INTRODUCTION

The Coastal Plain of South Carolina covers approximately 20,000 square miles. Beneath the Coastal Plain there are several aquifers that are important sources of water for municipal, industrial, and agricultural uses. This report presents maps depicting the potentiometric surfaces of the Coastal Plain aquifers of South Carolina in November 1982, declines in the potentiometric surfaces between the period prior to development and November 1982, and a generalized depiction of the geohydrologic framework. A companion report by Aucott and Speiran (1985) presents potentiometric surface maps for the period prior to development. The maps in these reports are the first comprehensive statewide potentiometric maps of the Coastal Plain aquifers in South Carolina. They have been developed as a part of the nationwide RASA (Regional Aquifer System Analysis) program of the U.S. Geological Survey. This report is intended to add to the understanding of ground-water flow in these aquifers, to provide a base of information for further studies, and to aid in planning the development of the water resources of the Coastal Plain of South Carolina.

GENERALIZED GEOHYDROLOGIC FRAMEWORK

The Coastal Plain province consists of a wedge of sand, clay, and limestone sediments of Late Cretaceous and younger age deposited on a pre-Cretaceous basement of consolidated metamorphic and sedimentary rocks. The wedge thickens from the Fall Line toward the present-day shoreline. This wedge can be divided into aquifers and confining beds based on relative permeabilities, areal extent, and continuity of the lithology of the sediments.

The aquifers consist of layers of sand or high permeability limestone separated by confining beds of clay, silt, or low permeability limestone. Water generally moves laterally within each of the aquifers. The confining beds inhibit but do not prevent the vertical movement of water between aquifers.

A regional framework for the aquifers of the Southeastern Coastal Plain has been developed in previous work on the Floridan aquifer system and preliminary work on the sand aquifers (Miller, 1984 and Renken, 1984). The regional framework has been modified in South Carolina by subdividing some aquifers to develop a State framework that best represents the hydrology of the aquifers in South Carolina and takes into account differences in data density and scale. The State framework and the regional framework were based on examinations of geophysical logs, water levels, geochemical data, and geologic descriptions. In addition, other studies were consulted during the development and review of the South Carolina framework.

The clastic aquifers of the South Carolina Coastal Plain have been designated as the surficial aquifer and aquifers A2, A3a2, A3a3, and A4. This terminology was adapted from the regional framework (Renken, 1984). Part of the Floridan aquifer system is also present in South Carolina. These aquifers are generally associated with a geologic formation or group of formations as indicated in the following table. This association is general because formational descriptions are frequently local in scope and because an aquifer may contain parts of other formational units. Because it is premature to assign formal names to the aquifers, geologic formations have been correlated with the aquifer designations to add to local identification of the aquifer framework. Generalized sections (figs. 1, 2, and 3) are presented to aid in the understanding of the aquifer framework.

Aquifer unit	Age of sediments	Geologic formations [1]
surficial	Pleistocene	Coastal terrace deposits
Floridan [2]	Eocene	Ocala Limestone Santee Limestone [3]
A2	Eocene	Barnwell Formation McBean Formation Congaree Formation
A3a2	Late Cretaceous	Black Creek Formation
A3a3	Late Cretaceous	Middendorf Formation
A4	Late Cretaceous	Cape Fear Formation

[1] These are geologic formations that are generally associated with a given aquifer. However, a given aquifer may not consist of the same formations in all areas, and locally an aquifer may consist of parts of additional formations not listed.

[2] Carbonate equivalent of aquifer A2.

[3] As a result of the criteria used by Miller (1984) to define the Floridan aquifer system, the updip parts of the Santee Limestone are included within aquifer A2. Because the potentiometric surfaces of aquifer A2 and the Floridan aquifer system are mapped together any future redefinition of the boundary between these units will not affect their combined potentiometric surfaces.

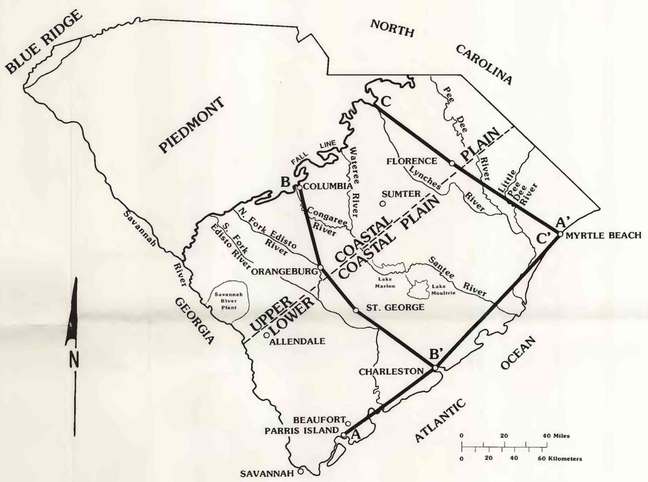
The surficial aquifer consists of coastal terrace deposits. These sediments are generally less than 40 feet thick and consist primarily of sand, shell, and clay that were deposited in a series of transgressions and regressions of the sea during the Pleistocene Epoch (Siple, 1946). The surficial aquifer is a water-table aquifer and is present throughout the lower Coastal Plain.

