2010 top water & wastewater projects

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Compiled by Neda Simeonova & Elizabeth Lisican

Hard work and innovation propel tens of thousands of water and wastewater projects and upgrades simultaneously across the country each year. While all different in size and scope, the goals of staying cost-efficient, using effective technology and meeting regulations are at the universal core of these projects.

From June through August 2010, *Water & Wastes Digest* encouraged project leaders to submit their entries showcasing an industry-specific project that was in design or construction in the past 18 months.

Nominated projects ranged in terms of goal, size and price—from $80,000 to $211 million. The editorial staff selected the winners based on the kinds of challenges that were faced and overcome by all parties involved with the project, as well as final goals achieved and success met. *WWD* is therefore proud to highlight these achievements in its annual list of Top Projects.

Thanks to all project leaders and representatives who took the time to submit their entries and photos for our awards program, and congratulations to the owners, designers and contractors honored in our 2010 Top Water & Wastewater Projects. WWD

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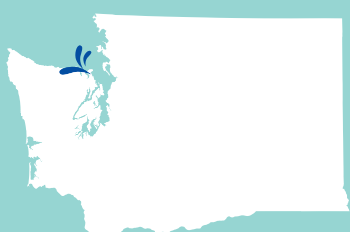
Ft. Flagler State Park Utilities Improvements & MBR Project

Location: Nordland, Wash.
Owner: Washington State Parks & Recreation Commission
Designer: Parametrix
Contractor: Seton Construction Inc.
Cost: $3 million
Size: 25,000 gpd (average daily flow); 50,000 gpd (peak daily flow)



Washington state is home to 142 state parks managed by the Washington State Parks and Recreation Commission (Commission) that encompass approximately 120,000 acres of land. Washington's parks showcase the natural beauty of the Northwest, and many of them are located along the waterways of the Puget Sound.

The intersection of the state's Puget Sound conservation efforts and the Commission's mission statement resulted in an allocation of funds to improve the storm water and wastewater treatment systems in 26 state parks that are located on Puget Sound. Ft. Flagler State Park was one of the parks identified for a complete wastewater treatment plant installation to replace its aging septic tank/drainfield systems.

Because water quality was a high priority, the Commission selected membrane bioreactor (MBR) technology for wastewater treatment. This technology enabled the 784-acre park to produce Class A reclaimed water for future uses and reduce the amount of nitrogen discharged to Puget Sound.

Key project challenges included: locating the treatment plant to avoid environmental and historic area impacts; integrating the operation building's architecture to match the historic district; designing the facility to minimize any interference with the public's park experience; automating the wastewater treatment plant and parkwide pump stations to allow for remote monitoring and operation; and the processing of high-strength wastewater from recreational vehicles.

To achieve these goals, a 25,000-gal-per-day MBR facility was constructed adjacent to the decommissioned sewage lagoons. The design team was able to reuse the lower lagoon for storing the waste activated sludge, which resulted in a significant operational cost savings to the park. The upper lagoon was used as the effluent discharge point where the flows combined with a perennial stream. This allowed the Commission the option of using the lagoon as a storage facility for future water reuse.

In addition to the new wastewater treatment plant, a parkwide sewage collection system was constructed to serve the campground areas, RV dump and historic district buildings. Other upgrades associated with this project included the replacement of the park's antiquated single-phase and three-phase power services, the campground water distribution system and a new telemetry system for remote monitoring of the MBR facility and eight pump stations serving the park.

Eastvale Water Treatment Plant New Raw Water Intake Project

Location: Eastvale, Pa.
Owner: Beaver Falls Municipal Authority
Designer: KLH Engineers Inc.
Contractors: Marucci & Gaffney Excavating Pipeline Systems Inc.; Wagner Electric Construction
Cost: $5.6 million
Size: 11 mgd

The Eastvale, Pa., Water Treatment Plant's new raw water intake was a long time coming: The existing raw water intake structure was more than a century old, and it was designed for a different purpose than it was being used for in modern times. The water system has grown to a point where it now serves close to 50,000 people in 23 communities.

"It's a rather large regional system, and as the system grew through the past century, they were basically stuck with this one existing intake and they finally got to the point where it was such a burden and a maintenance headache," said James S. Willard, P.E., project manager, of KLH Engineers Inc. "The problems were such that they oftentimes could not maintain adequate production at the facility."

Prior to the start of construction, the project team spent close to a year doing extensive planning. They looked at rainy wells and riverbend designs. They considered the concept of intake structures further out in the Beaver River, along with different types of screens. Willard described the process as a "matrix" in terms of meeting the primary function of having an adequate volume intake that was capable of removing the debris in the river, yet also taking into account maintenance considerations and capital and operating costs.

