mass transfer predictions. Rather than uniform flow, water tends to flow in channels or fingers through sand and other soils and this flow type is called preferential flow. This preferential flow resulted in less contact with sand particles and less transference of heat from the water to the sand. No further work on this predictive model is planned at this time. The final progress report was included as Appendix H in the 2007 report.

E.2 Erosion and Sediment Control

Requirements under this condition include:

Use MDE's 1994 Standards and Specifications for Soil Erosion and Sediment Control, or any subsequent revisions, evaluate new products for erosion and sediment control, and assist MDE in developing new standards; and

Perform responsible personnel ("green card") certification classes to educate highway construction contractors regarding erosion and sediment control requirements. Program activity shall be recorded on MDE's "green card" database and submitted as required in Part IV of this permit.

E.2.a MDE ESC Standards

SHA continues to comply with Maryland State and Federal laws and regulations for erosion and sediment control (ESC) as well as MDE requirements for permitting. We continue to implement the new NPDES Stormwater Construction Activity permit for all our construction projects that impact one acre or more in area.

We are maintaining implementation of the current Guidelines for State and Federal Projects Published January 1990 and Revised January 2004 and the *1994 Standards and Specifications for Soil Erosion* for our projects.

SHA has remained in compliance with the NPDES Construction Activity permit and has implemented changes in our construction inspection to adhere to the new inspection requirements. We continue to submit applications for coverage under this general permit for all qualifying roadway projects.

SHA ESC Quality Assurance Ratings

SHA continues to use our improved Quality Assurance rating system for ESC on all roadway projects. This effort improves field implementation of ESC measures by including an incentive payment to the contractor for excellent ESC performance or imposes liquidated damages on the contractor for poor ESC performance.

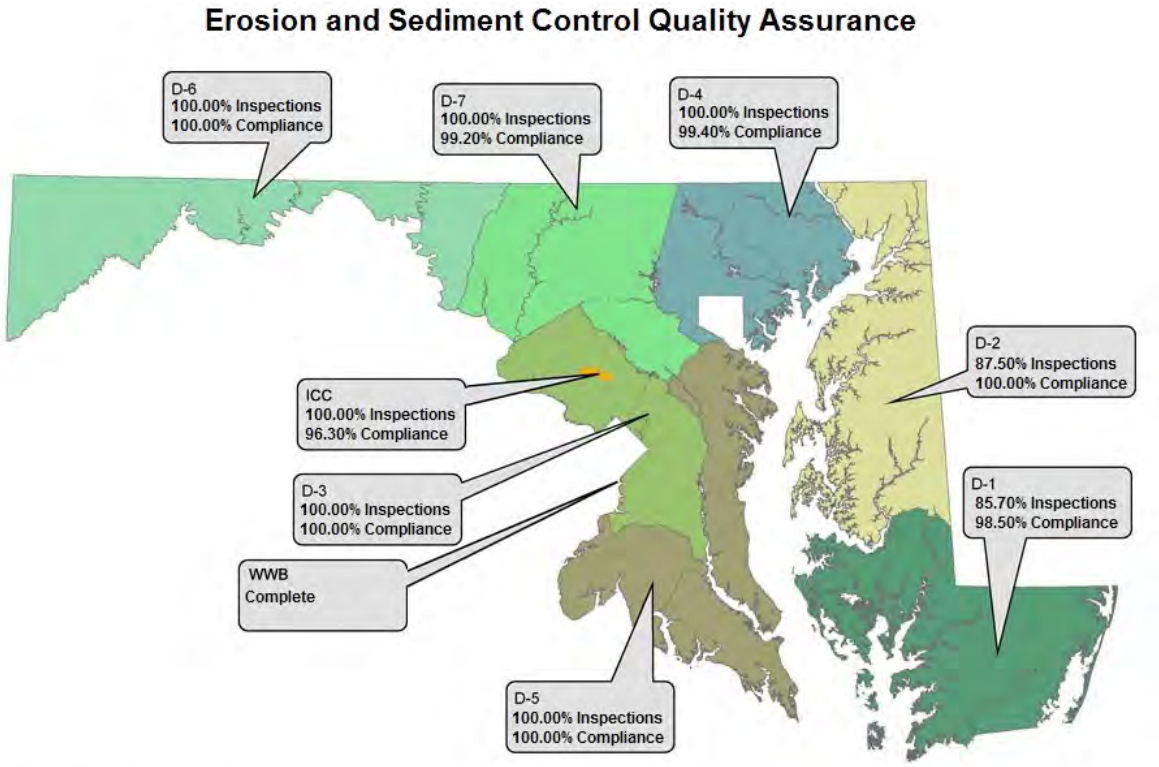

Figure 1-11: Erosion and Sediment Control Quality Assurance for FY2010, Fourth Quarter

SHA tracks QA inspections and ratings for reporting to our business plan (see Figure 1-11) and StateStat. Increased numbers of inspections and better documentation have improved the overall performance of our ESC program. It has also resulted in organizational changes within SHA. The QA inspection team is now housed under the Office of Environmental Design (OED). Incentive payments are made when the contractor receives an ESC rating score of 85 or greater. This incentive payment can be made quarterly (every 3 months) for projects that continue to receive 85 or greater ratings.

Liquidated damages are imposed on the contractor if the project receives a 'D' or 'F' rating. If two ratings of 'F' are received on a project, the ESC certification issued by SHA will be revoked from the contractor project superintendent and the ESC manager for a period of six months and until they complete and pass the certification training. This system of rewarding good performance and penalizing poor performance is expected to greatly improve contractor responsibility for ESC practices and improve water quality associated with construction activities.

AASHTO Gold Performance Excellence Award. The QA Team received an award from the AASHTO Standing Committee on Performance Management on October 1, 2010

recognizing their accomplishments in training, inspections and high project grades for SHA construction projects statewide.
Below is list of efforts that have been described in previous reports.

- Limit of Disturbance (LOD) Stationing
- Turf Acceptance Standard
- SHA ESC Field Guide
- ESC Quality Assurance (QA) Toolkit

E.2.b Responsible Personnel Certification Classes (Green Card Training)

SHA continued to sponsor and perform training for ESC Responsible Personnel Certification Classes over the past year. This training is conducted by SHA for SHA personnel, consultants and contractors.

SHA Basic Erosion and Sediment Control Training (BEST)

In addition to Green Card Training classes, SHA developed and implemented its own ESC Certification Program at two levels. Level I is known as BEST (Basic Erosion and Sediment Control Training). This day and a half training is aimed at contractors and field personnel and focuses on in-depth discussions of ESC design, construction and permitting requirements. This is also a prerequisite for Level II training.

The Level II training is intended for ESC design professionals. The Level II training began in June 2007. Progress in continuing developing this program has been delayed by released of new MDE standards.

Table 1-12: ESC Training SHA (1/2011 to 10/2010)

Type of Training	No. of Participants
Responsible Personnel (Green Card)	380
BEST Level I (Yellow Card)	349
BEST Level I (Yellow Card Recertification)	352
BEST Level II (Designer's Training)	0

E.3 Stormwater Management

The continuance of an effective stormwater management program is the emphasis of this permit condition. Requirements under this condition include:

Implement the stormwater management design principles, methods, and practices found in the 2000 Maryland Stormwater Design Manual, the 2009 update, and COMAR;

Implement a BMP inspection and maintenance program to inspect all stormwater management facilities at least once every three years and perform all routine maintenance (e.g., mowing, trash removal, tarring risers, etc.) within one year of the inspection; and

Document BMPs in need of significant maintenance work and prioritize these facilities for repair. The SHA shall provide in its annual reports detailed schedules for performing all significant BMP repair work.

E.3.a Implement SWM Design Manual and Regulations

SHA continues to comply with Maryland State and Federal laws and regulations for stormwater management (SWM) as well as MDE requirements for permitting. We also continue to implement the practices found in the *2000 Maryland Stormwater Design Manual* and the *Maryland Stormwater Management Guidelines for State and Federal Projects, April 15, 2010* for all projects. We have also implemented the requirements in the revised Chapter 5 of the 2000 Manual for environmental site design (ESD) and the Stormwater Management Act of 2007 for all new projects. Permitting needs are tracked for projects statewide through our Permit Database that is managed with Microsoft Office Access 2007 software.

E.3.b Implement BMP Inspection & Maintenance Program

Our continuing Stormwater Facility Program (managed by Ms. Dana Havlik) inspects, evaluates, maintains, remediates and enhances SHA BMP assets to maintain and improve water quality and protect sensitive water resources.

Inspections are conducted every three years as part of the NPDES source identification and update effort (see Section C, above). Maintenance and remediation efforts are accomplished after the inspection data has been evaluated and ranked according to SHA rating criteria.

Details of the Stormwater Facility Program are included as Part 2 of this document. Discussion of inspection results and maintenance, remediation, retrofit and enhancement efforts undertaken over the past year is included in that section.

As-Built Certification Process

SHA continues with our SWM facility as-built certification process. This process requires the design engineer to coordinate with MDE on the completion of as-built checklists and tabulations. The contractor is then required to inspect and certify the facility construction according to the approved design plans. SHA has made the delivery of this certification a separate pay item. As-built certification contract specification was revised in 2010.

Copies of the final approved as-built certifications are retained by SHA and integrated into the storm drain and BMP GIS/database. This information is then used as source identification updates are planned and assigned.

We are finding that compliance by the contractors is not consistent, and we are re-evaluating our process to determine a more effective means to achieve this requirement.

E.3.c Document Significant BMP Maintenance

See Part 2 for SWM Facility Program updates on major maintenance, remediation and BMP retrofits.

E.4 Highway Maintenance

Requirements under this condition include:

Clean inlets and sweep streets;

Reduce the use of pesticides, herbicides, and fertilizers through the use of integrated pest management (IPM);

Manage winter weather deicing operations trough continual improvement of materials and effective decision making;

Ensure that all SHA facilities identified by the Clean Water Act (CWA) as being industrial activities have NPDES industrial general permit coverage; and

Develop a "Statewide Shop Improvement Plan" for SHA vehicle maintenance facilities to address pollution prevention and treatment requirements.

E.4.a Inlet Cleaning and Street Sweeping

Mechanical sweeping of the roadway is essential in the collection and disposal of loose material, debris and litter into approved landfills. This material, such as dirt and sand, collects along curbs and gutters, bridge parapets/curbs, inlets and outlet pipes. Sweeping prevents buildup along sections of roadway and allows for the free flow of water from the highway, to enter into the highway drainage system.

The SHA desired maintenance condition is 95% of the traveled roadway clear of loose material or debris. In addition, 95% of the closed sections (curb and gutter) have less than 1 inch depth of loose material or debris, or excessive vegetation that can capture debris, in the curb and gutter.

In addition to street sweeping, SHA owns and operates four vacuum pump trucks that routinely clean storm drain inlets along roadways. Sediment and trash make up the majority of the material that is removed. The vacuum trucks operate in central Maryland, spanning the following Counties: Anne Arundel, Baltimore, Calvert, Carroll, Charles, Frederick, Harford, Howard, Montgomery, Prince Georges and St. Mary's. This practice ensures safer roadways through maintaining proper drainage and improves water quality in Maryland streams by removing the pollutants before they enter the waterways.

Pollutant Load Reductions

Sweeping and inlet cleaning are recognized as valid pollutant source reduction BMPs. We are evaluating appropriate load reductions that can be claimed by SHA in meeting local and Bay

TMDLs. This accounting will be added to reports for the next permit term.

SHA Highway Hydraulics Division is working with the SHA Office of Maintenance to document current routes, to extend these activities to watershed-based, priority roadways and to characterize and quantify material and debris removed as a result of these activities.

