

**MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER MANAGEMENT ADMINISTRATION**

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
MUNICIPAL SEPARATE STORM SEWER SYSTEM DISCHARGE PERMIT
MD0068357**

REVIEW OF FREDERICK COUNTY'S 2005 ANNUAL REPORT

Frederick County was reissued a National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system discharge permit (MD0068357) on March 11, 2002. NPDES regulations require permit conditions that effectively prohibit non-stormwater discharges and reduce the discharge of pollutants to the "maximum extent practicable." For each year of the County's permit, an annual report is required to help assess the County's stormwater program. The following is a review of Frederick County's annual report that was submitted to the Maryland Department of the Environment (MDE) on March 8, 2006.

Permit Administration:

Frederick County is required to identify key administrative and technical personnel responsible for permit compliance. The County submitted an updated contact list and organizational chart with its annual report. The current information reflects an additional staff position that was budgeted for fiscal year 2006. Any future organizational changes that affect the County's stormwater program should be reported promptly to MDE.

Legal Authority:

Frederick County was required to provide MDE with certification from the County Attorney that the authority to perform the activities described in 40 Code of Federal Regulations (CFR) 122.26(d)(2)(i) and permit number MD0068357 exists. The required certification was submitted on January 28, 2003. In the event that any provision of its legal authority is found to be invalid, the County will need to make the necessary changes to maintain adequate legal authority.

Source Identification:

Frederick County is required to identify sources of pollutants in stormwater runoff and link these sources to specific water quality impacts on a watershed-by-watershed basis. This involves continued development of its geographic information system (GIS) for storing, maintaining, and analyzing source identification data. The County reported that its orthophotography is being upgraded to a mapping scale of 1:120, which will include two-foot contour data and planimetric features. This upgrade should enable better interpretation and increased accuracy of elevation data, hydrographic features, impervious surfaces, etc. Additionally, the County is required to submit stormwater management facility construction completion data on MDE's Urban BMP Database. The current submittal provided information for a total of 541 stormwater management facilities, including the 30 that were built during the reporting period.

The County was also required to submit an example of its GIS capabilities that includes the

identification of all data layers available; the stage of development; and a description of how data are stored, accessed, and used. The County submitted a list of data layers, associated metadata, and the present status of its GIS capabilities. GIS data associated with geologic, land use, resource, infrastructure, and significant discharge attributes appear to be readily available. The County continues to make substantial progress in enhancing its GIS capabilities and should currently have the ability to conduct basic analyses for effective watershed planning.

Discharge Characterization:

Frederick County is required to conduct chemical, physical, and biological monitoring at a land use-specific outfall and an associated in-stream station within the Bush Creek watershed. Monitoring commenced at Peter Pan Run, a tributary to Bush Creek, in May 1999. This station is below a 3,500 unit planned urban development in Urbana, MD. The drainage area to the in-stream station is approximately 1,607 acres of mixed land use. The County reported that there are nine stormwater management facilities (dry extended-detention basins) and numerous others currently being used as sediment basins within the drainage area. The outfall at "Pond R" has been approved as the outfall for sampling. Equipment was installed in December 2002 and monitoring commenced in February 2003. "Pond R" was initially used as a sediment basin and converted to stormwater management in July 2004. The pond receives drainage from 30 acres of medium-density residential land use. To better assess the impacts of development, physical and biological monitoring are also conducted at three monitoring sites on Peter Pan Run. Components of the long-term monitoring program are being used to assess conditions in other Frederick County watersheds.

Continuous flow monitoring is required at the in-stream station to develop stage to discharge relationships and estimate seasonal and annual pollutant loads. For chemical monitoring, at least three samples determined to be representative of each storm event are to be collected and analyzed for 12 specified parameters. Temperature and pH are also to be recorded. Twelve storm events are to be sampled annually, three during each quarter with quarters based on calendar year. For periods of extended dry weather, baseflow samples are to be taken once per month.

The County reported that nine storm events were monitored between October 2004 and September 2005. The storm event sampling is well represented for the first three quarters of the reporting period with events ranging in rainfall depths from 0.24 to 2.24 inches. Generally, the total rainfall during the sampling period was well below (29.6 inches) what is considered the normal annual total of 43.07 inches. Samples collected are representative of the rising, peak, and falling limbs of each storm's hydrograph. Event mean concentrations (EMCs) were calculated and reported on MDE's Chemical Monitoring Storm Event Database as required. Additionally, monthly baseflow monitoring occurs at the in-stream station. Baseflow monitoring was discontinued at "Pond R" upon its conversion to a dry-extended detention facility.

