

Ambitious Water Quality Study Could Guide Development for Years



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YSI Water Quality Study
Application Note A536-03



Eric Gurr (below, middle) discusses a monitoring site with SonTek/YSI employee and YSI Systems employee. One of 20 monitoring stations shown above.



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Eric Livingston

Chief of the Florida Department of Environmental Protection's Bureau of Watershed Management in Tallahassee, Fla.

The City of Kissimmee, FL., has embarked on an ambitious water quality study that could provide a road map for development in the fast-growing tourist mecca – and save millions of dollars as the city begins to comply with water quality regulations.

Eric Gurr, the city's stormwater utility manager, has designed a water quality study on a grand scale. He's identifying the waterborne pollutants that enter and leave his city of 47,000 residents (and up to 6 million tourists per year) and building a model to predict their future movements.

Kissimmee is crossed by a maze of low-velocity streams and man-made canals, and dotted with natural and man-made lakes. The city is perched on the shore of Lake Tohopekaliga, a famous bass fishing destination. The local watersheds ultimately connect to the Gulf of Mexico and the Atlantic, as well as the fragile Everglades.

To understand what's happening within city limits, Gurr took on a data-intensive mission: sampling from 20 stations around Kissimmee for an array of 40 to 50 contaminants and water quality parameters. "We want to isolate which pollutants are going to be important in the future, where they are coming from, and what the ultimate discharge is," he says.

Race Against Time

Gurr races like a man who's running out of time. In the public works conference room, his laser pointer jumps across an aerial composite photo shot in 2004, showing wooded tracts that are now subdivisions and commercial developments. TMDLs, or total maximum daily loads, loom over most of the city's water bodies.

Gurr knows that if the state doesn't set scientifically justified TMDLs for Kissimmee's water bodies, U.S. EPA will use its land-use data and in-house estimates to set target loads for key pollutants in streams and lakes. The resulting requirements – from remediation efforts to best management practices – could cost a fortune, especially if they're based on erroneous assumptions and over-conservative estimates.

"You're looking at expenditures that can be in the tens or hundreds of millions of dollars," notes Eric Livingston, chief of the Florida Department of Environmental Protection's Bureau of Watershed Management in Tallahassee, Fla. "You want to be sure that you have as much accurate data as you can when you're creating your Basin Management Plan."

Gurr figures the \$1.4 million budget of his study - covered mostly by grants - will be just a fraction of what the city will save by carefully targeting its water quality efforts.

Data First

Before jumping into action, Gurr - a long-time hydraulics and hydrology consultant - wants to see some data first, to make sure engineering solutions are on target.

"If you don't know what the problem is, how do you solve it?" he asks. "Once I identify what the pollutants are, I'll be able to track where they're coming from. I can isolate them before they interact and dilute. Then we can sit down and decide whether we could approach them with baffle boxes, small vortexes, or leaf screens. It will cost less money to do these small interventions, and they'll have less impact on the systems and residents."

Integrated Solution

Part of keeping the big project under control is integrating several components of the hardware and software through a single supplier. At the heart of the system, a suite of YSI multiparameter water quality sondes gather and transmit data on dissolved oxygen (DO), turbidity and pH every 15 minutes, providing a detailed look at water quality - right down to diurnal cycles and the effects of storm events. At 11 sites, SonTek/YSI Argonaut®- SL (side-looking) flow meters provide stage and velocity data through the same YSI wireless data uplink as the sondes. At the other nine sites, which feature extremely shallow water, Gurr and SonTek installed concrete sumps to house the water quality sondes and Argonaut SW (shallow water) units to keep an eye on flows that often slow to a trickle.

Meanwhile, grab samples are collected manually three times per month; the collection units are also triggered to make automatic collections when rainfall events deliver more than 0.1 inch of precipitation. Those samples are analyzed for nutrients, metals and other contaminants, coliforms and other bacteria. Sediment and biological samples are also analyzed to assess the impact of the water quality parameters that are being measured.

Once he has sifted through the vast array of variables gathered during the four-month initial collection process, Gurr says he plans to zero in on the most pressing parameters for future monitoring efforts.

The second phase of the Kissimmee project is running the data through the Danish Hydrology Institute's MIKE SHE software, which melds a surface water model with a 3-D groundwater model. Gurr says, "With MIKE SHE, you can track a pollutant and find out the hydrology going into it, the hydrology when it gets there."

Be Prepared

Gurr plans to have his data collected and put through the first, skeletal run-through of the model. Fine-tuning could take another year, and is expected to help identify locations for 12 more sampling sites. In the meantime, Gurr expects to have a good grasp of the mounds of data he's collecting to help write targeted, science-based Basin Management Plan for local TMDLs.

"The more information we have about our own water bodies and discharges, the better off we're going to be," he says.

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