Southern Gulf Coast Aquifer Characterization:  Foundation

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EXTENDED ABSTRACT

The Gulf Coast Aquifer of Texas includes sand and clay units ranging in age from Oligocene (Catahoula Formation) to Pleistocene (Beaumont Formation). It covers an area of almost 42,000 square miles and spans the Texas coastal plain from Louisiana to Mexico, extending inland from the Texas coast approximately 80 miles. It is the most important aquifer in Texas, underlying numerous residential, commercial, agricultural, and industrial water users. Its resources are not infinite, as demonstrated by land surface subsidence in the Houston area.

An updated geologic interpretation of aquifer structure is being developed for the southern half of the Gulf Coast Aquifer extending from the Brazos River to the Rio Grande. In preparation, a two-year effort was focused on collecting and analyzing geophysical logs. The resulting new database offers several advantages over the currently available Source Water Aquifer Program (SWAP) database. It is more detailed and comprehensive, containing over 850 wells (both water and oil & gas) with unique API (American Petroleum Institute) numbers, digital locations, well header data, scan images of geophysical logs from all wells, and digitized log curves for over 400 wells. This new database uses a systematic methodology that ensures: (1) reproducible results; (2) easy public review of data and interpretations; and, consequently, (3) the capability for results to be easily reviewed and augmented by future investigators.

Likewise, the study approach provides: (1) overlap and integration with recent studies of adjacent aquifers; (2) consistency with a chronostratigraphic framework that best reflects internal aquifer architecture; and (3) translation between common subsurface chronostratigraphic nomenclature, long-standing aquifer nomenclature, and established outcrop formation nomenclature.

The framework for the stratigraphic aquifer characterization consists of more than 20 dip-oriented and four strike-oriented cross sections (Fig. 1). Cross-section locations and identification schemes are intended to be consistent with a pattern established in a study of the adjacent and updip Yegua-Jackson Aquifer.

The traditional aquifers within the overall Gulf Coast Aquifer, the Chicot, Evangeline, and Jasper, will be subdivided into two to three chronostratigraphic units each. For each of these chronostratigraphic units, sand-thickness and depositional-facies maps will be created. This will yield vertical resolution of aquifer properties that is about two-to three-fold greater than previous aquifer realizations. This increased resolution is a significant step forward in understanding the structure of the Gulf Coast Aquifer and will allow more accurate evaluation of groundwater resources through construction of detailed groundwater availability models.