BACKGROUND

This fact sheet is one in a series presenting results of test-drilling activities conducted as part of the Maryland Coastal Plain Aquifer Study to fill key data gaps. The test wells will help to better understand the structure, flow system, water-bearing properties, and natural water quality of the Aquia-Hornerstown, Miocene-age, and Manokin aquifers on the Eastern Shore of Maryland. In addition, the test wells will provide long-term water-level monitoring for resource management assessment, and flow-model calibration. The Maryland Coastal Plain Aquifer Study is a long-term, multi-phase initiative for comprehensive regional aquifer assessment developed in response to recommendations of the 2004 Maryland Advisory Committee on the Management and Protection of the State's Water Resources (Wolman Commission). The study is being conducted by the Maryland Geological Survey and the U.S. Geological Survey, with funding support from the Maryland Department of the Environment.

Points of interest:

CALVERT AQUIFER SYSTEM

- Sands are fine-grained, muddy, and contain abundant weathered shell material
- Relatively low transmissivity
- Little or no hydraulic connection between sands

Calvert Aquifer System Test Wells

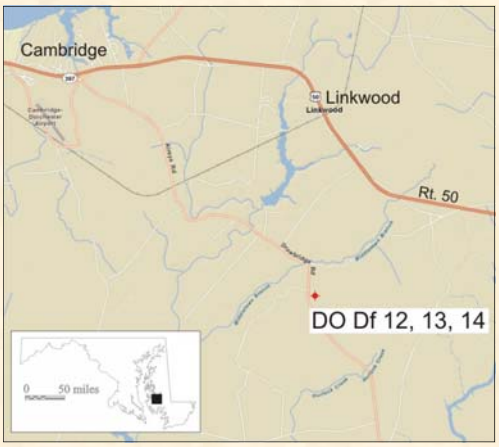
DO Df 12, 13, and 14 located at the Warner Tract, Chesapeake Forest Lands, Dorchester County, Maryland

MARYLAND GEOLOGICAL SURVEY **2010**

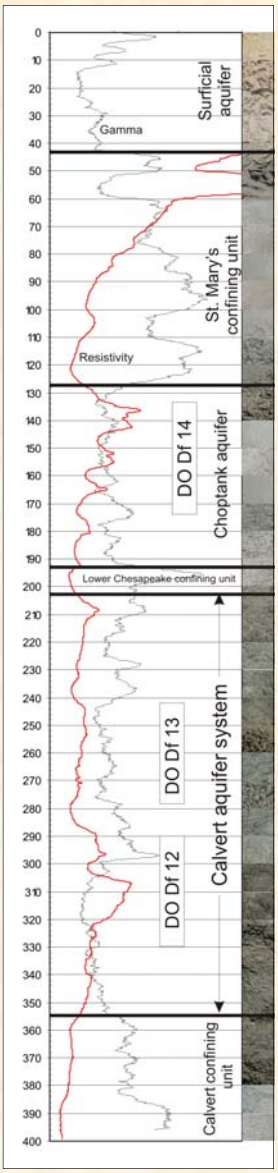
The Miocene-age Calvert aquifer system is an important water supply in the central Eastern Shore counties of Dorchester, Caroline, and Talbot, Maryland, as well as central Delaware. The Calvert aquifer system includes (from shallow to deep) the Frederica, Federalsburg, and Cheswold aquifers. These aquifers, more prevalent in Delaware, were described and mapped in Maryland by Cushing, Kantrowitz , and Taylor (1973); however, the borehole correlations and hydraulic properties were not thoroughly documented. No subsequent studies of the Calvert aquifer system have been conducted in Maryland. It is uncertain whether these units act as independent aquifers or as a single hydraulic unit, and whether they correlate with units mapped in Delaware. These considerations are important in determining whether the Maryland Department of the Environment groundwater appropriations should be issued for three individual aquifers or for a single composite aquifer. Test wells are needed to assess the hydraulic characteristics of the Calvert aquifer system, and to determine the connectivity of the individual units. Additionally, observation wells are needed to help determine hydraulic continuity of individual aquifer units, monitor water-level trends, and estimate available drawdown. The Warner Tract test site is one of five drilled in central Eastern Shore of Maryland as part of a systematic investigation of the Calvert aquifer system.

