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By PHILIP M. BROWN, DONALD L. BROWN, MARJORIE S. REID, and ORVILLE B. LLOYD, JR.

ABSTRACT

This report describes the subsurface distribution of rocks of Cretaceous to Late Jurassic(?) age in the Atlantic Coastal Plain, South Carolina, and Georgia, and examines their potential for deep-well waste storage. For mapping purposes, a waste-storage "operational unit" is established and defined. It is a sand or sandstone layer, 20 feet or more in thickness, that is immediately overlain and underlain by a layer of shale or clay, 20 feet or more in thickness, and which occurs in regional chronostratigraphic units (Units A, B, C, D, E, F, G(?), and H(?)) of Mesozoic age in areas where each of these units contains nonusable ground water. Nonusable ground water is defined as water that contains sodium chloride in excess of 10,000 mg/L.

Using a group of geohydrologic parameters derived from or combining 21 categories of basic data, established from study and interpretation of well cuttings and geophysical logs, a series of 32 regional maps and 8 stratigraphic cross sections was constructed. For each of the eight geologic units delineated in the subsurface, the maps illustrate the distribution of waste-storage potential in terms of areal extent, depth below land surface, sand-shale geometry, and the approximate sodium chloride concentration of a unit's nonusable ground water.

In areas where the geologic units contain nonusable ground water, the depth below land surface and the thickness of potential waste-storage reservoir and reservoir-seal combinations are variable. The range in variability appears to be broad enough to meet the need for a wide choice among the geologic requirements that would normally be considered in selecting specific waste-storage sites for detailed examination.

INTRODUCTION

As part of the U.S. Geological Survey's waste-storage research program, a series of studies is being conducted in the Atlantic Coastal Plain. Their purpose is to assess potential for the deep-well emplacement of liquid waste into the part of the regional sediment mass which lies below the deepest zones containing usable ground waters. For purposes of the current study, usable ground water is considered to be that which contains less than 10,000 mg/L dissolved solids.

South Carolina has a policy that forbids issuing permits for waste injection wells, and no permits have been issued in Georgia (Walker and Cox, 1976, p. 49 and 79). The U.S. Geological Survey does not advocate that waste be stored in the subsurface, but it does recognize that, in some cases, injection of industrial wastes may be the most environmentally acceptable alternative available to a waste generator or regulator.

This report presents the results of the study conducted in parts of South Carolina and Georgia (fig. 1). The report assesses the region-wide potential for waste storage in the deep subsurface. It contains interpretations and conclusions derived from analysis, synthesis, and extrapolation of structural, stratigraphic, and hydrologic data. These data were obtained from a relatively small number of widely scattered boreholes, chiefly oil tests, in a sparsely drilled region. The study is a continuation of previous studies undertaken in the area extending from New York through North Carolina (See Brown and others, 1972; Brown and Reid, 1976).

In the northern part of the Atlantic Coastal Plain, North Carolina through New Jersey, the geohydrologic conditions are such that the chief waste-storage target sections occur in rocks of Comanchean and Coahuilan age in areas where these rocks lie at depths greater than 1,500 feet below mean sea level (Brown and Reid, 1976). In the southern part of the Atlantic Coastal Plain, South Carolina through Georgia, different geohydrologic conditions prevail. For example, in the southern part some rocks of Gulfian age contain nonusable ground water, whereas to the north they contain usable ground water in onshore areas. Also, and except in a small area in southwestern Georgia, rocks of Coahuilan age are absent and rocks of Comanchean age either have a limited areal distribution or a limited thickness in many areas where they contain nonusable ground waters. Because of the different geohydrologic conditions that prevail in the northern and southern segments of the Atlantic Coastal Plain, Gulfian, as well as Comanchean and Coahuilan, rocks are included in the southern-segment, waste-storage study whereas only Comanchean and Coahuilan rocks were included in the northern-segment study.

ACKNOWLEDGMENTS

Frederick M. Swain, project micropaleontologist, studied and identified Ostracoda from selected wells, prepared lists of faunal occurrence and charts of environmental significance, and provided other valuable services that aided the mapping program. Richard N. Benson, project micropaleontologist, provided similar data, with respect to the Foraminifera, as well as other services. George E. Siple, who was assigned to the project for a limited time prior to retirement, prepared location maps and lithologic descriptions for some wells in South Carolina. Among colleagues of the U.S. Geological Survey, Harold Gill and Lin Pollard, Georgia, and Allen Zack, South Carolina, provided well locations and helped to assemble well cuttings and geophysical logs. Joseph Hazel, Paleontology and Stratigraphy Branch, furnished useful data from the Geological Survey's cored section in Dorchester County, South Carolina. Richard Cifelli, U.S. National Museum, made available the unpublished notes and records of the late Esther R. Applin.

Sam M. Pickering, Jr., State Geologist, Earth and Water Division, Georgia Department of Natural Resources, and Norman K. Olson, State Geologist, South Carolina State Development Board, Division of Geology, and members of their staffs, were helpful in making well data available for study.

Most of the cores, cuttings, geophysical logs, and other data used in the study were obtained through the cooperation of several companies that included Chevron Oil Co., Cities Service Oil Co., Exxon Corp., Layne Atlantic Co., Mobil Oil Co., and Sydnor Hydrodynamics, Inc.

PREVIOUS WORK

In the project area numerous local and multicounty reports have been published that describe and discuss elements of the region's hydrogeologic system. In Georgia, the various publications of P. L. and E. R. Applin and of S. M. Herrick are of particular importance in that they contain the basic elements of interpretive subsurface structure and stratigraphy that customarily have been used by subsequent investigators to describe the subsurface geology of the Georgia Coastal Plain. In South Carolina little quantitative information of mappable quality is available for the deep subsurface. In general, this is due to the lack of deep oil tests, the lack of cores and cuttings from all but a few "key" wells, and obscure or nonexistent well records for many of the deep water wells drilled throughout the South Carolina Coastal Plain. Of the publications that discuss the geology of the project area in a regional context, those of Grover E. Murray, Jr., and John C. Maher are particularly important contributions.

Original accounts and reviews of both local and regional structure and subsurface stratigraphy in the project area include, among others, the publications of Applin and Applin (1944, 1947, 1964, 1965, 1967), E. R. Applin (1955), P. L. Applin (1951), Arden (1974), Bonini and Woolard (1960), Bridge and Berdan (1952), Brown (1974), Callahan (1964), Cramer (1969, 1974), Forgotson (1958, 1963), Herrick (1961), Herrick and Vorhis (1963), Hull (1962), King (1961), Maher (1965, 1971), Marine and Siple (1974), Marsalis (1970), McLean (1960), Milton (1954), Milton and Hurst (1965), Milton and Grasty (1969), Murray (1956, 1961), Olson and Glowacz (1977), Patterson and Herrick (1971), Pressler (1947), Prettyman and Cave (1923), Rainwater (1968, 1970a, 1970b), Richards (1945, 1948, 1967), Sever (1964, 1965), Siple (1958, 1959, 1967), Stephenson (1914, 1928), and Woolard, Bonini, and Meyer (1957).

Brown, Miller, and Swain (1972) described the structural-stratigraphic framework and spatial distribution of permeability for the northern half of the Atlantic Coastal Plain, New York to North Carolina. Basic data, concepts, and conclusions from that report were used by Brown and Reid (1976) to evaluate the waste-storage potential of selected segments of the Mesozoic aquifer system in the northern half of the Atlantic Coastal Plain. The present report extends and incorporates elements of these two previous reports—it extends into South Carolina and Georgia the Mesozoic segments of the stratigraphic framework described by Brown, Miller, and Swain (1972) and it incorporates the technique used to evaluate waste-storage potential that was introduced and implemented by Brown and Reid (1976).

METHOD OF APPROACH

In sedimentary basins that may have deep-well, waste-storage potential, a fundamental geologic requirement is the presence, below zones of usable ground water, of porous and permeable strata, that are sufficiently thick and capable of receiving a given type and volume of waste, and that are immediately overlain and underlain by relatively impermeable strata, sufficiently thick and capable of retarding the migration of waste into overlying and underlying segments of a ubiquitous hydrologic system. The determinant criteria—position, permeability, and thickness—are mutually applicable to strata that have either reservoir or reservoir-seal potential.

When investigating the geologic potential of specific waste-storage sites in situations where type and volume of waste are known, the geologic information required by management for making an evaluation of each site is obtained by assessment and quantification of data available regionally and from drilling and testing several closely spaced, onsite boreholes. When, as in the present case, the problem is to assess the variable geologic potential for waste storage, as it may or may not exist, in a sparsely drilled, multistate area and in situations where type and volume of potential waste are unknown, a different type of exploration technique must be used. One such technique (Brown and Reid, 1976) consists of selecting and defining a widely distributed combination of strata with both reservoir and reservoir-seal potential for a seemingly wide variety of waste types and showing its subsurface distribution and physical attributes by means of maps, charts, and graphs. The purpose of this technique is to screen extensive geographic areas in order to delineate areas that do and do not have waste-storage potential so that limited waste-exploration budgets can be used to best advantage in the areas that have the greatest potential.

In most sedimentary basins several types and combinations of strata with reservoir and reservoir-seal potential can be identified in individual boreholes. The reasons for their occurrence are manifold and often complex in a geologic sense. However, one such combination usually is dominant and widely distributed throughout large segments of any basin. Its dominance and relative wide-scale distribution are a function of the interaction of tectonic forces and the sedimentologic responses that characterize each particular basin. A reconnaissance study of cuttings and geophysical logs from a few widely scattered wells in a basin generally is sufficient for purposes of recognizing the dominant combination.

From such a reconnaissance study in the project area (fig. 1), the dominant combination of strata with waste-storage potential was judged to consist of porous and permeable sand or sandstone that is immediately overlain and underlain by relatively-impermeable clay or shale. For practical reasons and in consideration of economic and safety constraints, an arbitrary thickness value of 20 feet or more may be assigned to both types of strata that make up the potential reservoir and reservoir-seal combination. Thus, by preliminary definition, the dominant combinations of strata with waste-storage potential in the project area consists of:

> **A sand or sandstone layer, 20 feet or greater in thickness, that is directly underlain and overlain by a clay or shale layer, 20 feet or greater in thickness.**

A major constraint inherent in the process of delineating potential waste-storage reservoirs within an aquifer system is that the potential reservoirs must lie below zones of usable ground water. The distinction between usable and nonusable ground water generally is based on the amount of dissolved solids present in the water. However, there is no specific value that is generally accepted for dissolved solids which serves to differentiate usable from nonusable ground waters. For purposes of this report, usable ground water is defined as water that contains less than 10,000 mg/L dissolved solids—a little less than one-third of the approximately 35,000 mg/L dissolved solids present in sea water.

In the deeply-buried parts of what is essentially a noncarbonate, sand-shale (aquifer-aquiclude) system in the project area, the amount of dissolved solids in ground water is about equivalent to the amount of sodium chloride for all practical purposes. Therefore, it follows that in order for aquifers to have waste-storage potential in the project area, they must contain water with a sodium chloride concentration greater than 10,000 mg/L.

On the basis of their distribution in the subsurface, their sand-shale geometry, and calculation of the sodium chloride concentration of their contained waters, eight geologic units of Mesozoic age were judged to have some possible potential for waste storage in the project area. They are the regional chronostratigraphic units A, B, C, D, E, F, G, and H. These units in the northern part of the Atlantic Coastal Plain range in age from Late Cretaceous to Early Cretaceous and Jurassic(?); they were defined, described, mapped, and illustrated by Brown, Miller, and Swain (1972). They were mapped throughout the subsurface in South Carolina and Georgia during this study, and their areal distribution, thickness, and waste-reservoir potential are shown on the maps and stratigraphic sections in this report. Previously, Brown and Reid (1976) described and illustrated the waste-storage potential of Units F, G, and H in the northern part of the Atlantic Coastal Plain.

With the selection of specific geologic units and establishment of a limiting value for the sodium chloride concentration in aquifer waters having waste-storage potential, our original definition of a sand-shale combination with reservoir potential can be amended so as to define a potential waste-storage reservoir "operational unit" for mapping purposes in the project area as follows:

> **A sand or sandstone layer, 20 feet or greater in thickness, that is directly underlain and overlain by a shale or clay layer, 20 feet or greater in thickness, and which occurs in Units A, B, C, D, E, F, G, or H, where each of these units contains waters that have a sodium chloride concentration greater than 10,000 mg/L.**

Once defined, the extent and distribution of the waste-storage "operational unit" can be determined by mapping units A through H in the subsurface, by determining the relative position and thickness of their sand-shale layers, and by determining the concentration of sodium chloride in their contained waters.

Using these procedures, the purposes of this report are to determine the presence or absence of the waste-storage operational unit in the project area and to list and evaluate some of the geohydrologic factors that control its incidence of occurrence and distribution.

BASIC DATA AND DERIVATION OF MAPPABLE GEOLOGIC PARAMETERS

Compilation and interpretation of the data for the several segments of the project were made jointly or separately by the authors.

Philip M. Brown planned the project, directed the work, correlated the sections, and wrote the report. Donald L. Brown calculated the salinities of formation waters from calibrated geophysical logs, determined the sand-shale geometry in key wells, and was chiefly responsible for preparation of the maps, some of which were modified from computer-drawn maps derived from basic project data. Marjorie S. Reid organized the basic well data, prepared the stratigraphic cross sections, the well-data tables, and other illustrative material. Orville B. Lloyd, Jr., assisted in the calculation of map values and preparation of the maps and was chiefly responsible for determining the accuracy of final map copy.

Subsurface data, derived from the study of well records, well cuttings and cores, and geophysical logs for about 400 wells, were examined during the course of the investigation. Eighty-eight wells were selected as having representative data of specific value for either regional mapping or waste-storage purposes. They make up the key-well network. Their location is shown in figure 1. Geohydrologic data for wells in the key-well network are listed on the well-data sheets in this report. On those sheets and throughout the report, the wells are identified in the manner described by Brown, Miller, and Swain (1972, p. 35–36). Because of space limitations, State and County names used in the well citations are abbreviated throughout the report. The abbreviations used for the counties in which key wells are located are as follows:

Georgia

Appling	AP	Dougherty	DOG
Atkinson	AT	Early	EA
Brantley	BRA	Echols	EC
Brooks	BRO	Glynn	GLY
Calhoun	CAL	Houston	HO
Camden	CAM	Jeff Davis	JD
Charlton	CHR	Laurens	LA
Chatham	CHA	Liberty	LI
Clinch	CLI	Lowndes	LOW
Coffee	COF	Mitchell	MIT
Colquitt	COQ	Montgomery	MO
Crisp	CRP	Pierce	PI
Decatur	DE	Pulaski	PU
Dodge	DOD	Screven	SCR
Dooly	DOO	Seminole	SE
Stewart	ST	Toombs	TOO
Sumter	SU	Treutlen	TR
Telfair	TEL	Wayne	WAY
Thomas	THO	Wheeler	WH

North Carolina

Brunswick	BR

South Carolina

Aiken	AK	Dorchester	DOR
Barnwell	BW	Georgetown	GEO
Beaufort	BEAU	Horry	HO
Charleston	CHN		

Using a combination of lithologic, paleontologic, and geophysical-log data, top and thickness values were established for the eight regional chronostratigraphic units (Units A through Unit H(?)) that occur in the wells which make up the key-well network. These values were then used to prepare eight stratigraphic cross sections as well as structure and isopach maps for each of the regional chronostratigraphic units and an isopach map combining the thickness of Units A through E and F through H(?). The structure and isopach maps were prepared using both mechanical and interpretive contouring methods. In many parts of South Carolina, where control was sparse, and lithic, paleontologic, or log markers were vague, it was necessary to invoke interval-correlation methods in some instances. In general, the overall correlation methods employed were judged to be sufficiently accurate for purposes of a regional waste-storage feasibility study.

Sand and shale lines were established on the SP (Self Potential) curve of electric logs. The thickness values for individual sand and shale layers were scaled off the logs and compared with thicknesses values and lithic characteristics shown on strip logs prepared from our examination of cuttings and cores from many of the wells in the key-well network. Sand-shale ratios were calculated from these thickness values. The sand and shale thickness values and the position of the sand and shale layers within the various chronostratigraphic units determined the presence or absence of the potential waste-storage "operational unit" in each well when used in conjunction with drill-stem test data and log-calculated sodium chloride values for formation water in individual geologic units. The log-calculated values for the approximate amount of sodium chloride present in formation waters in the deep subsurface were obtained using the SP and Resistivity methods described by Brown (1971). For most calculations, the SP rather than the Resistivity method was used because the latter method requires the use of porosity logs and they were available for only a few wells. Sodium chloride values obtained from both drill-stem tests and log calculation were used in determining the position of the isochlors drawn on the several maps in the report. Where calculated values for sodium chloride were available from more than one interval within a given geologic unit in any one well, the values were averaged and the resulting value was used in determining the position of the isochlors for a given geologic unit. (See supplementary-data section of report and table 8).

GEOLOGIC UNITS AND THEIR SUBSURFACE DISTRIBUTION

In the project area, eight geologic units were evaluated for waste-storage potential. They are designated informally by the letters H to A. They range in age from Jurassic(?) to Late Cretaceous. Together, they make up one of the three determinant elements of the waste-storage "operational unit" as defined on page 3. These letter-designated geologic sequences were established and first mapped in the northern part of the Atlantic Coastal Plain, where a type-reference section in the subsurface was established for each sequence (Brown and others, 1972, pl. 3). The sequences comprise informal chronostratigraphic units of regional extent; each unit contains a lithology or lithologies judged to be of the same age.

During the present study, the lateral extension of most of these subsurface units into the southern part of the Atlantic Coastal Plain was based upon lithologic continuity, lithologic association, and faunal control, as interpreted from the study of well cuttings and cores and supplemented by interpretation of borehole geophysical logs. Correlation is judged to be consistent with the boundaries of depositional sequences that are extant in both the northern and southern segments of the Atlantic Coastal Plain. Correlation is consistent with, but not necessarily bounded by, elements of the faunal-control framework established for the northern part of the Atlantic Coastal Plain (Brown and others, 1972, p. 35, pl. 2), and the framework is extended to the south in the present study.

As mapped in the project area, Unit G(?) and Unit H(?) are considered to be questionably equivalent to Units G and H, respectively, as they are recognized in the northern part of the Atlantic Coastal Plain. Because these units occupy only a small area in southwestern Georgia and were not found to contain fossils, they could not be extended geographically from their type area into the project area on the basis of lithologic continuity and faunal control. Their presence in southwestern Georgia was established on the basis of electric-log correlation with well sections in southern Florida, first described by Applin and Applin (1965). The well sections in Florida have lithologic compositions and microfaunas similar to those occurring in Unit G and Unit H in North Carolina.