"The basic screen that we settled on was a dual-flow traveling band screen," Willard said. "But another one of the factors that came into play with it was meeting the EPA 316B fish protection requirements."

This gave the team an added benefit of creating a stilling basin leading into the screens, which provided enhanced settlement. The improved settlement led to another one of the design concepts—to create hopper-bottomed intakes in both the primary intake chamber and the emergency intake chamber to allow them to draw out settled solids from the bottom of the basin and return them to the river.

Construction of the new intake, which went live in the fall of 2010, was accomplished by installation of a circular sheet pile coffer dam. The dewatering of that and establishment of the dry hole to work in was the most challenging aspect of the project, team members agreed.

"You open up books about water treatment plant design and you go to the section about designing a raw water intake—there are so many variables that are based upon the needs and upon the environment where you're designing for. This is about as pure design as civil engineering gets," said Rob Horvat, design engineer with KLH.

Suffolk Struvite Recovery Facility Project

The Hampton Roads Sanitation District (HRSD) Nansemond Treatment Plant, located in Suffolk, Va., needed an alternative to sidestream treatment of nutrient-rich dewatering recycle streams and to eliminate struvite buildup in pipes and equipment. The nutrient-rich recycle streams impact the treatment plant by placing additional loading on the biological nutrient removal (BNR) system and consuming plant capacity.

HRSD evaluated several sidestream processes and decided to utilize a new and innovative green technology known as Pearl Process, developed and patented by Ostara Nutrient Recovery Technologies Inc. The process was designed to recover phosphorous, which is a valuable and dwindling resource. It creates a slow-release fertilizer product that is in high demand. Ostara is contracted to purchase all material produced at the facility and is responsible to market and sell the product to distributors throughout the U.S. Proceeds from the sale of the product offset production costs.

As a result, the facility will improve overall reliability of its BNR system, eliminate chemical and solids handling costs for sidestream treatment and reduce the downtime and maintenance associated with the struvite buildup throughout the digestion and dewatering operations at the plant.

Project challenges included the design and construction of a fully automated struvite recovery facility (SRF) in six months using a Private-Public Education and Infrastructure Act (PPEA) procurement model at a municipal wastewater treatment facility. This was HRSD's first project to use the PPEA procurement model. The project was required to be cost neutral on a capital and operation and maintenance basis.

According to Nansemond Plant Manager William J. Balzer, P.E.: "Permitting of the facility was complicated by requirements for wetlands delineation by the Army Corps of Engineers. Fabrication of the reactors and procurement of the equipment with tight lead times in an economic recession presented many challenges to meeting the project schedule. The treatment plant currently uses an Emerson Distributed Control System, which seamlessly interfaces with the SRF automation over a modbus protocol."

The project was started on Nov. 22, 2009, and finish date was May 27, 2010.

Location: Suffolk, Va.
Owner: Hampton Roads Sanitation District
Designers: Hazen and Sawyer; Ostara Nutrient Recovery Technologies Inc.
Contractors: Mid Eastern Builders; Systems East Instrumentation; Kirby Mechanical; Suffolk Iron Works
Cost: $5.46 million
Size: 110,000 gpd; 6,450 sq ft

Old Town Water Quality & Asset Protection Plan Project

Within two years of purchasing twin glass-lined standpipes, Maine's Old Town Water District found itself facing two very different yet related problems: The standpipes were showing signs of serious ice damage in winter, and poor water quality in summer months due to large changes in disinfectant residual levels in their tanks. Both problems related to poor hydraulics within the storage tanks. Thus, the water district turned to a single solution to fight both the hot and cold: a PAX submersible mixer.

"I studied all the methods—there are several—and we decided on this mixer that's actively in there working because it creates a current, drives the water upward and circulates it within the tank," said Old Town Water District Superintendent Frank Kearney Sr. "We were concerned that our tanks are 100 ft tall, and would this really work in something that's 100 ft high? We put it in, and we started the first one in early winter—there was already some ice that had formed on the sides of the tank. Within a few days time, the ice was gone."

Energy efficiency and ease of operation also were attractive aspects of the mixers to the water district.

"We were relieved to know that it only cost about $1 per day in electricity here in central Maine to run it," Kearney said. "As far as annual operating costs, that was a relief to know that it wasn't going to be a burden to keep running the thing. Another thing is simplicity. We didn't want to have to alter our tanks to have a solution for this. I felt that we could do something simple that wouldn't require welding or restructuring the inside of the tank or require us to change the way we produce our water."

