Reclaiming treated wastewater with advanced technology filters is giving two southern California areas a steady supply of irrigation water, even during drought.

Reclaimed California Wastewater Provides Drought Insurance

By John V. Foley, Ray Miller, and Gary A. Garzonetti

Wastewater reclamation is providing an economical, uninterruptible supply of irrigation water to golf courses, parks and greenbelt areas as a result of projects undertaken by two rapidly developing water districts in southern Orange County, California. Both projects include advanced pulsed-bed tertiary filter systems that meet the state's strict standards for reclaimed water.

The South Coast County Water District, serving a 5 sq. mi. area near San Juan Capistrano south of Newport Beach, began pumping reclaimed water in March of last year, to sprinkler systems on two golf courses, three parks, a high school athletic field and a large subdivision. A $7.5 million advanced wastewater treatment and distribution system now delivers up to 1 mgd and by 1992 it will furnish as much as 2.6 mgd to eight users expected to consume 750 acre-feet per year. (One acre-foot equals about 326,000 gallons.)

Just north of the South Coast County district, the Moulton Niguel Water District, with a service area of 39 sq. mi., has supplied up to 600,000 gallons of water per day since last May to a country club under contract to purchase 300 acre-feet per year. This district plans to increase reclamation capacity to 6 mgd by 1995.

These two authorities are among seven making up the Aliso Water Management Agency, which oversees wastewater management in the Aliso Creek Watershed. The AWMA serves a total of 76 sq. mi. with a population of about 150,000, expected to increase to 255,000 by the year 2000.

Like many parts of southern California, the area has inadequate groundwater and depends largely on water imported from the Colorado River and northern California. Both supplies are controlled by the Metropolitan Water District of Southern California. During severe drought, greenbelt irrigation water is the first to be curtailed.

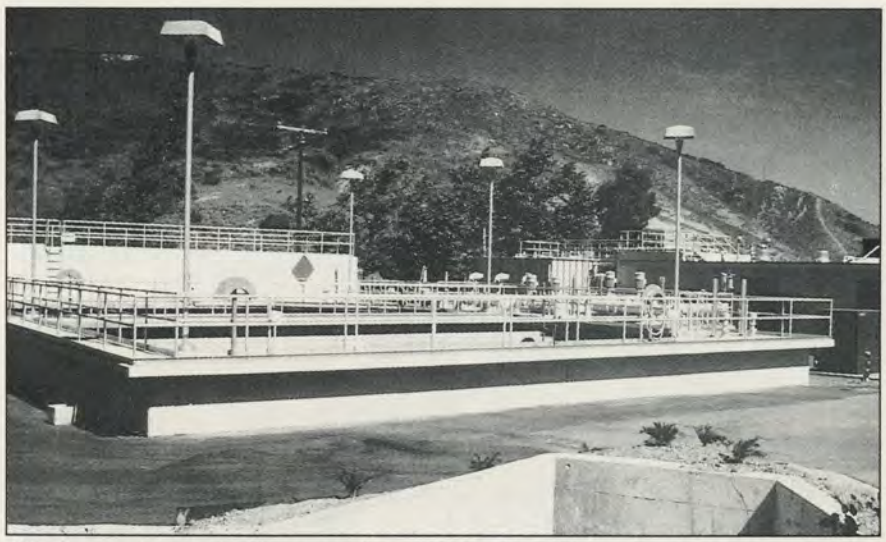
Water supplies from the State Water Project have fallen short of projections because of delays in construction of the delivery system. In addition, this year about 60 percent of the Colorado River water now furnished to Southern California will be diverted to the Central Arizona Project, supplying the Phoenix and Tucson areas. Those developments have forced many Southern California communities to consider all possible alternative water supplies.

Many have turned to wastewater reclamation as a means of conserving costly imported drinking water while providing a reliable source of irrigation water to customers at a lower price. The South Coast County Water District, for example, is expected to need about 5,000 acre-feet of water for all uses by the time the area is fully developed. By providing 750 acre-feet of reclaimed water, the district will meet 12 percent of its total water requirement and roughly 75 percent of its water needs for landscaping. The reclaimed water costs users 20 percent less than imported water, and the supply will not be interrupted, even during the worst dry spells.