The annual average EMC for several parameters increased at the in-stream station since the previous reporting period. Notable increases were reported for lead, nutrients, oil and grease, total suspended solids (TSS), and phosphorous. It is suspected that these increases are a result of

continuing construction activities and fertilization of newly seeded lawns. Elevated concentrations of fecal coliform were also found in several baseflow and storm event samples at the in-stream station. All annual average storm event EMCs at the “Pond R” outfall were less than the previous year, except for phenols and oil and grease. However, elevated concentrations of fecal coliform were found in several samples. It was also reported that the stormflow EMCs for nitrate and nitrite and fecal coliform were significantly higher, statistically, than baseflow.

Total annual loadings of all parameters at the in-stream station increased during the current monitoring year except for five-day biological oxygen demand (BOD₅), total petroleum hydrocarbons (TPH), phosphorus, zinc, and nitrate and nitrite. Loadings of oil and grease and phenols were the highest since monitoring began in 1999. It is suspected that this is due to the increasing presence of automobiles in developed areas of the watershed. Loadings of pollutants at “Pond R” outfall were less (at least 93% less) than the previous reporting period except for oil and grease. The County reported that the decrease in pollutant loadings is a result of the reduction in annual rainfall and total discharge during the reporting year.

In addition to chemical monitoring, the County is required to conduct biological and physical assessments in the stream segment between the outfall and in-stream stations. Biological monitoring includes benthic macroinvertebrate and fish sampling. Physical monitoring includes basic habitat assessment parameters, bank or erosion pins, velocity, cross-section and profile, and riparian measurements. Maryland Biological Stream Survey (MBSS) sampling methods are used for biological and physical habitat assessment. Multiple metrics are used to analyze the biological data. Sampling results continue to indicate that the habitat is “marginal,” and the benthic and fish communities are described as being “fair to poor” and “good to very poor,” respectively. While the diversity of fish species was relatively high, most were considered to be tolerant of impaired habitat.

Physical stream conditions within Peter Pan Run were reported to be generally similar to those in years past. However, certain stream parameters are beginning to show a pattern of slow change. An increase in embeddedness has occurred with a corresponding decrease in substrate quality. Additionally, bank erosion and channel widening has occurred. Conditions within the stream continue to show signs of deterioration from upstream construction impacts, namely increased bank erosion and sediment deposition.

It is noteworthy that 618 residential lots were recorded in the Urbana region for the period of 1990 through 1998 while more than twice as many (approximately 1,400) were recorded from 1999 through 2001. It is anticipated that 200-300 lots will be recorded annually until “build-out” in 2010. Annual load estimates for Peter Pan Run indicate that 1.2 million pounds of sediment (measured as TSS) washed down the stream in the past year. This would result in a soil loss yield of 0.37 tons per acre per year, which appears to be somewhat conservative considering the land use and land cover within the watershed.

Lastly, Frederick County is required to select a watershed to monitor in order to evaluate the effectiveness of stormwater management system implementation on stream channel protection. The County identified a 215-acre drainage area for monitoring where a proposed section of the “Villages of Urbana” development is to be built. MDE approved this watershed in December

2002. The stream segment to be monitored is an unnamed tributary to Peter Pan Run. Development within the watershed will result in the construction of 254 single-family dwellings and 216 town homes. Versar, Inc. conducted initial survey work and hydrologic modeling during late September and early October 2003. Field activities included establishing permanently monumented channel cross-sections and longitudinal profiles; conducting Rosgen Level I–III surveys; capturing global positioning system (GPS) coordinates for monument locations; and documenting site conditions with photographs. A longitudinal survey, totaling approximately 3,100 linear feet, is conducted annually to monitor changes in bed profile along the stream. Eleven cross-sections were selected at riffle locations to monitor changes in channel shape. Three additional cross-sections were selected at outside bends to measure lateral bank erosion rates.

Data from the initial baseline survey indicate that three individual stream channel types are represented within the study area. One of the channel types is considered to be a relatively stable form, while the other two are considered unstable with high erosion potential. For the most part, these streams have cut downward, become entrenched, and have steep and undercut banks. This process serves as a source of excess sediment as the stream channels become more stable through channel adjustments in plan form pattern, cross-sectional dimension, and longitudinal profile. The County reported that much of this instability is likely associated with the agricultural history of the drainage area rather than the recent land use change associated with the on-going residential development. The third year of monitoring was conducted during mid-October and early November 2005. Comparison of the cross-sectional profile data for the three annual surveys indicates minimal differences. Additionally, a moderate rate of lateral channel erosion was evident in the outside bend profiles.

