

Reservoir Characterization of the Chicot Aquifer in Acadia Parish, Louisiana

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Abstract

Rapid urban growth and increased use of ground water for agriculture and industry has brought the issue of aquifer sustainability to the forefront in many areas of the country and throughout the world. A drought season in 1998 resulted in farmers finding salt water flowing in their fresh water wells in some coastal areas of Louisiana. The Louisiana Legislature subsequently formed a water commission and advisory group to address the water issues of the state. The Louisiana Geological Survey is conducting a reservoir characterization and modeling study of the Chicot Aquifer system. The study is starting in the Acadia Parish area as part of a general plan to develop a digital 3-D model of the Chicot Aquifer stratigraphy. This 3-D model will ultimately become the stratigraphic element of a Telescopic Mesh Resolution (TMR) model within a MODFLOW model developed by the U.S. Geological Survey (Nyman, 1990).

Oil, gas, and water well electric logs and drillers' logs were used to identify the different stratigraphic and hydrochemical facies of the Chicot Aquifer in Acadia Parish (i.e. top of the Chicot, the clay layer separating Upper and Lower Chicot, the fresh water/salt water interface, and the base of the Chicot Aquifer). An approximate position of the base of the fresh water was determined from the resistivity curve with 40 ohms as the cut-off point. The fresh water/salt water interface, or the beginning of the transition zone into more saline water, was shown by the significant reduction in resistivity displayed on the electric logs. The Evangeline Aquifer in Acadia Parish, which is located just below the Chicot and contains no fresh water, provides an identifying log response that aids in determining the base of the Chicot Aquifer system.

A total of 3 structure contour maps, 3 isopachs, and 7 cross sections were developed from the correlation and interpretation of the electric logs used in the study. Throughout the study area the Chicot Aquifer, early Pleistocene age, overlies the late Pliocene age Evangeline Aquifer. The top of the Chicot Aquifer is fairly uniform with a depth ranging from less than 25 feet below ground surface (BGS) to a maximum of 137 feet BGS in Acadia Parish. The base of the Chicot Aquifer has been mapped at a maximum depth of 1,376 feet BGS in the southern part of the parish, and as shallow as 540 feet BGS in the northern part of the parish. The structure contour maps developed for the study suggest the presence of structural features believed to be associated with regional faulting and radial faulting associated with salt domes. The clay dividing the Upper and Lower Chicot units is not laterally continuous. This dividing clay is found between approximately 300 to 500 feet BGS and averages only 17 feet thick. It ranges from zero to 87 feet thick and dips to the South. The fresh water/salt water interface was found to begin as shallow as 415 feet BGS in the northwestern part of Acadia Parish and at a maximum depth of 1,115 feet BGS in the center of Acadia Parish north of the city of Crowley, Louisiana.

Reference

Nyman, D.J., K.J. Halford, and A. Martin, Jr., 1990, Geohydrology and Simulation of Flow in the Chicot Aquifer System of Southwestern Louisiana: U.S. Geological Survey, Water Resources Technical Report No. 50, 58 p.