The eight letter-designated units mapped in the subsurface and their approximate relation to Provincial Series and Stages recognized in the Gulf Coast region (Murray, 1961) are listed in table 1. As used in this report for purposes of discussion and cartographic presentation, Units F through H are considered Lower Cretaceous to Jurassic(?), and Units A through E, Upper Cretaceous. This is a natural grouping based on similarity of depositional sequences. The grouping is consistent with the usual and practical placement of the Upper Cretaceous-Lower Cretaceous boundary so as to coincide with the Gulfian-Comanchean boundary in the Gulf and Atlantic Coast region (Murray, 1961, p. 331).

The subsurface distribution of the geologic units mapped is shown in this report on maps and stratigraphic cross sections (pl. 1).

Four principal regional structural features, all or parts of which are located in the project area, have affected the distribution, thickness, and lithology of the geologic units judged to have waste-storage potential. Previously known and described under various names, they are the Cape Fear Arch, the Savannah (Southeast Georgia) basin, the Central Georgia uplift, and the Apalachicola (Southwest Georgia) embayment (fig. 1). Among others, Murray (1961), Applin and Applin (1965, 1967), and Maher (1971) have discussed one or more of these structural features in some detail and described their influence in shaping the geometry of sediments that overlie them. In this report, their presence and their influence on geologic units judged to have waste-storage potential are indicated by structural contours on the top of the pre-Unit H(?) basement surface and by structural top and thickness maps drawn for Units H(?) through A.

ROCKS OF THE PRE-UNIT H(?) BASEMENT SURFACE

As indicated on the cross sections and in well-data tables in this report, the geologic units judged to have waste-storage potential lie on a basement surface composed of a complex of different types of igneous, sedimentary, and metamorphic rocks that range in age from Precambrian(?) and early Paleozoic to Triassic(?).

Terrestrial red beds of probable Triassic age, interlayered with basalt and intruded by diabase, appear to have the most widespread distribution among those rocks that form the basement floor. They occur within and help to define a broad, northeast-trending rift belt that extends across central Georgia (section E–E', pl. 1) and into South Carolina. The maximum thickness of Triassic(?) rock penetrated in wells that make up the key-well network was 3,682 feet in a well (GA–PU–OT–1, section E–E', pl. 1) in Pulaski County, Ga.

Unmetamorphosed Paleozoic strata, consisting chiefly of quartzitic sandstone and black to maroon micaceous shale, have been described from a few wells in southern and western Georgia (see Applin and Applin, 1964 and

TABLE 1.—*Generalized correlation chart of upper Mesozoic units, Atlantic Coastal Plain, New York to Georgia*

ERATHEM	SYSTEM	SERIES	EUROPEAN STAGE	U.S. GULF COAST (FROM MURRAY, 1961). PROVINCIAL SERIES	U.S. GULF COAST (FROM MURRAY, 1961). PROVINCIAL STAGE	U.S. ATLANTIC COAST (FROM BROWN, AND OTHERS 1972). STRATIGRAPHIC UNIT
MESOZOIC	CRETACEOUS	UPPER CRETACEOUS	SENONIAN	GULFIAN	NAVARROAN	UNIT A
					TAYLORAN	UNIT B
					AUSTINIAN	UNIT C
			TURONIAN		EAGLEFORDIAN	UNIT D
			CENOMANIAN		WOODBINIAN	UNIT E
		LOWER CRETACEOUS	ALBIAN	? COMANCHEAN	WASHITAN	UNIT F
					FREDERICKS-BURGIAN	
			APTIAN		TRINITIAN	UNIT G
			NEOCOMIAN	? COAHUILAN	NUEVO LEÓNIAN	UNIT H
					DURANGOAN	
	JURASSIC	UPPER JURASSIC	PORTLANDIAN	? SABINASIAN	LA CASITAN	

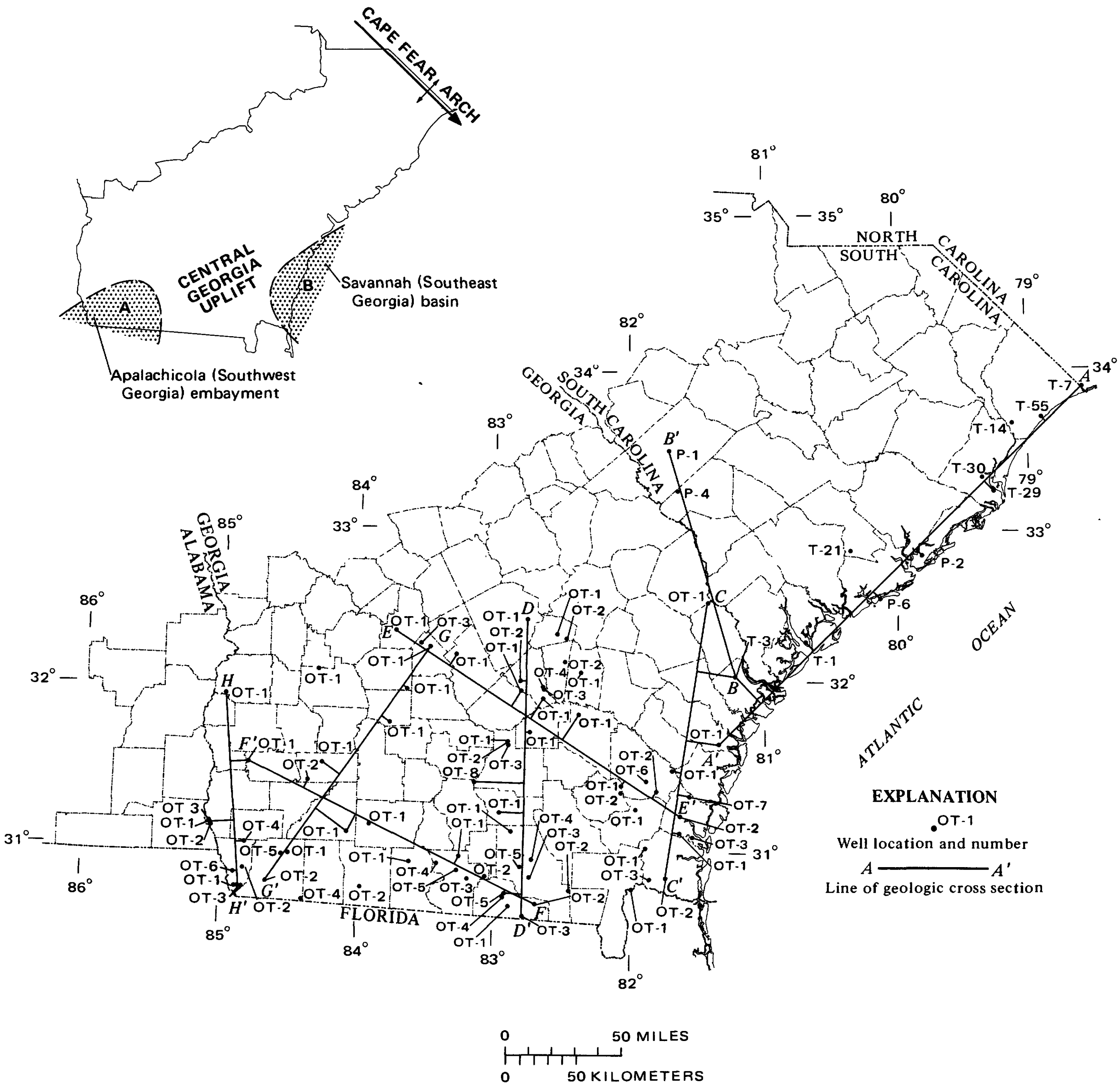

FIGURE 1.—The location of principal structural features in the project area.

Marsalis, 1970). Wells that penetrate Paleozoic rock are located predominantly, but not exclusively, in Lowndes and Echols Counties, Ga. (section F–F', pl. 1). The maximum thickness of Paleozoic rock penetrated in wells that make up the key-well network was 3,080 feet in a well (GA–LOW–OT–1, section F–F', pl. 1) in Lowndes County, Ga.

Milton and Hurst (1965) provide a detailed description of some of the "basement" rocks encountered in wells in the Georgia Coastal Plain.

A map of the structural surface of pre-Unit H(?) basement rock is shown on plate 2A. The map shows that the basement descends rather evenly toward the southeast from the Cape Fear Arch to the vicinity of the Savannah (Southeast Georgia) basin wherein the maximum depth to the top of basement is greater than 4,600 feet below mean sea level in parts of Brantley, Camden and Glynn Counties, Ga. (See sections A–A' and C–C', pl. 1.) The two major depocenters in the project area, the Savannah (Southeast Georgia) basin and the Apalachicola (Southwest Georgia) embayment, are separated by the saddle-shaped area shown on the map, the Central Georgia uplift. In the project area the maximum depth to the top of basement, about 7,000 feet below mean sea level, occurs in southwestern Seminole County, Ga. (section H–H', pl. 1), located in the Apalachicola (Southwest Georgia) embayment.

The total thicknesses for Lower Cretaceous to Jurassic(?) rocks and for Upper Cretaceous rocks that overlie the pre-Unit H(?) basement and which were evaluated for their waste-storage potential are shown on plate 2B and 2C. Lower Cretaceous to Jurassic(?) rocks, that range from about 1,000 to 3,600 feet in thickness, occur chiefly within and peripheral to the Apalachicola (Southwest Georgia) embayment. Throughout most of the project area and except where a fault-bounded trough may be present locally, these rocks generally are less than 500 feet thick. From this thickness-distribution pattern, it can be inferred that most of the project area, including the Savannah (Southeast Georgia) basin, was positive relative to the actively subsiding Apalachicola (Southwest Georgia) embayment during Early Cretaceous to Jurassic(?) time.

As may be seen from comparison of plates 2B and 2C, the overall thickness-distribution pattern for the Upper Cretaceous rocks is significantly different than that shown for the Lower Cretaceous to Jurassic(?) rocks. In general the Upper Cretaceous rocks attain a maximum thickness of from 2,000–2,300 feet in a northeasterly to easterly trending zone across central Georgia from whence they thin toward both the northwest and the southeast. From the thickness-distribution pattern shown for Upper Cretaceous rocks, it can be inferred that the two major depocenters in the project area, the Savannah (Southeast Georgia) basin and the Apalachicola (Southwest Georgia) embayment, were not areas of major subsidence relative to adjacent geographic areas during Late Cretaceous time.

Assuming that waste-storage potential may be greatest where geologic units with such potential are the thickest, the Apalachicola (Southwest Georgia) embayment may have the greatest waste-storage potential insofar as its Lower Cretaceous to Jurassic(?) rocks are concerned. Similarly, the linear northeast-trending belt across central Georgia may have the greatest waste-storage potential insofar as its Upper Cretaceous rocks are concerned.

Information that pertains to the areal distribution of individual geologic units evaluated for waste-storage potential is combined with other data and shown on a series of maps (pls. 3 through 10). Maps prepared for each of the eight geologic units show the following:

1. The areal distribution of the unit in the subsurface.
2. Structural contours on the top of the unit: mean sea level datum.
3. Delineation of areas within the unit where the calculated sand-shale ratio is one or greater.
4. Delineation of areas where the unit contains nonusable ground water defined as having an approximate sodium chloride concentration of 10,000 mg/L or greater.
5. Contoured thickness of the unit in areas where it contains nonusable ground water.
6. Contoured values for the approximate sodium choride concentration of its nonusable ground water.

The information presented on the maps is described and interpreted in the section on "Waste-storage Potential of Geologic Units."

SODIUM CHLORIDE CONCENTRATION OF FORMATION WATERS CONTAINED IN UNITS A THROUGH H(?)

A major constraint imposed on the potential utilization of subsurface geologic units for waste-storage purposes is the amount of sodium chloride in their contained waters. In the project area, and by our definition of usable and nonusable ground waters (See p. 3), formation waters in the various geologic units present in the deep subsurface must contain sodium chloride in excess of 10,000 mg/L in order for these units to have waste-storage potential. This requirement effectively eliminates all the Cretaceous geologic units (Units A through F) mapped in the subsurface of South Carolina from consideration as potential waste-storage reservoirs. (Units G and H, mapped elsewhere in the Atlantic Coastal Plain, are absent in South Carolina according to available well data.) During our investigation, no formation waters in geologic units of Gulfian and Comanchean age in the subsurface of South Carolina were found to contain as much as 10,000 mg/L of sodium chloride. Therefore, for purposes of our investigation of the waste-storage potential of some Mesozoic units in the southern part of the Atlantic Coastal Plain and irrespective of their sand-shale geometry, South Carolina is judged to have no waste-storage potential insofar as Units A through H(?) are concerned. In the following segments of this report there is no additional discussion of waste-storage potential in South Carolina.

In Georgia, all (Units G(?) and H(?)) or parts (Units A through F) of the eight chronostratigraphic units mapped in the subsurface contain formation waters that have a sodium chloride concentration in excess of 10,000 mg/L. The areal distribution of this type of formation water for each of the eight geologic units is shown by value-designated isochlors (10,000 mg/L and greater) on the structure and isopach maps drawn for individual units. In general and as shown on the individual structure maps, the boundary between those parts of each geologic unit that do and do not have waste-storage potential, insofar as the sodium chloride concentration of formation waters is a determinant, appears to be chiefly controlled by structural configuration as might be expected.

In table 2 a numerical value, determined by planimeter measurement, is given for the square mile area where each geologic unit contains formation waters having a sodium chloride concentration in excess of 10,000 mg/L; these are the areas that have waste-storage potential. Comparison of these values indicates that Unit F has the greatest and Unit H(?) the least waste-storage potential in terms of areal extent without considering the sand-shale geometry of each unit or its thickness.

From inspection of the structure maps on which the isochlors are superimposed, the geologic units being evaluated for waste-storage purposes in Georgia appear, in general, to have the greatest overall waste-storage potential in those areas where they lie at least 2,000 feet below mean sea level. In table 2, a numerical value, determined by planimeter measurement, is given for the square mile area in which each unit lies at a depth greater than 2,000 feet below mean sea level. A percentage value is given for that part of the geologic unit, deeper than 2,000 feet below mean sea level, which contains formation water with a sodium chloride concentration greater than 10,000 mg/L. Comparison of the percentage values indicates that, where segments of each geologic unit lie deeper than 2,000 feet below mean sea level, Unit G(?) and Unit H(?) have the greatest and Unit D the least waste-storage potential in terms of a depth/formation-water relation only.

For evaluation and planning purposes and from the depth and calculated salinity data contoured on the structure maps, a similar correspondence may be established for a depth/formation-water relation at different depths

TABLE 2.—*Comparative salinity/depth data for Units A through H(?) in Georgia*

Geologic Unit	Area where unit contains water having a sodium chloride concentration greater than 10,000 mg/L (sq mi)	Area where unit lies deeper than 2,000 feet below mean sea level (sq mi)	Percent of square mile area where unit is deeper than 2,000 feet and contains water having a sodium chloride concentration greater than 10,000 mg/L
A	5,824	9,361	62
B	7,232	12,697	57
C	8,876	18,433	48
D	7,240	22,533	32
E	13,653	25,348	54
F	16,319	28,109	58
G(?)	6,236	6,236	100
H(?)	4,608	4,608	100

of burial for given geologic units. If detailed waste-storage studies are undertaken in the project area, it may be convenient to establish such correspondence for specific cases of waste-storage evaluation where depth of burial may constitute a critical risk or economic factor in an overall evaluation of the waste-storage potential of several geologic units which otherwise may have about equal potential.

Beyond providing information that can be used to position a mappable boundary between usable and nonusable formation waters in geologic units judged to have waste-storage potential, the basic information, that pertains to the lateral extent of differentially saline types of both usable and nonusable ground waters, can be used for other purposes. It can be used to indicate the distribution and extent of natural gravity-flow or "flushing" patterns that are characteristic of the geologic units. It can be used to plan the development of or to manage the ground water contained in these geologic units. Also, it can be used for policy-making purposes if local governmental agencies feel the need to establish a more-limiting or less-limiting salinity criterion than the one used in this report for separating usable from nonusable ground waters.

According to our definition of usable and nonusable ground water, Units A through F contain both types of water. Units G(?) and H(?) contain only nonusable ground water. For comparative purposes isochlor maps for Units A through H(?) are shown on plate 11. The areal distribution of ground waters that contain sodium chloride in excess of 1,000 mg/L is shown by isochlors for Units A through F. Similarly, isochlors greater than 25,000 mg/L are shown for Unit G(?) and greater than 50,000 mg/L for Unit H(?).

From inspection of the maps shown on plate 11, it is apparent that gravity-flow or "flushing" patterns now characteristic of Units A through F have a definite north-south alinement, and for Units G(?) and H(?) a northeast-southwest alinement. The maximum concentration of sodium chloride recognized in ground waters in Georgia occurs in Unit F in parts of Brooks and Lowndes Counties; the concentration there is judged to exceed 200,000 mg/L.

SAND-SHALE GEOMETRY

There are three determinant factors embodied in our definition of a waste-storage "operational unit" for the project area. They are: (1) the distribution of Units A through H(?) in the subsurface, (2) the distribution of nonusable ground water within each unit, (3) the presence within each unit of sand or sandstone layers, 20 feet or greater in thickness, that are directly overlain and underlain by shale or clay layers, 20 feet or greater in thickness.

Once spatial distributions for the first two factors have been determined, final determination as to whether or not potential waste-storage reservoirs are present depends entirely on the presence or absence of the sand-shale (reservoir, reservoir-seal) combination in individual boreholes that penetrate given geologic units where they contain nonusable ground water. The determination as to the presence or absence of the requisite sand-shale combination is made from geophysical or lithologic-log evaluation of the stratigraphic column present in each available well. The evaluation is made in terms of the number of occurrences and thicknesses of sand, shale, and carbonate components, together with their relative positioning for each of the eight geologic units that might be present in a given borehole. From respective thickness values for the three lithologic components scaled off the logs, and from their geometric arrangement in a stratigraphic column, a judgment is made as to whether the sand-shale combination, required by the definition of the waste-storage "operational unit," is present or absent.

Using the procedures as outlined herein, it was determined that the requisite sand-shale (reservoir, reservoir-seal) combination is present one or more times in 15 wells, wherein the geologic units (A through H(?)) contain nonusable ground waters. Therefore, 17 percent of the 88 wells that make up the key-well network were found to penetrate geologic units judged to have some degree of waste-storage potential. Wells that have this storage potential, together with notation as to the geologic units and number of reservoir sands in each unit that have such potential, are listed in table 3.

