II. Capital Improvements and Infrastructure Retrofit

Design and construction of new stormwater projects, retrofitting of watersheds with flood control facilities, rehabilitation and retrofit of county maintained stormwater management facilities, the Stormwater Needs Assessment Program, innovative BMPs in Fairfax County, and other stormwater improvements and retrofits are discussed in this section.

Projects Constructed in 2004

The Stormwater Planning Division (SWPD) and the Maintenance and Stormwater Management Division (MSMD) of DPWES work together closely in the planning, design, and construction of stormwater management-related projects. The following represents a review of the achievements of SWPD and MSMD in the area of project construction along with our emergency response and floodplain management effort over the year 2004. Projects are classified as one of the following types:

Type 1: Individual house flooding mitigation measures through the construction of flood walls, berms, and other flood proofing methods. There were four projects, Bridle Path, Foxstone Drive, Marl Pat Drive, and Tucker Avenue, completed in this category for a total expenditure of $272,703.

Type 2: Storm drain pipes/channels to alleviate flooding. There were thirteen projects completed in this category in 2004, for a total expenditure of $374,517. The projects were Burr Oak Way, Edgebrook, Fern Oak, Gladstone Place (Ph I), Griffith Road, Hillbrook Spring, Linda Marie Court, McFarland Drive, Middle Valley, Mount Vee Manor, Prelude Court, Radcliff, and Rosemont.

Type 3: Stream stabilization/drainage pipe installation to protect adjoining homes from eroding streambanks. In 2004 one project was completed in this category, Indian Run (Ph IV), for a cost of $560,000.

Type 4: Stream stabilization/water quality designs using bio-remediation methods. The Long Branch project was completed in this category in 2004, for a total expenditure of $343,000.

Type 5: Dam rehabilitation by the improvements of outlet structures, emergency spillways, etc. There were five projects completed for a total of $309,000. The five projects were Braddock Forest, Centreville Green, Stone Crossing, Sully Station and Little Rocky Run R-3 Sec 29 Pond 2.

Type 6: Regional detention ponds designed to provide flood control and water quality treatment to meet state mandates. There were two regional ponds completed in 2004 with a total expenditure of $1,700,000. These were Regional Ponds D-47 and R-8.

The following are brief descriptions of each project listed in the order they appear in the type descriptions above.

Type 1

Individual house flooding mitigation measures

Bridle Path flood proofing

Bridle Path

There was no overland relief for the public storm sewer system for this residential property and, as a result, significant house flooding occurred. A floodwall with a two step concrete landing at the basement was installed, alleviating the problem for a cost of $4,223.

Foxstone Drive

The existing storm sewer system in the vicinity of the property was unable to handle the volume of stormwater generated during a 100-year storm event, causing the inlet behind the property to surcharge. Sufficient overland relief for the water was not available and the basement of 1865 Foxstone Drive in Vienna, VA was flooded regularly. The house was flood proofed by constructing a reinforced concrete wall with brick liner, eight feet tall and 65 feet long, and an overflow swale 75 feet long. The flood proofing wall with associated pump system and overland relief swale alleviated the house flooding. The project was completed in November 2003 for a cost of $82,000.

Foxstone Drive flood proofing

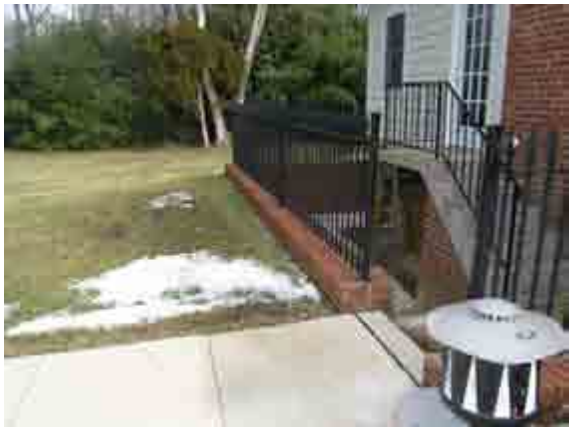
Type 1 (continued)

Individual house flooding mitigation measures

Marl Pat Drive

There was no overland relief for the public storm sewer system for this residential property and, as a result, significant house flooding has occurred at the property. The project consisted of the installation of a two-step walkout from the basement entrance door and a concrete paved ditch, and grading of the side yard for a cost of $ 36,470.

