CENTER FOR WATERSHED PROTECTION

Runoff Rundown

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The Birth of a Stormwater Wetland: Integrating Stormwater Management into Open Space Projects

Recently the Center for Watershed Protection completed the construction of a stormwater wetland project in Rising Sun, Maryland which highlighted how integrating stormwater management into infrastructure projects can be advantageous to both objectives.

In 2009, the Octoraro Watershed Association (OWA), with support from the Center, began a watershed planning effort for Stone Run in Cecil County, Maryland. As a result of this effort, several high priority restoration sites were identified, including the implementation of a stormwater wetland on an undeveloped parcel owned by the Town of Rising Sun. The site was targeted because of its potential to treat runoff from an approximately 20 acre drainage area made up of 17 acres of medium density residential land and three acres of Maryland State Highway Administration land not currently being treated by a stormwater management facility.

The Town's primary interest in the site was to develop it into a more formal park, which would include an off-leash dog park, walking trails, and areas for quiet reflection. This had long been a goal of the Town. To accomplish this, the Town acquired a Maryland Department of Natural Resources Program Open Space grant to develop the park elements. The Town's initial park concept plans did not take into account existing natural resource features, such as jurisdictional wetlands and existing stormwater conveyance areas, or stormwater management requirements.

The combined interest in this parcel presented an ideal opportunity to dovetail efforts to create a fully integrated project where stormwater management is a key feature of the overall site plan. Together, OWA, the Center and the Town worked to develop an alternative concept to the overall site design which allowed for all the park features the Town desired, preserved the site's natural features, and provided sufficient space for the proposed stormwater wetland. OWA, with the permission of the Town, applied for and acquired a grant from the Chesapeake Bay Trust to design the stormwater wetland components of the site. Simultaneously, the Town began working on further developing the concept designs for the dog park into final designs.

The integration of dog run areas and walking trails increased the site imperviousness slightly, which triggered the state stormwater management requirements. The stormwater wetland was able to treat the existing drainage area and met the state's Environmental Site Design requirements for the development of the park. This leveraging of efforts helped the town reduce design and construction costs and ensured that the stormwater management implemented on site is designed and sized to treat stormwater from the entire 20 acre drainage area to the site and not just the park.

The completed stormwater wetland design was permitted and the Center received a Chesapeake & Atlantic Coastal Bays Trust Fund Capital Improvement Grant for construction funding. Construction of the stormwater wetland began in July of 2013...and so did the rain. Despite soggy conditions and some lost construction days the major construction work was completed in three weeks and the vegetation was installed in September of 2013. Some minor adjustments of the check dam heights were required to match ponding depths to the design specifications. Almost immediately after construction was completed, a variety of wading and song birds began showing up, inspiring a "Name the Heron" contest in the Town.

Installation of the fenced dog park and other park elements is scheduled for November of 2013. The full project is a great amenity to the local community and supports the County's and State's efforts to meet Chesapeake Bay water quality goals. *For additional information on this project contact Bryan Seipp, Watershed Manager, at bts@cwp.org or Rupert Rossetti with the Octoraro Watershed Association at RupertRossetti@aol.com.*

Project Facts:

Location: Town of Rising Sun, Cecil County, MD

Landowner: Town of Rising Sun

Type of Practice: Stormwater Wetland

Year Built: 2013

Permits: Grading Permit (County); E&S (SCD); Construction General (MDE)

Drainage Area: 20.8 acres (41% Impervious, Medium Density Residential and State Highway Administration land uses)

Pollutant Load Reductions: TN= 44.8 lbs/yr, TP= 8.7 lbs/yr, TSS= 6,962 lbs/yr

Cost: Design= $29,000, Construction= $145,000

Septic Management Districts for System Maintenance and Upgrades: A Feasibility Study from Dorchester County, Maryland

In 2012, the Environmental Protection Agency (EPA) issued the Chesapeake Bay total maximum daily load (TMDL), also known as a "pollution diet," to clean up the Bay and its tributaries. In order to address all sources of nutrient and sediment loadings to the Bay and implement the TMDL, Bay states developed watershed implementation plans (WIPs) that outline actions they will take to reduce pollution. The Maryland WIP, which further broke down the nutrient load reductions by source sector (e.g., urban, agriculture), requires a 26% reduction in nitrogen load from septic systems (MDE, 2011).

