

Potential Untapped

Working to build up Texas' desalination water supply

By Jorge A. Arroyo

Over the past decade, the Texas Water Development Board (TWDB) has been at the forefront of the state's efforts to identify and address challenges to implementing seawater and brackish groundwater desalination supplies in Texas. TWDB is statutorily required to pursue and biennially report on the progress made toward implementing seawater desalination in Texas. Additionally, the 78th, 79th and 80th Texas Legislatures appropriated a total of \$4.2 million in grants for desalination demonstration projects and other related activities; this funding allowed TWDB to furnish a total of 18 grants.

Interest in desalination—especially brackish groundwater desalination—has increased with the pervasive drought the state is experiencing and the growing record of successful projects, such as the Kay Bailey Hutchison and Southmost Regional Water Authority brackish groundwater desalination plants.

Interest, need for new water supplies and opportunity notwithstanding, there are some important challenges to implementing desalination that are within the purview of TWDB, such as increasing knowledge of the brackish aquifers in the state; supporting efforts to enable practical, cost-effective methods of disposing desalination concentrate; and providing financial assistance for facility planning, pilot studies and technology demonstration efforts.

Primed for Desalination

Texas is ideally suited for desalination: It has more than 360 miles of coastline along the Gulf of Mexico with access to a seemingly endless supply of seawater. Moreover, approximately two-thirds of Texans live within 150 miles of the coast. Inland, more than 30 aquifers are spread



Batch-scale seawater RO system at CHIWAHA lab of El Paso Water Utilities

across the state, each containing different volumes of brackish groundwater. According to a 2003 estimate, brackish groundwater in Texas totals more than 2.7 billion acre-ft. The state's wide array of freshwater resources, however, has historically met most of its water needs. Thus, the use of saline water has only been required in extreme cases.

Although important gains have been made in the last decade, the desalination potential of the state is only nominally tapped. Currently, its installed desalination capacity is a relatively modest 120 million gal per day from 44 facilities (Figure 1). This is equivalent to 135,000 acre-ft per year. Approximately 60% of that capacity—or 78,400 acre-ft per year—is from brackish groundwater sources; the rest is from surface brackish water sources. Recommended water management strategies in the 2012 State Water Plan would increase the total installed capacity by 309,782 acre-ft per year by the end of 2060.

In addition to the traditional availability of fresh and relatively

inexpensive water sources, other factors challenging the implementation of desalination projects include:

- Acceptance of the method as a cost-effective means of producing new water;
- Lack of source water data; and
- Disposal of concentrate or brine byproduct of water desalination processes.

Funding Challenges

Over the past decade, TWDB has led efforts to identify and address these challenges. Actions taken include funding feasibility, pilot plant and technology demonstration studies; procuring additional data about the brackish aquifers of the state; and conducting a series of outreach efforts to promote desalination. Since 2000, TWDB has awarded approximately \$7.1 million in grants for 30 desalination-related projects. Desalination-specific appropriations issued by the 78th, 79th and 80th Texas Legislatures contributed approximately \$4.2 million of the total funded

amount. Currently, TWDB lacks desalination-specific funding.

Although the types of projects that TWDB has funded cover a wide range of issues, in general, all of these projects are intended to address specific challenges of implementing desalination. All completed reports are announced and made available through the agency's newsletters, in professional conferences and via the Internet. Key categories of funded projects include:

- Guidelines for implementing desalination projects;
- Feasibility studies;
- Economics of desalination;
- Regional water facility planning studies;
- A database of desalination systems;
- Pilot plant studies;
- Resource characterization;
- Energy use optimization;
- Concentrate management;
- Alternative energy sources; and
- Technology demonstration projects.

Additionally, TWDB staff has sought funding and partnership opportunities to advance desalination issues. Examples of these efforts are current studies with the U.S. Bureau of Reclamation to pilot and assess the feasibility of variable salinity processes and, more recently, preparing guidance for rapid assessment and implementation of temporary emergency supplies using desalination. In 2010, TWDB teamed up with the San Antonio Water System, U.S. Bureau of Reclamation and

other stakeholders to hold a seminar on innovative water technologies that showcased many of the outcomes of TWDB's funded studies and desalination projects.

Public Awareness

All of these efforts have helped maintain and increase awareness of desalination statewide; however, the acceptance of desalination as an alternative source of new water supply needs to occur at the local level, by the entity and consumers who would benefit from these new water supplies.

Addressing local needs for objective information about long-term drought-proofing benefits of desalination requires facility planning studies and, in some cases, pilot plant and technology demonstration studies. Eleven of the 27 applications submitted in response to TWDB's last three requests for proposals for desalination demonstration projects corresponded to these types of studies. Providing financial assistance for these types of studies will remain a critical factor in assisting communities with desalination technologies and assessing the local benefits of desalination.

Source Water Studies

Easy access to source water data, specifically brackish groundwater data, is a big hurdle to implementing desalination projects. Given its complexity and cost, brackish aquifer characterization is particularly challenging for smaller utilities considering desalination.

For the past two years, TWDB has been obtaining, cataloging and analyzing thousands of well logs as part of a brackish groundwater characterization program. In September 2011, its staff completed a full characterization of the Pecos Valley Aquifer, determining an available volume of 85 million acre-ft of brackish groundwater. This report is now being considered by the city of Odessa, Texas and the Colorado River Municipal



RO membrane units and instrument panel at Laguna Madre Water District Seawater Desalination Pilot Plant

Water District in their planning for desalination water supplies.

Discharge Technologies

Although there are promising technologies being developed to aid in the management of desalination concentrate, the practical options remain for the foreseeable future: discharge into the surface body of a water or wastewater collection system, inject underground, evaporate or dispose in a land application. TWDB has played an important role in exploring and demonstrating cost-effective concentrate management options. Additional work is needed on the regulatory end to facilitate implementation of technically feasible and cost-effective options for brine disposal.

TWDB has led the Texas' effort to advance the development of desalination water supplies. Continued efforts to advance desalination in the state will require financial assistance for facility planning, pilot and technology demonstration studies, improving the knowledge of brackish aquifers in the state, and working with key stakeholders to address regulatory roadblocks to concentrate management. **MT**

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Figure 1. Texas Installed Municipal Desalination Capacity

