

## **Challenges in Optimizing a Large-Scale Managed Aquifer Recharge Operation in an Urbanized Area**

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### ABSTRACT

Over the past 70 years the Orange County Water District (District) has constructed a large, complex managed aquifer recharge operation consisting of nearly two dozen recharge facilities that cover over 6.5 km<sup>2</sup>. These facilities include 10 km of the Santa Ana River channel, deep recharge basins that are up to 45 m deep, shallow basins, desilting basins, two rubber dams, many kilometers of pipelines, multiple pump stations, and a seawater intrusion barrier. The District's recharge facilities have allowed the District to recharge an average of 287,000 Ml/yr into the groundwater basin, thereby effectively increasing the yield of the groundwater basin and allowing for groundwater withdrawals in recent years in the range of 400,000 to 430,000 Ml/yr. Nevertheless, further enhancement of the District's recharge operations are needed to further increase the groundwater basin's sustainable yield and to optimize the water resources within the basin.

The District's recharge system is located in an urbanized area that was formerly agricultural. Available land for new recharge basins is scarce and high property values makes adding new surface recharge facilities difficult and costly. As a result, the District has focused on ways to maximize the efficiency of its existing system. In 2004 the District placed Basin Cleaning Vehicles (BCVs) in four shallow recharge basins to allow for continuous removal of the clogging layer that forms in the basins, thereby increasing the basins' recharge capacity and lengthening the time between basin cleanings. The BCV's have not performed as well as expected due to the inability to keep up with the high solids loading experienced in the basins, damage to cleaning system from rocks, and poor hood contact with the basin bottoms. Recent refinements in BCV design, including using a brush to clean the bottom instead of a cutter-head, indicates that under low solids loading conditions, they may be effective.

In addition to the BCV, the District is investigating ways to increase recharge via removing clogging material in the source water through desilting, installation of subsurface infiltration galleries under parking lots, parks and other areas and the installation of vadose zone recharge wells in areas where fine-grained surface sediments prevents efficient percolation of surface water to the groundwater basin.

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