Calhoun County Geology

and

Ground-Water Resources

William Scott Parks

BULLETIN 92

MISSISSIPPI GEOLOGICAL SURVEY
TRACY WALLACE LUSK
DIRECTOR AND STATE GEOLOGIST

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LETTER OF TRANSMITTAL

Office of the Mississippi Geological Survey
University, Mississippi
October 27, 1961

Hon. Henry N. Toler, Chairman, and
Members of the Geological Survey Board

Gentlemen:

Herewith is Mississippi Geological Survey Bulletin 92, Calhoun County Geology and Ground-Water Resources, by William Scott Parks.

Calhoun County was studied by Curtis C. Stacy, Jr. in 1951 and the resulting thesis was submitted to the University of Mississippi in partial fulfillment of the requirements for the degree of Master of Science. The project was unusually large for a master's thesis and the lack of time prevented the candidate from adequately completing the report in a manner suitable for publication. As a matter of fact no geologic map was submitted. Nevertheless the task of preparing the present report was aided immeasurably by the thesis as well as the notes and field maps which Mr. Stacy kindly released to the Survey.

For the first time, the Mississippi Geological Survey undertook the study of the ground water of a county. And it should be noted that most of this was done during the course of regular field work. The cooperation of the Mississippi State Board of Health in analyzing the water samples is acknowledged by the author, however, I wish to personally thank them. Our State Board of Health recognizes the inestimable value of publishing ground-water analyses sampled in a systematic manner.

The ever increasing rate at which geologic literature is being published has served to aggravate the change in the use of geologic classification and terminology. The status of the problem is such that one geologist can no longer be sure of the written meaning of another geologist. The need for uniformity compels us to do our part toward such a goal. Therefore, the new code recently published by the American Commission of Stratigraphic Nomenclature in the May 1961 issue of the Bulletin of the American Association of Petroleum Geologists has been followed as far as possible at this time in the report on Calhoun County. I urge all geologists to study this code and conform to its principles when preparing material for publication.

Respectfully submitted,

Tracy W. Lusk
Director and State Geologist

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CALHOUN COUNTY GEOLOGY AND GROUND-WATER RESOURCES

WILLIAM SCOTT PARKS

ABSTRACT

Calhoun County, located in north central Mississippi, lies within the parallels 33° 45′ and 34° 10′ north latitude and the meridians 89° 10′ and 89° 30′ west longitude. The county is in the Gulf Coastal Plain physiographic province and is entirely within the North Central Hills division, except for small areas in the eastern part which are in the Flatwoods division.

The bedrock strata exposed are a part of the Paleocene series and the Eocene series of the Quaternary system. The units from the base upward are the Porters Creek formation and the Naheola formation of the Midway group, the Wilcox group (undifferentiated) and the Meridian formation of the Claiborne group. The sediments consist chiefly of sand, silt, clay shale, clay and lignite and subordinate amounts of siderite, sandstone and siltstone. The exposed section is estimated to be about 650 to 825 feet in thickness. Considerable areas are covered by surficial deposits of Quaternary age which include alluvium, loess, colluvium and soil.

The regional structure is monoclinal, and the units are estimated to dip from about 20 to 25 feet per mile to the west and west-southwest. No surface evidences of major secondary structure were found.

Surface rocks and minerals of possible economic importance include sand and sandstone, clay, lignite, iron ore and bauxite. Sand and sandstone, clay and lignite are most abundant, but for various reasons these materials appear to be limited in their development potential. Deposits of iron ore and bauxite are of doubtful importance.

Sufficient quantities of water for most needs are available everywhere, but the depths at which water is obtainable differ considerably from place to place. Artesian water supplies are derived principally from parts of four geologic horizons—the Tuscaloosa group, the Eutaw formation and the Ripley formation of Cretaceous age and the Wilcox group (undifferentiated) of Tertiary age. Approximately one-third of the total popula-

tion (15,941) is supplied by public water systems in the towns of Bruce, Calhoun City, Derma, Pittsboro and Vardaman from wells in the Tuscaloosa group and the Eutaw formation. Domestic supplies are developed chiefly in the Eutaw formation and the Ripley formation in the eastern half of the county and in the Wilcox group (undifferentiated) in the western half. The records of 284 water wells and data on the chemical and physical properties of water from 17 selected wells are given.

INTRODUCTION

The geological investigation of Calhoun County actually began in 1951 as a thesis problem of Curtis C. Stacy, Jr. Even though the thesis was accepted as its part of the requirements for the Degree of Master of Science, time did not permit adequate completion of the report for publication.

The field work marking the culmination of the present report was begun May 20, 1960, and was conducted by the writer at such times when he was free of his other duties. The investigation consisted of a study of the character, distribution, and thickness of the geologic units. Especial attention was given to a search for mineral deposits and to an inventory of the water supply.

PREVIOUS INVESTIGATIONS

The first published reference to Calhoun County is in a report by Harper[1] in 1857 in which he briefly discussed the topography, stratigraphy, and mineral resources. Hilgard[2] in 1860 mentioned lignite at several localities. Crider[3] in 1906 described a lignite deposit and gave a table of analyses. In a report on Mississippi lignite, Brown[4] in 1907 had a section on Calhoun County lignite and included several analyses.

In 1914, Logan[5] in a bulletin on pottery clays briefly described the geology and clays. Two small bodies of bauxite were noted by Morse[6] in 1923. Stephenson, Logan, and Waring[7] in 1928 devoted a section to general features, ground-water conditions and local supplies. In a bulletin on the Midway and Wilcox groups, Lowe[8] in 1933 mentioned several exposures.

In 1945, the Mississippi Geological Society[9] published its Geologic Map of Mississippi on which geologic unit boundaries were traced through the county. In a recent report on public and industrial water supplies, Lang and Boswell[10] in 1960 give information in regard to water supplies at Bruce, Calhoun City, Derma, Pittsboro, and Vardaman.

GEOGRAPHY AND CULTURE

Calhoun County was created by an act of the Legislature on March 8, 1852 during the gubernatorial administration of Henry S. Foote. It was named in honor of John C. Calhoun, the distinguished lawyer and statesman. The territory of the county was originally part of old Chickasaw, Lafayette and Yalobusha Counties which had been organized from land acquired from the Chickasaw and Choctaw Indians. Pittsboro was selected as the county seat, because of its centralized geographic location. Calhoun County's boundaries have not been changed since it was established in 1852[11].

Located in north central Mississippi, the county lies within the parallels 33° 45′ and 34° 10′ north latitude, and the meridians 89° 10′ and 89° 30′ west longitude. It is an irregular, rectangular area of 378,880 acres or approximately 592 square miles, having a maximum east-west extent of about 21 miles and a maximum north-south extent of about 30 miles. The county is bounded on the north by Lafayette and Pontotoc Counties, on the east by Pontotoc, Chickasaw and Webster Counties, on the south by Chickasaw and Webster Counties and on the west by Grenada and Yalobusha Counties (Figure 1).

The county has four main improved roads: (1) State Highway 8, an east-west trending road through the southern half, connecting Houston, Calhoun City and Grenada; (2) State Highway 9, a northeast and south trending road through the central and northeastern parts, connecting Pontotoc, Bruce, Pittsboro, Calhoun City and Eupora; (3) State Highway 9-W a northwest-southeast trending road through the northwestern part, connecting State Highway 9 at a point just north of Bruce and State Highway 7 in Lafayette County; and (4) State Highway 32, an east-west trending road through the north central part, connecting Houlka, Bruce and Water Valley.

Excellent all weather gravel roads include State Highway 330, an east-west trending road, connecting State Highway 32

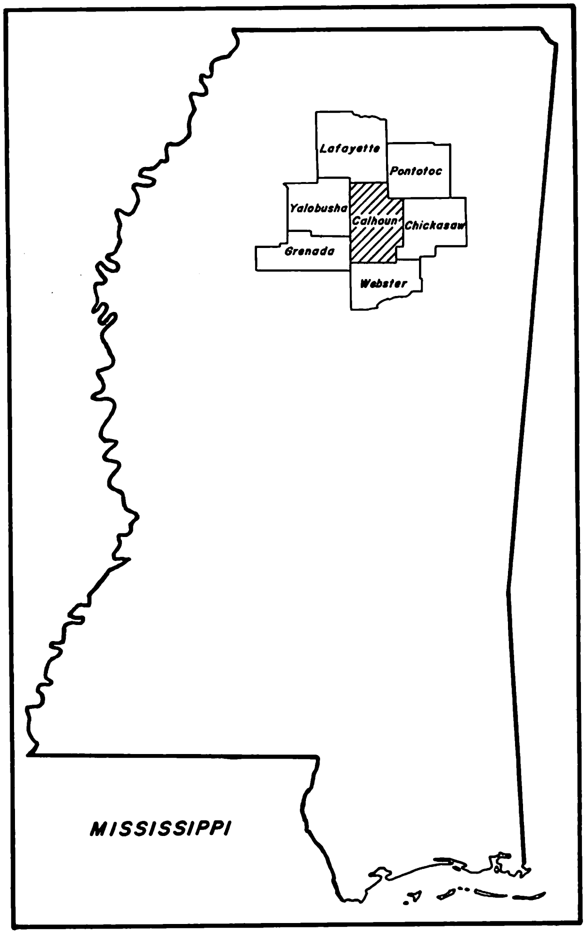

Figure 1.—Location of Calhoun County.

and Coffeeville; State Highway 341 (partially improved), a north-south trending road through the eastern part; State Highway 331, a north-south trending road, connecting State Highway 9 and State Highway 334 in Lafayette County; and State Highway 320, a northeast-southwest trending road, connecting State Highways 341, 9, 9-W and 32.

Only one railroad, the Mississippi and Skuna Valley Railroad, serves the county, extending from Bruce through the western half and connecting with the Illinois Central Railroad at Bruce Station in Yalobusha County.

The 1960 Census[12] shows a total population of 15,941 for Calhoun County, which is a decrease of 13.2 percent from the 1950 Census total of 18,369. The entire population is classed as rural. The larger towns, located in the central part of the county, are Bruce (pop. 1,698) and Calhoun City (pop. 1,714). Other smaller communities or towns include Big Creek (pop. 100), Derma (pop. 578), Pittsboro (pop. 205), Slate Springs (pop. 123), and Vardaman (pop. 637).

Calhoun County has no sizeable industries. The chief occupation is agriculture. The 1950 Census[13] reports over half of the total employed labor force of 5,771 as engaged in agricultural activities. Cotton is the leading cash crop. Other crops of importance include corn, oats and wheat. The raising of livestock (cattle and hogs) is a ranking source of farm income.

At one time the timber business was the leading occupation, and it still remains an integral part of the county's economy. Of all land in Calhoun County, 56.6 percent was classed as commercial forest land by the Forest Service[14] in 1957. Present forest production is chiefly hardwoods with some utilization of softwoods and pulpwood. Saw mills and planing mills are fairly numerous.

In 1950 manufacturing enterprises employed a total of 937 people of which 738 worked in the furniture and the lumbering and wood products industries, and 171 people were employed in the manufacture of wearing apparel and other fabricated textile products.

One gas line, supplying the North Central Natural Gas District of the Southern Natural Gas Company, serves the county with a 6-inch line at Vardaman and Calhoun City and a 4-inch line at Pittsboro and Bruce. Electric power is furnished by the Tennessee Valley Authority.

PHYSIOGRAPHY AND RELIEF

Calhoun County lies within the Gulf Coastal Plain physiographic province and is entirely within the North Central Hills division, except for small areas in the eastern part which are in the Flatwoods division (Figure 2). In Mississippi the Flatwoods is a long, relatively narrow, generally north-south trending belt of low relief, the surface of which is gently undulating to rolling and marks the outcrop of impervious clays of the Porters Creek formation. The North Central Hills is an extensive upland west of the Flatwoods which is hilly and at places is decidedly broken and rough. This division is developed chiefly on the dominately sandy deposits of the Wilcox and Claiborne groups[15].

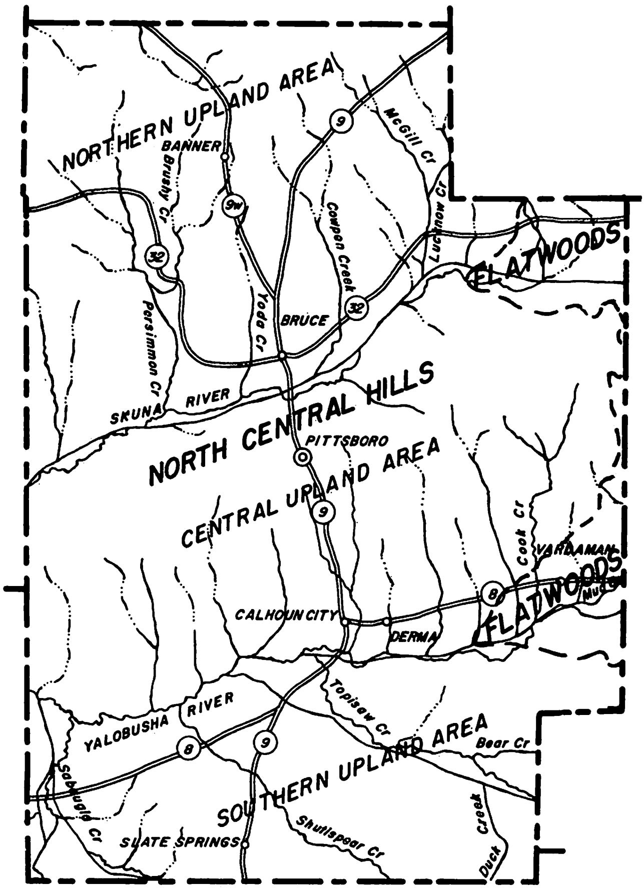

Figure 2.—Physiography and drainage of Calhoun County.

In Calhoun County the Flatwoods is represented by small areas in the extreme eastern part, extending short distances up the Skuna and Yalobusha River valleys. Relief is flat to low rolling. Altitudes range from less than 300 to more than 400 feet above sea level. The Flatwoods is developed on the clays of the Porters Creek formation of the Midway group.

The North Central Hills, including the greater part of the county, is a deeply dissected upland area which is crossed by two rather broad alluvial plains. The hills are generally rounded and slopes are moderate to steep. Valleys are wide, and streams have developed flood plains and terraces. Relief is low rolling to flat in the bottoms, rolling to moderate in the clay hill areas and moderate to high in the sand hill areas. Altitudes range from less than 250 to more than 600 feet above sea level. The hill area may be divided from north to south into five topographic regions: (1) A northern upland area, which is a dissected plateau-like terrane sloping to the south; (2) the Skuna River valley, which has an alluvial plain several miles wide; (3) a middle upland area, which rises abruptly from the Skuna River valley and forms a divide between the Skuna and Yalobusha Rivers; (4) the Yalobusha River valley which includes a rather broad alluvial plain several miles wide; and (5) a southern upland area, which is deeply dissected and crossed by the flood plains of the Sabougla, Shutispear and Topisaw Creeks.

The North Central Hills area is developed on the dominately sandy materials which make up the Naheola formation of the Midway group, the Wilcox group (undifferentiated), and the Meridian formation of the Claiborne group.

DRAINAGE

Calhoun County lies wholly within the Yazoo River Basin and is drained principally by two major streams, the Yalobusha and the Skuna Rivers, and by their tributaries (Figure 2).

The Yalobusha River, an east to west flowing stream formed by the confluence of Mud and Yalobusha Creeks in eastern Calhoun County, drains the southern half. Its main tributaries are Topisaw, Shutispear and Sabougla Creeks, which flow in general northwestward directions. Numerous small creeks flow southward into the Yalobusha River; however, Cook (Cane) Creek is the only tributary of any consequence.

The Skuna River, an east-northeast to west-southwest flowing stream, drains the northern half. Its main tributaries are Kittahutty, Lucknow, Cowpen, Yoda and Persimmon Creeks, which flow in general southward and south-southwestward directions. Most of the smaller tributaries flow southward, and only a few flow in northwestward and westward directions.

Grenada Lake is formed from the Yalobusha and Skuna Rivers, the waters of which are obstructed by a dam located about 3 miles northeast of Grenada, Grenada County. At maximum flood stage, the reservoir waters will back up the Yalobusha River into Calhoun County some 6 miles and cover an area of about 15 square miles. The conservation pool is at an elevation of 193 feet, and the spillway crest is at an elevation of 231 feet.

VEGETATION

Calhoun County includes areas which are parts of three of the five major forest types of Mississippi. Forest types represented are the Loblolly-shortleaf pine, the Oak-pine, and the Oak-gum-cypress. They are defined by the Southern Forest Experiment Station, U. S. Department of Agriculture[16] as follows:

"*Loblolly-shortleaf pine.* — Forest in which 50 percent or more of the stand is loblolly pine, shortleaf pine, or other southern yellow pines excepting longleaf or slash pine, singly or in combination. Common associates include oak, hickory, and gum.

"*Oak-pine.* — Forests in which 50 percent or more of the stand is hardwoods, usually upland oaks, but in which southern pines make up 25-49 percent of the stand. Common associates include gum, hickory, and yellow-poplar.

"*Oak-gum-cypress.* — Bottomland forests in which 50 percent or more of the stand is tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, except where pines comprise 25-49 percent in which case the stand would be classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple."

In general, the Flatwoods has an Oak-pine type of forest and the North Central Hills has a Loblolly-shortleaf pine type of forest on the sandy facies and an Oak-pine type on the clayey facies. The Oak-gum-cypress forest is found in the bottoms of the Yalobusha and the Skuna Rivers.

The following list of species sampled in Calhoun County was provided by Mr. Sam Guttenberg,[17] Assistant Chief of the Division of Forest Economics, Southern Forest Experiment Station, New Orleans, Louisiana. Mr. Guttenberg states that this list substantially accounts for most but not all trees to be found in the county.