After the first winter and climbing into the tank several times, the district was impressed and ordered another mixer in the summer of 2009. In the summer of 2010, the district installed a third one in a much bigger welded-steel tank about 50 years of age. Preventing ice in that one will preserve the coating inside.

"It's a painted tank, so this summer before I put the third mixer in, we contracted with a paint and renovation company and we sandblasted the inside of that and recoated it so it's like brand-new. Especially with the mixer, it should be good for another 30 years," Kearney said.

As impressively as the mixer had solved the ice problem, it took care of the district's summertime issues as well.

"We climbed the tank with the mixer and opened that hatch, and it was a chlorine smell like you'd expect treated drinking water to have—a very clean smell," Kearney said.

Location: Old Town, Maine
Owner: Old Town Water District
Designer: N/A
Contractor: N/A
Cost: $100,000
Size: Three storage tanks; 2 million gal total storage

Location: Bakersfield, Calif.
Owner: City of Bakersfield
Designer: Parsons Water Infrastructure
Contractor: Kiewit Pacific Co.
Cost: $211 million
Size: 32 mgd

Bakersfield WWTP No. 3 Expansion Project

In order to address needs and regulatory requirements, including nitrogen removal to 10 mg/L of total inorganic nitrogen for groundwater recharge, the city of Bakersfield, Calif., decided to upgrade and expand its Wastewater Treatment Plant (WWTP) No. 3 to treat 32 million gal per day (mgd). Before expansion, WWTP No. 3's capacity was 16 mgd, and it was often in violation of its effluent discharge permit in Kern County.

The project's major items of work to be performed included: 1) Approximately 3,900 ft of new 60-in. sewer on McCutchen Road from the McCutchen/Gosford Lift Station to the treatment plant to replace the existing 42-in. sewer; 2) A new headworks that includes mechanically cleaned bar screens, influent pumps and grit removal tanks; 3) Conversion of four existing secondary clarifiers into primary clarifiers; 4) A new activated sludge secondary treatment system that includes aeration basins, fine-bubble air diffusers, aeration blowers, blower building, secondary clarifiers, RAS/WAS pump station and plant process water pump station; 5) A 2-mgd tertiary treatment system that includes a rapid mixer, cloth media continuous backwash filter, chlorine contact tank and flocculation and disinfection chemical facilities; 6) Six new effluent disposal percolation basins; 7) Dissolved-air flotation sludge thickeners; 8) Replacement of existing digester heaters with new units in the six existing anaerobic sludge digesters; 9) Two new anaerobic sludge digesters and a sludge dewatering building; 10) A new power cogeneration building; 11) Plantwide odor control systems that include foul air ducting, blowers and odor removal biofilters; and 12) A new administration/operation building and new maintenance shop.

This project was the single largest CIP project for the city. City of Bakersfield Wastewater Manager Louis Sun said: "One major challenge was to build and complete this project by a deadline set from the Regional Water Board, which is why the schedule for this project was so aggressive. Other challenges are to perform a biddability/constructability review of the documents. Some of the items identified helped make the new plant operate more efficiently, but also save $5.4 million. We looked at the project from a contractor's point of view and how to avoid problems, conflicts, changes and claims."

The project was started in September 2007, and finish date was June 2010.

Location: Gowanda, N.Y.
Owner: Village of Gowanda
Designer: Wendel Cos.
Contractors: VCC Inc.; Manno Construction
Cost: $2.2 million
Size: 350 gpm

Gowanda Flood Damage Water System Recovery Project

The flash-flooding that took place on Aug. 9, 2009, in the village of Gowanda, N.Y., caused the tributaries of Cattaraugus Creek, Point Peter Brook and Thatcher Brook to flood much of the village, damaging about 400 homes and putting the village water supply out of operation. A boil water notice was issued. The storm rendered the Point Peter Brook reservoir source inoperable as a water source and the raw water pump station inoperable due to flooding and debris deposition.

"Much of the village was flooded, eroded; there were homes destroyed; there were roads washed out," said Jeffrey Telecky, project manager with Wendel Cos. "Their water system was put out of service. Their reservoir was filled with sediment. It was, frankly, a big mess."

A backup well supply that had not been in service for 15 years had to be put in service to provide water to the village system. The project goals were to take the necessary steps to provide safe drinking water to the residents, provide necessary fire flows, end the boil order, provide two high-quality and operating sources of water, and get the Point Peter Brook Reservoir supply source back fully operational and in service.