To assist in meeting this target, the Maryland Department of the Environment (MDE) promulgated regulation that requires all new construction in the Chesapeake Bay watershed having a septic system to use best available technology (BAT) for nitrogen removal. The new regulation also requires new and existing BAT system owners to perform operation and maintenance (O&M) for the life of the system. In addition, replacements of septic systems in the zone closest to the Bay (referred to as the "critical area") are required to use BAT nitrogen removal systems.

BAT involves adding nitrogen-reducing treatment components to a conventional septic system, often between the septic tank and drain field. These systems typically include a two-stage treatment process involving aeration and anaerobic denitrification. These systems employ many of the same principles that are used in the treatment of sewage at municipal wastewater treatment systems. The Chesapeake Bay Program (CBP) estimates that adding a denitrification component to a septic system receives a 50% nitrogen load reduction.

Dorchester County is located on the eastern shore of the Chesapeake Bay in Maryland and contains 1,700 miles of shoreline and thousands of acres of productive wetlands. Its bayside location and rural nature mean that the number of septic systems that must be upgraded to BAT under the new state law is relatively high. The County's WIP lays out an approach to meeting the required nitrogen reduction that includes establishing a county-wide septic system pump-out program and converting all septic systems in the critical area and twenty percent of systems within 1,000 feet of a

perennial stream to denitrification systems. In order to achieve these goals, the rate of septic conversions to BAT must be significantly increased over the current rate of 75 systems per year. The County estimates that 2,602 septic systems must be converted to BAT by 2025 at an estimated cost of $15,000 per system for a total cost of more than $39 million. In addition to the significant cost, the County's staff capacity would need to be increased to accommodate the additional review, approval and inspection that would be conducted by the County Health Department.

To help the County address these capacity and funding challenges, the Center for Watershed Protection, with funding from the National Fish and Wildlife Foundation, evaluated the feasibility of establishing a septic management district to help pay for the required system maintenance and upgrades. The formation of a District could reduce the financial burden on BAT septic owners for annual pump-outs and O&M by allowing an option to provide these services by the County at a lower cost to the homeowner than a private contractor. The study included research on case studies of septic management programs across the country and components of a septic management district. It also resulted in recommendations for the County to develop better information on septic management (e.g., location of septic systems, pumpout records) to assist in the decision-making on the future of a septic management district. A conceptual overview of how the septic management district would work is provided here.

The District would administer septic system operating permits and pump-outs to provide assurance that the systems are being inspected and maintained and to help improve water quality of local streams and rivers as well as protecting the health and welfare of the public. Septic system operating permits would be administered by the District annually for BAT systems and every 3-5 years for conventional systems. The District would provide the County with enforcement provisions if pump-outs and O&M are not completed.

Three options for providing the required O&M include:

1. The District would charge a user fee to the property owner to provide management oversight for all BAT systems that includes the following services: conduct annual inspections and maintenance as needed and contract with private haulers to conduct pump-outs. A portion of the fee would be used to fund system repairs and replacement.
2. The District would establish an operating permit program that requires property owners with BAT to obtain a permit annually. Before a permit is issued, the property owner must provide documentation that a pump-out and inspection were conducted and that any needed maintenance was completed. The owner contracts with a private hauler to conduct system pump-outs. Operation and maintenance is provided by a contractor or the system owner.
3. The District would charge BAT users an administrative fee to track system pump-outs and O&M and would send out reminders to BAT users for necessary pump-outs and maintenance. The owner contracts with a private hauler to conduct system pump-outs. Operation and maintenance is provided by a contractor or the system owner.

Under each scenario, an administrative fee to run the program is charged to the property owner. The District could also provide subsidized funding for maintenance based on financial hardship and provide some assistance in the event of catastrophic failures. A phased approach would be used for program implementation over 3-5 years, with systems prioritized based on the potential severity of their environmental and public health impact. A GIS-based inventory of septic systems would be used to track management, maintenance and repair of systems in order to allow the County to quantify the resulting nutrient reduction credit.

The County Environmental Health Department would provide oversight of the District and continue to issue septic system permits and provide oversight of conventional and BAT septic systems. Key staff should be trained in the installation and O&M of state approved BAT systems. Organization of the District should include a position of manager and administrative staff answering to County Council or a separate board while the work effort would be contracted with other departments and consultants to leverage existing resources to develop and maintain databases, identify and implement projects and report progress to MDE.

