Description of aquifer tests for the South Nowlin well.

Single-well step-drawdown and constant-rate tests of the well were conducted by Carson Pump of Carson City. The well is located at 39º 1’ 17.7” N, 119º 45’ 15.4” W, and is completed in the basin-fill aquifer of Carson Valley, Nevada. Copies of the time-drawdown and pump data were obtained from files of the Douglas County, Community Development Department, Engineering Division (Carl Ruschmeyer, written commun., 2005).Results of the aquifer test will be used in the development of a numerical ground-water flow model in Carson Valley, project # 9705-BPS01. Specifically, the estimated transmissivity will be used to develop a relation between transmissivity and specific yield. The relation will then be used with data from driller’s logs to develop a preliminary distribution of transmissivity for the valley.

Rates for the step-drawdown test were varied from 250, 500, 750, and 1,100 GPM, measured with a totalizing meter, for periods of about 3 hours on 10/12/96. The pump rate for the constant-rate test varied from 950 to 800 GPM for a period of 24 hours from 10/13/96 to 10/14/96. The pump rate decreased from 950 to 800 GPM at 11AM on 10/13/96, causing a decrease in slope of the time-drawdown plot. For this reason, separate analyses of the data were made. The static water level prior to the constant-rate test was 3.7 ft lower than prior to the step-drawdown test, indicating the well had not completely recovered from the step-drawdown test on the previous day. The methods of water-level measurement, location of discharge of pumped water, and pre-test water-level trends are not known. Carson Pump reported the well had been idle for an extended period prior to testing, and the well was pumped for development for 3 hours on 10/10/96.

Time-drawdown data were analyzed using an Excel spreadsheet program (Halford and Kuniansky, 2002) for the constant-rate test. The step-drawdown data were analyzed by plotting the drawdown (s) divided by the discharge at each step (Q_{NSTEP}):

s/Q_{NSTEP} , against the summation of the log of elapsed time (t_i) since the beginning of each step multiplied by the change in discharge at the beginning of the step (Q_i), divided by the discharge of that step (Q_{NSTEP}):

$^{NSTEP}\Sigma_{i=1} (\mathrm{Log}(\Delta t_i)\Delta Q_i)/Q_{NSTEP}$, from Lee (1982).

Transmissivity (T) is estimated with a straight line fitted to the plots for each step and calculated by the equation:

$T = (2.3/4\pi)\ (1/m')$, where m’ is the slope of the fitted line (Halford and Kuniansky, 2002, p. 24).
Results of the analysis provide estimates of the hydraulic conductivity of the annular space between the well casing and face of the well bore ($K_{annular}$), and Skin, a term that combines the effects differences in hydraulic conductivity between the formation and the annulus, and the effective diameter of well bore damage (Halford and Kuniansky, 2002, p. 24).

The analysis of the constant-rate pump test resulted in fairly similar estimates of hydraulic conductivity ranging from 7.3 to 8.4 ft/day, and transmissivity ranging from 2,000 to 2,600 ft^2/day for time-drawdown plots of both the 800 and 950 GPM pump rates and the step-drawdown test. A well efficiency of over 100 percent was estimated using the 950 GPM data, suggesting results estimated from the 800 GPM data may be more reasonable.

References Cited

Halford K.J., and Kuniansky, E.L. 2002, Documentation of spreadsheets for the analysis of aquifer pumping and slug test data: U.S. Geological Survey Open-File Report 02-197, 54 p.

Lee, John, 1982, Well testing: Society of Petroleum Engineers of AIME: New York, 159 p.