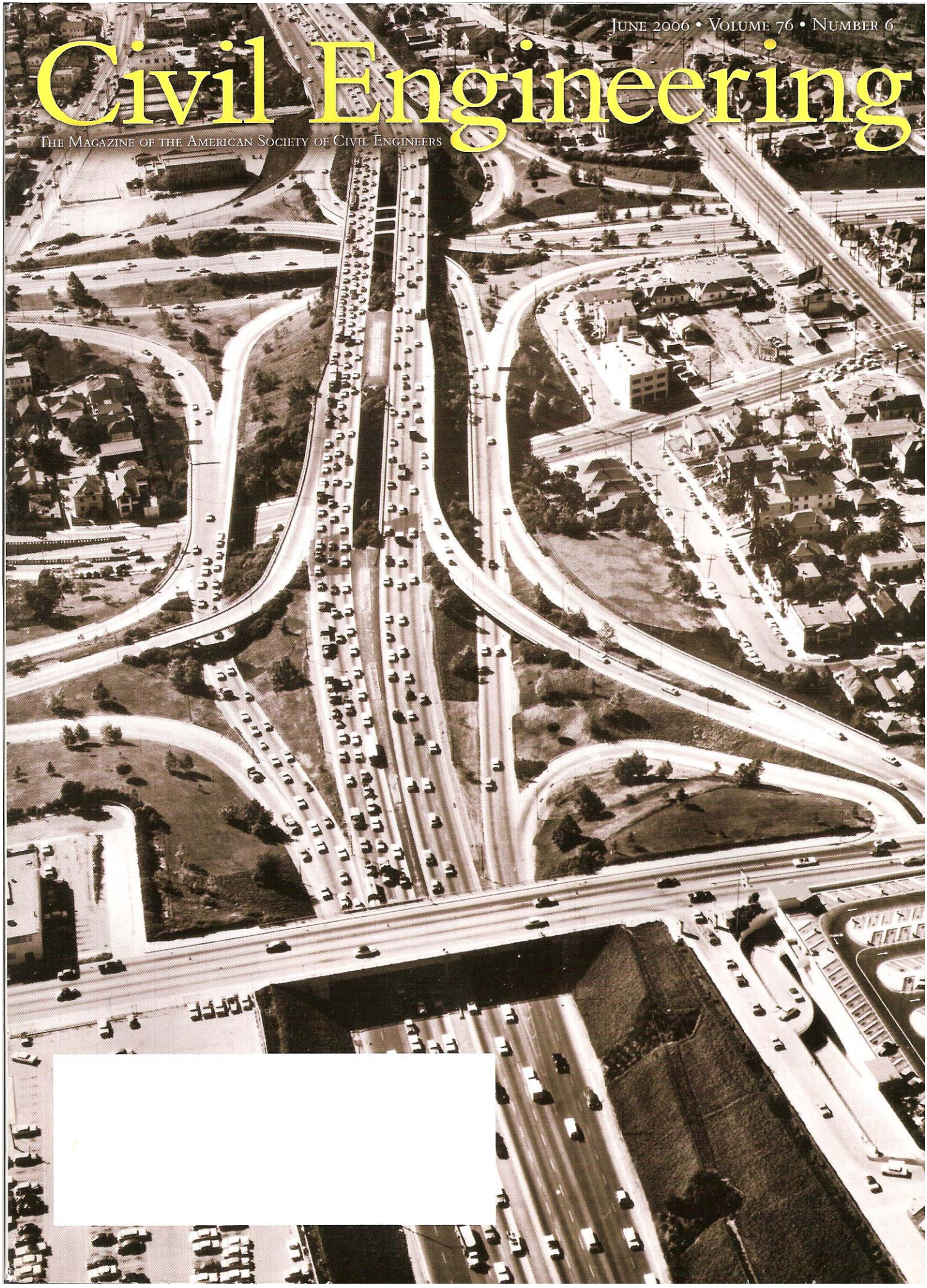
June 2006 • Volume 76 • Number 6

Civil Engineering

The Magazine of the American Society of Civil Engineers



Water Emerging As the Key Resource Of the Future

"Save for a rainy day" is a traditional expression of frugality, and of the wisdom of putting some resources aside while they're available to get you through times when those same resources might be scarce.

