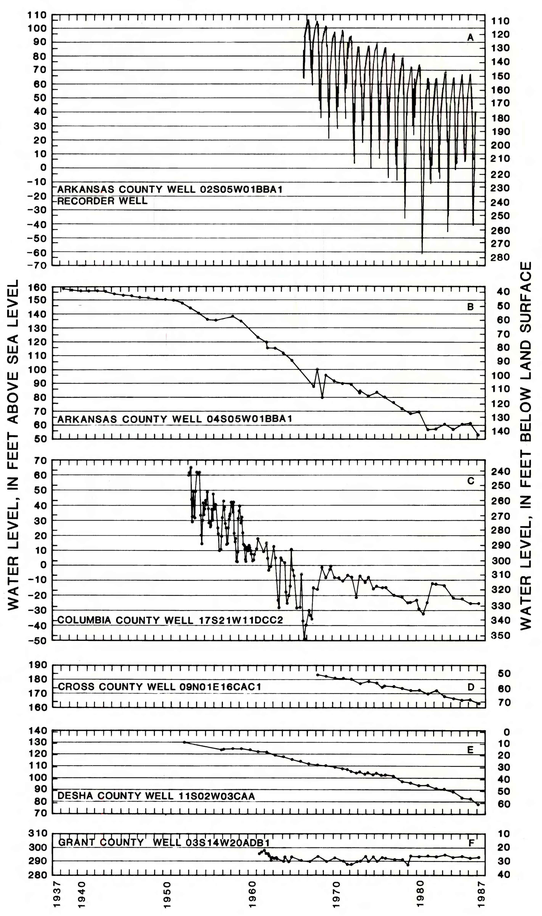
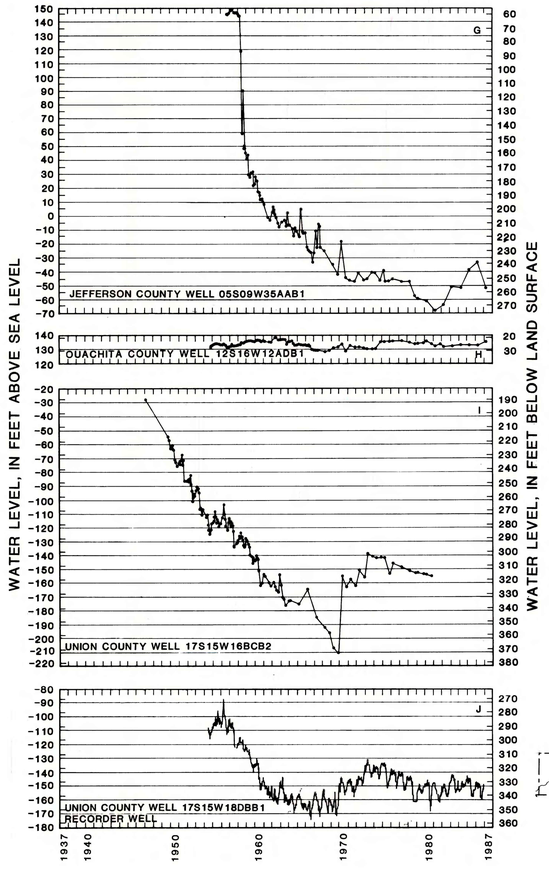
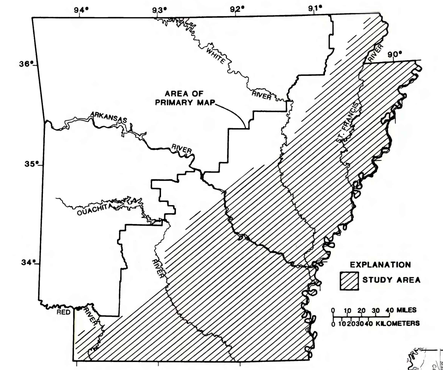




HYDROGRAPHS OF SELECTED WELLS COMPLETED IN THE SPARTA-MEMPHIS AQUIFER



LOCATION OF STUDY AREA

SELECTED REFERENCES

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Ryals, G.N., 1980, Potentiometric surface maps of the Sparta Sand; northern Louisiana and southern Arkansas; 1900, 1965, 1975, and 1980: U.S. Geological Survey Open-File Report 80-1180, 1 sheet.

Terry, J.E., Bryant, C.T., Ludwig, A.H., and Reed, J.E., 1979, Water-resources appraisal of the south-Arkansas lignite area: U.S. Geological Survey Open-File Report 79-924, 394 p.

Wasson, B.E., 1981, Potentiometric map of the Sparta aquifer system in Mississippi, fall 1980: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-1051, scale 1:500,000, 1 sheet.