Aquifer A2 consists of clastic sediments of Eocene age that are stratigraphically equivalent to the carbonate sediments of the Floridan aquifer system. Aquifer A2 crops out throughout most of its areal extent in the upper Coastal Plain. The formational units that comprise aquifer A2 are the Barnwell Formation, McBean Formation, and the Congaree Formation. Sediments from these formations have been lumped together because they act hydrologically as a single aquifer. This is evidenced by the general lack of a significant vertical potentiometric gradient between these formations except in small areas adjacent to Georgia and near the Fall Line. Aquifer A2 and the Floridan aquifer system can be treated as a single hydrologic unit in South Carolina because there are no significant water-level differences between them and there is no evidence of an intervening confining bed. The combined Floridan aquifer system and aquifer A2 exist only in the southern and western two-thirds of the Coastal Plain.

Aquifer A3 of the regional framework has been subdivided into three parts; two of which, aquifers A3a2 and A3a3, exist in South Carolina. Aquifer A3a2 is composed primarily of permeable sediments of the Black Creek Formation and is the uppermost of the three Upper Cretaceous aquifers defined in South Carolina. It consists of thinly laminated sand and clay lenses. The updip limit of aquifer A3a2 is generally parallel to the Fall Line. The aquifer crops out in the eastern part of the upper Coastal Plain, and is present in the subsurface throughout much of the Coastal Plain of South Carolina.

Aquifer A3a3, which is the middle of the three Upper Cretaceous aquifers, exists throughout the Coastal Plain of South Carolina. In the upper Coastal Plain it generally consists of more massive sands than does aquifer A3a2 and is generally comprised of the Middendorf Formation. This unit has also been referred to as the Tuscaloosa Formation (Cooke, 1936). In the lower Coastal Plain, the permeable sediments of aquifer A3a3 are lithologically quite similar to those of aquifer A3a2 but are strigraphically equivalent to the Middendorf Formation. Aquifer A3a3 crops out along most of the length of the Fall Line.

Aquifer A4 consists of sediments considered to be part of the Cape Fear Formation and is the basal aquifer in the Coastal Plain system of South Carolina. It consists predominately of sand, silt, and gravel layers separated by thick silt and clay layers. This unit has not been well defined in the upper Coastal Plain. However, where this aquifer is postulated to exist updip, it appears that its flow system is closely related to that of the overlying aquifer A3a3.



LOCATION MAP

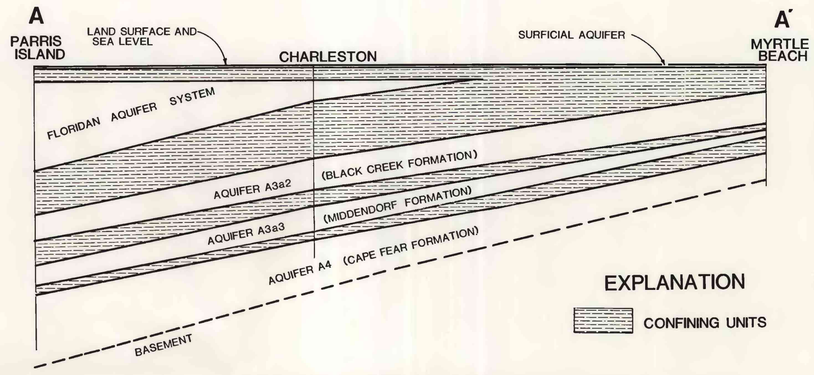


FIGURE 1.--GENERALIZED GEOHYDROLOGIC SECTION A-A'

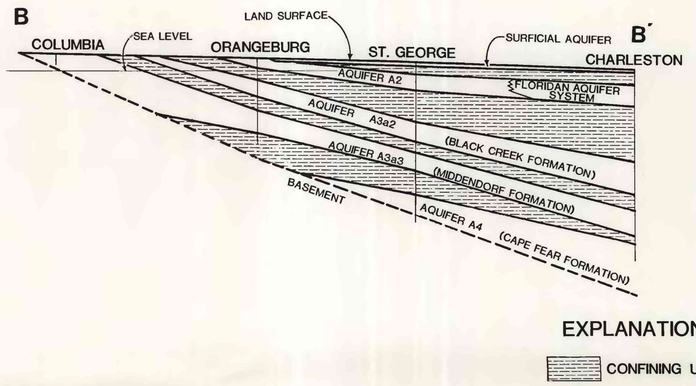


FIGURE 2.--GENERALIZED GEOHYDROLOGIC SECTION B-B'

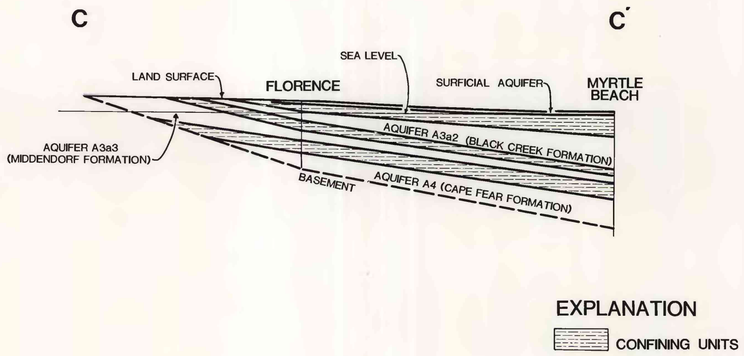


FIGURE 3.--GENERALIZED GEOHYDROLOGIC SECTION C-C'

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

BY

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