Under California law, wastewater used to irrigate lawns, parks or similar lands must undergo tertiary treatment including coagulation, sedimentation, filtration and chlorination. This minimizes the risk of pathogen spread. Average turbidity in the filtered wastewater must be less than 2 NTU (turbidity units) 94 percent of the time. Median total coliform bacteria concentration may not exceed 2.2 per 100 ml. A chlorine residual of at least 1 mg/l is required after chlorine contact.

Suppliers of reclaimed wastewater must test distribution systems to ensure environmentally safe operation. Irrigators must follow proper management practices to prevent effluent runoff, spray drift and contamination of potable water supplies. Specific management requirements for any given site are established by the State Regional Water Quality Control Board.

Both the South Coast County and Moulton Niguel districts use alum for coagulation



Chlorine contact tanks (foreground) and Hydro-Clear filter cells (right background) at South Coast County.

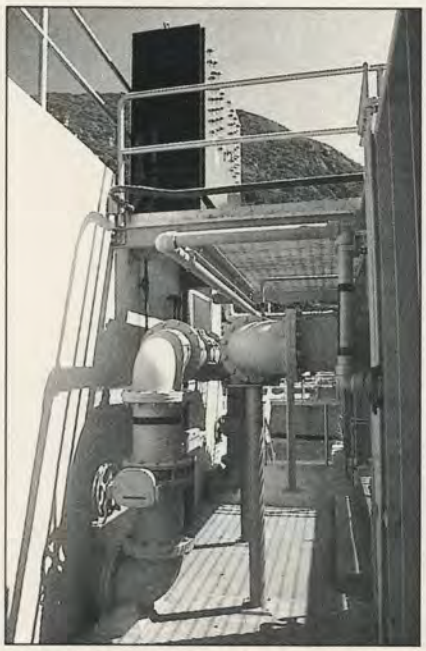
and sedimentation, and provide chlorine contact for the two-hour period required by state regulations. Tertiary filtration to meet the turbidity standard is provided by pulsed-bed rapid sand filters, supplied by Zimpro Inc. of Rothschild, Wisconsin. These filter cells, bearing the name Hydro-Clear, contain a 10 in. bed of fine-grain sand retained by a stainless steel mesh screen on a supporting underdrain structure.

During filtering, solids are trapped on the sand surface, forming a sludge layer. Sludge blanket formation is slowed by diffusers (Air-Mix), which generate mixing currents over the filter bed, lifting and circulating solids to reduce surface headloss and permit longer running times between backwashes than is possible in conventional dual media filters.

Filter runs are further prolonged by a device which forces trapped air from the underdrain cavity up through the shallow filter bed, regenerating the surface and redistributing solids within the filter media. Both Air-Mix and Pulse-Mix cycles are automatically activated as rising water in the filter cell contacts sensors. The cycles do not interrupt filtration.

After a predetermined number of pulses, a Hydro-Scour backwash system is automatically begun. Jets of water are forced up through the sand surface, washing solids from the sand media. The air diffusers help float the solids out of the filter cell.

The South Coast County Water District operates an activated sludge secondary wastewater treatment plant with a capacity of 2.5 mgd. The current average flow is 1.2 mgd. Construction of the tertiary treatment facility, which includes six of the filter cells described with a total area of 528 sq. ft., was started in 1981. The reclaimed water distribution system consists of more than 28,000 ft. of pipe ranging in diameter from 8 in. to 16 in., three booster pumping stations, and 2.2-million-gallons of storage capacity.



Filter piping and Hydro-Clear control cabinet at South Coast County.

Public money for the $7.5 million project came from district funds (24%), the Metropolitan Water District of Southern California (36%) and the State of California Office of Water Recycling (29%). The remaining 11 percent was provided by a private developer building a master-planned community including a golf course, several parks, and, eventually, about 3,500 homes. When completed, this development will use 450 acre-feet of reclaimed water per year.