The District would be funded through permit operating fees that will be used for administration costs, O&M, tracking and reporting to MDE. These funds would be used to administer the permit program, hire new staff, provide training and education, and if possible, establish a grant program for fixing and replacing failing septic systems. It is estimated that a septic management district in Dorchester County would generate $500,000 per year. Additional costs to the septic system owners include hiring a private hauler to conduct pump-outs and the option of hiring a private contractor for O&M.

Multiple benefits will be provided through the development of a County-wide septic system pump out and maintenance program. The County will be able to track septic system pump-outs and account for nitrogen reduction credit to apply towards the County Phase II WIP nutrient limits. The formation of a District could reduce the financial burden on BAT septic owners for annual pump-outs and O&M by allowing an option to provide these services at a lower cost to the homeowner than a private contractor.

For more information about this project, contact Julie Schneider at jas@cwp.org.

Linking Local Cleanup Plans to the Chesapeake Bay in Virginia

The Center for Watershed Protection and James River Association released a new study that shows that localities can effectively implement cleanup plans to meet their local water quality goals as well as the responsibilities set forth in the Chesapeake bay cleanup plan.

Urban stormwater is the fastest growing source of pollution to the James River and needs to be controlled effectively and efficiently in order to restore the health of the river. Local governments have raised significant concerns about being able to meet the pollutant reduction goals in the Virginia watershed implementation plan to meet the Chesapeake Bay total maximum daily load (TMDL) for nitrogen, phosphorus and sediment. The James River Association (JRA) is working with localities to develop feasible plans to meet their pollution reduction targets. One area where economies of scale and efficiency can be achieved is to coordinate best management practices (BMPs) and strategies recommended in TMDLs that address local impairments with those needed to meet the Bay TMDL goals. The Center for Watershed Protection conducted a study for JRA to assess the extent to which local TMDL implementation plans can also address pollutant reductions required of James River Basin localities to meet the Chesapeake Bay TMDL.

For this study, we reviewed implementation plans for bacteria TMDLs in the following watersheds in the James River Basin: the James River in the City of Richmond, the James River in the City of Lynchburg and Mill Creek and Powhatan Creek in James City County. Since the TMDL watershed boundaries did not align with the municipal boundaries, GIS was used to determine the number of recommended BMPs that would be implemented within the municipalities based on the percent of each watershed located within the jurisdiction. The analysis was limited to urban practices that would be applied in the separate storm sewer area. Nutrient and sediment removal performance was calculated based on approved methods from the Chesapeake Bay Program (CBP). For BMPs not approved by the CBP (e.g., septic repairs, rain barrels, pet waste programs), some limited research was conducted to derive pollutant removal estimates. Land use loading rates and septic system loads for each municipality were derived from the Virginia Assessment and Scenario

Tool. This information was used to estimate the nutrient and sediment reductions associated with implementation of the strategies in the local implementation plans within the three municipalities.

Table 1. Urban BMPs Implemented in James River MS4s to Meet Local Bacteria TMDLs

BMP	City of Richmond	City of Lynchburg	James City County
Pet waste stations	x	x	x
Pet waste education	x		
Pet waste composters	x		
Septic pumpouts	x	x	x
Connection to sewer	x	x	x
Septic repair	x	x	
Septic installation/ replacement	x	x	x
Alternative wastewater treatment system	x	x	
Wet ponds and wetlands	x		
Infiltration trench (w/ sand, veg.)	x		
Permeable pavement (w/o sand, veg., A/B soils, no underdrain)	x		
Bioretention (C/D soils, underdrain)	x	x	
Rain gardens (A/B soils, no underdrain)	x	x	
Rainwater harvesting- cisterns	x		
Rainwater harvesting – rain barrels	x		x
Vegetated roofs	x		
Forest buffers		x	
Wet pond retrofits			x
Stream restoration			x
Wetland restoration			x

Figure 1 compares the estimated reductions associated with implementation of only the BMPs and efficiencies that are approved by the CBP to the target load reductions for each municipality to meet the Chesapeake Bay TMDL. The targets established for the urban sector will be enforced through the National Pollutant Discharge Elimination System program municipal separate storm sewer system permits; however, final numbers are not yet available. For this study, the estimated targets for each municipality were derived from a spreadsheet provided by Virginia Department of Conservation and Recreation that uses inputs of regulated impervious and pervious land. Most municipalities are still in the process of calculating these acreages, so the targets used in this study are likely to change.