From inspection of the table, it is apparent that Unit F has the greatest and Unit C the least waste-storage potential in a regional sense. A combined total of 20 potential-reservoir sands are present in 15 wells. Five wells contain two potential-reservoir sands. Ten wells contain one such sand. The 15 wells, judged to have waste-storage potential, are located in 10 different counties. Early County, Ga., contains the greatest number of such wells (3) located in any one county.

TABLE 3.—*Number of reservoir sands and wells with waste-storage potential in Units A through H(?) in Georgia*

Wells	Geologic Units							
	A	B	C	D	E	F	G(?)	H(?)
	Number of sands with reservoir potential							
GA -AT -OT -1	--	--	--	--	--	1	--	--
GA -CAM -OT -1	--	1	--	1	--	--	--	--
GA -COQ -OT -1	--	--	--	--	1	--	--	--
GA -DE -OT -1	--	--	--	--	--	1	--	--
GA -DOG -OT -2	--	--	--	--	--	1	1	--
GA -EA -OT -1	--	--	--	--	1	1	--	--
GA -EA -OT -2	--	--	--	--	--	2	--	--
GA -EA -OT -3	--	--	--	--	--	1	--	--
GA -EC -OT -1	--	--	--	1	--	--	--	--
GA -GLY -OT -2	--	--	--	1	--	--	--	--
GA -GLY -OT -7	1	--	--	--	--	--	--	--
GA -LOW -OT -5	--	--	--	--	--	1	--	--
GA -MIT -OT -1	--	--	--	--	--	--	--	1
GA -SE -OT -3	--	--	--	--	--	1	--	--
GA -SE -OT -6	--	--	--	--	--	2	--	--
Total sands with reservoir potential	1	1	0	3	2	11	1	1
Total wells in unit with waste-storage potential	1	1	0	3	2	9	1	1

Data sheets for wells judged to have waste-storage potential are located in the supplementary data section of the report. Brown and Reid (1976, p. 5) previously described the nature of the data and the manner in which they are used as follows:

> The entries on the data sheets consist of 20 categories of data that relate either to the depth of occurrence or thickness of geologic units, to the depth of occurrence or thickness of a unit's sand and shale components, or to useful combinations of these data. The 20 categories of data were used directly or were combined or averaged so as to derive quantitative geologic parameters that could be mapped or tabulated to show the occurrence and distribution of potential waste-storage reservoirs in the study area.

For purposes of comparative evaluation of the waste-storage potential of the geologic units mapped, in terms of quantitative elements of their sand-shale geometries, the values listed for 10 categories of data shown on the individual well-data sheets were averaged if a unit contained more than one potential waste-storage interval or was listed individually if only one interval was present in a given unit. The individual or averaged values are listed in table 4. Values such as these, when considered within a cost-risk-benefit framework, can provide a quantitative basis for assessing the relative waste-storage potential of the different geologic units in the project area. Also, when compared with similar data from outside the project area, such as in the northern part of the Atlantic Coastal Plain (Brown and Reid, 1976, table 2, p. 15), they provide a quantitative basis for a regional assessment of relative waste-storage potential within some of the same geologic units.

If sands are considered to represent permeable zones and shales relatively impermeable zones in the geologic units judged to have waste-storage potential, then the ratio of a unit's sand thickness to its shale thickness indirectly denotes the relation between permeability and permeability-barrier potential in clastic sections considered for waste storage (Brown and Reid, 1976, p. 7). For sections composed of equal thicknesses of sand and shale, the ratio value is one and the total thickness of permeability and permeability-barrier zones in sections considered for waste storage is equal. As the ratio value increases from 1 to infinity, the greater becomes the proportionate thickness of potential permeability zones in the section. Conversely, as the ratio value decreases from 1 to 0 the greater becomes the proportionate thickness of potential permeability-barrier zones in the section.

TABLE 4.—*Summary of selected data for waste-storage parameters, Units A through H(?) in Georgia*

[Unit C contains no potential waste-storage intervals. Units A, B, G(?), and H(?) each contain one potential waste-storage interval. Units D, E, and F each contains more than one potential waste-storage interval]

	Geologic Units							
	A	B	C	D	E	F	G(?)	H(?)
Average number of potential waste-reservoir sands per well	1	1	0	1	1	1.2	1	1
Maximum thickness of potential waste-reservoir sand per well, in feet	155	195	---	100	58	79	90	63
Average thickness of potential waste-reservoir sand per well, in feet	155	195	---	90	49	45	90	63
Average thickness of individual sands with waste-storage potential, in feet	155	195	---	90	49	54	90	63
Average thickness of overlying shale seal per well, in feet	205	80	---	100	34	34	55	42
Average thickness of overlying shale seal per foot of potential waste-reservoir sand, in feet per foot	1.3	0.4	---	1.1	0.7	0.6	0.6	0.67
Average thickness of underlying shale seal per well, in feet	42	95	---	52	35	41	30	25
Average thickness of underlying shale seal, per foot of potential waste-reservoir sand, in feet per foot	0.3	0.5	---	0.6	0.7	0.8	0.3	0.4
Range for the average depth of Unit's potential waste-reservoir sands, in feet below mean sea level	3,116	3,415	---	3,114 – 4,080	2,898 – 3,174	2,833 – 4,495	4,103	5,494
Range in value for Unit's D/PR factor (feet of overburden per foot of potential waste-reservoir sand)	20	18	---	37 –48	55 –72	48 –113	46	87

TABLE 5.—*Summary distribution of sand-shale ratio values for Units A through H(?) in Georgia*

[Formation waters contain concentrations of sodium chloride greater than 10,000 mg/L]

Geologic unit	1. Sand-shale ratio is 1 or greater					2. Sand-shale ratio is less than 1					3. Total of columns 1 and 2	
	Area		Average thickness (ft)	Volume		Area		Average thickness (ft)	Volume		Area	Volume
	Square miles	Percent of total		Cubic miles	Percent of total	Square miles	Percent of total		Cubic miles	Percent of total	Square miles	Cubic miles
A	1,145	20	141	30.6	9	4,679	80	359	318	91	5,824	349
B	1,851	26	260	91.1	22	5,381	74	314	320	78	7,232	411
C	0	0	—	—	—	8,876	100	380	639	100	8,876	639
D	2,172	30	327	134	28	5,068	70	353	339	72	7,240	473
E	221	2	123	5.1	1	13,432	98	172	438	99	13,653	443
F	8,975	55	774	1,316	63	7,344	45	549	764	37	16,319	2,080
G(?)	62	1	1,070	12.6	1	6,174	99	754	882	99	6,236	895
H(?)	0	0	—	—	—	4,608	100	655	572	100	4,608	572

Sand-shale ratios were calculated for sections cut in wells that make up the key-well network. The ratio values are plotted on sand-shale distribution maps prepared for individual geologic units. Areas where the sand-shale ratio is one or greater are delineated by a map pattern. These are areas where the thickness of potential permeability zones is equal to, or greater than, the thickness of potential permeability-barrier zones. Conversely, nonpatterned areas on these maps are areas where the thickness of potential permeability-barrier zones is greater than the thickness of potential permeability zones.

For each geologic unit, areas and volumes were computed for the patterned and nonpatterned ratio-value zones shown on the individual sand-shale distribution maps. These data are listed in table 5. They provide a quantitative basis for evaluating the proportionate permeability and permeability-barrier distribution present in the sediment mass where it is judged to have waste-storage potential.

WASTE-STORAGE POTENTIAL OF GEOLOGIC UNITS

UNIT H(?), ROCKS OF CRETACEOUS AND LATE JURASSIC(?) AGE

The designated type-reference section for Unit H (Brown and others, 1972, p. 38, pl. 50) is a well section, 1,120 feet thick, in Pamlico Sound, Hyde County, N.C.

In the project area, Unit H(?) is confined to the subsurface. Its occurrence is restricted to a small block of counties in southwestern Georgia (pl. 3A) which lie within and help to define the Apalachicola (Southwest Georgia) embayment (fig. 1). Unit H(?) is judged to be present in 9 of the 88 wells that make up the key-well network (pl. 3C and table 6). Throughout its extent, Unit H(?) contains nonusable ground water (pl. 3C). On the basis of the geometry of its combined sand-shale layers, Unit H(?) is judged to have waste-storage potential in only one of the nine wells in which it is present (pl. 3C).

The sediments of Unit H(?) consist of varicolored (maroon, purple, green, and yellow) micaceous sandy clay, medium- to coarse-grained clayey sand and sandstone, and, occasionally, lenses of poorly sorted quartzitic and feldspathic gravel, that may contain diabase pebbles. Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit H(?) in this report.

Representative geophysical-log sections and depth of occurrence and thickness-distribution patterns for Unit H(?) are shown on the stratigraphic cross sections (pl. 1, sections F–F', G–G', and H–H'). The depth to the top of the unit ranges from about 4,200 feet below mean sea level, in parts of Lee, Randolf, Terrell, and Worth Counties, Ga., to about 5,800 feet below mean sea level in parts of Decatur and Seminole Counties, Ga. (pl. 3A). The thickness of Unit H(?) ranges from less than 100 feet in parts of Lee and Worth Counties, Ga. to more than 1,100 feet in parts of Decatur and Seminole Counties, Ga. (pl. 3B). As shown by contours (pl. 3B), the approximate sodium chloride concentration of ground water in Unit H(?) ranges from greater than 10,000 mg/L to greater than 100,000 mg/L. As calculated from structure-contour and isopach maps (pl. 3A and 3B) for areas which contain nonusable ground water (pl. 3B), Unit H(?) covers an area of 4,608 square miles and contains a volume of sediments comprising 572 cubic miles. (See table 5.)

In areas where Unit H(?) contains nonusable ground water (pl. 3C) and may, therefore, have waste-storage potential, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in only one well (GA–MIT–OT–1) in Mitchell County, Ga. (pl. 3C). In this well, the depth to the top of Unit H(?) is 5,302 feet below mean sea level and the unit is 575 feet thick. The total thickness comprises 75 feet (13 percent) sand and 500 feet (87 percent) shale.

One sand layer, 63 feet thick, immediately overlain by a shale layer 42 feet thick and underlain by a shale layer 25 feet thick, was judged to have waste-storage potential, in terms of the criteria for such established in this report. In this well, the depth to the top of the potential waste-reservoir sand is 5,494 feet below mean sea level. The D/PR factor (average depth of potential reservoir sand occurrence/total thickness of Unit's potential reservoir sand) is 87. The D/PR factor, or depth/potential reservoir factor, shows the comparative thickness of overburden per foot of potential reservoir sand in areas where potential waste-storage reservoirs are present (Brown and Reid, 1976, p. 6). The factor is useful in making a comparative assessment of regional waste-storage potential within a cost-risk-benefit framework.

Geohydrologic data for the one well section in Unit H(?), judged to have waste-storage potential, are listed in the supplementary-data section of this report. A comparative summary of the data from this and other wells that have sections with waste-storage potential and which penetrate one or more of the geologic units evaluated for waste-storage purposes is listed in table 4.

In general, the absence of waste-storage potential within Unit H(?) may be attributed to the fact that the sections penetrated are sand-deficient rather than shale-deficient.

UNIT G(?), ROCKS OF CRETACEOUS AGE

The designated type-reference section for Unit G (Brown and others, 1972, p. 39, pl. 50) is a well section, 942 feet thick, in Carteret County, N.C.

Unit G(?) is confined to the subsurface in the project area. Like Unit H(?), its occurrence is restricted to a small block of counties in southwestern Georgia (pl. 4A); these counties lie within the Apalachicola (Southwest Georgia) embayment (fig. 1). Unit G(?) is judged to be present in 14 of the 88 wells that make up the key-well network (pl. 4C and table 6). Throughout its extent, Unit G(?) contains nonusable ground water (pl. 4C). On the basis of the geometry of its combined sand-shale layers, Unit G(?) is judged to have waste-storage potential in only 1 of 14 wells in which it is present.

The sediments of Unit G(?) chiefly consist of mottled, red and brown to tan micaceous shale, fine- to coarse-grained, angular to subrounded quartz sand and sandstone, that may contain red nodular limestone and gray to green nodules of chert. Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit G(?) in this report.

Representative geophysical-log sections and depth-of-occurrence and thickness-distribution patterns for Unit G(?) are shown on the stratigraphic cross sections (pl. 1, sections F–F', G–G', and H–H'). The depth to the top of the unit ranges from about 3,200 feet below mean sea level, in parts of Crisp County, Ga., to about 5,000 feet below mean sea level in parts of Decatur and Grady Counties, Ga. (pl. 4A). The thickness of Unit G(?) ranges from less than 500 feet, in parts of Crisp and Turner Counties, Ga., to more than 1,000 feet in parts of Baker, Miller, Mitchell, and Seminole Counties, Ga. (pl. 4B). As shown by contours (pl. 4B), the approximate sodium chloride concentration of ground waters in Unit G(?) ranges from greater than 10,000 mg/L to greater than 100,000 mg/L. As calculated from structure-contour and isopach maps (pl. 4A and 4B) for areas where it contains nonusable ground water (pl. 4B), Unit G(?) extends across an area of 6,326 square miles and contains a volume of sediments equivalent to 895 cubic miles. (See table 5.)

In areas where Unit G(?) contains nonusable ground water (pl. 4C) and may, therefore, have potential for waste storage, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in only one well (GA–DOG–OT–2) in Dougherty County, Ga (pl. 4C). In this well the depth to the top of Unit G(?) is 4,013 feet below mean sea level and the unit is 740 feet thick. The total thickness comprises 170 feet (23 percent) sand and 570 feet (77 percent) shale.

One sand layer, 90 feet thick, immediately overlain by a shale layer 55 feet thick and underlain by a shale layer 30 feet thick, was judged to have waste-storage potential, in terms of the criteria established in this report. In this well the depth to the top of the potential waste-reservoir sand is 4,103 feet below mean sea level. The D/PR factor (average depth of potential reservoir sand occurrence/total thickness of Unit's potential reservoir sand) is 46.

Geohydrologic data for the one well section in Unit G(?) judged to have waste-storage potential are listed in the supplementary-data section of this report. A comparative summary of the data from this and other wells that have sections with waste-storage potential and which penetrate one or more of the geologic units evaluated for waste-storage purposes is listed in table 4.

UNIT F, ROCKS OF CRETACEOUS AGE

The designated type-reference section for Unit F (Brown and others, 1972, p. 40, pl. 43) is a well section, 83 feet thick, in Halifax County, N.C.

In the project area, Unit F has a wide distribution that extends from the North Carolina-South Carolina border, southwestward, to the Georgia-Alabama border (pl. 5A). It ranges in thickness from less than 100 feet, over much of the South Carolina and eastern Georgia coastal plains, to more than 1,500 feet, in parts of Early, Miller, and Seminole Counties in southwestern Georgia. The maximum thickness measured, 1,560 feet, is in a well in Early County, Ga. (GA–EA–OT–1, table 6).

Unit F is present in 81 of the 88 wells that comprise the key-well network (pl. 5A). Unit F contains both usable and nonusable ground water whose distribution is shown on plate 5 and plate 12. In areas where Unit F contains nonusable ground water, it is judged to be present in 52 of the 88 wells that make-up the key-well network. In 9 of these 52 wells, Unit F is judged to have waste-storage potential on the basis of the geometry of its combined sand-shale layers (pl. 5C).

The sediments of Unit F chiefly consist of gray, brown, and tan micaceous shale interlayered with poorly sorted, fine- to coarse-grained sandstone or loosely consolidated sand. Rosettes, nodules, and balls of siderite commonly occur in the sediments. Glauconite is present locally in trace amounts. Herrick (1961) and Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit F in this report.

Representative geophysical-log sections and depth-of-occurrence and thickness-distribution patterns for Unit F are shown on the eight stratigraphic cross sections assembled on plate 1. In areas where Unit F contains nonusable ground water, the depth to the top of the unit ranges from about 1,700 feet below mean sea level, in parts of Dooly County, Ga., to about 3,600 feet below mean sea level, in parts of Brooks, Decatur, Grady, and Thomas Counties, Ga. (pl. 5A). Also in areas of nonusable ground water, the thickness of Unit F ranges from less than 100 feet, in parts of eastern Georgia, to more than 1,500 feet, in parts of southwestern Georgia (pl. 5B). As shown by contours (pl. 5B), the approximate sodium chloride concentration of nonusable ground water in Unit F ranges from greater than 10,000 mg/L to greater than 200,000 mg/L. As calculated from structure-contour and isopach maps (pl. 5A and 5B) for areas where it contains nonusable ground water (pl. 5B), Unit F covers an area of 16,319 square miles and contains a volume of sediments equivalent to 2,080 cubic miles. (See table 5.)

In areas where Unit F contains nonusable ground water (pl. 5C) and may, therefore, have waste-storage potential, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in nine wells located in six counties in Georgia (pl. 5C) as follows:

GA–AT–OT–1	Atkinson County
GA–DE–OT–1	Decatur County
GA–DOG–OT–2	Dougherty County
GA–EA–OT–1	Early County
GA–EA–OT–2	Early County
GA–EA–OT–3	Early County
GA–LOW–OT–5	Lowndes County
GA–SE–OT–3	Seminole County
GA–SE–OT–6	Seminole County

In two of the nine wells (GA–EA–OT–2 and GA–SE–OT–6), the sand-shale combination with waste-storage potential occurs twice. In the other seven wells, the combination occurs once. In the nine wells the depth to the top of Unit F ranges from 2,803 feet (GA–DOG–OT–2) to 3,777 feet (GA–AT–OT–1) below mean sea level and averages 3,220 feet. In these wells the total thickness of Unit F ranges from 222 feet (GA–AT–OT–1) to 1,560 feet (GA–EA–OT–1) and averages 1,225 feet.

Total sand thickness for Unit F in the nine wells ranges from 108 feet (GA–AT–OT–1) to 1,228 feet (GA–EA–OT–2) and averages 805 feet. Total shale thickness for Unit F in the nine wells ranges from 114 feet (GA–AT–OT–1) to 767 feet (GA–EA–OT–3) and averages 420 feet.