Revenues from the sale of reclaimed water will pay the water district's share of the project cost. The district has agreed that the price of reclaimed water will never exceed 80 percent of the cost of residential drinking water. Imported water now costs homeowners 96 cents per 100 cubic feet (equivalent to about $418 per acre-foot). Other irrigation water customers are the Aliso Creek Golf Course, Dana Hills High School, and Niguel Shores, a large ocean-side subdivision.

A backup system can supply potable water to irrigators in case of any treatment plant upsets that might make water quality standards unattainable for periods ranging from a few hours to a few days.

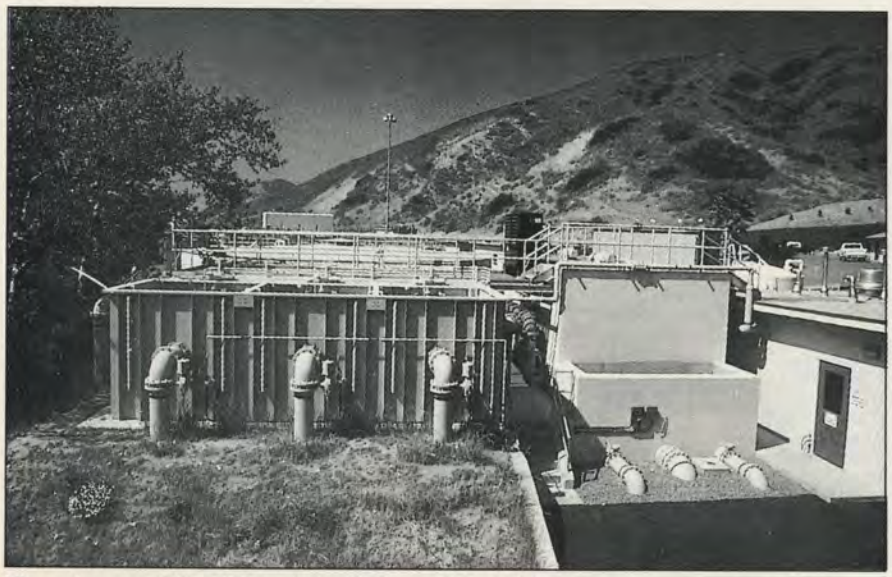
Because direct cross connections between a reclamation system and the potable water supply are not permitted, potable water would be added to the irrigation network through an air gap, either at the treatment plant or at the terminal reservoir.

The Moulton Niguel Water District operates a new regional wastewater treatment and solids processing plant completed in 1983 to serve the AWMA. This activated sludge plant has a capacity of 12 mgd and now processes an average of 3 mgd. It is equipped to handle up to 25 mgd of solids from several wastewater treatment plants in the AWMA.

The old treatment plant, handling 1 mgd, supplied secondary effluent for irrigation to the El Niguel Country Club from 1974 until the new reclaimed water quality standards, requiring a far greater degree of treatment, took effect in 1978. With an advanced treatment plant that includes one 110 sq. ft. filter cell, the district has resumed service to the country club. Water is pumped through a 2 mi. pipe line to a storage lagoon on the golf course.

The district is already preparing for expansion of the tertiary treatment facility, in stages, to its projected capacity of 6 mgd. More filter cells, which rest on above-ground concrete slabs, will be added as water delivery capability increases. Eventually, there will be a total of nine cells in modules of three, each module providing 2 mgd of filtering capacity. The first cell rests on a slab large enough for two more units, and piping for all nine has been installed. Plans for a pressure distribution system are in the early stages.

To date, the reclamation project construction has cost $450,000, to be recovered within about 7½ years through the sale of water. The district charges irrigators $200 per acre-foot, which is about $53 lower than the cost of imported water. The combination of lower costs and the promise of an uninterruptible supply, even during severe drought, has made reclaimed water extremely attractive to prospective irrigators. **WEM**



View of some of the piping at South Coast County filter structure.

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