Appendix C

Technical Memorandum

El Paso County Water Improvement District No. 1

Water Conservation Program

Aquifer Test Analysis for the Riverside Canal Improvement Project

Prepared for

United States Department of Interior

Bureau of Reclamation – El Paso, Texas

September 7, 2007

Prepared by:

Axiom-Blair Engineering, L.P.
P.O. Box 150069
Austin, TX 78715
(512) 394-1011

September 7, 2007

TABLE OF CONTENTS

1. Scope of Work

This technical memorandum was prepared to provide supplemental information regarding the characteristics of the shallow aquifer near the heading of the Riverside Canal at the request of the Bureau of Reclamation staff. No funds were available or budgeted for this work and as such the scope of the work was limited to a single test using hand measured data. An aquifer test was performed to estimate the transmissivity and storage coefficient of the aquifer (Boonstra 1999, and Driscoll 1987). Two existing irrigation wells were used in the test. Water was pumped from one well (CW6) for approximately 15 hours and the change in water level was observed in the other well (CW7). No water was pumped from the second well.

1.1. Location of Test

Figure 1 is a USGS map showing the location of the test wells. Figure 2 is an aerial photograph of the test area.

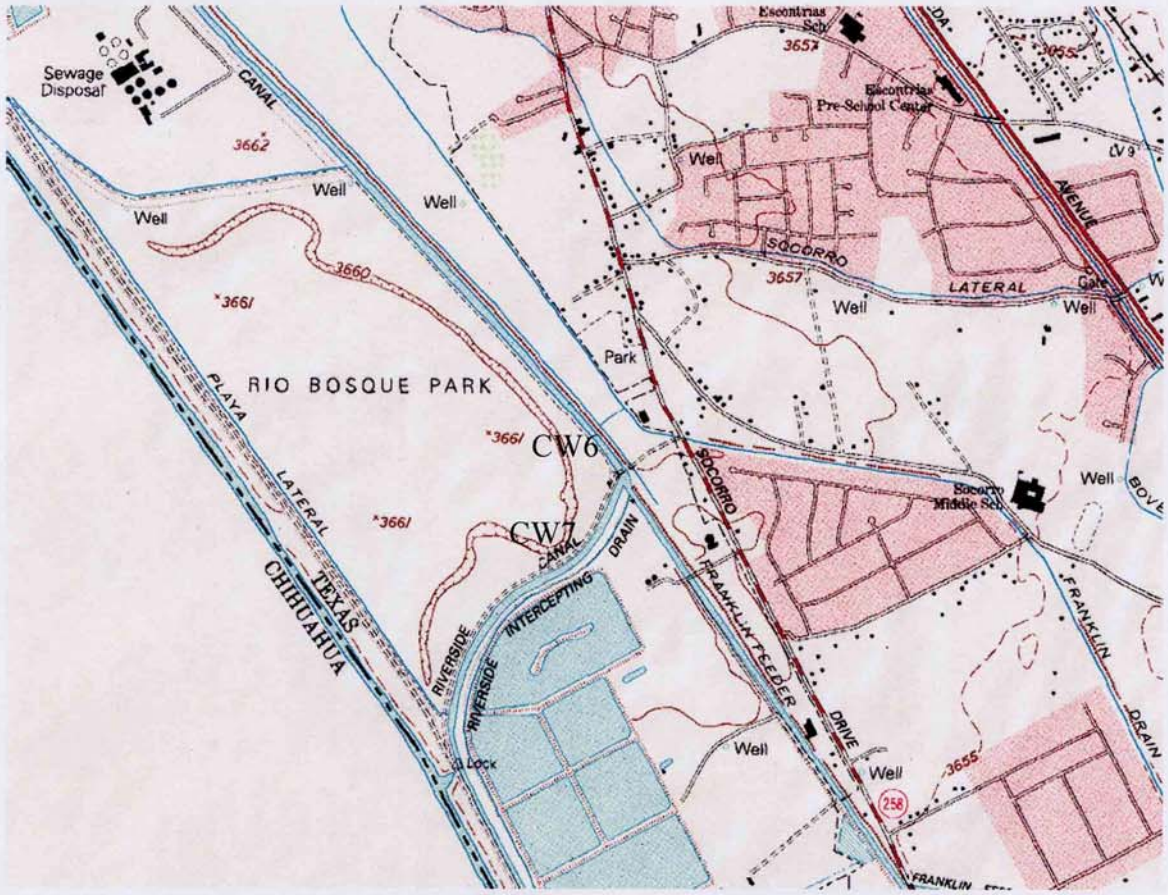


Figure 1 – USGS Topographic Map of Aquifer Test Area

Figure 2 – Aerial Photograph of Aquifer Test Area

1.2. Depth to Water Measurements

