Q&A Why is Stormwater an Issue?

Also in this issue:
- Reducing Water Use in the United States
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- A Better Way to Get the Right User Rates
- Quiet Warriors and Silent Sentinels
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The National Environmental Services Center (NESC) is a nonprofit organization providing technical assistance and information about drinking water, wastewater, infrastructure resilience, utility system management, solid waste, and environmental training to communities serving fewer than 10,000 people.

To achieve this mission, NESC offers a toll-free technical assistance hotline, hundreds of low-cost or free products, magazines and newsletters, and several searchable databases. We also sponsor conferences, workshops, and seminars. Visit the NESC website at www.nesc.wvu.edu or call toll-free (800) 624-8301 and request an information packet.

NESC is located at West Virginia University, one of the nation’s major doctoral-granting, research institutions.

Who We Are

A number of people are responsible for putting On Tap magazine together each quarter. We encourage our readers to contact us with ideas and suggestions. An e-mail address is provided for each staff member below, as well as their phone extension. Call our main number toll free at (800) 624-8301 and enter the appropriate extension at the prompt.

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Few of us understand where our water comes from, who’s using it, who controls it, the condition it’s in, who’s polluting it, how much should be used, and how to protect it. Taking the time to consider what we value about our water resources, and what messages our water carries to downstream neighbors, can lead to better decision making and more sustainable use of this vital resource.
Q&A Why is Stormwater an Issue?

By Kathy Jesperson
On Tap Assistant Editor
That old saying usually refers to a string of bad luck. In this instance, however, it can bring to mind overflowing storm sewers, stormwater runoff, and the pollution that gets swept into streams and rivers. Unmanaged or poorly managed stormwater runoff is becoming an increasing concern across the U.S.

**What is stormwater?**

Stormwater is precipitation, such as rainwater and melted snow that runs off streets, lawns, and other sites.

**Why is stormwater a problem?**

Typically, stormwater is absorbed into the ground where it is filtered and replenishes aquifers or flows into streams and rivers. But in developed or urban areas, where impervious surfaces—such as parking lots and roofs—don’t allow precipitation to be absorbed into the earth, problems can arise, such as contaminated streams, rivers, and coastal waters.

This pollution happens as water is washed over impervious surfaces, where it can pick up pollutants, such as sediment, nitrogen, phosphorus, bacteria, oil and grease, trash, pesticides, and metals. Not surprisingly, studies have shown that stormwater pollution equals that of sewage plants and large industries.

The U.S. Environmental Protection Agency (EPA) lists the following three issues as major concerns:

1. **Pollution.** As stormwater passes over developed land, it picks up pollutants and transports them to the nearest storm drain and eventually to rivers and bays. This contamination can harm or kill fish and other wildlife—and possibly close local businesses.

2. **Flooding.** Unable to soak into the ground, stormwater quickly flows or floods downstream from developed land, which can damage homes and businesses, flood septic system drainfields and overwhelm streams, wetlands, and wildlife habitat.

3. **Water shortages.** Impervious surfaces, such as roads, parking lots and rooftops, keep rainfall from soaking into the ground and replenishing groundwater and streams used for drinking water or fish habitat.

**Are there any rules that apply to stormwater?**

EPA continues to update its rules related to stormwater. Currently, wastewater treatment plant operators must obtain a National Pollutant Discharge Elimination System (NPDES)
permit and develop a stormwater management program to prevent prevent harmful pollutants from being washed or dumped into a Municipal Separate Storm Sewer Systems (MS4s). EPA stormwater regulations were launched in two phases:

- Phase I, issued in 1990, requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. There are approximately 750 Phase I MS4s.
- Phase II, issued in 1999, requires regulated small MS4s in urbanized areas as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. There are approximately 6,700 Phase II MS4s.

According to EPA, Phase I MS4s are covered by individual permits and Phase II MS4s are covered by a general permit. Each regulated MS4 is required to develop and implement a stormwater management program (SWMP) to reduce the contamination of stormwater runoff and prohibit illicit discharges.