Pinus taeda	(Loblolly pine)
Pinus echinata	(Shortleaf pine)
Liquidambar styraciflua	(Sweetgum)
Nyssa sp.	(Black gum)
Liriodendron tulipifera	(Yellow poplar)
Quercus velutina	(Black oak)
Quercus coccinea	(Scarlet oak)
Quercus falcata (rubra)	(Southern red oak)
Quercus falcata (rubra) *var. pagodafolia*	(Cherrybark oak)
Quercus shumardii	(Shumard oak)
Quercus nuttalli	(Nuttall oak)
Quercus nigra	(Water oak)
Quercus phellos	(Willow oak)
Quercus alba	(White oak)
Quercus stellata	(Upland post oak)
Fraxinus americana	(White ash)
Ulmus sp.	(Other elms)
Carya sp.	(Hickories except pecans)
Platanus occidentalis	(Sycamore)

CLIMATE

Normal monthly, seasonal and annual temperatures and precipitation for the county are given in Table 1. Temperature is based on a 5-year record, 1955-1959, and precipitation is based on a 10-year record, 1950-1959. As the table indicates, the county has a warm-temperate climate. Summers are long with many hot days, and winters are short and mild with frequent short spells of cold weather and occasional light snow falls. The highest temperature recorded is 102° Fahrenheit in August, and the lowest is 2° Fahrenheit in December. Rainfall is least during the fall and greatest during the winter. The average growing season is about seven months, usually from the last of March to the first part of November.

TABLE 1

NORMAL MONTHLY, SEASONAL, AND ANNUAL TEMPERATURE AND PRECIPITATION AT CALHOUN CITY, MISSISSIPPI*

Month	Temperature			Precipitation		
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year
	F°	F°	F°	Inches	Inches	Inches
December	47.0	81	2	5.02	1.65	7.97
January	42.2	79	10	5.29	2.29	9.65
February	48.2	81	9	5.41	2.45	8.40
Winter	45.8	81	2	15.72	6.39	26.02
March	53.1	88	17	5.20	1.85	9.10
April	63.2	89	29	5.17	1.70	9.65
May	72.2	94	39	3.62	1.30	5.60
Spring	62.8	94	17	13.99	4.85	24.35
June	75.8	98	43	3.89	.33	12.80
July	80.3	99	58	4.07	1.45	7.53
August	79.5	102	47	2.16	.20	6.82
Summer	78.5	102	43	10.12	1.98	27.15
September	73.9	99	37	3.42	.71	8.50
October	62.6	92	24	2.03	.33	5.30
November	52.2	87	11	4.09	.67	14.25
Fall	62.9	99	11	9.54	1.71	28.05
Year	62.5	102	2	49.73	14.93	105.57

*Temperature based on a 5-year record, 1955-1959; precipitation based on 10-year record, 1950-1959. Compiled from U. S. Department of Commerce, Weather Bureau, "Climatological Data," 1950-1959. Tabulations are complete except for temperature measurements during January, 1955.

SOILS

At the time the field work for the present report was being conducted, a soil survey of Calhoun County was in progress by the United States Department of Agriculture, Soil Conservation Service. In view of this soil survey, which is to be completed in 1962, Mr. R. R. Covell, State Soil Scientist,[18] provided certain general information in regard to soil groups.

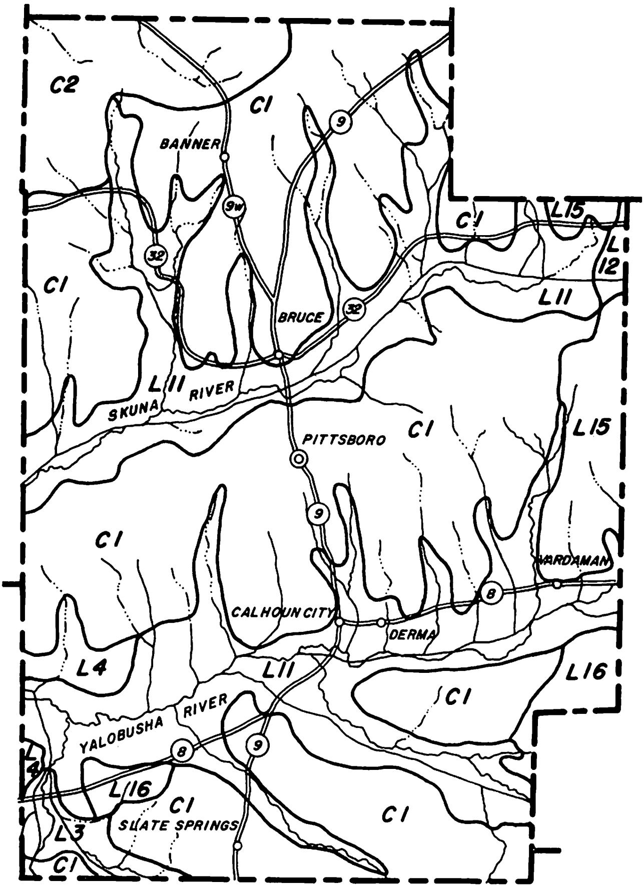

Figure 3.—Soil groups of Calhoun County. (After U. S. Department of Agriculture, Problem Areas in Soil Conservation— Calhoun, map, December 1940). Letter-number designations are keyed to text.

Of the eight groups of soils represented, groups C1 and C2 belong to the Red-Yellow Podzolic soils and groups L3, L4, L11, L12, L15 and L16 belong to the Low Humic Glei soils (Figure 3). The Red-Yellow Podzolic soils, which characteristically are found throughout an extensive region in the southeastern United States including most of the coastal plain, cover a large part of the county. They presently are defined[19] as: ". . . A group of well-developed, well-drained acid soils having thin organic (A_0) and organic-mineral (A_1) horizons over a light-colored bleached (A_2) horizon, over a red, yellowish-red, or yellow and more clayey (B) horizon. Parent materials are all more or less siliceous. Coarse reticulate streaks or mottles of red, yellow, brown, and light gray are characteristic of deep horizons of Red-Yellow Podzolic soils where parent materials are thick."

In the county the Red-Yellow Podzolic soils (C1, C2) are developed chiefly on the materials of the Wilcox group, but also are found on deposits belonging to the Naheola formation of the Midway group and the Meridian formation of the Claiborne group. These sediments are quite variable in texture.

The Low Humic Glei soils, although represented in a variety of groups, occupy somewhat smaller areas. These soils are defined[20] presently as: ". . . An intrazonal group of imperfectly to poorly drained soils with very thin surface horizons, moderately high in organic matter, over mottled gray and brown glei-like mineral horizons with a low degree of textural differentiation.

"Low Humic Glei soils range in texture from sand to clay, and the parent materials vary widely in physical and chemical properties. These soils occur largely under a natural cover of swamp forest, and perhaps of marsh plants in some areas. A large proportion of them range from medium to very strongly acid in reaction. Few are neutral or alkaline."

In the county the Low Humic Glei soils appear to have the following general relationships with regard to parent rocks: Soil group L15 is developed chiefly on the clays of the Porters Creek and Naheola formations; group L16 is developed on sands and clays of the Naheola formation in an area in the southeastern part of the county and on a clayey facies of the Wilcox in an area in the southwestern part of the county; L3, L4, L11 and L12 are developed on alluvial and stream terrace deposits.

The descriptions of soil groups in Calhoun County by Mr. R. R. Covell[21] are as follows:

"C1 Rough hill areas. The soils are usually thin and have limited profile development. They have sandy surfaces over friable sandy materials. Gravel occurs through these soils in local areas. Some of the soils are heavy, tough acid clays. Slopes are steep or very steep. Erosion is slight over much of the area, becoming moderate locally. Ridge tops are usually narrow, but some do widen out sufficiently for occasional fields. Small valleys are narrow or medium width and of limited value for cropping because of inadequate drainage. Much of this area is still in forest cover. Ruston, Eustis, Cuthbert, Shubuta, Mantachie, and Bibb Soils.

"C2 Rough hill areas. The soils are usually thin and have limited profile development. They have sandy surfaces over friable sandy materials. Gravel occurs through these soils in local areas. Some of the soils are heavy, tough acid clays. Slopes are steep or very steep. Erosion is slight over much of the area, becoming moderate locally. Ridge tops are usually narrow, but some do widen out sufficiently for occasional fields. Small valleys are narrow or medium width and of limited value for cropping because of inadequate drainage. Much of this area is still in forest cover. Eustis, Ruston, and Cuthbert Soils.

"L3 Productive valley lands. Soils range from imperfectly drained to well drained. Drainage is needed locally. Stream bank stabilization is needed in local areas. Some areas of deep and moderately deep loess terraces on fairly gentle slopes, with moderate erosion, are included in this unit. Most of this unit is open land. Richland, Collins, Hymon.

"L4 Terrace soils along major streams. These terrace soils are shallow to moderately deep on nearly level to gentle slopes with moderate erosion. Some poorly drained, gray flats are in evidence. Appreciable amounts of poorly to moderately well drained bottom lands occur in this unit area. This land generally has been cleared and is cropped. Richland, Olivier, and Calhoun.

"L11 Broad, flat, poorly and imperfectly drained, medium to moderately heavy textured bottoms, badly in need of drainage for best use. Overflows are a serious hazard. The general fertility level of these bottom lands is on the low side. Included in this unit area are varying amounts of gently sloping shallow, medium textured bench lands. Much of this area is still in timber, but an appreciable part has been cleared. Falaya, Waverly, Calhoun, Olivier.

"L12 Near neutral bottom lands in the thin loess section. These are locally called 'black lands.' The soils are usually silty or silty clay loam surfaces over heavy, dark subsoils. The land in this unit is quite productive but needs drainage for its most intensive use. Chastain, Una and Houlka.

"L15 Shallow, very shallow and moderately deep soils of thin loess over heavy, gray, acid clays. Slopes are nearly level and gentle with an occasional strongly sloping or steep break. Erosion is slight. Bottoms are broad, with moderately heavy textured, imperfectly drained soils. Drainage is needed for the bottom lands. Much of the land in this unit is in forest, but a sizeable part of it has been cleared and is in crops and pasture. Tippah, Dulac, Falkner, Falaya, Waverly, Cuthbert.

"L16 Very shallow to moderately deep acid soils composed of thin loess over heavy, gray, acid clays. Slopes range from strong to steep with some moderately sloping, medium width ridgetops. Erosion is moderate. Much of this area is in original or second growth timber. Bottoms are medium width, with somewhat heavy textured, imperfectly drained soils. Susquehanna, Cuthbert, Tippah, Dulac, Falkner.

"There is a thin deposit of loess on the broad ridge tops in all parts of the county, but more so in the L15 and L16 areas. There is also evidence of loess mixed with the first and second bottom soils in the L3 and L11 area."

STRATIGRAPHY

The bedrock strata outcropping in Calhoun County are a part of the Paleocene series and of the Eocene series of the Tertiary system. The deposits, which belong to three groups of rock, are subdivided into four units consisting of three formations and an undifferentiated group. The units from the base upward are the Porters Creek formation and the Naheola formation of the Midway group, the Wilcox group (undifferentiated), and the Meridian formation of the Claiborne group. Figure 4 is a generalized section of exposed strata.

The deposits are sedimentary and were laid down under both marine and nonmarine conditions. They consist of chiefly sand, silt, clay shale, clay and lignite and of subordinate amounts of siderite, sandstone, and siltstone. The oldest sediments crop out at the lower elevations in the eastern part of the county. To the west the deposits are successively younger, the youngest being at the higher elevations in the extreme western and

Figure 4.—Generalized section of exposed strata in Calhoun County

Era	System	Series	Group	Stratigraphic unit	Thickness (feet)	Lithologic Character
Cenozoic	Quaternary	Pleistocene and Recent		Colluvium and soil	0-10	Clay, silt and sand altered from bedrock by weathering processes and having undergone no transportation or having moved down the valleys relatively short distances.
				Alluvium	0-30	Clay, silt and sand which make up the flood plains or first bottoms of the major streams and their larger tributaries.
				Terrace deposits	0-20	Clay, silt and sand which make up terraces or second bottoms associated with the major streams.
				Loess	0-5	Buff to light-brown sandy loam or silty clay loam which forms a thin cover or is in scattered remnant pockets on the broad ridge tops.
	Tertiary	Eocene	Claiborne	Meridian formation	50-75	Sand, vari-colored, cross-bedded to evenly bedded, medium- to coarse-grained, highly muscovitic; contains lenses and partings of white clay. Basal few feet are commonly very coarse-grained and pebble-bearing. Only lower parts present. Estimated total thickness ranges up to 125 feet in Yalobusha County.
			Wilcox	Undifferentiated rocks	450-550	A heterogeneous body of chiefly sand, silt, clay shale, clay and lignite and of subordinate amounts of siderite, sandstone and siltstone. The sediments are complexly interlensed and intertongued. At most places the basal parts consist of sand. Above the basal sand the main body of the Wilcox consists predominately of fine sand and silt in the lower portions, and clay shale, clay and lignite become prominent in the upper portions. Locally large bodies of sand are present.
		Paleocene	Midway	Naheola formation	100-125	Laminated to thin-bedded, gray, yellow and red, fine-grained, commonly highly muscovitic, variably silty and shaly sand and dark-gray to black and light-gray, silty and sandy clay and clay shale. The sand and shale are commonly interlaminated and interbedded. Thin discontinuous beds of concretionary siderite are present at various levels throughout the formation. The lower 30 to 40 feet is predominately dark-colored sandy and silty clay shale.
				Porters Creek formation	50-75	Brownish-gray to dark-gray, finely and sparsely muscovitic, tough to slightly plastic, jointed, conchoidally fracturing clay. Some parts are silty, and some contain a small amount of fine-grained gray sand. The clay appears massive, but the siltier portions show faint lamination. Only the uppermost parts are at the surface. Estimated total thickness is 350 to 400 feet in the eastern part, thickening to 450 feet in the western part.

northwestern parts. The exposed section is estimated to range from about 650 to 825 feet in thickness. Over considerable areas, the bedrock is covered by surficial deposits of alluvium, loess, colluvium and soil which belong to the Pleistocene series or the Recent series of the Quaternary system.

MIDWAY GROUP

PORTERS CREEK FORMATION

The term "Porters Creek Group" was first applied provisionally by Safford[22] in 1864 to strata in Tennessee that he previously had included in the "Orange sand." Prior to Safford's naming of the Porters Creek, Hilgard[23] in 1860 had described the equivalent beds in Mississippi under the name "Flatwoods," but because the term "Flatwoods" was considered descriptive, it was later replaced by the geographic name "Porters Creek." Safford's type area is on Porters Creek, Hardeman County, Tennessee, about a mile and a half west of the railroad station at Middleton.

Subsequent workers have well established the Porters Creek as a valid unit of formational rank in Mississippi. In a report on Winston County, Mellen[24] in 1939 recognized three distinctive lithologies in the Porters Creek formation—a basal phase, a middle more typical phase, and an upper laminated phase. In his report, the upper laminated phase is considered to be the equivalent of the Naheola formation of Alabama. Other workers of the Mississippi Geological Survey have recognized the same three types of lithologies as described by Mellen as far north along strike as Tippah County. It has been suggested repeatedly that the upper laminated phase is the equivalent of the Naheola. In 1952, Vestal[25] in a report on Webster County mapped the upper laminated phase of the Porters Creek separately as the Naheola formation, thus restricting the upper limits of the Porters Creek in its previous usage by the Mississippi Geological Survey in northern Mississippi.

In the present report, the term "Porters Creek formation" is used essentially in the same manner as used by Vestal in Webster County—the upper laminated phase of previous usage is excluded from the formation.

Only the uppermost Porters Creek is at the surface in Calhoun County, and most everywhere that it normally should be exposed, the formation is covered by alluvium or stream terrace materials or by a moderately thick residual soil. The formation occupies small areas in the extreme eastern part of the county and along the lower slopes of the Skuna and Yalobusha River valleys, extending down those valleys a maximum of about four or five miles (Plate 1).

The surface developed on the Porters Creek is low rolling to flat which is typical of the Flatwoods. Altitudes range from less than 300 to more than 400 feet above sea level. Because of the low resistance of the clay to weathering processes, exposures are generally poor and infrequent. At places outcrops are present in the deeper and fresher roadcuts and in stream beds.

That portion of the Porters Creek formation which is exposed consists of a brownish-gray to dark-gray, finely and sparsely muscovitic, tough to slightly plastic, jointed, conchoidally fracturing clay. Some parts are silty, and some contain a small amount of fine gray sand. The clay appears massive but on close inspection may reveal faint lamination, especially in the siltier portions. Platy ironstone is common along joints, and fractures generally have black coatings. Small clay ironstone nodules or concretions are scattered here and there. On weathering the clay is reduced to a mealy textured clay soil.

About 32 feet of Porters Creek clay is exposed in scattered outcrops in the road ditches and in the gullies (NE.¼, NE.¼, Sec.28, T.12 S., R.1 E.) along State Highway 341 on the lower reaches of the south slope of the Skuna River valley 0.8 mile north of the junction of the road west to Reid. (See composite section described under "Naheola formation").

Just north of this exposure a road east from State Highway 341 along the lower south slope of the Skuna River valley into Chickasaw County crosses several low hills underlain by Porters Creek clay. A few rather poor exposures of weathered clay are in ditches and in the deeper road cuts (SE.¼, Sec.22 & E.½, Sec.24, T.12 S., R.1 E.). Near the Chickasaw County line, a fairly good exposure of about 10 feet of slightly weathered Porters Creek clay overlain by badly weathered clay and residual soil is in the roadcut (NW.¼, SE.¼, Sec.24, T.12 S., R.1

Figure 5.—Weathering Porters Creek clay exposed in a cut (NW. 1/4, SE. 1/4, Sec.24, T.12 S., R.1 E.) of a road on the lower south slope of the Skuna River valley 2.9 miles east-northeast of State Highway 341. July 21, 1961.

Figure 6.—Slightly weathered Porters Creek clay exposed in a cut (NW. 1/4, SE. 1/4, Sec.24, T.12 S., R.1 E.) of a road on the lower south slope of the Skuna River valley 2.9 miles east-northeast of State Highway 341. July 21, 1961.

E.) 2.9 miles east-northeast of State Highway 341 (Figure 5). This slightly weathered material is typical of the Porters Creek which is generally uniform in its consistency everywhere that it is exposed (Figure 6).

South of Vardaman, a generally east-west trending road along the lower south slope of the Yalobusha River valley crosses a series of low lying hills developed chiefly on the Porters Creek clay. Along this road east from State Highway 341 to the Chickasaw County line, a few scattered poor exposures are in the roadcuts and ditches (E.½, Sec.23 & Sec.24, T.14 S., R.1 E.). West of the highway 0.9 mile, about 8 feet of slightly weathered Porters Creek clay is in the roadcut and ditch (SW.¼, SW.¼, Sec. 22, T.14 S., R.1 E.) on the lower part of a hill capped by Naheola sandy clay shale. (See section described under "Naheola formation").

