

# Smoothing Troubled Waters

## Integrated Water Management Looks at the Big Picture



There's an old story about a young boy who, years ago, was visiting a dairy farm. "Why," he asked the old farmer, "does milk come in quart bottles?"

"For a very simple reason," the farmer replied. "That's all the cow gave."

The dairy industry took a giant step forward when it started packaging milk based on the needs of the consumer, rather than the limitations of the cows that produced it. A similar change is taking place in the U.S. water industry today as its leaders rethink their approach to water management, basing decisions more on balancing the needs of their customers and the needs of the environment, rather than on the limitations of traditional technologies.

The implications of that simple shift in thinking are profound.

"Until a few years ago, clean water standards were driven by the limitations of technologies available for treatment. Clean was as clean

as the technologies of yesterday allowed. Today, clean water standards are driven by maintaining water quality," explains John Mitchell, Burns & McDonnell wastewater practice director. "Lagoons, trickling filters and other technologies don't necessarily maintain water quality.

"The dead zone that now exists in the Gulf of Mexico is a result of the large amount of phosphorus and other nutrients from a variety of sources flowing into rivers that empty into the gulf," Mitchell says. "Much has been done under the National Pollutant Discharge Elimination System to reduce those pollutants, but a balanced approach between point sources and non-point sources will be necessary to correct the problem."

The dead zone is just one example. Water problems vary from one region to the next. But dwindling fresh water sources, contamination and rising costs are jeopardizing many communities' ability to ensure a safe, adequate and sustainable water supply.

To address these complex issues, Mitchell says, it takes an integrated view of all the factors that contribute to water quality.

"We as an industry can no longer ignore the interconnectedness of stormwater, wastewater and drinking water," says Darin Brickman, water practice manager for the Northwest, working out of the Burns & McDonnell Denver office. "It's like a three-legged stool. If one leg is broken, the entire stool collapses.

"Increasingly, our job is to understand and manage the movement of water from the moment it falls from the sky, to the pollutants it collects as it runs off surfaces on the ground, to how it's collected, treated, distributed, consumed and treated again before repeating the cycle," Brickman says. "We're being called on by municipalities to look at their entire watershed and take a global approach to addressing their water supply or quality problems."

## A CASE IN POINT

### Combined Sewer Overflow Program

Kansas City Looks Beyond Sewers, Thinks Green

#### The Issue:

As in many larger cities, older neighborhoods in Kansas City, Mo., combine stormwater and sanitary waste flows in a single collection system. When it rains, the volume of water frequently exceeds the capacity of the pipe that is carrying it to the plant for treatment, causing overflows of raw sewage into the environment.

#### Burns & McDonnell's Role:

Since 2002, Burns & McDonnell has worked with the city's Water Services Department to help it understand the scope of its combined sewer overflow problem and to develop a long-term plan for meeting water quality standards, achieving regulatory compliance and implementing green solutions on an unprecedented scale.

#### The Solution:

Burns & McDonnell proposed a range of options that collectively address the city's combined sewer overflow problem. Solutions might involve reducing the quantity of water that enters the stormwater system. Many of these are green solutions, such as rain gardens, retention basins and pervious pavement parking areas that reduce the volume and slow the flow of runoff reaching the sewer system. Still others are designed to separate the stormwater and sanitary flow or store it temporarily during heavy rainfall.

#### Status:

Several demonstration projects of treatment technologies and green infrastructure solutions have been completed while the

city and Environmental Protection Agency negotiate the consent order required to execute the plan. Burns & McDonnell is working on a project to separate sanitary and stormwater sewers in some Kansas City neighborhoods. Recently, Burns & McDonnell was selected to perform a similar project for the city of Omaha, Neb. — design of a \$6.5 million stormwater and sanitary sewer separation project in the historic Country Club District in central Omaha. Burns & McDonnell recently opened an office in Omaha to coordinate project activities, including a public involvement process to inform residents and solicit their input about proposed project details, including opportunities for green solutions.

### Sustainability Is the Word

Tougher regulatory requirements may be driving many of the current projects to protect the environment and improve the quality of our nation's water supply. But many municipalities and industrial companies are ahead of the regulatory curve in seeking sustainable solutions.

"Across the board, water and wastewater utilities are demanding solutions that are both environmentally and financially sustainable," says Dennis Haag, an environmental engineer who specializes in green solutions for Burns & McDonnell. "They want to leverage what they have to replenish their water resources."

That means things like selling the solids generated in the treatment process as fertilizer or using the biogas produced during treatment to generate heat or electricity.

It also means looking for new ways to finance construction projects. "Raising rates is always difficult," notes Mitchell. "When our engineers identify improvements that reduce energy consumption, increase efficiency

and reduce operating costs, a utility may forgo conventional financing and pay for the improvement using the savings it generates.

