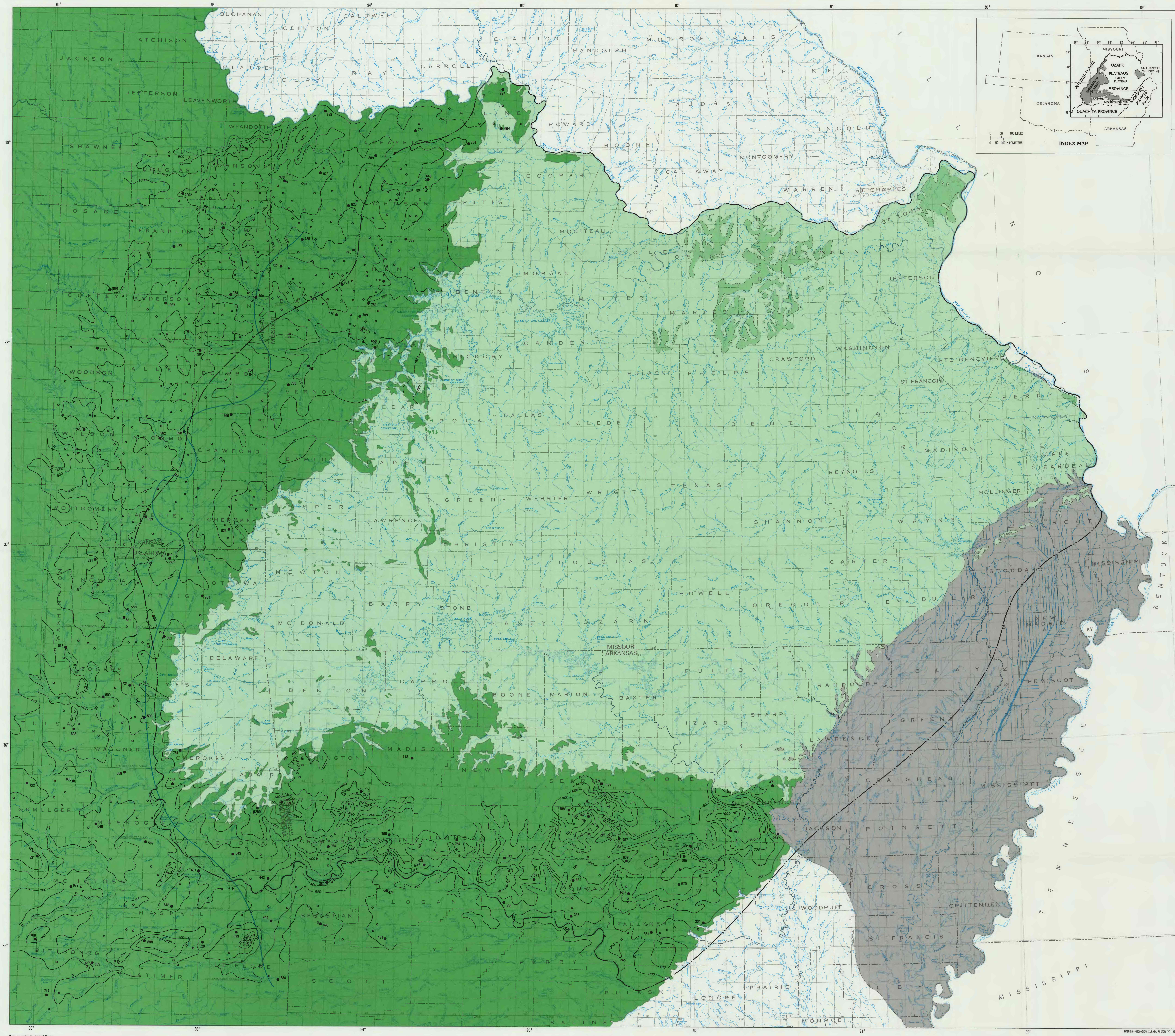
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

HYDROLOGIC INVESTIGATIONS
ATLAS HA–711–H (SHEET 3 OF 3)



Base from U.S. Geological Survey
State base maps, 1:500,000; Arkansas, 1967; Kansas, 1963; Missouri, 1973; Oklahoma, 1972

SCALE 1:750 000

25 0 25 50 75 100 MILES

25 0 25 50 75 100 KILOMETERS

EXPLANATION

- Outcrop area of Western Interior Plains confining system
- Outcrop area of unnamed geohydrologic units that are stratigraphically equivalent to the Western Interior Plains confining system
- Outcrop area of rocks comprising geohydrologic units older than Western Interior Plains confining system
- Area where Western Interior Plains confining system and stratigraphically equivalent units are missing in subsurface

