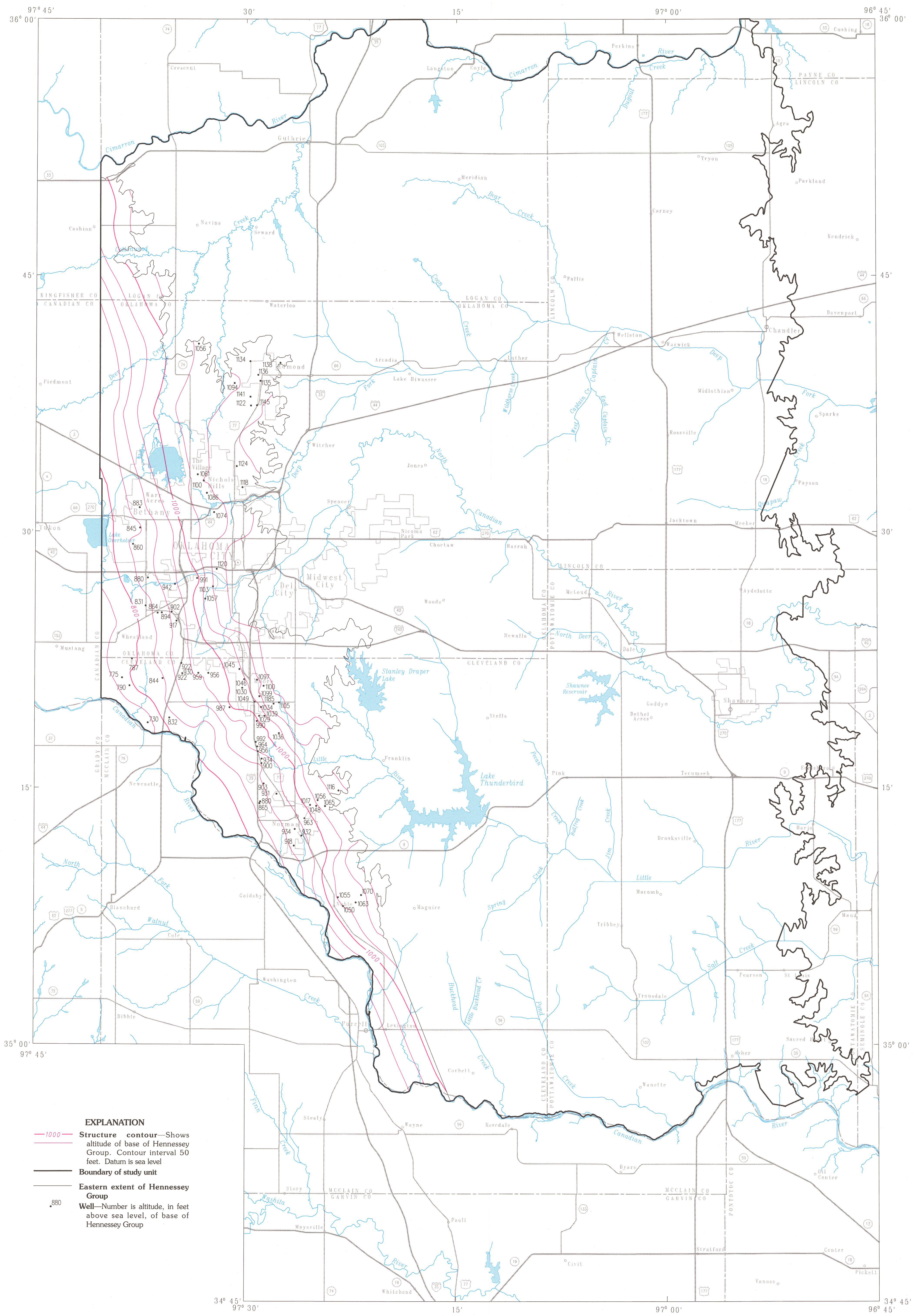

Figure 6. Altitude of the base of the Hennessey Group

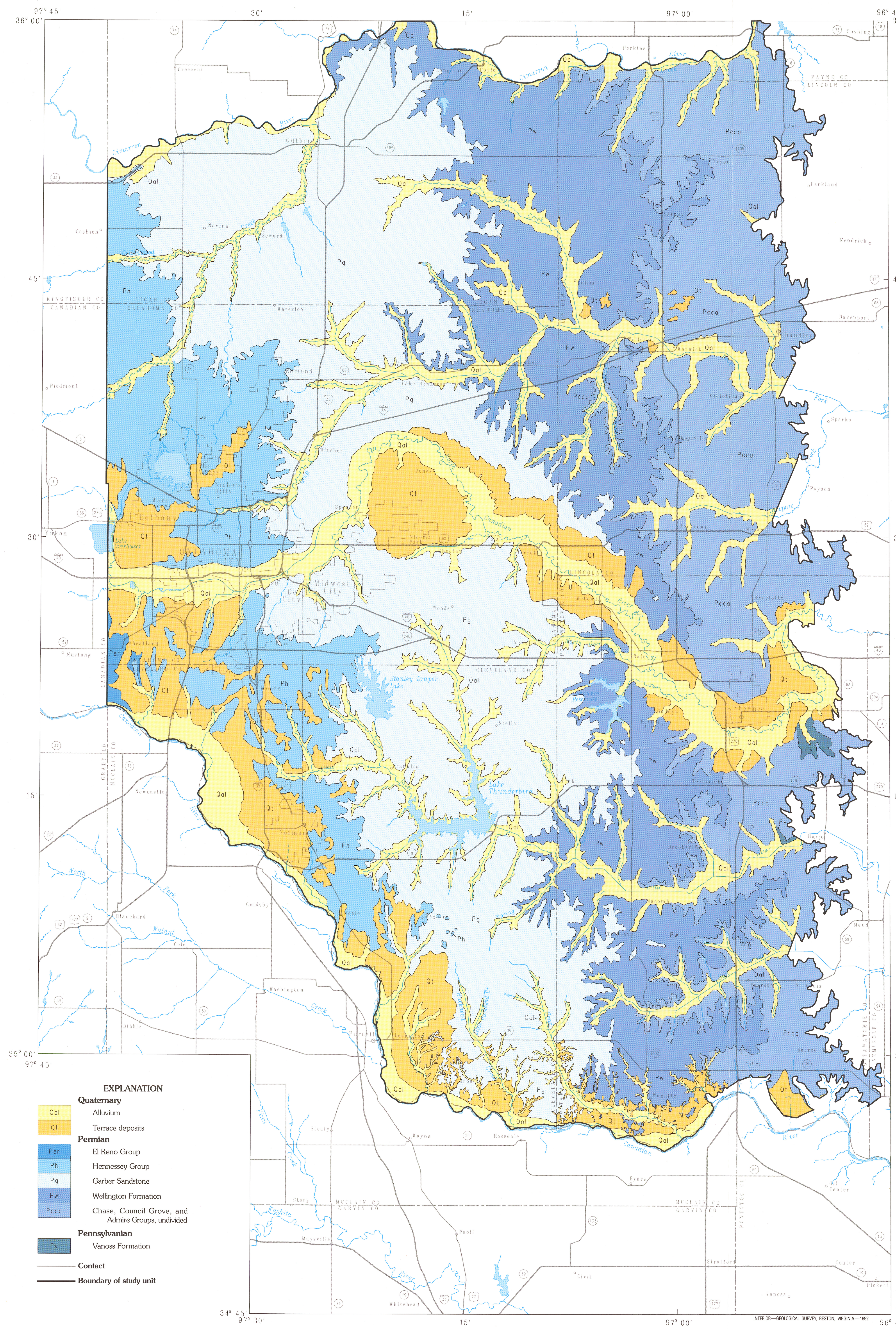

Figure 7. Surficial geology of the Central Oklahoma aquifer study unit

Geology modified from Bingham and Moore (1975), and Hart (1974)

Vanoss Formation

The Vanoss Formation is the only Pennsylvanian-age geologic unit in the study unit and is the oldest geologic unit considered in this report. The Vanoss Formation underlies the Chase, Council Grove, and Admire Groups and crops out along the eastern boundary of the study unit. The Vanoss Formation consists mainly of shale and a few thin, fine-grained sandstone beds. The Vanoss Formation generally does not yield substantial volumes of water to wells and is considered to be a confining unit. The Vanoss Formation is not considered to be part of the Central Oklahoma aquifer but is discussed in this report because it confines the Central Oklahoma aquifer and it crops out within the study unit.