Figure 1-13: Vacuum Pump Truck

SHA is developing procedures to understand and collect sediments to determine the pollutant loads gathered from highways. (See Figure 1-13 and 1-14) It is hoped that this understanding will result in additional impervious surfaces treatment.

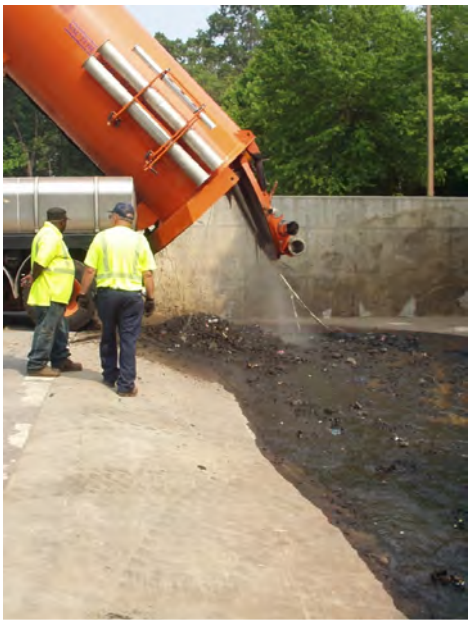

Figure1-14: Vacuum Truck at Owings Mills Shop Dewatering Facility

E.4.b Reduction of Pesticides, Herbicides and Fertilizers

SHA has standards for maintaining the highway system. One of these standards is the *SHA Integrated Vegetation Management Manual for Maryland Highways, October 2003* (IVMM). This manual incorporates the major activities involved in the management of roadside vegetation including application of herbicides, mowing and the management of woody vegetation. In order to maximize the efficiency of funds and to protect the roadside environment, an integration of these activities is employed.

Herbicide Application

Herbicides are selected based upon their safety to the environment and personnel, as well as for economical performance. In order to ensure that herbicides are applied safely to roadside target species, herbicide supervisory and application personnel are thoroughly trained, registered and/or certified by at least one of the following:

University of Maryland

Maryland Department of Agriculture

SHA.

Herbicide application equipment is routinely inspected and calibrated to ensure that applications are accurately applied in accordance to the IVMM, Maryland State law and the herbicide label.

Nutrient Management Plans

State law (COMAR 15.20.04-08 – Nutrient Management Regulations) requires SHA to develop a Nutrient Management Plan for all roadway projects. NMPs are developed by the SHA Landscape Operations Division (LOD).

NMPs determine the fertilizer application and soil amendment rates based upon soil sampling and testing for major plant nutrients (such as phosphorus and potassium), pH, and organic material. A NMP is developed to ensure optimal nutrient levels and growing conditions and to avoid the application of excess fertilizer.

Mowing Reduction/Native Meadows

A major initiative at the SHA is to reduce the extent of mowed areas within our right-of-way.

Along with this initiative, several pilot projects have been completed to install and maintain native meadow areas. Ultimately this practice will further reduce the need for fertilizer and herbicide application.

E.4.c Winter Deicing Operations

SHA continues to test and evaluate new winter materials, equipment and strategies in an on-going effort to improve the level of service provided to motorists during winter storms while at the same time minimizing the impact of its operations on the environment.

One method employed to decrease the overall application of deicing materials is to increase application of deicing materials prior to and in the early stages of a winter storm (anti-icing). This prevents snow and ice from bonding to the surface of roads and bridges and ultimately leads to lower material usage at the conclusion of storm events, thus lessening the overall usage of deicers.

SHA recently initiated a pilot program using a fairly new product called Geo Melt 55, a de-sugared sugar beet molasses that may be blended with brine. This organic material, also known as beet juice, lowers the freezing point of the brine to -30 degrees. Geo Melt 55 (Beet Juice) also enables the brine to adhere to bridges and road surfaces better and longer, which extends the effectiveness of the deicer.

In addition, SHA has expanded its 'sensible salting' training of State and hired equipment operators in an on-going effort to decrease the use of deicing materials without jeopardizing the safety and mobility of motorists during and after winter storms.

Table 1-15 lists materials used by SHA in winter deicing operations.

Table 1-15: SHA Deicing Materials

Material	Characteristics
Sodium Chloride (Rock and Solar Salt)	The principle winter material used by SHA. Effective down to 20° F and is relatively inexpensive.
Abrasives	These include sand and crushed stone and are used to increase traction for motorists during storms. Abrasives have no snow melting capability.
Calcium Chloride	A solid (flake) winter material used during extremely cold winter storms. SHA uses limited amounts of calcium chloride.
Geo Melt 55	A de-sugared sugar beet molasses may be blended with the brine. Also known as "beet juice," this organic material lowers the freezing point of the brine to –30º F. The light brown material is environmentally safe and does not stain roadway surfaces
Salt Brine	Liquid sodium chloride or liquefied salt is a solution that can be used as an anti-icer on highways prior to the onset of storms, or as a deicer on highways during a storm. Used extensively by SHA. Freeze point of -6° F.
Magnesium Chloride (Mag)	A liquid winter material used by SHA for deicing operations in its northern and western counties. It has a freeze point of 26 degrees and has proven cost effective in colder regions.
Caliber M-100	A magnesium chloride-based deicer with an agricultural additive. Its very low freeze point makes it ideal for use in Garrett County.
Potassium Acetate	A costly, environmentally friendly, liquid material used at SHA's two automated bridge anti-icing system sites in Allegany County.

Understanding Impacts of Deicing Chemicals

SHA is also pursuing research to understand the impact deicing chemicals have on surrounding ecosystems and organisms. See Section D, Discharge Characterization, for a list of resources we are studying.

New Road Salt Management

On May 20, 2010 the Governor approved Senate Bill 775, requiring SHA, in consultation with the Department of the Environment (MDE), to develop a best practices road salt management guidance document by October 2011. This document is necessary to reduce the adverse environmental impacts of road salt storage, application and disposal on Maryland's water and land resources.

SHA is currently working toward meeting the deadline and may establish the following items as part of the guidance document:

Determine Best Management Practices that protect the environment from the negative impacts or road salt,

Identify all activities that may result in the release of road salt in the environment, including road salt storage, application, and disposal of salt containing road salt,

Take into consideration of highway safety to the greatest extent possible,

Establish standards and procedures for identifying areas particularly vulnerable to road salt runoff and additional road salt management practices that need to be implemented in these areas,

Establish goals for achieving a reduction of the environmental impact of road salt release into the environment,

Include a training program for all state, local, and contract personnel involved in the performance of winter maintenance activities utilizing road salt,

Establish response procedures to address uncontrolled release of road salt that may adversely impact the environment, and

Established record keeping and annual reporting procedures for the quantity of road salt used, where the road salt is used and any training conducted.

E.4.d NPDES Industrial Permit Coverage

As discussed in the previous Annual Report, SHA developed and implemented a Compliance Focused Environmental Management System (CFEMS) to ensure multi-media compliance at all maintenance facilities statewide. The CFEMS covers procedures for management of environmental compliance issues, including those related to Industrial NPDES at maintenance facilities, such as spill response, material storage and vehicle washing. It includes the implementation of Standard Operating Procedures (SOPs), routine compliance inspections and environmental training covering a variety of media areas including stormwater management and spill prevention and response.

The CFEMS is being implemented in a phased approach. As stated in previous Annual Reports, Phase I environmental assessments at 29 SHA primary maintenance facilities were completed in the spring of 2007. Phase II compliance assessments, covering 65 satellite facilities, were completed in the summer of 2009. Phase II facilities are currently covered under the General Discharge Permit (02-SW). The permit status of these and other Phase II facilities was evaluated and updated based on the compliance assessments.

SHA has compiled the results of the Phase II assessments and ensured stormwater requirements have been met where applicable, e.g. permit coverage and Stormwater Pollution Prevention Plan (SWPPP) development. The SHA Environmental Compliance Division (ECD) will also begin routine inspections at Phase II facilities through its District Environmental Coordinators (DEC) to ensure stormwater pollution prevention BMPs are implemented. The DECs are responsible for ensuring compliance with applicable permits, plans and regulations at facilities in their region.

Subsequent phases will expand the CFEMS to other SHA facilities and operations. The SHA laboratories (5), landscape depots (2) and sign production shop (1) were assessed in January 2011. After the January 2011 assessment it was determined that none of the assessed facilities required regulatory permitting. As a Best Management Practice (BMP) each facility had a Storm Water Pollution Prevention plan created to ensure proper storm water management. All facilities have been added to our routine inspection program. The next planned phase will

be to assess the remaining facilities throughout the State. Including: Moveable bridges, weigh stations, rest areas, communication towers, offices and other remaining SHA facilities

E.4.e Statewide Shop Improvement Plans

SHA continues to maintain an effective Industrial Stormwater NPDES Program through ECD to ensure pollution prevention and permit requirements are being met at SHA maintenance facilities. Beginning in 2008 and continuing through 2009 SHA performed detailed site assessments at 29 primary maintenance facilities to gather information used to update the 2005 SWPPPs and Spill Prevention, Control, and Countermeasure Plans (SPCCP). At the end of 2009, SHA had completed final versions of SPCCPs for 27 of the primary maintenance facilities and SWPPPs for all 29 primary maintenance facilities.

Throughout 2010, SHA continued to address potential stormwater pollution issues by implementing Best Management Practices (BMPs) and designing / constructing capital improvements. SWPPPs were prepared and implemented at all Phase II satellite facilities, regardless of regulatory requirements, and SPCCPs were developed for all applicable satellite facilities. BMPs were identified during pollution prevention plan updates and routine inspections for Phase I (environmental assessment phasing) facilities (primary maintenance shops) and initial assessments SWPPP / SPCC development of Phase II satellite facilities. The status of BMP implementation for maintenance facilities is tracked by each DEC during routine inspections. Potential capital improvements are prioritized based on risk to human health and the environment and funding availability. The following list details the major pollution prevention efforts and maintenance facility improvements since the last annual report.

Completed Projects:

Finalized SWPPP for all satellite facilities

Finalized SPCCP for all applicable satellite facilities

Oil/water separator upgrade at Chestertown maintenance facility

Sanitary sewer floor drain connection at Cambridge maintenance facility

Petroleum storage tank system upgrades were completed at 36 maintenance facilities

Battery storage / spill kit procurement for satellite (Phase II) facilities

On-going Projects:

Statewide oil-water separator maintenance program

Statewide discharge sampling and reporting program for facilities with Individual Discharge Permits

Routine compliance inspections at all Phase I facilities (primary maintenance) and Phase II facilities (satellite)

Second annual multimedia environmental compliance training provided to maintenance shop personnel

Initiated Projects:

Glen Burnie and Owings Mills maintenance facilities to sanitary sewer system. Project advertised with construction slated for Spring of 2012. In support of improved storm water management a feasibility study is currently slated to begin in early 2012 to better understand where to construct more dewatering structures throughout the state. Once it is determined where to best locate the new structures. Advertisement is planned for 2013**.**

Outfall stabilization project at Prince Frederick maintenance facility. This project was completed under the past reporting period.