Marl Pat Drive, two steps



Tucker Avenue

Tucker Avenue

Flooding of two houses was occurring along a reach of Pimmit Run on Tucker Avenue in McLean, Virginia. On one house, a floodwall was retrofitted to the dwelling's architecture to block off a lower walk-out carport/house entry point that was subject to flooding. Window wells with grading were also included to block floodwater from entering. For the second house, the patio was raised in elevation and additional basement stairs were included to block the flood flows from entering the dwelling. The cost of this project was $150,000.

Type 2

Storm drain pipes/channels to alleviate flooding

Burr Oak Way

The rear door of the house at 10722 Burr Oak Way in Burke, Virginia, is at an elevation that is subject to flooding during major storm events. A reinforced concrete flood proofing wall, six feet tall and 20 feet long, was constructed by the door and the yard was regraded to provide an overflow swale 120 feet long. The swale between houses 10722 and 10724 conveys the storm drain surcharge to the existing channel behind house 10722. The cost of this project was $110,000.

Burr Oak Way

Edgebrook

There was no overland relief for the public storm sewer system for this residential property and as a result, significant house flooding has occurred. A grate inlet was replaced with a yard inlet for a cost of $2,000.

Fern Oak Court

There was no overland relief for the public storm sewer system for this residential property and, as a result, significant house flooding occurred. A two step walkout from the basement entrance door was constructed, raising the areaway wall. The side yard was regraded and an additional yard inlet was installed to pick up the increased stormwater. The cost of the project was $19,419.

Fern Oak, two steps

Fern Oak, yard inlet

Type 2 (continued)

Storm drain pipes/channels to alleviate flooding

Gladstone Place (Ph I)

The throat opening of the existing inlet limited the capacity of the stormsewer system, causing several residences to flood. The inlet was converted to a headwall opening to increase the capacity. Phase I of this project consisted of the modification of an existing inlet structure to a headwall and constructing a concrete ditch 30 feet long, leading to the new stormsewer inlet at a cost of $6,551.

Griffith Road

The storm drainage system was deteriorated requiring a pipe replacement and relocation of the system within the existing easement. This project consisted of installing 300 feet of 30-inch diameter storm drainage pipe and three drainage structures for a cost of $70,163.

Hillbrook Spring

The corrections to the pond on Winter Lane in Annandale, Virginia, were required to achieve code compliance using developer bonds. The dry detention pond was retrofitted with a BMP plate, the emergency spillway was armored with a cabled mattress, the outfall structure was modified to resolve erosion and safety concerns, the pond was excavated to design contours, and a trickle ditch was installed. The cost of this project was $73,000.

Hillbrook Spring

Linda Marie Court

Linda Marie Court

There was no overland relief for the public storm sewer system for this residential property and, as a result, significant house flooding has occurred at the property. The project consisted of the modification of an existing yard inlet and the grading of an overland relief swale through the side yard of an adjacent property for a cost of $6,911.

McFarland Drive

The swale that provides overland relief for stormwater around the house lacked sufficient grade differential to allow flow. To address the standing water in the side yard drainage swale, the grade of the swale was increased to allow the water to flow. Puddles and saturated ground was alleviated for a cost of $5,000.

Type 2 (continued)

Storm drain pipes/channels to alleviate flooding

Middle Valley

There was inadequate overland relief for the public storm sewer system and the existing inlet pipe and channel were blocked with debris, resulting in basement flooding. The project consisted of installing a floodwall at the back of the residence with three concrete steps for a cost of $17,693.

Mt. Vee Manor

Mt. Vee Manor is a developer default project and is located on Richmond Hwy in Mt. Vernon district. The developer had not developed the property per approved design plans and the adjacent property was being frequently flooded due to runoff from the site. To address this flooding situation, a minor storm drainage collection and conveyance system was built for a cost of $5,000. This, combined with re-grading the site, insured that the run-off from the site did not flood the neighboring property.

Mt. Vee Manor flood protection

Prelude Court

Prelude Court

The existing in-take pipe system had a history of clogging with debris. There was no overland relief and, as a result, significant house flooding has occurred. A low maintenance improvement was made to the system that allows smaller debris into the pipe system but prevents larger debris from blocking the opening or getting jammed in the pipe system. The cost of installing the row of concrete-filled bollards with cables as a debris barricade was $6000.

