**Maryland Department of the Environment**
**Water Management Administration**

# Review of Baltimore City's National Pollutant Discharge Elimination System Stormwater Annual Reports 2006-2008

Baltimore City was issued a National Pollutant Discharge Elimination System (NPDES) permit (MD0068292) on January 3, 2005. This permit lasts for 5 years and requires the City to prohibit non-stormwater discharges and reduce stormwater pollutants through its storm sewer system to the maximum extent practicable. For each year of Baltimore City's permit, a report is required for assessing the progress of stormwater management programs. This review by the Maryland Department of the Environment (MDE) provides the City with NPDES permit compliance status.

## Administration of Permit

Baltimore City's NPDES stormwater permit is administered by the Chief of the Surface Water Management Section. The City submitted an organizational chart detailing personnel and groups responsible for major program tasks related to the permit. This information is complete and complies with permit requirements.

## Legal Authority

Baltimore City's Solicitor has certified that the City has the legal authority to carry out all activities prescribed in its NPDES stormwater permit. This authority is basic to the City's stormwater efforts and needs to be maintained throughout the permit term. If any legal powers prove inadequate for complying with the requirements in 40 Code of Federal Regulations 122.26(d)(2)(i), the City should make necessary changes to maintain adequate legal authority.

## Source Identification

Baltimore City is required to identify and map sources of pollutants in stormwater runoff. This information is used in the development of watershed restoration plans and for tracking annual progress. Accordingly, the City is required to compile geographical information system (GIS) data on storm drain outfalls, best management practices (BMPs), impervious surfaces, monitoring locations, and watershed restoration projects. Baltimore City annually submits information on its monitoring locations and watershed restoration projects, however, data on its storm drain system, BMPs, and impervious surfaces have not been updated since 2005. Baltimore City needs to submit all source identification data annually to remain in compliance with the source identification permit conditions.

## Management Programs

Baltimore City is required to implement a management program designed to control stormwater discharges to the maximum extent practicable. The City's stormwater management program encompasses numerous elements including erosion and sediment control, post-construction runoff management, controlling pollutants associated with road maintenance activities, public education and outreach, and illicit discharge detection and elimination. A summary of these program elements is provided below.

Baltimore City provided administrative information on its stormwater management permitting program. For 2006-2008, there were 40 new development projects and 218 redevelopment projects. There were 1,244 stormwater management exemptions granted and 29 fee-in-lieu projects, which generated $908,872. During 2006-2008, 1,088 acres were developed and 28 new BMPs built to control 232 acres. A complete database of approved projects and pertinent stormwater management program data have been submitted.

Baltimore City inspected all of its stormwater management facilities (186) in 2007. No BMPs were inspected in 2006 or 2008. During the 2007 inspections, one facility was deemed unsatisfactory and 11 other facilities were never built. The City needs to reinspect all of its stormwater BMPs this calendar year to comply with the permit's triennial requirement. During this process, investigations should be conducted regarding why 11 BMPs were not built and use the appropriate enforcement actions as needed in each case.

A recent field review of about a half dozen BMPs in Baltimore City by the United States Environmental Protection Agency (EPA) and MDE found that every facility visited needed maintenance. The City's inspection reports from 2007 do not document the maintenance items found at these sites including overgrown discharge risers, missing trash racks, eroded flow channels, clogged inflow and discharge weirs, excessive tree growth on dam structures, and excessive trash. BMP maintenance is a fundamental stormwater management program element and is crucial for the proper functioning and pollutant removal capabilities of these facilities. Baltimore City needs to do a better job of ensuring that adequate inspections are being made and that facilities are being properly maintained. MDE has provided the City with a BMP maintenance manual and is willing to provide technical exchange through joint stormwater management facility inspections.

Baltimore City has requested continued delegation of erosion and sediment control authority. MDE's recent program review found that, overall, erosion and sediment controls on active construction sites in Baltimore City were in poor condition. A primary concern was that earth disturbing activities were occurring without erosion and sediment control plan approvals. Several of the land grading operations were occurring on City-owned property. Additionally, the inspection staff during the last year has gone from four inspectors to one and erosion and sediment control plan review staff was reduced as well. As a result, MDE required Baltimore City to provide a detailed proposal on how it expects to increase staff and address erosion and sediment control program deficiencies. Once this has occurred, MDE will conduct an additional field review to determine if enforcement authority should be delegated.

Baltimore City uses a comprehensive approach to discover and eliminate illicit connections to its storm drain system. Continual ammonia screenings (AS) are conducted in Baltimore's 4 major watersheds and stream impact sampling (SIS) is conducted downstream of all major outfalls. For 2006-2008, an average of 1,800 stations were visited annually and 1,500 water quality analyses performed. When sampling shows that pollutant levels are elevated, a pollutant source tracking (PST) investigation is triggered.