Grit Chamber assessment and upgrade design at Prince Frederick and Marlboro maintenance facilities. Design is complete. Construction to be completed in early 2012

Figure 1-16: Stormwater Outfall Improvements at SHA

Figure 1-17: Underground Storage Tank System

Table 1-18: Industrial NPDES Permit Status

District	Maintenance Facility	Permit Type
1	Berlin[1]	General
	Cambridge	General
	Princess Anne	General
	Salisbury	General
	Snow Hill	General
2	Centreville	Individual – SW
	Chestertown	General
	Denton	General
	Easton	General
	Elkton	General
	Millington[2]	General Terminated 4/22/10
3	Fairland	General
	Gaithersburg	General
	Kensington[2]	General Terminated 8/20/10
	Laurel	General
	Marlboro	General
	Metro/Landover[2]	General Terminated 8/20/10
4	Churchville	Individual – SW
	Golden Ring	General
	Hereford	**Individual** – SW[3]
	Owings Mills	General
5	Annapolis	General
	Glen Burnie	General
	La Plata	General
	Leonardtown	Individual – SW[3]
	Prince Frederick	General
6	Frostburg[1]	General Terminated 8/20/10
	Hagerstown	General
	Hancock	General
	Keyser's Ridge	Individual – GW
	La Vale	General
	Oakland	General
7	Dayton	Individual – SW[3]
	Frederick	General
	Thurmont[1]	General
	Westminster	General
Offices / Other Facilities	Brooklandville Complex[4]	General
	Hanover Auto Shop	Individual – SW[5]

Note: SW = Surface Water, GW = Groundwater

[1] Phase II facility (satellite) where a permit is required due to industrial activity

[2] Phase II facility (satellite) where a determination was made after initial compliance assessment that a permit was not required

[3] All wastewater is collected for pump and treat in a storage tank; no industrial wastewater discharge

[4] Property in the process of being transferred and is no longer used by SHA

[5] Vehicle wash discharge connected to sanitary sewer in 2009, SW provisions of individual permit remain in effect

Table 1-20 shows the SHA capital expenditures towards industrial pollution prevention BMPs from the current and past six fiscal years. Projected expenditures for 2011 are also included.

Table 1-20: Capital Expenditures for Pollution Prevention BMPs

Fiscal Year	Expenditure
2005	$ 613,210 - actual
2006	$ 592,873 - actual
2007	$ 450,608 - actual
2008	$ 590,704 - actual
2009	$ 478,889 – actual
2010	$ 613,766 – actual
2011	$ 500,000 – projected

E.5 Illicit Discharge Detection and Elimination

Requirements under this condition include:

Conduct visual inspections of stormwater outfalls as part of its source identification and BMP inspection protocols

Document each outfall's structural, environmental and functional attributes;

Investigate outfalls suspected of having illicit connections by using storm drain maps, chemical screening, dye testing, and other viable means;

Use appropriate enforcement procedures for eliminating illicit connections or refer violators to MDE for enforcement and permitting.

Coordinate with surrounding jurisdictions when illicit connections originate from beyond SHA's rights-of-way; and

Annually report illicit discharge detection and elimination activities as specified in Part IV of this permit. Annual reports shall include any requests and accompanying justifications for proposed modifications to the detection and elimination program.

E.5.a Visual Inspections of Outfalls

The SHA Storm Drain and Outfall Inspection and Remediation Program focuses on the physical conditions and structural functionality of major SHA culvert outfalls. Inspections for the SOIRP program will result in developing strategies for maintaining, repairing or otherwise remediating storm drain and outfall stabilization problems. The resulting remediation actions can be constructed through our open-end construction contracts, transportation enhancement program (TEP) funded projects or advertised projects. Projects have been developed to address stabilization issues in Harford and Baltimore counties**.** Preliminary site assessments have been initiated in Anne Arundel County and Prince George's County.

As part of our growing efforts to meet the anticipated Chesapeake Bay Program TMDL pollutant load reductions goals, SHA has initiated the development of an enhanced inspection and evaluation process for the storm sewer outfalls within the SHA right-of-way. These pilot projects will establish the evaluation process and develop the reporting and documentation framework for further study. The ultimate scope of the process is the identification, evaluation and prioritization for repair or replacement of all outfalls within the SHA Right-of-Way.

During the previous and current years, SHA has undertaken project related to outfall stabilizations and enhancement projects. The overall goal of these projects is to protect the receiving streams and improve the water quality within the watershed.

MD 4 Northbound Outfall Improvement. SHA advertised a contract to stabilize a severely eroded outfall along MD 4 NB in Prince Georges County. The erosion impacted Waters of the US and exposed an underground utility line. The scope of repair included new storm drain construction and scour hole installation. In-ground repair of a corroded 54" CMP under MD 4 was also included. Construction is currently still active.

Figure 1-21: Inspected outfall along MD 4

I-795 Outfall Repair and Enhancement. SHA advertised a contract to stabilize 2 eroded outfalls that resulted from pipe collapses on I-795 SB. The scope of work included new storm drain construction, E&S controls and outfall stabilization. The southernmost site involved erosion that impacted a timber noisewall. This site also contained wetlands and required permitting through MDE. Construction is still active.

E.5.b Document each Outfall's Attributes

SOIRP outfall inspections are currently being conducted on the outfalls in Frederick, Harford and Montgomery counties. Inspections are conducted using the SHA SOIRP Program outfall inspection protocol, Chapter 4 of the *SHA NPDES Standard Procedure*s. SHA is currently in the design phase for Baltimore and Harford County sites. The Baltimore County outfall sites were split into two phases and the first phase, consisting of 10 outfalls, has completed construction. The second phase of Baltimore sites is to be advertised for construction in FY11. The Harford County sites are currently at preliminary design stage.

E.5.c Illicit Connection Investigations

Illicit discharge screenings were completed in Frederick, Harford and Montgomery counties. As illicit discharges are found we currently are sending the report to the local NPDES coordinator for elimination. No illicit discharges have been found in these counties for this update season.

E.5.d Use Appropriate Enforcement Procedures

SHA notifies the NPDES coordinator or their IDDE designated contact at the counties or jurisdictions in which the illicit discharges or connections to SHA storm drain system are discovered.

E.5.f Annual Report Illicit Discharge Detection and Elimination Activities

Over the reporting period from 10/2010 to 9/2011, 844 outfalls were screened in the Phase I counties for illicit discharges and no illicit connections were discovered.

E.6 Environmental Stewardship

Requirements under this condition include:

a) Environmental Stewardship by Motorists
   i) Provide stream, river, lake, and estuary name signs and environmental stewardship messages where appropriate and safe,
   ii) Create opportunities for volunteer roadside litter control and native tree plantings; and
   iii) Promote combined vehicle trips, ozone alerts, fueling after dark, mass transit and other pollution reduction actions for motorist participation.

b) Environmental Stewardship by Employees
   i) Provide classes regarding stormwater management and erosion and sediment control;
   ii) Participate in field trips that demonstrate links between highway runoff and stream, river, and Chesapeake Bay health;
   iii) Provide an environmental awareness training module for all areas of SHA;
   iv) Provide pollution prevention training for vehicle maintenance shop personnel;
   v) Ensure Integrated Pest Management instruction and certification by the Maryland Department of Agriculture for personnel responsible for roadside vegetation maintenance; and
   vi) Promote pollution prevention by SHA employees by encouraging combined

vehicle trips, carpooling, mass transit, and compressed work weeks.

E.6.a Environmental Stewardship by Motorists

SHA continues many initiatives that encourage or target public involvement and participation in water quality programs. These initiatives cover the areas of litter control, watershed partnerships, community planting efforts and public education.

SHA public involvement and participation initiatives for the past year include:

Annual Earth Day Celebration – As part of its ninth annual event, the SHA Earth Day Team sponsored a two-weeklong celebration at the SHA headquarters complex beginning April 18, 2011. This annual event is sponsored by the SHA Office of Environmental Design and many volunteers from several offices at SHA Headquarters. This team brings together a diverse group of exhibitors from SHA and the local non-profit community to highlight our resources and how to best manage their use and preservation. Approximately 320 employees or visitors attended the events of the week. The workshops were as follows:

April 18th: Solar Energy Basics – Presentation on energy conservation, efficiency, money savings, passive solar considerations, photovoltaic modules (electric), hot water systems, sun tubes, Maryland solar grants and federal solar tax credits.

April 20th: Sustainable Landscapes–Presentation on the benefits of native vegetation and beneficial species.

April 21st: Container Vegetable Gardening - Participants planted seeds for a Spring Salad Garden in their own pots, all other supplies provided.

April 26th: Service Project - Landscape Maintenance at 707 N. Calvert and 211 East Madison Street: removal of invasive vegetation and weeds, planting native and general maintenance.

April 28th: Water on Tap: Discussion focused on water conservation, drinking water quality, and methods to ensure purity of water for use and consumption

Figure 1-22: Participants in the Earth Week 'Play and Learn' Session

In addition to the Lunch and Learn sessions, a web page was developed that contains additional information including a list of cyber exhibitors, volunteer opportunities, Baltimore Downspout Disconnection Program information, directions for making a rain barrel, herb care information, energy consumption information, recycling information and an earth day video.

Adopt-a-Highway Program – This program encourages volunteer groups (family, business, school or civic organizations) to pick up litter along one to three mile stretches of non-interstate roadways four times a year for a two year period as a community service.

Sponsor-a-Highway Program – SHA also has a program that allows corporate sponsors to sponsor one-mile sections of Maryland roadways. Table 1-23 shows the miles currently being sponsored. The Sponsor enters into an agreement with a maintenance provider for litter and debris removal from the sponsored segment

Table 1-23: Sponsor-a-Highway Programs

County	Available Miles	Miles Sponsored
Anne Arundel	35.78	61.33
Baltimore	23.03	82.06
Frederick	6.91	16.61
Harford	6.99	2.43
Howard	17.71	21.47
Montgomery	14.98	26.08
Prince George's	39.87	39.38
Totals	145.27	249.36

Partnership Planting Program – SHA develops partnerships with local governments, community organizations and garden clubs for the purpose of beautifying highways and improving the environment. Community gateway plantings, reforestation plantings, streetscapes and highway beautification plantings are examples of the types of projects that have been completed within the Partnership Planting Program.

Transportation Enhancement Program – SHA Administers the Federal Highway Transportation Enhancement Program (TEP) for the State of Maryland. In this capacity, SHA looks for opportunities to share the potential benefits of applying for funding under this program with projects that fall under the eligible funding categories.

For potential projects that fall under the funding category 'Mitigation of Water Pollution due to Highway Runoff', SHA Highway Hydraulics Division takes the initiative with watershed groups, local municipalities, community groups and counties to encourage their participation in this program. SHA provides assistance to potential project sponsors by advising on proposal content, reviewing drafts and then providing guidance on Federal Aid requirements for construction document preparation and advertisement process

SHA initiated the "I-270 SWM Facilities Functional Upgrades" Reconstruction of two SWM facilities on I-270 to current standards. One facility is located south of Muddy Branch Road and on is located north of MD 124. ***Sustainable Transportation – A Multi-Modal Approach', 2011 MdQI (Maryland Quality Initiative) Conference*** – The mission of MdQI is to provide the Maryland highway industry a forum that fosters coordinated and continuous quality improvement in order to ensure safe, efficient, and environmentally sensitive highways which meet the needs of all transportation stakeholders. This industry conference is held annually each winter and brings together public and private highway design and construction industry professionals in a forum of workshops, round table discussions, exhibits and networking.

The schedule for the upcoming conference to be held February 2-3, 2012 is not yet available. Additional information will be posted on the following web site as it becomes available: http//mdqi.org. See Figure 1-24

Figure 1-24: MdQI Website

E.6.b Environmental Stewardship by Employees

SHA continues to provide environmental awareness training to its personnel and is committed to continuing these efforts in the future. We have provided updated data for these efforts through the following training and awareness programs listed below:

SHA Recycles Campaign – In support of the SHA Business Plan, the Environmental Compliance and Stewardship Key Performance Area launched the SHA Recycles Campaign on April 22, 2008 to raise awareness and encourage change in consumer culture throughout the organization. The goal of this campaign is to reduce waste and litter by making conservation a priority, reusing what we previously discarded, and recycling as much as possible.

The SHA Recycles Campaign is working to build a consortium of stakeholders across the entire SHA organization towards this collective goal. The campaign encourages all employees to give feedback on what can be done to save

energy and fuel, reduce or eliminate waste, improve current recycling efforts, or change business practices to conserve resources. It provides education and outreach through displays and presentations at SHA events such as the Annual Earth Day Celebration, and office-wide training and recognition days.