The thickness of Unit F's potential reservoir sands ranges from 35 feet (GA–LOW–OT–5) to 79 feet

(GA–EA–OT–2) and averages 54 feet in the nine wells. The thickness of the individual sands range from 25 to 62 feet and averages 44 feet. The thickness of Unit F's potential reservoir seals, that immediately overlie reservoir sands, range from 20 feet (GA–AT–OT–1, GA–EA–OT–3, GA–SE–OT–3, and GA–SE–OT–6) to 40 feet (GA–DE–OT–1) and averages 34 feet. The range in thickness is the same for the individual overlying seals, but the individual average thickness is 28 feet. Similarly, the thickness of underlying reservoir seals ranges from 22 feet (GA–SE–OT–6) to 60 feet (GA–DE–OT–1) and averages 41 feet. Here also the range in thickness of the individual underlying seals is the same but the average thickness is 34 feet.

In wells where Unit F has waste-storage potential, the depth to the top of the potential reservoir sand ranges from 2,833 feet (GA–DOG–OT–2) to 4,495 feet (GA–SE–OT–3) below mean sea level and averages 3,843 feet. For the same wells the DP/R factor (average depth of the individual potential reservoir sand occurrence/total thickness of Unit's potential reservoir sand) ranges from 64 (GA–EA–OT–3) to 154 (GA–EA–OT–2) and averages 94. Lines of equal value for the D/PR factor calculated for Unit F are shown on plate 5C. In the two wells (EA–OT–2 and SE–OT–6) where the sand-shale combination with waste-storage potential occurs twice, a value for the D/PR factor was determined for each sand occurrence. The two values, one for the upper sand and one for the lower sand, are listed in table 7 for each of the two wells. On plate 5C, the smaller of the two numbers, which is the number representing the D/PR factor for the upper sand, was used to determine the position of lines of equal value for the D/PR factor in Unit F.

For the nine wells in which Unit F is judged to have waste-storage potential, geohydrologic data are listed in the supplementary-data section of this report. A comparative summary of geohydrologic data for the geologic units evaluated for waste-storage purposes is given in table 4.

UNIT E, ROCKS OF CRETACEOUS AGE

The designated type-reference section for Unit E (Brown, and others, 1972, p. 42, pl. 51) is a well section, 270 feet thick, in Albermarle Sound, Dare County, N.C.

In the project area, Unit E is generally absent in South Carolina, except in the parts of Beaufort, Charleston, and Jasper Counties, but it has a widespread distribution throughout central and southern Georgia (pl. 6A). It ranges in thickness from less than 50 feet in parts of South Carolina and central Georgia to more than 700 feet in parts of Early County in western Georgia. The maximum thickness measured, 713 feet, is in a well in Early County, Ga. (GA–EA–OT–3, table 6).

Unit E is present in 72 of the 88 wells that make up the key-well network (pl. 6A). Unit E contains both usable and nonusable ground water whose distribution is shown on plate 6 and plate 12. In areas where Unit E contains nonusable ground water, it is judged to be present in 48 of the 88 wells that make up the key-well network. In only 2 of these 48 wells is Unit E judged to have waste-storage potential on the basis of the geometry of its combined sand-shale layers (pl. 6C).

The sediments of Unit E consist chiefly of gray to brownish-gray micaceous shale, intercalated with thin layers of fine- to medium-grained sand and sandstone and containing lenses of leached skeletal-micritic limestone. Phosphorite, pyrite, and glauconite occur commonly in the middle and lower third of the unit. Herrick (1961) and Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit E in this report.

Representative geophysical-log sections and depth-of-occurrence and thickness-distribution patterns for Unit E are shown on seven of the eight stratigraphic cross sections assembled on plate 1. In areas where Unit E contains nonusable ground water, the depth to the top of the unit ranges from about 2,000 feet below mean sea level in parts of Dooly County, Ga. to more than 4,400 feet below mean sea level in parts of Camden and Glynn Counties, Ga. (pl. 6A). Also, in areas of nonusable ground water, the thickness of Unit E ranges from less than 100 feet in eastern and west-central Georgia to more than 300 feet in Decatur, Grady, and Seminole Counties, Ga. (pl. 6B). As shown by contours (pl. 6B), the approximate sodium chloride concentration of nonusable ground water in Unit E ranges from greater than 10,000 mg/L to greater than 100,000 mg/L. As calculated from structure-contour and isopach maps (pl. 6A and 6B) for areas where it contains nonusable ground water (pl. 6B), Unit E covers an area of 13,653 square miles and contains a volume of sediments equivalent to 443 cubic miles. (See table 5.)

In areas where Unit E contains nonusable ground water (pl. 6C) and may, therefore, have waste-storage potential, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in two wells in Georgia as follows:

GA–COQ–OT–1	Colquitt County
GA–EA–OT–1	Early County

In each well the sand-shale combination occurs once in Unit E. The depth to the top of Unit E ranges from 2,738 feet (GA–EA–OT–1) to 3,040 feet (GA–COQ–OT–1) below mean sea level and averages 2,889 feet. The total thickness of Unit E in these wells ranges from 200 feet (GA–COQ–OT–1) to 215 feet (GA–EA–OT–1) and averages 208 feet.

Total sand thickness for Unit E in the two wells ranges from 40 feet (GA-EA-OT-1) to 58 feet (GA-COQ-OT-1) and averages 49 feet. Total shale thickness for Unit E in the same wells ranges from 142 feet (GA-COQ-OT-1) to 175 feet (GA-EA-OT-1) and averages 159 feet.

The thickness of Unit E's potential reservoir sands ranges from 40 feet (GA-EA-OT-1) to 58 feet (GA-COQ-OT-1) and averages 49 feet.

Unit E's potential reservoir seals, that immediately overlie reservoir sands, are about 34 feet thick in each of the two wells. Similarly, the thickness of underlying reservoir seals ranges from 20 feet (GA-COQ-OT-1) to 50 feet (GA-EA-OT-1) and averages 35 feet.

The underlying shale seals for potential reservoir sands also extend from Unit E into the upper part of Unit F.

In wells where Unit E has waste-storage potential, the depth to the top of the potential reservoir sand ranges from 2,898 feet (GA-EA-OT-1) to 3,174 feet (GA-COQ-OT-1) below mean sea level and averages 3,036 feet. For the same wells the D/PR factor (average depth of potential reservoir sand occurrence/total thickness of Unit's potential reservoir sand) ranges from 55 (GA-COQ-OT-1) to 72 (GA-EA-OT-1) and averages 64.

For the two wells in which Unit E is judged to have waste-storage potential, geohydrologic data are listed in the supplementary-data section of this report. A comparative summary of geohydrologic data for the geologic units evaluated for waste-storage purposes is given in table 4.

UNIT D, ROCKS OF CRETACEOUS AGE

The designated type-reference section for Unit D (Brown and others, 1972, p. 42, pl. 48) is a well section, 310 feet thick, in Washington County, N.C.

In the project area, Unit D extends from the North Carolina-South Carolina border, southwest to the Georgia-Alabama border (pl. 7A). It ranges in thickness from less than 20 feet, along the inner margin of the Georgia and South Carolina coastal plains, to more than 600 feet in parts of Beaufort and Jasper Counties, S.C. and in a block of counties in west-central Georgia. The maximum thickness measured, 678 feet, is in a well in Dooly County, Ga. (GA-DOO-OT-1, table 6).

Unit D is present in 85 of the 88 wells that make up the key-well network (pl. 7A). Unit D contains both usable and nonusable ground water whose distribution is shown on plate 7 and plate 12. In areas where Unit D contains nonusable ground water, it is judged to be present in 85 of the 88 wells that make up the key-well network. In only 3 of these 85 wells is Unit D judged to have waste-storage potential on the basis of the geometry of its combined sand-shale layers (pl. 7C).

The sediments of Unit D consist chiefly of white, gray, red, or purple, poorly sorted sand, quartzose sandstone and sandy mudstone interlayered with micaceous shale. Carbonaceous material, glauconite, pyrite, and siderite may be sparse to abundant locally. Herrick (1961) and Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit D in this report.

Representative geophysical-log sections and depth-of-occurrence and thickness-distribution patterns for Unit D are shown on the eight stratigraphic cross sections assembled on plate 1. In areas where Unit D contains nonusable ground water, the depth to the top of the unit ranges from about 2,300 feet below mean sea level, in parts of Baker and Mitchell Counties, Ga., to more than 4,200 feet below mean sea level in parts of Camden and Glynn Counties, Ga (pl. 7A). In areas of nonusable ground water, the thickness of Unit D ranges from about 100 to 500 feet (pl.7B). As shown by contours (pl. 7B), the approximate sodium chloride concentration of nonusable ground water in Unit D ranges from greater than 10,000 mg/L to greater than 50,000 mg/L. As calculated from structure-contour and isopach maps (pl. 7A and 7B) for areas where it contains nonusable ground water (pl. 7B), Unit D covers an area of 7,240 square miles and contains a volume of sediment equivalent to 473 cubic miles. (See table 5.)

In areas where Unit D contains nonusable ground water (pl. 7C) and may, therefore, have waste-storage potential, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in three wells located in three counties in Georgia (pl. 7C) as follows:

GA-CAM-OT-1	Camden County
GA-EC-OT-1	Echols County
GA-GLY-OT-2	Glynn County

In each of the three wells, the sand-shale combination occurs once in Unit D. In these wells the depth to the top of Unit D ranges from 3,124 (GA-EC-OT-1) to 4,080 feet (GA-GLY-OT-2) below mean sea level and averages 3,758 feet. In these wells the total thickness of Unit D ranges from 200 feet (GA-EC-OT-1) to 395 feet (GA-GLY-OT-2) and averages 287 feet.

Total sand thickness for Unit D in the three wells ranges from 85 feet (GA-EC-OT-1 and GA-CAM-OT-1) to 181 feet (GA-GLY-OT-2) and averages 117 feet. Total shale thickness for Unit D in the same wells ranges from 115 feet (GA-EC-OT-1) to 214 feet (GA-GLY-OT-2) and averages 170 feet.

The thickness of Unit D's potential reservoir sands ranges from 85 feet (GA-EC-OT-1 and GA-CAM-OT-1) to 100 feet (GA-GLY-OT-2) and averages 90 feet. The thickness of Unit D's potential reservoir seals, that immediately overlie reservoir sands, range from 30 feet

(GA–EC–OT–1) to 140 feet (GA–GLY–OT–2) and averages 100 feet. Similarly, the thickness of underlying reservoir seals ranges from 40 feet (GA–EC–OT–1) to 70 feet (CA–CAM–OT–1) and averages 52 feet.

In one well (GA–EC–OT–1) the sand considered to have waste-storage potential occurs principally at the top of Unit D but also extends 10 feet into overlying Unit C. The overlying shale seal for this sand occurs in Unit C also. For purposes of description and tabulation, the sand is listed as being within Unit D. The overlying shale unit for well GA–CAM–OT–1 lies partly in Unit C and the overlying shale unit for well GA–GLY–OT–2 lies entirely in Unit C.

In wells where Unit D has waste-storage potential, the depth to the top of the potential reservoir sand ranges from 3,114 feet (GA–EC–OT–1) to 4,080 feet (GA–GLY–OT–2) below mean sea level and averages 3,756 feet. For the same wells the D/PR factor (depth of potential reservoir sand occurrence/total thickness of Unit's potential reservoir sand) ranges from 37 (GA–EC–OT–1) to 48 (GA–CAM–OT–1) and averages 42.

For the three wells in which Unit D is judged to have waste-storage potential, geohydrologic data are listed in the supplementary-data section of this report. A comparative summary of geohydrologic data for the geologic units evaluated for waste-storage purposes is given in table 4.

UNIT C, ROCKS OF CRETACEOUS AGE

The designated type-reference section for Unit C (Brown and others, 1972, p. 43, pl. 25) is a well section, 410 feet thick, in Pender County, N.C.

In the project area, Unit C extends from the North Carolina-South Carolina border, southwest to the Georgia-Alabama border (plate 8A). It attains a maximum thickness of greater than 500 feet, chiefly in Clay, Randolf, Terrell, and Lee Counties, Ga. Elsewhere in the project area, it ranges in thickness from less than 20 to about 400 feet. The maximum thickness measured, 641 feet, is in a well in Wayne County, Ga. (GA–WAY–OT–6, table 6).

Unit C is present in 84 of the 88 wells that make up the key-well network (pl. 8A). Unit C contains both usable and nonusable ground water whose distribution is shown on plate 8 and plate 12. In areas where Unit C contains nonusable ground water, it is judged to be present in 39 of the 88 wells that make up the key-well network. On the basis of the geometry of its combined sand-shale layers, Unit C was judged to have no waste-storage potential in the areas where it contains nonusable ground water.

In one well (GA–CAM–OT–1) a shale interval in Unit C is part of an underlying shale seal for a sand with reservoir potential in Unit B.

The sediments of Unit C consist chiefly of black- to gray or buff-colored micaceous marl and fine- to medium- to coarse-grained, highly glauconitic sand. In central and southern Georgia the marl exhibits a chalky character in many well sections. Herrick (1961) and Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit C in this report.

Representative geophysical-log sections and depth-of-occurrence and thickness- distribution patterns for Unit C are shown on the eight stratigraphic cross sections assembled on plate 1. In areas where Unit C contains nonusable ground water, the depth to the top of the unit ranges from about 1,900 feet below mean sea level in Miller and Mitchell Counties, Ga., to more than 3,700 feet below mean sea level in Camden and Glynn Counties, Ga. (pl. 8A). In areas of nonusable ground water, the thickness of Unit C ranges from 300 to 500 feet, except locally in a part of Wayne County, Ga., where the unit may attain a thickness of about 600 feet (plate 8B). As shown by contours (plate 8B), the approximate sodium chloride concentration of nonusable ground water in Unit C ranges from greater than 10,000 mg/L to greater than 15,000 mg/L. As calculated from structure-contour and isopach maps (pl. 8A and 8B) for areas where it contains nonusable ground water, Unit C covers an area of 8,876 square miles and contains a volume of sediment equivalent to 639 cubic miles. (See table 5.)

In none of the 39 wells drilled in areas where Unit C contained nonusable ground water did the unit contain at least 20-foot thick layers of sand or sandstone overlain and underlain by at least 20-foot thick layers of clay or shale. Therefore, for purposes of this report, Unit C is judged to have no waste-storage potential in the project area.

UNIT B, ROCKS OF CRETACEOUS AGE

The designated type-reference section of Unit B (Brown and others, 1972, p. 44, pl. 48) is a well section, 468 feet thick, in Carteret County, N.C.

In the project area, Unit B extends from the North Carolina-South Carolina border, southwest to the Georgia-Alabama border (pl. 9A). The unit attains a maximum thickness of from 600 to 750 feet in two northeast-trending depocenters, located in west-central and east-central Georgia, from whence it thins to both the northwest and the southeast. It is relatively thin across segments of the central Georgia uplift where it ranges in thickness from 100 to 400 feet. The maximum thickness measured, 715 feet, is in a well in Dougherty County, Ga. (GA–DOG–OT–1, table 6).

Unit B is present in 85 of the 88 wells that make up the key-well network (pl. 9A). Unit B contains both usable and nonusable ground water whose distribution is shown on plate 9 and plate 11. In areas where Unit B contains nonusable ground water, it is judged to be present in 27 of the 88 wells that make up the key-well network (pl. 9B). In only 1 of these 27 wells is Unit B judged to have waste-storage potential on the basis of the geometry of its combined sand-shale layers (pl. 9C).

The sediments of Unit B consist chiefly of light-gray to brown micaceous marl, gray sandy clay and shale, and fine- to coarse-grained quartz sand. Carbonaceous material is present in most sections, some individual layers may contain as much as 80–90 percent. Locally, sandy, micritic-skeletal limestone may be present as thin beds. Glauconite usually is present in trace amounts but may constitute as much as 50 percent of some 10-foot sample intervals. Nodular black and brown phosphorite is present in trace amounts in some sand layers. Herrick (1961) and Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit B.

Representative geophysical-log sections and depth-of-occurrence and thickness- distribution patterns for Unit B are shown on the eight stratigraphic cross sections assembled on plate 1. In areas where Unit B contains nonusable ground water, the depth to the top of the unit ranges from about 1,700 feet below mean sea level, in parts of Decatur and Grady Counties, Ga., to more than 3,400 feet below mean sea level, in parts of Camden and Glynn Counties, Ga. (pl. 9A). In areas of nonusable ground water, the thickness of Unit B ranges from about 100 feet to more than 500 feet (pl. 9B). As shown by contours (pl. 9B), the approximate sodium chloride concentration of nonusable ground water in Unit B ranges from greater than 10,000 mg/L to greater than 50,000 mg/L. As calculated from structure-contour and isopach maps (pl. 9A and 9B) for areas where it contains nonusable ground water, Unit B covers an area of 7,232 square miles and contains a volume of sediments equivalent to 411 cubic miles. (See table 5.)

In areas where Unit B contains nonusable ground water (pl. 9C) and may, therefore, have waste-storage potential, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in only one well (GA–CAM–OT–1) in Camden County, Ga. (pl. 9C). In this well the depth to the top of Unit B is 3,315 feet below mean sea level and the unit is 310 feet thick. The total thickness comprises 115 feet (37 percent) shale and 195 feet (63 percent) sand.

One sand layer, 195 feet thick, immediately overlain by a shale layer 80 feet thick and underlain by a shale layer 95 feet thick, was judged to have waste-storage potential. In this well the depth to the top of the potential waste-reservoir sand, that is present in the middle and lower thirds of Unit B, is 3,415 feet below mean sea level. The D/PR factor (average depth of potential reservoir sand occurrence/total thickness of Unit's potential reservoir sand) is 17.5.

Geohydrologic data for the one well section in Unit B judged to have waste-storage potential are listed in the supplementary-data section of this report. A comparative summary of the data from this and other wells that have sections with waste-storage potential and which penetrate one or more of geologic units evaluated for waste-storage purposes is listed in table 4.

UNIT A, ROCKS OF CRETACEOUS AGE

The designated type-reference section for Unit A (Brown and others, 1972, p. 45, pl. 24) is a well section, 386 feet thick, in New Hanover County, N.C.

In the project area, Unit A extends from the North Carolina-South Carolina border, southwest to the Georgia-Alabama border (pl. 10A). The unit attains a maximum thickness, greater than 1,000 feet, in parts of Glynn and McIntosh Counties, Ga., that lie within the Savannah (Southeast Georgia) basin (fig. 1). Unit A is absent or less than 50 feet thick in a tier of counties in southern Georgia that border Florida. Throughout western and central Georgia and the ocean-bordering counties in South Carolina, Unit A ranges in thickness from about 200 to 400 feet. The maximum thickness measured, 925 feet, is in a well in Glynn County, Ga. (GA–GLY–OT–7, table 6).

