PM PUBLIC MANAGEMENT October 2005 · Volume 87 · Number 9
FEATURES

Hidden Credits: Using Smart Growth Techniques to Manage Stormwater Under Phase II

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Stormwater used to be one of the least exciting subjects in city and county governance, but those days are over. A convergence of new Environmental Protection Agency (EPA) rules, unprecedented rates of growth, and water-quality concerns have brought stormwater management to the fore.

The search for solutions has extended not only across city and county boundaries but within them as well. Almost every city or county department, from public works to transportation, has had to turn attention to stormwater control. Given the changes, what should managers look for to effectively manage the departments that are, in turn, managing stormwater?

Some answers just might lie in programs and projects already underway. This article looks at some of these programs, as well as areas where decisions in one department might be working against stormwater management goals.

The Links to Stormwater and Water Quality

The first step in looking at solutions is to look at what generates stormwater-related problems. Stormwater runoff is generated when excess rain water cannot be absorbed into the ground and thus flows over the ground toward a receiving waterbody. Certainly the magnitude of a storm event, which cannot be controlled, plays a role in whether a storm will spur flooding or sewer overflows.

At the same time, stormwater generation is related to development and decisions on how and where it takes place. As the number of impermeable surfaces—such as roads, rooftops, and compacted surfaces—increases, less water soaks into the ground to feed groundwater and river base flows. This situation can greatly reduce in-stream flows during dry periods, and some streams essentially dry up.

When less rain water gradually soaks in, large pulses of stormwater enter streams, scouring once-stable streambanks and increasing the possibility of flooding. As stormwater flows to streams and lakes, it picks up oil, fertilizers, animal waste, litter, and even heat. Water quality and quantity problems associated with stormwater are further exacerbated by the development patterns that have prevailed over the past 50 years. While land development necessarily involves creation of impervious surfaces, how and where development takes place can influence the ultimate degree of environmental impact from the streets, rooftops, and yards.

Conventional development patterns of the past several decades are exemplified by separation of uses (e.g., housing, retail, and office uses in separate development pods), a dispersal of development projects, and highly engineered roadways and access routes. This separation of uses typically relies on travel that can be accessed only by automobiles. This, in turn, dictates parking lots, roads, and driveways that are engineered to meet the needs of auto-only travel.

Looking for Stormwater Solutions in Smart Growth

As the links between development patterns and water quality have been more clearly defined, environmental officials, local government planners, and engineers have begun to look for strategies to prevent flooding and property damage while also minimizing the amounts of pollutants flowing into water. Local governments increasingly are looking to the use of comprehensive plans and smart-growth principles to manage a host of city or county goals, which often include stormwater management.

Your locality or state may have smart growth (or in some areas, quality growth or sustainable growth) plans. Simply put, smart growth is development that serves the community, the economy, and the environment. According to the Smart Growth Network (www.smartgrowth.org), there are 10 guiding principles of smart growth:

1. Mix land uses.
2. Take advantage of compact building design.
3. Create a range of housing opportunities and choices.
4. Create walkable neighborhoods.
5. Foster distinctive, attractive communities with a strong sense of place.
6. Preserve open space, farmland, natural beauty, and critical environmental areas.
7. Strengthen and direct development toward existing communities.
8. Provide a variety of transportation choices.
9. Make development decisions predictable, fair, and cost-effective.
10. Encourage community and stakeholder collaboration in development decisions.

While better stormwater management is not explicit in the principles, the water-quantity benefits are, quite literally, built in. Compact building design, including building and parking footprints, can reduce the amount of impervious surface associated with each development unit of housing or commercial space. Directing development toward existing communities makes better use of

existing infrastructure and provides an economic base for ongoing maintenance and repair of pipes and treatment facilities.

Your city or county may already be engaged in planning and zoning ordinance revisions that have stormwater benefits. The sections here look at some of those efforts and how you can include them in meeting goals for water quality and regulatory requirements. By coordinating across departments, using programs already in place, and integrating those efforts in your environmental programs, you can save money and time.

Regional Planning

Watersheds may be an entirely new organizing feature for managers who are used to working within jurisdictional boundaries, or at most with metropolitan planning agencies. Planning at the watershed scale is gaining attention not only because of stormwater regulation but as a way to manage other water-quality and -quantity problems, such as protection of source water and flooding. Governing at the watershed level requires cooperation across new sets of political boundaries.

This is not to say that managers in neighboring cities and counties have not worked cooperatively before. In fact, if your community is affected by the stormwater rules, you are likely to also be in a fast-growing part of the country dealing with housing, emergency response, transportation, and economic development issues. Existing cooperative agreements on these issues might also serve as partnerships for watershed and stormwater planning.