Contact—Dashed where approximately located

Approximate boundary of Ozark Plateaus aquifer system

1000 **Potentiometric contour**—Shows altitude at which water levels would have stood in tightly cased wells open to the near-surface weathered layer of the Western Interior Plains confining system. Contours are consistent with surface topography. Contour interval, in feet, is variable. National Geodetic Vertical Datum of 1929

1000 **Line of equal dissolved-solids concentration**—Data from which lines of equal dissolved-solids concentration are derived are not shown. Interval 1,000 milligrams per liter

902 **Control data point**—Part of Central Midwest Regional Aquifer-System Analysis data base. Number is altitude, in feet, of water level. National Geodetic Vertical Datum of 1929

Auxiliary control data point

GROUND-WATER MOVEMENT IN THE NEAR-SURFACE WEATHERED LAYER AND WELL YIELDS

Because the Western Interior Plains confining system is a thick, complex sequence of interbedded permeable sandstone and limestone layers and large, relatively impermeable shale layers, the distribution of hydraulic heads within the confining system varies both vertically and laterally. Movement of ground-water through the confining system is slow and complex. Water-level measurements from wells that penetrate most or all of the Western Interior Plains confining system represent a weighted-average water level of the more permeable geologic groups in the confining system and are not representative of the unit as a single body. However, weathering processes at or near land surface increase the permeability of the limestone and shale units. Variations in permeability of the near surface rocks are lessened by the weathering process, and the weathered surface layer can transmit water like an aquifer. The predevelopment potentiometric map shown here represents the altitude of water table in the near-surface weathered zone. The measurements of water levels are generally from wells that penetrated no more than the upper 200 to 300 feet of the confining system. The hydraulic-head data also reflects measurements made at various times throughout this century. However, ground-water withdrawal from the weathered layer generally has been limited to small-capacity domestic wells because well yields and water quality are inadequate for public-supply wells. Consequently, drawdown of the potentiometric surface is considered negligible and even more recent hydraulic-head measurements probably depict altitudes that vary little from predevelopment conditions.

Hydraulic-head contours in the near-surface weathered layer are greatly affected by topographic features. Generally, ground water infiltrates in upland areas then moves toward the stream valleys where it discharges. Ground-water levels in the upland areas tend to be as much as 100 feet lower than the average land-surface altitude. Contour lines in the map area are drawn so that where a potentiometric contour crosses a stream trace, the altitude of the ground-water potentiometric surface is approximately equal to the altitude of the stream, unless hydraulic-head measurements indicated this assumption is invalid in a specific locality.

In the northwestern part of the Ozarks, ground water in the weathered surface layer of the confining system primarily moves toward the Missouri and Marais des Cygnes River valleys. A ground-water divide extending northwest from Barton County, Missouri, separates this ground-water area from the larger region to the south where ground water moves into the Verdigris and Neosho Rivers in southeastern Kansas and northeastern Oklahoma, and into the Arkansas River in Oklahoma and Arkansas. The latter two rivers parallel most of the southwestern and southern borders of the Ozark Plateaus. No water-level data are available in the vicinity of Madison and Newton Counties, Arkansas.

Well-recovery tests on 14 wells located near the border of the Ozark Plateaus in southwestern Missouri show a range of yields from 1 to 40 gallons per minute (Kleeschulte and others, 1985). Generally, well yields tended to decrease from east to west in this area. Similar tests conducted on 16 wells in southwestern Washington County, Arkansas, show that well yields in this area also are small, ranging from 2.5 to 19 gallons per minute (Muse, 1982). Production in these wells probably is concentrated in the Hale Formation and perhaps the Pitkin Limestone. Other geologic formations that the wells penetrate likely contain a much greater shale fraction and presumably yield little water.

The dissolved-solids concentration of water in the Western Interior Plains confining system increases to the west, generally exceeding 100,000 milligrams per liter at the west edge of the map area. The approximate westward limit of freshwater is shown by the 1,000 milligram-per-liter dissolved-solid concentration line. Because of the great thickness and lithologic complexity of the confining system, the dissolved-solids concentration can vary considerably both laterally and vertically.

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Predevelopment potentiometric surface of the near-surface weathered layer of the Western Interior Plains confining system

MAJOR GEOHYDROLOGIC UNITS IN AND ADJACENT TO THE OZARK PLATEAUS PROVINCE, MISSOURI, ARKANSAS, KANSAS, AND OKLAHOMA—WESTERN INTERIOR PLAINS CONFINING SYSTEM

By
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