This map shows generalized contours of the altitude of water levels in wells completed in the Sparta-Memphis aquifer in Arkansas for 1980. Most water-level measurements used in constructing the map were made in the spring of 1980. In parts of the State, where 1980 water levels were unavailable and data indicated no long-term change in water levels, measurements from as early as 1959 and as late as 1986 were used. At a few locations the altitude of the water surface in a stream or lake was used to define the potentiometric surface. Water-level data from Arkansas and adjacent States used in the construction of this map are from the ground-water file of the U.S. Geological Survey's National Water Data Storage and Retrieval System. This map should be useful to those studying flow systems in or including the Sparta-Memphis aquifer. This map was prepared as a part of the Gulf Coast Regional Aquifer-System Analysis study (Grubb, 1984).

The Sparta-Memphis aquifer consists of the permeable beds in the Sparta Sand and Memphis Sand of Eocene age. The Sparta Sand and Memphis Sand consist mostly of fine to medium sand. Some silt, clay, and lignite occur in the formations, particularly in the upper half of the Sparta Sand.

In the southern part of the area of occurrence of the Sparta-Memphis aquifer the Sparta Sand is underlain by the marine clay of the Cane River Formation. North of about latitude 35° N., the clay of the Cane River Formation undergoes a facies change to sand (Hosman and others, 1968, p. 15). The transitional zone is about 4 to 7 mi wide. North of the zone of transition the sands equivalent to the Carrizo Sand (which underlies the Cane River Formation), the Cane River Formation, and the Sparta Sand are called the Memphis Sand (Moore and Brown, 1969). The Sparta Sand corresponds to the upper part of the Memphis Sand. The Memphis Sand is underlain by clay of the Wilcox Group. East of the outcrop area the Sparta Sand and Memphis Sand are overlain by marine clay of the Cook Mountain Formation.

The Sparta-Memphis aquifer crops out near the west border of its occurrence and generally dips and thickens southward and toward the axis of the Mississippi embayment which is approximately located along the present axis of the Mississippi River. Much of the outcrop area of the Sparta Sand and the outcrop of the Memphis Sand on Crowleys Ridge is covered by terrace deposits of Quaternary age. The terrace deposits may attain a thickness of 40 ft. In some of the larger river valleys the outcrop of the Sparta Sand is covered by alluvium which may be as thick as 60 ft. The Mississippi River Valley alluvial aquifer overlies a part of the outcrop of Sparta Sand and most of the outcrop of the Memphis Sand to a depth of as much as 200 ft.

In the areas of outcrop, water-table conditions commonly occur at shallow depth but in the remainder of the aquifer outside the outcrop area, there are artesian conditions. The underlying and overlying clays confine the aquifer in this area. The thickness of the Sparta-Memphis aquifer near the outcrop is generally 200 to 400 ft south of the transition zone and 600 to 700 ft north of the transition zone. The aquifer reaches a maximum thickness of greater than 800 ft in several areas throughout the area of occurrence.

Water levels fluctuate seasonally in response to natural variation in ground-water recharge and discharge or to pumpage. Ground-water levels in and near outcrop areas (hydrographs F and H) generally fluctuate 5 ft or less yearly and show no long-term changes. Some wells outside the outcrop area (hydrographs other than D, F, and H) show long-term declines in water levels as a result of pumpage. The regional flow in the Sparta-Memphis aquifer as indicated by the potentiometric surface is generally away from the outcrop areas and southerly or toward cones of depression in the potentiometric surface. Cones of depression in the potentiometric surface of the aquifer are found at or near Camden, El Dorado, Magnolia, Pine Bluff, and West Memphis (primarily in Tennessee). These cones of depression are caused by pumpage for industrial and public supplies.

The gradients on the potentiometric surface are 10 to 50 ft/mi near the centers of drawdown cones and in outcrop areas where topographic relief is high. Gradients are 2 to 5 ft/mi in outcrop areas where topographic relief is low and in other areas that are relatively unstressed.

Most recharge to the Sparta-Memphis aquifer occurs by infiltration of rainfall on the upland outcrop areas of the southwestern portion of the area of occurrence and on Crowleys Ridge and by inflow from the overlying alluvium. Most discharge is to rivers in outcrop areas, adjacent units where confined, and to wells.

Withdrawals in Arkansas from the Sparta-Memphis aquifer in 1980 were about 200 Mgal/d (Holland and Ludwig, 1981, p. 28). The largest use (and the only use for much of the study area) is for industrial and public supply. However, in parts of Arkansas, Lonoke, and Prairie Counties many irrigation systems tap the aquifer. Yields to most domestic wells are probably small (less than 30 gal/min), but properly constructed wells screened to the full aquifer thickness will often yield 500 to 2,000 gal/min.

Ground water from the Sparta-Memphis aquifer is generally of good chemical quality and is suitable for most uses. Most wells in the aquifer yield soft water, less than 50 milligrams per liter (mg/L) hardness as calcium carbonate, with less than 500 mg/L of dissolved solids. Locally, however, the dissolved solids content is more than 1,000 mg/L.