"Municipalities also are increasingly looking at treated wastewater not as a used product that must be disposed of but as a resource to be taken advantage of.

"Communities are asking, 'If we cleanse the water to high standards, why are we just releasing it back into the ecosystem? Can we use it for irrigation? To replenish our aquifers? To reduce demand on our other water resources?'" Mitchell says.



Managing green space to reduce stormwater runoff is one green solution proposed as part of Kansas City's overflow control plan.

## A CASE IN POINT

### Aquifer Storage & Recovery Program

Wichita, Kan., Draws from a River to Replenish Its Water Supply

#### The Issue:

Faced with frequent droughts and increased demand, the city of Wichita, Kan., sought a solution to ensure the long-term sustainability of its water supply.

#### Burns & McDonnell's Role:

Burns & McDonnell has worked with the city of Wichita since 1992 to study its raw water sources and develop an integrated local water supply plan. In more recent years, it has begun implementation of that plan, which involves water conservation and restoration of the Equus Beds Aquifer, a dwindling 1,400-square-mile underground water supply many rely upon.

#### The Solution:

A key component of Wichita's water supply plan is to recharge the Equus Beds Aquifer with water drawn from the Little Arkansas River during high flows. After capturing excess flows through a surface intake and bank storage wells adjacent to the river, the water is pumped to a treatment facility where the water is treated to drinking water standards. (See How It Works, page 3.) The treated water is then pumped into the aquifer through a system of wells and passive recharge basins. Recharging the aquifer will restore the overall water table and slow the migration of a brine plume and mineralized water into the city's well field area.

#### Status:

Up to 10 million gallons per day (MGD) of river water is being diverted from the river during high flows. Construction is under way on a second phase that will increase capacity of the aquifer storage and recovery system to 40 MGD. Two additional phases will eventually create a system that reclaims up to 100 MGD of water, ensuring the region's water supply for the next 50 years.

### The Good News

We can all live without a lot of things. But water is not one of them. Without a safe, adequate supply, we are all in trouble.

But the problems the water industry faces today can't be solved by treatment alone. "Regulations have traditionally focused on the contributions of water-discharging entities such as municipalities and industrial facilities. Today, the need to deal with contributions across entire watersheds — be it runoff from urban roadways, rooftops and parking lots or rural agricultural activities — is recognized," Brickman says.

The good news is the water industry has more and better tools at its disposal to address the problems within its control.

"Technology is making many more things possible," Brickman says. "It used to be a challenge to get one's arms around stormwater issues. But with GPS, GIS and other technologies, it's becoming easier for us to study impacts to entire watersheds relative to both water quantity and quality."

Technology also is making treatment plants more efficient and less expensive to operate. "Increasingly, clients use technology to streamline operations such as monitoring



Water drawn from the Little Arkansas River during high flows is treated and pumped into the Equus Beds Aquifer, where it is stored and later recovered.

a plant's performance from a laptop and making process changes without mobilizing workers at the site," Mitchell says.

Treatment solutions are growing more effective as well. Reverse osmosis, membrane processes, chemical oxidation and other advanced technologies provide much higher levels of treatment and are growing more common as regulations get tighter and prices come down.

"If we're going to truly solve these problems, we're going to have to work together," Mitchell

says. "That means partnerships among industrial, municipal and agricultural interests, along with communities, to develop integrated solutions. And it means looking downstream at the impacts your actions are having elsewhere."

After all, we're all downstream.

*For more information, contact Jim Foil, 816-822-3180.*



A system of interceptor sewers, combined with a water treatment plant, will reduce phosphorus runoff into streams in Arkansas.

## A CASE IN POINT

### Northwest Arkansas Conservation Authority

Communities Take a Regional Approach to Protecting Water Quality

**The Issue:**

The cities in northwest Arkansas are growing rapidly and need more wastewater treatment capacity. Downstream neighbors in Oklahoma are concerned about the effects of phosphorus discharges into rivers that flow from Arkansas into their recreational and water supply lakes. A regional wastewater solution was sought to economically provide the needed capacity and meet stringent effluent phosphorus standards.

**Burns & McDonnell’s Role:**

Burns & McDonnell serves as an engineering consultant for the Northwest Arkansas

Conservation Authority, an agency formed by communities that chose to band together and take a regional approach to environmental protection. One of the authority’s first initiatives is implementing a regional wastewater treatment plan.

**The Solution:**

After assisting the authority with putting in place the necessary intergovernmental agreements for forming a regional wastewater authority, Burns & McDonnell designed a treatment plant to remove the phosphorus to a 1 milligram-per-liter (mg/l) concentration

before releasing the water into the ecosystem. Later, the permitted level was reduced to just 0.1 mg/l — one of the lowest phosphorus limits in the country. Burns & McDonnell accommodated the change through process redesign.

**Status:**

The first phase of the treatment plant and interceptors is under construction.