Handling And Cleaning WATER

A Major Growth Area for Years to Come

The water cycle chart is a familiar sight on classroom walls, with dark clouds dropping rain on a forest to one side, rivers running downhill into lakes and oceans on the other, where wavy lines of evaporation lead upward to fluffy new white clouds.

But, how does the picture change if, instead of pristine forests, the rain lands on roofs, highways, and parking lots? Or if, as it runs downhill to the lake, it collects oil, salt, and used foam coffee cups?

Handling water—not just storm water runoff but also drinking water and sewage—is increasingly on the minds of local officials, builders, and citizens nationwide. The solutions they devise will help builders get more out of valuable land, help communities comply with tough new regulatory standards, and help assure clean water for the future.

Daniel Waklman, president of Forester Communications, Santa Barbara, California and publisher of *Stormwater* magazine, notes that citizens of Los Angeles County recently approved a $500 million bond issue specifically for water systems, and that this proposal had almost no opposition. "It's very exciting news," Waldman says, "because it indicates that people care about clean water and are willing to pay for it. Regardless of what happens on a legislative level, people want clean water."

Quantity Management and Quality Management

Water systems must be built to address issues of both quantity and quality. Huge transient water flows can result from storms, and this runoff must be returned to the environment in a measured, staged way to prevent overwhelming streams and other natural resources. At the same time, the water must often be cleaned of solid and liquid pollutants it has gathered in its travels.

Communities, developers, and engineers are responding with new ways to store water, treat it, and release it. Generally, the challenges arise because the natural environment has been changes and surfaces that once permitted water to pass through them, such as soil and vegetation, have given way to surfaces that don't.

Scientific Software Group, in Sandy, Utah, a division of Environmental Modeling Systems, Inc. want to help engineers understand the consequences of this basic change. Vice President Colby Manwaring notes that engineers today "want to integrate more of the world into their models."

A decade ago, he adds, studies might have focused narrowly on a specific pond, stream, or other feature. Today they're addressing the broad question, "when it rains, where does the water go?" New software products bring great precision to this evaluation, he says, helping designers understand exactly what every paved or roofed surfaces does to the progress of water through the environment.

"If you've changed the perviousness of the soil, you have to fit it," says Tom Simon, national sales manager at ABT, Inc., in Troutman, North Carolina. "Fixing it" today means capturing water, storing it, treating it and releasing it.

The main driver in the business continues to be the Environmental Protection Agency (EPA). "Clearly this business is regulation driven," says James Lenhart, senior vice president at Stormwater Management, Inc., in Portland, Oregon. Although the EPA's National Pollutant Discharge Elimination System (NPDES) regulations are national in scope, they are "very local in implantation," Lenhart says. Moreover, he adds, "the regulations are outstripping knowledge. This is a very new discipline which requires both engineering expertise in chemistry

and biology, and there's not a lot of commonality in those areas."

Stormwater Management proves filtration and similar systems to treat water in combination with some other strategy to store and redistribute it, either by returning it to the groundwater on the same site or by releasing it into pipes and other vehicles to convey it elsewhere. Lenhart notes that allowing stored storm water to return to the surrounding soil is a widely accepted practice, intended to decrease the load on streams and recharge groundwater in the local area.

"When you recharge the groundwater, it can be a very effective treatment sometimes," says Ben Pocisk, manager of corrugated metal pipe products at Contech Construction Products in Middletown, Ohio. Pocisk notes that naturally occurring microbes in soil can often remove many pollutants from storm water. He says the storage/groundwater recharging market "is growing very dramatically, at 15 to 25 percent per year."

His view is seconded by Robert Maestro, owner of Hydrologic Solutions, Inc. Lake Ridge, Virginia. "We've been taking the runoff that used to soak into the ground and feed streams and putting it into a pipe," he says. "But when direct the runoff back into the ground where it used to go, you can get peak flow attenuation plus significantly higher water quality." This is because the water helps form an underground biomass that breaks down pollutants "like a septic drain field."

Christina DiTullio, marketing director at Cultec, Inc., Brookfield, Connecticut, also feels that for many storm water systems, "the goal is to return water to the soil. It's a more natural process" This natural process, she adds, is gaining ground in the market. "We now have engineers with more open minds. They realize you can't just put it into a pipe, and they're thinking of alternatives." Among the advantages of systems like Cultec's she adds, is the opportunity to install with shallower excavation, removing less soil from the site.

Still, not everyone is convinced returning storm water to the soil is the right path. Lenhart notes that, "a lot of people are concerned about putting untreated water back into the ground," he says.

Treating Further Upstream

An increasingly widespread solution is to combine underground storage with a treatment strategy designed to remove both solids and hydrocarbons. "The further upstream you go, the easier it is to remove pollutants," says T.J. Mullen president of BMP, Inc., in Middle River, Maryland. "Often a simple step is all that's needed." Mullen also agrees that with proper treatment early in the process, water can often be returned to the ground at the original site and be further processed by the natural environment, which he terms, "in essence, a treatment train."

Dan Edwards, chief engineer at the National Corrugated Steel Pipe Association, in Dallas, reports that "our members are increasingly looking at things that can be put into complete systems." Static underground storage, he explains, may remove pollutants that will settle out of water through the action of gravity, but many others aren't eliminated in this way. "Water can be treated before it goes into the tank," he says, "We can put a device in just before the tank," as well as applying several other mechanical processes to separate out many of the pollutants water collects as it becomes runoff."