A State-wide Recycling Task Force has also been formed at SHA to examine key issues in recycling and identify ways to improve the SHA Statewide Recycling Program.

Million Tree Initiative – In the fall of 2008, the Maryland State Highway Administration (SHA), the Maryland Department of Natural Resources (MDNR), Federal Highway Administration (FHWA), and the Maryland Department of Safety and Correctional Services (DPSCS) formed a partnership to plant trees along Maryland roadsides and in State right-of-way. The tree-planting program directly supports Governor Martin O'Malley's *Smart, Green and Growing* initiative. SHA is funding the trees and materials; MDNR is funding the labor, which is provided by inmates from DPSCS. On May 4, 2011, Governor O'Malley planted the One Millionth Tree with Inmates.

Figure 1-25: One Millionth Tree Ceremony

SHA Environmental Advisory Committee – A committee was formed by SHA in order to seek expert level, environmental advice from pronounced experts and practitioners in various fields and industries. This committee meets several times a year to advise SHA senior management on initiatives ranging from clean air, wind power, water quality and recycle/reuse.

Environmental Awareness Training (Chesapeake Bay Field Trips) – This training is provided to all new employees. This field trip demonstrates the link between highway runoff and its impacts on streams, rivers and on the health of the Chesapeake Bay. There were two trips this year on October 5th and 6th. There are plans for trips in both the Spring and Fall of 2012, as well as for the Spring of 2013. These trips are dependant upon available funding.

Graduate Engineers Training Program (GETP) – SHA continues to provide environmental awareness training to its personnel and is committed to continuing these efforts in the future. The two-year GETP provides training to over 100 new engineers and includes modules concerning the National Environmental Policy Act (NEPA) and Introduction to the Office of Environmental Design.

OHD University – This is an annual, internal training program for the Office of Highway Development that provides technical training for new engineers and others who desire to take refresher courses. In addition to highway engineering and technical issues, detailed information is presented for SWM, ESC and environmental permitting issues, including NPDES concerns.

Statewide Pesticide/Vegetation Management Training – There are several types of internal training sessions for pesticide management that SHA provides annually. They include re-certification, right-of-way pre-certification, aquatic pre-certification, herbicide update and an annual vegetation management conference. The numbers of participants at each of these training sessions are listed in Tables 1-26 to 1-27. There was no Pesticide Aquatic Certification (ENV600) training held in 2010.

Table 1-26: Pesticide Core and Right-of-Way Pre-Certification (ENV210)

SHA District	Number Trained
3 (MO, PG)	4
7(CL,FR, HO)	5
Totals	9

Table 1-27: Pesticide Applicator Training (ENV100) – 2011

SHA District	Number Trained
1 (DO, SO, WI, WO)	14
2 (CA, CE, QA, TA)	15
3 (MO, PG)	21
4 (BA. HA)	8
5 (AA, CH)	4
6 (MO, PG)	8
7(CL,FR, HO)	13
Totals	83

Maryland Department of Transportation (MDOT) Water Quality Policies and Water Quality Clearing House Web Page – This is a continuing effort that provides information on department-wide water quality policies and other regulations applicable to transportation projects. This webpage is periodically updated with regulatory/policy changes and can be accessed at www.mdot.state.md.us and clicking on the 'Office of Environmental Programs' link on the left-hand panel. The tabs at the top of the page lead to information on state and environmental regulations for transportation facility operations such as storage tanks and spill prevention and response; environmental resources such as Smart, Green & Growing, MDE, MDNR and EPA; MDOT environmental resources such as environmental stewardship in the 2009 MD Transportation Plan and the 2010 Annual Attainment Report on Transportation System Performance; and an information brochure for the MDOT Office of Environment.

- **SHA Environment and Community Web Page** – SHA has developed an environmental awareness web page that is located on the SHA internet site at the following link: http://www.marylandroads.com/index.aspx?PageId=675.

  Topics include the following programs: Transportation Enhancement Program (TEP), Adopt-a-Highway, Sponsor-a-Highway, Partnership Plantings, Green Highways Partnership and the Million Tree Initiative, as shown in Figure 1-28.

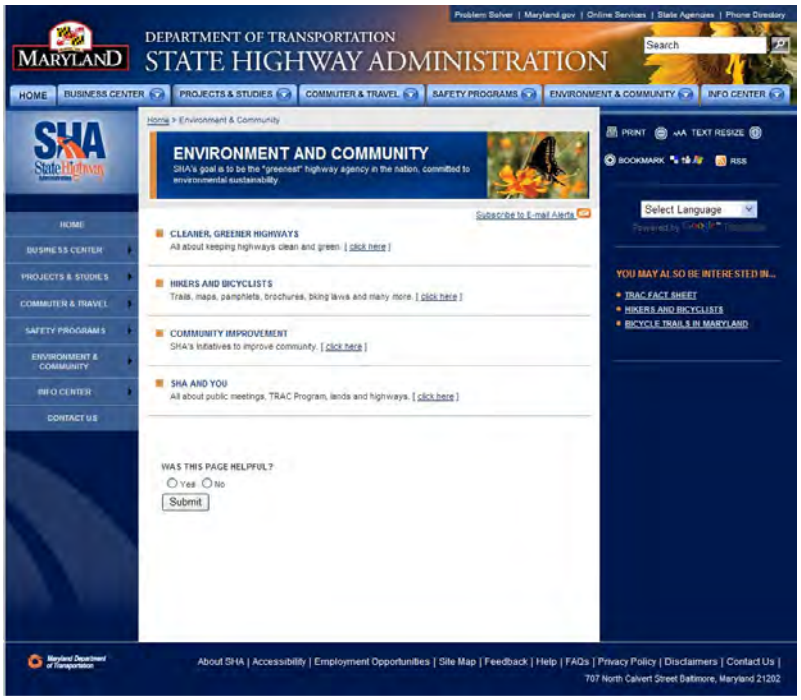

Figure 1-28 - SHA Internet 'Environment and Community' Web Page

Employee Commuter Reduction Incentives – SHA offers several incentives to reduce the number of drivers and/or number of commuter days/miles per week by Administration employees. Fewer commuter days and miles mean less vehicle pollutants entering the watershed.

Alternate work schedules include flexible work hours allowing employees to work compressed workweeks reducing the total number of commuting days and miles.

Teleworking allows employees to work from a remote location (presumably at or close to home) and also reduces the number of commuting days and miles per week. Each office has or is developing a teleworking policy.

Car-pooling has been encouraged at SHA for many years and reduces the number of commuters on the road. SHA car-pooling incentives include prioritizing parking space allocation to those in a designated car pool and Administration assistance in locating a carpool within the employee's residential area through parking database.

Finally, employee ID badges allow free access to MTA mass transit including the Baltimore area subway, light rail and buses. This encourages the use of mass transit by SHA employees who live within the Baltimore area.

SHA Vehicle and Equipment Idling Policy – On September 22, 2009, the former SHA Administrator, Neil Pedersen, issued a policy regarding idling of engines for state equipment and vehicles. The purpose is to reduce fuel consumption by state forces, and if adhered to, will result in pollutant load reduction as well.

F Watershed Assessment

The watershed assessment effort described by the permit includes continuing to provide available geographic information system (GIS) highway data to permitted NPDES municipalities and MDE; completing the impervious surface accounting by the fourth annual report; select sites for retrofitting impervious areas with poor or no control infrastructure; and working with NPDES municipalities to maximize water quality improvements in areas of local concern.

F.1 GIS Highway Data to NPDES Jurisdictions and MDE

SHA continues to make the SHA GIS storm drain and BMP data available to NPDES jurisdictions (when requested) and MDE.

We periodically coordinate with the MDE Science Services Administration on data issues for the Bay and local TMDL modeling.

F.2 Complete Impervious Accounting by Fourth Annual Report

SHA completed the Impervious Accounting for the all Phase I counties, by the fourth annual report, October 2009. Adjustments to the accounting will be undertaken when the MDE Impervious Accounting protocol is developed. Issues to be addressed by the protocol such as pro-rating treatment associated with BMPs by era of development and impervious equivalencies for BMPs that are not urban stormwater BMPs will be evaluated and the accounting recomputed for future SHA treatment requirements.

F.3 Impervious Area Retrofits

SHA continues to identify and develop sites that prove suitable for SWM facilities that provide water quality treatment of existing impervious areas within the SHA controlled R/W. SHA has expanded its efforts to meet our TMDL goals through the use of these facilities and has initiated the development of an inspection and evaluation process for the storm sewer outfalls within the SHA right-of-way. These pilot projects will establish the protocol for the evaluation process and develop the reporting and documentation framework for further study. The ultimate scope of the process is the identification, evaluation and prioritization for repair or replacement of all outfalls within the SHA system.

SHA has four construction contracts established for the installation of new stormwater facilities in various locations within the NPDES Phase 1 & 2 counties with three additional contracts in process. These efforts are coordinated within the

Chesapeake Bay and local TMDL priorities and within local water resources elements (WREs) for the individual counties and municipalities where possible.

F.4 Maximize Water Quality Improvements in Areas of Local Concern

As part of this permit condition, MDE required that we not only implement restoration efforts, but that we adhere to the watershed restoration goals and priorities established by local NPDES jurisdictions. Past performance over this permit term concerning this condition was discussed in detail in the last four reports. They include:

US 301 Watershed-based SWM Assessment, and

EPA Green Highways Grant – Framework for Watershed Based SWM. In partnership with the Environmental Protection Agency (EPA) and through a grant from the agency, SHA has been developing a framework document on how to implement a watershed-based approach to stormwater management (SWM). The document targets transportation agencies and their distinct role in watershed management. The final document is expected by the end of 2011

Indian Creek Stormwater Retrofit Study- SHA has initiated studies within the Indian Creek watershed in conjunction with locals, state, and federal officials. The goals of the studies are to identify watershed improvement projects that achieve water quality goals. The partnering with agencies and official is providing to be effective method to achieve high results within watersheds and across Right-of-Way responsibility areas.

With the TMDL requirements anticipated for the next permit term focused on waste load reductions for urban stormwater, our first focus in the future will be on the Chesapeake Bay segmentsheds and local TMDL watersheds where SHA is named as a contributor to the waste load allocation (WLA). This includes setting and meeting the 2-year milestones for the Bay TMDL as well as demonstrating compliance in local TMDL watersheds. SHA is programming and developing policies to coincide with the anticipated load reduction goals.

Requirements for this permit condition include developing and implementing twenty-five significant stormwater management retrofit projects, contributing to local watershed restoration activities by constructing or funding retrofits within locally targeted watersheds, and submitting annual reports on watershed activities that contain proposals, costs, schedules, implementation status and impervious acres proposed for management.

G.1 Implement 25 Significant SWM Retrofit Projects

The requirement that twenty-five projects be completed was met and reported on in past annual reports. We are continuing our efforts to maximize treatment of our baseline untreated impervious in anticipation of a percentage treatment requirement for our next permit term.

SHA continues to retrofit facilities and use innovative methods to address water quality.

Stormwater Facility Enhancements & Retrofits

These projects were developed outside of roadway development stormwater management requirements and consist of upgrading stormwater BMPs to current regulations, stream stabilization and restoration, and outfall stabilization projects. Table 1-29 lists these projects to date which total 113 and amount to approximately 910 acres of impervious surfaces treatment. In addition, there are number of projects for treatment of pre-1985 impervious surfaces in planning and design stages. The progress will be reported in the next reporting period after the construction completion. At the same time SHA will update the progress in treating. Our current level of treatment of by storm water controls alone is 3%.