These days, America's water treatment and distribution strategies are being shaped by a slightly different notion: It's the rain itself that needs to be saved. Discussions of resource scarcity may center on topics from oil reserves to endangered species, but one of the world's most vital resources also suffers from a severe and unchanging limitation: We have only so much water.

"Scarcity of water is becoming the driver of the 21st century," says Andrew Reese, P.E., vice president of AMEC Earth & Environmental, Inc., a London-based company with offices throughout the United States. Reese is a frequent speaker at the annual StormCon conferences sponsored by Forester Communications. The same widespread concern that used to be centered on water pollution or on flood control and mitigation is now aimed at capturing and holding onto water as it enters our ecosystem, as rain.

"We have a certain amount of water at the input end of the water cycle, as rainwater," says Reese. "That's all the input we've got. There is no other. Increasingly, we're going to see organizations that treat water as an integrated resource."

Communities all over America are moving to comply with Environmental Protection Agency regulations governing how they handle storm-water runoffs from developed sites, assuring they don't return more water to the environment than the same sites did previously and taking steps to treat water before release. Many property owners and their facilities designers are incorporating underground storm-water detention systems that enable water to be released more gradually into nearby streambeds and other runoff areas. But still others are asking the question: Why let that water get away at all?

"The idea of simply conveying storm water to an outlet and getting it out of your system is increasingly going to be passé," says Reese. Pressure to get the most from available resources is particularly acute in regions where water has always been scarce, such as the West and Southwest, but these pressures are also coming to the fore in more traditionally water-rich areas. Reese cites, for instance, the ongoing contention over allocation of water resources in two major river basins in the Southeast, a battle that has pitted Georgia, Florida, and Alabama against each other in what the Southern Environmental Law Center calls "the tri-state water wars."

Communities are moving more and more to earlier capture, treatment, and reuse of storm water, including directing these water supplies into irrigation and similar uses, as well as returning such water to the aquifer from which it will emerge in the future as drinkable

photo courtesy of QuakeWrap

Pipe lining materials protect against water leaks, maintain structural stability, and increase pipeline longevity.

water. "We will increasingly see storm water put into the ground for planned recovery," says Reese. "We will see storm-water injection for drinking water supply, and capture of storm water in reservoirs for use either in drinking water or for alternate water supply uses."

The Denver-based American Water Works Association (AWWA) reports that only about 2 percent of wastewater is reused. In specific areas subject to government mandates or other controls requiring more recycling, the reuse percentage can be as high as 20 to 25 percent. "Water reuse eases pressure on water supplies and conserves potable water reserves," AWWA says. The association also notes that "direct" potable water reuse, or the merging of reclaimed and potable water supplies in the distribution system, is not currently being practiced anywhere in the United States.

Indirect potable water reuse, AWWA adds, refers to the insertion of reclaimed water resources into existing natural resources, such as rivers, lakes, streams, or aquifers. Indirect reuse projects have been initiated in Los Angeles and Fountain Valley, California, Centreville, Virginia, and El Paso, Texas, and are being developed in several other areas, AWWA says. Whether for redirection to other uses or reinsertion into the aquifer, these strategies for water conservation start with capturing water, as Reese puts it, "where the drop hits the ground."

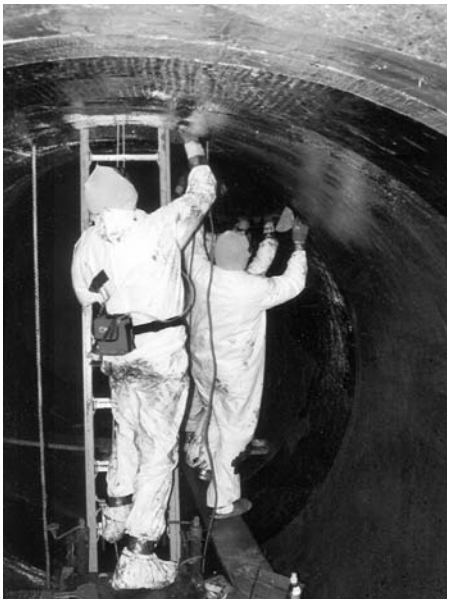
Matt Childs, president of the American Concrete Pipe Association, in Irving, Texas, sees more and more concrete pipe going into systems that intervene in the water cycle at an earlier point, for example by capturing, treating, and storing it closer to the source. Childs sees strong growth in smaller water capture

and treatment systems, including two-stage treatment tank systems that both skim floatables from the water surface and allow heavier pollutants to settle to the bottom of the tank. More concrete pipe is also going into underground retention structures, where it is favored because the product's strength enables builders to bury it more shallowly and cut excavation costs. "The main trend today is trying to protect storm water before it gets to the rivers and streams," Childs says.