Unit A is present in 77 of the 88 wells that make up the key-well network (pl. 10A). Unit A contains both usable and nonusable ground water whose distribution is shown on plate 10 and plate 11. In areas where Unit A is judged to contain nonusable ground water, it is present in 17 of the 88 wells that make up the key-well network. In only 1 of these 17 wells is Unit A judged to have waste-storage potential on the basis of the geometry of its combined sand-shale layers.

The sediments of Unit A consist chiefly of gray, sandy, micaceous clay interlayered with gray to white medium- to fine-grained quartz sand and gray marl. Algal limestone and chalk are the dominant sediments in Unit A in parts of southeast Georgia. Thin beds of sandy, skeletal limestone containing phosphorite pebbles occur commonly. Most sections are sparsely to heavily glauconitic. Herrick (1961) and Applin and Applin (1964) provide detailed lithologic descriptions for sediments in Georgia that we include in Unit A in this report.

Representative geophysical-log sections and depth-of-occurrence and thickness-distribution patterns for Unit A are shown on the eight stratigraphic cross sections assembled on plate 1. In areas where Unit A contains nonusable ground water, the depth to the top of the unit ranges from about 1,500 feet below mean sea level, in parts of Colquitt County, Ga., to more than 3,100 feet below mean sea level, in parts of Camden and Charlton Counties, Ga. (pl. 10A). In areas of nonusable ground water, the thickness of Unit A ranges from 100 to 400 feet except in a local depocenter in parts of Glynn and McIntosh Counties, Ga. where it may attain a thickness of about 1,000 feet (pl. 10B). As shown by contours (pl. 10B), the approximate sodium chloride concentration of nonusable ground water in Unit A ranges from greater than 10,000 mg/L to greater than 25,000 mg/L. As calculated from structure-contour and isopach maps (pl.10A and 10B) for areas where it contains nonusable ground water, Unit A covers an area of 5,824 square miles and contains a volume of sediments equivalent to 349 cubic miles. (See table 5.)

In areas where Unit A contains nonusable ground water (pl. 10C) and may, therefore, have waste-storage potential, the requisite sand-shale (reservoir, reservoir-seal) combination, as defined on page 3, was present in only one well (GA–GLY–OT–7) in Glynn County, Ga. (pl. 10C). In this well the depth to the top of Unit A is 2,346 feet below mean sea level and the unit is 925 feet thick. The total thickness is made up of 155 feet (17 percent) sand, 400 feet (43 percent) shale, and 370 feet (40 percent) carbonate rock.

One sand layer, 155 feet thick, immediately overlain by a shale layer 205 feet thick and underlain by a shale layer 42 feet thick, was judged to have waste-storage potential, in terms of the criteria for such established in this report. In this well the depth to the top of the potential waste-reservoir sand is 3,116 feet below mean sea level. The D/PR factor (average depth of potential reservoir sand occurrence/total thickness of Unit's potential-reservoir sand) is 20.

Geohydrologic data for the one well section in Unit A judged to have waste-storage potential are listed in the supplementary data section of this report. A comparative summary of the data from this and other wells that have sections with waste-storage potential and which penetrated one or more of the geologic units evaluated for waste-storage purposes is listed in table 4.

SUMMARY

Subsurface data, derived from study of well cuttings, cores, and geophysical logs from about 400 wells, 88 of which make up a key-well network, were used to develop the concept and definition of a waste-storage "operational unit." The component parts of the unit were mapped in the subsurface by direct and indirect methods. The waste-storage "operational unit" is defined as follows:

A sand or sandstone layer, 20 feet or greater in thickness, that is directly underlain and overlain by a shale or clay layer, 20 feet or greater in thickness, and which occurs in Units A, B, C, D, E, F, G, or H, where each of these units contains waters that have a sodium-chloride concentration greater than 10,000 mg/L.

For mapping purposes, the definition contains three determinant components. They are: (1) the distribution of the eight regional chronostratigraphic Units (A through H(?)) in the subsurface, (2) the distribution within each unit of ground water that has a sodium chloride concentration greater than 10,000 mg/L, and (3) within each unit, the presence or absence of a combination of sand and shale layers that have waste-storage potential.

The distribution and nature of the three determinant components of the waste-storage "operational unit" are shown by means of maps and by tables that contain data derived from interpretation of the maps. The basic set of maps prepared for each of the eight regional chronostratigraphic units judged to have waste-storage potential includes:

1. The areal distribution of the unit in the subsurface.
2. Structural contours on the top of the unit: mean sea level datum.
3. Delineation of areas within the unit where the calculated sand-shale ratio is one or greater.
4. Delineation of areas where the unit contains nonusable ground water defined as having an approximate sodium chloride concentration 10,000 mg/L or greater.
5. Contoured thickness of the unit in areas where it contains nonusable ground water.
6. Contoured values for the approximate sodium chloride concentration of its nonusable ground water.

The maps, tables, and basic-supportive data make available to management a wide range of quantitative information that can be used to evaluate waste-storage potential in the project area and in component parts of its sediment mass. The information can be used to help select the most favorable areas with waste-storage potential for detailed examination.

As developed in this report, the concept and utilization of an "operational unit" should have value as a quantitative exploration technique in subsurface investigations other than those that involve waste storage. For example, in conjunction with the use of other carefully defined "operational units" that contain mappable geohydrologic parameters, the concept should have particular utility for purposes of determining the spatial distribution of the various amounts and types of usable ground water that may be present in both local and regional aquifer systems.

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SUPPLEMENTARY DATA

TABLE 6.—*Well number, name, location, elevation, depth, and stratigraphic*

Well number	Well name	Coordinate location: Lat.	Coordinate location: Long.	Elevation of measuring point (ft)	Elevation of ground level (ft)	Total depth (ft)	Unit H(?): Depth to top below mean sea level (ft)	Unit H(?): Thickness (ft)	Unit G(?): Depth to top below mean sea level (ft)	Unit G(?): Thickness (ft)	Unit F: Depth to top below mean sea level (ft)	Unit F: Thickness (ft)
						Appling County, Ga.						
GA–AP–OT–1	Felsenthal–Weatherford, Mrs. W. F. Bradley #1	31°52′55″	82°23′00″	231	219	4,098	abs.	—	abs.	—	3,669	175
						Atkinson County, Ga.						
GA–AT–OT–1	Sun Oil Co., Dosten and Ladson #1	31°16′00″	82°57′00″	223	—	4,287	abs.	—	abs.	—	3,777	222
						Brantley County, Ga.						
GA–BRA–OT–1	Humble Oil & Refining Co. #ST–1 W. F. Helleman	31°17′23″	81°57′15″	52	42	4,512	—	—	—	—	4,418	>42
						Brooks County, Ga.						
GA–BRO–OT–1	D. E. Hughes Co., #1–B Rogers Sr.	30°57′16″	83°36′44″	133	123	3,850	—	—	—	—	3,412	>305
						Calhoun County, Ga.						
GA–CAL–OT–1	Sowega Minerals, J. W. West No. 1	31°33′55″	84°48′15″	345	—	5,265	4,365	480	3,673	692	2,517	1,156
						Camden County, Ga.						
GA–CAM–OT–1	The California Co., John A. Buie #1	31°02′41″	81°53′03″	65	—	4,947	abs.	—	abs.	—	4,385	224
GA–CAM–OT–2	Pan American Petroleum Corp., #1–C Union Camp	30°50′42″	81°44′10″	37	—	4,610	abs.	—	abs.	—	4,373	132
GA–CAM–OT–3	Pan American Petroleum Corp., #1–B Union Camp	30°50′45″	81°51′30″	28	14	4,710	abs.	—	abs.	—	4,347	170
						Charlton County, Ga.						
GA–CHR–OT–1	South Penn Oil Co. #1 O. C. Mizell	30°47′28″	81°59′25″	36	25	4,600	abs.	—	abs.	—	4,324	130
						Chatham County, Ga.						
GA–CHA–T–3	Savannah Ports Authority	32°07′01″	81°13′ 19″	20	20	3,440	—	—	—	—	—	—
						Clinch County, Ga.						
GA–CLI–OT–1	Wiley P. Ballard, Jr., Timber Products Co. #1–A	31°09′05″	82°51′50″	215	205	4,182	abs.	—	abs.	—	3,835	110
GA–CLI–OT–2	Luke Grace Drilling Co., #1 Lem Griffis	30° 47′00″	82°26′27″	119	110	4,088	abs.	—	abs.	—	3,671	53
GA–CLI–OT–3	Hunt Oil Co., Alice Musgrove #1	30°51′20″	82°43′17″	148	138	4,088	abs.	—	abs.	—	3,632	143
GA–CLI–OT–4	Hunt Oil Co. Alice Musgrove #2	30°58′38″	82°42′30″	171	161	3,410	—	—	—	—	—	—
GA–CLI–OT–5	Sun Oil Co. W. J. Barlow #1	30°55′42″	82°47′53″	177	167	3,848	abs.	—	abs.	—	3,601	57
						Coffee County, Ga.						
GA–COF–OT–1	Carpenter Oil Co., C. T. Thurman #2	31°42′55″	82°53′50″	304	299	3,556	—	—	—	—	—	—
GA–COF–OT–2	Carpenter Oil Co., Terrell Thurman #1	31°42′45″	82°53′39″	318	308	4,129	abs.	—	abs.	—	3,417	375
GA–COF–OT–3	Carpenter Oil Co., J. H. Knight #1	31°41′07″	82°53′19″	305	—	4,151	abs.	—	abs.	—	3,367	438
GA–COF–OT–8	Chevron Oil Co., Oveda Fussell	31°27′05″	83°08′06″	295	280	4,334	abs.	—	abs.	—	3,425	580
						Colquitt County, Ga.						
GA–COQ–OT–1	R. T. Adams, D. G. Arrington #1	31°11′07″	83°54′00″	270	260	4,904	—	—	4,150	>484	3,240	910

data for the 88 wells that make up the key-well network

Well number	Well name	Unit E		Unit D		Unit C		Unit B		Unit A		Remarks
		Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	
Appling County, Ga.												
GA–AP–OT–1	Felsenthal–Weatherford, Mrs. W. F. Bradley #1	3,521	148	3,209	312	2,774	435	2,201	573	1,819	382	Section E–E′. Top, Triassic(?), below mean sea level (feet): 3,844(?)
Atkinson County, Ga.												
GA–AT–OT–1	Sun Oil Co., Dosten and Ladson #1	3,497	280	3,031	466	2,437	594	2,157	280	1,582	575	Section D–D′ Potential waste-storage section. Top, Paleozoic, below mean sea level (feet):3,999
Brantley County, Ga.												
GA–BRA–OT–1	Humble Oil & Refining Co. #ST–1 W. F. Helleman	4,278	140	4,038	240	3,628	410	3,123	505	2,408	715	
Brooks County, Ga.												
GA–BRO–OT–1	D. E. Hughes Co., #1–B Rogers Sr.	3,227	185	2,877	350	2,467	410	2,089	378	2,067	22	
Calhoun County, Ga.												
GA–CAL–OT–1	Sowega Minerals, J. W. West No. 1	2,305	212	1,687	618	1,205	482	625	580	215	410	Sections F–F′, H–H′ Top, Triassic, below mean sea level (feet): 4,845
Camden County, Ga.												
GA–CAM–OT–1	The California Co., John A. Buie #1	4,337	48	4,070	267	3,625	445	3,315	310	3,135	180	Potential waste–storage section Top, Triassic(?), below mean sea level (feet): 4,609(?)
GA–CAM–OT–2	Pan American Petroleum Corp., #1–C Union Camp	4,283	90	3,973	310	3,693	280	3,313	380	2,818	495	Section C–C′ Top, Triassic, below mean sea level (feet): 4,505
GA–CAM–OT–3	Pan American Petroleum Corp.,#1–B Union Camp	4,294	53	3,977	317	3,692	285	3,324	368	2,842	482	Top, Triassic, below mean sea level (feet): 4,517
Charlton County, Ga.												
GA–CHR–OT–1	South Penn Oil Co. #1 O.C. Mizell	4,194	130	3,884	310	3,574	310	3,194	380	2,744	450	Top, pre– Cretaceous crystalline rock, below mean sea level (feet): 4,454
Chatham County, Ga.												
GA–CHA–T–3	Savannah Ports Authority	—	—	2,945	>475	2,600	345	2,140	460	1,720	420	Sections A–A′, B–B′, C–C′
Clinch County, Ga.												
Ga–CLI–OT–1	Wiley P. Ballard, Jr., Timber Products Co. #1–A	3,557	278	3,145	412	2,735	410	2,497	238	2,323	174	Top, Triassic(?), below mean sea level (feet):3,945
GA–CLI–OT–2	Luke Grace Drilling Co., #1 Lem Griffis	3,496	175	3,353	143	2,986	367	2,786	200	2,701	85	Top, Paleozoic, below mean sea level (feet): 3,724
GA–CLI–OT–3	Hunt Oil Co., Alice Musgrove #1	3,492	140	3,228	264	2,832	396	2,712	120	2,672	40	Top, Paleozoic, below mean sea level (feet): 3,775
GA–CLI–OT–4	Hunt Oil Co. Alice Musgrove #2	—	—	—	—	2,899	>340	2,799	100	2,761	38	
GA–CLI–OT–5	Sun Oil Co. W. J. Barlow #1	3,453	148	3,183	270	2,778	405	2,683	95	abs.	—	Section D–D′ Top, Paleozoic, below mean sea level (feet): 3,658
Coffee County, Ga.												
GA–COF–OT–1	Carpenter Oil Co., C. T. Thurman #2	3,186	>66	2,898	288	2,401	497	1,956	445	1,526	430	
GA–COF–OT–2	Carpenter Oil Co., Terrell Thurman #1	3,192	225	2894	298	2,397	497	1,952	445	1,534	418	Top, Triassic(?), below mean sea level (feet): 3,792
GA–COF–OT–3	Carpenter Oil Co., J. H. Knight #1	3,185	182	2,895	290	2,400	495	1,955	445	1,525	430	Top, Triassic(?), below mean sea level (feet): 3,805
GA–COF–OT–8	Chevron Oil Co., Oveda Fussell	3,277	148	2,760	517	2,345	415	1,880	465	1,485	395	Section D–D′ Top Triassic(?), below mean sea level (feet): 4,005
Colquitt County, Ga.												
GA–COQ–OT–1	R. T. Adams, D. G. Arrington #1	3,040	200	2,560	480	2,135	425	1,632	503	1,410	222	Section F–F′ Potential waste–storage section

TABLE 6.—*Well number, name, location, elevation, depth, and stratigraphic*

Well number	Well name	Coordinate location: Lat.	Coordinate location: Long.	Elevation of measuring point (ft)	Elevation of ground level (ft)	Total depth (ft)	Unit H(?): Depth to top below mean sea level (ft)	Unit H(?): Thickness (ft)	Unit G(?): Depth to top below mean sea level (ft)	Unit G(?): Thickness (ft)	Unit F: Depth to top below mean sea level (ft)	Unit F: Thickness (ft)
						Crisp County, Ga.						
GA–CRP–OT–1	Kerr–McGee, Cecil Pate #1	31°49′36″	83°46′12″	370	364	5,008	abs.	—	3,385(?)	465	2,710	675
						Decatur County, Ga.						
GA–DE–OT–1	Renwar Oil Corp., G. E. Dollar #1	30°59′27″	84°29′33″	129	124	4,990	—	—	4,596(?)	>265	3,383	1,213
GA–DE–OT–2	Hunt Oil Co., Metcalf #1	30°48′40″	84°39′13″	104	—	6,152	5,666(?)	>382	4,906(?)	760	3,446	1,460
GA–DE–OT–3	J. R. Sealy, #2 Spindle Top	30°46′37″	84°49′59″	77	70	3,805	—	—	—	—	3,329	>399
GA–DE–OT–4	Calvary Development Co., J. W. Scott #1	30°42′ 29″	84°23′17″	278	270	4,195	—	—	—	—	3,604	>313
GA–DE–OT–5	D. E. Hughes, Martin #1	30°58′43″	84°31′53″	132	—	3,717	—	—	—	—	3,298	>287
						Dodge County, Ga.						
GA–DOD–OT–1	Atlanta Gas Light, B & L Farms #1	32°15′30″	83°17′25″	310	302	4,529	abs.	—	abs.	—	2,030	430
						Dooly County, Ga.						
GA–DOO–OT–1	Georgia–Florida Drilling Co., #1 H. E. Walton	32°02′30″	83°39′00″	446	442	3,748	abs.	—	abs.	—	2,442	624
						Dougherty County, Ga.						
GA–DOG–OT–1	J. R. Sealy, Reynolds #1	31°34′08″	84°15′12″	209	199	5,012	4,531	>272	3,841(?)	690	2,756	1,085
GA–DOG–OT–2	J. R. Sealy, #2 Reynolds Lumber Co.	31°27′08″	84°21′21″	187	177	5,255	4,753	>315	4,013	740	2,803	1,210
						Early County, Ga.						
GA–EA–OT–1	Mont–Warren et al, A. C. Chandler #1	31°10′18″	85°04′40″	187	182	7,320	5,483(?)	915	4,513(?)	970	2,953	1,560
GA–EA–OT–2	Harris Anderson & Roy J. Anderson, #1 Great Northern Paper Co.	31°10′12″	85°04′25″	204	190	7,580	5,456(?)	950	4,526(?)	930	2,996	1,530
GA–EA–OT–3	Harris Anderson & Roy J. Anderson, #2 Great Northern Paper Co.	31°10′20″	85°04′52″	195	182	7,346	5,475(?)	970	4,510(?)	965	2,955	1,555
						Echols County, Ga.						
GA–EC–OT–1	Hunt Oil Co., Superior Pine Products #1	30°40′59″	82°52′43″	186	181	3,853	abs.	—	abs.	—	3,394	210
GA–EC–OT–2	Hunt Oil Co., Superior Pine Products #2	30°41′38″	82°41′17″	142	—	4,062	abs.	—	abs.	—	3,470	118
GA–EC–OT–3	Hunt Oil Co., Superior Pine Products #3	30°36′58″	82°46′58″	144	134	4,001	abs.	—	abs.	—	3,466	45
GA–EC–OT–4	Hunt Oil Co., Superior Pine Products #4	30°44′12″	82°55′23″	157	147	3,913	abs.	—	abs.	—	3,437	317
GA–EC–OT–5	Humble Oil Co., Bennett and Langdale #1	30°45′29″	82°54′36″	181	171	4,185	abs.	—	abs.	—	3,554	385