G Watershed Restoration

Table 1-29: Watershed Restoration Projects

Projects by Watershed	Retrofit Type	Status	Restored Impervious Acres
Lower Susquehanna River – 02-12-02			
BMP 120076	BMP retrofit	Complete	2.82
Chester River Area – 02-13-05			
BMP 170011	BMP retrofit	Complete	0.41
BMP 170012	BMP Retrofit	Complete	0.23
Bush River Area – 02-13-07			
BMP 120069	BMP Retrofit	Complete	4.16
BMP 120072	BMP Retrofit	Complete	4.68
BMP 120073	BMP Retrofit	Complete	3.99
BMP 120075	BMP Retrofit	Complete	1.77
BMP 120081	BMP Retrofit	Complete	2.39
BMP 120082	BMP Retrofit	Complete	1.00
Gunpowder River – 02-13-08			
I-83 Outfall Stabilization of Tributaries to Gunpowder Falls	Stream stabilization	Construction	7.85
Minebank Run Restoration, Drainage and WQ Improvements*	Stream restoration, outfalls stabilization, SWM retrofit	Design	236.8
Patapsco River – 02-13-09			
BMP 020120	BMP Retrofit	Complete	17.73
BMP 020121	BMP Retrofit	Complete	0.96
BMP 020122	BMP Retrofit	Complete	0.92
BMP 020625	BMP Retrofit	Design	2.46
BMP 030281	BMP Retrofit	Complete	8.35
MD 139 Tributary to Towson Run Stabilization	Stream Stabilization	Complete	260.30
BMP 020111	BMP Retrofit	Complete	6.04
BMP 020112	BMP Retrofit	Complete	0.56
BMP 020098	BMP Retrofit	Complete	0.68
BMP 020099	BMP Enhancement	Complete	0.75
BMP 020476	BMP Retrofit	Complete	3.79
BMP 020477	BMP Retrofit	Complete	Combined with 020476
BMP 130197	BMP Retrofit	Complete	0.44
BMP 130207	BMP Retrofit	Complete	1.57
BMP 130221	BMP Retrofit	Complete	0.17
BMP 130210	BMP Retrofit	Complete	0.24
BMP 130217	BMP Retrofit	Complete	0.10
West Chesapeake Bay – 02-13-10			
BMP 020019	BMP Retrofit	Complete	1.22
BMP 020022	BMP Retrofit	Complete	1.06
BMP 020027	BMP Retrofit	Complete	1.59
BMP 020029	BMP Retrofit	Complete	0.88
BMP 020031	BMP Retrofit	Complete	2.29
BMP 020088	BMP Retrofit	Complete	3.53
BMP 020481	BMP Retrofit	Complete	2.09

Projects by Watershed	Retrofit Type	Status	Restored Impervious Acres
BMP 020522	BMP Retrofit	Complete	1.70
BMP 020273	BMP Retrofit	Complete	1.18
BMP 020491	BMP Retrofit	Complete	1.79
BMP 020185	BMP Retrofit	Complete	0.48
BMP 020198	BMP Retrofit	Complete	0.68
BMP 020201	BMP retrofit	Complete	1.01
BMP 020205	BMP Retrofit	Complete	1.16
BMP 020206	BMP Retrofit	Complete	0.49
BMP 020210	BMP Retrofit	Complete	0.36
BMP 020220	BMP Retrofit	Complete	0.72
BMP 020258	BMP Retrofit	Design	3.27
BMP 020260	BMP Retrofit	Design	1.41
BMP 020268	BMP Retrofit	Design	7.08
BMP 020393	BMP Retrofit	Design	4.35
BMP 020394	BMP Retrofit	Design	3.27
BMP 020014	BMP Retrofit	Design	2.20
BMP 020015	BMP Retrofit	Design	1.22
BMP 020016	BMP Retrofit	Design	0.95
BMP 020017	BMP Retrofit	Design	0.44
BMP 020018	BMP Retrofit	Design	0.89
Patuxent River – 02-13-11			
BMP 160059	BMP Retrofit	Complete	3.2
BMP 020488	BMP Retrofit	Complete	5.56
BMP 160217	BMP Retrofit	Complete	0.64
BMP 160219	BMP Retrofit	Complete	0.91
BMP 160380	BMP Retrofit	Complete	3.42
Unnamed Tributary to Rocky Gorge Reservoir adjacent US 29	Stream Stabilization	Cancelled	
BMP 020301	BMP Retrofit	Construction	2.30
BMP 020311	BMP Retrofit	Construction	0.28
BMP 020437	BMP Retrofit	Construction	4.13
BMP 130149	BMP Retrofit	Complete	0.48
BMP 130150	BMP Retrofit	Complete	1.02
BMP 130154	BMP Retrofit	Complete	0.47
BMP 130159	BMP Retrofit	Complete	0.02
BMP 130160	BMP Retrofit	Complete	0.52
BMP 130162	BMP Retrofit	Complete	0.66
BMP 130179	BMP Retrofit	Complete	2.10
BMP 130180	BMP Retrofit	Complete	0.43
BMP 130187	BMP Retrofit	Complete	0.13
BMP 130188	BMP Retrofit	Complete	0.12
BMP 130189	BMP Retrofit	Complete	0.03
BMP 130190	BMP Retrofit	Complete	0.03
BMP 130191	BMP Retrofit	Complete	0.05
BMP 130192	BMP Retrofit	Complete	0.05
BMP 130193	BMP Retrofit	Complete	0.10
BMP 130194	BMP Retrofit	Complete	0.22
BMP 130232	BMP Retrofit	Complete	0.03

Projects by Watershed	Retrofit Type	Status	Restored Impervious Acres
BMP 130242	BMP Retrofit	Complete	0.72
BMP 130243	BMP Retrofit	Complete	3.49
BMP 150228	BMP Retrofit	Complete	0.13
BMP 150331	BMP Retrofit	Complete	0.23
BMP 130047	BMP Retrofit	Complete	1.39
Lower Potomac River – 02-14-01			
BMP 160456	BMP Retrofit	Complete	1.70
BMP 080014	BMP Retrofit	Construction	0.24
BMP 080039	BMP Retrofit	Construction	0.10
BMP 080040	BMP Retrofit	Construction	0.10
BMP 080041	BMP Retrofit	Construction	0.12
BMP 080042	BMP Retrofit	Construction	0.11
BMP 080043	BMP Retrofit	Construction	0.28
BMP 080044	BMP Retrofit	Construction	0.20
BMP 080083	BMP Retrofit	Construction	0.06
BMP 080095	BMP Retrofit	Construction	0.48
Washington Metropolitan-02-14-02			
BMP 160607	BMP Retrofit	Complete	0.41
BMP 160609	BMP Retrofit	Complete	Combined with 160607
BMP 160653	BMP Retrofit	Complete	15.80
Long Draught Branch Restoration	Stream Stabilization	On hold due to the permitting issues	228
BMP 150002	BMP Retrofit	Complete	0.31
BMP 150003	BMP Retrofit	Complete	1.69
BMP 150004	BMP Retrofit	Complete	Combined with 150003
BMP 150005	BMP Retrofit	Complete	Combined with 150003
BMP 150172	BMP Retrofit	Design	1.25
BMP 150301	BMP Retrofit	Complete	0.28
BMP 150362	BMP Retrofit	Complete	1.03
BMP 150380	BMP Retrofit	Complete	1.05
BMP 150550	BMP Retrofit	Complete	1.26
BMP 150076	BMP Retrofit	Complete	1.25
BMP 150059	BMP Retrofit	Design	4.67
BMP 150556	BMP Retrofit	Design	5.65
Middle Potomac River – 02-14-03			
Tributary to Tuscarora Creek Stabilization at US 340 and US 15	Stream Stabilization	Complete	1.94
BMP 150270	BMP retrofit	Complete	0.08
*Projects added since last report.			

Pavement Retrofit Projects

SHA worked closely with MDE to determine Bay TMDL requirements for SHA in order to establish funding and resource needs for the future 2-year milestones. As a result, in addition to the stormwater upgrade projects we are currently pursuing, we have established funding sources for the next three years to provide management, design and construction resources to implement new BMPs to meet both the future waste load reductions and impervious treatment requirement. Future projects include median treatment at existing open section roadways and include sites in all nine Phase I counties.

The Maryland State Highway Administration (SHA) intends to develop standards and protocols for the statewide assessment and repair of SHA owned unstable outfalls which may be contributing to channel erosion, thus resulting in sediment transport to downstream receiving channels. SHA has identified two overall goals which should result from developing assessment protocols, performing field investigations of potentially unstable outfalls and initiating repairs of these outfalls. The first goal is for data collection and repair recommendations to help maintain SHA infrastructure. Data collection will include GPS-locating of outfall channels downstream from SHA outfall structures, and completing standard forms to be linked with the outfall. The GPS and form data will be compiled into an outfall assessment geodatabase that is compatible for future migration into the SHA geodatabase inventory. This data will be used to prioritize the repair of SHA-owned infrastructure. The second goal is to obtain TMDL credits for repaired outfalls by preventing future erosion and the transportation of sediment loads to downstream receiving channels. Using established and acceptable methods approved by MDE, SHA intends to apply the assessment and evaluation protocol state-wide to prioritize unstable outfalls for repair. Those outfalls with the highest potential for future channel and bank erosion will likely be repaired first in order to prevent this erosion and the transport of sediment downstream. Thus the repairs are intended to prevent future channel erosion and will promote reductions in nitrogen, phosphorus and suspended solids to the receiving channel. SHA intends to apply for a credit for these reductions in order to meet TMDL goals.

Stream Project Assessments

In order to assess the success of SHA stream restoration and stabilization projects, SHA continues working with Dr. R. P. Morgan at UMD Center for Environmental Service, Appalachian Laboratory, to perform stream assessments on completed projects. Three assessment protocols are undertaken: benthic macroinvertebrates, fish and habitat.

Assessments investigate the presence of benthic macroinvertebrates and the quality of habitats using MBSS sampling protocols for the purpose of quantitatively describing the community composition, determining relative abundance in favorable habitat at each sampling station and assessing habitat categories. Fish are sampled using the Fish Indices of Biotic Integrity (FIBI).

SHA will be monitoring the following the sites

MD 2/45 Sullivan Branch: Post construction testing

Gunpowder Falls: Post construction testing

Long Draught: Pre- construction

Tuscarora Creek US 15 at US 40: Post Construction

US 15 Monocracy River-Pre-construction

I-695 at Minebank Run Stream: Pre-construction testing

Retrofit Database Delivery

Data related to the retrofits projects were submitted with previous reports.

G.2 Contribute to Local NPDES Watershed Restoration Activities

SHA often participates in and supports watershed interest groups and local jurisdictions in their activities. In addition, SHA has participated directly or indirectly in developing watershed plans as well as providing funding. The Maryland Department of Transportation's State Highway Administration oversees the Federal Transportation Enhancement Program (TEP) and encourages the use of these funds by local jurisdictions and

interest groups to fund water quality projects associated with roadway runoff.

The following is a summary of watershed activities undertaken during the report period:

I-695 at Minebank Run Stream Restoration, Drainage and Water Quality Improvements – SHA. This project (See Figure 1-30) was initiated to address multi outfall stabilization, stream restoration, SWM retrofits and reforestation. The Minebank Run watershed is a priority targeted by Baltimore County for restoration. The topographic survey has been completed, design work on this project has been initiated and project is scheduled for construction in 2014-2015. This project will provide pollutant significant load reductions for the Gunpowder River watershed.

