

# SOUTH CAROLINA LOCAL GOVERNMENT RATE SURVEYS

*An Analysis of Stormwater Management  
Rates and Practices - 2006*



UNIVERSITY OF  
SOUTH CAROLINA  
INSTITUTE FOR PUBLIC SERVICE  
AND POLICY RESEARCH

# **An Analysis of Stormwater Management Rates and Practices**

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## **Preface**

A core purpose of the University of South Carolina's Institute for Public Service and Policy Research (IPSPR) is to enhance the quality and effectiveness of state and local government management and leadership. In fulfilling this mission, the IPSPR administers the South Carolina Local Government Rate and Practices Surveys. The purpose of these surveys is to collect relevant and timely information on local government fees and to serve as a repository of information. The ultimate goal of South Carolina Local Government Rate and Practices Surveys is to help inform the decision-making process for local government councils and staffs.

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. There are a variety of practices local governments employ in the development and management of their stormwater programs. The purpose of the Stormwater Rate and Practices Survey is to allow local government officials to share information on rates, organizational structure, billing and collection practices, and implementation of Best Management Practices (BMPs).

## **Introduction**

From flooding issues to water quality concerns, stormwater management is gaining the attention of local officials in South Carolina. Stormwater pollution has been a problem in some areas for as long as there have been cities; the volume of stormwater continues to grow as development replaces porous surfaces with impervious blacktop, rooftop, and concrete.<sup>1</sup> Non-point source pollution is the number one cause of water quality problems in the United States.<sup>2,3</sup>

The problem begins when excess rainwater cannot be absorbed by the ground and the flow of water collects pollutants such as lawn care chemicals, pet wastes, motor oil, and toxic metals from streets and parking lots. As growth causes more development, impervious areas such as rooftops, streets, sidewalks and parking lots exacerbate the stormwater problem. Traditionally, stormwater management was narrowly focused on directing stormwater away from individual properties. However, as communities grew, the additive effects of the stormwater runoff from these individual properties contributed to watershed flooding and pollution problems.<sup>4</sup>

In an attempt to address water pollution issues, the US Congress amended the Federal Water Pollution Control Act of 1972 (also known as the Clean Water Act (CWA)) to prohibit discharge of pollutants into waters in the United States. Initial efforts to improve water quality primarily focused on industrial wastewater and municipal sewage. As control measures for these point source pollutions were put in place, it became evident that non-point source pollution needed to

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<sup>1</sup> Christopher Kloss and Crystal Calarusse. "Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows." National Resources Defense Council. (June 2006). 2

<sup>2</sup> Point source pollution refers to pollution such as raw sewage and industrial waste. Non-point source pollution carries many different pollutants from diffuse sources such as roadways, roofs, lawns and parking lots.

<sup>3</sup> "Stormwater Guidelines for Green, Dense Redevelopment: Stormwater Quality Solutions for the City of Emeryville." Community Design + Architecture with Nelson\Nygaard Consulting Associates and Phillip Williams Associates. (December 2005) 10

<sup>4</sup> "Using Smart Growth Techniques as Stormwater Best Management Practices." United States Environmental Protection Agency. <http://www.epa.gov/smartgrowth/stormwater.htm> 15

be addressed. In 1987, Congress amended the CWA, requiring a comprehensive national stormwater discharge program. There were two phases to this program: Phase I required NPDES permits for large and medium size MS4s; Phase II requires smaller MS4s to implement stormwater management programs.<sup>5</sup>

In South Carolina, there were only three jurisdictions that were classified as medium MS4s as part of the Phase I implementation - Greenville County, Richland County, and the City of Columbia. In 2003, South Carolina had 70 small MS4s that were required to submit applications for the NPDES permit. South Carolina MS4s apply for their NPDES permits through the South Carolina Department of Health and Environmental Control (DHEC). The permit application describes how a jurisdiction will manage a stormwater management plan. Four of the 70 small MS4s were eligible to apply for a waiver due to their small populations. Three were granted waivers by DHEC.

## Methodology

In order to identify survey topic areas, IPSPR staff reviewed national surveys, the Florida Stormwater Association survey, and the North Carolina League of Cities' Water and Sewer Survey, and the Environmental Protection Agency's Minimum Control Measures. Based on this review and other information, IPSPR staff constructed a draft survey. The survey was sent to selected members of the South Carolina Association of Stormwater Managers for review. IPSPR staff incorporated suggestions from these individuals.

One hundred forty-three surveys were sent to members of the South Carolina City and County Management Association, members of the South Carolina Association of Stormwater Managers, municipal officials of small MS4s, and county administrators or public works directors who were not members of the two previously mentioned associations. Surveys were sent electronically to those jurisdictions for which IPSPR staff had valid e-mail addresses. Others were mailed hard copies. IPSPR staff followed up with those jurisdictions that did not respond to the initial survey. A total of 107 jurisdictions responded to the survey, resulting in a 74% response rate.

Table 1

Population Groups	Number of Respondents	Response Rate
MS4s	57	79%
Non-MS4s	50	70%
Cities	75	77%
Counties	32	69%

## Report Format

The number of respondents may vary from one survey item to another depending on the services provided by a particular jurisdiction. For many of the survey questions, respondents had the option of selecting all choices that applied to their situation. The body of this report contains an

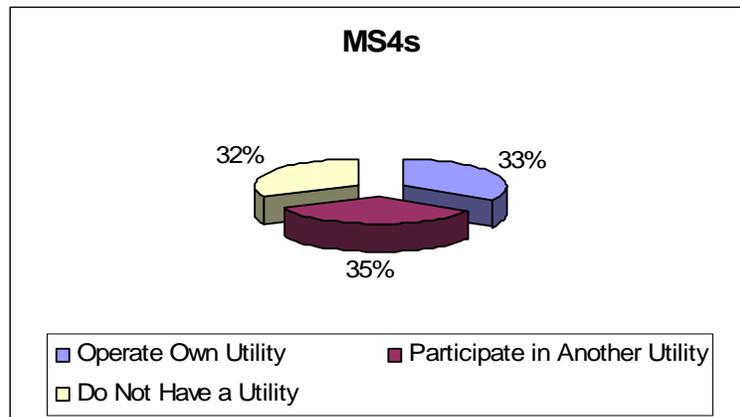
<sup>5</sup> A large MS4 is defined as having a population of 250,000 or more. Medium MS4s have a population of 100,000 to 250,000. Small MS4s are those jurisdictions of less than 100,000 people that are located within urbanized areas. The Environmental Protection Agency (EPA) defined urbanized areas as "a place and the adjacent densely settled surrounding territory that together have a minimum population of 50,000 people."

analysis of the Stormwater Rates and Practices Survey results. This analysis does not include information on the costs associated with service delivery. The purpose is to show the stormwater rates charged by South Carolina cities and counties and how these organizations are addressing NPDES requirements. Where applicable, the South Carolina results are compared to surveys conducted in Florida and North Carolina. Due to rounding, some of the percentages displayed on the graphs may not total 100%.