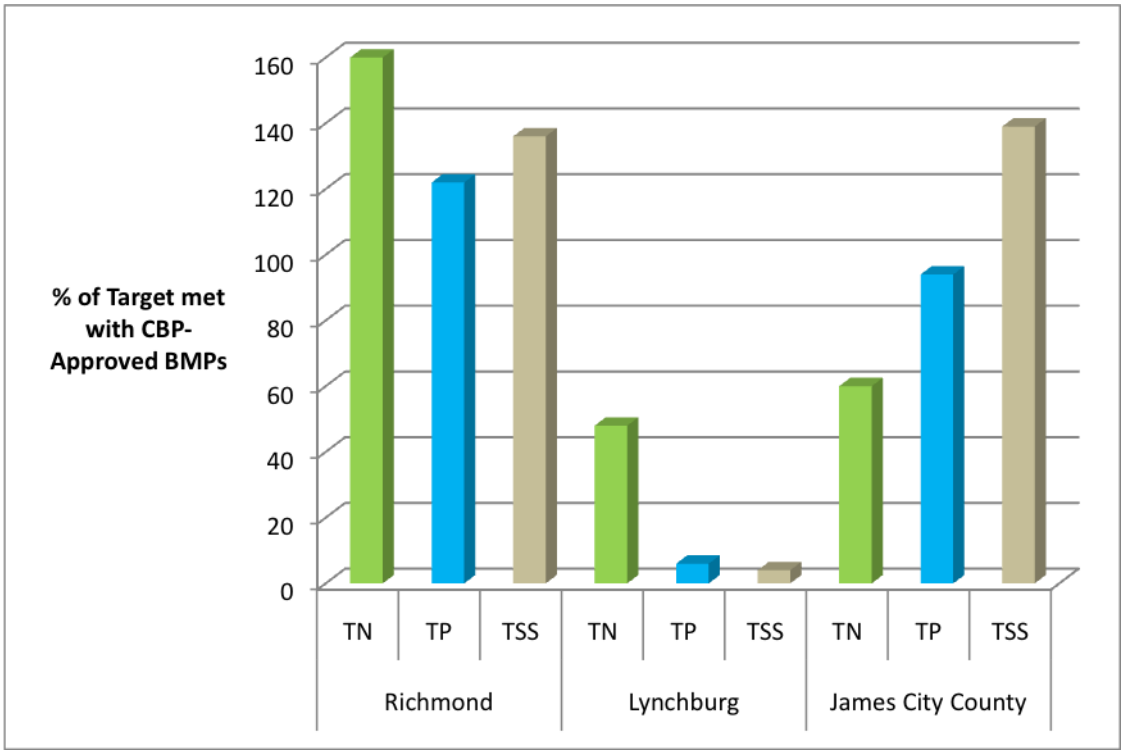

Figure 1. Portion of Chesapeake Bay TMDL Pollutant Load Reduction Targets Met Through Implementation of Local TMDLs in Richmond, Lynchburg and James City County

Overall, this study shows that the James River Watershed localities can make significant progress towards Bay TMDL goals through implementation of local TMDL plans, although to what extent depends somewhat on the local pollutants of concern, number and type of BMPs implemented, and which BMPs and pollutant removal performance values are accepted by the CBP. In general, expected progress towards achieving Bay TMDL load reductions is lower for sediment compared to nutrients, because the BMPs in the local TMDLs are designed to address bacteria, and these same practices are not typically good at removing sediment. Because this study focused on local bacteria TMDLs, the results may be of particular interest to communities in the Lower James where the majority of TMDLs are for bacteria. In the Upper James, where seven TMDLs have been developed for nutrients, it will likely be more feasible to align local TMDL implementation plans directly with Chesapeake Bay TMDL goals.

Major conclusions of this study include:

- Development of integrated TMDL implementation plans that address all local and regional impairments would allow localities to select the most cost-effective mix of BMPs to achieve all their water quality targets. The District of Columbia is currently developing such a plan for their local TMDLs, as required by their MS4 permit. The process and resulting plan may serve as a model for other communities to use.

- To assist in developing integrated TMDL plans, localities require comparative data on how effective the available BMPs are at reducing each pollutant of concern. This is currently a data gap, especially for pollutants such as bacteria and for emerging BMPs.

- One gap that may impede the integration of TMDL plans is the lack of detail provided in existing TMDL implementation plans. For example, in the current study, it was assumed that 100% of the required bacteria load reductions would be met through full implementation of the local implementation plans; however, a specific breakdown by each practice was not provided. It would be helpful if states and others developing TMDL implementation plans would provide details on what portion of the load will be reduced by each recommended practice.