CONVERSION FACTORS

For use of readers who prefer to use metric (International System) units, rather than the inch-pound units used in this report, the following conversion factors may be used:

Multiply inch-pound unit	By	To obtain metric unit
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
gallon per minute (gal/min)	0.0630	liter per second (L/s)
million gallon per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
foot per mile (ft/mi)	0.4905	meter per kilometer (m/km)

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level of 1929."

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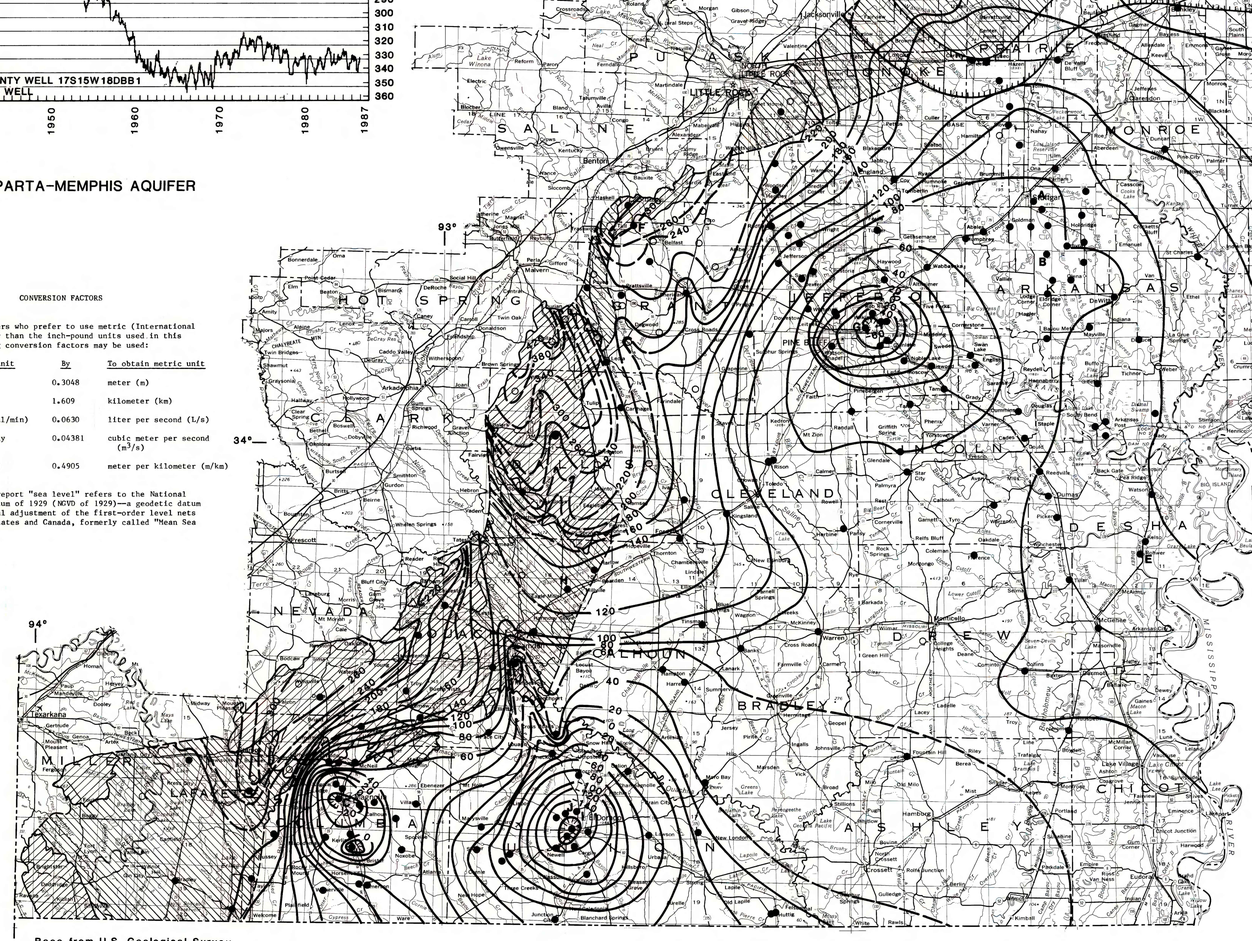
2301 Federal Office Building
Little Rock, Arkansas 72201

For purchase write to:

Books and Open-File Reports Section
U.S. Geological Survey
Box 25425, Denver Federal Center
Denver, Colorado 80225



Base from U.S. Geological Survey
State base map, 1967

GENERALIZED POTENTIOMETRIC SURFACE OF THE SPARTA-MEMPHIS AQUIFER, EASTERN ARKANSAS, SPRING 1980

By D.J. Ackerman