Sean Johnson, an account manager for ESRI, in Olympia, Washington, says GIS software products are finding ever-wider applications in the water industry. ESRI strategic partners are adapting the company's basic ArcGIS into powerful geospatial database products with clear uses in water resource management. "Water reclamation requires planning," Johnson says. "While the benefits are great, you have to study the impacts to the watershed outside of the application area. This requires understanding spatial relationships."

GIS systems provide models based on topographical information and a wide variety of data, enabling engineers to study possible storm events, runoff, and reclamation with great flexibility. This facilitates the design of pipe networks and protects the environment against severe storm events. "If a drop of water falls, where will it flow?" Johnson asks. "GIS is used to answer this and other questions affected by geography. We've worked with our partners and clients to define the structure that people use to store their GIS data for water resource applications and utility networks. These tools and data are available today. It's an exciting time," he adds.

Even as communities explore ways of capturing more storm water from diverse sources, they're also coping with the need to expand and modernize their water distribution infrastructure. Ralph Carpenter, marketing specialist at American Ductile Iron Pipe and American SpiralWeld Pipe, in Birmingham, Alabama, says the result *(continued on page 86)*



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(continued from page 82) has been a growing interest in trenchless installation methods.

"One of the biggest trends we're seeing is that for the first time, water transmission and distribution lines are being installed by horizontal directional drilling (HDD)," Carpenter says. Previously, many HDD installations used plastic pipes to cross such barriers as rivers, where excavation was impossible or too expensive. The recent trend, though, is enabling water system engineers to continue to use a familiar product that's often already in wide use throughout their systems.

"A lot of utilities nationwide have systems of primarily iron pipes," says Carpenter. He adds that "the water industry as a whole is extremely conservative, and rightly so." As a result, the Erie County Water Authority in upstate New York selected large-diameter ductile iron (DI) pipe with flexible joints to span a creek crossing of nearly 800 feet. "That had never been done before," Carpenter says.

Similar jobs installing long runs of large-diameter DI pipe using HDD are either in progress or in the planning stages in a number of other communities, Carpenter adds. HDD is one approach to the potential disruptions associated with trench excavation, a growing concern in the minds of pipe system planners who must upgrade or replace an aging infrastructure.

Another concern is the strength and service life of the installed pipe. Mo Ehsani, founder of QuakeWrap, in Tucson, Arizona, notes a growing interest in pipe lining materials that improve both the leak resistance and the structural strength of pipelines. Preventing leaks is critical to successful reclamation of storm water because it's essential to keep storm water and potentially polluted wastewater separate. Watertight pipes and joints prevent both infiltration of outside substances into the storm-water flow and loss of water into the surrounding soil.

"Most liners available on the market are just for leakproofing," says Ehsani. QuakeWrap specializes in thin composite lining materials, originally developed to help strengthen beams and girders on bridges and later applied to seismic upgrades of buildings. The company's products, Ehsani says, "are primarily for strengthening pipe where there has been a loss of the reinforcing steel." This loss can result from corrosion over time, he notes. Although pipe systems represent a relatively small fraction of QuakeWrap's business, Ehsani says the sector is growing as more and more utilities and other owners focus attention on the service life and performance of their water transmission and treatment systems.

Finally, AMEC's Reese notes that some users aren't content merely to capture water falling from the sky. A growing number of people are trying to create new water sources, for example by using air conditioning condensate to irrigate "green roofs," which in turn serve to capture and treat rainwater. "The whole water cycle is being considered," Reese says. "Who would have thought 20 years ago that bottled water would cost the same as Coca-Cola?" ❖

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Contech	87	866-740-3318
Cultec	82	800-4-CULTEC
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East Jordan	23	800-626-4653
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