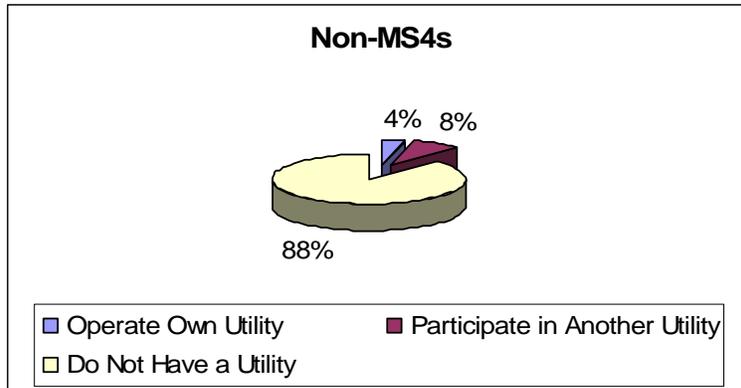
## Survey Results

The first two questions of the Stormwater Rate and Practices Survey addressed MS4 designation and whether the jurisdiction has a stormwater utility. Sixty-eight percent of MS4s either operate their own utility or participate with other jurisdictions. Twelve percent of non-MS4s operate their own utility or participate with other jurisdictions. Three MS4s and three non-MS4s indicated they are planning to establish a stormwater utility in the near future. Several other jurisdictions indicated they have stormwater management plans, but have chosen not to establish a stormwater utility.

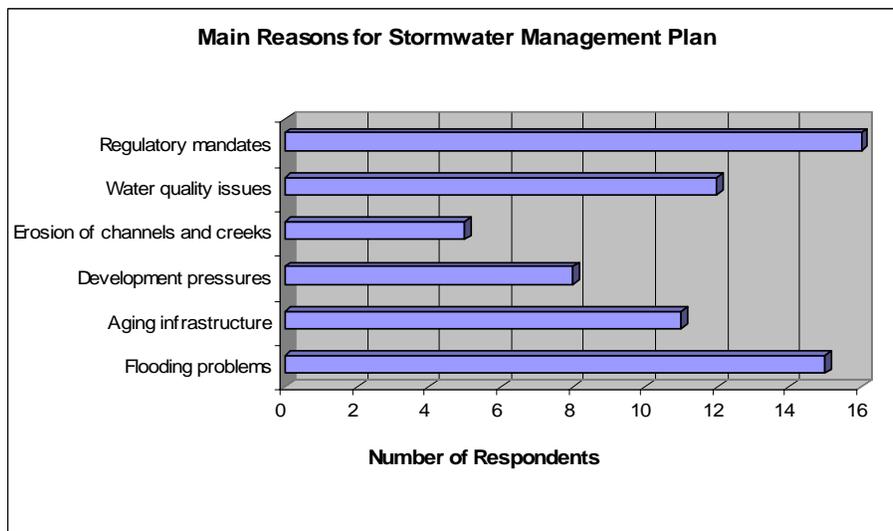
Of the 21 jurisdictions that reported having a stormwater ordinance, the City of Aiken was the first one to adopt an ordinance in 1992. Twelve of the 21 jurisdictions have adopted their ordinances since 2001. In Florida, most of the jurisdictions responding to the survey adopted their ordinances between 1987 and 1993.<sup>6</sup>



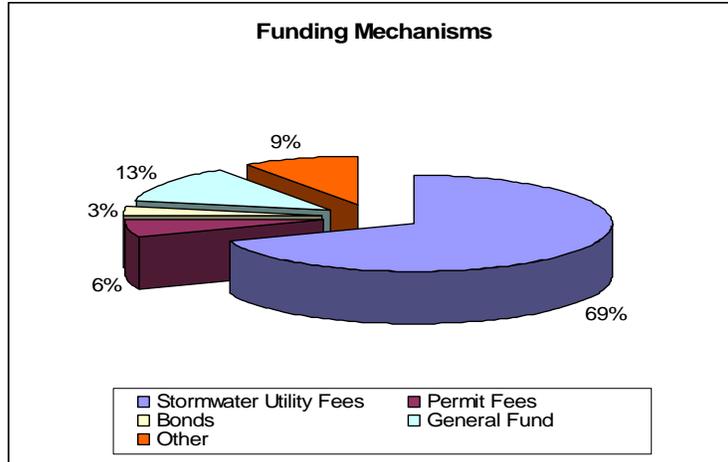
<sup>6</sup> "Stormwater Utilities Survey 2005." Florida Stormwater Association. Tallahassee (2005). 3



There are several reasons jurisdictions implement a stormwater management plan. Listed below are the reasons reported by the jurisdictions that responded to the survey. The most common responses were regulatory mandates and flooding issues. Several jurisdictions implemented stormwater management plans prior to federal mandate requirements, including two jurisdictions currently designated as non-MS4s.

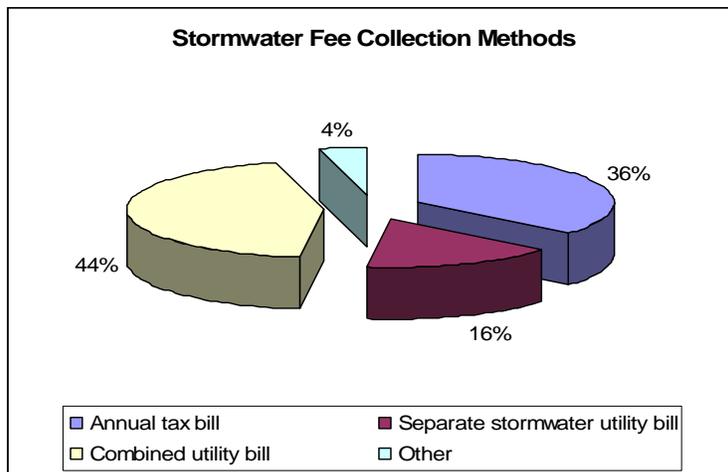


There are various ways to fund a stormwater utility. The two most common methods are user fees and tax-based general fund monies. Other mechanisms, such as permit fees and bonds, are usually not sufficient to solely fund the operation and are used as supplemental funding.



In South Carolina, the most common method is stormwater utility fees (69%). In comparable surveys conducted in 2005, stormwater utility fees were charged by 30% of respondents in North Carolina,<sup>7</sup> and 84% in Florida.<sup>8</sup>

There are several ways to collect stormwater fees. The two most common methods used in South Carolina are combined utility bills and annual tax bills. Surveys from North Carolina and Florida reported similar results.

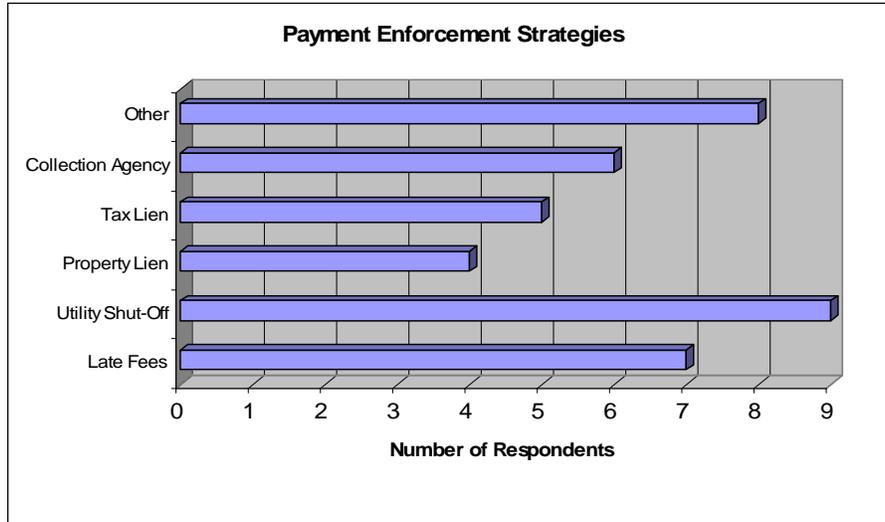


	Combined Utility Bills	Annual Tax Bills
North Carolina	84%	16%
Florida	75%	18%

<sup>7</sup> “2005 Water and Sewer Rates and Services Survey” University of North Carolina School of Government Environmental Finance Center and the North Carolina League of Municipalities. (2005)

