



Stormwater Management

A core purpose of the University of South Carolina's Institute for Public Service and Policy Research is to enhance the quality and effectiveness of state and local government management and leadership. Two key services the Institute provides in fulfilling this mission are the Local Government Service Delivery Forums and the Local Government Rate and Practices Surveys.

The purpose of the forums is to provide an opportunity for local government managers to share best practices and innovative techniques for service delivery issues and to exchange ideas and explore best practices. The purpose of the surveys is to serve as a timely repository of information and to help inform the decision-making process for local government councils and staffs.

During the fall of 2006, the Institute conducted a Stormwater Management Rate and Practices Survey to collect information on local government stormwater programs. In the spring of 2007, the Institute hosted a large forum on stormwater management to bring together the key stakeholders in South Carolina to learn more about the National Pollutant Discharge Elimination System (NPDES) Phase II requirements and to share best practices and lessons learned. The purpose of this bulletin is to share important information on stormwater management strategies.

Overview

As the deadline approaches for small municipal separate storm sewer systems (MS4s) in South Carolina to submit National Pollutant Discharge Elimination System (NPDES) permit applications, government officials are interested in learning how other jurisdictions are designing stormwater utilities and programs. Jurisdictions with Phase II permits are required to include in their stormwater management programs minimum control measures in the following six areas:

- ◆ Public Education and Outreach
- ◆ Public Participation/Involvement
- ◆ Illicit Discharge Detection and Elimination
- ◆ Construction Site Runoff Control

- ◆ Post-Construction Runoff Control
- ◆ Pollution Prevention/Good Housekeeping

The purpose of these minimum control measures is to prevent pollution caused by stormwater runoff. An effective stormwater management program has both prevention and treatment components. Techniques or strategies used to satisfy these minimum control measures are called Best Management Practices (BMP's). According to stormwater managers, Post-Construction Runoff Control and Illicit Discharge Detection and Elimination are the two most challenging minimum control measures to implement.

Post Construction Runoff Control

The Post-Construction Runoff Control measure requires a small MS4 to develop, implement, and enforce a program to address stormwater runoff from development projects that disturb one acre or more. The program requires that controls are in place that would prevent or minimize water quality impacts.

On occasion, there are natural areas developers can take advantage of to control post-construction runoff. However, in most instances, stormwater runoff controls have to be constructed. The structural BMP's include traditional strategies such as detention ponds and infiltration trenches. For examples of more innovative strategies, see page 3.

Illicit Discharge Detection and Elimination (IDDE) Programs

An illicit discharge is defined as a discharge to a stormwater system that is not composed entirely of stormwater. Although illicit discharges come from a variety of sources, one of the most common causes is interaction of the sewage disposal system and the storm drain system. One of the challenges in implementing IDDE requirements is that EPA outlines the requirements, but gives no guidance on how to implement an IDDE program.

Only about 20% of Phase II communities across the nation have an IDDE program. Two of the local governments in South Carolina that have established effective IDDE programs are Greenville County (Phase I jurisdiction) and Fort Jackson (Phase II community). Both of these programs feature the following practices:

- ◆ Outfall Inventory – to find all of the possible discharge points

- ◆ Dry Weather Screening – to check for obvious non-stormwater discharges
- ◆ Sample Testing – to see if the discharge is illicit and to identify the possible source
- ◆ Tracking Illicit Discharges – following the discharge back to the source and/or identifying it through chemical analysis

For more information on Greenville County's program, visit http://www.greenvillegov.org/storm_water/default.asp To learn more about Fort Jackson's IDDE program, contact Doyle Allen at allend@jackson.army.mil

Public Participation and Outreach

Educating and engaging the public about stormwater is a key to successful stormwater management. However, public outreach strategies can be costly. One way to achieve a successful public participation and outreach program is for local governments to combine resources and efforts.

Two examples of successful partnerships in South Carolina are the Coastal Waccamaw Stormwater Education Consortium and the Ashley-Cooper Consortium. Both of these consortiums pool resources to provide a unified message to the public about stormwater programs. The Ashley-Cooper Consortium uses combined resources to provide training to government employees, create model ordinances for stormwater, and map the consortium area.

To contact the Ashley Cooper Consortium, please contact Chuck Jarman with Charleston County Public Works at

cjarman@charlestoncounty.org To learn more about the Waccamaw Stormwater Education Consortium, contact Steve Moore at smoore@cityofmyrtlebeach.com.

