GOVERNING.com

NATURAL RESOURCES

Flushing Away Fears

May 2008 By TOM ARRANDALE

Toilet-to-tap water recycling gets past the yuck factor.

Clearly, residents of San Diego would rather not drink their own wastewater. The first time the idea of it came up, about a decade ago, a public outcry forced city officials to back away, even though the effluent would have been heavily treated to make it safe to drink. When a similar plan resurfaced two years ago, the San Diego Union-Tribune editorialized that "your golden retriever may drink out of the toilet with no ill effects. But that doesn't mean humans should do the same." The plan came back a third time last fall, amidst a lingering drought, and although the city council finally passed it, Mayor Jerry Sanders vetoed what he derided as "toilet-to-tap" water recycling. If there's one word that sums up the popular view about drinking highly refined sewage it's this: yuck.

Yet San Diego, a growing city located in a dry desert climate, no longer can afford to be picky about where its tap water comes from. Already, the city pipes 90 percent of its drinking water from faraway sources in the Colorado River and from Northern California. Before long, those supplies will be cut under federal-state agreements to preserve wildlife habitat and satisfy neighboring states' claims to the Colorado. And other options, such as desalinating water from the Pacific Ocean, for now face technological, environmental and cost hurdles. So by a 5-to-3 margin, the San Diego city council last December overrode Sanders' veto. The city will conduct a pilot project to test the feasibility of pumping highly treated wastewater into one of the city's main drinking water reservoirs. As council President Scott Peters says, "We're not really in a position to turn our noses up at any potential source of water."

However reluctantly, San Diego is joining a small but growing number of drought-prone communities that are turning to a once-unthinkable option for drinking water. Just north of San Diego, in Orange County, a new $490 million plant can purify 70 million gallons of wastewater a day — highly treated effluent that eventually wends a course back to residents' faucets. South of Denver, Arapahoe and Douglas counties have broken ground on a similar project. Patrick Mulhern, director of the Cottonwood Water and Sanitation District, which serves part of Douglas County, thinks many more communities will take to drinking reclaimed wastewater. "In any of the arid states, it's getting to be the way to go."

Still, the idea suffers from an obvious public relations problem. So these places have had to be clever about overcoming perceptions. They don't pump treated effluent directly back into the water mains that serve homes and businesses. Rather, they pump it into reservoirs and streams or inject it into groundwater aquifers, thus recharging their freshwater sources by mixing all of the water together. Supporters of this strategy don't call it toilet-to-tap. Orange County has labeled its process "groundwater replenishment," and others call it "indirect potable reuse."

The final product, water managers insist, is as pure as distilled water. In Orange County's facility, treated effluent runs through a series of microfilters, is forced through plastic membranes at high pressure, gets dosed with hydrogen peroxide and is exposed to ultraviolet lights to remove bacteria, viruses, metals and chemical contaminants. Once fed into the ground, the water also is cleansed naturally as it percolates as much as 1,000 feet into the earth. What's more, all drinking water pumped back out of the ground is filtered yet again before it ever pours into a water glass. Krista Clark, regulatory affairs director for the Association of California Water Agencies, says the project "will keep Orange County's groundwater basin reliable and produce super-quality drinking water in the future."

Separation Anxiety

The bias against wastewater recycling that San Diego's debate exposed has a deep history with cultural dimensions. In virtually all human cultures, after all, people abide by a universal taboo against consuming each others' excrement. That stricture was reinforced when 19th-century scientists discovered that sewage flowing directly from primitive cesspools into domestic wells spread bacteria that caused the deadly cholera epidemics that devastated crowded industrializing cities. Even today, inadequate sewage systems in developing nations make unsafe drinking water the primary cause of disease, causing 2 million or more deaths per year.

In the United States, local government utilities took charge of securing municipal water supplies and piping clean water to dwellings and businesses. Over the past century, communities also installed public sewage systems to prevent human waste from befouling rivers, lakes and groundwater. Keeping sanitary sewers flowing — and ensuring that city water is safe to drink — are now two basic services that constituents count on city and county agencies to provide. Once Americans flush their toilets, they don't have to worry much about where their own waste ends up.

Of course, many communities release their treated effluent into rivers and streams that serve as drinking water for downstream cities and towns. Generally speaking, however, communities have sought to keep a wall of separation between their sewer and drinking water systems. As water grows scarce and more valuable, the first thing all of them do is to extend limited supplies through conservation programs.

