Effects of lateral and vertical heterogeneity in the Yeso Formation on the regional hydrogeology in the Sacramento Mountains (abs.)

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During the spring of 2009, four shallow wells with total depths from 80 to 420 feet were drilled on private property along James Canyon, located approximately 6 miles east of Cloudcroft, in southeastern New Mexico. Three of these wells were drilled as monitoring wells as part of the Sacramento Mountains Watershed Study being done by the New Mexico Bureau of Geology and Mineral Resources. All 4 wells were located within 2.5 miles of each other. Water level elevations in the monitoring wells range from 7102 to 7916 feet above sea level, with the shallowest depths to water at higher elevations and deeper water at lower elevations. During drilling, well cuttings were collected at ten-foot intervals and stratigraphic columns at each well site constructed, in order to attempt local correlations between wells. This well series demonstrates the regional and local heterogeneity of the Yeso Formation, both laterally and vertically. No direct bed-to-bed correlations could be made among any of the four wells. In fact, the four wells do not exhibit the same lithology, even where they overlap one another, despite their relative geographic proximity. However, tentative correlations between the wells and a deep well drilled in Cloudcroft in 2006 can be made using transgressive/regressive cycles identified in the stratigraphic columns. These tentative correlations suggest at least six transgressive events occurred in southeastern New Mexico during the Permian.

The extreme lateral heterogeneity observed in the Yeso Formation is apparently a result of local sea level changes during the time of deposition, in addition to dissolution collapse due to hydration and dehydration of salts and formation of karst features in the upper Yeso Formation. The effects of this lithologic heterogeneity combined with regional fracture systems on the local and regional hydrogeology is apparent by the high variability of water level elevations observed in three of the four wells. It is likely that the four wells are tapping four different saturated waterbearing zones. The relatively shallow water bearing zones found at the higher elevation wells probably represent different perched aquifer systems at different stratigraphic levels. The deeper groundwater encountered in the lowest elevation well may represent a more regional aquifer system.

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