One partner in providing education is the Carolina-Clear Program offered by Clemson University. The Carolina-Clear Program offers services to local government for public education and outreach and public participation and involvement. Benefits of participating in a program such as Carolina-Clear, according to the Waccamaw Stormwater Education Consortium, include cost savings and enhanced working relationships with state and federal agencies. The Carolina-Clear program also provides a forum for members to discuss issues relevant to stormwater management. For more information on Carolina-Clear, please visit: <http://carolinaclear.clemson.edu/>.

Financing Stormwater Programs

Stormwater programs are funded in a variety of ways. When deciding how to finance stormwater, equity is a large concern. Choosing between a fee or tax raises the issue of tax burden. A fee will typically impact poorer homeowners more than a property tax. Thus, some governments may decide to tier their fees on the basis of property value, or grant waivers to those who are less able to pay. Other ways to tier finance systems are on residential lot size, with larger residential lots paying more than small lots. If the amount of land covered by impervious material can be attained, a fee can be tiered so that those with more impervious surfaces pay a greater amount.

Financing a stormwater system through a property tax may not raise such equity issues. However certain structures, such as churches and government property, which benefit from stormwater services, are exempt from property taxes.

Stormwater fees rarely cover the total cost of stormwater services. Governments should look to expand revenue options. Some ideas for this include linking fines with stormwater funding. For example, if a developer violates their permit regarding stormwater, the fine should be credited to the stormwater program instead of the general fund. A similar example is impact fees associated with new development. Governments also may use stormwater fees and taxes for operation and maintenance while using general fund (or general obligation funds) for capital finance.

For more information on stormwater program finance, go to the Environmental Protection Agency Region 4 Environmental Finance Center's website: <http://www.efc.unc.edu/>

Innovative Stormwater Practices

Green infrastructure, a smart growth strategy, is a series of techniques designed to address stormwater problems at the source by restoring the natural hydrologic functions of urbanized areas. Green infrastructure systems let the environment manage water naturally by retaining rainfall and absorbing pollutants. These techniques create green space and wildlife habitat, reduce energy consumption, and improve the aesthetics of development, in addition to addressing stormwater runoff. Several green infrastructure systems are described below.

Greenroofs -

One emerging technique is the application of green roofs, where the roofs of buildings are covered with a layer of a medium that is lighter and more absorbent than soil. The roofs filter and absorb stormwater, and have the added benefits of reducing heat and lasting longer than conventional roofs. Some studies report one-story buildings with these types of roofs experience a 30% reduction in cooling costs. National examples of cities that have initiated greenroof projects are Chicago, Milwaukee, Portland, OR, Seattle, and Washington, D.C. Riverside High School in Greer, SC, is a local example of this type of green strategy.



The green roof at Chicago's City Hall introduces vegetation in the heart of downtown. Temperatures above the Chicago City Hall green roof average 10° to 15°F lower than a nearby black tar roof. During the month of August this temperature difference may be as great as 50°F. The associated energy savings are estimated to be \$3,600 per year. PHOTO BY ROOFSCAPES, INC.

Landscape Architecture/Urban Forests -

Using vegetation to control stormwater is a key component of green infrastructure. Rain gardens, vegetated swales, bio-retention cells, and pocket wetlands are some of the landscaping methods employed to control stormwater runoff. Mature, deciduous trees also make a big impact on stormwater runoff and can absorb one-half inch of rainfall.

Seattle is a leader in these types of natural drainage systems in new developments and existing neighborhoods. The City has re-

rofitted many neighborhood streets in an effort to reduce stormwater runoff and improve water quality. These efforts have resulted in a reduction of impervious area by 11%. In addition, the use of hydraulic engineering and soil science to improve drainage has resulted in a 98% reduction in stormwater runoff from the redesigned streets.

Downspout Disconnection/Rainwater Collection -

Runoff from the roofs of buildings is a major cause of pollution and flooding in some communities. Cities such as Chicago, Pittsburgh and Toronto have implemented programs where downspouts are disconnected so the stormwater is not discharged in such a concentrated area. These cities also have installed rain barrels where the stormwater is collected and stored for future use.