Only the upper 50 to 75 feet of the Porters Creek formation is at the surface. On the basis of well logs, the entire formation is estimated to range in thickness from about 350 to 400 feet in the eastern part of the county, thickening to about 450 feet in the western part.

No fossils were found during the present investigation. Therefore, at least the upper part of the Porters Creek is considered to be unfossiliferous.

The Porters Creek formation is conformably overlain by the Naheola formation. The lower contact of the formation is not exposed.

NAHEOLA FORMATION

The name "Naheola" was first applied in 1887 by Smith and Johnson[26] to beds exposed at Naheola Bluff on the Tombigbee River, Choctaw County, Alabama. Since it was named, the Naheola has been well established as a valid unit of formational rank in east central Mississippi by the work of several geologists. In this area, the Naheola is separated from the underlying Porters Creek by the Matthews Landing marl. In northern Kemper County, however, the marl begins to lose its distinguishing characteristics, and still farther north, it is not recognizable at all. Consequently, in the absence of this marker bed in northern Mississippi, the recognition of the Naheola must be done solely by comparison of gross lithologies and stratigraphic position.

In 1939, Mellen[27] in a report on Winston County recognized three distinctive lithologies in the Porters Creek—a basal phase, a middle more typical phase, and an upper laminated phase. In his report, the upper laminated phase is considered to be the equivalent of the Naheola formation of Alabama. Subsequent workers of the Mississippi Geological Survey, which include Conant [28,29] in Tippah and Union Counties, Vestal[30] in Choctaw County, and Priddy[31] in Pontotoc County, have recognized the same three types of lithologies as described by Mellen. It has been suggested repeatedly that the upper laminated phase is the equivalent of the Naheola. Vestal[32] in 1952 in a report on Webster County mapped the upper laminated phase separately as the Naheola formation, thus restricting the upper limits of the Porters Creek formation in its previous usage by the Mississippi Geological Survey in northern Mississippi.

The bases on which the upper laminated phase is correlated with the Naheola formation have never been discussed in previous reports. However, the strongest evidences probably are (1) the similarity of sediments of the upper laminated phase and the Naheola, (2) the dissimilarity between the upper laminated phase and the underlying more typical Porters Creek, (3) the apparent stratigraphic position of the upper laminated phase, and perhaps (4) a more or less superficial tracing of deposits north along strike by various workers. On the strength of these evidences alone, this correlation seems to be inconclusive without more extensive work on a regional scale. Therefore, these laminated strata are herein only tentatively assigned to the Naheola formation.

In the present report, the name "Naheola formation" refers essentially to strata included in the upper laminated phase of the Porters Creek by Mellen and by other workers of the Mississippi Geological Survey and in the Naheola formation by Vestal in his Webster County report. The Betheden formation, named by Mellen[33] and included in the Midway as the equivalent to part of the Naheola formation, was not recognizable in Calhoun County.

In Calhoun County the Naheola formation occupies a north-south trending belt extending across the eastern half (Plate 1). This belt normally has an average width of about five to six miles. However, due to the extensive dissection of the terrane in areas bordering the Skuna and Yalobusha Rivers, the formation is exposed westwards down the valleys a maximum of about 10 to 12 miles. The east and west boundaries of this belt are very irregular in detail.

The surface developed on the Naheola ranges from low rolling to moderate relief, becoming rather high where outliers of more resistant Wilcox sands cap the hills. Altitudes range from less than 300 to more than 500 feet above sea level. This topography is somewhat intermediate or transitional between the low lying Flatwoods on the east and the higher relief North Central Hills on the west in which it is included. Naheola silty clay and clay shale generally make up the first series of hills which rise west of the Flatwoods.

Outcrops of Naheola materials are numerous in roadcuts and are occasionally found along streams. Many exposures are excellent, particularly those in cuts of roads ascending the steeper valley walls. At a few places, almost the entire Naheola section is exposed in a series of cuts along roads over relatively short distances.

Even though the Naheola formation is in general well exposed, its contact with the underlying Porters Creek formation is usually obscure. Because of its characteristically developed low lying topography and relatively deep residual soil cover, the Porters Creek does not lend itself readily to examination. Consequently, exposures of the contact between the two units are present only where unusually favorable conditions have left the Porters Creek in some relief protected by the overlying more resistant Naheola materials. Therefore, mapping of the contact is difficult and is based largely on contrasts in topography and soils and on a few isolated exposures.

Where exposed, the contact between the Porters Creek and the Naheola is gradational. The stratigraphic position of the contact is arbitary, and it may be drawn anywhere within several feet of strata. The writer choses to place the contact at that level where the more typical conchoidally fracturing purer clays belonging to the Porters Creek give way to somewhat darker colored subconchoidally fracturing silty clays or clay shales which are included in the Naheola. The presence of silt and muscovitic fine sand becomes conspicious in these basal Naheola materials.

The Porters Creek-Naheola contact is rather poorly exposed in a gully (NE.¼, NE.¼, Sec.28, T.12 S., R.1 E.) on the west side of State Highway 341 on the lower slope of the Skuna River valley 0.8 mile north of the junction of the road west to Reid. Near the base of this steep hill, about 32 feet of more or less typical Porters Creek clay is exposed in scattered outcrops in the road ditches and gullies. Farther up the hill, dark-colored, silty and sandy clay shale of the basal Naheola are well exposed in the deep gully west of the highway. (See composite section).

South of Vardaman an east-west trending road west from State Highway 341 along the lower south slope of the Yalobusha River valley crosses a series of low hills underlain by Porters Creek clay and capped by Naheola sandy clay shale. A contact exposure is in a cut (SW.¼, SW.¼, Sec.22, T.14 S., R.1 E.) 0.9 mile west of the highway. At this locality, outcrops in the roadcut and ditches on the lower slopes of the hill are Porters Creek clay. Overlying this clay are sandy clay shales of the Naheola, which cap the hill.

Section in the cuts and ditches (SW.¼, SW.¼, Sec.22, T.14 S., R.1 S.) of a road on the lower south slope of the Yalobusha River valley 0.9 mile west of State Highway 341.

	Feet	Feet
Recent		3.0
3. Soil and subsoil, red-brown, sandy clay loam	3.0	
Naheola formation		17.5
2. Clay shale, gray to brownish-gray mottled dark-gray, slightly weathered, very silty, finely laminated, jointed, subconchoidal fracture; contains laminae and small pockets of gray and yellowish, rusty, muscovitic, fine sand; has some platy ironstone along laminae and joint planes; has black coatings along fractures. Sand percentage increases upward	17.5	
Porters Creek formation		8.5
1. Clay, gray to brownish-gray mottled dark-gray, slightly weathered, slightly to moderately silty, finely and sparsely muscovitic, tough to slightly plastic,		

jointed, conchoidal fracture; appears massive but the siltier parts show faint lamination; contains platy ironstone along joints and black coatings along fractures; becomes increasingly silty and contains some fine sand in uppermost parts. (Start section in ditch at base of hill.) 8.5

Total section 29.0

Test Holes 2, 8 and 9 were drilled through the Porters Creek Naheola contact, but no success was made in picking the top of the Porters Creek. In Test Holes 8 and 9, the percentages of silt and muscovite were carefully noted, and they showed a definite decrease with depth to a point where the contact seemed apparent. Deeper drilling, however, revealed a more typical Porters Creek clay at depths of about 30 feet lower. At the top of this clay, thin streaks of a soft whitish iron carbonate were present. The electrical character of Widco logs run on the holes showed a gradation between the Porters Creek and the overlying Naheola, but gave no clue as to a suitable pick for the top of the Porters Creek.

In general the Naheola consists of laminated to thin-bedded, gray, yellowish and red, fine-grained, commonly highly muscovitic, variably silty and shaly sand and dark-gray to black and light-gray, silty and sandy clay and (or) clay shale. The sand and shale are commonly interlaminated and interbedded. In most part, lamination is conspicuous. Thin discontinuous beds of concretionary siderite altering to limonite and hematite, clay ironstone nodules or concretions, and platy ironstone or thin-bedded ferruginous sandstone along laminae are present throughout the formation.

Perhaps the best single exposure of the Naheola in the northern part of the State is in the roadcuts, ditches, and gullies (E.½, Sec.28, T.12 S., R.1 E.) along State Highway 341 on the south wall of the Skuna River valley from 0.25 to 1.0 mile north of the junction of the road west to Reid. This section, which reveals 105 feet of Naheola strata, includes both the lower and the upper contacts of the unit.

Composite section in the roadcuts, ditches, and gullies (E.½, Sec. 28, T.12 S., R.1 E.) along State Highway 341 on the south wall of the Skuna River valley from 0.25 to 1.0 mile north of the junction of the road west to Reid.

	Feet	Feet
Wilcox group (undifferentiated)		20.0
9. Sand, red, fine-to medium-grained sparsely muscovitic; appears massive; contains pockets of yellow and white sand. Base defined by platy ironstone	20.0	
Naheola formation		105.0
8. Clay shale, light-gray mottled dark-gray; contains some yellowish fine sand. Upper 3 feet weathered to a light-colored structureless clay which is sploched and stained yellowish with iron oxide; very rusty	7.0	
7. Sand and clay shale: Similar to unit 5, but the sands appear to be better developed and less silty; contains much platy ironstone along bedding and some concretionary siderite	19.0	
6. Clay shale and sand: Similar to unit 4, but contains some concretionary siderite	10.0	
5. Sand and clay shale: Gray, yellowish, and red, silty, muscovitic, fine sand interbedded and interlaminated with light-gray clay and clay shale; contains thin platy ironstone along laminae	15.5	
4. Clay shale and sand: Dark-gray to light-gray clay shale interbedded and interlaminated with yellowish, rusty, very muscovitic, silty, fine sand. (Note: The unusual dips of the bedding of units 4 and 5 suggest slump)	24.5	
3. Clay shale, dark brownish-gray to black, very silty, tough, finely laminated, jointed, subconchoidal fracture, blocky; contains laminae and small pockets of gray and yellowish, rusty, very muscovitic, fine sand; has some platy ironstone along laminae and joint planes and black coatings along fractures. Sand percentage increases upward	29.0	
Porters Creek formation		43.0
2. Clay, brownish-gray to dark-gray, tough to slightly plastic, slightly to moderately silty, finely and sparsely muscovitic, jointed, conchoidal fracture; appears massive; becomes increasingly silty and contains some fine sand in upper parts	32.5	
1. Covered interval (start section at center of road intersection—elevation 312 feet)	10.5	
Total section		168.0

An exposure similar to the one just north of Reid is in cuts (W.½, Sec.26, T.14 S., R.1 E.) of State Highway 341 on the south valley wall of the Yalobusha River about three miles south of Vardaman. At this locality, the Porters Creek-Naheola contact is obscured by weathering, and the Midway-Wilcox contact is evident only where a thin outlier of basal Wilcox sand forms a cap on a hill underlain by Naheola materials on the west side of the highway at the junction of a southwest trending road. Exposures of Naheola are discontinuous.

The lower 30 to 40 feet of the formation is chiefly dark-colored sandy clay shales. At places, the basal several feet of the Naheola is made up of dark-gray to black, subconchoidally fracturing, blocky, compact, silty clays, which contain some laminae and small pockets of gray and yellowish, rusty, muscovitic, fine sand. The yellowish sand gives the dark-colored clays a mottled appearance on the freshly cut surface. On close inspection, these basal Naheola clays show very fine lamination. Some concentrations of muscovite are present along sand laminae. Upward these silty clays grade into clay shales containing laminae and thin beds (up to a few inches in thickness) of yellowish or red, rusty, highly muscovitic, silty, fine sand. Thin platy ironstone along sand laminae make lamination conspicuous on the face of cuts.

The lower part of the Naheola is well exposed in several cuts (SE.¼, SE.¼, Sec.22 & SW.¼, Sec.23, T.12 S., R.1 E.) of a road along the lower south slope of the Skuna River valley about a mile east of State Highway 341.

About a mile south of the road junction at Reid, a road southeast from State Highway 341 reveals Naheola strata in the cuts (SE.¼, SW.¼, Sec.34, T.14 S., R.1 E.) about half a mile east of the highway on the west valley wall of a branch of Cook (Cane) Creek.

An excellent section of Naheola is in several cuts (NE.¼, NW.¼, Sec.16, T.13 S., R.1 E.) of the main northwest and east trending road from Loyd about a mile east of the community on the east facing valley wall of Cook (Cane) Creek. At the base of this hill, silty clays and sandy clay shales of the lower part of the Naheola are exposed in the roadcuts and ditches. The lowermost clays in this exposure may be Porters Creek.

From about a mile and a half to two miles from State Highway 341, a discontinuous section of Naheola is in a series of cuts

(W.½, NE.¼, & NE.¼, SW¼, Sec.28, T.14 S., R.1 E.) of the road on the south wall of the Yalobusha River valley. The lowermost strata of a 35-foot exposure just north of the bend in the road on the lower slope of the valley are lower Naheola sandy clay shales (Figure 7).

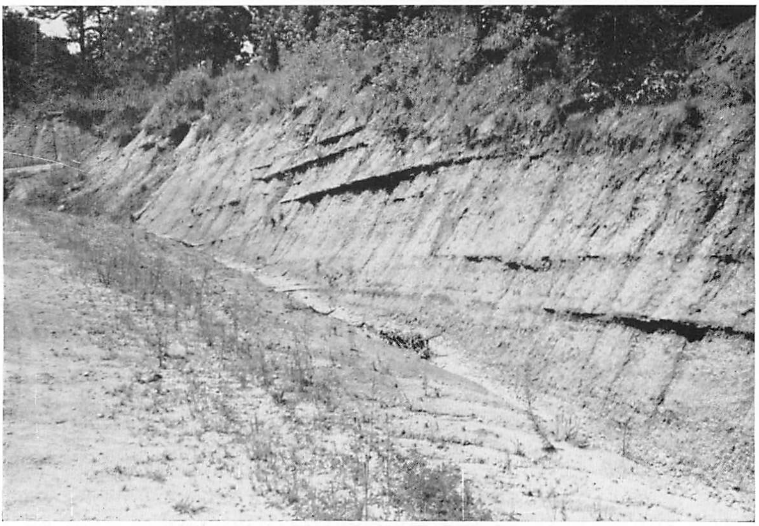

Figure 7.—Lower Naheola laminated sandy clay shales exposed in a cut (NW.¼, NE.¼, Sec.28, T.14 S., R.1 E.) of a road on the lower south slope of the Yalobusha River valley about a mile and a half west of the State Highway 341. July 22, 1961.

The upper part of the Naheola consists of gray, yellowish and red, laminated to thin-bedded, variably silty and shaly, commonly very muscovitic, fine sand interlaminated and interbedded with dark-gray or light-gray, silty and sandy clay and (or) sandy clay shale. The sediments in the upper Naheola are generally lighter in color, and the sands are more prominent. At a few places, where stratigraphic relations are not clear, strata of the Naheola and the Wilcox are easily confused. Because of the erosional disconformity between the Naheola and the Wilcox, the uppermost Naheola is rarely preserved if at all. At a few localities, Naheola strata adjacent to the Midway-Wilcox contact appear to be weathered or leached, and this zone may represent the remnant of an old soil developed on the Naheola surface before Wilcox deposition.

Strata of the upper Naheola are in the cuts (SW.¼, NW.¼, & NW.¼, SW.¼, Sec.26, T.14 S., R.1 W.) of a road on the south wall of the Yalobusha River valley about two miles south-southeast of State Highway 8 at Derma. This section, which is poorly exposed except in the uppermost part, reveals at least five different discontinuous beds of concretionary siderite (up to 1 foot thick) at various levels in the upper part of the formation (Figure 8). At the top of the hill the Naheola is overlain by a thin cap of Wilcox sand.

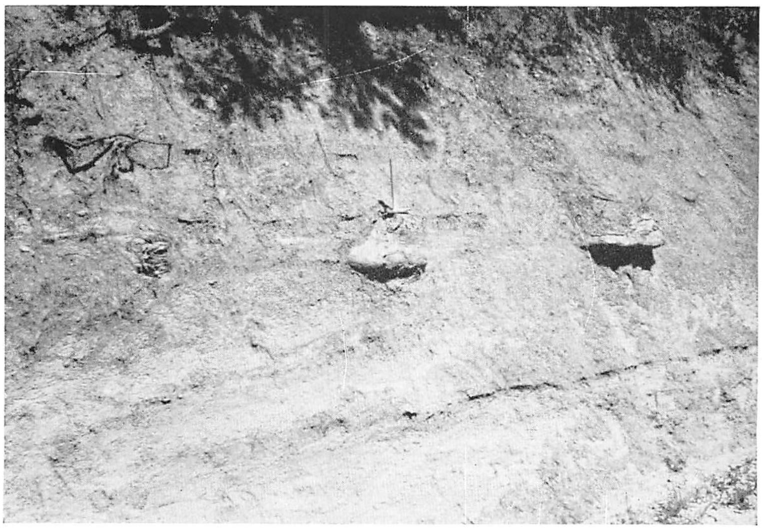

Figure 8.—Upper Naheola laminated shaly fine sands containing siderite concretions exposed in a cut (NW.¼, SW.¼, Sec.26, T.14 S., R.1 W.) of a road on the south wall of the Yalobusha River valley about two miles south-southeast of State Highway 8 at Derma. July 22, 1961.

Light-colored sands exposed in the south cut and ditch (SE.¼, SW.¼, Sec.7, T.13 S., R.1 E.) of the main northwest and east trending road from Loyd about a mile west of the community possibly represent the uppermost part of the Naheola. Numerous borings were noted on the fresh surface of several fairly large blocks of laminated sand, which had broken from the face of the cut and had fallen into the ditch. The strata at this place closely resemble some Wilcox materials.

The thickness of the Naheola is variable because of the erosional disconformity at its top. In Calhoun County, its maximum thickness is estimated to range up to about 100 to 125 feet.

The formation is considered to be unfossiliferous. Sand filled tubes and borings were found in some exposures.

The Naheola formation conformably overlies the Porters Creek formation and is disconformably overlain by the Wilcox group (undifferentiated).