Potentiometric Surface

A potentiometric surface is defined by the levels to which water will rise in tightly cased wells. However, in a region of an aquifer with significant vertical flow, different water levels can be measured in wells at the same location but completed at different depths. Thus, no single potentiometric surface can be mapped to represent the three-dimensional distribution of head in an aquifer with vertical flow. Potentiometric head in the Central Oklahoma aquifer does change with depth, so no single potentiometric surface could be mapped.

A particular potentiometric surface was determined for the Central Oklahoma aquifer study unit by measuring water levels in shallow water wells. This potentiometric surface approximates the upper limit of the zone of saturation, and is referred to as the "water table." Water levels were measured between December 22, 1986, and April 24, 1987, from the shallowest wells that could be located, regardless of the geologic unit in which the wells were completed.

The water table (fig. 2) is a subdued replica of the topography of the land surface of the overlying Central Oklahoma aquifer study unit. The highest altitudes are about 1,300 feet above sea level in the western part of the study unit, along the drainage divide between the Canadian and North Canadian Rivers. The lowest altitudes are about 800 feet above sea level where the Cimarron River leaves the study unit.

HYDROGEOLOGIC MAPS OF THE CENTRAL OKLAHOMA AQUIFER

Maps were prepared to show some of the hydrogeologic features of the study unit. The maps include: (1) water table (fig. 2); (2) base of fresh ground water (fig. 3); (3) base of the Chase, Council Grove, and Admire Groups (fig. 4); (4) base of the Wellington Formation (fig. 5); (5) base of the Hennessey Group (fig. 6); and (6) surficial geology (fig. 7).

Water Table

The water table map (fig. 2) was prepared by using the water levels in shallow wells measured between December 22, 1986, and April 24, 1987. Wells outside the study unit were included so the water table could be mapped to the study-unit boundary. The altitudes of perennial streams in the study unit were used in the contouring process.

Base of Fresh Ground Water

The base of fresh ground water map (fig. 3) was produced by interpreting the same geophysical logs that were used to construct the structure contour maps. In addition, data from Hart's (1966) base of fresh ground water map were included on the map. The contour maps were computer generated, using an unbiased interpolation method.

Base of Chase, Council Grove, and Admire Groups (undivided);Base of Wellington Formation; and Base of Hennessey Group

Three of the maps included with this report are structure contour maps of the base of specific geologic units: (1) The base of the Chase, Council Grove, and Admire Groups, undivided (fig. 4); (2) the base of the Wellington Formation (fig. 5); and (3) base of the Hennessey Group (fig. 6). All three structure contour maps were produced using identical methods. The data for the structure contour maps were obtained by correlating geophysical logs of wells of sufficient depth to penetrate the geologic units. Geophysical logs of wells were correlated throughout the study unit at a density of approximately 4 wells per township. The geophysical logs were from oil and gas wells and from public-supply water wells. Because it is difficult to distinguish the contact between the Garber Sandstone and the Wellington Formation on geophysical logs in parts of the study unit, no structure contour map of the base of the Garber Sandstone was prepared. Additional control for the structure contour maps was provided by determining the altitude of the surface contacts between the geologic units using geologic and topographic maps. Additional control to the west of the study unit was provided by geophysical logs of wells beyond the western edge of the study unit. The contours were computer generated, using an unbiased interpolation method.

Surficial Geology

The surficial geology map (fig. 7) was compiled by digitizing existing geologic maps that covered parts of the study unit. The surficial geology in the northern part of the study unit, north of 35 degrees latitude, is from Bingham and Moore (1975). The surficial geology of Permian-age geologic units south of 35 degrees latitude is from Hart (1974). Because Hart (1974) placed the alluvium and terrace deposits on a smaller scale map, it was necessary to remap the alluvium and terrace deposits. Alluvium and terrace deposits south of 35 degrees latitude and north of the Canadian River were remapped based on soil type and topography, and combined with the map of Permian-age geologic units from Hart (1974).

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