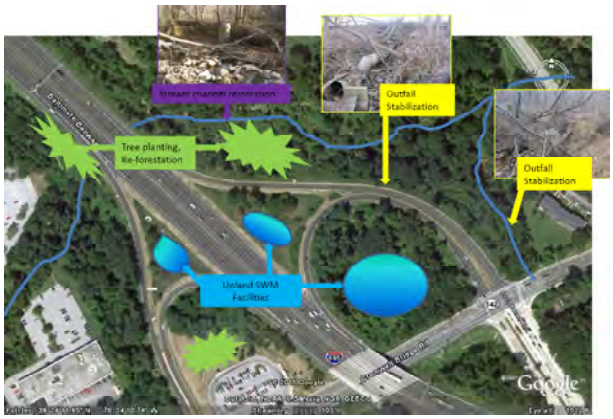

Figure 1-30: Minebank Run Restoration, Drainage and Water Quality Improvement - Concept Design

Westminster SWM Regional Pond – Carroll County. This project is proposed by Carroll County and SHA is sponsoring for TEP funding that has been approved. The project proposes retrofit of regional stormwater management facility to treat currently untreated impervious surfaces within 250 acres watershed. SHA will provide technical review and guidance for navigating the Federal Aid approval process. SHA will receive a portion of the water quality credit associated with the treatment of the SHA impervious surfaces within the drainage area. The preliminary estimate indicates SHA credit to be about 25 acres of impervious and 30 acres of pervious surfaces.

Figure 1-31: Carroll County Westminster Pond Project

Laurel Lakes Task Force – PG County. The I-95/Contee Road project recently received design funding. Due to procurement and right-of-way challenge, SHA is pursing remediation of the outfall separate from the overall project. The project will be designed in accordance with the Stormwater Management Act of 2007, implementing ESD features.

South River Federation – AA County. The BMP upgrade projects mentioned in the last annual report were delayed to address in-stream issues.

Whitehall Creek Watershed – AA County. This is a Transportation Enhancement Program (TEP) funded project being undertaken by Anne Arundel County. SHA is supporting this project through the TEP review process. The project proposes construction of various stream segments at the head of the watershed as well as significant stabilization from the US 50 interchange at MD 279 up to the point of tidal influence. Currently, the project is under design in final review stage.

Warehouse Creek Stream Restoration –AA County. This is a Transportation Enhancement Program (TEP) funded project being undertaken by Anne Arundel County. SHA is supporting this project through the TEP review process. This project proposes 1,100 LF of stream restoration coupled with three potential storm water management practice opportunities targeted to improve water quality through sediment load reduction. The total drainage are draining to this project is 371 acres.

Brampton Hills Stream Stabilization- Howard County. This project is sponsored by TEP and administered by the Howard County Department of Public Works, Environmental Division. The project consists of the stabilization of 2,100 linear feet a stream within the County Open Space. As part of the project SHA with be ensuring the water quality treatment by SWM facilities will continue to perform at an acceptable level.

G.3 Report and Submit Annually

SHA completed and submitted information on our twenty-five required watershed restoration projects and other activities to meet the permit requirement in past reports including retrofit proposals, costs, schedules, implementation status and impervious acres proposed for management.

Documentation in the form of construction plans, cost estimates and schedule for these additional projects can be provided to MDE at their request.

H Assessment of Controls

This condition requires that SHA develop a proposal and receive approval for a watershed restoration project by October 21, 2006; develop and receive approval for a monitoring plan that should include chemical, biological and physical monitoring according to parameters specified in the permit and submit data annually.

H.1 Restoration Site Approved by October 21, 2006

The Long Draught Branch restoration project was previously approved as our restoration site. This project has undergone difficulties in obtaining the joint permit approval for construction. SHA is investigating the possibility of altering the proposed design in order to address agency concerns and is continuing to pursue this project. However, the current budget re-allocation has caused us to delay construction funding until 2014. We will continue to provide monitoring on this project in accordance with the permit requirements.

H.2 Monitoring Plan

Based on the previous approval of the Long Draught Branch project by MDE-WMA, significant monitoring (physical, chemical and biological) was performed. The final report for the pre-construction monitoring data was included in the 2008 annual report.

The pre-construction monitoring was completed on this project. Since the project has been delayed, the post-construction monitoring data will not be available until after the construction is completed.

In the interim, we are pursuing monitoring of a failed infiltration basin and these monitoring results were summarized in Section D.

H.3 Annual Data Submittal

Monitoring data was included with previous reports. As new monitoring data becomes available, it will be shared upon request.

I. Program Funding

This condition requires that a fiscal analysis of capital, operation and maintenance expenditures necessary to comply with the conditions of this permit be submitted, and that adequate program funding be made available to ensure compliance.

In 2006, SHA had procured open-end consultant contracts in the amount of $9 million in order to accomplish both the current Phase I and Phase II NPDES permits. We are currently in the process of procuring additional open-ended consultant contracts in the amount of $18 million for five years to continue our efforts for the future.

In addition to the funding commitment from this office we also use State Planning and Research funds (SPR), Transportation Enhancement Program (TEP) funds and SHA Operations and Maintenance funds in completing NPDES requirements.

Currently, SHA tracks spending for the NPDES program as a whole and breaks out a few items such as NPDES Stormwater Facility Program and industrial activities. We do not currently track many of the requested areas such as street sweeping, inlet cleaning or database maintenance as separate expenditures.

According to our current records, the total spent for the MS4 NPDES, the Stormwater Facility Program and the Industrial NPDES are listed in Table 1-32 below.

Table 1—32: SHA Capital Expenditures for NPDES

Fiscal Year	Expenditure (Millions)
2005	$ 3.40
2006	$ 7.26
2007	$ 5.74
2008	$ 5.73
2009	$ 6.42
2010	$ 8.68
2011	$ 9.84

J Total Maximum Daily Loads

The current SHA NPDES Phase I permit requires SHA to manage its design, construction and operations to reduce pollution from our highways and improve water quality of the Chesapeake Bay. SHA has implanted variety of measures described in the report to comply with conditions of the current permit to meet waste load allocations specified in Total Maximum Daily Loads (TMDL) developed for impaired water bodies.

As part of the Clean Water Act containing provisions for the Chesapeake Bay EPA has established new water quality standards and issues - Total Maximum Daily Loads (TMDLs) on 12/29/2010. The Maryland Phase I Watershed Implementation Plan (WIP) was issued 12/03/2010 with an addendum to the WIP issued 12/16/2010. Therefore, SHA expects that the next permit term will include specific reductions of nitrogen, phosphorous and sediment requirements.

SHA has been given specific baseline loads and waste load allocations for the nutrients phosphorus and nitrogen from MDE on September 14, 2011. These loads are 'delivered' loads and represent the maximum level of the pollutants that can be discharged to the Bay.

Impervious restoration can be accomplished by removing pollutants at the source with such methods as street sweeping and inlet cleaning; providing structural BMPs to treat polluted runoff; changing land uses by converting impervious surfaces to pervious or wooded; or implementing non-structural controls such as permeable paving or disconnecting impervious surfaces from storm drain systems.

To comply and meet these challenging requirements, SHA is developing multiple implementation strategies that include capital improvements, retrofits, and several maintenance operations that will be included in the SHA Watershed Implementation Plan.

SHA is assessing the current capacity of pollutant reduction accomplished through existing operations and programs as part of the 2013 milestones and draft action plan that will be delivered to MDE in November 2011.

Chesapeake Bay Restoration Plan

At the 26th meeting of the Chesapeake Bay Executive Council, Governor Martin O'Malley announced presented two-year milestones as a part of the Chesapeake Bay Restoration Plan to accelerate Maryland's efforts to meet nutrient reduction goals by 2020, five years earlier than the 2025 end date agreed to by the other jurisdictions.

Governor O'Malley and his team developed two-year milestones to initiate the restoration efforts immediately and accelerate the implementation process. This first set of 2-Year Milestones should be completed by December 31, 2011, and will then be followed by subsequent 2-Year Milestones until the goal are achieved.

Maryland's 2-year Milestones consist of 34 specific measurable actions that will result in load reduction of 3.75 millions lb of nitrogen and 193,000 lb of phosphorus by the end of the year 2011. The individual actions are related to agriculture lands, developed land, pollution; private lands, and public lands

SHA nutrient reduction implementation projects fall under all of these categories, but the main focus is on:

Reduction of pollution from developed land - treatment of highway runoff through retrofits of storm water management systems

Restoring natural filters on public lands in terms of tree planting, stream restoration and stream side forest buffers creation.

One of the 34 program actions under the Chesapeake Bay Restoration Plan that is most relevant to SHA includes retrofit of stormwater management systems on 90,000 acres to control pollution loads through the use of structural and non-structural techniques that intercept, filter and

treat runoff from developed lands. The total number of restored acres by different strategies is summarized in Table 1-21.

Table 1-34: Summary of SHA Implementation Efforts towards Maryland's 2 Year Milestone

Program Activity	Restored Acres
SWM Retrofits	462
Urban Tree Planting	747
Stream Restoration	529
TOTAL:	1,739

Grass Swale Study

Per the direction of the Accounting for Stormwater Waster load Allocations and Impervious Acres treated, SHA has initiated the development of process to evaluate the existing grass conveyance systems within SHA Right of Way. The protocols will be used to identify and quantify the areas treated by these practices so they can be included in SHA's existing Impervious Surface Account and for future pollutant load accounting systems and restored impervious acres. In addition, SHA is documenting the recommended methodology for using a desktop evaluation based on GIS analysis of topographic data and aerial photography. The methodology will include a field verification phase to test the accuracy of the GIS analysis.

This protocol and results will be presented to MDE for review. The results of the analysis will be incorporated as a part future reports and updates.

PART TWO

Stormwater Management Facilities Program

2.1 Introduction

This part of the report provides a summary of the Maryland SHA Stormwater Management (SWM) Facilities Program activities between October 2010 and October 2011.

Based on the latest estimates SHA owns about 2350 stormwater management (SWM) facilities statewide that were constructed to treat the highway runoff. Since 1999, SHA has managed a comprehensive program to locate, inspect, evaluate, maintain and remediate BMPs to sustain their functionality, improve water quality, and protect sensitive water resources.

The program's primary goal is to maintain SHA's stormwater facilities to operate as designed and to strategically enhance their functions to meet today's stormwater standards. The SWM Facilities Program consists of four major components:

- Identification, inspection and database development and maintenance for SHA assets management,
- Preventive maintenance and remediation of stormwater BMPs,
- Visual , functional and environmental quality enhancements, upgrades and retrofits of SWM facilities, and
- Monitoring, research studies and technology tools development.

2.2 Inventory and Inspections

The following section summarizes the inspection system and inventory results to provide a status of SHA-owned SWM facilities.

2.2.1 Inspection Protocol

The inspection protocol is documented in *Chapter 3 of "Maryland State Highway Administration Stormwater NPDES Program, Standard Procedures*

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Performance Rating"

During the initial field assessment, the individual parameters of each SWM facility are *scored* (on a scale 1 to 5) and used to establish an overall BMP performance rating:

A **No Issues** – BMP functioning as designed with no problem conditions identified. There are no signs of impending deterioration.

B **Minor Problems** are observed, however, BMP is functioning as designed.

C **Moderate Problems** are observed; although the BMP is functioning as designed, performance and functionality are significantly compromised.

D **Major Problems** are observed, and the facility is not functioning as designed. Several issues exist that have compromised the BMP performance or indicate failure.

E **Severe Problems** exist, and the facility is not functioning as designed with several critical parameters having problem conditions. BMP facility shows signs of deterioration and/or failure. Remedial action should be performed immediately.

The remedial inspection protocol describing methodologies used in the field for assessing the current functionality of a SWM facility and providing guidance for remedial actions is included in the - Chapter 7 of "*Maryland State Highway Administration Stormwater NPDES Program, Standard Procedures*. The consistent remedial assessment and action rating enable SHA to properly allocate funding mechanism to ensure timely response and proper scheduling maintenance activities.

SHA Remediation Rating

During remedial inspections SHA performs qualitative evaluation for maintenance and remediation by assigning the remedial rating. This rating system is based on the overall initial

inspection rating, performance, functionality, integrity and visual appearance; and also scope and complexity of the potential remedial work:

I No Response Required – schedule for multi-year inspection. These facilities are functioning as designed.