Radcliff

The invert of the corrugated metal pipe had completely deteriorated resulting in severe erosion. Thirty feet of deteriorated corrugated metal pipe was replaced with reinforced concrete pipe and a new headwall at a cost of $28,434.

Rosemont Circle

The curb elevation did not allow water to drain from the rear of the house. A curb inlet and yard inlet were added to correct the house flooding for a cost of $24,266.

Type 3

Stream stabilization/drainage pipe installation to protect homes

Indian Run (Phase IV)

Streambank erosion was occurring along a reach of Indian Run near Little River Turnpike in Annandale, Virginia, and there was house flooding. The streambanks were armored with riprap for a distance of 250 feet and an unnamed tributary to Indian Run was placed inside 250 feet of 60 by 38-inch elliptical pipe with a three-foot overflow swale to redirect the flood flows to Indian Run, eliminating flooding of the house. Cost of this project was $560,000.

Indian Run, streambank erosion

Type 4

Stream stabilization/water quality designs using bio-remediation methods

Long Branch Stream Rehabilitation

Increased inflows into the stream from a highly urbanized drainage area resulted in considerable deterioration of the Long Branch Stream located at the border of Fairfax and Arlington Counties. Stream restoration was performed to rectify a majority of the problems. However, soon after the stream restoration, Hurricane Isabel caused considerable damage to the in-stream restoration efforts. This damage was corrected for a cost of $343,000.

Long Branch stream rehabilitation

Type 5

Dam rehabilitation—improvements of outlet structures and emergency spillways

Braddock Forest

The pond's function was impaired due to failures of the corrugated metal riser pipe, deterioration of the principal spillway pipe, sediment build up, and deterioration of the control structure. Repairs and improvements were made to the dam embankment, a new riser structure and pipes were installed, a new water quality control device was installed, and the pond was enhanced with wetland marsh (to be planted in spring 2005) for a cost of $85,000.

Braddock Forest before retrofit

Braddock Forest after retrofit

Centreville Green

The pond's function was impaired due to pipe separation, sediment build up, constant blockage, and water quality control deterioration. Repairs and improvements were made to the dam embankment and riser structure, a new water quality control device was installed, and the pond was enhanced with a wetland marsh (scheduled planting spring 2005) for a cost of $63,000.

Centreville Green before retrofit

Centreville Green after retrofit, prior to wetland planting

Type 5 (continued)

Dam rehabilitation—improvements of outlet structures and emergency spillways

Stone Crossing Section 1

The pond's function was impaired due to failures including pipe separations, sediment build up, constant blockage, and water quality control device deterioration. Structural repairs and improvements to a dam embankment and riser structure were made, a new water quality control device was installed, and the pond was enhanced with wetland marsh (scheduled planting spring 2005) for a cost of $61,000.

Stone Crossing after retrofit

Sully Station (Ph I) Pond II

Sully Station (Ph I) Pond II

Piping problems along the principal spillway were noticed during routine maintenance operations of the Sully Station (Ph I) Pond II, a dry pond with BMP located off route 28 on Westfields Boulevard. Non-rehabilitation could have led to failure of the dam and subsequent flooding. The following improvements were made: the principal spillway was replaced, a concrete apron was installed in front of the riser, a new BMP plate was installed, a concrete cradle was installed along the entire length of the principal spillway, a drainage blanket was installed along the downstream third of principal spillway, and new trash rack was installed. The cost was $25,000.

Little Rocky Run R-3 Sec 29 Pond 2

The pond's function was impaired due to failures including pipe separation, sediment build up, constant blockage, and water quality control device deterioration. Structural repairs and improvements to a stormwater management dam embankment and riser structure were constructed and a new water quality control device was installed and enhanced with wetland marsh (scheduled planting spring 2005) for a cost of $75,000.

Type 6

Regional detention ponds, flood control and water quality, state mandates

D-47 Regional Pond

Regional Pond D-47 was constructed by the developer of Fairfax Ridge via a cost sharing arrangement with the county. It provides water quality and quantity control for a 111-acre drainage area and features water quality control and progressive quantity control by providing extended detention of the one-year storm event. This pond will serve to reduce downstream flooding problems in the Fairfax Farms Subdivision that have plagued residents for over 15 years. The total project cost is $800,000.

