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TULAROSA BASIN NATIONAL DESALINATION RESEARCH FACILITY DESIGN AND CONSTRUCTION UPDATE

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BACKGROUND

Access to fresh water is an increasingly critical national and international issue. Demand for fresh water in many regions of the world has already outstripped supply. Saline and brackish waters constitute over 97 percent of the water in the world. Supplementing fresh water supplies through cost-effective “revolutionary” desalination technologies could provide significant relief to the limited fresh water resources in many parts of the world.

To address the development of the “next generation” of desalination technologies needed to realistically impact future fresh water supplies, a federal partnership between Sandia National Laboratories and the Bureau of Reclamation was established by Congress in 2001 to evaluate and coordinate the development of a brackish ground water desalination research facility in the Tularosa Basin of New Mexico. While significant efforts have been devoted to address coastal or seawater desalination issues, no facilities currently exist in the United States

to address the unique research needs, such as system performance and environmental impact, of desalination and effective utilization of brackish ground water in inland areas.

Therefore, the role of the Tularosa Basin desalination research facility is to become a national and international leader in the research, testing, evaluation, and demonstration of novel technologies for cost-effective ground water desalination and environmentally sound concentrate management.

ADVANTAGES OF THE TULAROSA BASIN

The ground water resources of the Tularosa Basin have been extensively studied for decades. The basin has extensive brackish ground water resources and has over 100 million acre-feet of recoverable brackish ground water. Within a 5-mile radius of several potential facility sites, water with salinity from 1000 ppm total dissolved solids (TDS), almost fresh water, to over 20,000 ppm TDS, almost as salty as sea water, is available. A wide range of water chemistries including sodium chloride, carbonate, and sulfate-based brine waters also exist in the basin.

The relatively easy access to these types of brackish ground water provides an opportunity to evaluate new desalination technologies over a wide range of water chemistries and water qualities in one location. Additionally, the Tularosa Basin is one of the world's leading areas of wind, solar, and geothermal energy enabling the assessment of renewable energies to help reduce future desalination energy needs, one of the biggest costs for inland desalination.

FACILITY STUDY DESIGN

An Executive Committee of water resource and desalination experts from around the country and large municipal water agencies from the Southwest was formed in January of 2002 to help guide in the evaluation of potential facility sites and identify the research attributes of the proposed desalination research facility. The conceptual facility design and location evaluations were focused on developing a facility to effectively conduct activities to support national and international research and education on inland brackish ground water desalination, concentrate management and reuse, and renewable energy research related to inland desalination.

Based on several evaluation criteria, including water availability, access to utilities, site costs, and

ability for future growth, a site in the southwest part of Alamogordo, New Mexico near the intersections of US Highway 70 to Las Cruces and US Highway 54 to El Paso was proposed for the research facility. The recommendations from the Executive Committee were published in a Facility Study Report to Congress in September 2002.

Based on that report, Congress appropriated initial funding to begin final design of the Tularosa Basin National Desalination Research Facility in January 2003. Laguna Construction was selected by the Bureau of Reclamation as the construction manager and general contractor for the desalination research facility. Laguna subcontracted with Malcolm Pirnie for the final design of the facility. As part of the facility design process, the Bureau of Reclamation established a facility design review team from their Denver office to oversee the detailed facility design. The Executive Committee also supported the final design efforts by providing overall feasibility and useability perspectives during the design review process.

The final design was started in June 2003, with two different major elements, the water supply system including wells, storage, and piping, and the facility design. Water well drilling started in October 2003 and was completed in March 2004. The 90 percent design review for the facility was completed in April 2004. Based on the final facility design and water supply well construction, the general facility capabilities include:

Facility Location Features

- Within Alamogordo city limits and near existing utilities,
- Site location for easy access to saline and brackish waters of 2000, 4000, and 6000 ppm TDS,
- Access to Alamogordo water reuse line for treated water utilization,
- 40-acre site to allow for future expansion and concentrate and renewable energy applications, and
- Good access and visibility from major highways.

Facility Design Features

- Five site wells providing approximately 400 gpm water capacity from different producing zones,
- About 16,000 square-foot building for desalination research, that includes:
 - 6 research bays for pilot-scale desalination testing at up to 30 gpm each,
 - Office space for operations staff and visiting

researchers,

- Control and conference rooms,
- Areas for bench-scale system testing,
- Water laboratory, and areas for equipment maintenance and chemical storage, and
- A resource and learning area for visitors
- Three large outdoor research pads for larger-scale desalination system testing,
- 4-5 acres for evaluation of renewable energy desalination applications,
- 4-5 acres for concentrate disposal and minimization,
- 4-5 acres of concentrate reuse for agricultural applications, and
- Site layout designed for self-guided visitor tours of all research areas.

FACILITY CONSTRUCTION AND OPERATIONAL SCHEDULE

The Groundbreaking for the Tularosa Basin National Desalination Research Facility took place on Tuesday, June 29th, 2004. Representatives from the Bureau of Reclamation, Sandia, Laguna Construction, the City of Alamogordo, and Senator Domenici's staff spoke at the ceremony. Figure 1 shows the groundbreaking event with local dignitaries. The groundbreaking drew almost 150 attendees representing a diverse group of organizations including state and federal water agencies, water utilities, government officials, and Executive Committee members.



Site construction is ongoing, with plans to have all utilities and outdoor test pads installed by January 2005. This will enable the facility to start testing a large portable desalination system in January 2005 that is being developed by the Office of Naval Research for possible expeditionary force applications. To meet the

needs of the Navy system, all the source water wells for the facility will be utilized. Testing of the Navy system should last for 3-4 months. The funding for the facility construction needed by the Navy for their operations and testing is currently in place.

Construction of the research facility building is scheduled to begin in October 2004 and will continue through approximately April 2005. Funding for this phase of the project is expected in Congress's 2005 budget appropriations. The possibility of an FY2005 continuing resolution may impact the expected April 2005 facility opening date. Initial facility operations will be provided through FY2005 as part of an expanded design/build/operate contract. Operations of the facility following the initial operational capability in FY2005 will be through an operations and management contract renewed on an approximately 5-10 year basis.