Johnson and Koning, 2005 -- Proceedings of the 4th Annual Española Basin Workshop, Santa Fe, New Mexico, March 1-3, 2005: U.S. Geological Survey Open-File Report 2005-1130, p. 8.

AN UPDATE OF HYDROGEOLOGIC CONDITIONS IN THE SOUTHERN ESPAÑOLA BASIN

JOHNSON, Peggy S., and KONING, Daniel J. N.M. Bureau of Geology and Mineral Resources, 801 Leroy Pl., Socorro, NM 87801 peggy@gis.nmt.edu Results of hydrogeologic studies by the New Mexico Bureau of Geology, the New Mexico Office of the State Engineer, and Santa Fe

County provide an update of hydrologic conditions, water level changes, and hydrogeologic properties in the Santa Fe embayment of the southern Espanola Basin. Data collection has two aspects: 1) the compilation and collection of water level and aquifer test data; 2) geologic mapping of faults and other structures in addition to the gross texture and composition of the basin fill. The geologic mapping has been compiled at a scale of 1:50,000 and includes the Tesuque and Ancha Formations of the Santa Fe Group, from which the City of Santa Fe obtains most of its groundwater. Results will provide improvements to groundwater flow models for water rights administration and well field assessments. Interpretation of water level data demonstrates trends in water level changes and defines zones of influence surrounding large pumping centers. Combining detailed mapping of faults, USGS aeromagnetic data, and expanded water level measurements improves understanding of geologic controls on groundwater flow and well-field drawdown. The San Isidro fault and associated fault splays that deform ancestral Santa Fe River sediments in the Tesuque Formation west of the City appear to compartmentalize drawdowns from the City of Santa Fe well field and produce a strong hydraulic gradient across the fault. The gradient anomaly associated with the fault does not appear to extend north into finer-grained facies of the Tesuque Formation, but does extend south for a short distance, affecting water levels in coarse-grained Tesuque and Ancha wells. An elliptical shaped zone of influence surrounding the City well field may also result from west-dipping beds that concentrate drawdown along strike in a north-south trend. Water-level declines associated with the pumping center appear to extend north to Tano Road and south beyond Arroyo Hondo. A hydrogeologic model, constructed using lithosome-based geologic mapping and aquifer (pump) tests, relates aquifer properties to spatial trends in gross basin fill texture and depositional facies. Percentile plots of hydraulic conductivity (derived from aquifer tests), sorted by lithosome and textural units, provide unit-specific conductivity values to about one order of magnitude. Units dominated by small-scale heterogeneity show the greatest range in hydraulic conductivity, up to 2 orders of magnitude. Units dominated by relatively coarse-grained, homogeneous channel deposits indicate hydraulic conductivities ranging over less than one-half order of magnitude. Increased variability appears to be imprinted on some units due to secondary factors such as increased cementation and either fracturing or grain-size reduction associated with faults. The total range in conductivity values for Tesuque and Ancha Formation sediments is estimated at 0.04 to 160 ft/d. Products of this collaborative study include a series of geologic and hydrologic maps, a database of well, water level, and aquifer test data from both historic compilations and new data collection, and a new water-level monitoring network for the greater Santa Fe area.