Extensive dye-testing and storm drain video cameras are often used to investigate suspected problems, discover illicit connections, and initiate enforcement actions to eliminate pollutant

sources. During 2006-2008, 250 PSTs were initiated and 124 were resolved, 75 were not found or the trail ended, 18 have repairs pending, and 24 are under continued investigation. The City consistently discovers and resolves between 30 and 50 illicit discharges per year using its sampling and PST programs. These programs require large investments of resources and persistence and the City is commended for managing a very successful illicit discharge and elimination program.

One targeted City activity for illicit discharges is brick cleaning operations. For 2006-2008, 1,481 sites were permitted, 553 inspections were made, 110 stop work orders were issued, and 25 instances of illegal discharges to the storm drain system were documented for further legal action. In 2008, five criminal cases were initiated for prosecution by the City's Special Projects Unit in cooperation with MDE's Environmental Crimes Unit. Violation notices totaling $4,500 have been assessed and two operators found illegally storing over 100 drums of hazardous lead paint waste were fined $10,000 each and face felony charges in Maryland Court.

Under its NPDES permit, Baltimore City is required to identify all City-owned industrial facilities requiring stormwater permit coverage and report on the status of pollution prevention plans. In 2004, the City applied for NPDES industrial permit coverage and developed pollution prevention plans for City-owned industrial sites. Numerous water quality problems were identified including evidence of broken sanitary pipes; stormwater and leachate bypassing control structures; and significant rills, erosion, and failing berms. MDE's review of the City's program in 2005 noted that these items were not addressed. Information provided in the 2006-2008 annual reports is very general and does not address the problems previously noted in the City's pollution prevention plans.

During the EPA audit in 2009, the City's new Central Garage was found not to be covered by an NPDES industrial stormwater permit and two other industrial facilities had obvious housekeeping issues and active pollutant discharges. Baltimore City needs to immediately address its industrial non-compliance with NPDES stormwater permits. MDE requests that the City provide information on how the pollution problems documented in 2004 pollution prevention plans were resolved and submit signed copies of up-to-date pollution prevention plans and inspections for all City-owned industrial facilities for MDE review.

Baltimore City continues to implement street maintenance programs for the reduction of stormwater pollutants. The most notable activities are street sweeping, storm drain and inlet cleaning, and wise use of deicing material and pesticides. Street sweeping in 2006-2008 averaged approximately 80,000 road miles and 7,200 tons of dirt removed annually. These numbers are down considerably from the program’s height in 1999-2001 when it averaged 115,000 road miles and 16,000 tons of debris collected annually. While the City has mentioned in its annual reports since 2005 that the reason for this decrease is broken street sweepers, it has done little to rectify the situation.

Storm drain maintenance data show that inlet cleaning and pipe vacuuming averaged 2,500 tons of debris collected annually for 2006-2008. These numbers are down considerably from the program's height in 2001-2003 when it averaged 4,500 tons annually. Street sweeping, inlet cleaning, and storm drain pipe vacuuming provide significant water quality improvement to Baltimore's streams and harbor, especially where there are physical constraints on stormwater

retrofit construction. The City needs to improve equipment maintenance for its fleet of street sweepers and vacuum trucks so that debris collection rates can match prior performance.

Baltimore City continues to report the amount of pesticides used annually by the Bureau of Highways in accordance with integrated pest management procedures. All City personnel that apply pesticides are licensed by the Maryland Department of Agriculture (MDA). The most widely used herbicide in the City is Roundup at an average rate of 150 gallons/year. Additionally, 120 gallons/year of Brushmaster are used. The MDA inspects City storage sites to ensure that they are in compliance with good housekeeping requirements. Baltimore City should continue to follow integrated pest management strategies and further investigate opportunities for reducing the use of pesticides.

Baltimore City Bureau of Highways keeps data on deicing material used to combat icy road conditions. For 2006-2008, 18,000 tons of sodium chloride were used to clear City streets. This amount is relatively less than the average annual total of 27,000 tons for the years 1999-2005. The City is monitoring several streams to gauge the effects of chlorides on receiving waters but has yet to analyze these data. The City is required to examine its deicing practices on a continual basis and make improvements where possible for reducing the amount of deicing chemicals used.