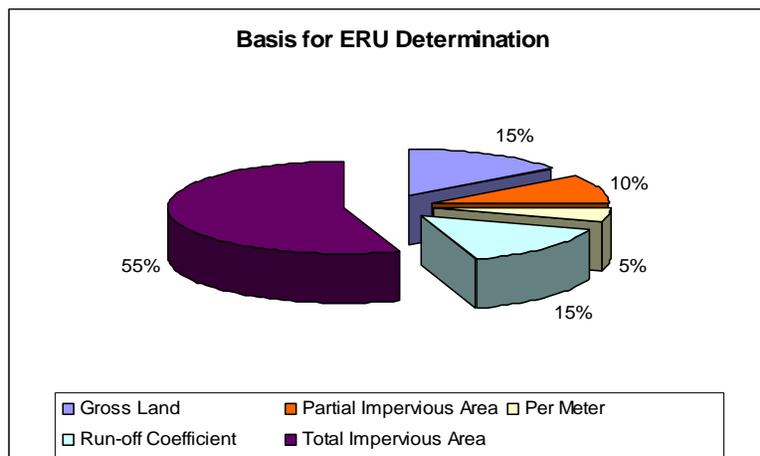
<sup>8</sup> Stormwater Utilities Survey 2005. 13

The most common strategy for collecting delinquent stormwater utility fees in South Carolina is utility shut-off. Examples of “other” methods include court orders, debt set-off programs, and collection letters. In Florida, the most commonly used methods are utility shut-off (54%) and property liens (28%).<sup>9</sup>



In South Carolina, residential stormwater fees of respondents do not vary with the size of the property, with two exceptions. Rates in the City of Greenville and Beaufort County vary according to the size of the property. Residential stormwater fees range from \$1.50 to \$6.00 per month. The average fee for responding jurisdictions in South Carolina is \$3.28 per month. In Florida, the 2005 average rate was \$3.88 per month, and ranged from \$.75 to \$8.75 per month.<sup>10</sup>

Commercial and other non-residential fees vary significantly according to the size of the property. Non-residential fees are based on Equivalent Residential Units or Equivalent Runoff Units (ERUs). An ERU is typically the size of an average residential lot. In South Carolina, the most common basis for determining the area of an ERU is the amount of impervious area.



<sup>9</sup> Stormwater Utilities Survey 2005. 21

<sup>10</sup> Stormwater Utilities Survey 2005. 10

In South Carolina, the average size of an ERU determined by impervious area is 2,815 square feet, compared to 2,684 square feet in Florida.<sup>11</sup>

The following table summarizes the ERU area and basis for jurisdictions that responded to the survey. IPSPR staff has summarized this information. For more specific information, please contact the individual jurisdictions. Both Richland and Spartanburg counties operate stormwater utilities that are funded through taxes. Therefore, neither county's information appears on tables 2-4.

Table 2

City or County	Population	Basis for ERU	
		Area	Basis
City of Aiken	28,000	10,000	Gross land area
Beaufort County	120,937	4,906	Impervious Area
Town of Bluffton	4,100	4,906	Impervious Area
City of Charleston	100,000	2,200	Impervious Area
Charleston County	330,368		
City of Columbia	117,088	2,454	Impervious Area
City of Conway	13,442	2,700	Impervious Area
Dorchester County	112,858	14,520	With 40% Impervious
City of Easley	17,000	5,000	Impervious Area
City of Florence	30,248	2,500	Impervious Area
City of Georgetown	8,900		Electric or Water Meter
City of Greenville	56,000	2,389	Impervious Area
Greenville County	402,000	2,466	Impervious Area
City of Greer	21,421	2,500	Impervious Area
Horry County	226,992	20,000	25% Impervious
Town of Mount Pleasant	57,334	20,000	Gross land area
City of Myrtle Beach	26,593	5,000	Impervious Area
City of North Augusta	18,600	14,520	x.35 run-off coefficient
City of North Charleston	87,000	14,520	x.4 coefficient
City of North Myrtle Beach	17,000	3,500	Impervious Area
City of Rock Hill	60,600	10,000	Gross land area
Town of Summerville	36,000	14,520	x.4 coefficient

Notes:

*Charleston County – The County has not yet determined the basis for ERU.*

<sup>11</sup> Stormwater Utilities Survey 2005. 9

The following table summarizes the stormwater fee structures for jurisdictions that responded to the survey. The rates are reported on a monthly basis. Several jurisdictions have very complex formulae for determining non-residential rates. IPSPR staff has summarized the rate basis where possible. For more specific information, please contact the individual jurisdictions.

Table 3

City or County	Residential Rate	Commercial Rate	Multi-Family Rate	Undeveloped Property Rate
City of Aiken	\$3.22	\$3.22 x 5.7 ERUs x acres of impervious area	\$3.22 x 0.75 per residential unit	No charge
Beaufort County	\$3.70	Number of ERUs x \$3.70	Apartments: \$1.44; Townhouses: \$2.22; Condos: \$1.00	Acreage x run-off factor x 8.72 x \$3.70
Town of Bluffton	\$4.08	Number of ERUs x \$4.08	Apartments: \$1.44; Townhouses: \$2.22; Condos: \$1.00	Acreage x run-off factor x 8.72 x \$4.08
City of Charleston	\$6.00	Number of ERUs x \$6.00	Owner can choose from \$6.00 x ERU, or .75 ERU per residential unit	No charge
Charleston County	\$3.00	Number of ERUs x \$3.00	Number of ERUs x \$3.00	\$1.50
City of Columbia	\$3.95	Number of ERUs x \$3.95	Number of ERUs x \$3.95	No charge
City of Conway	\$5.25	Based on a declining block rate. The first 50 ERUs are charged 1 x the ERU rate. The next 50 ERUs are charged at a rate of 0.9 x the ERU rate, the next 50 x 0.8 x the rate, the next 50 x 0.7 x the rate, the next 50 x 0.6 x the rate, & everything above 250 ERUs x 0.5 x the rate.	Based on a declining block rate. The first 50 ERUs are charged 1 x the ERU rate. The next 50 ERUs are charged at a rate of 0.9 x the ERU rate, the next 50 x 0.8 x the rate, the next 50 x 0.7 x the rate, the next 50 x 0.6 x the rate, & everything above 250 ERUs x 0.5 x the rate.	
Dorchester County	\$2.43	Pervious (40% or less of total area is impervious): \$75 per acre; Impervious (more than 40% impervious): \$150 per acre; Maximum charge is 75 acres	Considered Impervious Commercial	No charge
City of Easley	\$2.00	\$2.00	\$2.00	No charge
City of Florence	\$3.34	\$3.34 x number of ERUs up to 30,000 sq.ft. As the amount of hard surface on the property increases beyond 30,000 sq.ft., a declining rate with adjustment factor is applied.	Number of ERUs x \$3.34	No charge
City of Georgetown	\$4.00	\$4.00 x 6.3 x number of acres	\$4.00 for each meter	No charge
City of Greenville	1,640 sq. ft. or less = \$2.75; more than 1,640 sq. ft. = \$4.83	Number of ERUs x \$4.83	Number of ERUs x \$4.83	Single family = \$2.75; Multi-family or Commercial = \$4.83

