Description of aquifer tests for the South Clapham 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 2’ 5.7” N, 119º 44’ 0.1” 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 150, to 300, and 450 GPM, measured with a totalizing meter, for periods of about 3 hours on 9/16/96. The pump rate for the constant-rate test was 200 GPM for a period of 6 hours on 9/20/96. The static water level prior to the constant-rate test was 0.1 ft greater than that prior to the step-drawdown test, indicating the well had completely recovered from the step-drawdown test four days prior, and little effects of long-term water-level changes. The method of water-level measurement is not known. The discharge of pumped water was through a 200 ft hose to a nearby ditch. The well was reported completed on sometime in 1978, and it is assumed the well was in use during the 18-year period prior to testing. Carson Pump reported entrained air in the discharge, indicating the upper perforations of the well screen were exposed during testing.

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}):

$^{NSTEP}\Sigma_{i=1} (Log(\Delta t_i)\Delta Q_i)/Q_{NSTEP}$, 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 step-drawdown test resulted in estimates of hydraulic conductivity and transmissivity, respectively, of 7 ft/day and 2,000 ft^2/day. The analysis of the constant-rate test resulted in estimates of hydraulic conductivity and transmissivity, respectively, of 5 ft/day and 1,800 ft^2/day. It is uncertain which value 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.