Baltimore City is required to provide outreach and educational material to residents and the business community for reducing stormwater pollutants. As part of this effort, the City has a complaint hotline "311" that can be used to report pollution problems. Additionally, outreach material, including information on new storm drain markers developed by the Mayor's Cleaner and Greener Program, can be found at www.ci.baltimore.md.us/government/dpw/water.html. Additionally, Baltimore City staff have been assigned as watershed coordinators. These coordinators work as direct liaisons with the public, attend public meetings, and help with festivals in all four major watersheds. Furthermore, the City provides funding for local watershed groups to provide outreach through fliers, monitoring, and tree planting activities.

While education and outreach to local watershed groups has been a hallmark of the City's NPDES stormwater program, outreach to the permitted community, including the City itself has faltered. Baltimore should embrace the Mayor's Cleaner and Greener Program and utilize its new Office of Sustainability, and strive to lead by example. City programs that directly effect stormwater and need significant improvement include industrial stormwater permits and pollution prevention plan implementation; street sweeping and storm drain cleaning; and the inspection and maintenance of BMPs. Better water quality in Baltimore City will be difficult to achieve until fundamental stormwater programs managed by the City are taken seriously and administered more effectively.

## Watershed Assessment and Planning

The City is required to complete the development of watershed management plans for all of its watersheds by the end of the permit term. A watershed management plan for the Gwynns Falls was completed in 2004. Since then, Baltimore City and County have been working cooperatively through the Baltimore Watershed Agreement (BWA) to develop Stormwater Action Plans (SWAP) for the Jones Falls, the Back River, and the Baltimore Harbor watersheds.

The BWA requires that each SWAP create a planning workgroup; share GIS mapping layers and use them to promote environmental site design, protect water quality, and address environmental justice; and to develop a training program for all developers, design professionals, plan reviewers and inspection staff. Plans are now complete for the lower Jones Falls and Back River and grant money has been shared with the Baltimore Harbor Watershed Association to develop a targeted watershed plan for the Harris Creek Watershed. The City conducts extensive chemical, biological, and physical monitoring to support these watershed planning efforts. These plans set the framework for Baltimore City to restore 20% of its impervious surfaces and assess another 10% by the end of the permit term.

**Watershed Restoration**

Baltimore City is required to implement watershed plans to restore 20% of the its impervious surfaces area. The Surface Water Management Section estimates that there are 23,373 acres of impervious surface area in the City requiring that 20%, or 4,675 acres of impervious surface area be restored. The City has provided an update on the status of current restoration projects including the Powder Mill and Maidens Choice stream restoration projects in the Gwynns Falls watershed (5,200 linear feet @ $3,693,247); the Lower Stony Run, East Stony Run, and Western Run stream restoration projects in the Jones Falls (8,100 linear feet @ $8,835,776); the Moores Run Wetland and Yorkwood Elementary School Greening in the Herring Run ($3,566,000); and the Bush Street Trash-Debris Collector and Watershed 263 Ultra-Urban BMP Theme Park in the Direct Harbor Watershed ($991,000). The City continues to monitor these watershed restoration BMPs to determine their effectiveness, provide pollutant removal efficiencies, and meet restoration requirements.

A list of all restoration projects completed, under construction, and planned appeared in an organized table in the City's 2006 report. At that time, the City claimed that 2,184 impervious acres were restored. Because the City has monitored non-traditional BMP designs like stream restoration, trash collection, and street sweeping, pollutant reduction amounts from these projects were related to more traditional BMPs and impervious surface equivalent analyses were made. Since that time, no updates to this table showing cumulative restoration have been provided, however the City has recently furnished these data upon request to MDE. The data show that a cumulative total of 1,251 impervious acres were restored by 2007 and 1,659 impervious acres by 2008. Accounting methods for determining the impervious surface area "restored" by the City have been conservatively revised downward since the 2006 annual report.

Baltimore City claims that accounting for impervious surfaces restored and relating non-traditional BMPs to impervious surfaces restored has caused some confusion and has requested guidance from MDE to set restoration guidelines. The current permit, however, requires the City to determine water quality conditions, rank water quality problems, and to specify overall watershed restoration goals. MDE believes it prudent to allow each jurisdiction a certain amount of flexibility in the setting of water quality goals because each has its own set of unique problems and solutions. MDE recommends that the City use current stormwater design standards as its water quality bar when determining acres of impervious surfaces restored. MDE also believes that local data on stream restoration projects and other non-traditional BMPs may be related back to the current stormwater management criteria to determine impervious surface equivalents for meeting NPDES impervious surface restoration requirements.