City or County	Residential Rate	Commercial Rate	Multi-Family Rate	Undeveloped Property Rate
Greenville County	\$2.13	Number of ERUs x \$2.13	Number of ERUs x \$2.13	Number of ERUs x \$2.13
City of Greer	\$1.80	Number of ERUs x \$1.80	Number of ERUs x \$1.80	\$1.80
Horry County	\$2.45	Based on intensity of development	Gross Area - River and Marsh Area = Net Billable Area; (Net Billable Area (sq.ft.) /20,000 sq.ft.) x (IDF/0.25) x \$29.40 = Final Bill The Intensity of Development Factor (IDF) is the impervious percentage broken into ranges	Declining block rate if over 12 acres (minimum fee is \$6.00 per year)
Town of Mount Pleasant	\$1.50	The intensity of development factor is greater than the single family unit used as the base ERU because of the amount of impervious area. The run-off coefficient or C Factor for nonresidential/commercial property has been determined to be as set forth below. An equation is used to relate the run-off coefficient of the multi-family property to the base ERU. This equation is then multiplied by the average acreage for the appropriate size range of the property in question. The determined ratio is then multiplied by the base rate to determine the yearly fee. Light Industrial: 0.73; Neighborhood Commercial: 0.77; Office Professional: 0.78; Area wide Business or Marine District: 0.86	The intensity of development factor is greater than the single family unit used as the base ERU because of the amount of impervious area. The run-off coefficient or C Factor for multifamily residential has been determined to be 0.56. An equation is used to relate the run-off coefficient of the multi-family property to the base ERU. This equation is then multiplied by the average acreage for the appropriate size range of the property in question. The determined ratio is then multiplied by the base rate to determine the yearly/annual fee.	Undeveloped or vacant property is charged ½ of the ERU base rate. The run-off coefficient is approximately ½ of the run-off coefficient for the ERU.
City of Myrtle Beach	\$3.50	Number of ERUs x \$3.50	Number of ERUs x \$3.50	No charge
City of North Augusta	\$4.00	Number of ERUs x \$4.00 x (run-off coefficient/.35)	.75 x \$4.00 per unit	No charge
City of North Charleston	\$2.00	The runoff coefficient is 0.83. An equation is then used to relate the runoff coefficient of the nonresidential/commercial property to the base ERU. This equation is then multiplied by the acreage of the property in question. The determined ratio is then multiplied by the base rate to determine the annual fee.	The runoff coefficient is 0.60. An equation is used to relate the runoff coefficient of the multifamily-family property to base ERU. This equation is then multiplied by the acreage of the property in question. The determined ratio is then multiplied by the base rate to determine the annual fee.	No charge
City of North Myrtle Beach	\$6.00	Number of ERUs x \$6.00	Number of ERUs x \$6.00	No charge

City or County	Residential Rate	Commercial Rate	Multi-Family Rate	Undeveloped Property Rate
City of Rock Hill	\$2.37	All non-residential properties: $(\text{Number of ERUs} \times \$1.74) + ((\text{Number of ERUs}/43,560 \text{ sq ft}) \times \$1.20) + \$0.28$	No charge	No charge
Town of Summerville	\$3.00	The runoff coefficient is 0.83. An equation is then used to relate the runoff coefficient of the nonresidential/commercial property to the base ERU. This equation is then multiplied by the acreage of the property in question. The determined ratio is then multiplied by the base rate to determine the monthly fee.	The runoff coefficient is 0.60. An equation is used to relate the runoff coefficient of the multifamily-family property to base ERU. This equation is then multiplied by the acreage of the property in question. The determined ratio base rate to determine the monthly fee.	No charge

*Notes:*

1. Residential rates are per one ERU
2. Beaufort County – Residences less than 2,521 sq. ft. are considered .5 ERU. Residences over 7,266 sq. ft. are considered 1.5 ERU. Manufactured homes are charged \$1.33 per month. Town of Beaufort, Town of Hilton Head Island, and Town of Port Royal all participate in Beaufort County’s stormwater utility. The Town of Bluffton also participates, but has a different rate structure.
3. Greenville County – The County’s rate for residences of less than 1,000 sq. ft. is \$1.90 per month.
4. Town of Mt. Pleasant - Recreation facilities, parks, and golf courses are charged half of the ERU base rate for each individual tax parcel. In addition, clubhouses, tennis and pool facilities, and the like are billed at the appropriate commercial rate.

One way of comparing non-residential fees is to standardize the billing area fee to rate per 1,000 square feet. In South Carolina, the average non-residential fee is \$.82 per 1,000 square feet, ranging from \$.08 to \$2.73 per 1,000 square feet. In the 2005 Florida survey, the average was \$1.82 and the range was \$.35 to \$4.73.<sup>12</sup>

Table 4

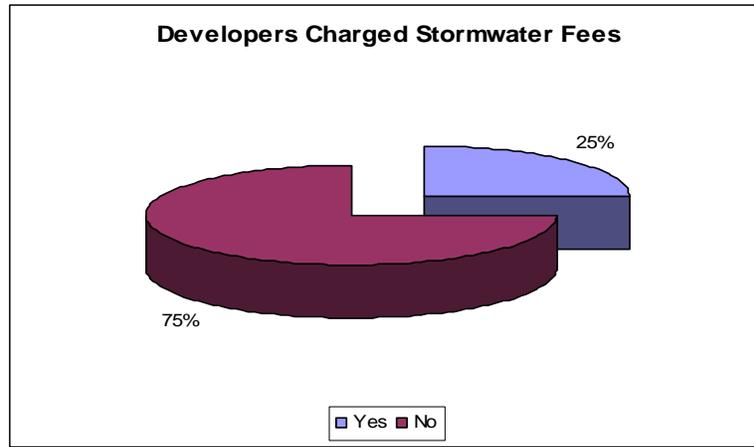
City or County	Monthly rate per 1,000 square feet
City of Aiken	\$ 0.32
Beaufort County	\$ 0.75
Town of Bluffton	\$ 0.83
City of Charleston	\$ 2.73
City of Columbia	\$ 1.61
City of Conway	\$ 1.94
Dorchester County	\$ 0.17
City of Easley	\$ 0.40
City of Florence	\$ 1.34
City of Greenville	\$ 1.15
Greenville County	\$ 0.86
City of Greer	\$ 0.72
Horry County	\$ 0.12
Town of Mount Pleasant	\$ 0.08
City of Myrtle Beach	\$ 1.15
City of North Augusta	\$ 0.28
City of North Charleston	\$ 0.14
City of North Myrtle Beach	\$ 1.71
City of Rock Hill	\$ 0.24
Town of Summerville	\$ 0.21

Not all properties within a jurisdiction are subject to stormwater fees. The following graph illustrates properties exempt from stormwater fees in South Carolina.

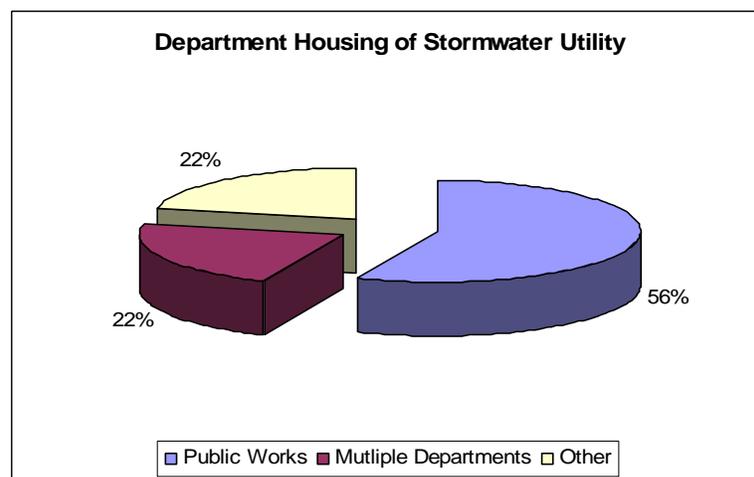


<sup>12</sup> Stormwater Utilities Survey 2005. 11

In Florida, the most frequently reported exempt property types were public roadways, undeveloped land, and railroad right-of-ways.<sup>13</sup> Another exemption typical in South Carolina is developers in the process of developing property.



