

Constructed Wetlands Wastewater Reclamation

When the Carlsbad Municipal Water District needed to reduce nutrients in its recycled water supply, district officials turned to Brown and Caldwell for help. The company developed a constructed wetlands system that reduced solids, dissolved organics and nutrients in both recycled water and stormwater runoff.



BROWN AND
CALDWELL

The City of Carlsbad considered using the man-made Lake Calavera Reservoir for recycled water storage.

BACKGROUND

Lake Calavera is a man-made reservoir that was completed in 1940 and is owned by the Carlsbad Municipal Water District (MWD). It was originally constructed to store surface water for California's Northern San Diego County. Today, Lake Calavera is no longer used as a water supply and Carlsbad MWD is considering it to store recycled water. The value of the lake is now dependent on its aesthetics and the presence of a fish population and related wildlife.

In 1999, Carlsbad MWD advanced a plan to pump recycled water into the lake to hold until spring for landscape irrigation. The problem: open-storage reservoirs holding nutrient-rich recycled water can grow excessive amounts of algae, which can result in odor and nuisance conditions. One approach to limiting algae growth considered is to minimize nutrients in the water with constructed wetlands.

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Stormwater treatment

But in 2001, when Carlsbad MWD determined the location, size and elevation of Lake Calavera were not optimal for recycled water storage, it decided to use the lake and the Brown and Caldwell-designed wetlands for stormwater collection and treatment. The 100 acre-feet to 300 acre-feet of stormwater runoff generated annually in the hydrologic basin now filter through the constructed wetlands – reducing solids, dissolved organics and nutrients – and stored to supplement the district’s other recycled water supplies. And a small portion of the water removed from the lake is recycled through the constructed wetlands to keep the vegetation alive, the treatment biota active and to minimize the algae content of the lake water.

Solutions

Brown and Caldwell conducted a feasibility study in 1999 to determine whether constructed wetlands would reduce nitrogen and phosphorus in the recycled water to concentrations that would not stimulate algae growth. The company determined that 17 acres of constructed wetlands would be needed to treat 1 mgd of recycled water – based on phosphorus removal as the limiting nutrient.

Another problem was the topography surrounding Lake Calavera. Constructed wetlands require a relatively level site or one that can be converted to a series of wetland terraces. Much of the land surrounding the lake is quite steep (15-percent grades or greater) To overcome this constraint, Brown and Caldwell mapped the topography and soils, and used slopes with less than 15-percent grades to develop a series of terraced wetland cells.