R-8 Regional Pond

This facility provides water quality and quantity control for a 100-acre drainage area. It is designed as a "wet" pond that incorporates wetlands plantings along a ten-foot wide bench around the perimeter. The pond and accompanying trail serve as an amenity within the center of the Buckley's Reserve Subdivision. The facility was constructed by the site developer via a cost sharing arrangement with the county. The total project cost is $900,000.

R-8 Regional Pond

Retrofitting of Watersheds with New Flood Control Facilities

Given limited funding sources, implementation of detention pond retrofit projects relies primarily on coordination with active projects during the rezoning and plan approval process. As funding permits, either through general fund appropriations, pro rata share revenues, or developer participation agreements, retrofit projects are implemented. The following tables list the regional ponds that have or will achieve retrofit benefits. The first table lists those projects that have been bonded or were completed during calendar year 2004. The second table lists those projects that currently have a submitted design plan incorporating construction/retrofit of a facility, which will provide BMPs for existing development. It is noted that this list may not be all-inclusive. The pictures are of Regional Pond R-8 and Regional Pond R-161, both Little Rocky Run watershed retrofit projects completed this year.

Regional Facilities Bonded or Completed During 2004

Facility Name	New facility	Total area controlled (acres)	Area of existing development retrofitted with BMPs (acres)
Regional Pond C-41	yes	92	na
Regional Pond D-47	yes	111	90
Regional Pond D-46	yes	277	180
Regional Pond H-9	yes	100	60
Regional Pond R-8	yes	100	20
Regional Pond R-16	yes	120	105
Regional Pond R-161	yes	235	50
Total		**1035**	**505**

Regional Pond R-8, Rocky Run watershed retrofit

Regional Pond R-161, Rocky Run watershed retrofit

Regional Facilities in Design or Land Acquisition Phase During 2004

Facility Name	New facility	Retrofit existing facility	Total area controlled (acres)	Area of existing development retrofitted with BMPs (acres)
Regional Pond C18	yes		442	342
Regional Pond C20 (Intl. Town & Country Club)	yes		515	252
Regional Pond C24	yes		99	0
Regional Pond C28	yes		181	124
Regional Pond C35	yes		109	30
Regional Pond C54	yes		328	95
Regional Pond D02 (Great Falls Hunt)	yes		246	33
Regional Pond D14 (Little Run Farm)	yes		147	79
Regional Pond H02	yes		101	15
Regional Pond R17	yes		322	322
Reston 913		yes	315	315
Regional Pond S05	yes		264	264
Regional Pond S07	yes		453	453
Vine Street	yes		229	229
Weltman Estates		yes	99	99
WolfTrap		yes	302	302
Total			**4,152**	**2,954**

Rehabilitation and Retrofit of County Maintained Stormwater Management Facilities

In 2004, four stormwater management ponds, serving a total drainage area of 72.96 acres, were rehabilitated and/or retrofitted (see table below). Rehabilitations consisted of repair, replacement, or modification of the facility to meet or exceed safety and functional requirements and to extend the service life of each facility. Retrofits employed the use of shallow wetland marshes to enhance nutrient uptake and provide an increase in water absorption and transpiration. A secondary effect of wetland marshes and naturally vegetated pond floors is the creation of habitat for wildlife. Below is a summary of the sites.

Rehabilitated Facilities with Enhancements

Pond Name	Tax Map	Access Address	Drainage Area (Ac)	Season Completed
Braddock Forest	68-1	left side of property at 4704 Western Street	6.76	Spring 2004
Centreville Green Pond 4A	66-1	5670 Lonesome Dove Ct.	24	Summer 2004
Little Rocky Run R3 Sec.29 Pond 2	65-4	13914 Marblestone Drive	26.5	Summer 2004
Stone Crossing Sec. 1	54-1	Opposite 14662 Stone Crossing Ct.	15.7	Spring 2004
		Total	72.96	

Fairfax County continues to identify and repair/retrofit stormwater dry ponds that have experienced structural failure. These ponds no longer provide the water quantity or quality benefits as originally intended, and the repairs are necessary to maintain compliance with the county's MS4 permit. The repair work generally results in significant disturbance of the dam embankment, control structure, and pond floor. With these ongoing construction activities and associated restoration requirements, an opportunity has arisen to also provide retrofit elements that enhance the water quality treatment, natural habitat, and aesthetic aspects of the ponds. Though these retrofit elements may vary to a degree from site to site, a complete retrofit project will, where practical, generally conform to the Virginia Department of Conservation and Recreation standards for the installation of shallow marsh wetlands. The pollutant removal efficiencies of these retrofitted facilities exceed that of the typical county stormwater quality pond. It is anticipated that additional Best Management Practice (BMP) credits may be obtained through these types of practices and will help meet the intent of the Chesapeake Bay 2000 Agreement and the Virginia Tributary Strategies initiative. The considered practices are as follows:

- The installation of sediment basins at the inlets
- The removal of some or all of the concrete low-flow ditches
- The installation of check dams in portions of low-flow ditch intended to remain
- The installation of diversion berms, peninsulas, and islands to increase treatment flow paths
- The installation of shallow marsh pools planted with wetland grasses and other types of wetland and wet meadow plantings (i.e., herbaceous shrubs, ornamental trees, etc.)
- The installation of modifications to the outlet structure and principal spillway pipe

Stormwater Needs Assessment Program

Fairfax County hired a consultant to develop a Watershed Community Needs Assessment and Funding Options Study (July 2004) to address the strategies for developing a comprehensive stormwater management program and a dedicated funding mechanism to support it. The plan will address program needs, which include watershed planning, capital improvements, changing service levels, increased maintenance for infrastructure inventories, unfunded mandates, and emergency events. In addition to the study, the consultant is facilitating a series of meetings for a Board of Supervisors-appointed committee of residents who are reviewing the level and extent of service of the current comprehensive stormwater management program and possible funding sources.

The committee is named the Stormwater Advisory Committee and is made up of seventeen residents that represent diverse community interests. The residents were appointed to the committee by the Board of Supervisors in August, September, and October, 2004. The committee members began meeting once per month in October, 2004, to review the current comprehensive stormwater management program, identify future needs, and possible funding sources. The committee will continue to meet until March, 2005, to develop their recommendations for improvements to the current program and a dedicated funding source to finance the improvements. The committee will propose their recommendations to the members of the Board of Supervisors in March, 2005.

The county has initiated a Speakers Bureau to present information about stormwater management, the challenges facing the county's current program, and the Stormwater Needs Assessment Project (SNAP) working to address these challenges. This outreach effort is targeted at groups, organizations, and associations in Fairfax County. The Speakers Bureau's purpose is to raise awareness about the issues facing the county with respect to stormwater management and to make residents aware of the project working to face those issues.

In addition to the Speakers Bureau, the county has developed a Web site to communicate the Stormwater Needs Assessment Project to residents. Residents can visit this site and review agendas and meeting minutes of the Stormwater Advisory Committee meetings. Residents can also sign up to receive monthly updates about the project:

http://www.fairfaxcounty.gov/dpwes/stormwater/needsassessment.htm

Innovative BMPs in Fairfax County

Federal and State guidelines are placing an increasing emphasis on controlling stormwater runoff close to its source. Environmentally sensitive site design and low impact development (LID) practices that serve to minimize impervious cover and replicate natural hydrologic conditions are widely-recommended approaches for accomplishing this goal. Fairfax County's Public Facilities Manual (PFM) currently does not specifically address better site design or LID other than through a letter to industry for "innovative practices." The county is endeavoring to maintain a comprehensive stormwater management program that is both responsive to the need for stakeholder participation and adaptable to rapidly evolving technical information and guidance. With this in mind, the county's Environmental Agenda calls for better site design practices that protect our streams and other natural resources. It also encourages the use of LID concepts and techniques, especially in new residential and commercial areas, and in retrofitting established areas.

LID is a design strategy with the goal of maintaining or replicating the pre-development hydrologic regime through the use of integrated design techniques to create a functionally equivalent hydrologic site design. Hydrologic functions of storage, evapotranspiration, infiltration, and ground water recharge, as well as the volume and frequency of discharges, are maintained through the use of integrated and distributed micro-scale stormwater retention and detention areas, reduction of impervious surfaces, and the lengthening of flow paths and runoff times. Other prerequisite environmentally sensitive site design strategies focus on reduction of impervious cover; prevention of stormwater pollution; and the conservation/protection of environmentally sensitive site features such as riparian buffers, wetlands, steep slopes, valuable (mature) trees, flood plains, woodlands, highly permeable soils, and public safety.