WILCOX GROUP (UNDIFFERENTIATED)

The name "Wilcox" was first used by E. A. Smith, former State Geologist of Alabama, in an early unpublished manuscript for strata typically exposed in Wilcox County, Alabama. The geographic term "Wilcox" was adopted by the U. S. Geological Survey on March 23, 1905 to replace the descriptive name "Lignitic" which had been in use in Alabama and Mississippi[34].

In Mississippi the Wilcox has been ranked both as a formation and as a group. In east central Mississippi, the presence of sparingly fossiliferous marine beds in a mostly nonmarine Wilcox section aids in subdividing the unit into formations which are satisfactorily correlated with equivalent units in Alabama. Therefore, in the southern most parts of its outcrop belt, the Wilcox is justifiably ranked as a group.

North of Kemper County, however, the entire Wilcox is a, more or less, heterogeneous body of very lenticular, highly irregularly bedded, nonmarine sediments. Mapping of individual beds along strike is extremely difficult, if not impossible, except over very limited areas. Several attempts have been made to subdivide the nonmarine Wilcox into subordinate units. The literature concerning the Wilcox is voluminous.

In a report on Winston County, Mellen[35] in 1939 recognized four distinct divisions in the Wilcox: (1) the Fearn Springs formation; (2) the Ackerman formation; (3) the Holly Springs formation; and (4) the Hatchetigbee formation. Mellen's subdivision is based largely on the recognition of similarities which seem to exist along strike among several, more or less, repetitious successions of strata in the geologic column each of which he considers a formation. Mellen compares the individual succession of strata to a cyclothem.

Several later workers of the Mississippi Geological Survey have followed Mellen's subdivision of the Wilcox. Consequently, many problems have arisen from the application of this stratigraphy over extensive areas along strike, and the validity of the units is the subject of much controversy. The definitions of the various units have been modified, expanded or restricted, and some of the terminology has been abandoned completely. In fact, practically no overall agreement has been reached as to the units boundaries or as to the areal extent over which the units may be recognized. Some geologists do not recognize any subordinate units in the Wilcox of sufficient size or distinctive enough character to justify any subdivision.

During the present investigation, it was decided that no previously described subdivision of the Wilcox had a practical application in Calhoun County without much additional regional study beyond the scope of the report. Therefore, in order to avoid further confusion of the stratigraphy, the Wilcox is treated as an undifferentiated group.

In the present report, the term "Wilcox group (undifferentiated)" refers to strata between the underlying Naheola formation of the Midway group and the overlying Meridian formation of the Claiborne group.

The Wilcox group (undifferentiated) occupies a north-south belt across most of the western half of Calhoun County and extends eastward in the northeastern, central and southeastern parts (Plate 1). The eastern boundary is very irregular in detail, because of the extensive dissection of the terrane by streams. Basal Wilcox sands form several outliers along the eastern most boundary, where the sands cap less resistant Naheola strata. The western boundary, which in most part is present in Yalobusha and Grenada Counties, is found only where an eastward extension of Claiborne sand cap the higher elevations in relatively small areas in the extreme western and northwestern parts of Calhoun County.

The surface developed on the Wilcox is hilly and ranges from moderate to high relief, except where crossed by the flat lying alluvial plains. Altitudes range from less than 250 feet to more than 600 feet above sea level. The terrane is typical of the sand and clay hills topography which is characteristic of the North Central Hills—the clay hills have gentler slopes and a more moderate relief than the sand hills which are commonly steep and stand in rather high relief.

Outcrops of Wilcox strata are numerous in roadcuts and are occasionally present along streams, in gullies and in borrow pits. Considerable areas are covered by surficial deposits.

The contact between the Naheola formation of the Midway group and the overlying Wilcox group (undifferentiated) is exposed at several places in Calhoun County. Where it is best exposed, the contact is generally sharp and clearly shows disconformable relations. At most localities laminated Naheola strata are overlain by basal Wilcox sands, but in a few places the basal Wilcox sediments closely resemble the laminated Naheola materials and the exact stratigraphic position of the contact is questionable.

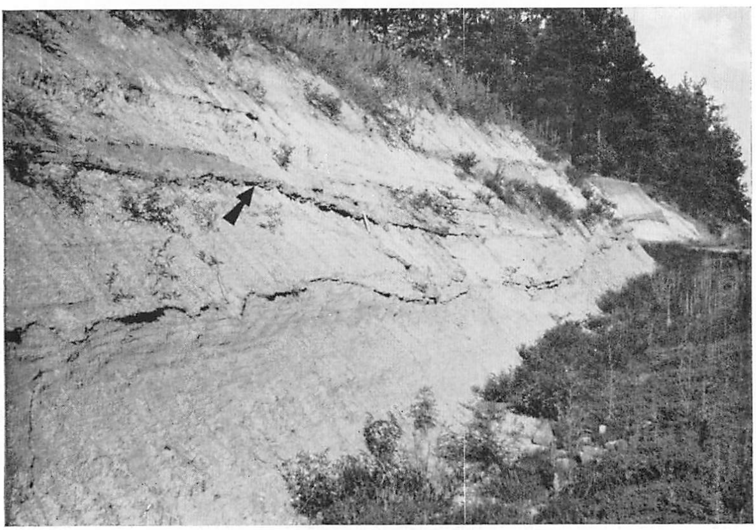

Figure 9.—Questionable Midway-Wilcox contact exposed in a cut (NE.¼, SW.¼, Sec.3, T.13 S., R.1 W.) of the road from State Highway 32 southeast to Loyd about four and a half miles northwest of the community. Arrow points to ironstone layer beneath a thin lenticular bed of sand which may be basal Wilcox. July 22, 1961.

In the northern part, the Midway-Wilcox contact is obscure at most places. A good exposure is in the cut (SW.¼, NE.¼, Sec.14, T.11 S., R.1 W.) of a road on the northeast facing slope of Lucknow Creek about half a mile northeast of the junction of the road southeast from Sarepta. Here laminated Naheola sands and clay shale are overlain by basal Wilcox sands containing clay balls and breccia.

Along the divide between the Skuna and Yalobusha Rivers, the contact is exposed at several places because of the deep dissection of the terrane by streams. A few good exposures are present in the vicinity of Reid. The best of these is in the cut (NW.¼, SE.¼, Sec.28, T.12 S., R.1 E.) of State Highway 341 about a quarter of a mile north of the road west to Reid. (See composite section described under "Naheola formation").

The road from State Highway 32 southeast to Loyd crosses the Midway-Wilcox contact at several places. A series of cuts (Center Sec.3, T.13 S., R.1 W.) about four and a half miles northwest of Loyd reveal upper Naheola strata at the lower elevations and lower Wilcox materials at the higher elevations. The contact between the two units is not clearly defined, because the lowermost Wilcox sediments closely resemble the uppermost laminated Naheola materials. A thin, lenticular bed of sand, which appears to be somewhat coarser than the more typical Naheola sands, is midway up the hill in cuts on the north side of the road (Figure 9). This sand appears to be in erosional contact with the underlying strata and may be at the base of the Wilcox. Farther southeast along this road, the contact is sharply defined in a cut (NE.¼, NW.¼, Sec.11, T.13 S., R.1 W.) on a southeast facing valley slope of a small branch of Thompsons Creek about three and a half miles northwest of Loyd. At this locality, dark-colored sandy clay shale of the Naheola is overlain by highly cross-bedded Wilcox sand (Figure 10).

In the areas south of the Yalobusha River, the Midway-Wilcox contact crops out at several localities, but generally the exposures are poor. At a distance of about three and a half miles south of Vardaman, the contact is exposed in the cut (SW.¼, SW.¼, Sec.26, T.14 S., R.1 E.) of State Highway 341 on the south wall of the Yalobusha River valley at the junction of a road southwest. Here laminated shaly fine sand of the Naheola is overlain disconformably by a lenticular bed (1.5 to 3.0 feet in thickness) of white silty coarse Wilcox sand containing numerous small rounded clay balls which give the sand a pisolitic appearance. Above this lens are red-brown to

Figure 10.—Midway-Wilcox contact exposed in a cut (NE.¼, NW.¼, Sec.11, T.13 S., R.1 W.) of the road from State Highway 32 southeast to Loyd on the southeast facing valley slope of a small branch of Thompsons Creek about three and a half miles northwest of the community. July 21, 1961.

Figure 11.—Midway-Wilcox contact showing disconformable relations exposed in a cut (SW.¼, SW.¼, Sec.26, T.14 S., R.1 E.) of State Highway 341 on the south wall of the Yalobusha River valley at the junction of a road southwest. Hammer at base of lenticular bed of white silty coarse sand containing numerous small rounded clay balls which give the sand a pisolitic appearance. July 22, 1961.

yellow, fine-to medium-grained sands containing clay balls and fragments of silicified wood scattered throughout (Figure 11).

The locations of less prominent exposures of the Midway-Wilcox contact are:

(1) in a cut of the road on the southwest wall of Savannah Creek valley about three-quarters of a mile northwest of State Highway 32 (SE.¼, NE.¼, Sec.10, T.12 S., R.1 W.);

(2) in a cut of the road east from Reid about half a mile from State Highway 341 (SW.¼, SW.¼, Sec.27, T.12 S., R.1 E.);

(3) in a cut of the road on the southwest facing valley wall of the Skuna River about half a mile northeast of the junction of the road east and south from State Highway 32 to Reid (SW.¼, NE.¼, Sec.24, T.12 S., R.1 W.);

(4) in a cut of the road on a north facing slope of the Skuna River about two miles northeast of Old Town Church and Cemetery (NE.¼, NW.¼, Sec.35, T.12 S., R.1 W.);

(5) in a cut of the road on the northeast valley wall of a northwest flowing tributary of the Skuna River about half a mile south of the junction of a road east and south from State Highway 32 to Reid (NW.¼, SW.¼, Sec.30, T.12 S., R.1 E.);

(6) in a cut of an abandoned road on the north valley wall of Thompsons Creek about a quarter of a mile south of the junction of the road southeast from State Highway 32 to Loyd (SW.¼, NE.¼, Sec.11, T.13 S., R.1 W.);

(7) in a cut of the road southeast from State Highway 32 to Loyd about a mile and a half west of the community (SE.¼, SE.¼, Sec.12, T.13 S., R.1 W.);

(8) in a cut of the generally north-south trending ridge road along the east valley wall of Duncan Creek about a mile south of the junction of the road northwest to Pittsboro (SW.¼, SW.¼, Sec.25, T.13 S., R.1 W.);

(9) in a cut of the road on a southwest facing valley slope of Duncan Creek about half a mile southwest of the generally north-south trending ridge road along the east valley wall of the creek (NE.¼, SW.¼, Sec.1, T.14 S., R.1 W.);

(10) in an east ditch of a dead end road on the north facing valley slope of a small creek branch 0.4 mile north of the junction of an east-west road and about two and a half miles due northwest of Vardaman (NW.¼, SW.¼, Sec.32, T.13 S., R.1 E.);

(11) in a cut of the road on the east facing valley wall of a southeast flowing tributary of the Yalobusha River 1.8 miles west of Vardaman (SE.¼, SW.¼, Sec.5, T.14 S., R.1 E.);

(12) in a cut of the road southeast from Derma to Bentley on the south valley wall of the Yalobusha River about two miles south of State Highway 8 (NW.¼, SW.¼, Sec.26, T.14 S., R.1 W.);

(13) in a cut of the generally east-west trending ridge road along the valley wall of the Skuna River 0.2 mile south of the junction of the road northwest at Hamilton Fire Tower (SW.¼, SW.¼, Sec.29, T.14 S., R.1 E.); and

(14) in a cut of a road 0.35 mile south of the junction of the road southeast from Bentley to Hohenlinden, Webster County (Center Sec.26, T.22 N., R.10 E.).

Test Holes 1, 2, 3, 9 and 10 were drilled through the Midway-Wilcox contact. The contact in most of these test holes constitutes a fairly sharp break in lithologies, except in Test Hole 3 in which the basal Wilcox sand is not present and the lowermost Wilcox consists of clays or clay shales.

In general the Wilcox group (undifferentiated) is a heterogeneous body of nonmarine sediments consisting of chiefly sand, silt, clay shale, clay and lignite and of subordinate amounts of siderite, sandstone and siltstone. The sediments are complexly interlensed and intertongued. Individual beds are commonly lenticular and grade both laterally and vertically over short distances. The bedding is as complex as the lithology. Few outcrops are evenly bedded. Diagonal, irregular and distorted bedding is common. Stratification is not continuous over any considerable distance, and contemporaneous erosion surfaces are at many localities.

At most places the basal part of the Wilcox is comprised of sands which vary somewhat in character from outcrop to out-

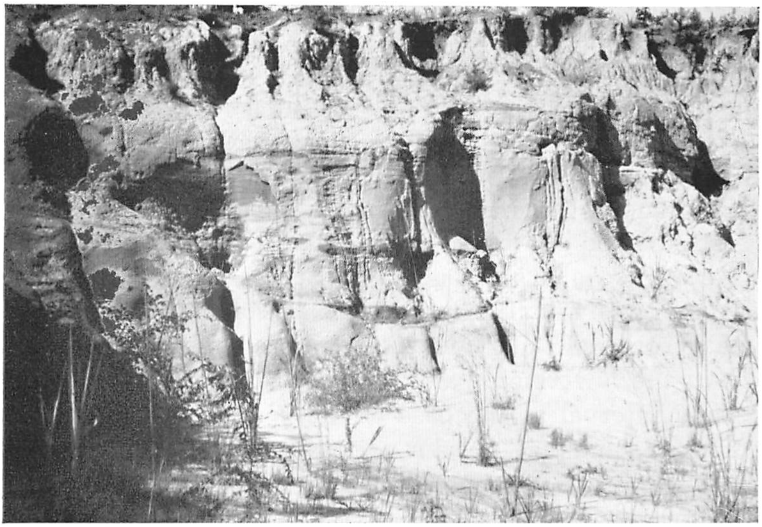

Figure 12.—Channeling in basal Wilcox sand exposed in a borrow pit (SE. ¼, SE. ¼, Sec. 12, T. 13 S., R. 1 W.) just southwest of the road from State Highway 32 southeast to Loyd about a mile and a half west of the community. July 22, 1961.

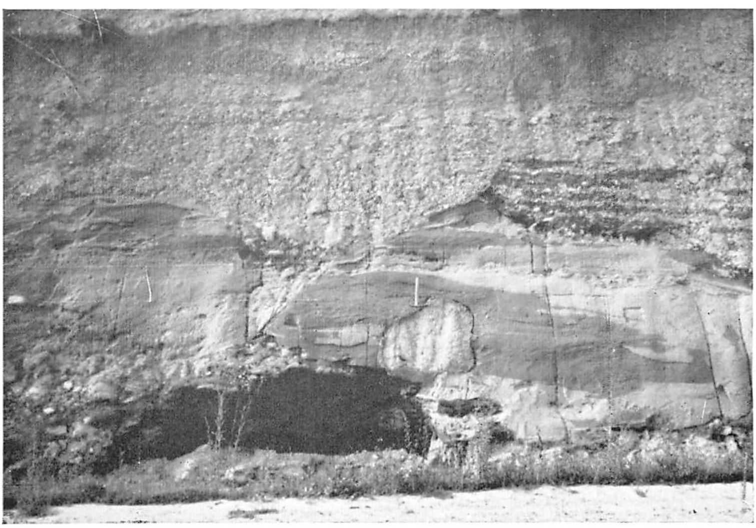

Figure 13.—Clay balls and clay ball conglomerate in basal Wilcox sand exposed in a cut (NW. ¼, NE. ¼, Sec. 11, T. 13 S., R. 1 W.) of the road from State Highway 32 southeast to Loyd about three miles northwest of the community. July 21, 1961.

crop. The sands are yellow to white weathering to red brown or light gray to gray weathering olive to tan. They are generally fine grained or fine to medium grained, but are locally coarse grained. Clay balls and clay breccia or clay ball conglomerates are present in the sand at several localities. The sands appear massive in some exposures and are distinctly cross-bedded in others. Channel features are common. Occasionally fragments of silicified wood and rarely a few quartz pebbles or cobbles are found scattered about the outcrop. Lenses of clay and silt are developed locally in the sands, and at some places the sands are shaly or shale out completely. In a few places the clay lenses in the lowermost parts of the sand section are bauxitic. This sand interval at the base of the Wilcox is relatively thin or absent at some places and ranges over 100 feet thick at others, but in general it is estimated to range from about 50 to 75 feet in thickness.

Perhaps the best exposures of the basal Wilcox sands are in cuts of the road northwest from Loyd to State Highway 32. At a distance of about a mile and a half west of the community (SE.¼, SE.¼, Sec.12, T.13 S., R.1 W.), weathered Wilcox sand is exposed overlying Naheola strata. Abundant fragments of silicified wood are scattered along a level in the sand. Just southwest of the road at the top of the hill is a borrow pit which reveals a thickness of about 20 feet of sand. A channel feature is clearly evident in the walls of the pit (Figure 12). Large chunks and balls of gray clay are worked into the base of the upper sand which is locally coarse grained. Farther along this road from about three to three and a half miles northwest of Loyd (NE.¼, Sec.11, T.13 S., R.1 W.), abundant clay balls and clay ball conglomerate features are well exposed in several cuts (Figure 13).

An excellent exposure of about 40 feet of basal Wilcox sand is in the cut of a road on the south wall of Thompsons Creek valley about two and a half miles due northeast of Pittsboro (NW.¼, SE.¼, Sec.10, T.13 S., R.1 W.). The sand is gray (weathers olive to tan), fine grained, mealy textured, cross-bedded to evenly bedded and contains clay balls and clay breccia in the lower several feet.

A few other good exposures of the basal Wilcox sands are:

(1) in a borrow pit just southwest of a northwest trending road along the southwest wall of Savannah Creek valley about a mile and a half from State Highway 32 (NW.¼, NE.¼, Sec.10, T.12 S., R.1 W.);

(2) in two borrow pits on the sides of a road east from State Highway 341 about half a mile due east of Reid (SE.¼, SE.¼, Sec.28 & SW.¼, SW.¼, Sec.27, T.12 S., R.1 E.);

(3) in a borrow pit less than a quarter of a mile west off of the road southeast from Derma on the south wall of the Yalobusha River valley about two miles from State Highway 8 (NW.¼, SW.¼, Sec.26, T.14 S., R.1 W.);

(4) in a roadcut on a northwest facing slope of the Yalobusha River valley about a mile north of State Highway 8 (NW.¼, SW.¼, Sec.33, T.23 N., R.9 E.); and

(5) in several borrow pits on both sides of a road at distances of from about three-quarters of a mile to a mile and a quarter southwest of State Highway 341 near the Chickasaw County line (SW.¼, NE.¼, & NE.¼, SW.¼, Sec.34, T.14 S., R.1 E.).

