Reuse in the Northeast

A sustainable approach to solving water supply challenges at the University of Connecticut

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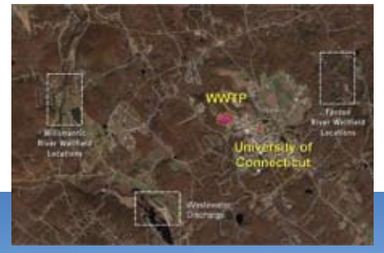
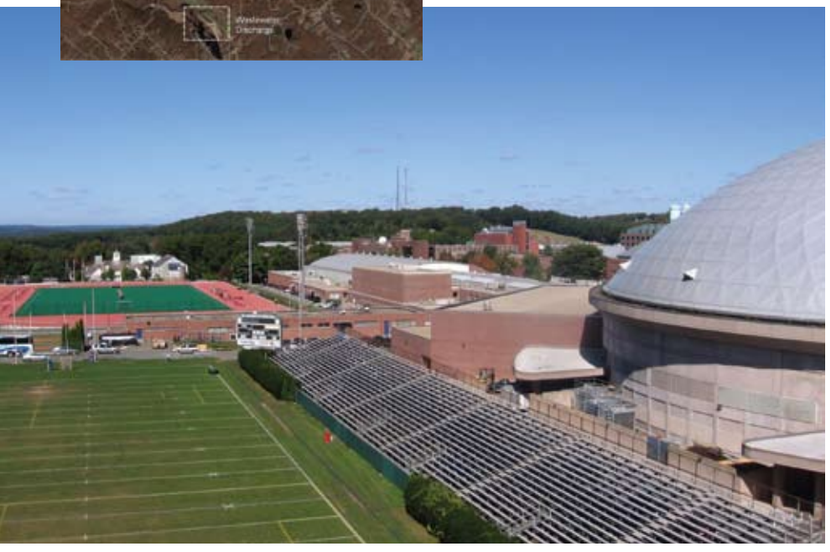
Water and wastewater utilities are beginning to discover that wastewater reuse can be an important component of a comprehensive watershed management program or alternative water supply plan. Removing wastewater streams from surface water bodies can reduce pollutant loads, including nutrients, heavy metals, pharmaceuticals and endocrine-disrupting compounds, to these receiving waters.

Instead of discharging wastewater to lakes, rivers or streams that often feed other water supplies, wastewater can be treated to a higher level and reused for beneficial purposes. Wastewater reuse also reduces water demands that potable supplies would otherwise have to satisfy.

Although not traditionally viewed as a region having much need for reclaimed water projects, a growing number of facilities in the Northeast are strongly considering the benefits of reclaimed water. There are currently several operational facilities located throughout the Northeast that have beneficial reuse projects.





With new withdrawal limits placed on the Fenton River wellfield and the Willimantic River wellfield producing a lower yield, UCONN launched a reclaimed water program.

Utilities typically are steered away due to lack of drivers, lack of public education and acceptance and lack of established regulatory framework (although this is changing for states such as New Jersey and Massachusetts that do have reuse regulations). In recent years, however, more utilities are looking toward wastewater reuse as a way to free up potable water supplies for other uses. This is becoming particularly important for communities that are approaching the limits of their water supply.

Drivers Behind UCONN's Reclaimed Water Program

The University of Connecticut (UCONN) in Storrs, Conn., provides potable water and wastewater treatment services to its main campus and depot campus, as well as to some adjacent areas within the town of Mansfield. In anticipation of increasing potable water needs on its campus due to a growing population, and faced with a lack of additional water supplies in the area, UCONN sought to implement a long-term, sustainable program to provide an adequate supply of water to meet the nonpotable needs of its campus.

Hazen and Sawyer was retained to study the feasibility of constructing a reclaimed water facility for the purpose of utilizing appropriately treated effluent from UCONN's wastewater treatment plant as feedwater for both the university's Central Utilities Plant (which includes boiler and cooling tower water systems) and turf irrigation.