In the initial survey year, the TR-20 and TR-55 hydrologic models developed by the Natural Resource Conservation Service (NRCS) were used to simulate hydrologic changes expected to occur as the watershed changes from pre-development conditions to the planned build out. Results indicated much lower peak discharges for an undisturbed forested watershed when compared to agricultural land use, mass grading, or build-out scenarios, the latter two with stormwater management ponds.

The County continues to satisfy its NPDES requirements for discharge characterization. Efforts with regard to the long-term monitoring requirements continue to be strong. These efforts effectively integrate many of the monitoring and management implementation requirements of the County's stormwater program. Additionally, the County's efforts to quantify the impacts of development on water quality will go a long way to track long-term trends and the effectiveness of its stormwater management program.

Management Program:

Frederick County is required to conduct preventative maintenance inspections of all stormwater management facilities on at least a triennial basis. The County reported that its Division of Public Works, Environmental Compliance Section (DPW/ECS) staff conducted preventative maintenance inspections at 169 of its 541 stormwater management facilities during the reporting period. Information regarding the County's data management abilities, number of inspections

conducted, problems found, and enforcement activities was submitted. Initial inspections found 58 of the 169 facilities in need of maintenance. Upon reinspection, 9 of the 58 were determined to be acceptable. Enforcement action is pending at the remaining 50 facilities. Unacceptable vegetation, debris, and rodent damage were the problems most frequently cited. The County reported that it continues to provide a document entitled “*Stormwater Management Facility (Ponds) Operation and Maintenance Schedule*” to facility owners to improve compliance with maintenance requirements.

The County is also required to implement the stormwater management design policies, principles, methods, and practices found in the *2000 Maryland Stormwater Design Manual* (Design Manual). The County has modified its existing ordinances, regulations, and administrative procedures to meet State stormwater requirements. Since July 2001, any new development proposal in Frederick County has been required to meet or exceed the Design Manual criteria.

Additionally, the County is required to identify and report the modifications needed to address any problems with implementation. The County reported that it is making changes to a few of the facility designs outlined in the Design Manual. For example, the bio-filter soil mix is being modified to promote better drainage and micropools in wet retention ponds are being made deeper to avoid stagnate water, mosquito problems, and excessive plant growth. The County also reported that it continues to struggle with the use of MDE’s *Standard Stormwater Management Plan for Single Lot Residential Construction*. The County stated that the plan does not contain sufficient design information and that a substantial number of sites within Frederick County cannot meet the design criteria. Staff has also found it very difficult to effectively use the non-structural methods and innovative site planning techniques. The County reported that any efforts to make the design guidelines more analytical, or to provide a “users manual” to allow more consistent and effective implementation, would help developers better meet the intent of these design guidelines rather than the exact written code. MDE has and will continue to consider alternative approaches to address local obstacles to implementing the Design Manual.

Tailoring the Statewide model standard stormwater plan to the County’s development trends and implementing non-structural practices to fit local hydrologic conditions is the best way to ensure the most effective control of urban runoff. MDE realizes that adjustments to various best management practices (BMP) are essential if local conditions warrant. The County is encouraged to draft a standard plan that works to eliminate problems encountered with MDE’s model. Additionally, specific options for non-structural credit implementation should be developed in order to address difficulties encountered thus far.

The County is required to implement an inspection and enforcement program to ensure that all discharges to and from the municipal separate storm sewer system that are not composed entirely of stormwater are either permitted by MDE or eliminated. At a minimum, the County is to field screen at least 150 outfalls annually. Dry and wet-weather field screening for illicit connections has primarily occurred during triennial stormwater facility maintenance inspections. This has resulted in 169 outfalls being screened during the reporting period. The County reported that it has not identified any illicit discharges through its screening process since inception. The

County also reported that the Maryland State Highway Administration performed outfall screening in Frederick County between March 2005 and June 2005. At that time, 95% of the fieldwork was completed and approximately 15 potential illicit discharges were identified.