Above the basal sands the main body of the Wilcox consists of alternations of sand, silt, clay shale, clay, lignite and occasional siderite concretions. Fine sand and silt predominate in the lower parts, and clay shale, clay, lignite and siderite are more prominent in the upper parts. The sediments show channeling or irregular deposition most everywhere. Generally, the sand and sandier sediments are well exposed, but outcrops of the clayey deposits and lignite are poor and infrequent. The records of Test Holes 3, 4, 5, 6, 7, 9, 10 and 11 probably best show Wilcox lithologies.

The best series of exposures through parts of the main body of the Wilcox are in the many cuts along State Highway 9-W from its junction with State Highway 9 north of Bruce to the Lafayette County line and along State Highway 32 from Bruce to the Yalobusha County line. The cuts along these highways show the various Wilcox sediments and illustrate the complexity of the unit. The best of these exposures is in the cut of State Highway 9-W about two miles north of Banner at Banner Fire Tower (SW.¼, SW.¼, Sec.14, T.11 S., R.2 W.) (Figure 14).

Figure 14.—Excellent exposure of Wilcox strata in a cut (SW.¼, SW.¼, Sec.14, T.11 S., R.2 W.) of State Highway 9-W about two miles north of Banner. March 24, 1961.

Large bodies of sand are present locally at most any level in the main body of the Wilcox, but the greatest development appears to be near the middle of the Wilcox section. An excellent sand exposure is in two pits adjacent to State Highway 9 about four miles north of Bruce. The east pit (NE.¼, NW.¼, Sec.7, T.12 S., R.1 W.) reveals about 75 feet of coarse-to very coarse-grained sand which appears to occupy a channel cut in fine-grained materials. A thin sheet of ferruginous grit or siliceous and ferruginous siltstone forms a crust over the finer strata and outlines the channel which extends from the bottom of the pit to the top of the pit. Across the highway a west pit (NW.¼, NW.¼, Sec.7, T.12 S., R.1 W.) exposes 55 feet of white, yellow and tan weathering red-brown, fine-to medium-grained, cross-bedded sand containing thin partings of gray clay and lenses of white clay. The sands of the two pits are strikingly dissimilar.

A good section in several cuts of a north-south trending road on a north facing slope of Cowpen Creek about two and a half miles south of State Highway 9 and four and a half miles due southwest of Sarepta (SW.¼, SE.¼, Sec.32, T.11 S., R.1 W.) shows two Wilcox sands.

SECTION IN THE CUTS (SW.¼, SE.¼, SEC.32, T.11 S., R.1 W.) OF A ROAD ON A NORTH FACING SLOPE OF COWPEN CREEK ABOUT FOUR AND A HALF MILES DUE SOUTHWEST OF SAREPTA.

	Feet	Feet
Wilcox group (undifferentiated)		104.5
5. Sand, white to yellow weathers tan to brown, medium-to coarse-grained, cross-bedded, sparingly and finely muscovitic; contains some scattered clay pebbles and clay balls. Large masses of tubular ferruginous sandstone from a very prominent ledge several feet thick near the top of the exposure. Base defined by a thin layer of ironstone. Maximum thickness	25.0	
4. Silt or very fine-grained sand, gray to dark-gray weathers light bluish-gray, laminated, very finely muscovitic; contains much disseminated lignite as small flakes along laminae; appears discontinuous or eroded at places; grades laterally into very fine silty sands. Maximum thickness	7.0	
3. Sand, light-gray weathers tan, fine-to medium-grained, cross-bedded; contains many clay balls; becomes level bedded near the top and appears to grade into the overlying unit. Maximum thickness	15.5	
2. Covered interval	20.5	
1. Sand, light-gray weathers olive to tan, fine-grained, cross-bedded; contains clay balls at various levels	36.5	
Total section		104.5

Other good exposures of sands in the main body of the Wilcox include:

(1) in two borrow pits on opposite sides of a northeast trending road about a mile and a half from Pittsboro (NE.¼, NW.¼, Sec.16, T.13 S., R.1 W.);

(2) in two borrow pits on opposite sides of State Highway 9-W about two miles north-northwest of Bruce (NW.¼, NE.¼, Sec.24, T.12 S., R.2 W.);

(3) in a borrow pit just west of a northwest trending road about three miles from Calhoun City (NW.¼, NE.¼, Sec.3, T.23 N., R.9 E.);

(4) in a borrow pit just east of State Highway 32 at a distance of 0.3 mile south of Ellard (SE.¼, NW.¼, Sec.28, T.12 S., R.2 W.);

(5) in the cuts of a road to Concord Church on an east facing wall of Persimmon Creek valley about a mile due west-northwest of Ellard (NE.¼, NW.¼, Sec.29, T.12 S., R.2 W.);

(6) in the cuts of a road northwest from Sabougla into the Grenada Reservoir area (NW.¼, NW.¼, Sec.16, T.22 N., R.8 E.); and

(7) in a gully just north of the road from Bounds to Retreat about half a mile west of Bounds (SW.¼, SW.¼, Sec.33, T.24 N., R.8 E.).

The clays, clay shales and silts are generally dark colored (dark gray, dark greenish gray, gray, chocolate and green) and weather to light colors (white, buff and light gray). The individual beds of clay or clay shale are generally relatively thin and are variably silty and lignitic. They commonly are interbedded with sand and silt. A good section showing the beds of clay, clay shale and silt is exposed in the cuts (NW.¼, SE.¼, Sec.6, T.11 S., R.2 W.) of the road on an east facing slope of Otoucalofa Creek valley about a mile and a half west-northwest of State Highway 9-W.

SECTION IN THE CUTS (NW.¼, SE.¼, SEC.6, T.11 S., R.2 W.) OF A ROAD ON THE EAST FACING SLOPE OF OTOUCALOFA CREEK VALLEY ABOUT A MILE AND A HALF WEST-NORTHWEST OF STATE HIGHWAY 9-W.

	Feet	Feet
Wilcox group (undifferentiated)		82.5
13. Sand and silt: Light-gray silts and fine-grained sands; poorly exposed in road ditch; covered in most part by colluvium	8.0	
12. Clay, gray weathers light-gray, slightly plastic, massive, slightly silty; in part lignitic	5.0	
11. Silt, light-gray, clayey, sandy, finely muscovitic, massive	6.5	
10. Clay, dark-gray to black, slightly silty, plastic, lignitic	2.0	
9. Clay, dark-gray weathers gray to light-gray, plastic, tough, massive; in part lignitic; slightly silty in lower parts becoming very silty in upper parts	18.0	
8. Sandstone, poorly to well indurated, ferruginous, fine-grained; is in the form of discontinuous concretionary masses	0.5	

7. Sand, light-gray weathers buff to tan, fine-grained, finely muscovitic; contains thin beds and laminae of gray clay	6.7	
6. Ironstone; forms ledge in ditch bank	0.2	
5. Sand, light-gray, fine-grained; poorly exposed at a few places in ditch; covered in most places by colluvial sands	12.0	
4. Silt, clay shale and sand: Laminated light-gray clayey silts and clay shale alternating with thin beds of muscovitic fine-grained sand; becomes predominately sand laterally	8.0	
3. Sand, light-gray to yellow weathers tan, fine-grained, muscovitic, cross-bedded; contains stringers of clay pebbles and thin interbeds of gray clay	5.2	
2. Clay shale, light-gray, silty, plastic; contains laminae and small pockets of muscovitic fine-grained sand	5.0	
1. Covered interval (start section in center of road opposite telephone pole)	5.4	
Total section		82.5

Other good exposures of Wilcox clays or clay shales and silts are:

(1) in cuts of a northwest trending road at distances of 2.5 and 3.0 miles from State Highway 32 (NE.¼, SW.¼, and NW.¼, SW.¼, Sec.4, T.12 S., R.1 W.);

(2) in cuts of State Highway 331 and of the roads leading west and east near Shady Grove Church (SW.¼, Sec.5, SE.¼, Sec.6, NE.½, Sec.7, T.11 S., R.1 W.);

(3) in a cut of State Highway 9-W just northwest of the junction of Highway 9-W and State Highway 9 about a mile and a quarter north of Bruce (SW.¼, SE.¼, Sec.24, T.12 S., R.2 W.);

(4) in a cut of the road to Turkey Creek Church about half a mile northwest of State Highway 32 (NE.¼, NE.¼, Sec.3, T.12 S., R.3 W.);

(5) in the cut of the old Banner to Water Valley road just southeast of the junction of a road south about three miles north and west of State Highway 32 (SW.¼, SE.¼, Sec.24, T.11 S., R.3 W.); and

(6) in a cut of a north-northeast trending road to Paris, Lafayette County at a distance of 0.9 mile north of the old Banner to Water Valley road (NE.¼, NE.¼, Sec.14, T.11 S., R.3 W.).

Figure 15.—Excellent exposure of 24 inches of Wilcox lignite in a cut (SW.¼, SE.¼, Sec.7, T.13 S., R.1 W.) of a northeast trending road on the west facing slope of a creek branch at a distance of about half a mile east of State Highway 9 and a mile due north of the town square at Pittsboro. March 24, 1961.

Lignite beds ranging in thickness from a few inches up to several feet are present at many levels in the Wilcox associated with beds of clay or clay shale and silt. The beds generally thin or disappear in relatively short distances. The lignite, particularly the thicker beds, commonly has a few feet of variably silty and lignitic underclay. An excellent exposure of 24 inches of lignite is in the cut (SW.¼, SE.¼, Sec.7, T.13 S., R.1 W.) of a northeast trending road on the west facing slope of a creek branch at a distance of about half a mile east of State Highway 9 and a mile due north of the town square at Pittsboro (Figure 15). Another easily accessible exposure of 28 inches of lignite is at Camp Spring (SW.¼, SW.¼, Sec.18, T.13 S., R.1 W.) located a few hundred yards southwest of the curve in State Highway 9 at a distance of 0.7 mile northwest of the town square at Pittsboro.

Thin discontinuous beds of flattened concretions of siderite altering to iron oxides are present at various places. The concretions differ considerably in size and shape, and thicknesses range from a few inches up to a foot or more.

The maximum thickness of the Wilcox in Calhoun County is estimated to range from about 450 to 550 feet. The thickness of the unit is quite variable because of the erosional disconformities at the base and at the top.

The Wilcox contains nonmarine fossils such as impressions of plant remains and lignitized wood. Fragments of silicified wood are found scattered here and there.

The Wilcox group (undifferentiated) disconformably overlies the Naheola formation of the Midway group and is disconformably overlain by the Meridian formation of the Claiborne group.

CLAIBORNE GROUP

MERIDIAN FORMATION

The name "Meridian" was first used by Lowe[36] in 1933 for basal Claiborne sand typically exposed at and near Meridian, Lauderdale County, Mississippi. Lowe considered the Meridian a member of the Tallahatta formation. In 1940, Foster[37] in a report on Lauderdale County raised the Meridian from member status to formational rank. MacNeil[38] in 1946 states that ". . . while working on the new Mississippi geologic map (Mississippi Geological Society's Geologic Map of Mississippi published in 1945), the writer found that the type Holly Springs formation of northern Mississippi, formerly included in the Wilcox and correlated with the Tuscahoma sand of Alabama, is the nonmarine equivalent of the Tallahatta to the south." He states further that "The name Holly Springs was accordingly abandoned in favor of Tallahatta for all of Mississippi." In 1951, Attaya[39] in a report on Lafayette County maps the Meridian as the basal formation of the Claiborne. Several subsequent workers of the Mississippi Geological Survey have recognized the Meridian as a mappable unit in other areas along strike in northern Mississippi.

In the present report the term "Meridian formation" refers to basal Claiborne sand between the underlying Wilcox group (undifferentiated) and the overlying Tallahatta formation of the Claiborne group.

Only the lower part of the Meridian formation is present in Calhoun County. The formation occupies relatively small areas at the higher elevations in the western and northwestern parts (Plate 1).

The Meridian sand caps high relief hills and ridges which are underlain by strata of the Wilcox group (undifferentiated). Altitudes range up to more than 500 feet above sea level. Several of the higher hills are capped by consolidated masses of ferruginous sandstone. The terrane is characteristic of the sand hill topography of the North Central Hills.

Generally exposures of the Meridian are poor and infrequent. Gullies and roadcuts expose weathered, iron oxide stained sand. Vegetation is dense in much of the outcrop area.

The contact between the Wilcox group (undifferentiated) and the overlying Meridian formation of the Claiborne group is exposed at a few localities. The contact is in most places sharply defined, because of the contrast between the sediments of the two units. Generally the finer sediments of the Wilcox are disconformably overlain by coarse- to very coarse-grained, pebble-bearing sand of the basal Meridian.

An exposure of the Wilcox-Claiborne contact is in the cut (Center, NE.¼, Sec.23, T.11 S., R.3 W.) of the old Banner to Water Valley road near Union Grove Church at a distance of about three and three-quarters miles north and west of State Highway 32. Here weathered yellow and brown, coarse-to very coarse-grained, pebble-bearing Meridian sand overlies white mottled yellowish, tan and purple, silty clay or clayey silt of the Wilcox group (undifferentiated).

Section in a cut of the old Banner to Water Valley road near Union Grove Church (Center NE.¼, Sec.23, T.11 S., R.3 W.).

	Feet	Feet
Meridian formation		8.0
2. Sand, yellow and brown weathers red-brown, coarse-to very coarse-grained, pebble-bearing, appears massive; contains ferruginous crusts and rusty stains	8.0	
Wilcox group (undifferentiated)		5.5
1. Clay, white mottled yellowish, tan and purple, massive; slightly silty in upper few feet grading downward into clayey silt	5.5	
Total section		13.5

Another exposure of the contact is in the cut (NE.¼, NW.¼, Sec.12, T.11 S., R.3 W.) of a road northeast to Paris, Lafayette County, about two miles from the junction of the old Banner to Water Valley road. At this locality yellowish to tan, coarse-grained sand weathering red brown overlies white mottled yellowish and red, silty clay or clayey silt. At the base of the Meridian is a very coarse-grained, pebble-bearing, ferruginous sandstone (0.7 foot thick) which forms a ledge in the roadcut (Figure 16).

Figure 16.—Wilcox-Claiborne contact exposed in a cut (NE.¼, NW.¼, Sec.12, T.11 S., R.3 W.) of a road northeast to Paris, Lafayette County, about two miles from the junction of the old Banner to Water Valley road. Ferruginous sandstone ledge marks the base of the Meridian formation. March 24, 1961.

Other exposures of the Wilcox-Claiborne contact are:

(1) in a cut of the road to Turkey Creek Church at a distance of 0.7 mile northwest of State Highway 32 (NE.¼, NE.¼, Sec.3, T.12 S., R.3 W.);

(2) in a cut of the road northeast to Paris, Lafayette County, about a mile north of the Junction of the old Banner to Water Valley road (NE.¼, NE.¼, Sec.14, T.11 S., R.3 W.);

(3) in a cut of the road northeast to Paris, Lafayette County, at the Lafayette County line about a mile north of the inter-

section of an east-west trending road from State Highway 9-W (NE.¼, NE.¼, Sec.1, T.11 S., R.3 W.); and

(4) in a cut of an east-west trending road on the northeast facing valley slope of a branch of Otoucalofa Creek about five miles west of State Highway 9-W (SW.¼, NW.¼, Sec.3, T.11 S., R.3 W.).

The Meridian formation consists chiefly of medium-to coarse-grained, cross-bedded to evenly bedded, highly muscovitic sand. In fresh exposures the sand is various colors, white, yellow, tan, pink, and purple, and in weathered exposures it is brown to red brown. The basal few feet are generally very coarse-grained and contain scattered pebbles or are locally gravelly. Muscovite, which commonly is in the form of relatively large flakes, is found concentrated in small pockets and along laminae. At some places the sand contains partings and lenses of white clay.

The only exposure of Meridian sand of any consequence is in the borrow pit (SW.¼, SE.¼, Sec.34, T.11 S., R.3 W.) just northwest of Turkey Creek Church about a mile from State Highway 32 near the Yalobusha County line. About 35 feet of white to yellow weathering red-brown, medium- to coarse-grained, highly muscovitic, cross-bedded sand is exposed. The sand contains lenses or pockets and partings of very fine white clay.

At a few places the sand is cemented with iron oxide to form large tabular masses which cap the higher hills. The most prominent exposure of ferruginous sandstone is on top of Concord "mountain" about a mile and a half due west-northwest of Ellard (SE.¼, Sec.19, T.12 S., R.2 W.). Another good exposure is on top of Gauley "mountain" about three miles due southwest of Pittsboro (SW.¼, Sec.35, T.13 S., R.3 W.).

That part of the Meridian formation present in Calhoun County is estimated to have a maximum thickness of about 50 to 75 feet. Turner[40] estimates the thickness of the entire formation to range from 40 to as much as 125 feet to the west in Yalobusha County.

The Meridian formation of the Claiborne group disconformably overlies the Wilcox group (undifferentiated). The upper contact of the formation is not exposed in Calhoun County.

PLEISTOCENE AND RECENT DEPOSITS

Deposits of late geologic times, which cover the bedrock in considerable areas, were laid down or formed presumably as a part of the Pleistocene series or the Recent series of the Quaternary system. These surface materials include alluvium, terrace deposits, loess, colluvium and soil.

Perhaps the most prominent (geologically) of the surficial deposits in the county is the alluvium present in the channels and in the flood plains of the streams. The flood plains or first bottoms, where well developed, are broad, relatively flat, low lying areas. They are underlain by alluvial materials consisting of a mixture of chiefly sand, silt and clay and of subordinate amounts of fragmental rocks. Terraces or second bottoms associated with the larger streams represent the remnants of old flood plain surfaces of an earlier stage of stream development. The sediments underlying the terraces are the same general character as those under the first bottoms. At places terraces cover the bedrock on the higher grounds adjacent to the present flood plains. Flood plains and terraces are best developed along the Yalobusha and Skuna Rivers and along the lower parts of their larger tributaries.