**What is the NPDES Stormwater Program?**

The NPDES Stormwater Program regulates stormwater discharges from three potential sources: MS4s, construction activities, and industrial activities. Most stormwater discharges are considered point sources, and operators of these sources may be required to receive an NPDES permit before they can discharge. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as streams, rivers, lakes or coastal waters.

Most states are authorized to implement the NPDES Stormwater Program and administer their own stormwater permitting programs. EPA remains the permitting authority in a few states, territories and on most tribal lands. For these areas, EPA provides oversight and issues stormwater permits.

**What is an MS4?**

MS4 is shorthand for municipal separate storm sewer systems. EPA defines an MS4 as a conveyance—a way of moving or transporting—or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

**Who is covered under the NPDES Stormwater Program?**

The NPDES Stormwater Program covers the following types of stormwater discharges:

- MS4s. Operators of large, medium and regulated small MS4s may be required to obtain authorization to discharge stormwater.
- Construction activities. Operators of construction sites that are one acre or larger (including smaller sites that are part of a larger common plan of development) may be required to obtain authorization to discharge stormwater under an NPDES construction stormwater permit. Where EPA is the permitting authority, operators must meet the requirements of EPA’s Construction General Permit
- Industrial activities. Industrial sectors may require authorization under an NPDES
industrial stormwater permit for stormwater discharges. Where EPA is the permitting authority, operators must meet the requirements of EPA’s Multi-Sector General Permit.

What’s a TMDL?

Throughout the U.S. there are thousands of waters listed for impairments from stormwater sources. The most common pollutants coming from stormwater sources include sediment, pathogens, nutrients, and metals. These impaired waters need a Total Maximum Daily Load (TMDL), which identifies the total pollutant loading that a waterbody can receive and still meet water quality standards, and specifies a pollutant allocation to specific point and nonpoint sources. The TMDL is implemented via the National Pollutant Discharge Elimination System (NPDES) stormwater permitting system. States and EPA Regions have used a variety of methods to develop stormwater-source TMDLs during the past decade. With the expansion of NPDES Stormwater regulations to smaller municipalities and smaller construction activities, there has been increasing demand for more detailed quantification of stormwater allocations in TMDLs that are more useful for implementation in NPDES permits.

What is section 404 of the Clean Water Act?

Section 404 requires prior authorization from the U.S. Army Corps of Engineers for the discharge of dredged or fill material into waters of the U.S., including wetlands. The term “discharge of dredged material” means any addition of dredged material into, including redeposit of dredged material other than incidental fall back within, the waters of the U.S. The term “discharge of fill material” means the addition of fill material into waters of the U.S.

These regulations are designed to improve the effectiveness of compensatory mitigation to replace lost aquatic resource functions and area, expand public participation in compensatory mitigation decision making, and increase the efficiency and predictability of the mitigation project review process.

How can stormwater be managed?

While the challenges to stormwater management are many, solutions are available. Communities have an important role to play in protecting water resources and public health by implementing appropriate stormwater management practices. For example, best management practices (BMPs) that include technologies and management systems reduce the impact that stormwater has on public health and the environment.

Solutions may include more traditional systems include conveyance systems, such as pipes, drains, and ditches, to transport stormwater. But BMP strategies are flexible, making site-specific solutions possible for many different circumstances. For example, solutions that are suitable for newly developed land can be retrofitted for existing areas. BMP strategies most commonly being used in urban areas involve rainwater capture and control practices. Commonly referred to as green infrastructure, these BMPs include green roofs, rain barrels and cisterns, rain gardens, pocket wetlands, and permeable pavements. These solutions can work on individual sites, at the neighborhood level, or can be incorporated into a more widespread municipal stormwater management program. And they have added benefits—they beautify neighborhoods, cleanse the air, reduce energy costs, improve economies, and support American jobs.

Where can I find more information?

