DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS REPORT 84-4215
SHEET 2 OF 7

WATER-LEVEL DATA

Water-level data used in compiling these maps were collected during November or early December 1982. The majority of the water-level measurements were made by U.S. Geological Survey personnel, but some of the measurements were provided by the South Carolina Water Resources Commission and the Department of Energy, Savannah River Operations Office. Most of the measuring point altitudes used were derived from topographic quadrangle maps of 1:24,000 and 1:62,500 scales having land-surface altitude contour intervals of 5 to 20 feet.

Although many measurements were made in wells in areas of pumping stress, care was taken as much as possible to assure the measurements represented static water levels of the aquifer at the time of the measurement. A few measurements may be composite measurements from wells screened in more than one aquifer, but these measurements were checked with single zone measurements whenever possible. Density difference corrections were made for wells where there were significant salinity concentrations.

POTENTIOMETRIC MAPPING METHODOLOGY

To ensure that the potentiometric maps presented in this report represent conditions during November 1982, extensive comparisons were made between the November 1982 maps, the predevelopment maps, and known pumpage patterns. Previously published potentiometric maps including Warren, 1944; Siple, 1967; Zack, 1977; Hayes, 1979; Johnston and others, 1980; Johnston and others, 1981; and Faye and Prowell, 1982; were consulted for the parts of the study area they covered. Comments by A. D. Park (South Carolina Water Resources Commission, oral commun., 1982) were incorporated into figure 4 in Berkeley, Charleston, and Dorchester Counties where he was conducting a geohydrologic study.

In areas of sparse data, the potentiometric maps were constructed consistent with similar parts of the flow system where more detailed data exist. For example, vertical gradients between the aquifers are downward in suspected recharge areas and upward in suspected discharge areas. The effects of known ground-water pumpage were also inferred in areas where little or no data were available. Because of the density of the data, the accuracy of the data, the nature of the hydrologic system, and the scale of the maps, a contour interval of 25 feet was selected to best represent the potentiometric surfaces.

FLOW SYSTEM

The major source of recharge to the Coastal Plain aquifers of South Carolina is precipitation in aquifer outcrop areas. Potentiometric highs in the interstream uplands of the outcrop areas of aquifers A2, A3a2, and A3a3 result from this recharge.

The major discharge from aquifers A2, A3a2, and A3a3 is to rivers and streams in the upper Coastal Plain. The bending of the potentiometric contours upstream in the vicinity of the Savannah River and other major rivers (figs. 4, 5, and 6) is indicative of ground-water discharge to the rivers. Discharge also occurs to the smaller streams in the upper Coastal Plain, but the effects of these discharges on the potentiometric surfaces are indicated only where data are available to show that the effects are significant. The depiction of these effects is limited because of the map scale and data density. Discharge by wells in 1982 was significant in many areas (Lonon and others, 1983).

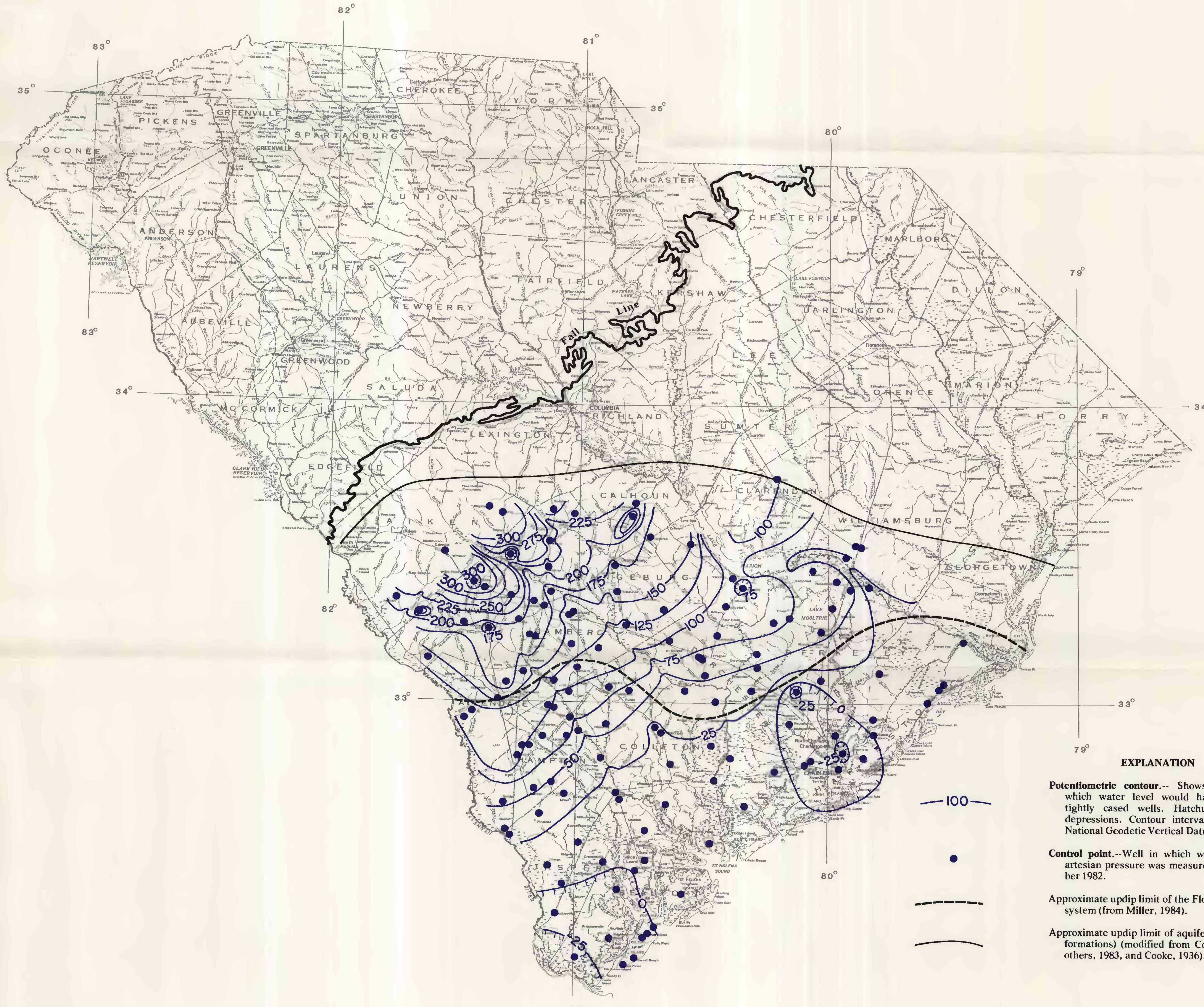
Leakage between aquifers through confining beds is a significant factor in the flow system. Downward gradients in the upper Coastal Plain, such as in some areas of the Savannah River Plant (SRP), located in Aiken and Barnwell Counties, indicate downward leakage from aquifer A2 to aquifer A3a2. Downward leakage such as that occurring in the SRP is an important source of recharge to the deeper aquifers in some areas.