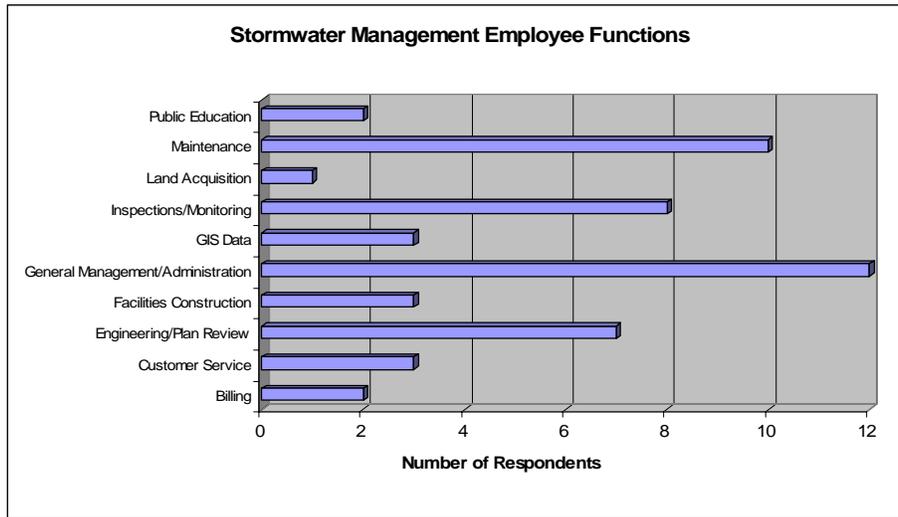
Local governments in South Carolina have organized their stormwater utilities in a variety of ways. More than three-quarters of survey respondents have located the stormwater utility in a single department. Twenty-two percent of the respondents have spread stormwater management functions across multiple departments. In Florida, 64% of stormwater utilities are located in a public works department.<sup>14</sup> One of the survey questions asked for the number of personnel assigned to stormwater management functions. The responses were difficult to summarize due to some employees splitting responsibilities among other departments and vacancies reported by some respondents.



<sup>13</sup> Stormwater Utilities Survey 2005. 18

<sup>14</sup> Stormwater Utilities Survey 2005. 3

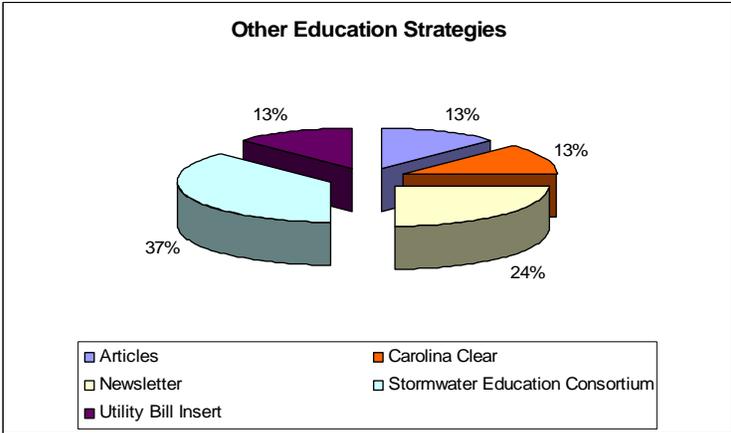
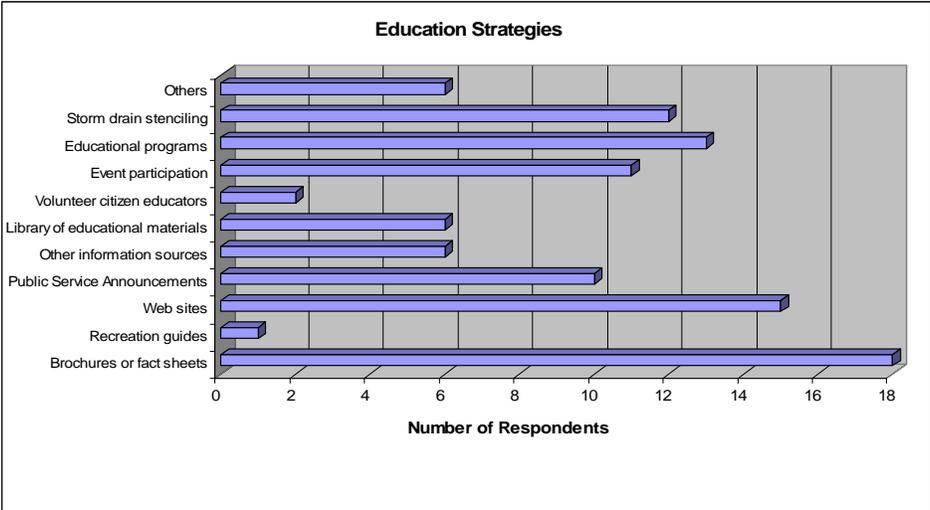
The functions performed by stormwater utility employees vary from one jurisdiction to another. General management and maintenance are the most common functions performed.



Jurisdictions with Phase II permits are required to include in their stormwater management programs minimum control measures in the following six areas:

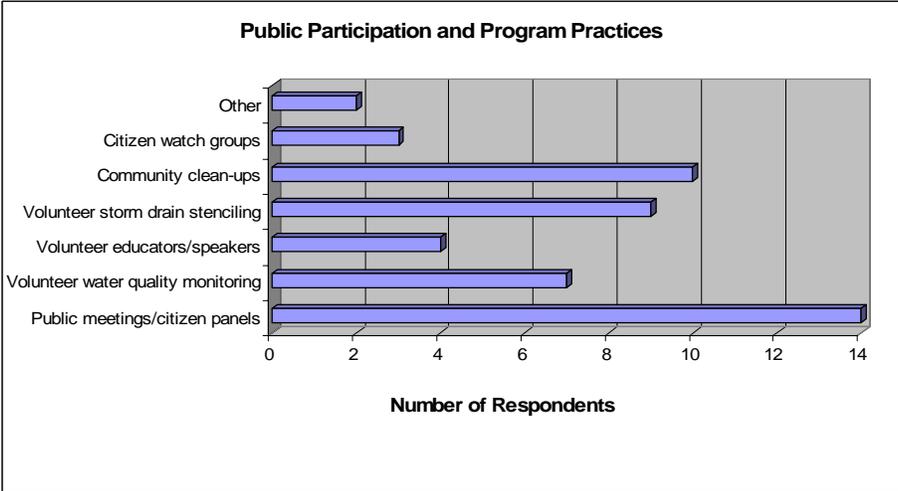
- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

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. Public education and outreach measures help inform the community of the importance of a stormwater management program. Community support and compliance are critical to the success of the program. The following graphs summarize public education and outreach strategies employed in South Carolina. The second graph illustrates the specific strategies respondents listed as “other.”