data for the 88 wells that make up the key-well network— Continued

Well number	Well name	Unit E Depth to top below mean sea level (ft)	Unit E Thickness (ft)	Unit D Depth to top below mean sea level (ft)	Unit D Thickness (ft)	Unit C Depth to top below mean sea level (ft)	Unit C Thickness (ft)	Unit B Depth to top below mean sea level (ft)	Unit B Thickness (ft)	Unit A Depth to top below mean sea level (ft)	Unit A Thickness (ft)	Remarks
						Crisp County, Ga.						
GA–CRP–OT–1	Kerr–McGee, Cecil Pate #1	2,630	80	2,005	625	1,460	545	950	510	555	395	Section G–G′ Top, Triassic(?), below mean sea level (feet): 3,850(?)
						Decatur County, Ga.						
GA–DE–OT–1	Renwar Oil Corp., G. E. Dollar #1	3,098	285	2,561	537	2,153	408	1,641	512	1,541	100	Section G–G′ Potential waste-storage section
GA–DE–OT–2	Hunt Oil Co., Metcalf #1	3,156	290	2,701	455	2,266	435	2,001	265	1,951	50	Section G–G′
GA–DE–OT–3	J. R. Sealy, #2 Spindle Top	3,073	256	2,571	502	2,281	290	2,087	194	2,049	38	Well actually in Seminole County, Ga.
GA–DE–OT–4	Calvary Development Co., J. W. Scott #1	3,318	286	2,842	476	2,404	438	2,182	222	abs.	—	
GA–DE–OT–5	D. E. Hughes, Martin #1	3,060	238	2,528	532	2,128	400	1,610	518	1,538	72	
						Dodge County, Ga.						
GA–DOD–OT–1	Atlanta Gas Light, B & L Farms #1	1,968	62	1,706	262	1,500	206	990	510	685	305	Section E–E′ Top, Triassic(?), below mean sea level (feet): 2,460
						Dooly County, Ga.						
GA–DOO–OT–1	Georgia–Florida Drilling Co., #1 H. E. Walton	2,368	74	1,690	678	1,168	522	630	538	382	248	Section G–G′ Top, Triassic, below mean sea level (feet): 3,066
						Dougherty County, Ga.						
GA–DOG–OT–1	J. R. Sealy, Reynolds #1	2,611	145	2,061	550	1,571	490	856	715	571	285	Section G–G′
GA–DOG–OT–2	J. R. Sealy, #2 Reynolds Lumber Co.	2,663	140	2,108	555	1,658	450	968	690	718	250	Section F–F′ Potential waste-storage section
						Early County, Ga.						
GA–EA–OT–1	Mont–Warren et al, A. C. Chandler #1	2,738	215	2,103	635	1,618	485	1,173	445	1,013	160	Section H–H′ Potential waste–storage section Top, Paleozoic, below mean sea level (feet): 6,398
GA–EA–OT–2	Harris Anderson & Roy J. Anderson, #1 Great Northern Paper Co.	2,691	305	2,092	599	1,611	481	1,162	449	1,018	144	Potential waste–storage section Top, Paleozoic, below mean sea level (feet): 6,406
GA–EA–OT–3	Harris Anderson & Roy J. Anderson, #2 Great Northern Paper Co.	2,242	713	2,105	137	1,625	480	1,177	448	1,025	152	Potential waste–storage section Top, Paleozoic, below mean sea level (feet): 6,445
						Echols County, Ga.						
GA–EC–OT–1	Hunt Oil Co., Superior Pine Products #1	3,324	70	3,124	200	2,646	478	2,504	142	2,469	35	Potential waste–storage section Top, Paleozoic, below mean sea level (feet): 3,604
GA–EC–OT–2	Hunt Oil Co., Superior Pine Products #2	3,328	142	3,248	80	2,798	450	2,643	155	2,576	67	Section F–F′ Top, Paleozoic, below mean sea level (feet): 3,588
GA–EC–OT–3	Hunt Oil Co., Superior Pine Products #3	3,271	195	3,151	120	2,678	473	2,526	152	2,451	75	Section D–D′ Top, Paleozoic, below mean sea level (feet): 3,511
GA–EC–OT–4	Hunt Oil Co., Superior Pine Products #4	3,265	172	3,105	160	2,668	437	2,513	155	2,463	50	Top, Paleozoic, below mean sea level (feet): 3,754
GA–EC–OT–5	Humble Oil Co., Bennett and Langdale #1	3,389	165	3,164	225	2,749	415	2,629	120	abs	—	Sections D–D′, F–F′ Top, Paleozoic, below mean sea level (feet): 3,939

TABLE 6.—*Well number, name, location, elevation, depth, and stratigraphic*

Well number	Well name	Coordinate location: Lat.	Coordinate location: Long.	Elevation of measuring point (ft)	Elevation of ground level (ft)	Total depth (ft)	Unit H(?): Depth to top below mean sea level (ft)	Unit H(?): Thickness (ft)	Unit G(?): Depth to top below mean sea level (ft)	Unit G(?): Thickness (ft)	Unit F: Depth to top below mean sea level (ft)	Unit F: Thickness (ft)
						Glynn County, Ga.						
GA–GLY–OT–1	Humble State–1, Union Bag Camp	31°08′20″	81°38′20″	29	14	4,633	abs.	—	abs.	—	4,481	115
GA–GLY–OT–2	Humble #1, W. C. McDonald Estate	31°14′ 42″	81°38′01″	25	15	4,747	abs.	—	abs.	—	4,553	122
GA–GLY–OT–3	E. B. LaRue, #1 Roy H. Massey	31°06′ 49″	81°32′32″	20	15	4,240	—	—	—	—	—	—
GA–GLY–OT–7	Pan Am. Petroleum, #1 Union Camp	31°22′ 20″	81°33′54″	24	13	4,460	abs.	—	abs.	—	4,216	85
						Houston County, Ga.						
GA–HO–OT–1	Tricon Minerals, Inc. H.B. Gilbert #1	32°24′07″	83°43′57″	371	364	1,698	abs.	—	abs.	—	861	464
						Jeff Davis County, Ga.						
GA–JD–OT–1	Chevron Oil Co., J. L. Sinclair #1	31°46′08″	82°44′53″	287	271	4,058	abs.	—	abs	—	3,463	284
						Laurens County, Ga.						
GA–LA–OT–1	Calapor Mfg. Corp., Grace McCain #1	32°28′40″	82°45′33″	287	280	2,547	abs.	—	abs.	—	1,703	556
						Liberty County, Ga.						
GA–LI–OT–1	E. B. LaRue, #1 Jelks–Rogers	31°41′31″	81°20′54″	26	16	4,264	abs.	—	abs.	—	3.992	232
						Lowndes County, Ga.						
GA–LOW–OT–1	Hunt Petroleum Co., #1 J. T. Stalvey	30°59′25″	83°15′08″	167	157	7,200	abs.	—	abs.	—	3,483	470
GA–LOW–OT–2	Hunt Petroleum Corp., Langsdale #1	30°51′25″	83°03′23″	182	171	5,060	abs.	—	abs.	—	3,498	418
GA–LOW–OT–3	Hunt Petroleum Corp., L. P. Shelton well no. 1A	30°50′54″	83°11′16″	212	201	5,000	abs.	—	abs.	—	3,520	468
GA–LOW–OT–4	Hunt Petroleum Corp., Jack Cole #. 1	30°56′12″	83°24′23″	254	243	5,200	abs.	—	abs.	—	3,488	620
GA–LOW–OT–5	Hunt Petroleum Corp., #1 E. N. Murray, Jr.	30°54′21″	83°16′52″	201	191	5,004	abs.	—	abs.	—	3,482	705
						Mitchell County, Ga.						
GA–MIT–OT–1	Stanolind, J. H. Pullen #1	31°08′28″	84°04′13″	338	328	7,490	5,302(?)	575	4,452(?)	850	3,292	1,160
						Montgomery County, Ga.						
GA–MO–OT–2	J. E. Weatherford, Lonnie Wilkes #1	32°13′01″	82°28′47″	293	283	3,424	abs.	—	abs.	—	2,562	540
						Pierce County, Ga.						
GA–PI–OT–1	W. B. Hinton–Donald Clark, Adams McCaskill #1	31°26′30″	82°03′40″	75	75	4,354	abs.	—	abs.	—	abs.	—
GA–PI–OT–2	Pan American, Adams–McCaskill #1	31°23′47″	82°04′16″	82	75	4,378	abs.	—	abs.	—	abs.	—

data for the 88 wells that make up the key-well network— Continued

Well number	Well name	Unit E		Unit D		Unit C		Unit B		Unit A		Remarks
		Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	
						Glynn County, Ga.						
GA–GLY–OT–1	Humble State–1, Union Bag Camp	4,426	55	4,201	225	3,766	435	3,376	390	2,659	717	Section C–C′ Top, pre–Cretaceous crystalline rock, below mean sea level (feet): 4,596
GA–GLY–OT–2	Humble #1, W. C. McDonald Estate	4,475	78	4,080	395	3,665	415	3,345	320	2,495	850	Sections C–C′, E–E′ Potential waste–storage section Top, pre–Cretaceous crystalline rock, below mean sea level (feet): 4,675
GA–GLY–OT–3	E. B. LaRue, #1 Roy H. Massey	—	—	4,128	>92	3,750	378	3,465	285	2,600	865	
GA–GLY–OT–7	Pan Am. Petroleum, #1 Union Camp	4,126	90	3,906	220	3,496	410	3,271	225	2,346	925	Section C–C′ Potential waste–storage section Top, pre–Cretaceous crystalline rock, below mean sea level (feet): 4,301
						Houston County, Ga.						
GA–HO–OT–1	Tricon Minerals, Inc. H. B. Gilbert No. 1	abs.	—	599	262	424	175	159	265	+181	340	Section E–E′ Top, pre–Cretaceous crystalline rock, below mean sea level (feet): 1,325
						Jeff Davis County, Ga.						
GA–JD–OT–1	Chevron Oil Co., J. L. Sinclair #1	3,303	160	2,843	460	2,337	506	1,925	412	1,519	406	Section D–D′ Top, Triassic(?), below mean sea level (feet): 3,747
						Laurens County, Ga.						
GA–LA–OT–1	Calapor Mfg. Corp., Grace McCain #1	1,573	130	1,293	280	1,128	165	903	225	673	230	Section D–D′ Top, Triassic(?), below mean sea level (feet): 2,259
						Liberty County, Ga.						
GA–LI–OT–1	E. B. LaRue, #1 Jelks–Rogers	3,854	138	3,444	10	3,006	438	2,694	312	2,209	485	Sections A–A′, C–C′ Top, Triassic(?), below mean sea level (feet): 4,224(?)
						Lowndes County, Ga.						
GA–LOW–OT–1	Hunt Petroleum Co., #1 J. T. Stalvey	3,275	208	2,933	342	2,693	240	2,523	170	abs.	—	Section F–F′ Top, Paleozoic, below mean sea level (feet): 3,953
GA–LOW–OT–2	Hunt Petroleum Corp., Langsdale #1	3,348	150	3,053	295	2,768	285	2,520	248	abs.	—	Section F–F′ Top, Paleozoic, below mean sea level (feet): 3,916
GA–LOW–OT–3	Hunt Petroleum Corp., L. P. Shelton well no. 1A	3,343	177	3,028	315	2,758	270	2,473	285	abs.	—	Top Paleozoic, below mean sea level (feet): 3,988
GA–LOW–OT–4	Hunt Petroleum Corp., Jack Cole No. 1	3,236	252	2,896	340	2,636	260	2,316	320	abs.	—	Top, Paleozoic, below mean sea level (feet): 4,108
GA–LOW–OT–5	Hunt Petroleum Corp., #1 E. N. Murray, Jr.	3,309	173	2,979	330	2,719	260	2,449	270	abs.	—	Potential waste–storage section Top, Paleozoic, below mean sea level (feet): 4,187
						Mitchell County, Ga.						
GA–MIT–OT–1	Stanolind, J. H. Pullen #1	3,052	240	2,552	500	2,102	450	1,587	515	1,357	230	Sections F–F′, G–G′ Potential waste–storage section Top, Triassic (?), below mean sea level (feet): 5,877(?)
						Montgomery County, Ga.						
GA–MO–OT–2	J. E. Weatherford, Lonnie Wilkes #1	2,361	201	2,082	279	1,861	221	1,517	344	1,207	310	Top, Triassic(?), below mean sea level (feet): 3,102
						Pierce County, Ga.						
GA–PI–OT–1	W. B. Hinton–Donald Clark, Adams McCaskill #1	4,160	110	3,812	348	3,510	302	3,070	440	2,670	400	Section E–E′ Top, pre–Cretaceous crystalline rock, below mean sea level (feet): 4,270
GA–PI–OT–2	Pan American, Adams–McCaskill #1	4,164	102	3,874	290	3,538	336	3,068	470	2,638	430	Top, pre–Cretaceous crystalline rock, below mean sea level (feet): 4,266

TABLE 6.—*Well number, name, location, elevation, depth, and stratigraphic*

Well number	Well name	Coordinate location		Elevation of measuring point (ft)	Elevation of ground level (ft)	Total depth (ft)	Unit H(?)		Unit G(?)		Unit F	
		Lat.	Long.				Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)
						Pulaski County, Ga.						
GA-PU-OT-1	Dana #1	32°18'08"	83°28'58"	341	328	6,030	abs.	—	abs.	—	654	1,353
GA-PU-OT-3	Atlanta Gas Light Co., # 1 Griffith	32°19'32"	83°32'27"	332	324	6,174	abs.	—	abs.	—	518±	1,365±
						Screven County, Ga.						
GA-SCR-OT-1	Boenwell Drilling Co., McCain-Pryor #1	32°35'06"	81°25'38"	137	130	2,678	abs.	—	abs.	—	2,053	474
						Seminole County, Ga.						
GA-SE-OT-1	Humble Oil and Refining Co., #1 J. R. Sealy	30°46'37"	84°52'41"	96	Under water	4,500	—	—	—	—	3,344	>1,060
GA-SE-OT-2	Mont Warren, Grady Bell #1	30°53'25"	84°49'02"	114	108	3,807	—	—	—	—	3,296	>397
GA-SE-OT-3	J. R. Sealy, #5 Spindle Top Ida	30°46'52"	84°50'59"	106	98	5,328	—	—	4,849(?)	>373	3,322	1,527
GA-SE-OT-4	Mont Warren Emily Harlow	31°03'13"	84°48'42"	147	137	3,572	—	—	—	—	3,113	−312
GA-SE-OT-6	S. C. Dunlap, Saunders Co., #1	30°51'41"	84°53'10"	110	98	7,098	5,807(?)	1,108	4,760(?)	1,047	3,250	1,510
						Stewart County, Ga.						
GA-ST-OT-1	Heinze-Spanel, W. C. Bradley No. 1	31°59'33"	84°59'10"	548	—	2,912	abs.	—	abs.	—	1,482	830
						Sumter County, Ga.						
GA-SU-OT-1	Hill & Son Drilling Co., Moore-Martino #1	32°09'30"	84°18'15"	532	520	2,365	—	—	—	—	1638	>195
						Telfair County, Ga.						
GA-TEL-OT-1	#1 Henry Spurlin	32°01'45"	82°48'35"	242	231	4,008	abs.	—	abs.	—	2,988	512
						Thomas County, Ga.						
GA-THO-OT-2	Thomas A. Durham, Irene E. W. Sedgewick #1A	30°47'11"	83° 57'44"	279	266	6,669	abs.	—	4,614	857	3,474	1,140
						Toombs County, Ga.						
GA-TOO-OT-1	Tropic Oil and Gas, Gibson #1	32°08'49"	82°21'57"	198	198	3,681	abs.	—	abs.	—	2,842	470
						Treutlen County, Ga.						
GA-TR-OT-1	Barnwell Drilling Co., Inc. Jim L. Gillis, Sr. #1	32°23'17"	82°32'25"	358	351	3,240	abs.	—	abs.	—	2,132	563
GA-TR-OT-2	McCain and Nicholson, #1 Jim Gillis, Sr.	32°21'45"	82°28'23"	349	—	3,180	abs.	—	abs.	—	2,301	516
						Wayne County, Ga.						
GA-WAY-OT-1	Humble #1 Union Bag Camp Paper	31°31'23"	81°41'10"	65	49	4,554	abs.	—	abs.	—	4,167	124
GA-WAY-OT-2	California Co., Brunswick Peninsular Corp. #1	31°23'30"	81°48'31"	73	63	4,620	abs.	—	abs.	—	4,389	113
GA-WAY-OT-6	Hunt Petroleum Corp., W. K. Davis—Scott and Mead #1A	31°27'16"	81°52'53"	62	62	4,475	—	—	—	—	4,342	>71

data for the 88 wells that make up the key-well network— Continued

Well number	Well name	Unit E		Unit D		Unit C		Unit B		Unit A		Remarks
		Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	
						Pulaski County, Ga.						
GA-PU-OT-1	Dana #1	429	225	189	240	84	105	19	65	+71	90	Sections E-E′, G-G′ Top, Triassic(?), below mean sea level (feet): 2,007
GA-PU-OT-3	Atlanta Gas Light Co., # 1 Griffith	—	—	—	—	—	—	—	—	—	—	No data available for Units A thru E Top, Triassic(?), below mean sea level (feet): 1,883
						Screven County, Ga.						
GA-SCR-OT-1	Boenwell Drilling Co., McCain-Pryor #1	abs.	—	1,578	475	1,475	103	1,223	252	773	450	Sections B-B′, C-C′ Top, pre-Cretaceous crystalline rock, below mean sea level (feet): 2,527
						Seminole County, Ga.						
GA-SE-OT-1	Humble Oil and Refining Co., #1 J. R. Sealy	3,024	320	2,554	470	2,234	320	1,964	270	1,944	20	Site now under water—Jim Woodruff Reservoir
GA-SE-OT-2	Mont Warren, Grady Bell #1	2,961	335	2,478	483	2,220	258	1,786	434	1,726	60	
GA-SE-OT-3	J. R. Sealy, #5 Spindle Top Ida	3,028	294	2,612	416	2,270	342	2,066	204	2,024	42	Section H-H′ Potential waste-storage section
GA-SE-OT-4	Mont Warren Emily Harlow	2,903	210	2,323	580	1,933	390	1,363	570	1,283	80	Section H-H′
GA-SE-OT-6	S. C. Dunlap, Saunders Co., #1	2,970	280	2,455	515	2,150	305	1,820	330	1,735	85	Section H-H′ Potential waste-storage section Top, Triassic(?), below mean sea level (feet): 6,915(?)
						Stewart County, Ga.						
GA-ST-OT-1	Heinze-Spanel, W. C. Bradley No. 1	1,332	150	742	590	297	445	+28	325	358±	330	Section H-H′ Top, Triassic(?), below mean sea level (feet): 2,312
						Sumter County, Ga.						
GA-SU-OT-1	Hill & Son Drilling Co., Moore-Martino #1	1,510	128	978	532	508	470	8	500	+332	340	
						Telfair County, Ga.						
GA-TEL-OT-1	#1 Henry Spurlin	2,853	135	2,593	260	2,258	335	1,918	340	1,588	330	Section E-E′ Top, Triassic(?), below mean sea level (feet): 3,500
						Thomas County, Ga.						
GA-THO-OT-2	Thomas A. Durham, Irene E. W. Sedgewick #1A	3,227	247	2,751	476	2,456	295	2,161	295	2,117	44	Top, Paleozoic, below mean sea level (feet): 5,471
						Toombs County, Ga.						
GA-TOO-OT-1	Tropic Oil and Gas, Gibson #1	2,682	160	2,422	260	2,222	200	1,842	380	1,502	340	Top, Triassic(?), below mean sea level (feet): 3,312
						Treutlen County, Ga.						
GA-TR-OT-1	Barnwell Drilling Co., Inc. Jim L. Gillis, Sr. #1	1,982	150	1,707	275	1,492	215	1,242	250	1,022	220	Top, Triassic(?), below mean sea level (feet): 2,695
GA-TR-OT-2	McCain and Nicholson, #1 Jim Gillis, Sr.	2,131	170	1,811	320	1,571	240	1,321	250	1,081	240	Top, pre-Cretaceous crystalline rock, below mean sea level (feet): 2,817
						Wayne County, Ga.						
GA-WAY-OT-1	Humble #1 Union Bag Camp Paper	3,965	202	3,607	358	3,335	272	2,880	455	2,405	475	Section C-C′ Top, Triassic, below mean sea level (feet): 4,291(?)
GA-WAY-OT-2	California Co., Brunswick Peninsular Corp. #1	4,237	152	3,812	425	3,497	315	3,097	400	2,587,	510	Section E-E′ Top, pre-Cretaceous crystalline rock, below mean sea level (feet): 4,502(?)
GA-WAY-OT-6	Hunt Petroleum Corp., W. K. Davis—Scott and Mead #1A	4,196	146	3,921	275	3,280	641	3,008	272	2,281	727	