At places small, thin, scattered pockets of weathered loess are at the higher elevations on the ridge tops in the western part of the county. This loessal material consists of a buff to light-brown silt loam containing some disseminated fine sand.

Colluvium, which consists of a heterogeneous mixture of bedrock materials, rock fragments and soil, is on the slopes of many of the hills as a result of various surface features which include landslide, soil creep, slope wash and slump. These phenomenons are local and are a part of erosional processes.

Soil is present over most of the land surface, except where it has been removed by erosion or excavation. Soil types vary from place to place. They depend on the nature of the climate, the parent rock, the topography and drainage, and the vegetation for the development of their character in a region. Because soils are of agricultural importance, they are discussed in more length under a separate heading "Soil" in another part of this report.

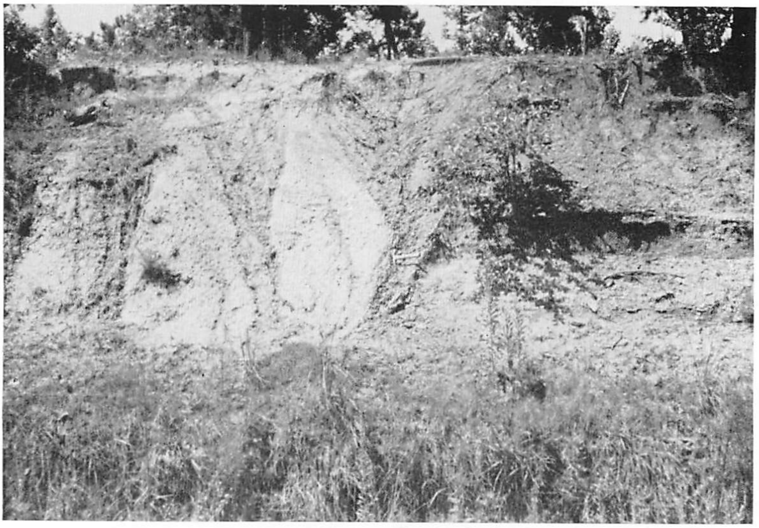

Figure 17.—Reverse fault exposed in roadcut (SW.¼, SE.¼, Sec.8, T.13 S., R.1 E.) at a distance of 0.4 mile east of Loyd. Hammer is on the fault plane. Naheola clay shale upthrown (left), and Naheola laminated shaly sand downthrown (right). July 21, 1961.

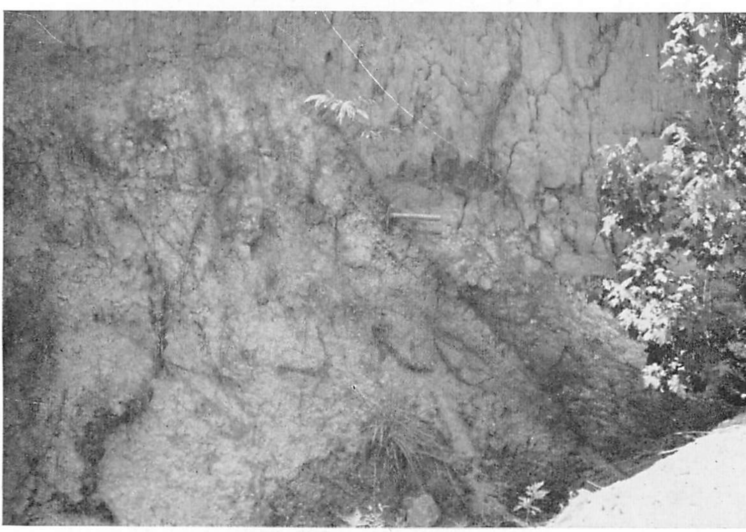

Figure 18.—Normal fault exposed in roadcut (SW.¼, SW.¼, Sec.25, T.13 S., R.1 W.) on the south facing slope of a small branch flowing into Duncan Creek about four and a half miles due southeast of Pittsboro. Hammer is on the fault plane. Naheola sandy clay shale upthrown (left), and Wilcox sand downthrown (right). July 22, 1961.

STRUCTURE

The structure of the bedrock strata exposed is in general monoclinal. The accurate determination of the rate of regional dip is impossible because of the lack of a reliable datum on which to make such measurements. Rough estimates based largely on unit contacts incidate an average dip of from 20 to 25 feet per mile to the west and west-southwest. Local departures from the normal dip appear to be common, but in most cases these irregularities are believed to be the result of slumping or to be bedding phenomenon. No evidences which were thought to be reasonably conclusive of major secondary surface structure were found during the present survey.

The recognition of faulting is difficult because of the general nature of the exposed sediments. Perhaps several small scale faults have contributed to the uncertainties which exist in the stratigraphy. Two small faults which clearly show movement were noted.

At a distance of 0.4 mile east of Loyd (SW.¼, SE.¼, Sec.8, T.13 S., R.1 E.), the plane of a reverse fault trending N. 15° E. is exposed in the cuts on both sides of the road. The fault plane is near vertical dipping slightly to the west. Naheola clay shale is on the upthrown, west, side of the fault, and Naheola laminated shaly sand is on the downthrown, east, side (Figure 17).

The plane of an east-west trending normal fault is exposed in cuts on both sides of a road on the south facing slope of a small branch flowing into Duncan Creek (SW.¼, SW.¼, Sec.25, T.13 S., R.1 W.) just south of the junction of a road southeast from Pittsboro about four and a half miles from the city limits. The fault plane is near vertical dipping slightly to the north. Naheola sandy clay shale is on the upthrown, south, side of the fault, and Wilcox sand is on the downthrown, north, side (Figure 18). The Naheola strata show down drag into the fault plane.

At several places Naheola strata, which normally are near horizontally laminated, show anomalous dips (Figure 19). These irregularities in dip seem to be local in extent and are considered to be the result of surface slumping. Apparently it is a rather common feature for slump blocks of shaly Naheola strata to develop on the hillsides, especially on the steeper slopes.

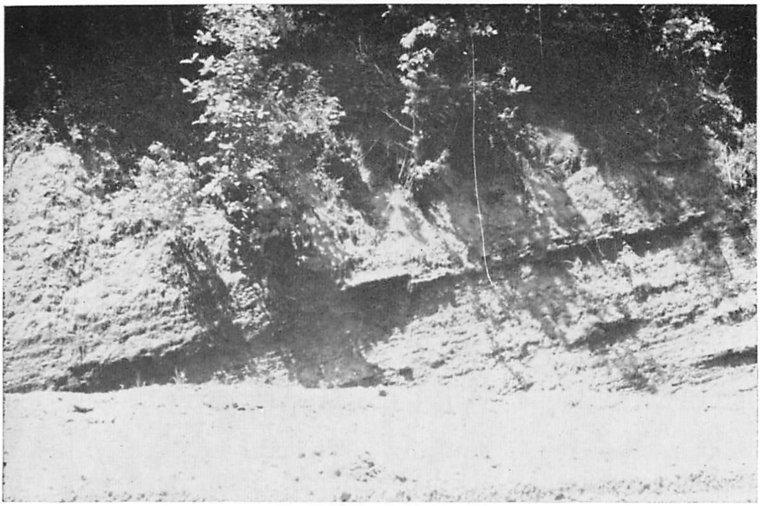

Figure 19.—Steeply dipping Naheola strata exposed in a cut (NW.¼, NW.¼, Sec.4, T.13 S., R.1 E.) of a road on the northeast facing valley wall of a branch of Cook (Cane) Creek about two miles northeast of Loyd. July 21, 1961.

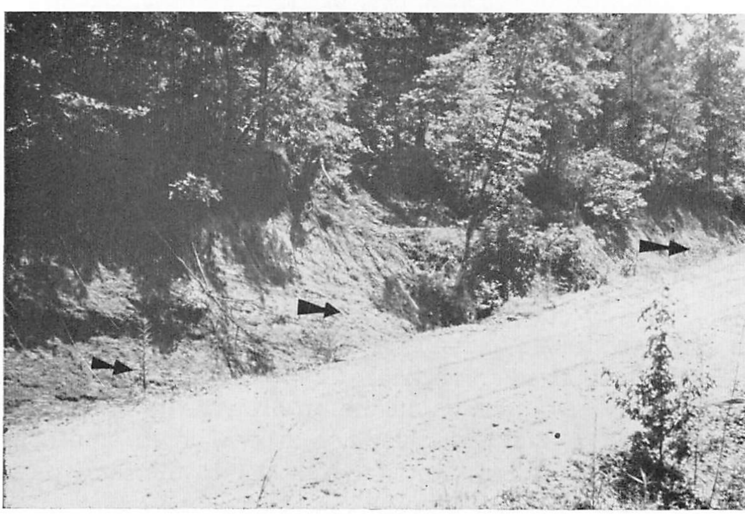

Figure 20.—Rotational slump block exposed in the cuts (NE.¼, NW.¼, Sec.8, T.13 S., R.1 E.) of a road on the northeast facing valley wall of a branch of Cook (Cane) Creek about half a mile northeast of Loyd. Lamination planes are near horizontal in uppermost cut. Dip of strata steepens down hill. In lowermost cut (not pictured) stratification is near horizontal. Arrows indicate approximate dips, but the dips appear less than they actually are due to the angle of the photograph. July 21, 1961.

An example of a slump block is revealed in the cuts (NE.¼, SW.¼, Sec.8, T.13 S., R.1 E.) of a road on the northeast facing valley wall of a branch of Cook (Cane) Creek about a half a mile northeast of Loyd (Figure 20). At this locality the lamination planes are near horizontal in the uppermost cuts and progressively steepen into the hillside down the slope. In the lowermost cuts the stratification is normal or near horizontal. Slump blocks of this type apparently have undergone a slight backward rotation during their decent. As pointed out by Keady[41], this type of slump block is almost in agreement with the Toreva-block landslide described by Reiche[42] in 1937.

Deviations from the normal dip, reverse dips and dips steeper than normal are common in the Wilcox strata. Generally these dips are not continuous over any considerable distance and are believed to be the result of bedding phenomenon or surface slumping. These dips probably obscure any anomalous dips which may be present due to secondary structure.

ECONOMIC GEOLOGY

The most abundant rocks or minerals at the surface are sand, clay, lignite and sandstone, but for various reasons these materials seem to be limited in their development potential. Iron ore and bauxite, which are present in small quantities, are of doubtful importance. To date there has been one small gas well discovery.

SAND AND SANDSTONE

Sand is very abundant at or near the surface in many parts of Calhoun County. Unlimited quantities of sand are available from the Wilcox group (undifferentiated) and from the Meridian formation. Many borrow pits are scattered over the county from which sand is obtained for use in road construction and for local building purposes. The sands range from fine to very coarse grained, but they are more commonly of the finer sizes. The chief impurities are clay and silt, muscovite, and iron oxide stains and coatings.

Table 2 gives the mechanical analyses of 21 random sand samples from 15 localities. An analysis of 100 grams of each sample was made using the Wentworth grade scale. Although the Wentworth scale is not convenient to the engineer, it served a dual purpose in this report inasmuch as it allowed a size classification of the sands generally acceptable by most geologists. Six sample localities (S-1 through S-6) are in the basal Wilcox; eight (S-7 through S-14) are in other parts of the Wilcox; and one (S-15) is in the Meridian. The sample localities listed represent most of the more prominent sand exposures.

TABLE 2

MECHANICAL ANALYSES OF SAND SAMPLES

(PERCENT)

Sample No.	Grade sizes							Total
	4-2 mm (9 mesh)*	2-1 mm (16 mesh)*	1-0.5 mm (32 mesh)*	0.5-0.25 mm (60 mesh)*	0.25-0.125 mm (115 mesh)*	0.125-0.062 mm (250 mesh)*	less than 0.062 mm (residue)*	
S-1-A	----	----	0.1	0.4	83.6	8.2	6.6	98.9
S-2-A	----	Trace	Trace	10.1	79.5	3.4	5.4	98.4
S-3-A	----	Trace	0.1	12.6	58.8	8.6	19.8	99.9
S-3-B	----	Trace	Trace	5.3	78.6	3.8	12.1	99.8
S-4-A	----	1.0	17.4	42.3	25.4	1.8	11.4	99.3
S-5-A	----	----	0.2	13.7	63.4	13.3	8.4	99.0
S-6-A	----	----	Trace	3.8	65.9	12.7	17.0	99.4
S-7-A	----	----	13.2	76.9	3.6	0.3	4.5	98.5
S-8-A	2.8	50.3	34.5	3.2	1.2	0.2	6.3	98.5
S-9-A	----	----	0.8	82.3	9.6	0.7	4.9	98.3
S-9-B	----	----	7.8	82.6	2.7	0.2	6.2	99.5
S-10-A	----	----	26.9	47.4	18.1	0.2	7.2	99.8
S-10-B	----	----	23.9	68.1	4.9	0.2	2.0	99.1
S-10-C	----	----	16.6	77.8	1.7	0.1	2.6	98.8
S-11-A	----	Trace	16.6	78.7	2.3	0.1	2.2	99.9
S-12-A	----	0.1	70.8	21.8	3.6	0.8	2.4	99.5
S-13-A	----	----	0.7	51.2	27.1	2.7	16.8	98.5
S-14-A	----	Trace	2.2	86.0	6.3	0.9	3.5	98.9
S-14-B	----	0.1	21.6	70.5	5.4	0.9	1.4	99.9
S-14-C	----	3.0	8.5	76.9	5.7	1.3	4.5	99.9
S-15-A	----	1.8	36.1	42.4	9.7	4.9	4.8	99.7

*U. S. Standard sieves used for obtaining grade sizes (percent retained).

LIST OF SAND SAMPLE LOCALITIES

S-1 A 30-foot exposure in a borrow pit just southwest of a northwest trending road along the southwest valley wall of Savannah Creek about a mile and a half from State Highway 32 (NW.¼, NE.¼, Sec.10, T.12 S., R.1 W.).

Sample S-1-A—10 feet above base of pit.

S-2 A 15-foot exposure in a borrow pit just southeast of a road junction at a distance of 0.3 mile east of State Highway 341 near Reid (SW.¼, SW.¼, Sec.27, T.12 S., R.1 E.).
Sample S-2-A—5 feet above base of pit.

S-3 A 20-foot exposure in a borrow pit just southwest of the east-west road through Loyd about a mile and a half west of the community (SE.¼, SE.¼, Sec.12, T.13 S., R.1 W.).
Sample S-3-A—5 feet above base of pit.
Sample S-3-B—10 feet above base of pit.

S-4 A 20-foot exposure in a borrow pit just east of a southwest trending road about a mile and a half from State Highway 341 near the Chickasaw County line (SW.¼, SE.¼, Sec.34, T.14 S., R.1 E.).
Sample S-4-A—5 feet above base of pit.

S-5 A 40-foot exposure in a roadcut on a south slope of Thompsons Creek about two and a half miles due northeast of Pittsboro (NW.¼, SE.¼, Sec.10, T.13 S., R.1 W.).
Sample S-5-A—20 feet above base of exposure.

S-6 An 80-foot exposure in a roadcut on a northwest facing slope of the Yalobusha River valley about one mile north of State Highway 8 (NW.¼, SW.¼, Sec.33, T.23 N., R.9 E.).
Sample S-6-A—40 feet above base of exposure.

S-7 A 15-foot exposure in a borrow pit just east of a south trending road on a north facing slope of Cowpen Creek valley about two and a half miles from State Highway 9 (SE.¼, SE.¼, Sec.32, T.11 S., R.1 W.).
Sample S-7-A—5 feet above base of pit.

S-8 A 75-foot exposure in a borrow pit just east of State Highway 9 about four miles north of Bruce (NE.¼, NW.¼, Sec.7, T.12 S., R.1 W.).
Sample S-8-A—25 feet above base of pit.

S-9 A 55-foot exposure in a borrow pit just west of State Highway 9 about four miles north of Bruce (NW.¼, NW.¼, Sec.7, T.12 S., R.1 W.).
Sample S-9-A—10 feet above base of pit.
Sample S-9-B—40 feet above base of pit.

S-10 An 80-foot exposure in two borrow pits on the northeast and southwest sides of State Highway 9-W about two miles north-northwest of Bruce (NW.¼, NE.¼, Sec.24, T.12 S., R.2 W.).
Sample S-10-A—15 feet above base of southwest pit.
Sample S-10-B—in highway cut at road level.
Sample S-10-C—25 feet above base of northeast pit.

S-11 A 30-foot exposure in two borrow pits on the east and west sides of a northeast trending road about a mile and a half from Pittsboro (NE.¼, NW.¼, Sec.16, T.13 S., R.1 W.).
Sample S-11-A—10 feet above base of west pit.

S-12 A 15-foot exposure in a borrow pit just west of a northwest trending road about three miles from Calhoun City (NW.¼, NE.¼, Sec.3, T.23 N., R.9 E.).
Sample S-12-A—7 feet above base of pit.

S-13 A 40-foot exposure in a borrow pit just east of State Highway 32 at a distance of 0.3 mile south of Ellard (SE.¼, NW.¼, Sec.28, T.12 S., R.2 W.).
Sample S-13-A—15 feet above base of pit.

S-14 A 60-foot exposure in a gully just north of the road from Bounds to Retreat about half a mile west of Bounds (SW.¼, SW.¼, Sec.33, T.24 N., R.8 E.).
Sample S-14-A—10 feet above base of exposure.
Sample S-14-B—20 feet above base of exposure.
Sample S-14-C—35 feet above base of exposure.

S-15 A 35-foot exposure in a borrow pit just northwest of Turkey Creek Church at a distance of 0.9 mile from State Highway 32 (SW.¼, SE.¼, Sec.34, T.11 S., R.3 W.).
Sample S-15-A—15 feet above base of pit.

Locally the sands are cemented with iron oxide to form ferruginous sandstone. Fragments and boulders of ferruginous sandstone of various shapes and sizes are commonly found in many parts of the county as an aggregation in colluvium and in stream terrace materials or as individual pieces scattered over the hillsides. At several places, however, relatively large tabular masses of sandstone cap the higher hills. The most prominent of these masses is on top of Concord "mountain" about a mile and a half due west-northwest of Ellard (SE.¼, Sec.19, T.12 S., R.2 W.). Another prominent exposure is on top of Gauley "mountain" about three miles due southwest of Pittsboro (SW.¼, Sec.35, T.13 S., R.2 W.).