Table 1 list the depth to the groundwater surface measured from the top of the well casing. The estimated pumping rate was 750 gpm from Well CW6. At the start of the test the depth to groundwater was approximately 15 to 16 feet below the surrounding ground surface. After 15 hours of pumping, the measured draw down of the in well CW7 was 0.10 feet. Well CW7 is approximately 750 feet south of well CW6. After approximately 6 hours after the pumping was stopped, the water level in CW6 had recovered to 0.80 feet below the original water level.

The specific capacity of the well was approximately 28 gpm per foot of draw down. The total volume of water pumped was 675,000 gallons or 2.1 acre-feet.

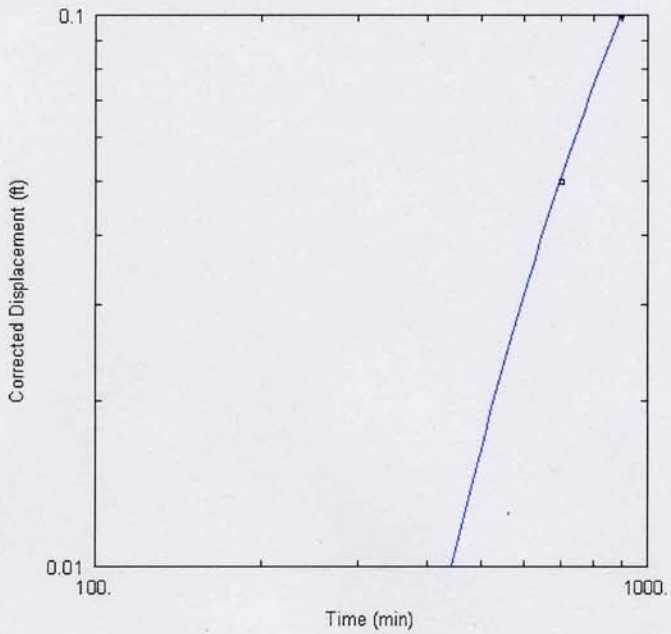
Table 1 : Depth to Groundwater

	Well ID	
Elapsed Time	CW6	CW7
minutes	feet	feet
0	17.50	18.70
5	43.00	
700	44.00	18.75
900	44.50	
905	23.00	
906	22.00	
912	21.50	
917	21.50	18.80
1245	18.30	

1.3. Analysis

Based on the measurements made during the draw down and recovery period of the aquifer test and the assumption that the shallow aquifer is unconfined, AQTESOLV, 2002, software estimated transmissivity is be 8,200 sq.ft/day and the specific yield of approximately 0.06 (see Figure 3). Alvarez (1980) reported transmissivity values of 4,010 sq.ft/day and specific yield of 0.15 to 0.20, and a saturated thickness of 190 feet. The hydraulic conductivity for these values is approximately 21 feet per day.