Safe Drain, Inc. of Santa Clara, California, also focuses on keeping pollutants out of storm water runoff. "EPA is being more proactive in enforcing not only the Clean Water Act but also spill prevention control and countermeasures," says John Barhaugh, director of sales and marketing. To prevent chemical and other contaminants from getting into drainage systems, may users opt for

filter devices that allow heavier material to settle out of water before it flows through into the drains. Construction sites area among the most common applications for these filters, Barhaugh says; keeping silt out of storm sewers is a cost effective way to reduce the load on the sewer system.

Attacking pollution problems further upstream means capturing more water runoff at the very beginning, says Leslie Pickering, marketing manager at ACO Drains in Chardon, Ohio. Her company markets a variety of trench drainage and related products designed to evacuate water from highways, airport runways, and similar settings before it can pool and create problems. "The main trend we see is that people are using longer sections of trench, longer runs that intercept water better," Pickering says. Catching more of the water runoff not only offers a chance to remove pollutants but also an opportunity to reuse the water, she adds. This approach, described as "gray water," is another growing concern among storm water management specialists.

In many water-deprived parts of the country, such as Nevada, people "are trying to do everything they can to capture rainwater," notes Justin May, regional manager at StormTrap, Inc. in Norris, Illinois. StormTrap's precast modular concrete storage systems are riding the crest of this demand, he adds. "It is an aggressively growing business, growing by 300 to 400 percent a year."

Maestro of Hydrologic Solutions, points out another risk that can be mitigated by returning storm water to its site of origin. Water stored in a surface pond, or freshly running off roofs and pavement at the end of a hot day can be very warm, and discharging the heated water into streams can "change the whole ecology of the stream," he says. This can be particularly true in areas where late afternoon thunderstorms can pour huge quantities of water onto very hot surfaces. Underground storage and eventual return to groundwater can reduce the impact of these thermal loads, Maestro says.

Kate Wright, an engineer with Invisible Structures, Inc., in Golden, Colorado, says capturing and reusing gray water may help local jurisdictions meet the huge demands for water other than for drinking purposes. She notes that one-third of all the water consumed in Los Angeles is used to water lawns. Golf courses, parks, ball fields, and a multitude of other needs can often be met with rainwater captured, treated, and stored by carefully planned systems, she adds.

Gray water uses haven't won everyone over, however, "in the United States there has been a lot of resistance to using gray water, though we're starting to see more of it," says Lehnhart of Stormwater Management. "People are still kid of skittish."

Adding Capacity

Quantity management of storm water runoff often means installing higher capacity storm sewers in the same space that once accommodated less capacious systems. Precast concrete ox sections are winning a share of this market, says John Duff, president of the American Concrete Pipe Association in Dallas.

"Box sections are often preferred when you have a large volume of water to handle," Duffy says. "You can get the same volume capacity as a round pipe in less vertical space. Duffy notes, for example, that a rectangular pipe four feet high and eight feet wide can be installed in the same excavated depth as a single 48-inch diameter round pipe, but will carry much more water. Rectangular box sections present some complexities in installation, Duffy says, but "when you get up into the larger sizes, boxes are usually at least considered." All in all, he adds, "the storm sewer market has been our biggest market, especially in the largest sizes.

Building Better Systems

Michael Livermore, marketing manager at Amitech USA in Zachary, Louisiana, observes that "more and more engineers designing drinking water, sewer, and storm sewer systems are looking at designing systems with much longer useful lives." Engineers are increasingly specifying products with an eye to minimizing future maintenance and avoiding costly failures, even years into the future. One reflection of this is the standards being applied to sanitary sewers. "When a sanitary sewer line crosses an existing drinking water line, the sewer pipe must meet the standards for a potable water line." Livermore says. He adds that Amitech sees fewer and fewer combined storm water and sanitary sewer systems, and at the same time sees increasing reliance on underground detention systems. The current year, he adds, "is shaping up to be a very good year."

Another key to improving existing sewer systems is understanding exactly what condition they are in, says Eric Lindner, president of Envirosight, in Randolph, New Jersey. "The infrastructure does fall into disrepair." He says. "Some towns have no maps, some have inaccurate maps, and some have never even take a look." Envirosight couples high-magnification, remote-controlled mobile cameras with Global Positioning System (GPS) software to enable owners to identify problem areas within their pipe systems very specifically. This not only identifies needs but also verifies maps showing the locations of pipes. The market, Lindner says, "has been very receptive and keeps us very busy."

Clear and specific information about the condition of infrastructure may be vital, but so are reliable data about the performance of specific systems, some manufacturers say. "The industry needs standards" is the opinion of Robert Andoh, group technical director at Hydro International in Portland, Maine. "There is no national lab to certify devices, to quantify how effective they are." What's needed, he adds, is "for all the stakeholders in the field to come together." Similarly, "standards and regulations tend to vary from state to state, and approval of a device in one region doesn't necessarily mean anything in another region. The industry could do with more uniformity across the board."

This lack of standards has become a concern, Andoh adds, as awareness of storm water has risen. "There's a growing awareness that storm water is a major source of pollution" he says, "both in sediment itself and in what is attached to the sediment."

Many practicing engineers, as well as highway departments, aren't sufficiently rigorous in appraising the performance of systems they've been using for years, according to Roger Singleton, owner of Silt-Saver in Conyers, Georgia. "We can never get to the next level of water quality unless we have performance and efficiency benchmarks for each application," he says.

Silt-Saver, Singleton says, markets "a simple device to keep silt out of drain inlets, to let the water flow and do so without failure." Yet many engineers have never demanded actual proof of the performance of systems they specify for this purpose. "Because performance and efficiency have not been considered," he concludes. "A water quality effort is only as good as the cheapest product allowed."

Driven both regulations and economics, storm water management is going to remain a "front of mind" issue by builders, owners, and engineers in the coming years. "It's needed, " StormTrap's Justin May says of the effort. "It's necessary to help ensure that we don't have a massive problem in the future."