

Innovative by Design

Zero-discharge water recycling plant serves as a model for eco-friendly wastewater treatment.

By Mark Strauss

When the Los Angeles Regional Water Quality Control Board implemented stricter regulations to improve the quality of treated wastewater discharges to the Santa Clara River, the City of Fillmore had a decision to make. Its wastewater treatment plant, which was built in 1955, needed significant upgrades to both comply with the increased standards and to meet the demands of a growing population. Rather than simply building a facility to discharge highly treated water to the river, the city took an innovative approach and decided to replace the plant with a new, state-of-the-art water recycling facility that would end the practice of river discharges and enable development of a full-scale water reuse system to benefit many areas of the town. The result is a plant that meets the requirements of federal and state regulations as a zero-discharge facility and a water recycling program that irrigates school grounds,

parks, and other green areas.

This project goes far beyond wastewater treatment and encompasses water and energy conservation, environmental preservation, sustainability, recreation, education, and an overall better quality of life for the residents of Fillmore and Ventura County. It also serves as an example of how a community can tackle an infrastructure challenge by choosing a public-private partnership (PPP) and a design-build-operate (DBO) model.

The city chose to contract with American Water (www.amwater.com), the nation's largest investor-owned water and wastewater utility company, in a PPP to design, build, and operate a facility to produce high-quality disinfected water to meet the stringent standards required for surface and sub-surface irrigation of public and private facilities. The total project cost \$42.5 million, and included a \$26-million zero-discharge, membrane bioreactor

plant and appurtenances, and a \$4-million water reuse system. (The balance of the cost included offsite engineering, construction, and permits.)

The plant features state-of-the-art technology that maximizes energy efficiency to help keep costs down. A flow-equalization system minimizes water flow during the day, when cost and energy use is highest. Wastewater is cycled back into the plant where it is treated during off peak hours—when power demand and cost are lower. A membrane bioreactor system (MBR) and an ultraviolet (UV) disinfection system yield cleaner recycled water suitable for irrigation.

Treated water flow is regulated through pumps based on pressure and flow measurements. The UV disinfection system features an automated mechanical wiper cleaning system that removes debris without removing the UV lamps or halting operation. Using recycled wastewater significantly reduces demand for potable water. The recycled water irrigation system is controlled via a fiber optic network using state-of-the-art monitoring and control systems.

Operating at full capacity the Fillmore plant is designed to treat 2.4 mgd of water. The current configuration is intended to operate at 1.8 mgd. The plant's peak pumping capacity is 4,146 gpm of effluent. The facilities also include a recycled water tank that has a storage capacity of one MG.