Permeable Pavements -

Impervious surfaces are the primary conduit of stormwater runoff. Cities such as Chicago, Detroit, and Greenville, SC, have replaced asphalt and concrete surfaces with permeable pavement systems. These systems allow the rainwater to soak through and replenish groundwater, while deterring contaminants from running into rivers, lakes and drinking supplies. The permeable pavement system requires little maintenance and may last 25 years or more. For additional information on Greenville's initiative, call 864-232-2273.

In another effort to reduce impervious surfaces, local governments are redefining the width of streets and the formulas for determining residential and commercial parking. Reducing the standard number of parking spaces per 1,000 square feet of buildings, converting parallel spaces to diagonal spaces, and requiring shared parking arrangements are practices that have been adopted to ease the need for additional spaces/lots.

In South Carolina, the Saluda-Reedy Watershed Consortium released a report on opportunities for reducing impervious cover by modifying pavement and development standards in Greenville and Pickens counties and their respective municipalities. The report includes an "audit" of all related ordinances in both counties. To download a copy of the report, visit <http://www.saludareedy.org/paveaudit.html>

Many of these green strategies require upkeep and maintenance once constructed. This may become an issue when developers turn over maintenance responsibilities to homeowners' associations. Communities have discovered that homeowners' associations have not been able to provide the maintenance and upkeep of BMP's. Some communities have taken over the responsibility for monitoring and maintaining these stormwater controls. For example, the City of Charlotte currently monitors 20 BMP's and has developed a local manual. For more information, visit <http://stormwater.charmeck.org>

Technology

The City of San Francisco uses mobile GIS software and hand-held equipment to automate its stormwater inspection and monitoring efforts. This system enables the City to efficiently locate and monitor the condition of the stormwater collection system. To learn more about the City's program, contact Lily Dryden at ldryden@sfgwater.org

The City of Austin, Texas, is using stormwater management software to help reduce the effects of flooding. The StormCAD software, designed by Connecticut-based Haestad Methods Inc., is helping the city improve storm-drain management by providing calculations for such things as catchment runoff, gutters and pipe-lines. The department is using the program to develop master

plans for all watersheds in and around flood-prone areas of the city. For more information about Austin's stormwater program, visit http://www.ci.austin.tx.us/watershed/stormwater_treatment.htm

Woolpert, Inc., an engineering firm in Columbia, SC, has developed an IDEAL (Integrated Design and Evaluation Assessment of Loadings) Model. This model estimates the performance of Post-Construction BMP's and can help in the planning and design of BMP's. The model is currently designed for use in Greenville County and along the South Carolina coast. For more information, contact Brian Bates at brian.bates@woolpert.com

Additional Resources

NACO Produces New Stormwater Report

The National Association of Counties (NACo) has released a new report, *Stormwater Management: Three Profiles of County-Based Initiatives*. The stormwater management publication profiles three counties that took the lead to develop and implement stormwater management programs. Each profile features a specific innovative strategy that was implemented to reduce stormwater runoff and describes the impetus that lead to action, background information, key county contacts, and lessons learned. For more information on NACo's environmental programs or to order a copy of these publications, contact James Davenport at 202/661-8807 or jdavenport@naco.org

New CD-ROM Address Urban Runoff Pollution

The Natural Resources Defense Council (NRDC) has updated its popular report, *Stormwater Strategies*, on CD-ROM with new information on strategies being employed by communities around the country to control urban runoff pollution. The collection of

100 case studies serves as a guide for local decision makers, municipal officials, and environmental activists. As part of the updated CD-ROM, NRDC has added a new chapter on low-impact development, which has emerged as a simple, effective and economical stormwater strategy that also carries broader aesthetic appeal. To learn more about this report, visit <http://www.nrdc.org/water/pollution/storm/stoinx.asp>

Stormwater Strategies Calculator

As part of the "Green Values Stormwater Toolbox" offered by The Center for Neighborhood Technology, users can access a Stormwater Calculator to help determine the hydrological and financial impact of using green infrastructure. To learn more about this resource, visit <http://greenvalues.cnt.org/>

About the Institute

The Institute for Public Service and Policy Research is an interdisciplinary research and public service unit of the University of South Carolina. Its principle purpose is to address current and emerging issues relating to matters of public policy, governance, and leadership through research, educational activities, publications, and direct assistance programs. The goal of the Institute is to improve the quality of social, political, environmental, and economic life, with a primary focus on South Carolina. To learn more about the Institute, please visit: <http://www.ipspr.sc.edu/>

