GEOHYDROLOGIC INVESTIGATION OF THE SOUTHERN CHUPADERA MOUNTAINS AREA: AVAILABILITY AND SUSTAINABILITY OF WATER SUPPLIES FOR DOMESTIC USE

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The geology and hydrology of the southern Chupadera Mountains and the basin immediately west were investigated as part of a water availability assessment for subdivision water supply. The study area includes the bajada on the southeast margin of the Magdalena Mountains, and the south side of the Chupaderas above the Rio Grande valley floor near San Marcial in Socorro County, New Mexico.

More than 21,000 acres (33 sections) were evaluated for over 800 twenty-plus-acre homesites in three phases. After three initial exploratory boreholes were advanced, eight wells were drilled and tested in alluvium and Santa Fe Group materials in the bajada, and seven wells in the tuffs and volcanoclastic materials of the southern Chupaderas. A number of existing wells were also pump-tested and sampled. Test data were integrated with geologic maps, satellite imagery, and literature research to develop a comprehensive picture of the area’s hydrogeology. Areas unsuitable for subdividing into lots based on hydrologic factors were excluded from the final layout plans and totaled several thousand acres.

Results show a surprising subsurface complexity beneath the veneer of alluvium covering the bajada. The basement configuration consists of en echelon fault blocks, overlain by Santa Fe Group sedimentary materials interbedded with tuffs and rhyolites. Transmissivity of the basinfill materials averages about 650 ft²/day (square feet per day) for domestic wells that tap the aquifer. Wells completed in interbedded volcanics have similar transmissivity values, averaging 570 ft²/day. Expected yields are 5 to 10 gpm (gallons per minute), and water quality is generally excellent.

The hydrology of the Chupadera Mountains, by contrast, is dominated by the distribution of fractured volcanic materials (the La Jencia and Lemitar tuffs) lying atop relatively impermeable volcanoclastic materials (clay-rich Spears Group). Transmissivity in the main aquifer zone averages about 17,250 ft²/day, indicating much higher production (greater than 50 gpm). Outside of the main aquifer zone, transmissivity drops to less than 10 ft²/day and well yields are marginal. Water quality is excellent in the main aquifer zone, with no dissolved arsenic problems encountered.

Aquifer test results were used in site-specific Theis calculations and/or MODFLOW groundwater flow models to predict the future drawdown effects of withdrawals for water supply. The results indicate that drawdowns are minimal due to low lot density and good aquifer transmissivity. Calculations show that projected water use can be sustained by aquifer storage for 200 to 300 years at the project locations. The total projected water use in the area is close to 500 AFY (acre-feet per year) or about 20% of published regional recharge estimates to the Rio Grande valley in this area, suggesting that the local water supply could be sustained indefinitely.

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