For more information about stormwater, including regulations and permitting, visit EPA’s site at: http://cfpub.epa.gov/npdes/stormwater/swbasicinfo.cfm
The United States is one of the world’s biggest users of water—many Americans use as much water as approximately 900 Kenyans. As a result, water resources in the U.S. are shrinking. In the last five years, there have been water shortages in almost every part of the country, including the worst drought in at least 25 years, which hit 80 percent of the country’s farmland in 2012. Even worse, the damaged land won’t fully recover this year, and at least 36 states are expecting local, regional, or statewide water shortages, even without drought.

The Natural Resources Defense Council expects water scarcity to affect the American South, West, and Midwest the most. Fourteen states in these regions already have “extreme” or “high” risk of water scarcity. Arizona, Florida, Idaho, Nevada, and Texas face the most danger because they are expected to see some of the largest increases in population by 2030. Water scarcity is about more than lack of water, it’s about lack of drinkable water. It is estimated that as many as 53.6 million Americans have contaminated tap water.

But as eaters and consumers, we can profoundly reduce water waste and water consumption through the food choices we make. Recent research from the Barilla Center for Food & Nutrition shows that a healthful diet and environmentally sustainable diet can go hand in hand.
Eating a little less meat. Switching from a meat-centered weekly menu to a diet rich in vegetables and grains could save 2,500 liters of water a day! And eating grass-fed and locally raised meat, eggs, and dairy products can also save water.

Steam veggies instead of boiling. In general, steaming vegetables uses less water than boiling, and according to a study in the *Journal of Food Quality*, it is more nutritious. For example, boiling corn on the cob in a large pot may use 6-8 quarts of water, whereas steaming only uses 1-2 quarts. If you must boil, save the water for your garden, soup stock, or use it to clean pots.

Provide support for small-scale, family farms. Agricultural subsidies in the U.S. disproportionately support large-scale agribusinesses over the small-scale producers who are more likely to be engaged in sustainable food production, and may be challenged by drought or commodity price fluctuations. Changes in government support services could reduce this deficit and improve food and water security.

Streamline water use in home gardens. During the summer months, the U.S. Environmental Protection Agency (EPA) reports that nearly 40 percent of household water is used for watering lawns and gardens. National Geographic suggests incorporating native plants into your garden that are adapted to the local climate and often require less water. Manually watering plants, instead of using automatic sprinklers, cuts water use by 33 percent, according to a report by the EPA. Consumers can also buy self-watering planters, or construct rain barrels that can save you up to 1,300 gallons of water.

Reduce food waste. The U.N. Food and Agriculture Organization reports that nearly one third of all food produced for human consumption is wasted throughout production, storage, transportation, consumption and disposal. Learn about your food’s shelf life and how long you can store food in your freezer. Other ways to reduce food waste are only buying what you plan to eat, using leftovers to create new meals or donating food you can’t use to soup kitchens.

It’s more important than ever that Americans find ways to save every drop.

Danielle Nierenberg is a food and agriculture expert and co-founder of Food Tank: The Food Think Tank (www.FoodTank.org).
In June 2013, The U.S. Environmental Protection Agency (EPA) released results of a survey showing that $384 billion in improvements are needed for the nation’s drinking water infrastructure through 2030. The agency’s fifth Drinking Water Infrastructure Needs Survey and Assessment identifies investments needed over the next 20 years for thousands of miles of pipes and thousands of treatment plants, storage tanks, and water distribution systems, which are all vital to public health and the economy. The national total of $384 billion includes the needs of 73,400 water systems across the country, as well as American Indian and Alaska Native Village water systems.

“A safe and adequate supply of drinking water in our homes, schools and businesses is essential to the health and prosperity of every American,” said EPA Acting Administrator Bob Perciasepe. “The survey EPA released today shows that the nation’s water systems have entered a rehabilitation and replacement era in which much of the existing infrastructure has reached or is approaching the end of its useful life. This is a major issue that must be addressed so that American families continue to have the access they need to clean and healthy water sources.”