TABLE 6.—*Well number, name, location, elevation, depth, and stratigraphic*

Well number	Well name	Coordinate location		Elevation of measuring point (ft)	Elevation of ground level (ft)	Total depth (ft)	Unit H(?)		Unit G(?)		Unit F	
		Lat.	Long.				Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)
						Wheeler County, Ga.						
GA–WH–OT–1	T. R. Davis & Assoc., Jordan Heirs No. 1	31° 58′47″	82°38′48″	195	185	4,010	abs.	—	abs.	—	3,070	439
GA–WH–OT–2	Parsons, # 1 Clyde E. Hinson	32°05′40″	82°48′40″	206	195	3,614	abs.	—	abs.	—	2,889	325
GA–WH–OT–3	Southern Natural Gas Co., Ronnie Towns #1	32°02′37″	82°38′12″	169	157	4,070	abs.	—	abs.	—	3,053	598
GA–WH–OT–4	Southern Natural Gas Co., Dr. D. B. McRae #1	32°02′53″	82°38′42″	175	164	3,643	—	—	—	—	3,035	>433
						Brunswick County, N.C.						
NC–BR–T–7	N.C. Division of Water Resources, Calabash—Test #1, 1972	33°53′35″	78°35′20″	48	48	1,335	abs.	—	abs.	—	1,124	163
						Aiken County, S.C.						
SC–AK–P–1	Layne Atlantic, City of Aiken, 1953	33°31′45″	81°42′30″	480	480	519	abs.	—	abs.	—	+295	334
						Barnwell County, S.C.						
SC–BW–P–4	Hartsfield Well Co., Savannah River Plant, 1967	33°17′12″	81°38′36″	301	301	863	—	—	—	—	179	>383
						Beaufort County, S.C.						
SW–BEAU–T–1	Layne Atlantic, 1940 Parris Island Test #2	32°19′40″	80°41′50″	18	15	3,454	—	—	—	—	3,240	>196
						Charleston County, S.C.						
SC–CHN–P–2	Sydnor Well and Pump Co., Snee Farms Corp.	32°51′05″	79°49′45″	20	20	2,130	—	—	—	—	1,926	>184
SC–CHN–P–6	Seabrook Development Corp., Test Well #1	32°35′30″	80°08′30″	8	3	2,705	—	—	—	—	2,522	>175
						Dorchester County, S.C.						
SC–DOR–T–21	USGS Clubhouse Corners, Core Hole #1, 1975	32°53′15″	80°21′25″	23	18	2,530	abs.	—	abs.	—	2,239	234
						Georgetown County, S.C.						
SC–GEO–T–29	Esterville Plantation	33°15′08″	79°16′24″	18	18	1,835	—	—	—	—	1,722	>95
SC–GEO–T–30	Georgetown Rural Test well, Penny Royal Road	33°20′17″	79°21′43″	20	20	810	—	—	—	—	—	—
						Horry County, S.C.						
SC–HO–OT–14	#1 Fannie Collins	33°40′55″	79°07′40″	23	15	1,419	abs.	—	abs.	—	1,057	318
SC–HO–T–55	Myrtle Beach, 10th Avenue	33°42′30″	78°54′22″	25	25	1,448	abs.	—	abs.	—	1,225	178

data for the 88 wells that make up the key-well network— Continued

Well number	Well name	Unit E		Unit D		Unit C		Unit B		Unit A		Remarks
		Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	Depth to top below mean sea level (ft)	Thickness (ft)	
								Wheeler County, Ga.				
GA–WH–OT–1	T. R. Davis & Assoc., Jordan Heirs No. 1	2,967	103	2,755	212	2,347	408	2,025	322	1,585	440	Section E–E' Top, Triassic(?), below mean sea level (feet): 3,509
GA–WH–OT–2	Parsons, No. 1 Clyde E. Hinson	2,764	125	2,494	270	2,166	328	1,799	367	1,517	282	Section D–D' Top, Triassic(?), below mean sea level (feet): 3,214
GA–WH–OT–3	Southern Natural Gas Co., Ronnie Towns #1	2,911	142	2,686	225	2,431	255	2,041	390	1,711	330	Top, Triassic(?), below mean sea level (feet): 3,651
GA–WH–OT–4	Southern Natural Gas Co., Dr. D. B. McRae #1	2,900	135	2,680	220	2,345	335	2,005	340	1,675	330	
								Brunswick County, N.C.				
NC–BR–T–7	N.C. Division of Water Resources, Calabash— Test #1, 1972	abs.	—	944	180	630	314	352	278	12	340	Section A–A' Top, pre-Cretaceous crystalline rock, below mean sea level (feet): 1,287
								Aiken County, S.C.				
SC–AK–P–1	Layne Atlantic, City of Aiken, 1953	abs.	—	+385	90	abs.	—	abs.	—	abs.	—	Section B–B' Top, pre-Cretaceous crystalline rock, below mean sea level (feet): 39
								Barnwell County, S.C.				
SC–BW–P–4	Hartsfield Well Co., Savannah River Plant, 1967	abs.	—	31	148	abs.	—	abs.	—	abs.	—	Section B–B'
								Beaufort County, S.C.				
SW–BEAU–T–1	Layne Atlantic, 1940 Parris Island Test #2	3,122	188	2,509	613	2,187	322	1,612	575	1,247	365	Section A–A'
								Charleston County, S.C.				
SC–CHN–P–2	Sydnor Well and Pump Co., Snee Farms Corp.	abs.	—	1,616	310	1,244	372	912	332	622	290	Section A–A'
SC–CHN–P–6	Seabrook Development Corp., Test well #1	abs.	—	2,008	514	1,642	366	1,184	458	842	342	Section A–A'
								Dorchester County, S.C.				
SC–DOR–T–21	USGS Clubhouse Corners, Core Hole #1, 1975	abs.	—	1,837	402	1,517	320	1,077	440	777	300	Top, Triassic(?), below mean sea level (feet): 2,473
								Georgetown County, S.C.				
SC–GEO–T–29	Esterville Plantation	abs.	—	1,422	300	1,082	340	740	342	360	380	Section A–A'
SC–GEO–T–30	Georgetown Rural Test well, Penny Royal Road	—	—	—	—	—	—	665	>125	225	440	
								Horry County, S.C.				
SC–HO–OT–14	#1 Fannie Collins	abs.	—	897	160	647	250	379	268	47	332	Top, pre-Cretaceous crystalline rock, below mean sea level (feet): 1,375
SC–HO–T–55	Myrtle Beach, 10th Avenue	abs.	—	1,023	202	717	306	431	286	23	408	Section A–A' Top, pre-cretaceous crystalline rock (?), below mean sea level (feet) 1,403

TABLE 7.—*Geohydrologic data for the 18 wells judged to have waste-storage potential*

Unit A

Potential reservoir sand determination	Well number GA-GLY-OT-7
Depth to top of unit (MSL)	−2,346
Thickness of unit (feet)	925
Unit's total sand thickness (feet/percent)	155/17
Unit's total shale thickness (feet/percent)	400/43
Unit's sand–shale ratio	0.4
Number of potential reservoir sands in unit	1
Total thickness (feet) of unit's potential reservoir sands	155
Average thickness (feet) of unit's potential reservoir sands	155
Maximum thickness (feet) of a potential reservoir sand layer in unit	155
Ratio—unit's potential reservoir sand thickness: unit's total thickness	.17
Ratio—unit's potential reservoir thickness: unit's total sand thickness	1
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	42–155–205
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.27:1:1.32
Depth to top of uppermost potential reservoir sand (MSL)	3,116
Depth to top of lowermost potential reservoir sand (MSL)	3,116
Average depth to top of unit's potential reservoir sand (MSL)	3,116
Percent of potential reservoir sand in upper third of unit	0
Percent of potential reservoir sand in middle third of unit	0
Percent of potential reservoir sand in lower third of unit	100
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	20
Average sodium chloride in mg/L / Average depth (feet)	10.2

Unit B

Potential reservoir sand determination	Well number GA-CAM-OT-1
Depth to top of unit (MSL)	−3,315
Thickness of unit (feet)	310
Unit's total sand thickness (feet/percent)	195/63
Unit's total shale thickness (feet/percent)	115/37
Unit's sand–shale ratio	1.7
Number of potential reservoir sands in unit	1
Total thickness (feet) of unit's potential reservoir sands	195
Average thickness (feet) of unit's potential reservoir sands	195
Maximum thickness (feet) of a potential reservoir sand layer in unit	195
Ratio—unit's potential reservoir sand thickness: unit's total thickness	0.63
Ratio—unit's potential reservoir thickness: unit's total sand thickness	1
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	95–195–80
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.49:1:0.41
Depth to top of uppermost potential reservoir sand (MSL)	3,415
Depth to top of lowermost potential reservoir sand (MSL)	3,415
Average depth to top of unit's potential reservoir sand (MSL)	3,415
Percent of potential reservoir sand in upper third of unit	2
Percent of potential reservoir sand in middle third of unit	53
Percent of potential reservoir sand in lower third of unit	45
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	17.5
Average sodium chloride in mg/L / Average depth (feet)	11.9

TABLE 7.—*Geohydrologic data for the 18 wells judged to have waste-storage potential*—Continued

Unit D

Potential reservoir sand determination	Well number		
	GA–CAM–OT–1	GA–EC–OT–1	GA–GLY–OT–2
Depth to top of unit (MSL)	−4,070	−3,124	−4,080
Thickness of unit (feet)	267	200	395
Unit's total sand thickness (feet/percent)	85/32	85/42	181/45
Unit's total shale thickness (feet/percent)	182/68	115/58	214/55
Unit's sand–shale ratio	0.5	0.7	0.8
Number of potential reservoir sands in unit	1	1	1
Total thickness (feet) of unit's potential reservoir sands	85	85	100
Average thickness (feet) of unit's potential reservoir sands	85	85	100
Maximum thickness (feet) of a potential reservoir sand layer in unit	85	85	100
Ratio—unit's potential reservoir sand thickness: unit's total thickness	0.32	0.4	0.25
Ratio—unit's potential reservoir thickness: unit's total sand thickness	1	1	0.55
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	70–85–130	40–85–30	45–100–140
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.82:1:1.5	0.47:1:0.35	0.45:1:1.4
Depth to top of uppermost potential reservoir sand (MSL)	4,075	3,114	4,080
Depth to top of lowermost potential reservoir sand (MSL)	4,075	3,114	4,080
Average depth to top of unit's potential reservoir sand (MSL)	4,075	3,114	4,080
Percent of potential reservoir sand in upper third of unit	100	78	100
Percent of potential reservoir sand in middle third of unit	0	22	0
Percent of potential reservoir sand in lower third of unit	0	0	0
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	48	37	41
Average sodium chloride in mg/L / Average depth (feet)	12.1	12.4	12.7

Unit E

Potential reservoir sand determination	Well number	
	GA–COQ–OT–1	GA–EA–OT–1
Depth to top of unit (MSL)	−3,040	−2,738
Thickness of unit (feet)	200	215
Unit's total sand thickness (feet/percent)	58/29	40/19
Unit's total shale thickness (feet/percent)	142/71	175/81
Unit's sand–shale ratio	0.4	0.2
Number of potential reservoir sands in unit	1	1
Total thickness (feet) of unit's potential reservoir sands	58	40
Average thickness (feet) of unit's potential reservoir sands	58	40
Maximum thickness (feet) of a potential reservoir sand layer in unit	58	40
Ratio—unit's potential reservoir sand thickness: unit's total thickness	.29	.19
Ratio—unit's potential reservoir thickness: unit's total sand thickness	1	1
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	20–58–34	50–40–33
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.35:1:0.59	1.25:1:0.6
Depth to top of uppermost potential reservoir sand (MSL)	3,174	2,898
Depth to top of lowermost potential reservoir sand (MSL)	3,174	2,898
Average depth to top of unit's potential reservoir sand (MSL)	3,174	2,898
Percent of potential reservoir sand in upper third of unit	0	0
Percent of potential reservoir sand in middle third of unit	10	0
Percent of potential reservoir sand in lower third of unit	90	100
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	55	72
Average sodium chloride in mg/L / Average depth (feet)	23.8	3.9

TABLE 7.—*Geohydrologic data for the 18 wells judged to have waste-storage potential*—Continued

Unit F

Potential reservoir sand determination	Well number		
	GA–AT–OT–1	GA–DE–OT–1	GA–DOG–OT–2
Depth to top of unit (MSL)	−3,777	−3,383	−2,803
Thickness of unit (feet)	222	1,213	1,210
Unit's total sand thickness (feet/percent)	108/49	841/69	950/79
Unit's total shale thickness (feet/percent)	114/51	372/31	260/21
Unit's sand–shale ratio	0.9	2.3	3.6
Number of potential reservoir sands in unit	1	1	1
Total thickness (feet) of unit's potential reservoir sands	42	62	42
Average thickness (feet) of unit's potential reservoir sands	42	62	42
Maximum thickness (feet) of a potential reservoir sand layer in unit	42	62	42
Ratio—unit's potential reservoir sand thickness: unit's total thickness	0.19	0.05	0.03
Ratio—unit's potential reservoir thickness: unit's total sand thickness	0.39	0.07	0.04
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	30–42–20	60–62–40	23–42–30
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.71:1:0.48	0.97:1:0.65	0.55:1:0.71
Depth to top of uppermost potential reservoir sand (MSL)	3,885	4,214	2,833
Depth to top of lowermost potential reservoir sand (MSL)	3,885	4,214	2,833
Average depth to top of unit's potential reservoir sand (MSL)	3,885	4,214	2,833
Percent of potential reservoir sand in upper third of unit	0	0	100
Percent of potential reservoir sand in middle third of unit	95	0	0
Percent of potential reservoir sand in lower third of unit	5	100	0
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	92	68	67
Average sodium chloride in mg/L / Average depth (feet)	19.2	15.9	—

Unit F

Potential reservoir sand determination	Well number		
	GA–EA–OT–1	GA–EA–OT–2	GA–EA–OT–3
Depth to top of unit (MSL)	−2,953	−2,996	−2,955
Thickness of unit (feet)	1,560	1,530	1,555
Unit's total sand thickness (feet/percent)	890/57	1,228/80	788/51
Unit's total shale thickness (feet/percent)	670/43	302/20	767/49
Unit's sand–shale ratio	1.3	4.1	1.0
Number of potential reservoir sands in unit	1	2	1
Total thickness (feet) of unit's potential reservoir sands	50	79	58
Average thickness (feet) of unit's potential reservoir sands	50	39.5	58
Maximum thickness (feet) of a potential reservoir sand layer in unit	50	54	58
Ratio—unit's potential reservoir sand thickness: unit's total thickness	0.03	0.05	0.04
Ratio—unit's potential reservoir thickness: unit's total sand thickness	0.06	0.06	0.07
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	44–50–30	24–54–38 23–25–24	43–58–20
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.88:1:0.60	0.44:1:0.7 0.92:1:0.96	0.74:1:0.34
Depth to top of uppermost potential reservoir sand (MSL)	3,683	3,762	3,686
Depth to top of lowermost potential reservoir sand (MSL)	3,683	3,840	3,686
Average depth to top of unit's potential reservoir sand (MSL)	3,683	3,801	3,686
Percent of potential reservoir sand in upper third of unit	0	0	0
Percent of potential reservoir sand in middle third of unit	100	100	100
Percent of potential reservoir sand in lower third of unit	0	0	0
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	74	48.1	64
Average sodium chloride in mg/L / Average depth (feet)	12.9	17.2	12.8

TABLE 7.—*Geohydrologic data for the 18 wells judged to have waste-storage potential*—Continued

Unit F

Potential reservoir sand determination	Well Number		
	GA-LOW-OT-5	GA-SE-OT-3	GA-SE-OT-6
Depth to top of unit (MSL)	−3,482	−3,322	−3,250
Thickness of unit (feet)	705	1,527	1,510
Unit's total sand thickness (feet/percent)	477/68	955/63	1,010/66
Unit's total shale thickness (feet/percent)	228/32	572/37	500/34
Unit's sand-shale ratio	2.1	1.6	2.0
Number of potential reservoir sands in unit	1	1	2
Total thickness (feet) of unit's potential reservoir sands	35	40	77
Average thickness (feet) of unit's potential reservoir sands	35	40	38.5
Maximum thickness (feet) of a potential reservoir sand layer in unit	35	40	40
Ratio—unit's potential reservoir sand thickness: unit's total thickness	0.05	0.03	0.05
Ratio—unit's potential reservoir thickness: unit's total sand thickness	0.07	0.04	0.08
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	24-35-30	36-40-20	22-40-20 44-37-35
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.69:1:0.86	0.9:1:0.5	0.55:1:0.5 1.2 :1:0.9
Depth to top of uppermost potential reservoir sand (MSL)	3,971	4,495	4,060
Depth to top of lowermost potential reservoir sand (MSL)	3,971	4,495	4,313
Average depth to top of unit's potential reservoir sand (MSL)	3,971	4,495	4,187
Percent of potential reservoir sand in upper third of unit	0	0	0
Percent of potential reservoir sand in middle third of unit	0	0	52
Percent of potential reservoir sand in lower third of unit	100	100	48
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	113	112	54
Average sodium chloride in mg/L / Average depth (feet)	58.4	—	18.1

Unit G(?)