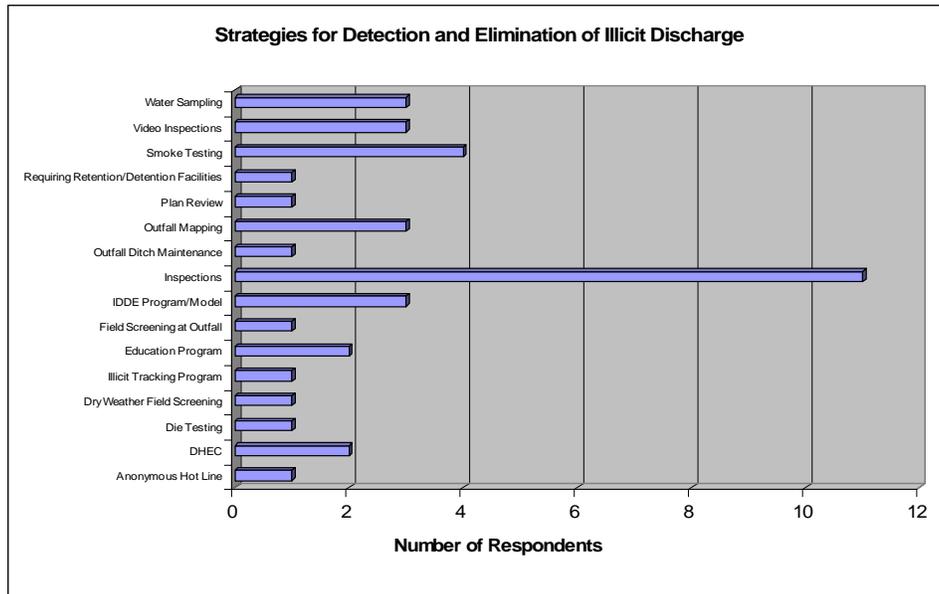


*Note: Several other respondents indicated they are considering using Carolina Clear.*

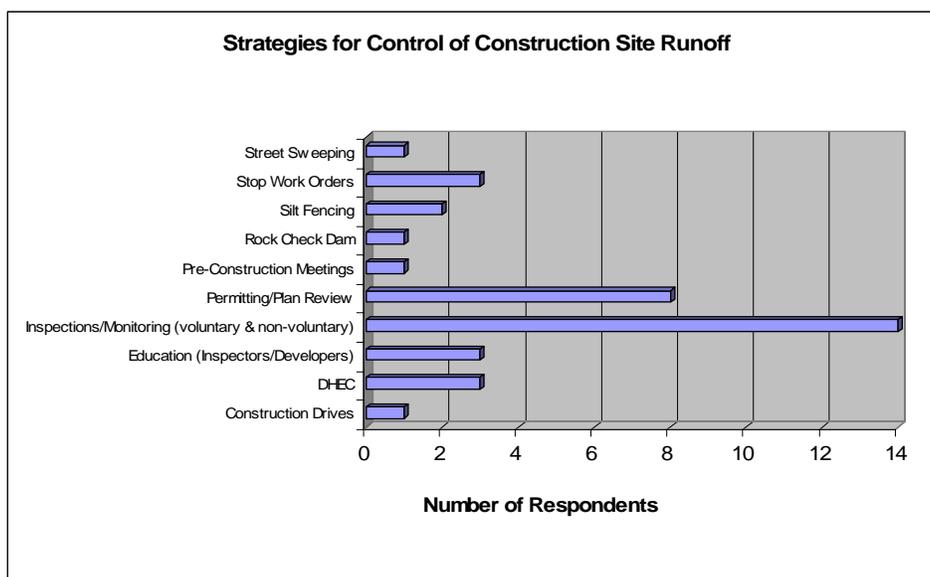
The public can play an active role in the development and implementation of a community's stormwater management program. Volunteers can be valuable resources to communities. The following graph summarizes public participation and involvement strategies employed in South Carolina:



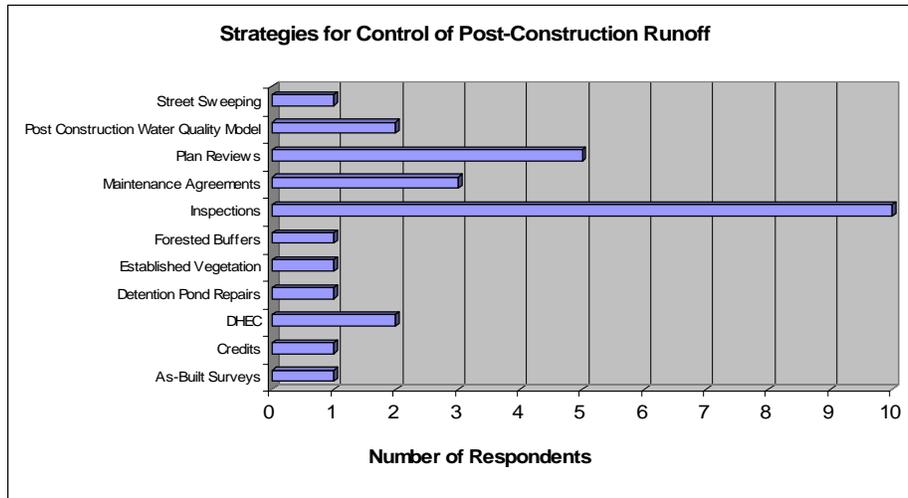
Some causes of illicit discharges into a stormwater system are improper disposal of automotive fluids, industrial spills, laundry wastewaters, and septic tank effluents. Small MS4s are required to address illicit discharges through mapping, education, detection and enforcement practices. The following graph summarizes illicit discharge detection and elimination strategies employed in South Carolina:



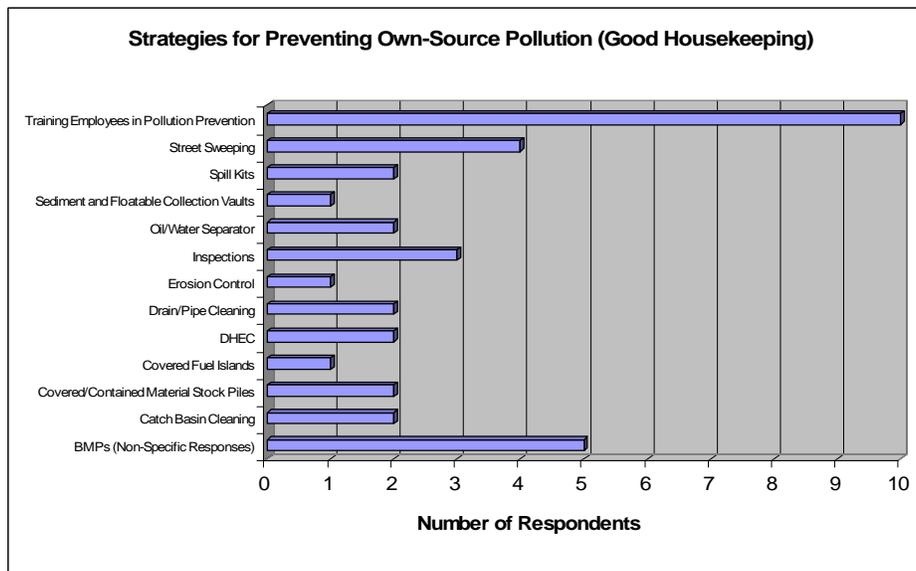
Sediment from construction sites is one of the leading causes of polluted stormwater runoff. Other pollutants from construction sites such as chemicals, debris, and concrete truck washout also contribute to the problem. Communities attempt to control construction site runoff through plan review, inspection and enforcement measures. The following graph summarizes construction site runoff control strategies employed in South Carolina:



There are two effects of post-construction runoff. The first is an increase in the amount of pollutants found, caused by stormwater flowing over areas changed by development. Chemicals and sediment are carried into lakes, streams and other bodies of water. Secondly, the volume of stormwater runoff increases as a result of more impervious surfaces in the form of pavement and rooftops. Instead of percolating through vegetation and soil, the runoff rapidly flows into bodies of water causing flooding and erosion. Communities attempt to control post-construction runoff through planning and a variety of structural practices, such as retention ponds and vegetation. The following graph summarizes post-construction site runoff control strategies employed in South Carolina:



City and county governments are required to monitor their own actions and adopt practices to prevent or reduce pollutant runoff as the result of government operations. The following graph summarizes pollution prevention and good housekeeping strategies employed in South Carolina:



## **Innovative Stormwater Practices**

Jurisdictions across South Carolina employ a host of strategies to combat stormwater runoff and the resultant pollution and flooding. Many communities throughout the United States have found innovative solutions to stormwater problems. These innovative practices are based on the principles of smart growth and green infrastructure.