Your locality, for example, may have a memorandum of understanding (MOU) or memorandum of agreement (MOA) with a local soil conservation district, university, or metropolitan planning organization for planning efforts initiated before the stormwater rules came into effect. Provisions on cost-sharing, enforcement, resource allocation, or data generation might be in place; these can be a good starting point for working with those entities for a watershed-wide planning effort. In addition, determine if there are existing MOUs or MOAs on water-quality monitoring, floodplain mapping, or other water-related activities.

There are other activities that may not occur through a formal organization but that can be used to meet stormwater requirements. States are increasingly creating and modifying land use legislation that allows cities and counties to work together creatively. Managers are likely to be familiar with local and regional efforts to set aside land for preservation. These land preservation deals may have aspects that deal with water quality or quantity—aspects that can be counted in comprehensive stormwater regulations.

What should a manager look for? See if your local government is involved in efforts to establish transfer or purchase of development rights. The areas to be preserved may also be areas that are part of a sourcewater protection plan or

important forest cover, and therefore play a role in regional stormwater control. (See more information in this article for areas designated to receive development rights.) You can also check to see if your jurisdiction has special overlay zoning to protect sensitive waterbodies or wetlands. If so, they could be important elements in meeting the requirements of stormwater regulations.

There are also emerging policy innovations that could be included in your plan. Water-quality trading programs are emerging to control nutrients and a few other pollutants but are also being used for water quantity and stormwater. The Charles River Watershed in Massachusetts was one of the first communities chosen to pilot a water-quality trading program sponsored by EPA. While the foundation of the program is pollutant-based, it was sparked by the alteration of water flow to the river caused by increased development in the watershed. For more information, visit the Web site at www.crwa.org.

Another emerging tool in watershed programs is that of impervious surface caps. Research indicates that water-quality problems show a marked increase once 10 percent of a watershed is covered by such impervious surfaces as development, roads, and parking lots. This could encourage impervious surface trading among jurisdictions in a watershed for a balance of developed and preserved land.[1]

Streets and Street Design

Two aspects to street design and stormwater have implications for stormwater management: the retrofit of existing streets for better stormwater performance and the layout of new streets. Since many departments of transportation are now required to obtain stormwater permits, there is a growing body of information on best management practices (BMPs) for roadways. Common mitigation techniques include obtaining buffer strips between roadways and streams, and creating bioinfiltration areas or other stormwater management measures.

Seattle, Washington, is a leader in retrofitting existing streets to catch excess stormwater. Its "Green Streets" program uses both structural and nonstructural techniques for retaining and infiltrating rainwater that would otherwise travel along curbs and drain into waterways.

In addition to street surfaces, street layout can have a great impact on stormwater generation, though in complex ways. Certainly, streets create obvious connected, impervious cover by way of parking lots, driveways, curbs, and gutters. For most water-quality professionals, connected impervious surfaces have traditionally been associated with poor water outcomes because the cumulative volume of water, and the pollutants that flow with it, are led uninterrupted to receiving waterways. This begs the question of whether the converse is better for water quality: Does a disconnected and dispersed road system serve the watershed better? The answer lies both in road design and the design of development projects served by those roads.

In most growing areas, site development is governed by subdivision codes or zoning codes that establish discrete areas for housing and commercial activity. Most new development relies on the automobile as the sole viable travel option. As a result, parking spaces, drive lanes, and wide roads are built to meet a system where almost every trip is made by car.

The route to getting better watershed and stormwater performance from better street designs is complex, but you should look for such design aspects as new codes that reduce the number of parking spaces and a mix of uses to better link commuting, shopping, and other activities.

According to the U.S. Department of Transportation's Bureau of Transportation Statistics, on average, people travel 40 miles per day, 88 percent of it (35 miles) in a personal vehicle such as an automobile. Americans take 411 billion daily trips annually. People average about four trips per day.[2] These numbers translate into standards for road design, building design, and parking for individual car trips.

Your planning office, however, may be considering plans that call for a more connected and multi-use transportation system. These systems look at a better mix of development uses, a more compact form, and new development standards that recognize the opportunities for reducing both the length and number of auto trips. These designs may be listed as "new urbanist plans," "traditional neighborhood designs," or "conservation designs." Depending on your zoning and planning system, these may be separate plans or incorporated in "planned unit development" zones or subdivision codes.

The route to getting better watershed and stormwater performance from better street designs is complex, but you should look for such design aspects as new codes that reduce the number of parking spaces and a mix of uses to better link commuting, shopping, and other activities. At the core of these plans should be a new pattern of street design that allows a more compact form and connects the new development to existing development and activity areas.

One other aspect of street design that local government managers need to consider are standards that govern street design and width for emergency response and safety. In some areas, overly wide streets are required to meet an emergency response model that allows two emergency vehicles to pass in opposite directions. Some emergency responders note that safety is actually compromised under this model because the wide streets encourage higher speeds.