Two letters to industry on the use of BMPs have been sent to all Architects, Builders, Developers, Engineers, and Surveyors practicing in the county—one in 2001, the other in 2002 (***Appendix B***). ***Procedures for requests to use innovative Best Management Practice (BMP) facilities in Fairfax County*** are defined in a Letter to Industry dated October 2, 2001; and ***Innovative BMPs—3.07 Enhanced extended detention dry ponds now acceptable for public maintenance in residential areas and on governmental sites*** was sent on May 14, 2002. Enhanced detention dry ponds are now acceptable for public maintenance in residentially zoned areas and on governmental sites subject to compliance with the revised design standards in the "Guidelines for the Use of Innovative BMPs in Fairfax County, Virginia."

Fairfax County's objective is to encourage the use of LID concepts and techniques, especially in new residential and commercial areas, and seek opportunities for retrofitting established areas. Four items were on the LID action list for 2004: 1) Development of an Implementation Plan for Stormwater Management that integerates LID; 2) Integration of environmentally friendly site design (EFSD) techniques and LID practices into Fairfax County's comprehensive stormwater management program; 3) Preparation of a new letter to industry; and 4) Participation in and development of LID demonstration projects.

1) In February, 2004, a draft Implementation Plan for the "Role of Regional Ponds in Fairfax County's Watershed Management" was drafted with the following recommended action items:

- Develop and implement a countywide watershed management program
- Develop a comprehensive Stormwater Policy and Manual
- Encourage public participation in stormwater management in Fairfax County
- Ensure a dedicated/comprehensive funding source
- Evaluate projects based on social, economic, and environmental issues

2) A contract was entered into with the Low Impact Development Center in Beltsville, Maryland to prepare an LID-related white paper, develop PFM amendments to include LID approaches to stormwater management, conduct LID public/stakeholder meetings, and present resulting recommendations for integration of EFSD and LID to county staff and the Board of Supervisors. The deliverables from this contract will be completed by September 2005.

3) A letter to industry entitled ***Acceptance and review of stormwater information provided on rezoning, special permit, and special exception applications*** has been drafted jointly by LDS, SWPD, and MSMD in 2004 and released in February, 2005. This letter designates the Environmental and Site Review Division of LDS as the lead agency for the coordination of DPWES review of stormwater issues on rezoning, special permit, and special exception applications. The letter advances sound guidance for infill development and land use that is responsive to the need for environmentally-friendly stormwater management.

4) DPWES, NVSWCD, and others are currently cooperating in the planning, design, construction, and outreach activities associated with several LID demonstration projects funded through DCR grants. Currently in different stages of completion, each project varies in the practices to be installed as well as in its goals, ranging from redevelopment to stormwater retrofit.

Future plans for action include: 1) continued implementation of recommendations; 2) pending BOS approval of the recommendations from this initial stage of integration; subsequent integration of EFSD and LID into county guidelines for stormwater management will continue; 3) continued related changes in county policy, PFM, and other guidance documents; and 4) continued EFSD and LID demonstration projects to lead by example and adapt accordingly. A brief description of two projects follows:

Demonstrating Innovation: A Stormwater Retrofit at the Providence Supervisor's Office

This LID demonstration project is located within the Accotink Creek watershed and has a drainage area of 0.83 acre. In addition to the Providence Supervisor's Office, the site is also the location of the county's Merrifield Fire Station. DPWES and NVSWCD are partnering in the analysis, design, and construction. The overall complex encompasses a land area of 1.8 acres with approximately 1.44 acres being impervious. The proposed work will serve as a highly visible demonstration project featuring three LID practices: a bioretention basin (rain garden), a green roof, and permeable pavers. The bioretention basin and permeable pavers with underlying gravel infiltration bed will allow runoff to drain into a retention area where it can then slowly infiltrate into the surrounding soil. The green roof installation on an existing concrete storage structure will serve to reduce rooftop stormwater runoff and provide a comparison to an adjacent storage structure with an impervious roof. The bioretention basin will occupy an area of 680 square feet and the permeable paver area is 1,550 square feet in size, with a combined volume of approximately 9,841 cubic feet in the underlying gravel infiltration bed. The disturbed area will be 2300 square feet in size. The green roof will occupy an area of approximately 240 square feet. These three integrated LID practices will work in harmony to address both water quality and water quantity retrofit goals on the site. They are expected to retain and infiltrate a significant amount of the stormwater currently running off the impervious surface. See ***Appendix C*** for the LID conceptual design layout.

