Climate Showing up in Stanley Consultants' Water Practice

Mid-sized firm targets flooding, CSOs in the Midwest, drought in the West

Design and engineering firm **Stanley Consultants** is helping local and state government clients in the Midwest, Southwest and Florida plan for climate change—usually without an explicit reference to its causes. "We as engineers look for data that affect our planning and design of infrastructure without getting ensnarled into the political controversy of why," said Tony Mardam, practice leader for water and wastewater.

Ranked No. 66 in design firms for 2014 by **ENR**, with water firm revenues at around 20%, Stanley Consultants has about 1,100 employees, according to Mardam.

In the Midwest, Stanley Consultants' local government work is focused mostly on flood mitigation, while it is helping Western clients retool their water resources strategies in light of the current and projected droughts and water shortages. As discussed in CCBJ's Q2 2015 issue on water resources, climate change presents water quality problems for the Midwest. According to Mardam, "many Midwestern cities are looking very hard at how changing weather patterns could affect their water quality."

"Some of our cities now are seeing patterns of one dry year followed by one wet year," said Mardam. In agricultural states like Iowa, this means that during the wet year, "a lot more fertilizer will run off into creeks and rivers than you expect."

"We have some Midwestern clients who are seeing water quality deteriorate because of more frequent and pronounced swings between wet and dry years," said Mardam. "The stochastic models prepared by hydraulic researchers clearly show this is happening, and we're seeing it as engineers when we sample the water sources. Fertilizer runoff is becoming a growing problem in quite a few watersheds due to this developing bi-annual pattern of wet years following dry years."

TDS challenges in the Southwest

In the Southwest, water quality issues are increasing for users of Colorado River water. "With the drought, there's much more evapotranspiration and more erosion in the river bed, so we're seeing more TDS [total dissolved solids] in the water," said Mardam.

TDS levels of 800 mg/L are now common for Colorado River water delivered in Phoenix metro area, and while not harmful, nor in violation of the maximum contaminant levels (TDS has a 500 mg/l MCL limit but is a secondary contaminant so doesn't trigger violations), the saline taste is unpalatable. "People don't mind cold 800 TDS water, but the salt taste is more pronounced when the water is at room temperature," said Mardam.

Water treatment typically used to treat high TDS water worsens the TDS burden in wastewater by discharging brine which ends up at wastewater treatment plants. This has been an increasing concern in California due to impact of high TDS water on groundwater resources and the potential to use treated wastewater for potable reuse. (The issue prompted the legislature to enact AB1366 in 2012, authorizing water agencies with salinity challenges to regulate water softeners which can increase the TDS loading.)

Mardam says the optimal technical solution is to "remove the salt" by using membranes, including reverse osmosis. "But when you do RO, you open a different set of issues," he said. "RO produces 80 percent potable water and 20 percent reject water, which is very highly saline, on the order of 5 times the concentration of the source water, so 2,400 to 2,500 mg/l TDS for Colorado River Water."

"What do you do with it? You have to either evaporate the water, leaving salt deposits, or bleed it into your sewer system, or you can drill a deep well for subsurface injection, or you can discharge it into some kind of water body. All of these options have a host of cost, regulatory, and environmental challenges."

Climate change amplifies traditional threats

Changing weather, of course, is not the prime cause of high TDS or the excessive nutrient loads in the Midwest; but it is either already making these problems worse or will within a decade or two. In quantifying climate change impacts, however, Mardam points to the dilemma discussed by Illinois Floodplain Manager Paul Osman in the page-one overview of this issue: a lack of data, especially data that is accurately downscaled for regional projections.

"Yes, we know the planet is warming," said Mardam. "We see changes in global weather patterns. But at the micro levels we look at—a watershed, a city, a flood system—those patterns are very hard to define."

"The whole issue of responding to changing climate conditions is also suffering from two other problems," said Mardam. "One, there's not enough money to think about it and do anything about it, and two, unfortunately the scientists who are working on solutions are removed from what's possible to accomplish with available budgets. We basically have to use our best judgment in planning and designing infrastructure for what we think the conditions will be over the next 20 years."