- Localities may wish to explore the use of emerging BMPs as well as BMPs for which water quality benefits have not yet been quantified, and encourage the state and CBP to review them for inclusion in the Bay Model. For example, the preliminary analysis in this study shows that pet waste programs can be very cost-effective for pollutant reduction; yet there is little research available to support a credit at this time. Localities can also get involved in conducting local monitoring studies for emerging BMPs to quantify the resulting pollutant load reductions.

Demonstrating Regenerative Stormwater Conveyance Systems in Lancaster County, PA

The Center recently wrapped up a project in Lancaster County, PA that resulted in the installation of a Regenerative Stormwater Conveyance (RSC) system as a demonstration project for reducing nutrients and sediment from the County's urban and suburban land.

Lancaster County is located within the Lower Susquehanna Basin of the Chesapeake Bay Watershed, which delivers the highest loads of nutrients and sediment to the Bay. While much progress has been made in addressing pollution from agricultural lands and wastewater treatment plants, little has been done to address nutrient and sediment pollution from the County's urbanized and developing lands. The Center, through a partnership with the County and the Susquehanna River Basin Commission, conducted a countywide stormwater retrofit assessment that resulted in the installation of a Regenerative Stormwater Conveyance system at Froelich Park in Mountville Borough. The RSC project served as an early implementation project ahead of the release of the County's Integrated Water Resources Plan.

The Center conducted the hands-on stormwater retrofit field assessment using the results of a desktop assessment as guidance to identify potential retrofit sites, such as known problem areas and large areas of impervious cover. Due to the large size of the County (984 square miles), field teams spent one day in each of the County's six planning commission districts, which helped to provide an equal distribution of field work across the County's 60 municipalities. The County provided excellent organization of the field work to ensure maximum involvement from boroughs, townships, and local engineers that had jurisdiction in the areas assessed. The County's organization of the field work was instrumental in the success of the field effort and overall project enthusiasm.

Of the resulting 40 potential retrofit projects identified (treating over 100 acres across 15 properties), County staff selected the Froelich Park project for design and construction with input from a local steering committee. The committee, made up of township and borough representatives, recommended the RSC system because it is new to the County and the committee felt it would be a good demonstration project. The Froelich Park site contained an eroded ditch at the end of a stormwater outfall pipe which was continuing to erode and impact the existing gravel pathway. The project was to replace the ditch with a swale that would have a series of pools and cascades to slow the water and allow it to infiltrate into the ground. The swale and adjacent lawn area were planted with native plant material.

Eroding channel at Froelich Park before restoration

The project coordination was handled by the Lancaster County Planning Commission with Lancaster Inter-Municipal Committee as the construction manager. The Center designed the practice in conjunction with a local engineering firm. The project implementation involved in-kind services and material donations provided by several local companies. An educational sign was developed and installed at the park and an educational training was held in the Fall of 2013 for local engineers and municipal officials to discuss the project. A visual tour of the project is provided in this video.

Moving from the planning phase to the implementation phase of this project in Lancaster County was fairly complicated because of Pennsylvania's local governmental structure and staff changes within the County. Unlike other Bay states, where counties take the lead and to a certain degree control the planning process, project implementation in Pennsylvania is at the local level through the cities, boroughs, towns and townships. Due to the limited municipal staff

capacity, the County and the Lancaster Inter-Municipal Committee played a key role in the contracting and installation of the project. In addition, because RSC projects are fairly new, there were challenges related to the availability of construction material, in particular the use of sandstone boulders. These were not locally available, so the project used limestone instead.

The completed RSC project

This project will serve as an example of a local innovative stormwater retrofit practice in Lancaster County that can be implemented in other locations throughout the County.

The project was funded through a grant from the National Fish and Wildlife Foundation and an anonymous foundation. For more information, contact Bryan Seipp at bts@cwp.org.

Project Facts:

Location: Mountville Borough, Lancaster County, PA

Landowner: Mountville Community Services Foundation

Type of Practice: Regenerative Step Pool Storm Conveyance

Year Built: 2013

Drainage Area: 1.99 acres impervious cover; pervious (developed) 2.14 acres

Pollutant Load Reductions: TN= 9.3 lbs/yr, TP= 1.19 lbs/yr, TSS= 324 lbs/yr