The survey, required under the Safe Drinking Water Act to be submitted to Congress every four years by EPA, was developed in consultation with all 50 states and the Navajo Nation, and shows that improvements are primarily needed in:

- **Distribution and transmission**: $247.5 billion to replace or refurbish aging or deteriorating lines.
- **Treatment**: $72.5 billion to construct, expand or rehabilitate infrastructure to reduce contamination.
- **Storage**: $39.5 billion to construct, rehabilitate or cover finished water storage reservoirs.
- **Source**: $20.5 billion to construct or rehabilitate intake structures, wells and spring collectors

To address these needs, EPA allocates Drinking Water State Revolving Fund grants to states based on the finding of the assessment. These funds help states to provide low-cost financing to public water systems for infrastructure improvements necessary to protect public health and comply with drinking water regulations.

Learn more about EPA’s infrastructure efforts, including the Drinking Water State Revolving Fund and the Drinking Water Infrastructure Needs Survey and Assessment by visiting: [http://water.epa.gov/infrastructure/](http://water.epa.gov/infrastructure/).
Water and Waterwater Infrastructure Earn a “D”

ASCE Grades Up from Previous Report Card

Every four years, the American Society of Civil Engineers (ASCE) releases a report card assessing the nation’s infrastructure. The latest, released in March 2013, shows the overall score improving from a D to a D+, while the water and wastewater infrastructure improved from a D– to a D.

“At the dawn of the 21st century,” the ASCE report notes, “much of our drinking water infrastructure is nearing the end of its useful life. There are an estimated 240,000 water main breaks per year in the United States.” Other costs noted include stricter regulations, nutrient removal, and new technology.

The report, available at www.infrastructurereport-card.org, provides background information and state-by-state data.
Author’s Note: The following includes some generalizations. Generalizations are sometimes wrong. They are not used here to disparage anyone. They are used only to educate while using fewer words.

To successfully acquire user rate study or analysis services to fix your rates problem, you need a good acquisition process. Here are some ideas about how to undertake such a process.

The Rates Problem
If you are involved in rate setting for a utility, you should consider its current rates, fees and policies:

• Are they supporting solid reserves?
• Is equipment being replaced and refurbished on a good schedule?
• How will upcoming capital improvements affect rates?
• Is the customer base growing or shrinking rapidly?
• Does the system buy or sell at wholesale?
• Are there rumblings about the legality or fairness of the rates?

In short, can you prove that you have great rates—adequate, fair, and appropriately simple or complex? If not, the guidance and data provided by a rate study or, better yet, a rate analysis will help you do that.

How Rate Setting Guidance is Commonly Acquired
Stand-alone rate studies are rare. Most of those are solicited using a process called “Qualifications Based Selection” (QBS) and are awarded to engineers or other professionals. It is certainly not always the case, but it is common for engineers, accountants, and investment bankers, among others, to take on rate study projects as a marketing strategy to get work in their professional field. This can be a good thing for the client if the service provider is also a rate analyst. If not, it can lead to adopting inappropriate rates, fees and policies.

A Better Way
Rate analysis is more complete and useful than a rate study but it need not cost more. Therefore, the following refers to rate analysis.

To get a rate analyst, and the right one, you need to use the right solicitation and selection process. Here’s the basic framework:

**Rate analysis:** a thorough examination of all issues that will affect the system for a substantial period, usually five to 10 years, in order to arrive at “great rates.”

**Rate study:** a set of calculations done to arrive at rates that will be adequate for at least one year. It may or may not include other attributes of a rate analysis.

Rate study is a subset of rate analysis.
• The would-be client (you) should identify potential service providers who are rate analysts. You would not hire a lawyer to design a water tower or a power transmission line. You should not hire a non-analyst to do rate analysis.
• Do not tie rate analysis to other services. If you do, you will disqualify most rate analysts.
• Solicit identified analysts by a brief phone call. You should tell the analyst that you want to end up with rates that are adequate, fair and appropriately simple or complex. Also tell them your guarantee requirements (you will not pay them if you are not satisfied). Then let the analyst lead most of the conversation to follow. During this call the analyst will get the information they need to scope the project and make a proposal.
• One or more analysts will propose services and fees.
• Consider proposal(s), diligently call references of the top one or more candidates (no one knows a rate analyst better than their past clients), review guarantees and choose the analyst that best fits your needs.