CLAY

Clay is abundant in the exposed strata but most of it is closely associated with sand and silt and other impurities. The clays of the different geologic units vary considerably in mineralogical composition and in physical properties.

The Porters Creek formation, where exposed, consists of a brownish-gray to dark-gray, tough to slightly plastic, conchoidally fracturing clay. In most part, the clay is relatively silt and sand free and is nearly uniform in character from place to place. Only the upper 50 to 70 feet of the formation is at the surface, and most everywhere that it normally should be exposed, it is covered by surficial deposits consisting of flood plain and stream terrace materials or of a moderately deep residual soil. Over-burden appears to be less at some localities along the lower south slopes of the Yalobusha and the Skuna River valleys (Plate 1). Outcrops of typical Porters Creek clay are:

(1) in a roadcut on the lower south slope of the Skuna River valley at a distance of 2.9 miles east-northeast of State Highway 341 (NW.¼, SE.¼, Sec.24, T.12 S., R.1 E.);

(2) in ditches along State Highway 341 on the lower south slope of the Skuna River valley at a distance of 0.8 mile north of the junction of a road west to Reid (NE.¼, NE.¼, Sec.28, T.12 S., R.1 E.); and

(3) in the lower part of a roadcut and in the ditch on the lower south slope of the Yalobusha River valley at a distance of 0.9 mile west of State Highway 341 (SW.¼, SW.¼, Sec.22, T.14 S., R.1 E.).

The Naheola formation contains layers of silty and sandy clay shale at various levels throughout, but the clay shale is best developed in the lower part. The lower clay shales are generally dark gray to black, silty and subconchoidally fracturing. They contain variable amounts of fine muscovitic sand in the form of small pockets, laminae and, less commonly, thin beds. These shales appear to be similar in character to the clay of the Porters Creek formation, except that they are silty and contain much more sand. The best exposures of the clay shale in the lower part of the Naheola formation are:

(1) in the gully west of State Highway 341 on the lower south slope of the Skuna River valley about three-quarters of a mile north of the road west to Reid (NE.¼, NE.¼, Sec.28, T.12 S., R.1 E.);

(2) in a roadcut on the lower slope of an east facing valley wall of a branch of Cook (Cane) Creek about half a mile east-southeast of State Highway 341 and about a mile due southeast of Reid (SE.¼, SW.¼, Sec.34, T.12 S., R.1 E.);

(3) in a roadcut on the lower slope of an east-northeast facing valley wall of a branch of Cook (Cane) Creek at a distance of 1.3 miles east of Loyd (SE.¼, SW.¼, Sec.9, T.13 S., R.1 E.); and

(4) in a roadcut on the lower slope of a west-northwest facing valley wall of a branch of Cook (Cane) Creek at a distance of 2.8 miles east of Loyd (SE.¼, SW.¼, Sec.11, T.13 S., R.1 E.).

The Wilcox group (undifferentiated) contains much clay, but the clays are commonly interbedded and interlaminated with sand, silt and lignite. Exposures of Wilcox clays are generally poor and infrequent. Based on the outcrops and the test holes, the individual beds appear to be too thin or too silty and sandy to be of much importance. The clay layers are lenticular and grade both laterally and vertically into sandy and silty materials. Clay seems to be more prominent in the upper part of the Wilcox, which is exposed in the western and northwestern parts. A few outcrops of silty Wilcox clays are:

(1) in the cuts of a northwest trending road at distances of 2.5 and 3.0 miles from State Highway 32 (NE.¼, SW.¼, and NW.¼, SW.¼, Sec.4, T.12 S., R.1 W.);

(2) in a cut of a north-northeast trending road to Paris, Lafayette County, at a distance of 0.9 mile north of the old Banner to Water Valley road (NE.¼, NE.¼, Sec.14, T.11 S., R.3 W.);

(3) in roadcuts on the northeast facing valley wall of Otoucalofa Creek at a distance of 1.6 miles west-northwest of State Highway 9-W (Center SE.¼, Sec.6, T.11 S., R.2 W.); and

(4) in the cuts of State Highway 9-W near the junction of a west-northwest trending road at a distance of four and a half miles north and northwest of Banner (NE.¼, NW.¼, Sec.9, T.11 S., R.2 W.).

In the late 1800's, B. F. Ussery operated a small hand pottery in northwestern Calhoun County in which he manufactured various items of stoneware including pitchers, jars, churns, jugs and crude tableware from clay in the upper part of the Wilcox (Figure 21). The last site of his pottery is reported to have been located on the north side of the old Banner to Water Valley road about five and a half miles west and north of Banner near Union Grove Church (NE.¼, Sec.23, T.11 S., R.3 W.). No doubt the quantity of raw material used for such an operation allowed a selective choice and blending of the better Wilcox clays in the vicinity.

Figure 21.—Stoneware, molasses jug (left) and churn, made in small hand pottery operated by B. F. Ussery in northwestern Calhoun County during the late 1800's. Articles figured are the property of W. R. Ussery, Bruce, Mississippi. November 15, 1960.

LIGNITE

Lignite beds are present at different levels throughout most of the Wilcox group (undifferentiated) in Calhoun County. They vary in thickness from a few inches to as much as 7 feet, but beds over 2 or 3 feet thick are uncommon. The beds are generally very limited in lateral extent and seem to thin or disappear in short distances.

In an early report on the lignite of Mississippi, Brown[43] in 1907 includes a section on the county in which he describes exposures of lignite at several localities and mentions other places where lignite was reported to be present. Most of the outcrops discussed by Brown were located, and a search was made for other lignite. Particular attention was given the location of thick beds (four feet or more) found at or near the surface.

The only bed of any consequence known at the surface is on the old J. A. Head place (now owned by G. D. Head). This bed, which is not readily accessible, is partially exposed in the bottom of a south flowing creek branch near a small bluff (NW.¼, SE.¼, NE.¼, Sec.11, T.11 S., R.1 W.) at a distance of about three-quarters of a mile due south of the main unimproved road (old Sarepta to Water Valley road) from Providence Church to State Highway 331. The exposure is at the base of relatively high relief hills, and the overburden is great in much of the area. The lignite is brownish black and compact and blocks out in fairly large pieces. The thickness of the bed is reported to be about eight feet. Test Hole 4, located on the ridge to the northeast, revealed seven feet of lignite of which the lower few feet appeared clayey. About half a mile to the northeast on the east side of the north-south trending ridge on adjoining properties (SE.¼, NW.¼, NW.¼, Sec.12, T.11 S., R.2 W.), lignite crops out in the bottom of a southeast flowing creek branch. The thickness is reported to be about five feet. Test Hole 5, located on the ridge to the northwest, penetrated 1.5 feet of lignite. Assuming that the lignite of the exposures and of the test holes is the same bed, it thins to the north and to the east.

The location and thickness of several other outcrops of lignite examined are:

(1) a 17-inch bed at Parkers Spring located southeast from an old house place on the lower part of a northeast facing slope of the main north-south ridge at a distance of about a mile due north of Trusty (SW.¼, NE.¼, Sec.12, T.12 S., R.3 W.);

(2) a 24-inch bed in the cut of a northeast trending road on the west facing slope of a creek branch at a distance of about half a mile east of State Highway 9 and a mile due north of the town square at Pittsboro (SW.¼, SE.¼, Sec.7, T.13 S., R.1 W.);

(3) a 28-inch bed at Camp Spring located a few hundred yards southwest of the curve in State Highway 9 at a distance of 0.7 mile northwest of the town square at Pittsboro (SW.¼, SW.¼, Sec.18, T.13 S., R.1 W.); and

(4) a 12-inch bed at the spring on the old Tom Walton place located a few hundred yards north of an unimproved road northwest from Slate Springs at a distance of 1.4 miles from the junction of State Highway 9 (NE¼, SE.¼, Sec.19, T.22 N., R.9 E.).

The quality of the lignite varies considerably from outcrop to outcrop as does the thickness. Some beds contain a little clay, and others contain much. Iron sulfide (marcasite) is found at some places with the lignite or in the clays associated with lignite beds. Brown[44] states that "The Calhoun County lignites are among the very best in the State." Table 3 shows analyses (air dried basis) of several samples of lignite. The analyses for samples numbered 1 and 2 were in a report by Crider [45] in 1906 and were presumably made on samples taken from the bed of lignite on the old J. A. Head place. The analyses for samples numbered 42, 43, 44 and 45 were given by Brown in his report. These samples were taken from the general locations: Sample 42 — from a well heap just east of the town square at Pittsboro; Sample 43 — from the 28-inch bed exposed at Camp Spring about a mile due northwest of the town square at Pittsboro; Sample 44 — from material originally taken from a shaft sunk on the old John McPhail place about two miles due north-northwest of Slate Springs; and Sample 45 — from a 12-inch bed in the spring on the old Tom Walton place about a mile and a quarter due northwest of Slate Springs.

TABLE 3

ANALYSES OF LIGNITE SAMPLES

Sample No.	Locality	Moisture	Volatile Matter	Fixed Carbon	Ash	Total	Sulphur	Calories	B. T. U.
1	J. A. Head	13.910	46.030	37.320	2.840	101.00	----	--------	--------
2	J. A. Head	9.310	50,200	34.250	6.240	100.00	----	--------	--------
42	Pittsboro	13.96	39.97	38.58	7.49	100	.56	5,190	9,342
43	Camp Spring	12.20	46.27	30.86	10.67	100	.76	5,096	9,173
44	John McPhail	11.46	40.74	37.59	10.21	100	.78	5,486	9,875
45	Slate Springs	12.26	37.43	41.94	6.37	100	.94	5,533	9,959

Each of the Test Holes 3, 7, 10 and 11, which were drilled primarily for stratigraphic determinations, revealed several beds of lignite at different depths. The number of beds penetrated in drilling is significant inasmuch as it indicates that there are many beds of lignite in the Wilcox even though surface exposures are few. The lignite beds at the surface are commonly concealed by soil and by slump, and no doubt many others are covered by surficial deposits. Perhaps in the future some thick beds of lignite will be revealed by excavation or will be encountered in the drilling and digging of water wells.

IRON ORE

Thin discontinuous beds of flattened siderite concretions altering to iron oxides are present in the Naheola formation and in the Wilcox group (undifferentiated). The concretions differ considerably in size and in shape. Thicknesses range from less than an inch to a foot or more. Many concretions appear to be siliceous or silty and of poor quality. No large concentrations of good quality iron were found during the present survey. A few localities, where the concretions appear to be more abundant, are:

(1) in the cuts of the east-west road through Loyd from about half a mile east to a mile west of the community. (S. line, Secs. 7 & 8, T.13 S., R.1 E.) (upper part of the Naheola);

(2) in the roadcuts on the south wall of the Yalobusha River valley about two miles south-southwest of State Highway 8 at Derma (SW.¼, NW.¼, & NW.¼, SW.¼, Sec.26, T.14 S., R.1 W.) (at least five levels in the upper part of the Naheola);

(3) in the cuts of State Highway 331 and of the roads leading west and east near Shady Grove Church (SW.¼, Sec.5 and SE.¼, Sec.6 and NE.¼, Sec.7, T.11 S., R.1 W.) (middle part of the Wilcox); and

(4) in the cuts of the old Banner to Water Valley road and the road south (Sec.24, T.11 S., R.3 W.) (upper part of the Wilcox).

BAUXITE

Although low grade bauxite is present in large quantities at several localities in the State associated with the Midway-Wilcox contact, no deposits of bauxite of importance have been found at this horizon in Calhoun County. A few small tabular boulders of siliceous and ferruginous bauxitic rock are scattered on the hilltop and hillslopes (NW.¼, SW.¼, Sec.12, T.11 S., R.1 W.) near the junction of a segment of old State Highway 9 and a road south just southeast of State Highway 9 at a distance of about two miles northeast of Sarepta. The bauxitic rock consists of yellow and red pisolites in a brownish-black, sandy, ferruginous matrix. The boulders vary in thickness up to 1.5 feet, but Test Hole 1 penetrated 3.5 feet which is believed to be maximum. The bauxitic rock overlies bauxitic and kaolinitic clay (See Test Holes 1 & 2). The boulders, which appear to be the remnant of a once more extensive bed, are limited to a small area. At least one building in Sarepta stands on pillows of pieces of similar material.

OIL AND GAS

To date there has been a total of ten wildcat test wells drilled in Calhoun County in search for oil and gas — nine were abandoned as dry holes and one (the last drilled) was completed as a commercial gas well.

In the 1920's, the Northeast Mississippi Oil and Gas Company's No. 1 Ellis C. Williams[46] was begun at a location near Sarepta. The well apparently had little support inasmuch as it was reported abandoned in 1930 at a total depth of only 678 feet.

There was no further drilling activity until July 7, 1937, when the S. and O. Properties—No. 1 G. C. Cooner[47] (Ed Spencer —No. 1 J. C. Cooner) was begun at a location (SE.¼, NE.¼, Sec.12, T.24 N., R.8 E.) about four miles due southwest of Bruce. The well was started in alluvium overlying the Wilcox at an elevation of 265 feet above sea level and was drilled to a total depth of 2,120 feet into the Tuscaloosa. There were no reported shows of oil or gas. The well was reported temporarily abandoned as a dry hole on May 1, 1938. Later reports do not show whether or not the well was ever reopened.

On July 26, 1937, the B. G. Dowell—No. 1 H. D. Hughes[48] was started at a location (NE.¼, NW.¼, Sec.18, T.23 N., R.9 E.) about four and a half miles due west of Calhoun City. The well was begun in the Wilcox at an elevation of 313 feet and bottomed in the Selma at a total depth of 1,605 feet. No shows of oil or gas were reported, and the well was abandoned as a dry hole on September 26, 1937.

In May 1938, the L. C. Lucas—No. 1 E. C. Boland[49] was started at a location (NW.¼, SW.¼, Sec.9, T.22 N., R.9 E.) about three miles due north of Slate Springs. The well was begun in the Wilcox at an elevation of 266 feet and bottomed in the Selma at a total depth of 769 feet. No shows of oil or gas were reported, and the well was abandoned as a dry hole on July 8, 1939. The top of the Selma is reported at a depth of 738 feet.

Drilling activity was at a stand still until October 27, 1953, when the Carter Oil Company's No. 1 John W. Crane[50] was begun at a location (NE.¼, SW.¼, Sec.31, T.13 S., R.1 E.) about three and a half miles due northwest of Vardaman. The well was started in the Wilcox at an elevation of 392 feet (DF) and bottomed in the Ordovician at a total depth of 9,237 feet. No shows of oil or gas were reported, and the well was abandoned as a dry hole on March 9, 1954. The Schlumberger electric log tops reported are: Clayton at 507 feet, Selma at 600 feet, Eutaw at 1,310 feet, Tuscaloosa at 1,637 feet, Pottsville at 2,252 feet, Mississippian at 6,988 feet, Iowa at 7,330 feet, Devonian at 7,454 feet, Silurian at 8,250 feet, Ordovician sandstone at 8,535 feet, Ordovician limestone at 8,590 feet and Ordovician dolomite at 8,840 feet.

On March 3, 1954, the Honolulu Oil Corporation—No. 1 D. R. Davis[51] was started at a location (SW.¼, SW.¼, Sec.22, T.12 S., R.1 E.) about eight and a half miles due east of Bruce near Reid. This wildcat was supported by the Carter Oil Company and Justiss-Mears and was projected to test the Ordovician. The well began in alluvium overlying the Midway at an elevation of 315 feet (DF) and bottomed in the Mississippian at a total depth of 3,325 feet. A promising flow of gas was encountered in 16 feet of sand between the depths of 3,290 and 3,325 feet in the Abernethy sand horizon. The well tested an estimated rate of flow of 1,100 MCF (thousand cubic feet) of gas per day through a quarter inch choke with a tubing pressure of 768 pounds per square inch and an estimated 690 MCF of gas per day through a three-sixteenths inch choke with a tubing pressure of 930 pounds per square inch. As testing operations continued, the pressure diminished considerably, and the well was abandoned as a dry hole on August 2, 1954. The Schlumberger electric log tops reported are Millerella at 2,866 feet, Carter at 2,980 feet, and Abernethy at 3,205 feet.

During the testing period of the D. R. Davis No. 1, the Honolulu Oil Corporation—No. 2 D. R. Davis[52] was begun on April 20, 1954 at a location (SW.¼, NW.¼, Sec.27, T.12 S., R.1 E.) a few thousand feet to the south for the purpose of testing the Ordovician. The well began in the Midway at an elevation of 369 feet (DF) and bottomed in the Knox at a total depth of 8,390 feet. There were several insignificant showings of gas and one slight show of oil in the cuttings. The well was abandoned as a dry hole on August 2, 1954. The Schlumberger electric log tops reported are: Clayton at 366 feet, Selma at 455 feet, Eutaw at 1,180 feet, Tuscaloosa at 1,515 feet, Pennsylvanian at 1,760 feet, Mississippian at 2,410 feet, Millerella at 2,900-2,990 feet, Carter-Sanders at 3,022 feet, Abernethy at 3,245 feet, Evans at 3,585 feet, Lewis at 3,815 feet, Iowa at 3,926 feet, St. Jo at 3,995 feet, Devonian at 4,078 feet, Silurian at 4,770 (?) feet, Ordovician at 5,110 feet, and Knox at 8,190 (?) feet.

On December 12, 1954, the Seaboard Oil Company—No. 1 J. L. Williams[53] was begun at a location (SW.¼, SE.¼, Sec.35, T.13 S., R.1 E.) about a mile due northeast of Vardaman. This wildcat was to be a 7,000 foot test on a farmout from the Carter Oil Company and the Honolulu Oil Corporation. Drilling started in the Midway at an elevation of 326 feet (DF) and bottomed in the Ordovician at a total depth of 9,785 feet. Only slight showings of gas were encountered. The well was abandoned as a dry hole on May 3, 1955. The Schlumberger electric log tops reported are: Mississippian at 5,280 feet, Millerella at 6,120-6,214 feet, Abernethy at 6,502 feet, Evans at 6,820 feet, Iowa at 7,175 feet, Devonian at 7,277 feet, Silurian at 8,120 feet and Ordovician at 8,496 feet.