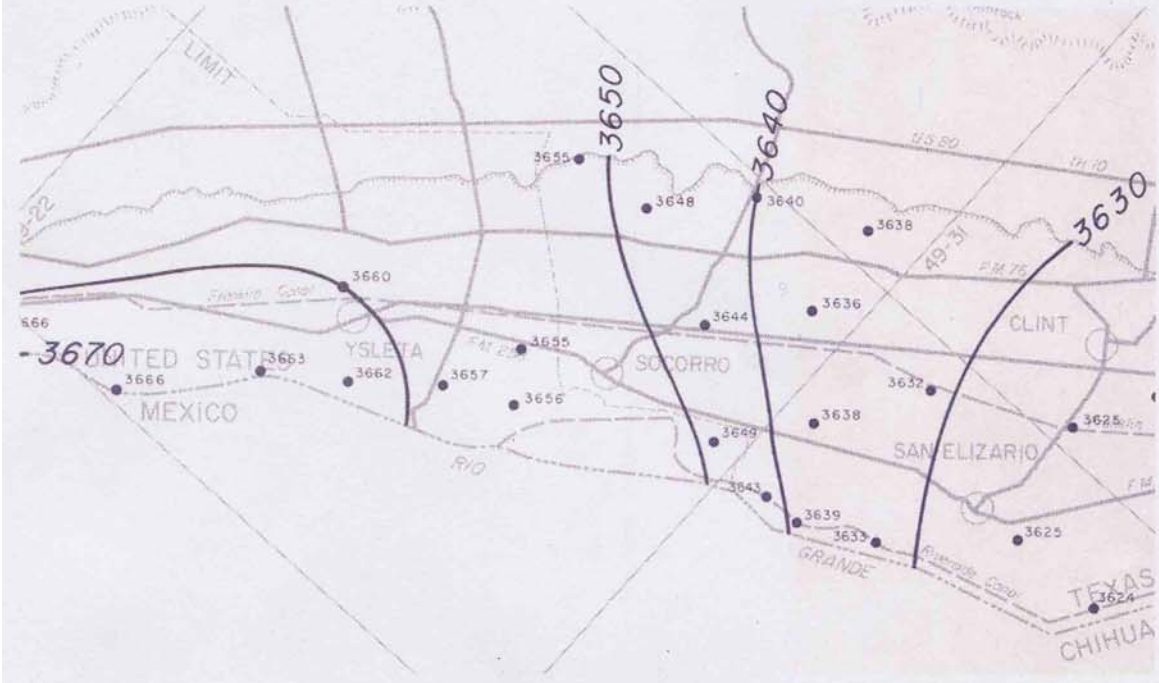
Figure 3 – Theis Curve for Well CW7



Alvarez reported a groundwater elevation in 1973 near the test area of approximately 3,650 feet or about 15 below the ground elevation of the Riverside Canal bank (see Figure 4). The current groundwater elevation is approximately the same as it was in 1973. This is because the shallow groundwater elevation is primarily controlled by the elevation of the water in the nearby agricultural drainage canal system. Any increase in the amount of water pumped in Texas and Mexico from the shallow aquifer or decrease in the amount of recharge from irrigation or canal seepage would have to be greater that the current drain flow to change the elevation of the groundwater. Furthermore, the high transmissivity of the aquifer allows water to readily flow horizontally from other locations to the recharge any loss due to a pumping well.

Van der Heijde's THWELLS computer program was used to simulate the pumping of 300 acre-feet of water per year from the test well during the primary irrigation season. The simulation results predicted a decline on the shallow aquifer at a distance of 2,500 feet from the irrigation well equal of approximately 1 foot after 122 days after pumping stopped (243 days of pumping and 122 days of recovery. The model assumed no recharge to the aquifer. If the flow in the nearby drains is greater than 300 acre-feet per year, then the groundwater removed by the well would be offset by similar reduction of flow in the drains. Also, any irrigation or other water applied to nearby lands would help reduce or stabilize the amount of decline cause by the pumping.

Figure 4 – 1973 Groundwater Elevations from Alvarez (1980)



2. References

Alvarez, Henry and Wayne Bucker, 1980, Report 246, Groundwater Development in the El Paso Region, Texas with Emphasis on the Resources of the Lower El Paso Valley, Texas Water Development Board.

AQTESOLV, 2002, Software User's Manual, Hydrosolve, Inc. Reston Virginia.

Boonstra, J., 1999, Well Hydraulics and Aquifer Tests, in J.W. Delleur (Ed.), The Handbook of Groundwater Engineering. Boca Raton, Florida: CRC.

Driscoll, F.G., 1987, Collection and Analysis of Pumping Test Data. in F.G. Driscoll (Ed.), Groundwater and Wells (pp 534-579). St. Paul, Minnesota: Johnson Division.

Van der Heijde, P.K.M., THWELLS, Image Well Analysis Software, International Groundwater Modeling Center, Colorado School of Mines, Golden, Colorado.