Other parts of this process are outlined in the booklet called the “Rate Analyst Guide,” available for FREE download at gettinggreatrates.com/ggr/freebies/rag.pdf.

Results You Can Expect
This process is far simpler, quicker, surer, and more personal than the arm’s length strategy of most QBS processes. That befits the nature of this work. It is not designing concrete and steel or discerning the law. It is setting people’s rates. That is personal.

This process almost guarantees that you will get the right rate analyst and the right rates.

Fees you pay will probably be about one-third to one-half those you would pay using the standard QBS process.

Try this improved approach next time. You’ll be glad you did.

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Rate analyst test: Ask them how they make money.
Rule of thumb: A rate analyst earns at least 50 percent of their revenue from rate analysis work.

An Even Better Way

The big problem for would-be clients: few have ever done this before. They have no feel for how to do this successfully and they really only have one chance to get it right. For precisely this reason five state rural water associations have set up RATES Programs.

The RATES Program is a supervised approach to rate analysis acquisition and delivery. Association staff monitors how the analyst (currently the author) prices and performs services. If the analyst is in jeopardy of failing to live up to program standards, he gets fired. Without such monitoring a poorly performing or even a failing analyst or non-analyst can “run amuck,” undetected for years.

RATES Program Results
• Rate analyst acquisition is simple and sure.
• You will be satisfied with the outcome or you don’t have to pay anything.
• You will not be blamed (too much) for the rate increase that is almost certain to come because you don’t want to raise rates, but the analyst says it really is needed.

Visit gettinggreatrates.com to see if your state has a RATES Program. And visit gettinggreatrates.com/ggr/testimonial.pdf to read what a recent participant had to say about their experience with the
Two decades ago, a Baltimore public works director, when asked what he would do with unlimited funding, responded, “I’d dig up every street and replace everything.” Ideally, every older municipality wants to be able to at least clean and line its aging water, sewer and storm pipes. Replacement is, literally, a pipe dream. Traditionally a new road would get a ribbon-cutting and probably a good chunk of federal funding; a new sewer would get a flush?

Baltimore’s underground is a myriad of pipes, conduits and tunnels. The city’s system provides water to 1.8 million customers who live in the city and surrounding areas. The wastewater system treats the influent from 1.6 million people.

Our citizens are familiar with infrastructure failure. On average the Department of Public Works’ Bureau of Water and Wastewater (DPW-W&WW) responds to more than a thousand water main breaks annually. Most neighborhoods have been impacted with at least a brief service interruption; others have been more severely affected.

Age is the Main Issue

Most infrastructure failures are due to age. Of the almost 1,600 miles of water mains in Baltimore, more than half are over 80 years old. Fifty-four miles were installed in the 19th century.

The year 2009 was especially troublesome. In February, a 16-inch main flooded an uptown neighborhood, causing extensive damage to a state office building and other structures. In April, a 20-inch cast-iron main erupted, flooding portions of downtown, closing businesses and government offices. Both of these mains date back to 1921. The very next day, a 36-inch concrete main erupted along the train tracks in Halethorpe, southwest of the city, disrupting east-coast rail traffic for several hours. And in September, a 72-inch concrete main burst in the Dundalk community of Baltimore County, flooding scores of basements.

The last two were not particularly ancient but they were of a specific type, Class IV pre-stressed concrete pipe (PCCP). PCCP has proved problematic throughout the nation because the outer wires become brittle and break; a manufacturing defect found in these large, high-pressure mains installed almost a half-century ago. There are approximately 130 miles of pre-stressed mains in Baltimore’s system, ranging from 30 to 144 inches in diameter, approximately 15 percent are Class IV PCCP.
Although Class IV is a small part of the city’s system, it is embedded in the large transmission mains. Because these are major conveyors of water to regional customers, they present special challenges. With their troubling history there is a need to inspect, repair, replace, and monitor them.