Well Construction and Testing

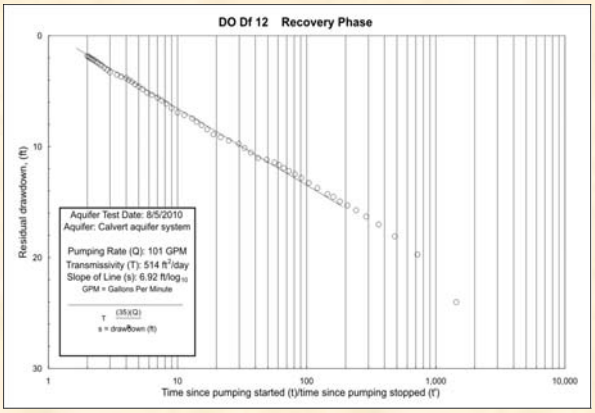
Test wells DO Df 12, 13,and 14 were drilled between July 21 and 29, 2010 to depths of 400, 280, and 180 feet, respectively. Drill cuttings were collected at 10-ft intervals, three split-spoon samples were collected, and gross lithologic descriptions were made. Geophysical logs (gamma radiation, 16- and 64-inch resistivity, single-point resistivity, self-potential, and 6-ft lateral) were run in the open hole by the U.S. Geological Survey Maryland Water Science Center. The holes were reamed to 9 5/8-inch diameter and well screens (4.5-inch diameter SDR-17 PVC; 0.02-inch slot) were installed from 290 to 330 ft in DO Df 12, 242 to 272 ft in DO Df 13, and 134 to 174 ft in DO Df 14. All wells include 5-ft cellars. The wells were cased to the surface with 4.5-inch SDR-17 PVC pipe. The wells were completed with steel protective casings and locking caps.



The deepest test well penetrated (from top to bottom) the Surficial aquifer, the St. Mary's confining unit, the Choptank aquifer, the Lower Chesapeake confining unit, the Calvert aquifer system, and part of the Calvert confining unit. DO Df 14 was screened in the Choptank aquifer, which at the test site consists of fine, silty sand with abundant weathered shell material. The uppermost sand of the Calvert aquifer system was not screened, as it was too fine-grained to be productive. DO Df 13 was screened in the middle sand of the Calvert aquifer system, which consisted of very fine, silty sand. DO Df 12 was screened in the lowermost sand of the Calvert aquifer system, which consisted of fine-grained marine sand with shell fragments.



The completed wells were airlifted to remove drilling fluid and to develop the well screens. DO Df 13 could not produce enough water to be properly developed and tested. Twenty-four hour aquifer tests were conducted on DO Df 12 and 14 at constant rates of 101 gallons per minute (gpm) and 8.6 gpm, respectively. During each test, there was little or no observable change in water levels in the observation wells as a result of pumping from the test well. Transmissivities calculated by the Cooper-Jacob method for the recovery phase of the tests were 514 ft^2/day for DO Df 12 and 28 ft^2/day for DO Df 14.



Water samples from DO Df 12 and DO Df 14 were collected during the aquifer tests and are being analyzed for major ions, nutrients, metals, and radionuclides. The specific conductance, pH, and alkalinity measured in the field were 1153 microsiemens per centimeter, 8.0, and 378 mg/L, respectively for DO Df 12. The specific conductance, pH, and were 1300 microsiemens per centimeter, 7.8, and 379 mg/L, respectively for DO Df 14.

Links to ongoing water level measurements in the USGS database: DO Df 12, DO Df 13, DO Df 14

Reference:

Cushing, E.M., Kantrowitz, I.H., and Taylor, K.R., 1973, Water Resources of the Delmarva Peninsula: U.S. Geological Survey Professional Paper 822, 58 p.