As part of its public outreach efforts, the County contracted the Center for Watershed Protection (CWP) to provide training according to the protocols established in *“Illicit Discharge Detection and Elimination (IDDE) – A Guidance Manual for Program Development and Technical Assessments”* (CWP, October 2004). The training was held on April 28, 2005 with 24 individuals attending, primarily from local governments. The County reported that it intends to implement outfall identification reconnaissance as detailed in the IDDE Manual. This will occur during Stream Corridor Assessments (SCAs) as part of the Watershed Restoration Action Strategy (WRAS) process. WRAS’s are the end product of Maryland’s Unified Watershed Assessment process that was developed by the Maryland Department of Natural Resources (MDNR) in 1998 as a result of the federal Clean Water Action Plan initiative.

The County is also required to identify all County-owned facilities that require NPDES stormwater discharge permit coverage, submit documentation that permits have been obtained, and report the status of pollution prevention plan implementation. Previously, the County submitted a database identifying 266 County-owned properties. The County has worked with MDE’s Environmental Permits Service Center to determine which facilities may need NPDES permit coverage. As a result, there are nine facilities that require permitting. Eight require an Industrial Wastewater/Stormwater Discharge Permit while the remaining one requires a “No Exposure Certification for Exclusion from NPDES Stormwater Permitting.” The County reported that all but one facility have been permitted. An application was submitted to MDE in December 2005 for the facility that remains to be permitted. Pollution prevention plan development and implementation have yet to be achieved.

The County is required to continue implementing its program for responding to illegal dumping and spills. Procedures to address spills are coordinated between ECS and the County’s Office of Emergency Response. The County reported that it did not respond to any spills during the reporting period. Additionally, the County has developed a database to track facilities that have obtained environmental permits. These facilities have been geo-referenced to assist with rapid spill response.

Frederick County is required to maintain an acceptable erosion and sediment control program. MDE’s review of the County’s program in 2005 determined that erosion and sediment control compliance needs improvement. The County is currently approved for continued delegation of erosion and sediment control enforcement authority through June 30, 2007. Additionally, four "Responsible Personnel" certification classes for erosion and sediment control were conducted resulting in 56 individuals being trained. Information regarding earth disturbances exceeding one acre or more is to be reported quarterly and should be specific to the permitting activity for the three months preceding submittal. This information was not submitted routinely to MDE during 2005 due to problems associated with the County’s recently installed Hansen Permitting System. The County did, however, submit grading permit information for the entire year. It is hoped that the County’s new data management system will address these deficiencies and that data submittal becomes routine.

The County is required to implement a public outreach program that focuses on pollution prevention. Extensive outreach occurred as part of the WRAS process and activities associated with numerous public, school, and community organizations. This includes disseminating information regarding pollution prevention, recycling, lawn care, household hazardous waste, etc. The County submitted a list of its activities related to public outreach. Results of these activities include increased recycling and increased use of alternative transportation, to name just a few. The County continues to do an outstanding job with its public outreach efforts.

The County was required to develop and implement a plan to reduce pollutants associated with road maintenance. Previously, an evaluation of road maintenance activities was completed that identified each of the current practices being followed and developed recommendations to help minimize pollutant discharges. A narrative summary of selected examples was included in the document entitled “*Assessment of Road Maintenance Activities and Their Impacts on Runoff*” (Versar, Inc., May 2002). During 2005 the County continued to implement several of the recommendations developed in the report. For example, the Office of Highways and Transportation (OH&T) continues to be a main sponsor of a public outreach effort that collected 15.8 tons of trash and recyclables and 420 tires from County roadways during 2005. Additionally, 34 miles of roadways were swept, 494 inlets were cleaned, and deicing effectiveness was improved by the use of a pre-wetting agent.

Frederick County is required to examine the use, control, and reduction of herbicides, pesticides, and fertilizers for all of its departments. Frederick County sponsored a study entitled “*Recommendations for Alternatives to Pesticide/Herbicide/Fertilizer Use for Frederick County*” (Versar, Inc., December 2003) to characterize the use of pesticides, herbicides, and fertilizers by County agencies. Most departments apply pesticides on an “as needed” basis, while fertilizer applications are performed 1-3 times per year at specific locations. Most of the departments indicated that application rates are based on label instructions and are made at the lowest rate required for effectiveness. Study results indicate that pesticide, herbicide, and fertilizer use by Frederick County does not require any drastic reduction in application practices because agencies have already minimized use of these chemicals and use more environmentally acceptable substitutes. Additionally, Integrated Pest Management (IPM) programs are in place and the County continues to evaluate and modify its use of herbicides, pesticides, and fertilizers to ensure that use is minimized and application is at the lowest rate required for effectiveness.

