

Seminole Integrated Wind-Water Demonstration System

Progress Report for December 2011

Submitted to

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1.0 INTRODUCTION AND OVERVIEW

1.1 Scope and Content This progress report is submitted jointly to the Texas Department of Rural Affairs (TDRA) and to the Texas Water Development Board (TWDB). TDRA formerly was called the Office of Rural and Community Affairs (ORCA). The report is submitted as part of TDRA contract number 728082 and TWDB contract number 0804830832. In addition to project funding from the TDRA and the TWDB, major participants include the City of Seminole, Texas Tech University and the US Department of Energy through Texas Tech University. The project was initiated in April 2009, and the completion date is currently set at March 2013.

1.2 Project Description This project addresses the continuing depletion of the Ogallala aquifer, the current principal source of potable groundwater for much of west Texas and northward through Kansas. The approach is to access, lift, and purify brackish, much deeper water-bearing formations in the Santa Rosa of the Dockum group. On the basis of preliminary evidence, these formations are believed to occur in Gaines County at depths ranging from 1500 to 2000 ft. There may also be water-bearing strata between 600 and 800 ft.

The purification will be accomplished using reverse osmosis (RO). The electrical energy required for the well lift pumps and those of the RO system will be supplied principally by a grid-connected wind turbine. The purified water is to be utilized as part of the municipal water supply of Seminole, Texas, a community with a population of about 7,000. Seminole is located in Gaines County in the southern panhandle of West Texas bordering New Mexico. The results are expected to be applicable to many other arid and semi-arid regions as well.

The project encompasses the following broad tasks:

- 1) The siting, permitting, drilling and characterization of a well drilled into the Santa Rosa, including site acquisition, pre-drilling hydro-geological investigations, permitting, logging, well completion and test,
- 2) The design and construction of required infrastructure, including well completion, site preparation, foundations and civil works to support the wind turbine, RO system and other system elements,
- 3) Installation and commissioning of a wind turbine including the foundation, electrical infrastructure, and liaison with the local utility,
- 4) The procurement, installation and commissioning of a commercial reverse osmosis system, including necessary permits, civil structures, electrical work and piping,
- 5) The design, permitting and construction of an evaporation pond or other means for dealing with the concentrate from the RO system,
- 6) Operation and characterization of the integrated wind-water purification system for a period of 12 months, and
- 7) Documentation and reporting of project results and performance.

2.0 SUMMARY OF ACTIVITIES THIS PERIOD

2.1 Overview Collaboration between the City of Seminole, WRC and WiSE researchers, and engineering/management consultants continued, site infrastructure design was completed and put out for bid, and well installation neared completion.

2.2 Site Layout and Balance of System Design West Texas Consultants (WTC)

completed design of the site infrastructure for the demonstration project, including concentrate management through discharge to the City's wastewater treatment plant, which requires a sewer line and lift station to move the flow, and the building and associated amenities at the site. The lift station is being sized to allow it move both the produced permeate water and the concentrate to the Seminole wastewater treatment plant during the demonstration period. This capacity can also allow the City to eventually use it to move up to 50 gpm of concentrate if the RO capacity is expanded to 150 gpm, which was the steady flow rate maintained for most of the pump capacity test by the well driller. The final plans for the site, including the pad, building, tanks, and other appurtenances, were completed and put out for bid in late December. Bids are due in mid-January.

2.3 Wind Turbine Procurement and Site Preparation The turbine nacelle and blades were previously received in Seminole, and the lattice tower members were delivered in December. Construction is scheduled to take place in January 2012.

2.4 RO System Procurement The RO system and spare parts from Crane Environmental were received in Seminole in late December. The equipment will remain in storage at the City warehouse until the RO building is built, later in 2011. We are currently in communication with representatives from Crane about the logistical details of start-up of the RO system after installation. PSC will work with the City and WRC to get Texas Commission for Environmental Quality (TCEQ) approval for the demonstration project after the water sample results are determined from the Santa Rosa well. PSC is interacting directly with WTC for logistical details for the final sizing and placement of the RO building and associated piping and water storage issues, which are included in the site specifications mentioned above.

2.5 Santa Rosa Well Procurement West Texas Water Well Service (WTWWS), from Midland, Texas, completed most of the major components of the well installation by December. Cost savings relative to the original bid were gained by selection of a more readily available pump and motor combination thanks to the higher than expected water column in the well. PSC negotiated a small change order, using the savings from the pump purchase, in the contract to allow addition of a downhole pressure transducer/conductivity sensor/temperature sensor with datalogger to monitor water levels and gross water quality. As soon as the paperwork is complete for that change, WTWWS can complete the final steps.

2.6 Local Outreach Thanks to an invitation from Lori Barnes, manager of the Llano Estacado Underground Water Conservation District, Ken Rainwater was invited to make a presentation about the desalination project to a conference entitled "Innovative Farming: Integrating Limited Water Resources into Today's Farming" in Seminole on December 6. Several Gaines County farmers have either already drilled Santa Rosa wells or are considering the possibility, and Ken got to discuss the issues with them.

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