"Ultimately what they ended up doing was rehabbing the emergency well and providing that water to their water treatment plant and treating it so that eventually the boil order came off. There were a number of long-term things that needed to be done mostly related to rehabbing their primary water source, which included getting all of the debris out of the Point Peter Brook reservoir, rehabbing the pump station that pumps the water from there to the water treatment plant and a bunch of ancillary rehabilitation related to that," Telecky said.

To date the village has completed removal of 14,000 cu yd of sediment debris from the reservoir, rehabilitated the pump station, and the reservoir is back in operation as the primary potable source of water for the village. There is an ongoing project for additional work upstream of the reservoir, including additional debris removal, Allen Spring flood damage repair, construction of a reservoir forebay and other work to ensure the entire watershed supply source will be a safe supply for years to come.

(Image Not Available)

2010 top water & wastewater projects

Location: Wellington, Kan.
Owner: City of Wellington
Designer: WesTech Eng. Inc.
Contractor: CAS Construction LLC
Cost: $8.8 million
Size: 1.71 mgd

Wellington Wastewater Treatment Facility Project

The city of Wellington is located in Summer County, Kan., and has a population of 7,677.

In 2009, the city decided to replace its 50-plus-year-old mechanical wastewater treatment plant. The original plant consisted of Bullseye-type aeration plants and no nutrient removal. The design of the new plant needed to obtain an estimated future flow of 1.71 million gal per day (mgd) along with a peak wet-weather flow of 6 mgd. The plant would need to provide biological removal of nitrogen and phosphorus.

One of the main project concerns was making the treatment system simple to operate, and it was determined that an oxidation ditch would provide an ideal solution on that account. Two clarifiers also were installed.

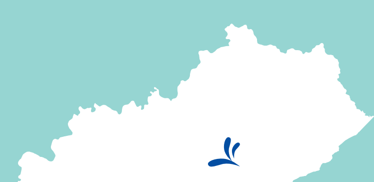
According to Jacqueline Fowers of WesTech Eng. Inc., the projected due date for the Wellington Wastewater Plant was October 2010; however, the project was completed two months ahead of schedule and was commissioned to the city of Wellington in August 2010.

The project encountered several challenges along the way. The original Wellington Wastewater Plant was located in an area that was naturally inclined to flooding, and in previous years, the plant had encountered flooding. With flooding being a common problem in the Wellington area, a new site needed to be selected in order for the new plant to be built.

To meet the challenges presented by potential flooding, the city chose East Botkin on the south side of Wellington as the site of the new plant—an area that is set high on a plain. Two pump stations were then built along with the wastewater plant to start the process of clarification.

Even with rains that were expected to slow the building of the oxidation ditch, the project was delivered two months ahead of its scheduled completion date. Thanks to a smooth submittal phase, suppliers delivering on time and the contractor's dedicated crew, Wellington residents can enjoy cleaner water sooner.

Location: Jamestown, Ky.
Owner: City of Jamestown, Ky.
Designer: Kenvirons Inc.
Contractor: Reynolds Inc.
Cost: $13,058,000
Size: 4,200 gpm



Jamestown Water Treatment Plant Project

Membrane processes often are thought to be associated with high costs, but the Jamestown Water Treatment Plant (WTP) project demonstrates that assumptions do not always yield truth.

"One of the stereotypes associated with membrane filtration is that the capital costs for these facilities usually can be prohibitive," said R. Vaughn Williams, P.E., project manager for Kenvirons Inc. "By reusing a lot of the old basins or existing basins at Jamestown, we really can focus the majority of the construction toward the membrane filtration facilities, and we really did that in an economical way."

A unique feature of the Jamestown WTP project developed from the urgent need for more potable water. The existing WTP was already experiencing peak demands in excess of its rated capacity when the packaged plant was mobilized at the site. The interim plant provided several benefits: additional water for high-demand periods, training for the city's operators and optimized operation of the membrane filters. The membrane filters used in the package plant were relocated into the permanent plant. Economic conversion of a conventional treatment plant into a modern membrane filtration plant necessitated creative modifications of the existing facilities.

The conventional plant had three independent flocculation/sedimentation trains, and each was modified for inclusion in the new treatment strategy. Basin No. 1 is now used to recover 90% of the waste stream generated by the membrane filters, Basin No. 2 is used for pretreatment and Basin No. 3 is divided into two independent three-stage flocculation basins.

"We switched from a conventional treatment process to a membrane filtration process, which has a much smaller footprint, and we reuse the old basins for other functions," Williams said. "We converted flocculation basins, converted the old filters and chemical storage areas. One of the said basins was converted into a reject recovery basin. So instead of wasting the reject water coming off the membranes, we took a tenth of it, which is about 10% of the total flow coming into the plant."