In addition, they note that disconnected cul-de-sacs have a greater effect on hampering response times than narrower streets. The key for a manager is to include emergency responders, public works officials, and stormwater managers in revisions to street codes to find solutions to fit multiple objectives. The Local

Government Commission (www.lgc.org) has developed fact sheets and research to help localities design multi-objective street design.

Parking

In the past, rarely used, excess parking spaces were seen as a development feature that came with little or no extra cost. The costs, however, are becoming more apparent as localized flooding increases, infiltration is diminished for aquifer recharge, and local water quality decreases. For stormwater managers, this extra impervious surface presents a real challenge—but one that can be tackled by reviewing and fine-tuning development regulations.

Resource Information

The Environmental Protection Agency (EPA) and other organizations are developing a growing number of Web sites and publications to help communities develop plans and policies that consider both smart growth and stormwater. EPA's Web site on smart growth (www.epa.gov/smartgrowth) contains links to many free publications, including upcoming publications on street design, parking, and using smart growth techniques as stormwater best management practices.

In 2004, EPA published "Protecting Water Resources with Smart Growth," a good introduction to thinking about joint water and smart growth policies and programs. EPA's Office of Water sponsors the Watershed Academy, which contains educational materials that can be downloaded for free. Visit the Web site at www.epa.gov/owow/watershed/wacademy/.

ICMA has also developed expertise and resources on smart growth. For communities looking for specific policies and implementation strategies, the primers "Getting to Smart Growth" and "Getting to Smart Growth II" offer information, examples, and additional resources. To join the Smart Growth Network and gain access to information on smart growth, e-mail Dan Emerine at smartgrowth@icma.org or call 202/962-3623. For additional materials on smart growth, go to the Smart Growth Network's Web site at www.smartgrowth.org.

Local governments and developers typically plan the number of parking spaces for a particular development project based on published standards. These standards suggest a given number of spaces per 1,000 square feet or per housing unit, and tend to overestimate the number of spaces needed. An analysis conducted by the Institute of Transportation Engineers in 1987 found that while the recommended parking ratio for shopping malls is five spaces per

1,000 square feet, the actual demand is only four spaces per 1,000 square feet. In conducting the research, ITE found the typical range of spaces provided at shopping malls to be from four to six spaces.

There are several policies that communities can adopt to better manage parking and, consequently, the stormwater that flows through parking lots. These can include:

Shared parking arrangements among several building owners or tenants.
Different types of businesses can have different demands for parking throughout a day. Spaces used by office workers during the day, for example, can be used for restaurant parking at night. Shared arrangements are usually based on an agreement signed by the users so that liability, patrol, and cleanup are agreed upon ahead of time.

Better use of on-street public parking spaces.
Parking along public streets might be an overlooked resource for a community that wants to add parking efficiently. Unused travel lanes can be converted to spaces, or parallel parking spaces can be converted to diagonal spaces to add parking. In St. Louis, Missouri, diagonal parking is allowed near churches on Sunday in spaces reserved for parallel parking during the workweek.

Setting parking maximums, not minimums.
Parking standards are usually expressed as the minimum number of spaces to consider for a particular use (e.g., retail or housing). Parking maximums put a cap on the number of spaces that can be built and give water managers better control over the overall development footprint of building projects.

"Unbundling" the cost of parking for apartments.
Renters usually write one check a month for rent, which includes the cost of a parking space. By "unbundling" the cost of the parking into a separate bill, the real costs of a parking space are accentuated. Unbundling the costs of parking can be a good strategy to argue for fewer spaces in locations where land costs are high and other transportation options exist. This can also be a good strategy in college towns where parking pressures are severe and the potential for new or expanded transit is high.

Redevelopment

One of the more overlooked, yet most powerful, stormwater management strategies lies in the redevelopment of existing parcels of developed land. The relationship of redevelopment to stormwater is pretty straightforward: When a building is abandoned and the activity transfers to a new building, the watershed must deal with the impacts of two impervious parcels, even if one is vacant. Thus, efforts to steer development demand toward older downtowns,

empty parking lots, vacant properties, and underperforming commercial areas have a powerful stormwater angle.

One example of an explicit tie between redevelopment and stormwater lies in New Jersey's Model Stormwater Control Ordinance for Municipalities. In this model ordinance, projects that qualify in "urban redevelopment centers" are exempt from the state's water recharge requirements.

Among other things, projects in enterprise zones qualify. This innovative approach takes advantage of work already completed to delineate neighborhoods for priority redevelopment efforts, and serves as an incentive for redevelopment. The exemption is given because land in the urban areas is not likely to be best suited for recharging aquifers and the most common BMPs for recharge are not the best way to handle stormwater in urban settings.

