BIOCYCLE

Putting Recycled Water to Use in Washington State

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A region that suffers from drinking water shortages and low stream flows learns how to treat its wastewater as a resource.

The LOTT Alliance is the regional wastewater treatment system serving the cities of Lacey, Olympia, Tumwater and northern Thurston County (LOTT) in Washington State. The core of LOTT's long-range wastewater resource management plan is production of Class A Reclaimed Water, which is the highest quality of reclaimed water as designated by the Washington Departments of Health and Ecology.

The region's decision to focus on reclaiming, or reusing, water was driven by a number of factors. These include the state's discharge limitations on LOTT's central wastewater treatment plant, which directs its discharges into south Puget Sound. This area of Puget Sound suffers from low dissolved oxygen problems, which are worsened by nutrients in most wastewater treatment discharges. Reclaiming water also made sense because the region suffers from drinking water shortages and low stream flows that harm threatened and endangered fish. All of this is coupled with a strong desire by local citizens to conserve water and treat wastewater as a water resource.

LOTT currently produces up to 1 million gallons per day (mgd) of Class A Reclaimed Water at its central Budd Inlet Treatment Plant in Olympia, and an additional 0.75 mgd at its Hawks Prairie Reclaimed Water Satellite. As currently envisioned, LOTT will expand reclaimed water production at both sites, as well as construct a second satellite, the Chambers Prairie Reclaimed Water Satellite.

Washington's Class A Standards

At the Budd Inlet Treatment Plant, LOTT's wastewater receives advanced secondary treatment, including nitrogen removal and ultraviolet

disinfection, before the treated water is discharged into Puget Sound. By doing this, LOTT provides an example of how to protect Puget Sound for other regional sewer plants that continue to discharge nutrients.
The LOTT plant diverts a portion of its treated water to the Budd Inlet Reclaimed Water Plant to be filtered through a continuously backwashing sand filter. LOTT uses a sodium hypochlorite solution to further disinfect the reclaimed water, which is necessary to maintain a chlorine residual throughout the distribution pipelines. The plant has produced up to 1 mgd since 2004, though the actual volume produced each day varies to match demand for reclaimed water.
The Hawks Prairie Reclaimed Water Satellite consists of the Martin Way Pump Station, the Martin Way Reclaimed Water Plant and the Hawks Prairie Reclaimed Water Ponds and Recharge Basins. LOTT diverts wastewater from the pump station to the Martin Way Reclaimed Water Plant for treatment, where a membrane bioreactor system is used to produce Class A Reclaimed Water. Most of the treatment process (primary and secondary) occurs in underground tanks. Membrane filtration provides a third level of treatment, and disinfection with sodium hypochlorite follows. LOTT only treats the liquid portion of the flow at the Satellite; solids are returned to the sewer where they are conveyed to the Budd Inlet Treatment Plant for handling. LOTT sends the Class A Reclaimed Water through a purple pipe network (marked purple to designate recycled water) to the Hawks Prairie Reclaimed Water Ponds and Recharge Basins, where the water feeds constructed wetland ponds and is infiltrated to groundwater. The ponds also serve to illustrate to the public that the Class A Reclaimed Water is a safe and valuable resource that supports wildlife and has many other beneficial uses.

Distributing Reclaimed Water for Reuse

As a wastewater utility, LOTT is not a water purveyor. Instead, its four government partners distribute reclaimed water for uses throughout their respective communities. An intergovernmental Reclaimed Water Policies Task Force spent five years identifying and addressing more than 40 policy issues related to the distribution and use of the LOTT generated reclaimed water. The task force resolved many of these issues through a series of local distribution, supply and end-user agreements. The agreements offer a regional resource approach, while preserving each jurisdiction's operating autonomy and allocating the reclaimed water fairly between the partners.

Downtown Olympia is currently using reclaimed water from the Budd Inlet Reclaimed Water Plant to irrigate state- and city-owned parks and streetscapes along the Port of Olympia. LOTT also uses a portion of the reclaimed water for nonpotable purposes at the Budd Inlet Treatment Plant and a downtown pump station. Reclaimed water from the Hawks Prairie Reclaimed Water Satellite is used by LOTT at the Martin Way Plant and the Hawks Prairie Ponds for processes, cleaning, irrigation, habitat and recharge. Future uses include irrigation at a new, mixed use development in Lacey, which features Cabela's, a large retail outfitter, and a regional athletic complex. Before these new uses can be realized, substantial infrastructure improvements will need to be completed.

In 1992, the Washington Reclaimed Water Act provided the initial guidance for a new program to manage the conversion of wastewater into "new" supplies of water for nondrinking water purposes. After 15 years of planning, development and implementation, there are 22 operating reclaimed water facilities within the state, and another 50 facilities in the planning or design stage. Currently there is a significant effort to create a new reclaimed water regulation by 2010. According to Katharine Cupps, lead engineer for the Washington Department of Ecology, "Reclaimed water use is a fundamental element of our strategy to provide sustainable water supplies to meet our future needs."