Frederick County has successfully implemented many of the stormwater management program elements required by its NPDES permit. Continued implementation and successful integration of program components should result in effective water quality improvements. A noteworthy effort has been put forth to increase public awareness regarding pollution prevention. As noted above, pollution prevention plan development and implementation needs to be addressed for County-owned facilities.

Watershed Restoration:

Frederick County is required to conduct a systematic assessment of water quality within its watersheds. WRAS’s have been initiated for the Lower and Upper Monocacy watersheds (approximately 299,653 acres or 468 mi²). This accounts for approximately 70% of the land area

in Frederick County and contains sixteen of the County's twenty-one subwatersheds. Selected stream segments in various subwatersheds are being evaluated according to MDNR's SCA methodology. Assessments have been completed for the Lower Bush Creek, Ballenger Creek, and Lower Linganore Creek watersheds (subwatersheds of the Lower and Upper Monocacy watersheds). Additionally, quantitative and qualitative assessments of water chemistry, physical habitat, and biology are being conducted to assess water quality conditions. Currently, monitoring occurs every two to three years in the three highest priority watersheds: Lower Bush Creek, Ballenger Creek, and Lower Linganore Creek. In 2005, the County continued its stream monitoring program in the Lower Bush Creek watershed and at selected sites in the Ballenger Creek, Lower Linganore, and Bennett Creek watersheds.

The County is also required to track progress and evaluate the effectiveness of implementing programs and projects to treat 10% of its impervious area that has not been treated to the maximum extent practicable. The County's estimate of imperviousness is based on values assigned to various land uses. The total of these values minus the area treated by stormwater management facilities represents the untreated area. There are 6,725 acres of untreated impervious area estimated in Frederick County. The restoration and retrofit opportunities identified through watershed assessments will work toward meeting the County's impervious area treatment goal. The County identified twelve restoration projects (e.g., Ballenger Elementary School Stream Restoration, Urbana High School Low Impact Development Retrofit, Liberty Village Rain Gardens, etc.) that are to be implemented during the next three years. It is estimated that these projects will reduce contributions of nitrogen by 684 lbs/yr, phosphorus by 153 lbs/yr, and sediment by 51,480 lbs/yr. The total treated impervious area will equal 172 acres.

The County continues to make progress with its watershed restoration efforts and the next permit will build upon existing requirements. The County will need to complete the restoration work required by its existing permit and restore an additional 10% by the end of the next permit term. MDE understands that implementation of restoration work takes years of planning, financial support, and follow-through. However, considering the current level of implementation, the County may find compliance with NPDES watershed restoration goals unachievable.

Program Funding:

Frederick County is required to maintain adequate funding to comply with all conditions of its NPDES stormwater permit. Funding for Frederick County's NPDES program is provided through general funds that are distributed to the DPW for general operating and capital improvement project expenses. Additionally, the County secures funds from various grant agencies (e.g., Chesapeake Bay Trust, National Fish and Wildlife Foundation, MDNR, etc.). The County's fiscal year 2006 operating budget for NPDES related activities totals \$564,769.

The Capital Improvement Project funding for restoration efforts in the Lower Bush Creek, Ballenger Creek, and the Upper and Lower Linganore Creek watersheds were reported to be \$644,340. Grant awards totaled \$74,800. The present level of funding appears to be adequate to support the existing level of activity for Frederick County's stormwater program. However, as program implementation expands, the County will need to increase fiscal support and should consider developing a dedicated funding source for its NPDES stormwater programs.

Assessment of Controls:

Annually, the County is required to submit estimates of expected pollutant load reductions as a result of implementation of its management programs. The County submitted estimates of pollutant load reductions as a result of existing structural stormwater controls. The “simple method” (Schueler, 1987) was used to estimate loads based upon the pollutant removal efficiency of various BMPs. Overall, stormwater management treats runoff from approximately 54% of the urban impervious area in Frederick County. Total pollutant load reduction associated with BMP implementation has been estimated to be approximately 40% for TSS, 27% for total phosphorus, 24% for nitrogen, and 20% for BOD₅. Removal of metals ranged from an estimated 27% to 42%.

Summary:

Frederick County continues to do well with regard to NPDES stormwater program implementation. By bringing together numerous components such as pollutant source identification, monitoring, and watershed assessments, the County has established a sound framework for the successful implementation of stormwater management programs and capital improvement projects. The County’s program can be strengthened by the development and implementation of pollution prevention plans for County-owned facilities and increased implementation of restoration work.