Tinner Hill Cultural Center

The top of Tinner Hill, along the Fairfax County/City of Falls Church border is being developed to commemorate the historic founding of the first rural branch of the N.A.A.C.P. in the nation. To honor the original importance of water to this historic community and to protect the current residents of the hill who live below this small county-owned site, the project will include eight separate LID design techniques to contain, reuse, and infiltrate up to the 100-year storm event. Assisted by county stormwater planners and the Northern Virginia Soil and Water Conservation District (NVSWCD) and with the help of a DCR state grant through the Northern Virginia Regional Commission, The Tinner Hill Heritage Foundation will develop "The Drinking Gourd Trail" to lead visitors past each of the LID designs, each with narrative signage.

This site will become a primary county demonstration site to display LID practices that all developers and landowners can use on any size property. The design techniques include a vegetated green roof, rain garden, permeable pavers, grass pavers, vegetated swale, infiltration trench, above- and below-ground cisterns, and a "carriage-road-style" driveway. See ***Appendix C*** for the LID conceptual design layout. For further information call (703) 241-4109 or visit:

www.tinnerhill.org

Tinner Hill Cultural Center—"The Drinking Gourd Trail"
The trail leads visitors past each of the LID designs,
each with narrative signage.

The Planning and Design Division (PDD)

PDD in the Office of Capital Facilities (OCF) has undertaken an initiative to implement new and innovative approaches to addressing Best Management Practices on the sites of new and expanded county buildings. The rain gardens/bioretention facilities that are being designed and implemented by PDD have a bioretention sand filter located at the ground surface. The sand filtering material is mixed with organic material to create a filtering material that will support plant life. Perforated underdrains are typically installed at the bottom of the sand filter layer(s) to convey filtered stormwater runoff to an appropriate outfall location. The embankment material and the periphery of the rain garden are then landscaped to provide a vegetated, environmentally sensitive BMP facility that is aesthetically pleasing. Nine rain garden facilities have been installed or are in the design stages. Four of the facilities have been completed, four facilities are in the construction phase, and one facility is in the design phase. These nine rain garden facilities will provide BMPs for over ten acres of impervious land. See ***Appendix C*** for a list of facilities.

Reston 913 Retrofit and DCR Water Quality Study

Reston 913, a 1.8 hectare regional in-line dry detention pond originally constructed in northwest Fairfax County in 1980 for flood control, has been identified for retrofitting as part of a Virginia Department of Conservation and Recreation Water Quality Improvement Fund (DCR WQIF) grant. The scope of the project consists of installing a BMP weir at the outlet to the pond with a drawdown time of 24 to 48 hours and conducting pre- and post-development water quality monitoring. Data generated from the monitoring program will be used to determine whether differences in pollutant loadings and peak concentrations as a result of the wetlands before and after construction of the weir wall are statistically significant. Similar hypothesis tests will be conducted to determine whether significant changes in wetland vegetation characteristics are indicated. Since the basic monitoring design is the before-and-after approach, an important aspect of data analysis will be to take into consideration year-to-year and seasonal variability.

Sanitary Sewer Extension and Improvement (E&I) Program

Waste Management and Capital Facilities within the Department of Public Works and Environmental Services jointly administer the E&I Program. The purpose of this program is to provide sanitary sewer service to eligible areas that have been identified by the Department of Health as having non-repairable malfunctioning septic systems. Pollution abatement and addressing public health considerations are achieved by providing sanitary sewer service to these areas. During 2004, one E&I projects was completed consisting of 500 linear feet of eight-inch sewer line, 3500 linear feet of four-inch force main, two-pump station, and providing sanitary sewer service connections for ten existing homes.

Yorktowne Square

Rain Garden

NVSWCD designed a rain garden at the Yorktowne Square Condominiums to overcome an existing drainage problem within the community. The rain garden controls and treats runoff from 0.56 acres of rooftops, parking lots, and lawns. DPWES-MSMD helped to install the project by providing heavy equipment and operators to excavate and install underdrains, and the rain garden materials. The layers consist of mulch, a nutrient-rich and well-drained planting soil layer, and two filter layers. It is equipped with an underdrain system and an observation pipe, which helps with maintenance and monitoring. The surface area of the rain garden is 600 square feet. The residents of Yorktowne Square planted the vegetation and also constructed a dry stream bed to direct stormwater runoff from a parking lot to the rain garden.