II Minor Maintenance – perform preventative maintenance to sustain facility performance. Activities can typically be performed within an 8-hour workday by an average maintenance crew. These facilities are functioning as designed.

III Major Maintenance or Repair – Maintenance or repair is needed to return the site to original functionality within the existing footprint of the facility. Remediation is more significant than just preventative maintenance and will likely require heavy equipment mobilization, construction material and possible Maintenance of Traffic.

IV Retrofit Design - Remedial design and construction is required since the facility cannot be returned to its original functionality within its existing footprint. It involves the construction of new type of facility in the vicinity of the existing facility.

V Immediate Response – Public safety hazards exist that require immediate correction.

VI Abandonment – the facility is not maintainable and will not provide sufficient benefit to justify remedial design.

2.2.2 Inventory

BMP Inventory is being performed countywide on SHA's roadways in Maryland jurisdictions with Phase I and II MS4 permits, and on a district-level. Table 2-1 summarizes the total number of SHA maintained BMPs identified in each County and SHA District.

Table 2-1: Current SHA Maintained SWM Facilities

District	County	No. BMPs	Totals
1	Dorchester	28	173
	Somerset	11	
	Wicomico	50	
	Worchester	84	
2	Caroline	4	134
	Cecil	15	
	Kent	6	
	Queen Anne's	102	
	Talbot	7	
3	Montgomery	341	609
	Prince George's	268	
4	Baltimore	213	357
	Harford	144	
5	Anne Arundel	419	562
	Calvert	31	
	Charles	96	
	St. Mary's	16	
6	Allegany	41	71
	Garrett	12	
	Washington	18	
7	Carroll	49	442
	Frederick	82	
	Howard	311	
Statewide			**2348**

BMP inventories are being constantly updated as remediation and retrofit projects are completed. In some instances, SWM may be replaced, consolidated, retrofitted, constructed or re-constructed by a private developer to serve as a Joint Use facility. In order to track pending changes in BMP inventory, SHA keeps improving the internal process and database management tools. As the inventory spans statewide, major efforts of inspection and maintenance are strategically expedited in NPDES counties.

2.2.3 Field Inspection

The initial BMP inspections and inventories are completed for all counties, including non-MS4 counties. This information is used for tracking of SHA impervious area being treated by storm water controls. The statewide inventory is continuously being updated with inspection information, so the remedial actions can be established and based on the field inspections

and/ or subsequent field investigations. This year over 300 SWM facilities have been added to the SHA inventory after completion inventory updates in Montgomery, Prince Georges, Baltimore, and Howard Counties.

2.3 Maintenance & Remediation

This section summarizes the status of SHA maintenance and remedial responses to deficiencies identified through the inspections of SWM facilities. The program's primary goal is to keep SHA stormwater facilities functioning as designed and (when the opportunity arises) to enhance their functions. The responses are separated between routine maintenance major maintenance and retrofit projects. Table 2-2 shows the status of the remediation responses by maintenance or retrofit/enhancement design in SHA Districts 3, 4, 5 & 7, while including the NPDES Phase I counties.

Table 2-2: Remediation Responses

District 3 - Responses	**I**	**II**	**III**	**IV**	**TOTAL**
Montgomery County	58	238	42	3	**341**
Prince George's Co.	162	76	27	3	**268**
Totals	**220**	**314**	**69**	**6**	**609**

District 4 - Responses	**I**	**II**	**III**	**IV**	**TOTAL**
Baltimore County	151	40	12	10	**213**
Harford County	41	57	35	11	**144**
Totals	**189**	**95**	**48**	**22**	**357**

District 5 - Responses	**I**	**II**	**III**	**IV**	**TOTAL**
Anne Arundel County	323	43	9	44	**419**
Calvert County	4	19	8	0	**31**
Charles County	83	3	1	9	**96**
St. Mary's	1	13	1	1	**16**
Totals	**411**	**78**	**19**	**54**	**562**

District 7- Responses	**I**	**II**	**III**	**IV**	**TOTAL**
Carroll County	42	6	1	0	**49**
Frederick County	65	14	3	0	**82**
Howard County	240	42	16	13	**311**
Totals	**347**	**62**	**20**	**13**	**442**

2.3.1 Routine Maintenance

Routine maintenance or preventive maintenance is generally considered a repair activity that addresses minor issues such as mowing, vegetative maintenance, trash and debris removal. The objective is to maintain performance of a BMP and/or to avoid deterioration of specific BMP elements. SWM facilities that require routine maintenance are assigned "II" rating by SHA.

SHA is currently performing most of the routine maintenance using two (2) OHD Open Ended Asset Management contracts and Design, Operate and Maintain Project (DBOM) for Charles County. One additional Open Ended Asset Management contracts has been advertised and will be activated by November 2011.

Since the completion of the statewide inventory, routine maintenance activities are scheduled based on the local needs and geospatial data. Roadway corridors are typically completed within a few weeks.

Figures 2-3 and 2-4 show the typical vegetative management activities at SWM ponds in Charles County.

Figure 2-3: Minor Maintenance Activities BMP 080065 Before Maintenance

Figure 2-4: Minor Maintenance Activities-BMP 080065 After Maintenance

2.3.2 Major Maintenance

SHA performs major maintenance tasks that address significant deficiencies at BMPs through the open ended contract lead by OHD – Innovative Contracting Division. The intent is to restore performance of a BMP and/or to avoid failure of specific elements. SWM facilities that require major or remedial maintenance are assigned a "III" rating by SHA. Figure 2-5 shows an example of SWM Facility requiring major maintenance in terms of excavation of accumulated sediments in infiltration basin to restore its functionality.

Figure 2-5: Removal of Sediment from Infiltration Basin in Howard County (BMP 130316)

SHA continues performing detailed field assessments for BMPs identified for major maintenance. A workorder and a summary report is prepared for each BMP that provides sketches using as-built plans, photographs, cost estimate, repair recommendations, specifications and maintenance of traffic plan.

Major maintenance is underway in most inspected counties, including Phase II counties

and non-NPDES jurisdictions, but the focus in the past year has been on Anne Arundel, Baltimore, Howard and Charles Counties.

Table 2-3 lists the total number of facilities that were maintained between October 2010 and October, 2011 in NPDES Phase I Counties.

Table 2-6: Summary of BMP Maintenance in NPDES Phase I Counties

County	District	BMPs Maintained 10/2010 to 10/2011
Anne Arundel	5	5
Baltimore	4	12
Charles	5	43
Howard	7	5
Note: Cost of Remedial Construction Activities in NPDES Phase I counties from 10/2010 to 10/2011: $718,659		

2.3.3 Filtration Facilities Remediation

SHA continues to perform major remedial activities on all types of BMPs, especially infiltration trenches. In the past year SHA initiated remediation of filtration facilities, namely sand filters since they have been widely designed and constructed in past 5 years on many projects and reached their initial service term. Typical remedial activities are shown in Figure 2-7 through Figure 2-9.

Figure 2-7: Sand Filter Maintenance (BMP030035) Baltimore County

Figure 2-8: Sand Filter Forebay Before Maintenance (BMP030035) Baltimore County

Figure 2-9: Sand Filter Forebay After Maintenance (BMP030035) Baltimore County

The functionality of filtration facilities is compromised when the top layers of the media becomes clogged with fine sediments, debris and trash. If left unmaintained, eventually the filtration capacity is compromised and the permanent ponding is observed. In some cases wetland vegetation emerges in within the wet zones and the facility becomes a shallow wetland with limited water quality volume and low pollutant removal efficiency.

General recommendation for remediation depends on the severity of clogging. In many cases the functionality can be restored by removal of the top layer of the filter and replacing with clean materials. Vacuuming or flushing the filter is an option for sites clogged with fine sediments. However, often the restoration requires total replacement of the media and the underdrain system. Examples of these activities are illustrated in Figures 2-10 though 2-13.

Figure 2-10: Sand Filter (BMP130259) During Maintenance, Howard County

Figure 2-11: Sand Filter (BMP130259) Before Maintenance, Howard County

Figure 2-12: Sand Filter (BMP130259 During Maintenance, Howard County

Figure 2-13: Sand Filter (BMP130258) After Maintenance, Howard County

2.4 SWM Retrofits, Visual and Functional Enhancement Projects

MD SHA has actively continued planning, design and construction of SWM Functional Enhancement and Retrofit Projects funded through state as well as federal funds for drainage improvements.

Locations for enhancement projects are evaluated based on feasibility, permitting process, and overall net benefit. SHA seeks opportunities to improve efficiencies of older facilities that currently provide minimal water quality treatment to restore them to achieve maximum reduction of pollutant loads from highway runoff. SHA is also looking for opportunities to divert more runoff from untreated impervious areas to the existing SWM facilities to maximize the water quality benefits of the retrofit projects

In addition, as a part of the watershed restoration efforts, SHA is taking the holistic approach on water quality project planning and initiating SWM projects to treat currently untreated impervious areas while addressing drainage infrastructure improvements as well as degraded outfall channels stabilization.

The current status of SWM enhancement, retrofit and water quality improvement projects is summarized in Table 2-14.

Table 2-14: Summary of SWM Enhancement, Retrofit and Water Quality Improvement Projects

Project	County	No. of BMPs	Contract Number	Total Cost (PE, R/W, Construction)	Status
1. MD 28 – Retrofit of SWM Facility 150344	MO	1	MO247A21	$120,000	Will be constructed through T&M Contract
2. US 50 –Retrofit of Infiltration Basins	AA	3	AA822A21	Preliminary Estimate $800,000	Survey and concept design completed
3. I-97/ MD100 SWM Facilities Functional Upgrades	AA	12	AA5355174	$1,180,000	Construction completed in May 2011
4. SWM Retrofit and Drainage Improvements at Sawmill Creek	AA	1	AA2735174	$550,000	Construction completed in August 2011
5. MD 4 – Enhancement of SWM Facilities	AA	3	AA5515174	$720,000	Under Construction, completion expected in Spring 2012
6. MD 355 – Retrofit of SWM Facility 150012	MO	1	MO410A21	$70,000	Will be constructed through T&M Contract
7. MD 32 Infiltration Basins Retrofit	AA	10	AX931B21	Preliminary $1,500,000	Field Investigation, Concept design
8. Enhancement of SWM Facility 150173 and Outfall Stabilization	MO	3	MO637A21	Preliminary $850,000	Survey requested Concept design
9. I-270 SWM Retrofit of BMP 150059 and 150556	MO	2	MO106A21	PI Estimate $510,000	Survey completed, Semi-final review
10. I-695 Minebank Stream Restoration , Drainage and Water Quality Improvements	BA	3	BA712B21	PI Estimate $2,000,000	Survey completed, Concept Development
Totals		**39**		**$8,300,000**	

Examples of some of the projects listed in Table 2-4 are explained below.

Construction of SWM Functional Upgrades in Anne Arundel County along I-97 and MD 100 has been completed and the as-built plans have been accepted by MDE.

Similarly, the SWM retrofit and drainage improvements project at SHA Glen Burnie maintenance shop was completed in late summer of 2011. Figure 2-13 show the post construction conditions of the project.

Figure 2-11: Glen Burnie Maintenance Shop Retrofit Project Location

Figure 2-12: Sand Filter Installation at SHA Glen Burnie Maintenance Shop – During Construction

Figure 2-13: Sand Filter Installation at SHA Glen Burnie Maintenance Shop –After Construction

The construction phase of functional enhancements of SWM facilities along MD 4 in Anne Arundel County started in July 2011 and the completion is anticipated early spring 2012. The current progress is shown in Figure 2-14 below.