Inspections Are Key
Inspections can be done in a number of ways. Mains can be shut down and physically examined from the inside using hand-held detection devices and cameras. Because these are major carriers of water, the shutdown might impact water supply.

Advances in technology now allow inspections without disruptions. Some of these technologies use the water flow to propel the device through the main.

Beginning in 2008, acoustic fiber-optic cable was installed in a 5.8 mile section of Baltimore’s critical southwest transmission main to listen for real-time breaks of the outer wires on the Class IV pipe. In March 2012, another piece of equipment was utilized as the main was inspected by a PipeDiver™, a tool that looks like a 12-foot long, worm-like, fishing lure. Inserted into the north end of the main, it was propelled southward by its fins using the water flow. As it travelled it generated electromagnetic fields to energize the outer wires of the main, creating “snapshots” of each 16-20 foot section of pipe.

The collected data was downloaded, extensively analyzed, and checked against other data, including readings taken by the fiber-optic cable. While the information gathered was troubling, it was not unexpected.

Collected data indicated severe wire breakage in one section of the main. The breakage was located in the southwestern portion of the city below vacant railroad property. If the information was correct then immediate action was necessary to avoid a catastrophic main failure.

Repair Before Failure
On July 9, 2012, Public Works Director Alfred H. Foxx, announced water conservation measures as the southwest transmission main would be shut down because it was in danger of failing. The shutdown occurred, without disruptions to customers, and excavation of the main began July 16.

By July 23, new sections of main were in place and the line recharged. When that section of main was exposed it was instantly clear that the technologies worked. Approximately 30 percent of the pipe section had failed wires; a very dangerous situation on a large, high-pressure main.

These technologies will enable Baltimore to plan ahead; and through carbon-fiber lining and replacement of questionable sections, the mains can remain in service for decades.

The challenge to address the Class IV PCCP mains is being met, but what of smaller mains?
A 123-year-old, 20-inch, water main broke in the heart of downtown Baltimore on the same day that work began on the southwestern transmission main.

Days later, a 10-foot storm drain tunnel failure in East Baltimore opened a massive hole in the street. Closed-circuit TV and ground-penetrating radar were employed to survey the extent of the damage.

Baltimore is using the best technology in the infrastructure challenge; however, the greatest tool is the ability to identify and evaluate the condition of all infrastructure and assets toward the initiating appropriate upkeep, repair and replacement; otherwise known as asset management. A commitment to dedicated, consistent yearly funding coupled with a sound asset management strategy, will enable Baltimore City to safeguard its assets and infrastructure for decades.

Baltimore plans to increase the number of miles of main rehabilitation from the current less than five miles to 40 miles annually, a commitment of $300 million over the next five years.

Is that enough to address the needs of an excellent but aging water system?

In an era of tight-budgets the answer is a qualified yes. More needs to be done; and upgrades and improvements to increase efficiency will require ratepayer support. Baltimore has kept its increases in the single digits each year, balancing the system’s needs and customers’ burdens.

Out of sight is not out of mind to the Baltimore City Department of Public Works. As in war there is a strategy to win. The quiet warriors and strategists are the engineers, working tirelessly on the plan of attack so that the soldiers in the field, the maintenance crews, can concentrate on prevention rather than reaction. The silent sentinels are the detection devices and data collection systems generating images that map the battlefield in preparation for winning the war.

A challenge? Of course, but challenges are meant to be met.
Technical Assistance

It’s Just a Phone Call Away
(and it’s free)

Operating a water or wastewater utility has never been easy. And with new technologies and increasing regulations, the job just keeps getting more difficult. If you have questions about a particular technology or about other aspects of running your system, the National Environmental Services Center’s (NESC) technical staff may have the answers you need. Our engineers, certified operators, and support staff have decades of experience working with small drinking water and wastewater systems.

Call us at (800) 624-8301 and select option 3 to speak with one of NESC’s technical assistance specialists. Even though many of our customers find our experience and information invaluable, we don’t charge for the call or the advice. It’s free!