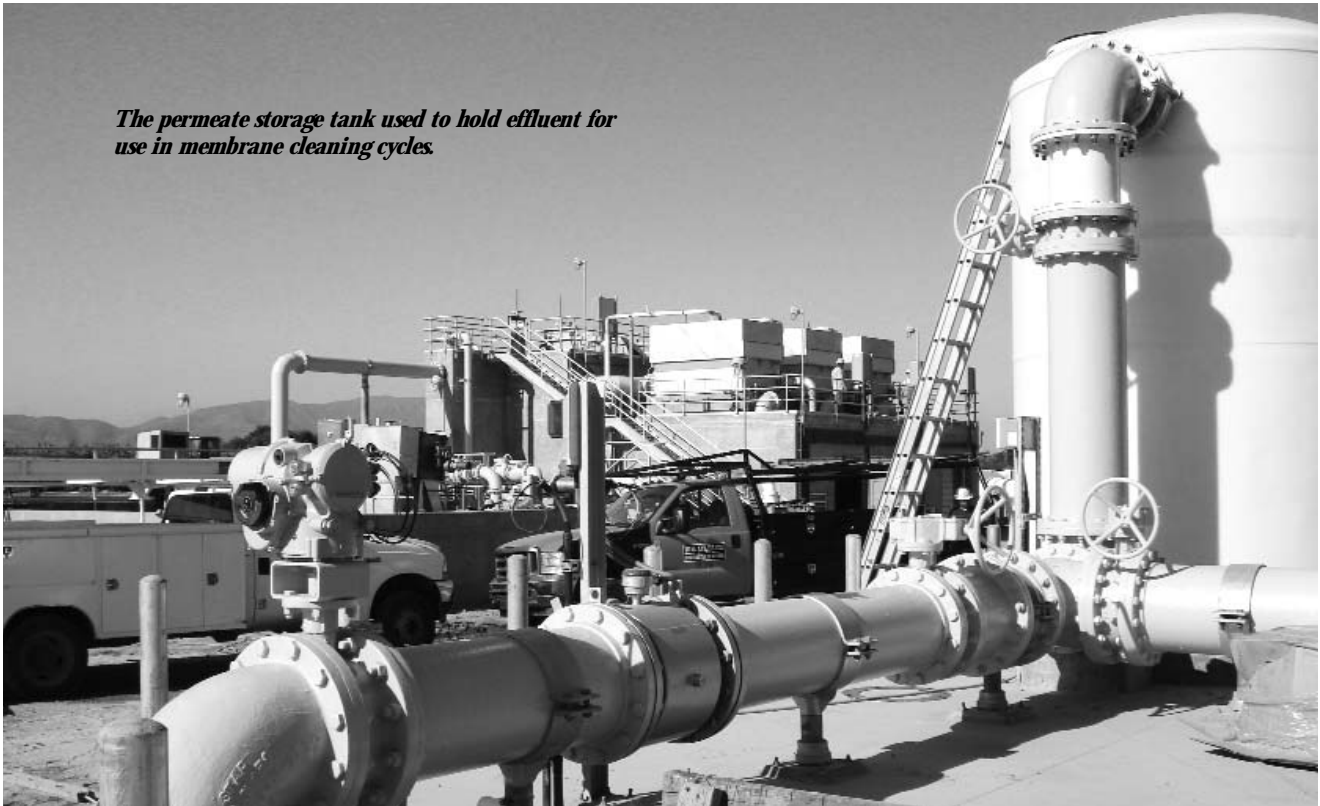
Ten Times Cleaner

The new plant is yielding water ten times cleaner than other types of modern activated sludge plants, and this



Construction view of the Fillmore Water Recycling Plant's one million gallon recycled water holding tank.

The permeate storage tank used to hold effluent for use in membrane cleaning cycles.



water is being used to irrigate multiple properties, which is a true luxury in California, where water supply is always in demand.

The current irrigation system provides 200,000 gpd to two public schools, the new Two Rivers Park, and a new greenbelt along a historic railroad in downtown Fillmore. About 800,000 gpd is discharged to an underground Effluent Disposal System (EDS) that provides groundwater recharge. Plans for the irrigation water also include areas in new home developments, commercial building developments, the site of the old wastewater treatment plant (which is being converted into a park), school grounds at city hall, and other public areas. As the transfer piping and irrigation systems are developed for these areas, the water will be transferred from the EDS to the irrigation systems.

As part of the capture and disposal system, American Water is operating a surface drip irrigation system on about 20 acres of grass growing fields. This unique form of irrigation saves about 30 percent in water use and allows the disposal of recycled water during rain events—a critical need for the zero discharge plant.

In addition, the current 200,000 gpd being used for irrigation has reduced the use of potable water sufficiently to allow the city to postpone drilling a new well and helps preserve its limited supply of good quality potable water.

Beyond the environmental and community success of this project, the P3 approach and DBO model allowed the city to achieve a \$4 million savings. Working through a prime contract with the city at a guaranteed cost allowed officials to effectively manage expenditure and significantly contributed to the project being completed ahead of schedule and under budget.

A unique characteristic of this project was the savings in the potential savings from the contingency funds. American Water, the city, the contractor, and engineers had potential savings to realize at the end of the project if the contingency reserve could be increased and preserved. This gave the team a shared goal of achieving value and cost savings when selecting equipment and making design decisions, and this teamwork approach was sustained through the completion of the project.

The city and American Water worked closely to bring together cost saving

ideas and innovation to save both construction and operations dollars while maintaining the high quality of discharges required. Examples include the use of UV disinfection; real time control of electrical usage; a fully automated, 100 percent redundant control system to allow the plant and the offsite irrigation systems to operate, without staffing, during night hours, producing significant electrical cost savings; and use of the screwpress for sludge dewatering instead of the more expensive centrifuge or belt press units. The city and American Water also worked closely to obtain permits and approvals for these systems. Without this cooperation, the permitting process could have easily delayed the project at several junctures.

The plant began operating in October 2009, and has already received several awards including Project of the Year by the Ventura County chapter of the American Public Works Association and a meritorious achievement in the Water Reuse Project of the Year category of the Global Water Awards.

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