Potential reservoir sand determination	Well number
	GA-DOG-OT-2
Depth to top of unit (MSL)	−4,013
Thickness of unit (feet)	740
Unit's total sand thickness (feet/percent)	170/23
Unit's total shale thickness (feet/percent)	570/77
Unit's sand-shale ratio	0.3
Number of potential reservoir sands in unit	1
Total thickness (feet) of unit's potential reservoir sands	90
Average thickness (feet) of unit's potential reservoir sands	90
Maximum thickness (feet) of a potential reservoir sand layer in unit	90
Ratio—unit's potential reservoir sand thickness: unit's total thickness	0.12
Ratio—unit's potential reservoir thickness: unit's total sand thickness	0.53
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	30-90-55
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.33:1:0.61
Depth to top of uppermost potential reservoir sand (MSL)	4,103
Depth to top of lowermost potential reservoir sand (MSL)	4,103
Average depth to top of unit's potential reservoir sand (MSL)	4,103
Percent of potential reservoir sand in upper third of unit	100
Percent of potential reservoir sand in middle third of unit	0
Percent of potential reservoir sand in lower third of unit	0
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	46
Average sodium chloride in mg/L / Average depth (feet)	—

TABLE 7.—*Geohydrologic data for the 18 wells judged to have waste-storage potential*—Continued

Unit H(?)

Potential reservoir sand determination	Well number GA-MIT-OT-1
Depth to top of unit (MSL)	−5,302(?)
Thickness of unit (feet)	575
Unit's total sand thickness (feet/percent)	75/13
Unit's total shale thickness (feet/percent)	500/87
Unit's sand-shale ratio	0.1
Number of potential reservoir sands in unit	1
Total thickness (feet) of unit's potential reservoir sands	63
Average thickness (feet) of unit's potential reservoir sands	63
Maximum thickness (feet) of a potential reservoir sand layer in unit	63
Ratio—unit's petential reservoir sand thickness: unit's total thickness	0.11
Ratio—unit's potential reservoir thickness: unit's total sand thickness	0.9
Thickness (feet)—Immediately underlying shale seal—potential reservoir sand—immediately overlying shale seal	25-63-42
Ratio (feet)—Thickness of immediately underlying shale seal: thickness of potential reservoir sand: thickness of immediately overlying shale seal	0.4:1:0.67
Depth to top of uppermost potential reservoir sand (MSL)	5,494
Depth to top of lowermost potential reservoir sand (MSL)	5,494
Average depth to top of unit's potential reservoir sand (MSL)	5,494
Percent of potential reservoir sand in upper third of unit	0
Percent of potential reservoir sand in middle third of unit	100
Percent of potential reservoir sand in lower third of unit	0
D/PR factor (average depth of potential reservoir sand occurrence/total thickness of unit's potential reservoir sand)	87.2
Average sodium chloride in mg/L / Average depth (feet)	——

TABLE 8.—*Approximate sodium chloride concentration of ground water in Units A through H(?) in wells forming the key-well network*

[C, data calculated; D, data from drill stem test]

Well number	Unit	Depth interval, feet below mean sea level	Concentration of sodium chloride (NaCl) in formation water, in milligrams per liter
GA-BRA-OT-1	A	2,548	44,000 – C
GA-CLI-OT-3	A and B	2,684-2,752	34,000 – C
GA-CLI-OT-4	A	2,763-2,789	6,500 – C
GA-COF-OT-1	A	1,716-1,751	1,300 – C
GA-COF-OT-2	A	1,652-1,752	1,800 – C
GA-COF-OT-3	A	1,695-1,755	1,700 – C
GA-COF-OT-8	A	1,650-1,680	2,900 – C
GA-COQ-OT-1	A and B	1,630-1,680	5,600 – C
GA-DE-OT-4	Post A	1,732-1,822	35,000 – C
GA-DE-OT-5	A and B	1,568-1,668	2,600 – C
GA-EC-OT-1	A and B	2,474-2,514	5,000 – C
GA-EC-OT-3	A and B	2,456-2,566	6,900 – C
GA-EC-OT-4	Post A, A and B	2,458-2,523	9,500 – C
GA-GLY-OT-2	A	3,250-3,340	39,000 – C
GA-GLY-OT-7	A	3,116-3,141	32,000 – C
GA-LI-OT-1	A	2,669-2,694	1,900 – C
GA-PI-OT-1	A	2,855-2,917	2,800 – C
GA-SE-OT-6	A	1,750-1,820	3,900 – C
GA-ST-OT-1	A	(−58)-(−28)	1,200 – C
GA-TOO-OT-1	A	1,652-1,672	700 – C
GA-WAY-OT-2	A	2,627-2,727	47,000 – C
GA-BRA-OT-1	B	3,348-3,368	35,000 – C
GA-CAM-OT-1	B	3,415-3,445	41,000 – C
GA-CAM-OT-2	B	3,313-3,363	80,000 – C
GA-CAM-OT-3	B	3,322-3,672	38,000 – C
GA-CHR-OT-1	B	3,364-3,464	45,000 – C
GA-CLI-OT-3	A and B	2,684-2,752	34,000 – C
GA-COF-OT-1	B	2,096-2,166	1,000 – C
GA-COF-OT-2	B	2,088-2,194	1,200 – C
GA-COF-OT-3	B	2,095-2,215	2,200 – C
GA-COQ-OT-1	A and B	1,630-1,680	5,600 – C
GA-CRP-OT-1	B	1,300-1,340	3,000 – C
GA-DOD-OT-1	B	990-1,080	2,300 – C
GA-EC-OT-3	A and B	2,456-2,566	6,900 – C
GA-EC-OT-4	A and B	2,458-2,523	9,500 – C
GA-EC-OT-5	B	2,643-2,669	47,000 – C
GA-GLY-OT-1	B	3,571-3,591	16,600 – C
GA-GLY-OT-2	B	3,585-3,605	39,000 – C
GA-JD-OT-1	B	2,118-2,143	2,700 – C
GA-LA-OT-1	B	1,053-1,118	1,000 – C
GA-LOW-OT-2	B	2,538-2,566	9,000 – C
GA-LOW-OT-3	B	2,508-2,520	26,800 – C
GA-ST-OT-1	B	26-38	1,400 – C
GA-SU-OT-1	B	174-506	1,800 – C
GA-TEL-OT-1	B	1,998-2,018	700 – C
GA-WAY-OT-1	B	2,965-3,005	5,800 – C
GA-WH-OT-1	B	2,185-2,235	600 – CO
GA-WH-OT-3	B	2,146-2,241	1,200 – C
GA-WH-OT-4	B	1,615-1,675	800 – C
SC-DOR-T-21	B	1,335-1,377	1,300 – C
GA-AP-OT-1	C	2,949-2,984	3,700 – C
GA-CLI-OT-2	C and D	3,308-3,361	8,900 – C
GA-COF-OT-1	C	2,496-2,526	1,900 – C
GA-COF-OT-2	C and D	2,885-2,932	800 – C
GA-CRP-OT-1	C	1,760-1,790	2,800 – C
GA-JD-OT-1	C and B	2,323-2,773	18,500 – C
GA-ST-OT-1	C	462-477	1,500 – C
GA-TEL-OT-1	C	2,278-2,323	500 – C
GA-TOO-OT-1	C and B	2,172-2,197	800 – C
GA-WAY-OT-1	C and D	3,605-3,645	600 – D
GA-WH-OT-1	C	2,545-2,595	400 – C
GA-WH-OT-2	C	2,194-2,244	1,100 – C

TABLE 8.—*Approximate sodium chloride concentration of ground water in Units A through H(?) in wells forming the key-well network*
Continued

Well number	Unit	Depth interval, feet below mean sea level	Concentration of sodium chloride (NaCl) in formation water, in milligrams per liter
GA-WH-OT-3	C	2,481-2,551	1,200 - C
GA-WH-OT-4	C	2,355-2,415	600 - C
GA-AT-OT-1	D	3,077-3,477	5,000 - C
GA-BRA-OT-1	D	4,138-4,460	21,000 - D
GA-BRO-OT-1	D	2,967-3,167	17,200 - C
GA-CAL-OT-1	D	2,225-2,285	1,300 - C
GA-CAM-OT-1	D	4,075-4,165	50,000 - C
GA-CAM-OT-3	D, E and F	4,167-4,662	40,000 - D
GA-CHR-OT-1	D	4,100-4,110	28,700 - C
GA-CLI-OT-1	D	3,145-3,475	8,000 - C
GA-CLI-OT-2	C and D	3,308-3,361	8,900 - C
GA-CLI-OT-3	D	3,322-3,402	34,000 - C
GA-CLI-OT-5	D	3,183-3,331	42,300 - C
GA-COF-OT-2	C and D	2,885-3,185	1,800 - C
GA-COF-OT-3	D	2,895-2,945	900 - C
GA-COF-OT-8	D	3,035-3,275	5,600 - C
GA-COQ-OT-1	D	2,985-3,020	6,200 - C
GA-CRP-OT-1	D	2,390-2,400	7,000 - C
GA-DE-OT-1	D	2,801-2,846	21,500 - C
GA-DE-OT-2	D	2,931-2,996	23,300 - C
GA-DE-OT-4	D	3,082-3,162	49,000 - C
GA-DE-OT-5	D	2,768-2,893	7,100 - C
GA-DOD-OT-1	D	1,780-1,810	1,300 - C
GA-EA-OT-1	D	2,443-2,613	1,900 - C
GA-EA-OT-2	D	2,426-2,456	2,100 - C
GA-EC-OT-1	D	3,144-3,169	39,000 - C
GA-EC-OT-4	D	3,179-3,205	40,000 - C
GA-EC-OT-5	D	3,289-3,313	54,000 - C
GA-GLY-OT-1	D	4,286-4,306	30,000 - C
GA-GLY-OT-2	D	4,155-4,175	53,000 - D
GA-GLY-OT-7	D	3,956-4,066	29,000 - D
GA-JD-OT-1	D	2,903-3,183	1,800 - C
GA-LA-OT-1	D	1,453-1,518	1,700 - C
GA-LI-OT-1	D	3,449-3,774	10,400 - C
GA-LOW-OT-1	D	2,938-2,998	8,000 - C
GA-LOW-OT-2	D	3,083-3,170	8,300 - C
GA-LOW-OT-3	D	3,046-3,304	9,900 - C
GA-LOW-OT-4	D	2,896-3,154	9,500 - C
GA-LOW-OT-5	D	3,039-3,226	48,000 - C
GA-PI-OT-1	D	3,850-4,160	4,000 - C
GA-PU-OT-1	D	359-419	1,800 - C
GA-SCR-OT-1	D	1,583-1,643	500 - C
GA-SE-OT-1	D	2,604-2,849	24,600 - C
GA-SE-OT-2	D	2,771-2,820	44,000 - C
GA-SE-OT-4	D	2,463-2,868	5,100 - C
GA-SE-OT-6	D	2,690-2,820	16,500 - C
GA-ST-OT-1	D	852-1,327	2,400 - C
GA-SU-OT-1	D	1,068-1,438	700 - C
GA-TEL-OT-1	D	2,828-2,838	900 - C
GA-TOO-OT-1	D	2,562-2,602	800 - C
GA-WAY-OT-1	C and D	3,605-3,935	4,900 - D
GA-WAY-OT-2	D	4,027-4,177	86,500 - C
GA-WH-OT-1	D	2,755-2,775	3,000 - C
GA-WH-OT-2	D	2,744-2,759	6,500 - C
GA-WH-OT-3	D	2,701-2,751	1,200 - C
GA-WH-OT-4	D	2,680-2,710	3,000 - C
GA-CAL-OT-1	E	2,465-2,500	4,400 - C
GA-CLI-OT-1	E	3,715-3,740	34,000 - C
GA-CLI-OT-3	E and F	3,582-3,682	65,000 - C
GA-CLI-OT-5	E	3,545-3,611	70,500 - C
GA-COF-OT-2	E	3,362-3,417	4,300 - C
GA-COF-OT-3	E	3,235-3,250	4,800 - C
GA-COQ-OT-1	E	3,174-3,202	76,000 - C
GA-DE-OT-1	E and F	3,261-3,501	32,300 - C
GA-EA-OT-1	E	2,901-2,933	11,500 - C
GA-EA-OT-2	E	2,946-2,996	15,000 - C
GA-EA-OT-3	E	2,405-2,925	3,400 - C
GA-EC-OT-3	E	3,361-3,416	70,500 - C
GA-EC-OT-4	E	3,415-3,435	48,000 - C
GA-EC-OT-5	E and F	3,552-3,579	66,000 - D
GA-JD-OT-1	E	3,415-3,450	6,600 - C
GA-LOW-OT-1	E	3,448-3,483	52,000 - C
GA-LOW-OT-2	E	3,470-3,491	18,000 - C
GA-MIT-OT-1	E	3,162-3,252	105,000 - C
GA-SE-OT-1	E	3,294-3,344	60,000 - D
GA-SE-OT-2	E and F	3,276-3,301	82,000 - C
GA-SE-OT-4	E	3,091-3,103	17,500 - C
GA-TOO-OT-1	E	2,802-2,837	800 - C
GA-WH-OT-1	E	3,045-3,060	500 - C
GA-AT-OT-1	F	3,887-3,927	75,000 - C
GA-BRO-OT-1	F	3,412-3,487	39,000 - C
GA-CAL-OT-1	F	2,537-3,673	30,400 - C
GA-CAM-OT-1	F	4,385-4,609	65,000 - C
GA-CHR-OT-1	F	4,324-4,454	52,400 - C
GA-CLI-OT-1	F	3,860-3,880	83,000 - C
GA-CLI-OT-2	F	3,685-3,724	13,400 - C
GA-COF-OT-2	F	3,659-3,684	13,900 - C
GA-COF-OT-3	F	3,495-3,785	24,200 - C
GA-COF-OT-8	F	3,465-3,749	31,600 - C
GA-COQ-OT-1	F	3,316-3,780	110,000 - C
GA-CRP-OT-1	F	2,720-3,190	52,000 - C
GA-DE-OT-1	F	3,771-4,271	63,500 - C
GA-DE-OT-2	F	3,849-4,906	63,000 - C
GA-DE-OT-3	F	3,395-3,611	50,000 - C
GA-DE-OT-4	F	3,607-3,722	61,000 - C
GA-DE-OT-5	F	3,358-3,398	46,000 - C
GA-DOO-OT-1	F	2,664-2,688	800 - C
GA-EA-OT-1	F	3,033-4,113	45,700 - C
GA-EA-OT-2	F	3,271-3,816	61,000 - C
GA-EA-OT-3	F	3,005-4,510	46,800 - C
GA-EC-OT-1	F	3,410-3,584	29,400 - C
GA-EC-OT-4	F	3,475-3,698	43,300 - C
GA-EC-OT-5	F	3,769-3,834	64,000 - C
GA-GLY-OT-2	F	4,605-4,670	35,500 - C
GA-GLY-OT-7	F	4,261-4,296	10,700 - C
GA-HO-OT-1	F	1,089-1,294	2,400 - C
GA-JD-OT-1	F	3,506-3,528	16,300 - C
GA-LA-OT-1	F	1,753-2,233	3,100 - C
GA-LI-OT-1	F	4,024-4,104	11,200 - C
GA-LOW-OT-1	F	3,723-3,918	82,500 - C
GA-LOW-OT-2	F	3,523-3,834	22,000 - C
GA-LOW-OT-3	F	3,532-3,897	68,800 - C
GA-LOW-OT-4	F	3,501-3,956	145,000 - C
GA-LOW-OT-5	F	3,482-3,941	215,000 - C
GA-MIT-OT-1	F	3,302-3,767	147,500 - C
GA-PU-OT-1	F	709-1,999	1,400 - C
GA-SCR-OT-1	F	2,073-2,528	600 - C
GA-SE-OT-1	F	3,554-4,349	62,200 - C
GA-SE-OT-2	F	3,321-3,686	117,000 - C
GA-SE-OT-4	F	3,158-3,249	34,000 - C
GA-SE-OT-6	F	3,325-4,760	70,000 - C
GA-ST-OT-1	F	1,512-1,912	2,400 - C
GA-TEL-OT-1	F	3,318-3,348	1,200 - C
GA-THO-OT-2	F	4,441-4,471	122,000 - C
GA-TOO-OT-1	F	2,967-3,302	1,100 - C
GA-TR-OT-1	F	2,252-2,556	800 - C
GA-TR-OT-2	F	2,341-2,751	500 - C
GA-WAY-OT-1	F	4,195-4,250	26,000 - C
GA-WAY-OT-2	F	4,427-4,497	57,000 - C
GA-WH-OT-1	F	3,213-3,445	500 - C
GA-WH-OT-2	F	2,894-3,034	5,600 - C
GA-WH-OT-3	F	3,053-3,301	1,500 - C
GA-WH-OT-4	F	3,135-3,165	1,600 - C
GA-EA-OT-1	G(?)	5,463-5,478	66,000 - C
GA-EA-OT-2	G(?)	4,721-4,816	50,000 - C
GA-EA-OT-3	G(?)	4,750-4,825	114,000 - C
GA-SE-OT-6	G(?)	5,050-5,080	57,500 - C
GA-THO-OT-2	G(?)	5,421-5,461	47,000 - C
GA-DE-OT-2	H(?)	6,004-6,044	117,000 - C
GA-EA-OT-2	H(?)	5,816-5,856	36,000 - C
GA-EA-OT-3	H(?)	5,833-5,890	115,000 - C
GA-SE-OT-6	H(?)	6,290-6,300	127,000 - C

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