Yorktowne Square raingarden

Green Roof

The 5,000-square-foot green roof at Yorktowne Square Condominium is one of the first, if not the first, retrofitted green roof in the state. Building Logics' German design green roof system was chosen because it was lightweight and the 35-year-old building had structural limitations. The soil substrate contains less than fifteen percent organic matter and is made up of a lightweight, highly absorbent clay baked material. There were 8,400 sedums planted on the roof (*Sedum album, Sedum sexangular,* and *Sedum reflexum*). Within one year, the vegetated cover more than doubled. A graduate student in civil engineering at George Mason University has set up an experiment to measure the effectiveness of the green roof in reducing water runoff by measuring the volume of water draining from the green roof and an identical roof without vegetation. In addition, the water runoff from both roofs will be tested to measure any filtering qualities the green roof may provide (see ***Appendix D***).

Yorktowne Square green roof

Northern Virginia Soil and Water Conservation District LID Research

Integrating Low Impact Development (LID) concepts into a re-development site

During 2004, NVSWCD and ATR Associates, with the help of a grant from DCR, conducted research and analysis, developed a plan, and made recommendations for incorporating low impact development practices into the stormwater management plan for a 55-acre site at the former Lorton Prison as it is being re-developed into the Lorton Workhouse Arts Center. Working in collaboration with a stakeholders group—the Lorton Arts Foundation and its consulting engineers and landscape architects, and county staff—NVSWCD and ATR conducted a comprehensive feasibility study and developed a plan for specific recommendations and an accompanying design report. Factors considered during the study and in making the recommendations include the hydrologic regime and rainfall intensity of the region, amount of impervious surface, soil infiltration capability, and opportunities within each sub-watershed for capturing stormwater and increasing the groundwater contribution through infiltration. At the same time, it was important to maintain the historical and architectural integrity of the site. The major practices recommended were bio-retention filters and swales, porous paves, underground detention, and rain gardens. The Lorton Arts Foundation and its design engineers and landscape architects will decide what recommended practices will be integrated into the final plan. In advance of the re-development project, one practice, a rain garden, was installed near a building facing a major road. The heavy equipment work was done by DPWES-MSMD. Once the re-development is completed, an education and information program will highlight all the LID practices, and will include a permanent display at the on-site museum.

BMP Handbook

The Northern Virginia Regional Commission (NVRC) is beginning an effort to revise the 1992 edition of the Northern Virginia BMP Handbook. Research and technology has grown over the last ten years regarding stormwater management and best management practice design. The current handbook does not

always reflect today's stormwater management trends. The BMP Handbook is a widely used resource for Fairfax County planners and public works staff. NVRC will coordinate with local jurisdictions to seek input and coalesce the broad spectrum of interests to revise the manual to reflect the current state of stormwater management.

The Northern Virginia Regional Commission also worked with the Virginia's Low Impact Development (LID) ad hoc workgroup on that group's technical committee to develop a technical bulletin on LID to be incorporated into the Virginia Stormwater Management Manual. The bulletin will provide localities and consultants a common guidance document for incorporating LID into development projects under Virginia's stormwater regulations. The work group finished its efforts with the technical bulletin in January 2005 and is forwarding the document to the Virginia Department of Conservation and Recreation (VADCR) for review and incorporation.

Stream Restoration (Partnerships)

The two stream restoration projects that were sponsored and jointly constructed by Virginia Department of Forestry (VDOF), Reston Association (RA), NVSWCD and the Fairfax County DPWES Maintenance and Stormwater Management Division—Snake Den Branch and Difficult Run—remain stable, function as designed, and continue to handle storms successfully.

Lake Barcroft Watershed Improvement District Retrofits

The Lake Barcroft Watershed Improvement District (LBWID) continually strives to make advancements in a clean lake and a properly operating dam. Adjustments have been made to the diversion debris trap over Tripps Run at Potterton Road in order to increase its effectiveness and efficiency. In addition, the number of man-hours spent removing debris from the lake has increased. The LBWID is planning its next large-scale dredging event (approximately 12,000 cubic yards) for 2006, in addition to the small-scale dredging with its own equipment.

A new Cathodic Protection System (CPS) was installed on the Lake Barcroft Dam to protect the metal components of the dam from corrosion, replacing the CPS swept over the dam during Hurricane Isabel. In addition to the CPS, the LBWID installed new lake level sensors and a new rain gauge, both of which are connected to the dams PLC (logic controller/computer) which was installed last year.