The Treatment Process

Sources of reclaimed water are primarily domestic wastewater, with smaller amounts of industrial process water and storm water. The production of reclaimed water requires a highly engineered, multi-step treatment process that mimics nature's natural restoration processes. For reclaimed wastewater to be acceptable to the general public, it has to meet very stringent treatment standards. In addition to the removal of conventional pollutants such as suspended solids, nutrients such as nitrogen and phosphorous may need to be reduced, along with the removal or inactivation of all disease causing organisms such as bacteria and viruses. Since conventional secondary wastewater technology does not achieve these rigorous standards, it is necessary to apply advanced wastewater technology. In Washington, regulatory standards ensure a high level of reliability so that only water meeting stringent water quality requirements may leave a treatment facility.

Utilities across the state have found creative ways to put reclaimed water to beneficial use. These new uses include crop and landscape irrigation,

toilet flushing, dust control, industrial cooling, groundwater recharge, wetlands and stream-flow augmentation. For example, the city of Sequim uses reclaimed water to irrigate public landscapes along 10 downtown streets, as well as other public works uses. At Carrie Blake Park, a reclaimed water demonstration site, Sequim uses reclaimed water for ponds, decorative water falls, wetlands and flushing the park toilets. Reclaimed water leaving the park is used to augment streamflow for support of salmon habitat.

In the growing city of Yelm, reclaimed water serves the purpose of landscape irrigation, groundwater recharge, fire suppression and power generation. It even serves fish ponds that are stocked with rainbow trout. One of the newest reclaimed water facilities at the privately owned company, Cardinal Glass, recycles 100 percent of its domestic wastewater flow for air pollution control equipment. This small custom glass fabrication plant has no off-site environmental discharge.

Both stricter water quality discharge standards and water shortages are driving the need for reclaimed water. As new water cleanup reports (Total Maximum Daily Loadings) are prescribed for waterways to protect or improve their quality, incentives are created for moving from discharge or disposal to a new beneficial use for the reclaimed water. In Eastern Washington, low annual rainfall and drought conditions push communities to conserve valuable water resources. Although most people think of Western Washington and the Seattle vicinity as “water rich,” dry summers are characterized by low stream flows that are insufficient to maintain viable fisheries, and public water supplies strained by a doubling in water consumption due to landscape irrigation. The region enjoys a lot of water, but not always enough water during times of need.

In the Puget Sound area of Western Washington, often compared to Chesapeake Bay or the Great Lakes as an essential natural resource, many governmental partners are working together to protect and restore degraded water. Pollution problems in Puget Sound threaten shellfish beds and endangered salmon. By converting marine discharge of wastewater to production and reuse of reclaimed water, Washington communities provide multiple environmental benefits.

Challenges for Water Reuse

An advisory committee has identified several barriers to reuse, in order to help Washington regulators as they proceed with developing new rules about reclaiming water. The most significant challenge to the distribution and use of reclaimed water is the lack of infrastructure to move water

from reclaimed water plants to potential customers. Often the point of treatment is geographically remote from the desirable point of reuse. Installing a separate purple pipe network with storage and pumping components in developed communities is extremely expensive.

Cash reserves to fund this infrastructure are often limited, and low rates, used as an incentive to reuse, are insufficient to support construction. To alleviate this burden, the Washington state legislature initiated funding assistance for reclaimed water planning and construction by providing $5 million in 2008 grants. Even with state-funded grant dollars available, competition is high, and with interest in reclaimed water projects growing statewide, the pool of available funds is not sufficient to meet demand. Current recommendations before the Legislature outline an expanded grant program for reclaimed water facilities that will provide $50 to $100 million annually beginning in 2010.

Another barrier to reclaimed water projects is the lack of information and understanding by the general public that the water is highly treated and very safe for nonpotable purposes. Few people realize that current treatment processes have improved immensely from the days when discharge to the natural environment was the only wastewater treatment provided prior to water reuse by communities downstream.

Public acceptance of reclaimed water is a challenge, although it is less of an issue in the LOTT service area than others. The public generally supports the use of reclaimed water, as evidenced by public values expressed during LOTT's long-range planning process. However, recent studies of potential harm to human and environmental health from pharmaceuticals, personal care products and other compounds have generated some concern regarding use of reclaimed water. With hundreds of compounds in question, limited existing research and no definitive answers from the scientific community, it is difficult to allay public fears.

Reclaimed Water in Washington State

The science of reclaiming or recycling our limited water supplies will undoubtedly grow over the next several decades. Language from the 2007 Washington Legislature confirms this prediction: “Global warming has reduced the volume of glaciers in the North Cascade mountains to between 18 and 32 percent since 1983, and up to 75 percent of the glaciers are at risk of disappearing under projected temperatures for this century. Developing and implementing adaptation strategies, such as water conservation that includes the use of reclaimed water, can extend existing water supply systems to help address the global warming impacts. In

particular, because reclaimed water uses existing sources of supply and fairly constant base flows of wastewater, it has year-round dependability, without regard to any given year's climate variability."

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