

Seminole Integrated Wind-Water Demonstration System

Progress Report for July 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 was recently extended to 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, and capitol purchases moved forward. The major current site event is the Santa Rosa well construction, which began in June and continued in July.

2.2 Site Layout and Balance of System Design

West Texas Consultants (WTC) continued work on the infrastructure for the demonstration project, including concentrate management through discharge to the City's wastewater treatment plant, which will require a sewer line and lift station to move the flow, and the building and associated amenities at the site. Ken Rainwater, Chad Tompkins of WTC, and representatives of Parkhill, Smith and Cooper (PSC) are communicating often to confirm these details and those associated with the wind turbine site preparation.

2.3 Wind Turbine Procurement and Site Preparation

The turbine nacelle and blades were previously received in Seminole. WTC completed the geotechnical work for the foundation design and submitted it to the City in late June. The lattice tower will soon be ordered from the manufacturer.

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. 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.

2.5 Santa Rosa Well Procurement

West Texas Water Well Service (WTWWS), from in Midland, Texas, arrived on-site on June 21 after the site was prepared with an access road and pad strong enough to hold the drilling rig and associated equipment. The 12.25-in surface casing was placed in an eventual 17.5-in hole to a depth of approximately 274 ft, terminating about 100 ft below the base of the Ogallala and the underlying Cretaceous layer. The surface casing was cemented on June 24. An 11-in hole was advanced below to a depth of 1683 ft by the end of June 30. The well was completed at a total depth of 1808 ft with a 7-in casing on July 8. Judy Reeves of Cirrus Associates was on site for all the June drilling to collect samples and advise her geologic log. Ken Rainwater of the WRC and Zane Edwards of PSC also visited the site. Geophysical gamma and neutron porosity logs were run on July 21 by E-P Wireline/Schlumberger. The logs were interpreted by Dr. Reeves of Cirrus and Dennis Powers, another geologist who consults with WTWWS on deep wells. The most promising zones were noted from 540-650 ft, 890-920 ft, and 1610-1770 ft. These zones were perforated on July 22, with two perforations shot per ft. Well development and pump testing were planned for early August. Dr. Rainwater discussed the well progress with the City Council on July 25.

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