Smart growth (or what also is referred to as sustainable growth or quality growth) is “development that serves the community, the economy and the environment.”<sup>15</sup> Smart growth tenets include open space preservation, walkable neighborhoods, mix-land use, developing existing communities, and using compact building design. These green strategies promote a healthy lifestyle, create green space and wildlife habitat, reduce energy consumption, and improve the aesthetics of development, in addition to addressing stormwater runoff.<sup>16</sup>

For example, compact building design reduces the amount of impervious surface. In Seattle, Washington, streets have been redesigned by reducing the amount of impervious area by 11% and using hydraulic engineering and soil science to improve drainage. The results were a 98% reduction in stormwater runoff from the redesigned streets.<sup>17</sup>

Several communities have attempted to reduce the number of excess parking spaces, and ultimately the amount of impervious surfaces. In many communities, parking lots at shopping centers are very rarely full. Planners are now reducing the number of parking spaces per 1,000 square feet of shops from five or six to four. For businesses with on-street parking, shared parking arrangements and converting parallel spaces to diagonal spaces are practices that have been adopted to ease the need for additional spaces/lots.<sup>18</sup>

Steering development into existing sites is another smart growth practice that aids in stormwater management. Redevelopment of vacant buildings (along with their empty parking lots) reduces the amount of new impervious areas that put a strain on stormwater systems.

Green infrastructure 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.<sup>19</sup> Several green infrastructure systems are described below.

### ***Greenroofs -***

The roofs of buildings are covered with a layer of medium that is lighter and more absorbent than soil. Plant species that can withstand extreme weather conditions are planted in the medium. The roofs filter and absorb stormwater, and have the added benefits of reducing heat and lasting

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<sup>15</sup> Lisa Nisenson and Jennifer Molloy. “Hidden Credits: Using Smart Growth Techniques to Manage Stormwater Under Phase II.” *Public Management*. Volume 87, Number 9. (October, 2005) 2

<sup>16</sup> “Stormwater Guidelines for Green, Dense Redevelopment: Stormwater Quality Solutions for the City of Emeryville” 11

<sup>17</sup> Susan Stoltzfus. “Ideas in Action: A Guide to Local Government Innovation.” Seattle Public Utilities. Volume 10. (Fall 2004)

<sup>18</sup> Nisenson and Molloy. “Hidden Credits.” 6

<sup>19</sup> Kloss and Callaruse. “Rooftops to Rivers.” 8

longer than conventional roofs. Greenroofs also provide aesthetic value.<sup>20</sup> The cities of Chicago, Milwaukee, Portland, OR, Seattle, and Washington, D.C. are among the cities that have initiated greenroof projects.<sup>21</sup>

#### ***Landscape Architecture/Urban Forests -***

Using vegetation to control stormwater is a key component of green infrastructure. Rain gardens, vegetated swales, and pocket wetlands are some of the landscaping methods employed to control stormwater runoff. Deciduous trees also make a big impact on stormwater runoff. Mature trees can absorb one-half inch of rainfall.<sup>22</sup>

#### ***Downspout Disconnection/Rainwater Collection -***

Stormwater 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.<sup>23</sup>

#### ***Permeable Pavements -***

Impervious surfaces are the primary conduit of stormwater runoff. Cities such as Chicago and Detroit have replaced asphalt and concrete surfaces with a permeable pavement system. This system allows for infiltration and retention of a three-inch per hour rainfall event. The permeable pavement system requires little maintenance and lasts 25 years or more.<sup>24</sup>

## **Conclusion**

Whether as a result of regulatory mandates or environmental concerns, local governments throughout South Carolina and across the country are faced with the challenge of managing stormwater runoff. As development continues and the deadline for the implementation of NPDES Phase II regulations approaches, stormwater management will require more attention from local government officials. The authors hope that the information contained in this report will serve as a starting point for local governments in South Carolina to share best practices and to discuss working cooperatively to address this issue.

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<sup>20</sup> Alex Boado. "Incentives for Greenroofs." *Ideas in Action*. International City/County Management Association. (2004)

<sup>21</sup> Kloss and Callaruse. "Rooftops to Rivers." 17-31

<sup>22</sup> Kloss and Callaruse. "Rooftops to Rivers." 8

<sup>23</sup> Kloss and Callaruse. "Rooftops to Rivers." 17-33

<sup>24</sup> Kloss and Callaruse. "Rooftops to Rivers." 19

## APPENDIX A

### Stormwater Management Practices and Rate Survey

As part of the South Carolina Local Government Rate Surveys initiative, the Institute for Public Service and Policy Research at the University of South Carolina is gathering information on stormwater management practices and rates. If your organization currently does not have a stormwater management plan or participates in another jurisdiction's system, please answer the first two questions below and return the survey to us. Please return your completed survey **by August 1<sup>st</sup>** to Anna Berger via e-mail at [aberger@sc.edu](mailto:aberger@sc.edu) or by fax at (803) 777-0298. You will receive a copy of the report once the results are compiled. Please contact Anna Berger or Bill Tomes at (803) 777-8156, if you have any questions. Thank you in advance for your participation.

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City/County Name:

City/County Population:

Contact Name:

Contact Phone/E-mail:

1. Are you a designated MS4?

No

Yes

2. Do you have a stormwater management plan?

No (***You do not have to complete the rest of the survey.***)

Yes (***Please indicate your circumstance below.***)

We operate our own stormwater utility.

We participate in another jurisdiction's stormwater utility. Please list jurisdiction. (***You do not have to complete the rest of the survey.***)

We are participating (or plan to participate) in a regional utility with other jurisdictions. Please list the name of the regional utility.

We have not yet established a stormwater utility. (***You do not have to complete the rest of the survey.***)

3. What are the main reasons your jurisdiction initiated a stormwater management plan? (Check all that apply.)

- Flooding problems
- Aging infrastructure
- Development pressures
- Erosion of channels and creeks
- Water quality issues
- Regulatory mandates

4. How does your jurisdiction define an ERU? Please include area amount (e.g., square footage, acres) and the ERU basis (e.g., impervious area, gross land area).

5. Please list any exempt property classes (i.e., churches, airports, schools, etc.).

6. Please list your stormwater fees below or attach your fee schedule:

Type	Fee	Explanation
Residential		
Commercial		
Multi-Family		
Undeveloped Property		
Other Categories (please list)		

7. Please indicate which of the following payment enforcement strategies you use. (Check all that apply.)

- Late Fees
- Utility Shut-Off
- Property Lien
- Tax Lien
- Collection Agency
- Other (Please explain.)