San Jose, California, developed an ordinance on the municipal level that allows alternative compliance measures where the standard list of BMPs is deemed by the city to be impractical. The ordinance gives the city latitude to find that certain smart growth projects can qualify as water quality benefit projects. These projects are, by their design or location in the watershed, considered to have water benefits.

In the list of definitions, the city lists examples of smart growth projects, significant redevelopment projects in the urban core, brownfield sites redevelopment, and projects that contain affordable housing. To many, this may seem to be an unorthodox approach to stormwater management, but it shows that the city understands the regional implications of dispersed growth.

As a local government manager, you may want to review economic development plans to see where they can also serve within regional stormwater planning. For transfer of development rights, your locality may contain areas designated to receive development rights and density from areas to be preserved.

Stormwater Management and Key Regulatory Elements

The Clean Water Act is the legislation governing stormwater. Point source discharges to waters of the U.S. are regulated using National Pollutant Discharge Elimination System (NPDES) permits. The Clean Water Act provides for the delegation of authority over these permits to the states. Currently, most states have been delegated that authority.[3]

In 1987, the Clean Water Act was amended to require the permitting and control of urban stormwater discharges. In 1990, regulations for the first phase of the NPDES program went into effect for certain local governments with populations of more than

100,000.

New rules published in 1999 extended coverage to operators of regulated small local, separate storm sewer systems (MS4s) serving less than 100,000. MS4s are local governments that have separate (not combined with sanitary sewer systems) storm sewer systems that deliver stormwater directly to rivers, streams, or the ocean. These facilities were required to apply for a stormwater permit by March 2003. NPDES permits are renewed every five years.

The NPDES stormwater permit. States that have delegated authority to carry out the stormwater provisions of the Clean Water Act issue NPDES permits. In the District of Columbia and in states, territories, and tribal lands that are not authorized for the program, EPA issues NPDES permits. The permits are written to comply with minimum requirements issued by EPA. Localities then apply for coverage under the state permit to discharge stormwater. Most states and EPA issue coverage under general permits: a one-size-fits-all approach where all permittees have identical permit requirements. States are also offering the option of permit coverage under individual or customized permits.

Stormwater management plan.

Under the NPDES stormwater program, permittees must develop a stormwater management plan that provides the details of how the community (owner or operator of the storm sewer system) will comply with the requirements of the permit. Permits are based on a framework of six minimum measures:

- Public Education and Outreach on Stormwater Impacts
- Public Involvement/Participations
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-Construction Stormwater Management in New Development and Redevelopment
- Pollution Prevention/Good Housekeeping for Municipal Operations

Stormwater ordinance. A number of states are encouraging—and in some instances requiring—that localities develop ordinances for stormwater control. These can be stand-alone ordinances or woven

into existing land use, preservation, or water regulations.

For more information, visit the Web site at www.epa.gov/npdes.

On a watershed scale, this pairing of land to be preserved with land to be developed may have benefits for the watershed that can be a part of your stormwater management plan. For the transfer of development rights receiving area, this may be counterintuitive, since you may be adding impervious surface. Regional and local stormwater management plans, however, should recognize the benefits of a strategy that both preserves and redirects development.

You should also check to see if there are local regulations that serve as barriers to the type of development that delivers better stormwater performance on the site and watershed levels. As mentioned above, limits on the amount of impervious surface have been implemented at the site level in the past. This, however, has turned out to be less protective in some areas because limiting impervious cover at the site level can drive large lot development.

This, in turn, disperses development further, resulting in extended infrastructure requirements, longer roads to serve housing, and less emphasis on connecting jobs and housing. Impervious cover limits can also stand in the way of "main street" and transit district development, where intensive development on each lot is desired.

Summary

As a local government manager, you are in a unique position to identify and coordinate programs to achieve multiple benefits. For stormwater management, this article has presented several opportunities that exist with common economic development, land development, and public works programs.

At first glance, these existing departments may see new stormwater rules as an intrusion into established programs. The key for city and county managers is to help make the connections, identify hidden opportunities in existing plans, and broker new rules that meet the objectives of a variety of interests, departments, and budgets.

[1]Note that impervious coverage caps on a watershed basis are different from those established within local zoning codes for individual development projects. While site-level impervious surface caps have been shown, in some cases, to exacerbate dispersed development, on a watershed basis, a cap can help watershed managers focus on both land to preserve and land to develop.

[2]U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, 2001 National Household Travel Survey, Preliminary Data Release Version 1.

[3]Currently, Idaho, New Mexico, Arizona, Alaska, Maine, New Hampshire, Massachusetts, and Puerto Rico have not been delegated the authority to issue the NPDES permits for stormwater.

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