

Bridging the Gap:

Desalination of Recycled, Brackish, and Ocean Water

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Experiencing almost 15 percent growth since the 1990 census, the population of Southern California has increased by nearly two million new people in 13 years. Current water supplies are strained to meet this growing population. Compounding the issue, recent droughts have stressed local groundwater resources and diminished snow-pack runoff from the mountains. Further, the federal government has restricted California's use of the Colorado River supplies, and imported water supplies from Northern California are shrinking due to environmental mitigations.

Many of the Southern California communities live in water-starved areas, and it's important to consider where the region's water will come from in the future. One Southern California water agency is proactively seeking ways to bridge the gap by expanding its knowledge of desalination. West Basin Municipal Water District (West Basin) has been using reverse osmosis (RO) technology to desalinate water since 1993. Desalination removes virtually any mineral and most biological or organic chemical compounds from water, but specifically, it removes salt.

West Basin is a public agency that wholesales imported water to local cities, mutual water companies, private companies and investor-owned utilities in a 200-square-mile area of southwest Los Angeles County, Calif. that encompasses 851,000 people. West Basin currently supplements its supply by desalinating recycled water and brackish water, and hopes to use the

same RO technology to desalinate ocean water. The West Basin Water Recycling Facility produces 27,000 acre-feet of recycled water annually; the Marvin Brewer Desalting Facility produces 1,200 acre-feet of brackish water annually; and the Ocean Water Desalination Demonstration Project performs research on 30,000 gallons each day.

Desalinated Recycled Water

The cornerstone of West Basin's recycling program is the West Basin Water Recycling Facility. Using secondary effluent from the City of Los Angeles' Hyperion Treatment Plant (HTP), West Basin produces five qualities of "designer recycled water": tertiary, nitrified, softened RO, pure RO, and ultra-pure RO. The latter three are produced using desalination technologies:

Softened RO Water — Softened RO water is used in the West Coast Basin Barrier Project after pre-treatment by either lime clarification or Micro Filtration (MF), followed by RO. The Barrier project is a series of 153 wells constructed along the Southern California South Bay coast to protect the coastal groundwater aquifers against saltwater intrusion from the Pacific Ocean. Softened RO water is combined with potable water and injected into the wells to form a fresh water barrier. Approximately 7,300 acre-feet of softened RO water are produced annually; the rate at which it is provided to the local users is at about \$470 per acre-foot. This is about 10 percent less than the \$510 per acre-foot cost of imported water supplies.

Pure RO Water — Pure RO water is secondary treated water from HTP that has been treated with MF and RO. This water is used for low-pressure boiler-feed water for a local refinery. Approximately 6,500 acre-feet of pure RO water are produced annually.

Ultra-Pure Reverse Osmosis Water — Ultra-pure RO water is secondary treated water from HTP that has been treated with MF once and RO twice. The salt levels are reduced from approximately 750 parts per million (ppm) to less than 5 ppm; delivery of this quality water is guaranteed 24 hours per day year round. This water is used for high-pressure boiler-feed water for a local refinery. Approximately 2,600 acre-feet of ultra-pure RO water are produced annually. It is provided to the local users at a cost greater than imported water, but comparable to that of the refinery that uses the ultra-pure water.

Solid waste from the RO waters is dried, caked, and then taken to a landfill for cover. The liquid waste brine is piped back to the HTP, combined with other liquid waste, and discharged into the ocean five miles offshore.

Brackish Water Desalination

West Basin is also using RO technology to desalt brackish groundwater for drinking water needs. The Marvin Brewer Desalting Facility began operations in 1993 and has the capacity to treat up to 1.3 million gallons a day (mgd). Salt concentrations of 3,600 ppm in brackish groundwater are reduced to 400 ppm in the facility, with



approximately 1,200 acre-feet of drinkable water produced each year. Liquid waste brine is piped into the county sewer line. Without RO technology, this brackish groundwater could not be used as potable water.

Ocean Water Desalination

West Basin has recently taken steps to investigate whether desalinating ocean water from the Pacific Ocean would be considered a viable option for supplementing its water supplies. Ocean water desalination is already in use around the world by countries that do not have a sufficient supply of water, and also by military and cruise ships. The benefits associated with ocean water desalination are numerous. It is a new, virtually limitless supply of water that is drought-proof (independent of changes in weather patterns), independent of water rights, and a source of high-quality water.

In May 2002, West Basin began operating an Ocean Water Desalination Demonstration Project using MF and RO technology to desalinate ocean water. Co-located with a power plant, the demonstration project obtains its source water from the power plant's feed line and returns its discharge to the power plant's outfall line, where it is discharged back into the ocean.

Approximately 30,000 gallons per day are processed through the facility, with raw ocean water salt levels of 35,000 ppm being reduced to 350 ppm. More than 500 analytical tests are performed monthly. During the course of this project, the West Basin seeks to study raw ocean water, desalted water quality, brine discharge quality, and the effectiveness of RO

membranes. Using knowledge gained from the demonstration project, West Basin ultimately plans to develop a full-scale ocean desalination plant serving 20 mgd to its service area.

West Basin's \$1.2 million Ocean Water Desalination Demonstration Project has been made possible by support from federal, state, and local agencies and organizations, and national research groups (see end note.)

United States Desalination Coalition

West Basin hopes that the Ocean Water Desalination Demonstration Project and any future projects related to ocean-water desalination will become regional and national assets through open and collaborative efforts. The company has partnered with four other Southern California agencies to form a non-profit organization called The United States Desalination Coalition, which seeks legislative funding for seawater and brackish groundwater desalination and for transporting the treated water for municipal use. Public agencies from other states, including Florida and Texas, have already expressed interest.

For additional information, please contact Art Aguilar at (310) 660-6205.

The Ocean Water Desalination Demonstration Project is supported by: Association of California Water Agencies, American Water Works Association Research Foundation, California Avocado Growers, California Department of Water Resources, Calleguas Municipal Water District, East Bay Municipal Water District, Long Beach Water Department, Los Angeles Department of Water and Power, Metropolitan Water District of Southern California, Municipal Water District of Orange County, National Water Research Institute, Poseidon Resources, Inc., San Diego County Water Authority, Tampa Bay Water, U.S. Bureau of Reclamation and West Basin.

The Public Opinion on Desalination: Survey Results

In May 2002, West Basin Municipal Water District conducted a statewide poll in California of 601 registered voters, focusing on a variety of topics relating to water and desalination. The poll results indicated that 70 percent favored desalination as a future drinking water supply for the following reasons:

- *Reduced dependence on imported water*
- *Improved quality of local water supplies*
- *Increased water available for environmental use*
- *Increased water available for agricultural use*

Fifty-two percent of poll respondents indicated that they would support the increase of imported water from Northern California to Southern California. Although most respondents also thought of water supply as a future issue, not one currently facing California, the support for water agencies trying to "bridge the gap" was apparent. With this voter support, West Basin seeks to actively pursue ocean water desalination as a future water source.