In summary, numerous projects are being studied, designed, and implemented in all four of the City's major stream systems. Because the City has not provided updates to its watershed restoration accounting, it is difficult for MDE to determine compliance with this permit condition. Based on the best current data submitted by Baltimore City, it has restored 7% of its impervious surface area leaving another 13% to be restored by the end of the permit term. The City needs to do a better job of accounting for capital improvement projects implemented, relating the data back to watershed restoration requirements, and where shortfalls lie, increasing planning and budgeting efforts to ensure compliance with NPDES permit conditions.

**Assessment of Controls**

Baltimore City has established numerous monitoring locations to identify sources of pollution and for tracking the results of its watershed restoration program. A long-term monitoring site has been operational in the Moores Run for a dozen years to give feedback on restoration activity in this watershed. Additionally, the City has begun chemical monitoring of several drainage areas where watershed restoration efforts are targeted. These include Biddison Run in the Herring Run watershed, the Stony Run in the Jones Falls watershed, and in Watershed 263 that drains to the Gwynns Falls. Current monitoring is being used to characterize baseline conditions that will be used to judge effectiveness once restoration practices are completed.

For the Moores Run, the City has met or exceeded the number of storms required for monitoring in its permit during the past three years. Quality assurance problems with its contracted laboratory in 2008 caused the City to change laboratories. Also, because a majority of total petroleum hydrocarbon (TPH) samples were below the detection limit of 5 mg/l in 2006 and 2007, the City decided to discontinue monitoring TPH. MDE believes that the number of TPH samples recorded below the detection limit is probably the result of the City setting a high detection limit for TPH. The City should ensure that its efforts to detect TPH are appropriate, not abandon sampling of this known stormwater pollutant altogether.

Baltimore City has used its chemical monitoring of the Moores Run to calibrate the Storm Water Management Model (SWMM) to estimate annual pollutant loads. The City will need to expand its pollutant load analysis in the future to sum runoff from its entire storm drain system. The City may fortify its monitoring data with additional data from surrounding jurisdictions, MDE's statewide NPDES database, Chesapeake Bay Program data, or national stormwater sources. The goal will be to estimate jurisdiction-wide stormwater pollutant loads and reductions due to management and watershed restoration programs. These exercises will become increasingly important as municipal governments will be required to show progress toward meeting local and regional water quality goals.

Along with chemical monitoring the City is required to conduct annual biological and physical sampling as well. While four sites have been established for biological monitoring in between Hamilton Avenue and Radecke Avenue in the Moores Run, in 2006 only 3 sites were monitored and in 2008 only two sites were monitored. Additionally, physical assessments were conducted in 2003, 2005, 2007, and 2008. The City should increase its effort to complete annual biological, physical, and chemical monitoring of the Moores Run to fulfill permit conditions, but more importantly, to comprehensively understand urban stormwater runoff, restoration, and trends. A

primary concern remains the physical stability of stream reaches immediately below restoration projects. The U.S. Army Corps of Engineers has stated that a stream stabilization project in the upper reaches of the Moores Run completed in 2007 needs to be fully examined. The City should continue to conduct downstream geomorphologic surveys to determine the net sediment and phosphorus discharges along the entire reach of a stream including the restored and unrestored segments.

## Program Funding

Annually, Baltimore City is required to provide a fiscal analysis of the capital, operation, and maintenance expenditures necessary to comply with all conditions in its NPDES stormwater permit. For fiscal year 2009, the City spent $12,933,100 on NPDES stormwater management tasks. A breakdown of the major NPDES components shows that approximately $70,000 is being spent on source identification; $9 million on management programs, including $7.8 million on street sweeping and inlet cleaning; $3.3 million on watershed planning and restoration; and $110,000 on monitoring. Watershed planning and restoration have averaged $3.2 million annually since 2005. Because Baltimore City will fall short of meeting the 20% impervious surfaces restoration requirement, additional planning, program implementation or funding will be necessary for the City to remain in compliance with its NPDES stormwater permit.

## Summary

Baltimore City has continued to comply with NPDES municipal stormwater permit requirements for permit administration and legal authority. Some stormwater management programs like pollutant source tracking have been superior and able to reduce many illicit connections to the City's storm drain system. Outreach to citizen groups and cross-jurisdictional cooperation has been excellent as well. Other stormwater programs lag and need increased attention and resources in order to remain in compliance with NPDES stormwater permit conditions. These programs include stormwater BMP source identification, inspection, and maintenance; industrial pollution prevention plan implementation; and street sweeping and storm drain vacuuming. While stormwater retrofits and stream restoration projects are being implemented on a more regular basis, only 1,659 acres of impervious surface area have been restored leaving 3,016 acres needed for restoration by the end of the permit term. Budget trends for capital improvement projects have not increased to keep pace with permit requirements for restoration leaving the City in jeopardy of non-compliance.