Contrasts in Water Quality From Paired Domestic and Public-Supply Wells in the Ogallala Formation, Kansas, Oklahoma, and Texas

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ABSTRACT

Closely located domestic and public-supply wells completed in the Ogallala Formation aquifer in parts of Kansas, Oklahoma, and Texas were sampled using identical sampling protocols to allow comparison of water quality associated with well type. The median distance between paired wells was 2.55 miles. Paired wells had highly similar land-use settings. The depth of the screened intervals in paired domestic and public-supply wells generally overlapped; however, public-supply wells commonly are pumped at 400-900 gallons per minute compared to 5-10 gallons per minute for a domestic well. Fifteen pairs of wells were sampled for more than 200 water-quality constituents. Water-quality results for naturally derived constituents (major ions, trace elements, radon) were highly correlated, as indicated by statistically significant duplication between paired analyses. Differences in water quality between paired wells were observed for selected anthropogenic compounds derived at the land surface (pesticides, tritium), indicating that some public-supply wells produced water that was more recently recharged and had been more greatly influenced by surface activities. The relatively deep water table (median depth to water 196 feet) in this regional aquifer and the fact that well screens usually begin several tens of feet below the water table suggests that undisturbed water in the interval of the well screens is probably older recharge and not as likely to be influenced by land-surface activities. The presence of recently recharged water and anthropogenic compounds in some public-supply wells was likely due to operational variations (pumping rate and pumping cycles), as demonstrated in a particle-tracking simulation, where water containing surface-derived anthropogenic compounds from near the water table was more quickly drawn to high volume public-supply wells due to larger capture zones and greater drawdown. These findings indicate that water-quality samples collected from different well types in the same

area are not necessarily directly comparable and that drinking-water monitoring programs designed around one well type cannot always be used to infer source-water quality for other types of water production systems.