8. In what year was your stormwater utility or stormwater management ordinance adopted? Please attach a copy of your ordinance.

9. Please indicate the method in which your stormwater fees are collected:

- Annual tax bill
- Separate stormwater utility bill
- Combined utility bill
- Other (Please explain)

10. Please indicate the funding mechanisms for your stormwater utility. (Check all that apply.)

- Stormwater Utility Fees (as described in question #6)
- User Fees (e.g., park entrance fees, etc.)
- Developer Impact Fees
- Permit Fees
- Inspection Fees
- Effluent Discharge Fees
- Special Taxes
- Bonds
- General Fund
- Other (Please explain)

11. If you operate your own stormwater utility, in which department is your stormwater utility or stormwater management program housed?

12. If you operate your own stormwater utility, how many staff members does your jurisdiction currently have dedicated to stormwater management? What functions or tasks do these employees perform?

13. Are there any ways for property owners to reduce their stormwater fees (i.e., discounts for residents in developments where stormwater mitigation practices are in place, credit system for BMPs, density bonuses, etc.)? If so, please explain.

14. Are developers charged stormwater fees? If so, please explain in what circumstances the fees are charged, how the fees are calculated, and what the fees are.

15. Please indicate which of the following stormwater public education strategies your jurisdiction uses or participates in with neighboring jurisdictions. (Check all that apply.)

- Brochures or fact sheets
- Recreation guides (for golfers, bikers, hikers, etc.)
- Web sites
- Public Service Announcements
- Other information sources such as bumper stickers, refrigerator magnets, etc.
- Library of educational materials
- Volunteer citizen educators
- Event participation
- Educational programs
- Storm drain stenciling
- Tributary signage
- Others: (please list)

16. Please indicate which of the following stormwater practices you incorporate into your public participation and involvement programs. (Check all that apply.)

- Public meetings/citizen panels
- Volunteer water quality monitoring
- Volunteer educators/speakers
- Volunteer storm drain stenciling
- Community clean-ups
- Citizen watch groups
- "Adopt a Storm Drain" programs
- Others: (please list)

17. Briefly describe your strategies for controlling construction site runoff.

18. Briefly describe your strategies for controlling post-construction runoff.

19. Briefly describe your strategies for detecting and eliminating illicit discharge.

20. Briefly describe your strategies for preventing pollution from municipal or county operations.

## APPENDIX B

<b>Jurisdictions Responding</b>		
Abbeville County	Dillon County	Manning, City of
Aiken, City of	Dorchester County	Marion County
Allendale, Town of	Duncan, Town of	Mauldin, City of
Anderson, City of	Easley, City of	Moncks Corner, City of
Anderson County	Edgefield, Town of	Mount Pleasant, Town of
Arcadia Lakes, Town of	Edgefield County	Myrtle Beach, City of
Atlantic Beach, Town of	Fairfield County	Newberry, City of
Bamburg Board of Public Works	Florence, City of	North Augusta, City of
Barnwell County	Florence County	North Charleston, City of
Beaufort County	Folly Beach, City of	North Myrtle Beach, City of
Beaufort, City of	Forest Acres, City of	Oconee County
Bennettsville, City of	Fountain Inn, City of	Orangeburg, City of
Berkeley County	Gaffney, City of	Orangeburg County
Bluffton, Town of	Georgetown, City of	Pageland, Town of
Briarcliffe Acres, Town of	Georgetown County	Pickens, City of
Burnettown, Town of	Goose Creek, City of	Pickens County
Camden, City of	Greenville, City of	Pine Ridge, Town of
Cayce, City of	Greenville County	Port Royal, Town of
Central, Town of	Greenwood, City of	Richland County
Charleston, City of	Greenwood County	Rock Hill, City of
Charleston County	Greer, City of	Santee, Town of
Cheraw, Town of	Hampton County	Simpsonville, City of
Cherokee County	Hanahan, City of	Spartanburg County
Chesnee, City of	Hartsville, City of	Springdale, Town of
Chester, City of	Hilton Head Island, Town of	Summerton, Town of
Chesterfield County	Horry County	Summerville, Town of
Clarendon County	Inman, City of	Sumter, City of
Clemson, City of	Irmo, Town of	Sumter County
Clinton, City of	Jasper County	Travelers Rest, City of
Clover, Town of	Johnston, Town of	Walterboro, City of
Colleton County	Lancaster, City of	Wellford, City of
Columbia, City of	Landrum, City of	West Columbia, City of
Conway, City of	Lexington, Town of	Woodruff, City of
Cowpens, Town of	Lexington County	York, City of
Darlington, City of	Liberty, City of	York County
Darlington County	Loris, City of	

## APPENDIX C

### *Jurisdictions with Stormwater Management Systems*

<b>Jurisdiction</b>	<b>Contact Information</b>
Aiken, City of	Tim Bledsoe, Engineering Technician, tbledsoe@aiken.net, 803.642.7717
Beaufort County	Eddie Bellamy, Public Works Director, eddieb@bcgov.net, 843.470.6403
Bluffton, Town of	Laura Bailey, lbailey@townofbluffton.com
Charleston, City of	Laura Cabiness, Public Works Director, cabinessl@ci.charleston.sc.us, 843.724.3754
Charleston County	Charles Jarman, Engineering Superintendent, cjarman@charlestoncounty.org
Columbia, City of	Dee Bennett, Engineering Operations Manager, dabennett@columbiasc.net, 803.545.3230
Conway, City of	Jerry Barnhill, Public Works Director, jbarnhill@cityofconway.com
Dorchester County	Doug Thompkins, Public Works Director, dtompkins@dorchestercounty.net, 843.832.0070
Easley, City of	Tracy Jones, Stormwater Manager, tjones@easley-sc.org, 864.855.7940
Florence, City of	Brantley Carter, Public Works Department Manager, bcarter@cityofflorence.com, 843.665.3236
Georgetown, City of	Lane Mixon, Engineering Manager, lmixon@cogsc.com, 843.545.4500
Greenville, City of	Julie Arrowood, arrowoj@greatergreenville.com, 864.467.4410
Greenville County	Jason Gillespie, JGillespie@greenvillecounty.org
Greer, City of	Lillian Hanley, Stormwater Engineer, lhanley@cityofgreer.org, 864.801.2026
Horry County	Thomas Garigen, Stormwater Manager, garigent@horrycounty.org, 843.365.2097
Mount Pleasant, Town of	Hillary Repik, Stormwater Program Manager, stmwat@townofmountpleasant.com, 843.856.2157
Myrtle Beach, City of	Stephen Moore, Streets & Drainage Superintendent, smoore@cityofmyrtlebeach.com, 843.918.2000
North Augusta, City of	Thomas Zeaser, Public Works Director, tzeaser@northaugusta.net, 803.441.4220
North Charleston, City of	Mike Dalrymple, Assistant Director of Public Works, mdalrymple@northcharleston.org, 843.745.1026
North Myrtle Beach, City of	Kevin Blayton, Public Works Director, kblayton@nmb.us, 843.280.5500
Richland County	Srinivas Valavala, Stormwater Manager, srinivasvalavala@richlandonline.com, 803.576.2465
Rock Hill, City of	Bobby Banks, bbanks@ci.rock-hill.sc.us
Spartanburg County	Ronald Kirby, County Engineer, rkirby@spartanburgcounty.org, 864.595.5336
Summerville, Town of	Russell Cornette, Town Engineer, rwcornette@summerville.sc.gov, 843.851.4226