A growing number of cities have begun putting treated wastewater to use, not for drinking but for watering the grass at parks and golf courses or using it to cool industrial equipment at factories. San Diego, for one, already has spent more than $300 million on two water reclamation plants that make wastewater safe for irrigating landscapes. Some South Florida communities make recycled water available for watering household lawns. And Denver is expanding a water recycling plant that opened in 2004 in order to serve the newly planted lawns and trees in developments going up on the site of the

old Stapleton Airport. The idea in all of these cases is that using recycled wastewater to keep grass green frees up more valuable potable water for people to drink.

By and large, the public accepts using recycled wastewater for outdoor watering. There are two big problems with such projects, however. First, they require laying an entirely new distribution system, in order to keep nonpotable water from mixing with drinking water. The second pipes — typically colored purple to prevent builders from hooking up to them by accident — are expensive to lay, and also require installing costly backflow prevention devices at each hookup to keep recycled water out of drinking water lines. Budget cuts have prevented San Diego from completing its original ambitious plans for an extensive purple-pipe system to distribute reclaimed water from its two plants, which as a result, now operate far below capacity.

The second problem is gravity. The logical place to site a water recycling facility is next to a sewage plant — but sewage plants almost always are located at a city's lowest elevation because that allows waste to get there by flowing downhill. As a result, using reclaimed water for irrigation typically means spending quite a bit on electricity to pump it back uphill.

Recharging with Discharge

These complications, combined with growing worries of water shortages, are major reasons why some utilities are looking at the next logical, if controversial, step: treating sewage effluent so thoroughly that humans can drink it.

It's not an entirely new idea. As far back as 1985, Denver began operating a pilot project that turned sewage-plant effluent into purified drinking water at a rate of 1 million gallons a day. Denver's Potable Water Demonstration Project helped pioneer the sophisticated membranes, ultraviolet lights and oxidation techniques that make it possible for treated wastewater to meet the standards of the federal Safe Drinking Water Act. But during seven years of operating the plant, Denver never connected its discharge pipes in a way that would pump the reclaimed water straight to the tap. For one thing, the power

to run the state-of-the-art purification processes turned out to be prohibitively expensive compared to Denver's other options at the time. But in addition, says Brian Good, Denver Water's operations and maintenance manager, "our customers were not ready for potable use of recycled wastewater from a public perceptions standpoint."

Denver eventually tore the pilot plant down to make way for the other plant that recycles water just for irrigation purposes. Good says Denver has no plans to repeat the drinking water experiment. Currently, Singapore is the world's only major city that pipes cleaned wastewater directly into its drinking water system. In the United States, only Cloudcroft, New Mexico, a small mountain resort, has taken the step of improving its sewage treatment enough to be able to pump the water straight into its above-ground water tanks. Denver's Good, a board member of the Water Reuse Association, says it's conceivable that larger U.S. communities will eventually turn to this direct approach to water recycling, "but not anytime in the near term."

That is why, for now, water agencies are taking the more indirect approach of using reclaimed water to recharge water supplies. That strategy, too, is not entirely new, although water managers don't like calling attention to it. Since 1978, Northern Virginia water agencies have been pumping intensively treated effluent into the Occoquan Reservoir, supplying about half the water supply for fast-growing Washington, D.C., suburbs in Fairfax County. El Paso, Texas, also injects treated wastewater to recharge the groundwater basin that provides most of its water.

Now, as water shortages loom large, even more communities are willing to give indirect potable reuse a taste. The burgeoning suburbs south of Denver are projected to deplete a groundwater basin that provides their sole source of potable water within 20 to 30 years. So the Cottonwood district partnered with Arapahoe County's water and sewage authority to build a $32 million water recycling project. The plant will be designed to pipe 12 million gallons a day of highly treated effluent into Cherry Creek, whose waters filter down through the stream bed to refill the groundwater basin.

Cottonwood district voters approved bonds for the plant in 2003 by a 60 percent margin, and there were no significant objections to converting effluent to drinking water. As Mulhern points out, three other municipalities upstream already discharge wastewater into Cherry Creek with no ill effects for local residents. "Really the only difference is that we're bringing our own wastewater," Mulhern says.

"It's very expensive, absolutely," Mulhern adds. But the district's only alternative is to compete with other communities to buy water rights from eastern Colorado farmers. Compared with importing water from 50 miles away, he adds, "this is a much more cost-effective supply."

For San Diego, Council President Peters is reaching the same conclusion. Besides, it's not as if the water San Diego has been pulling from the Colorado River is clear as a mountain stream. In fact, 350 public sewage treatment plants, including some serving Las Vegas, release effluent into the river upstream from where San Diego withdraws its drinking supply. "All water is recycled," Peters says. "And all water is treated to make sure it's clean enough to be piped to homes.

"We're not in a position to be choosy."