Prior to development, discharge from aquifers A3a2, A3a3, and A4 occurred as upward leakage throughout much of the lower Coastal Plain, although flow quantities were probably small. Upward leakage was probably greater in the eastern part of the lower Coastal Plain than in the southwestern part (Aucott and Speiran, 1985). However, leakage is now downward in much of eastern South Carolina because the vertical hydraulic gradient has been reversed in much of the area.

Water-level declines in aquifers A3a3 and A3a2 have been occurring as a result of ground-water withdrawals. Water-level declines in aquifers A3a2 and A3a3 (figs. 8 and 9) that have caused the reversal in vertical gradient in much of eastern South Carolina are a result of large ground-water withdrawals from these aquifers in the Myrtle Beach area (about 10 Mgal/d in 1980; Lonon and others, 1983). In addition to the Myrtle Beach area, there are significant withdrawals from these aquifers in the vicinity of Florence, Sumter, and the SRP. Withdrawals of about 7Mgal/d by the city of Florence (Lonon and others, 1983) have caused declines in the potentiometric surface in aquifer A3a3. Withdrawals from aquifers A3a3 and A3a2 by the city of Sumter (about 12 Mgal/d in 1980; Lonon and others, 1983) and the SRP near Aiken (about 9Mgal/d in 1980; G.E. Lonon, South Carolina Water Resources Commission, oral commun., 1984) have also resulted in water-level declines, but these have been less severe than declines resulting from comparable withdrawals in the Florence and Myrtle Beach areas. This is probably because the transmissivities of these aquifers are considerably greater at Sumter and SRP than in the Florence and Myrtle Beach areas (Siple, 1967; Zack, 1977; and Park, 1980).

The potentiometric surface of aquifer A2 and the Floridan aquifer system has been affected by pumpage in the Charleston area and in the area around the city of Savannah (fig. 7). Although pumpage in the Charleston area is difficult to quantify, a noticeable decline in the potentiometric surface has occurred. Ground-water withdrawals in the Savannah area were about 75 Mgal/d in 1970 (Counts and Krause, 1976). These withdrawals have created a widespread decline in the potentiometric surface in Savannah and vicinity (Matthews and others, 1982).

Smaller more local water-level declines have also occurred in aquifers A2, A3a2, and A3a3 as a result of less concentrated pumpage.



EXPLANATION

—100— **Potentiometric contour.**-- Shows altitude at which water level would have stood in tightly cased wells. Hatchures indicate depressions. Contour interval is 25 feet. National Geodetic Vertical Datum of 1929.

● **Control point.**--Well in which water level or artesian pressure was measured in November 1982.

Approximate updip limit of the Floridan aquifer system (from Miller, 1984).

Approximate updip limit of aquifer A2 (Eocene formations) (modified from Colquhoun and others, 1983, and Cooke, 1936).

FIGURE 4.--POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER SYSTEM AND AQUIFER A2 (EOCENE AGE FORMATIONS) NOVEMBER 1982

0 20 40 60 Miles

0 20 40 60 80 Kilometers

Fall line from Overstreet and Bell (1965)

Base from U.S. Geological Survey State base map, 1970

For additional information write to:
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POTENTIOMETRIC SURFACES OF NOVEMBER 1982 AND DECLINES IN THE POTENTIOMETRIC SURFACES BETWEEN THE PERIOD PRIOR TO DEVELOPMENT AND NOVEMBER 1982 FOR THE COASTAL PLAIN AQUIFERS OF SOUTH CAROLINA

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