Iowa developed state funding mechanism for flood protection

Last year, Congress passed and President Obama signed the Water Resource

Reform and Development Act, but while the **U.S. Army Corps of Engineers** is developing implementation guidance, funding still has to be appropriated. Mardam reported that some cities—in at least one case with his firm's help—are not counting on WRRDA funding but pushing ahead with dedicated financing mechanisms for flood control infrastructure.

"We're seeing cities taking a proactive role. They know they have to put up the 35 percent local match, so some are spending that now for planning and design in hopes of receiving federal funding," said Mardam. "Some cities in Iowa and other states are looking at the worst-case scenarios in which they don't receive any federal money and planning to fund projects on their own."

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In Iowa, flood-prone cities including Cedar Rapids have taken advantage of a state provision to fund flood mitigation projects out of a portion of local sales tax revenues. Cedar Rapids received a $264 million grant from this fund in 2013. "We helped the City write the grant and attended the hearings to explain the benefit-cost analysis," said Mardam. "For other cities where funding is inexistent or limited, our grant writing is part pro bono and part paid."

"We have long experience in demonstrating benefit-cost analyses for the Corps of Engineers, which doesn't fund projects that have a less than 1 benefit cost ratio," said Mardam.

Forming stormwater utilities to deal with CSO issues

Stanley Consultants has also helped local governments form stormwater utilities. "This is becoming pretty common for Midwest cities that have combined sewer overflow systems" that lead to illegal discharges of wastewater in large storms.

Many cities have been forced to upgrade their systems after signing consent decrees, but others are separating stormwater from wastewater proactively. "They commission a firm like ours and ask us to develop a stormwater utility and recommend a rate for stormwater services," said Mardam.

As discussed in the green infrastructure feature in this issue of CCBJ, stormwater utility rates can incentivize investment in bioswales, rain gardens and other green infrastructure. Mardam reports that Stanley Consultants seeks to incorporate natural stormwater management features in its projects as much as possible. "Our Denver office has a strong landscape architecture practice, and we try to use them to put green infrastructure in all our projects," he said. "Instead of having pavers that are impervious, we'll put pervious pavers in. We'll build some landscaped berms instead of a hard wall. We do a lot of that with our designs."

However, Mardam notices that most stormwater managers don't prioritize the green approach. "Now, there are not many projects that specifically ask for such designs," he said. "When we do a master plan for stormwater, we'll include as much green infrastructure as we can, or as much as the client wants. There's always the cost-benefit analysis, and if it's more expensive, the client is usually going to say, 'No. Put a wall there, don't worry about it being green.' Some are easier to convince than others, and that's certainly our goal, to design for sustainability and the lowest energy footprint." ☼

AquaFence Gains Traction in Flood Product Market

Protecting vulnerable properties in coastal cities will be a growing business for decades. The challenges at the community scale are formidable, with city governments beginning to consider strategies ranging from multi-billion dollar flood protection gates (like those protecting Rotterdam, London and other historically vulnerable cities) to abandoning some coastal neighborhoods.

Building-scale solutions are also emerging, such as elevating one- and two-family houses, an approach highlighted but deemed technically difficult and "very expensive" for most urban buildings in a **HUD**-funded 2013 report by the **New York-Connecticut Sustainable Communities Consortium**. Sandbags are a traditional measure to protect homes and buildings, but in dense downtown neighborhoods, they can be difficult to store and deploy quickly.

Other technologies competing with sandbags include bags filled with water or other material, removeable gates for doors, "smart vents" for cellar openings and modular barriers that can surround a small house.

In vulnerable downtown commercial districts, a new temporary, removeable flood barrier system known as the **AquaFence** is gaining significant traction. According to AquaFence Director Adam Goldberg, as of October 2015, the firm had sold its systems to about 40 building owners in New York and others in Washington, Louisiana and Massachusetts—where the port authority has ordered nine Aquafences.

In the U.S. alone, AquaFence claims to be protecting $10 billion worth of real estate assets. Globally, AquaFence has found customers in Thailand, Spain, Germany, Hungary and the UK, according to Goldberg.