Figure 2-14: MD 4 SWM Functional Enhancement Project During Construction

In summary, the proposed and implemented SWM retrofit and enhancement projects are designed to contribute towards the improvement of water quality of highway runoff to reduce the pollutant loads (specifically phosphorus, nitrogen and total suspended sediments) in the environmentally sensitive watersheds of Chesapeake Bay. These retrofits are designed to address original water quality capacity as well as to comply with the most recent design standards for water quality requirements.

2.5 Other Topics

2.5.1 Data Management

SHA has performed inventory of SWM drainage infrastructure in all NPDES counties and BMP inspections in all twenty-three counties with the intent to finalize statewide BMP inventory database by June 2011. SHA has proceeded with the second cycle re-inspection in four counties. This effort involves continuous creation and updating of GIS data for source identification and database records for inspections and remediation activities. The effect also relies on available funding.

SHA has finalized the structure of ESRI geodatabase and detailed schema that allows for the establishment and enforcement of topologic and/or network rules and unique data entry. Domain rules are updated when needed. The database format resulted in improved data intelligence and integrity. SHA plans to integrate geodatabase with other SHA initiatives to improve communication between offices.

SHA and its consultant partners use two custom software to collect and store geospatial information. The Office Tool is used to input data, as well as integrity assurance (QA) checks. In addition, a Field Tool is used with coordination with GPS units to collect and edit field data.

Along with the database format, a data viewer tool – NPDES Viewer- has been enhanced. The functionality of this tool allows the user to view the spatial information as well as digital images associated with each BMP including as-built plans, photographs, inspection reports and other documents. NPDES Viewer is used to view data from various levels such as a highway corridor, SHA district, County, or watershed.

A component for BMP maintenance tracking called Remediation Tool has been added to the NPDES Viewer. This application allows tracking maintenance activities, and associated cost as well retrofit project progress and current functionality of SHA owned SWM facilities. It also allows the reporting of data to managers and administrators.

2.5.2 IMAP

The most recent tool incorporating BMP geodatabase that is used for quick data viewing, reporting and spatially displaying is a web application named iMap. (Screen captures are shown on Figure 2-15). The application can be found at http://www.mdimap.com/sha/

This tool was developed by SHA primarily for reporting the current status and progress of SHA Business Plan objectives to the StateStat Committee. This tool was also used to present

SHA SWM program at the Lt. Governor's meeting in July 2010.

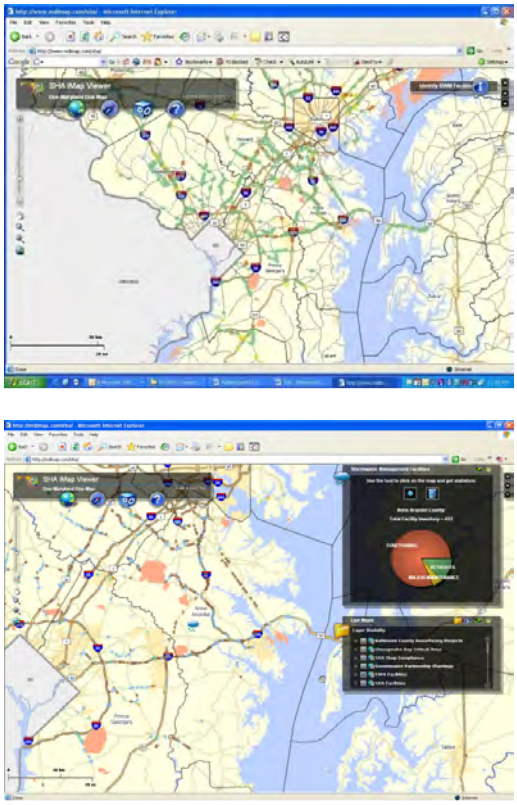

Figure 2-15 iMap Screen Captures

2.5.3 eGIS

SHA has developed comprehensive mapping solutions for all internal department and division to view spatial data related to project development and operations. eGIS has contents related to all aspects to highway operations and allows planners and engineers to access asset related data on a real-time basis.

Current NPDES drainage and storm water information has been integrated into eGIS platform. With eGIS capability, the users who are not experts in using GIS software are enabled to view data. This greatly enhances cross communication and other business functions.

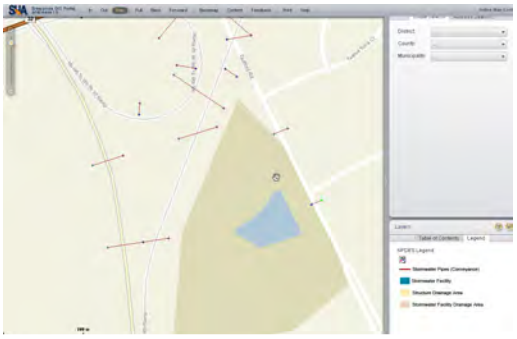

Figure 2-16 Screen Shot of eGIS

2.5.4 Standard Procedures

In order to maintain consistency and compatibility of the data collected during source identification and BMP inspections, SHA continues conducting NPDES Standard Procedures Workshop for outfall inspections, BMP inspections and illicit discharge screening.

Chapter 7 of NPDES Standard Procedures for SWM maintenance work order development has been updated to include knowledge gained over the last few years. The chapter describes the procedure for field assessment of BMPs previously designated as requiring remediation after an initial inspection or at any time throughout the inspection cycle. After the preventative cyclical inspections and database updates, final performance ratings and level of functionality are evaluated. BMPs with major deficiencies that entail more than minor maintenance require a detailed Remedial Assessment to determine specific causes of deficiencies and to develop a remedial action plan. The procedures that are outlined in the chapter assist the decision making process for maintenance, repair, and remediation of SWM facilities. It also provides standardization in the assessment process, instructions to inspect BMP facilities statewide, examples for identifying and assessing the causes of the deficiencies, and to recommend repairs with relatively consistent results. The intent of the document is not to be an all-inclusive resource manual and other resources are consulted in conjunction with the document. Cost estimating and common causes for facility failure are the updated key portions. Examples of work action are included for common facility types.

2.5.5 SWM Processor

MD SHA has developed comprehensive SWM design software that enables design engineers to optimize water quality needs for roadway improvements. Figure 2-20 shows a screen capture of the interface. SWM Processor is developed for engineers to manage the stormwater management design process as listed in MDE Stormwater Management Design Manual. The program has a built-in computation model with flexible user interface and report generator. It enables the design engineer to perform calculations efficiently with several error checking mechanisms. The engineer can save the project data including project information and calculation data to a centralized database or XML file. The program generates standardized reports including the computational procedures as seen in the examples in the Design Manual. The database catalogs all projects that have been entered. External users may install the software without the cataloging and forward computations to be imported into system. Consistent computational policies for stormwater management are needed for long-term success of any comprehensive SWM program.

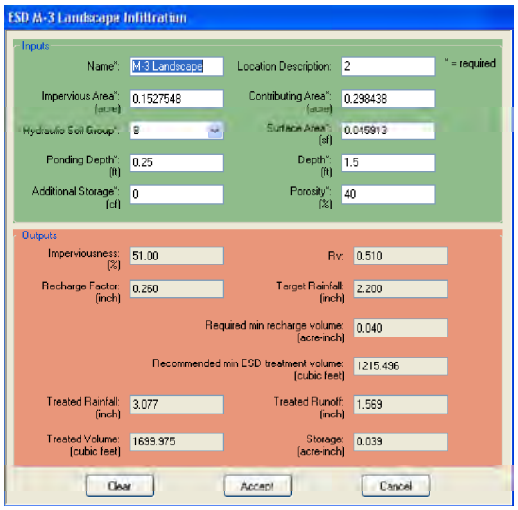

Figure 2-17 Screen Shot of SWM Processor

2.5.6 Qlikview Dashboard

Qlikview is an intelligent business reporting software that allows Program Managers to make informed and consistent decisions regarding resource allocations. Stormwater maintenance activities are reported and summarized. Production trends that show current program performance and progress are displayed in formats via a HTML browser. Graphs and charts are updated in real-time as activities are advanced, while providing decision making support.

Automated queries, based on SWM attributes such as County, Watershed, Shop, District, and facility type are produced to generate target areas of greater need.

Figure 2-18 Screen Capture of Qlikview Dashboard

2.6 Summary

The SHA continues improving protocols and standard procedures for inventorying and inspecting SMW facilities. This leads to the development of a responsive asset management program to sustain BMP performance, and also includes functional and visual enhancements to upgrade SWM to the today's standards. The SHA researches SWM facilities performance through monitoring and research studies. The SHA continues development of data management technology to manage and utilize BMP data more efficiently. Tools are being developed to facilitate timely decisions on remedial actions, and meet NPDES permit requirements.

The SHA Business Plan goes beyond the NPDES Phase I permit requirements by promoting the statewide inventory and a high-level of BMPs performance. The goal is to bring 90 percent of all SHA owned SWM facilities to their functionality by the end of the FY 2012. Currently 87.5 % of SHA inventoried SWM facilities function as designed. Figure 2-19

summarizes the progress as well as illustrates the overall trend of the program for the past decade.

During the last 10 years, SWM Facilities Program has shown environmental stewardship in the areas of innovative state-of-the-art inspection and data management technology as well as BMP remediation techniques. The program components and structure demonstrate strategic approach to meet the NPDES Permit requirements and enhance the performance efficiency of SWM facilities to reduce pollutant loads from highway runoff and improve water quality in the sensitive watersheds of the Chesapeake Bay.

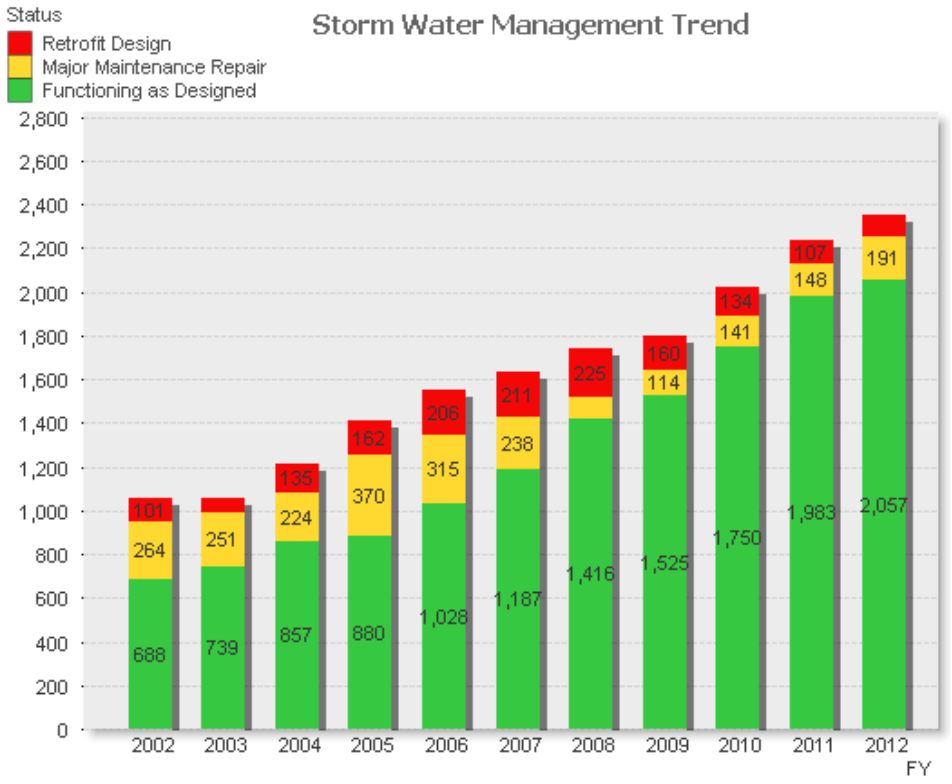

Figure 2-19 Progress in SWM Facilities Program