Structure, Stratigraphy, and Heterogeneity of the Gulf Coast Aquifer, Brazos River to Rio Grande, Texas

Knox, Paul R.[1]; Young, Steven C.[2] (1) Baer Engineering and Environmental Consulting, Inc., Austin, TX. (2) URS Corporation, Austin, TX.

The Gulf Coast Aquifer is one of the most significant aquifers of Texas. The increasing pressure on this resource requires a new generation of numerical Groundwater Availability Model (GAM). A geophysical well-log-based stratigraphic study of 457 wells from the Brazos River south to Rio Grande was undertaken to produce a chronostratigraphically based earth model for the GAM that would provide an accurate aquifer architecture which groups depositionally contiguous, and thus hydraulically communicating, aquifer regions. A four-fold lithologic classification provided sand thickness and sand percent data for mapping and facies interpretation of each of the nine intervals correlated. Outcrop geology and age control from micropaleontologic data in downdip wells clarified onlapping, erosional, and subcropping contacts.

The lowermost unit of the Gulf Coast Aquifer is the dominantly early Miocene-age Jasper Aquifer, composed of the Catahoula, Oakville, and lowermost Lagarto Formations. Highstand fluvial/deltaic facies at the outcrop pass basinward into shelf/floodplain shales, which, in turn, pass into lowstand wave modified to wave-dominated deltaic facies. The overlying early to middle Miocene Burkeville Confining System is here taken as the middle unit of the Lagarto Formation. A laterally extensive shelf facies spans coastal counties and is locally interrupted by fluvial/deltaic facies which link highstand and lowstand depocenters. The overlying middle- to late-Miocene age Evangeline Aquifer includes the upper part of the Lagarto Formation and the lower and upper units of the Goliad formation. The Goliad outcrop covers underlying Gulf Coast Aquifer units in south Texas through erosion and onlap. Depositional patterns in the lower two layers are similar to those of the middle Lagarto, but areas of shelf shales step successively landward and locally serve to complement the confining capabilities of the Burkeville. Pprimary aquifer facies in the Evangeline are highstand fluvial/deltaic sands in the upper Goliad that extend from the outcrop area downdip, nearly to the modern coast. The overlying late Miocene to Pleistocene age Chicot Aquifer includes the Willis, Lissie, and Beaumont Formations. The Willis covers Goliad outcrops north of the SanMarcos arch and is in turn covered by the Lissie south of the arch. Extensive fluvial/deltaic facies downdip from outcrops, except in South Texas, account for the high quality of this aquifer.