"We're taking that flow, reducing it back down by another 10%, so we're only wasting a very small percentage of the water coming up the hill into the water plant."

(Image Not Available)

2010 top water & wastewater projects

Location: Medina, N.Y.
Owner: Village of Medina
Designer: Larsen Engineers
Contractors: Babcock Enterprises Ltd.; O'Connell Electric Co. Inc.; Hoot Mechanical and Electrical Inc.
Cost: $1.4 million
Size: 2,777 gpm

Medina Wastewater System Green Improvements Project

The village of Medina, N.Y., is setting the example for its community by striving to become net-zero. The village's first step was to tackle its largest energy consumer—the wastewater treatment plant. Detailed studies were performed and funding was established to reduce the energy consumption at the plant. These energy-saving strategies include:

- A 43kWe/79kWth Stirling Biopower combined heat and power co-generation unit using anaerobically digested sludge in order to produce methane gas;
- A 120-kW solar PV system; geothermal effluent-powered heat pump for heating and air conditioning;
- High-efficiency lighting upgrades, including LED outdoor lighting;
- A green roof using modular pregrown panels; and
- A rainwater harvesting system with on-demand pumping.

As with most communities, limited funding is always a challenge. The village applied for and subsequently received 90% of the funding toward the project from the Green Infrastructure Grant Program, which is administered through the Environmental Facilities Corp. One of the greatest challenges was having only four months to completely design, bid and obtain signed contracts in order to receive grant funding. To add to the complexity, three other projects received the same funding and consisted of a similar scope of work.

According to Ram Shrivastava of Larsen Engineers, other project challenges included:

- Working with the local energy suppliers and coordinating the interconnection of both the solar PV and co-generation units;
- The existing roof structure had to be structurally reinforced to hold the additional weight of the solar panels;
- Coordinating the manufacturing and installation of the proprietary co-generation equipment in order to meet the grant completion date;
- Meeting Buy American requirements;
- Meeting M/WBE goals; and
- Monthly reporting and tracking required for the use of stimulus funds.

Project start date was January 2010, and it is scheduled for completion in December 2010.

Location: Celaya, Guanajuato, Mexico
Owner: Junta Municipal de Agua potable y Alcantarillado de Celaya
Designer: Aquatec Internacional SA de CV
Contractors: Aquatec Internacional SA de CV; Calidad Construccion y Diseno
Cost: $760,000 USD
Size: 475 gpm

Santa Rita Potable Water Project

In many parts of the world, including Mexico, Bangladesh and Peru, arsenic contamination is one of the most malevolent signs of poverty and hardship. The case is certainly no different for a neighborhood in Celaya, Guanajuato, a city in central Mexico. The city gets its potable water from a deep well and suffers from arsenic concentration levels of 60 ppb. (The Mexican standard is 25 ppb, and the World Health Organization [WHO] standard is 10 ppb.) The city's well is owned and operated by local water company Junta Municipal de Agua potable y Alcantarillado (JUMAPA).

Fortunately, change is happening.

"The city gave us the terrain to build a plant, but when we began to do exploration to make the foundation, we found that there was a landfill in the past that nobody knew about," said Oscar Quinones, manager with Aquatec Internacional SA de CV. "Then we began excavation during August and September and we removed all the garbage in the soil and we put in good soil to do the foundation; and this is important ... Arsenic is worse when you have poor people, children, old people. That was the case for this community where the plant will be ... It's amazing what we are finding," Quinones said.

During the predesign stages, several restrictions were established by the local water company. Technologies like coagulation-sedimentation were not possible. The water company restricted reverse osmosis and other alternatives as possible treatment. Flow of 475 gal per minute restricted the application for some media filtration and for domestic-size devices. With hardness content of about 200 ppm calcium carbonate, silica at about 70 mg/L and some total suspended solids present, some media filtration could not work.

Thus, JUMAPA selected Aquatec Internacional to design, build and operate the new system to remove arsenic using the proposed technology of coagulation-ultrafiltration (UF). It not only overcame the related challenges but also exceeded some of the restrictions by, for instance, demonstrating results of less than 8 ppm arsenic in trials.

Quinones noted the significance of this project for Dow Chemical Co., manufacturer of the UF modules used on this project: "They have a media—some particles of titanium dioxide—to remove arsenic. It's the first time Dow will have UF modules to remove arsenic."

The plant has an expected completion date of Jan. 15, 2011.