

Seminole Integrated Wind-Water Demonstration System

Progress Report for April 2013

Submitted to

Texas Department of Agriculture
Att: Travis Brown
Tel 512-936-7878
PO Box 13231
Austin, TX 78711

Contract No. 728082

Texas Water Development Board
Att: Sanjeev Kalaswad
Tel 512-936-0838
PO Box 13231
Austin, TX 78711-3231

Contract No. 0804830832

Submitted by

City of Seminole
Att: Tommy Phillips, City Administrator
Tel 432-758-3676
302 South Main Street
Seminole, Texas 79360

May 10, 2013

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 originally set at March 2013. As of early February, 2013, the construction contracts at the site have been completed, such that the TDRA and TWDB contracts could financially end. Continuous operation and monitoring of the system will extend for a year beyond March, 2013, so that the seasonal behavior of the wind turbine energy generation can be observed and documented while the well and RO system also perform.

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 were 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. Our drilling and geophysical investigation found potentially productive zones at 540-650 ft, 890-920 ft, and 1610-1770 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 and WRC and WiSE researchers continued. During this month, the continuous operation of the well, wind, turbine, and RO system began with a successful 24-hr operation test starting on April 18, and the system ran successfully through the end of the month.

2.2 Site Construction West Texas Consultants (WTC) reported Tejas Partners' construction work as completed previously. A security fence has been ordered to surround the wind turbine, and that construction should happen next month.

2.3 Wind Turbine and Site Preparation The wind turbine became operational on March 6. After consultation with WTC and the City of Seminole staff, the WRC is working with Real-Time Automation of Hobbs, NM, to install a data-logging system to remotely track the electricity generation from the wind turbine and allow delivery of those data to the City's SCADA system and also through the internet.

2.4 RO System The City staff continued intermittent operation of the well and RO system during the first half of the month to keep its membranes and sensors viable for the later continuous operation. Keith Summerford of Crane Environmental came to Seminole for April 18 and 19 to perform final startup maintenance on the RO system in preparation for continuous operation. After checking the system and servicing several of the electronic sensor, Summerford started the 24-hr test period in the early afternoon of April 18. City staff Gary Duncan and Tommy Williams, as well as Ken Rainwater of the WRC were also in attendance for additional training from Summerford. After a few hours of adjustments, the flow conditions stabilized with approximately 38 to 40 gpm of permeate flow and 14 to 16 gpm of concentrate flow. The incoming raw water TDS settled at approximately 6500 mg/L, higher than the typical value 2000 mg/L during the short-term operations but very near the TDS level considered when the RO system was specified. The permeate TDS was approximately 400 mg/L. A silt density test indicated that the combination of the sand separator and the prefilters was protecting the RO membranes very well. Figure 1 below demonstrates the variations in depth to water and total dissolved solids (TDS) concentration recorded by the downhole Aqua Troll during the month of

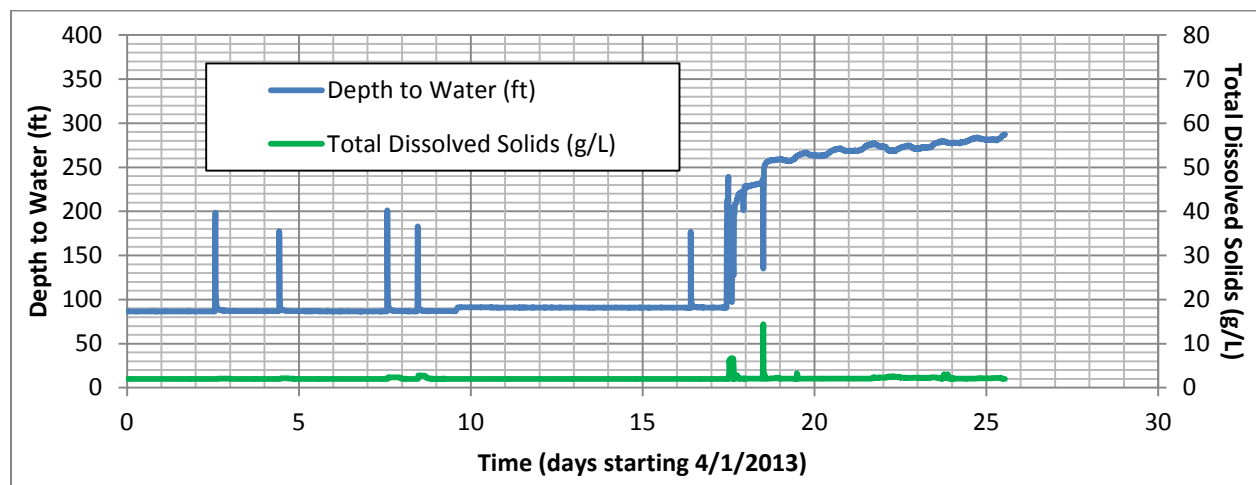


Figure 1. Depth to water and total dissolved solids variations from April 1 to April 26, 2013

Seminole Integrated Wind-Water Demonstration System Progress Report for April 2013

Apparently the sensor, which is above the pump, remains in the less brackish water in the shallowest part of the well, remaining stable at about 2000 mg/L after the flow and drawdown stabilized. The drawdown was oscillating somewhat and was approximately 190 ft at the end of the dataset plotted. The WRC is also working with Real-Time Automation to add a data collection system to monitor the digital data collected by the RO system and make it available through the City's SCADA system.

2.5 Santa Rosa Well The well pump and VFD worked well together, and the City staff was learning about the proper settings to work best with the RO system. Real-Time Automation will also set up data collection from the well's VFD to the City's SCADA system.

2.6 Local Outreach The kickoff workshop and media event is still being planned to explain the different aspects of the project for the local public and other interested parties. The WRC and WiSE staff will be contacting all contributing organizations for their interest and availability as the final date is confirmed.

Distribution:

Sanjeev Kalaswad, TWDB
Travis Brown, TDRA
Tommy Phillips, City of Seminole
Kay Howard, Howco
Pam Groce, SECO
Judy Reeves, Cirrus
Chad Tompkins, WTC
Zane Edwards, PSC

Leonard Nail, PSC
Amy Cook, TTU
Ken Rainwater, TTU
Phil Nash, TTU
John Schroeder, TTU
Lori Barnes, LEUWCD
Daniel Albus, PSC