A key driver for this project was the limited capacity of UCONN's existing water sources, two permitted groundwater supplies: the Fenton and Willimantic river wellfields. In 2005, a portion of the Fenton River ran dry—an event attributed to elevated water withdrawals necessary to meet the seasonal peak demand during drought conditions.

Recognizing the potential for recurrence, the university's first measure was to implement several restoration and conservation measures. A modification of the withdrawal management protocols at the Fenton River wellfield was implemented; this involved ceasing pumping of the Fenton River wells based on specific stream flow criteria.

With these new limits placed on the Fenton River wellfield—coupled with lower yield from the Willimantic River wellfield—UCONN found it necessary to identify other sources of water to consistently meet demands and preserve natural resources. The university's focus on sustainability prompted the decision to implement a reclaimed water program—a first-of-its-kind industrial reuse application in the state of Connecticut, and one of only a handful in the Northeast.

Treatment Train

The university operates its own water pollution control facility located on the main campus. Treatment includes seasonal chlorination and oxidation ditches that allow for conventional activated sludge aeration, nitrification and denitrification. Following an analysis of current and future potable and nonpotable water demand and wastewater flows, several cutting-edge treatment process alternatives were evaluated to determine the most efficient, practicable and sustainable solution to meet targeted water quality standards for industrial and irrigational reuse.

The primary reclaimed water goals discussed with the Connecticut Department of Environmental Protection are total suspended solids less than 5 mg/L and "nondetect" for fecal coliform. The selected alternative entails the construction of a 1-million-gal-per-day reuse facility that utilizes microfiltration (MF), ultraviolet (UV) disinfection and reverse osmosis (RO) to treat wastewater effluent before its use as boiler feedwater, makeup water for cooling towers and irrigation water for turf fields.

MF is an innovative, effective treatment process that removes both contaminants and pathogens by filtration through a porous membrane. However, to protect high-pressure boilers and to provide proper maintenance, makeup water for the boiler systems must be high purity. Thus, treated ("reclaimed") water from the pressurized MF system will be further treated using an upgraded, existing RO system for softening and demineralizing prior to use as boiler feedwater. If it is determined that even higher purity water is required, an ion-exchange system will be available upstream of the RO.

RO treatment is not needed for the cooling tower system. Instead, the MF effluent for cooling tower makeup will be treated for scale, corrosion and biological-growth control using scale and corrosion inhibitors and biocides. Reclaimed water from the new MF treatment system also will be used for irrigation on campus.

For disinfection, both UV light and liquid sodium hypochlorite were considered. While both methods would meet the required disinfection goals, UV was found to be more advantageous, and in-vessel LPHO UV disinfection was selected as the preferred option. The water entering the new 1-million-gal reclaimed water storage tank, however, requires a disinfectant residual to prevent bacterial regrowth. A small dose of chloramines, therefore, will be added as a secondary disinfectant to maintain the required residual for irrigation and prevent biofouling of the water storage tank, distribution pipelines and RO membranes.

Sustainable Design

Using reclaimed wastewater will make an equivalent amount of water supply available to meet UCONN's existing and future potable water demands—a key component in improving the sustainability of campus operations. Implementing a reuse program will ease the water demands placed on the Fenton River and help to conserve this vital resource while setting a positive, hands-on example for UCONN students regarding sound environmental stewardship.

The new reuse facility also incorporates several sustainable design features, including energy conservation through the use of rooftop solar panels coupled with a solar orientation of the facility; sustainable construction through the use of Leadership in Energy and Environmental Design-certified sustainable materials that are locally produced; and collection and reclamation of rooftop storm water by blending with the reclaimed water for beneficial use on site. Also, the project will include a sustainable heat pump system that harnesses the heat from the reclaimed water and converts it into building heat for the new reclaimed water facility building.

With the success of this program, water reuse has the potential to become a more common and better understood practice in the region and should help to advance the establishment of regulatory water quality standards in the state. With the increasing emphasis on ensuring a sustainable water supply, coupled with population growth and overburdened water supply sources, water reuse provides a viable means to effectively and safely meet heightened water demands, engendering a reliable supply while conserving natural resources. MT

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