On August 25, 1957, the E. W. Marks and H. H. Hutchins Trustee—No. 1 D. R. Davis[54] was begun at a location (SW.¼, NW.¼, Sec.22, T.12 S., R.1 E.) to the north of the Honolulu tests. The well was started in alluvium overlying the Midway at an elevation of 315 feet (DF) and bottomed in the Mississippian at a total depth of 3,384 feet. There was no information released. The well was abandoned as a dry hole on December 3, 1957.

The most recent test, the Gulf Oil Corporation—No. 1 Reid 26-15[55], was begun July 24, 1960 at a location (SW.¼, SE.¼, Sec.26, T.12 S., R.1 E.) near Reid. The well was started in the Midway at an elevation of 473 feet (DF) and drilled into the Devonian at a total depth of 4,227 feet. It was completed October 4, 1960, as a small gas well. Completion tests were made from perforations opposite the Abernethy sand horizon at depths of from 3,398 to 3,404 feet. Initial potential was established to be 1,084 MCF (thousand cubic feet) of dry gas per day with 20.12 barrels of salt water through an open head with a tubing pressure of 109 pounds per square inch and a casing pressure of 227 pounds per square inch. Bottom hole pressure was reported to be 1,150 pounds per square inch, and shut in tubing pressure 1,097 pounds per square inch. Schlumberger electric log tops reported are: Mississippian at 3,250 feet, Abernethy at 3,385 feet, Evans at 3,768 feet, Lewis at 3,985 feet, Tuscumbia at 4,098 feet and Devonian at 4,208 feet. The State Oil and Gas Board named the area of this discovery "Reid field."

GROUND-WATER RESOURCES

A study of the ground-water resources of Calhoun County was made as a part of the regular geological investigation in order to add to the existing ground-water information of the area and to provide a guide for water well drillers and prospective well owners. Previous reports, which give some data on the county's water supply, include an early reconnaissance study published in 1928 on the ground-water resources of Mississippi by Stephenson, Logan and Waring[56] and a recent survey published in 1960 on public and industrial supplies in a part of northern Mississippi by Lang and Boswell[57].

The field investigation for the present report consisted of an inventory of the representative wells and of the public and industrial supplies and of the collection of water samples from selected wells for chemical analysis. Most of the wells inventoried were drilled for artesian supplies. Data on only a few shallow dug and bored wells and on no springs were collected, because these sources of water were not considered of primary importance.

The records of wells are listed in Table 5. Data concerning the depth, diameter, water level, method of lift, use of water, and yields were obtained, in most cases, from the individual owners. This type of information is, of course, only as reliable as the memory or records of the persons interviewed. Therefore, both the owner and the driller were contacted in regard to many of the wells. The location of the wells is shown on Plate 2. A grid system, similar to one set up by the Ground-Water Branch of the U. S. Geological Survey for each county in the State, is used for well numbering. On a county highway map, grid areas are designated alphabetically, beginning with the letter A in the upper left corner and progressing to the right. Successive rows of grid areas are lettered left to right. The letter I is omitted in order to avoid confusion. Grid lines generally follow township lines, except for areas less than half a township or for irregular parts of townships which are included in the adjoining grid area. The wells are numbered consecutively within each grid designation.

AVAILABILITY

The water supply of Calhoun County is furnished chiefly by deep wells. Some water is provided by shallow dug or bored wells and by springs. Sufficient quantities of water for most needs are available everywhere, but the depths at which water is obtainable differ considerably from place to place. Figure 22 shows three general areas which are supplied by one or more of the four major water-bearing units.

In the eastern half of the county, which is underlain by a considerable thickness of relatively non-water producing beds of the Porters Creek and the Naheola formations, only small quantities of water are obtainable in shallow wells. Water for ordinary domestic uses is furnished, at several localities, by shallow wells made in the thin sand beds present in the otherwise impermeable strata. Some water is obtained by the collection of rainwater in cisterns or by the hauling of water from a nearby artesian source. Artesian wells are developed in one of three aquifers (Figure 23). Most public supples, which necessarily require large volumes of water, are derived from deep wells made in the gravel and sand of the Tuscaloosa group. Generally, domestic and farm supplies are developed in the lower part of the Eutaw, except in the extreme eastern part where water from the Ripley formation is available at more moderate depths (Figure 22).

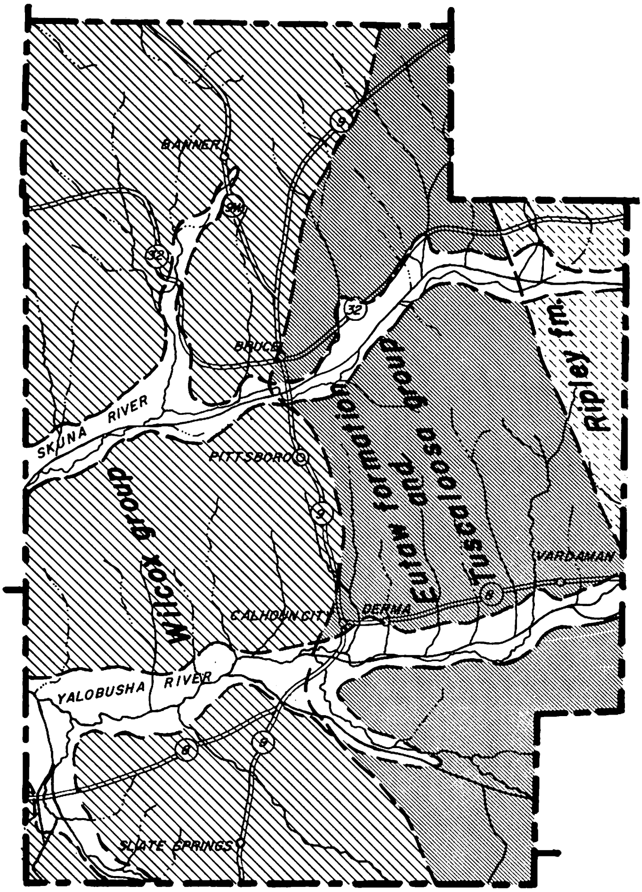

Figure 22.—General regions supplied by the four major water-bearing units. Areas not lined are regions of probable artesian flow.

In the western half of the county, numerous deep wells and shallow dug or bored wells furnish water from the sands of the Wilcox group. Springs are relatively common in the Wilcox terrane and a few are utilized. Artesian water in adequate quantities for domestic and farm uses is obtainable at moderate depths at most localities. The Columbia Gulf Transmission Company has the only industrial supply developed in the Wilcox which provides moderate quantities of water from large diameter wells.

In the bottom lands associated with the Yalobusha and Skuna Rivers, some shallow dug and bored wells are made in the sandy alluvial materials overlying the bedrock.

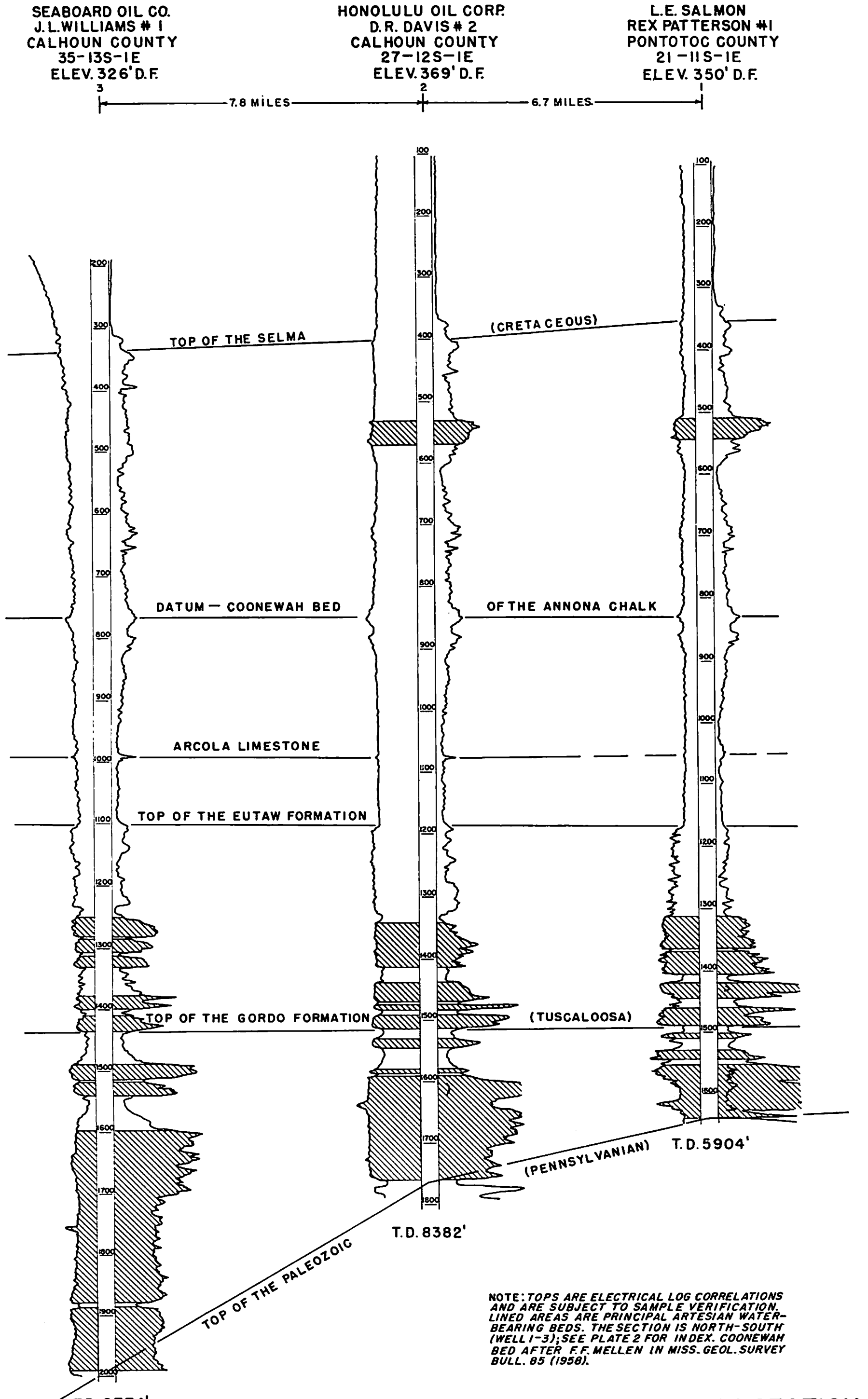

FIGURE 23.—STRATIGRAPHIC ELECTRIC LOG SECTION

WATER-BEARING UNITS

Artesian water supplies are derived principally from parts of four geologic horizons, which are the Tuscaloosa group, the Eutaw formation and the Ripley formation of Cretaceous age and the Wilcox group (undifferentiated) of Tertiary age. A generalized section of post-Paleozoic rocks and a summary of their water-bearing properties are given in Figure 24.

The Tuscaloosa group, composed of the Gordo formation and in some areas beds belonging to the Coker formation, consists chiefly of irregularly bedded gravel and sand and subordinate beds of clay and shale. The clay and shale beds are more prominent in the upper parts, and the lower parts are made up mostly of gravel and sand. The gravel and sand, which provide an excellent aquifer, yield moderate to large quantities of water to deep artesian wells. Public supplies at Bruce, Calhoun City and Derma are developed in the Gordo formation from wells ranging from 1,862 to 1,993 feet in depth. The public supply at Vardaman, which is developed in the lower part of the Tuscaloosa group from a well drilled to a total depth of 1,906 feet, is believed to be derived from the Coker formation. Reported yields from these wells range from 162 to 350 gallons per minute.

The Eutaw formation consists of glauconitic, micaceous, variably calcareous sands and of beds of gray clay and shale. The upper parts of the formation are more argillaceous and calcareous and generally do not provide a satisfactory aquifer. Lower parts are made up of sand (becoming gravelly in basal portions), having interbeds of clay and sandy shale. The lower sands (and gravels), which provide a very good aquifer, yield moderate to fairly large supplies of water in relatively deep wells ranging in depth from about 1,200 to 1,800 feet in depth. The public supply at Pittsboro is derived from the lower part of the Eutaw from a well drilled to a total depth of 1,771 feet. The reported yield from this well is 105 gallons per minute. Many wells drilled in the eastern half of the county for farm and domestic purposes requiring quantities of water not obtainable at shallow depths are completed in the lower Eutaw sands.

The Ripley formation is made up of beds of calcareous sand, impure chalk, sandy limestone and calcareous clays. The sands are generally too calcareous and non-porous to be considered as

Figure 24.—Generalized section of post-Paleozoic rocks in Calhoun County, and their water-bearing properties

Era	System	Series	Group	Stratigraphic unit	Symbol	Thickness (feet)	Lithologic character	Water-bearing properties
Cenozoic	Quaternary	Pleistocene and Recent		Alluvium	Qal	0-30	Clay, silt and sand.	Yields water to shallow dug and bored wells in the flood plains of the Yalobusha and Skuna Rivers and their larger tributaries.
				Terrace deposits	Qt	0-20	Clay, silt and sand.	Not know to be an aquifer. A few shallow dug and bored wells on the higher grounds adjacent to the flood plains of the Yalobusha and Skuna Rivers may derive water from terrace deposits.
	Tertiary	Eocene	Claiborne	Meridian formation	Em	50-75	Sand, medium-to coarse-grained, highly muscovitic, contains lenses and partings of white clay.	Yields water to a few shallow dug and bored wells in the extreme northwestern part of the county.
			Wilcox	Undifferentiated rocks	Ew	450-550	A heterogeneous body of chiefly sand, silt, clay shale, clay and lignite and of subordinate amounts of siderite, sandstone and siltstone. The sediments are complexly interlensed and intertongued. At most places there is a basal sand.	Yields water to numerous shallow dug and bored wells and drilled artesian wells for domestic and farm uses in the western half of the county. Furnishes small to moderate quantities of water. The basal sand is the most productive.
		Paleocene	Midway	Naheola formation	Pan	100-125	Fine, muscovitic, sands interbedded and interlaminated with dark-gray to black silty clay shale.	Furnishes small quantities of water to shallow dug and bored wells and to a few drilled wells in the eastern half of the county for domestic and farm uses.
				Porters Creek formation	Pap	350-450	Compact, dark bluish-gray to black, massive clay and clay shale; becomes calcareous in lower parts.	Relatively impervious — not a source of water supply.
				Clayton formation	Pac	20-40	Fossiliferous sandy limestone, calcareous sandstone and sandy marl.	Not known as a source of water supply.

Figure 24.—Continued

Era	System	Series	Group	Stratigraphic unit	Symbol	Thickness (feet)	Lithologic character	Water-bearing properties
Mesozoic	Cretaceous	Gulf	Selma	Prairie Bluff formation	Kp	50-75	Hard, fossiliferous chalk and limestone.	Relatively impervious — not a source of water supply.
				Ripley formation	Kr	150-200	Impure chalk, sandy limestone, variably calcareous sand, sandstone and calcareous clay.	A sand in the lower part of the formation furnishes small to moderate quantities of water to artesian wells in the extreme eastern part of the county drilled for domestic and farm supplies. The aquifer ranges from 30 to 40 feet in thickness, but is restricted to about a 30 square mile area.
				Demopolis and Mooreville formations	Kd Km	525-625	Chalk containing variable amounts of clay, silt and sand; thin beds of limestone.	Relatively impervious — not a source of water supply.
				Eutaw formation	Ke	325-350	Glauconitic sands, gray clay and clay shale. Generally more argillaceous and calcareous in upper portions. Lower parts consist of beds of sand and clay shale. Gravelly in basal portions.	A good aquifer which supplies moderate quantities of water to artesian wells in the eastern half of the county drilled for domestic and farm purposes.
			Tuscaloosa	Undifferentiated rocks (chiefly Gordo formation and at places beds belonging to the Coker formation)	Ktg Ktc	150-300	Chiefly chert gravel and sand and subordinate beds of clay and clay shale. Clay beds are more prominent in upper parts.	An excellent aquifer which yields moderate to large quantities of water to artesian wells in the eastern half of the county. Presently supplies most municipalities.
		Comanchea		Undifferentiated rocks	Klc	0-?	Beds considered to be of early Cretaceous age are believed to wedge out beneath the Tuscaloosa group and are not present north of a line which crosses Calhoun County.	Not known to be an aquifer. Fresh water reserves may be present, but no wells are believed to have penetrated strata of this age.

an aquifer in most parts of the county. However, a sand in the lower part of the formation furnishes numerous farm and domestic wells in the extreme eastern part. This sand is 30 to 40 feet in thickness and appears to be restricted to an estimated 30 square mile area (Figures 22 and 23). Wells range from about 375 to 750 feet in depth and supply small to moderate quantities of water.

The Wilcox group (undifferentiated) consists of a body of lenticular and very irregularly bedded sand, silt, clay shale and clay, having occasional thin beds of lignite and concretionary siderite. The lower parts are generally sandy, and the upper parts become more argillaceous with shale and clay beds prominent near the top. The localized development of the Wilcox sands does not allow satisfactory correlations between wells; however, the lower sands where present are generally the most productive. The Wilcox furnishes small to moderate quantities of water in numerous wells for farm and domestic uses in the western half of the county. Wells range from about 100 to 500 feet in depth. Two large diameter wells, 283 and 286 feet in depth, supply the Columbia Gulf Transmission Company at their installation near Banner with a reported production of 7,000 gallons per day.

PUBLIC WATER SUPPLIES

Approximately 5,000 people or about one-third of the total population are supplied by public water systems in the towns of Bruce, Calhoun City, Derma, Pittsboro and Vardaman. The total average daily pumpage for public use is estimated to be about 375,000 gallons. Information was obtained from the water department of the various towns in regard to their individual water supplies.

BRUCE

Bruce (pop. 1,698) is supplied by one municipal well (D1), which was drilled in 1959 to a total depth of 1,862 feet and developed in the Gordo formation. Prior to the drilling of this well, the town was supplied by a well (G1) owned by the E. L. Bruce Company. Well G1 is still connected to the town supply for emergency uses. The present water storage is provided by a 50,000 gallon elevated tank. The average daily pumpage is approximately 160,000 gallons. This average had to be computed on a 15 month period from around October 1, 1959 to December 28, 1960, due to the fact that no monthly records were kept and only the total cumulative pumpage was available. The largest single draw is a garment factory located in the town. No treatment of the water is used.

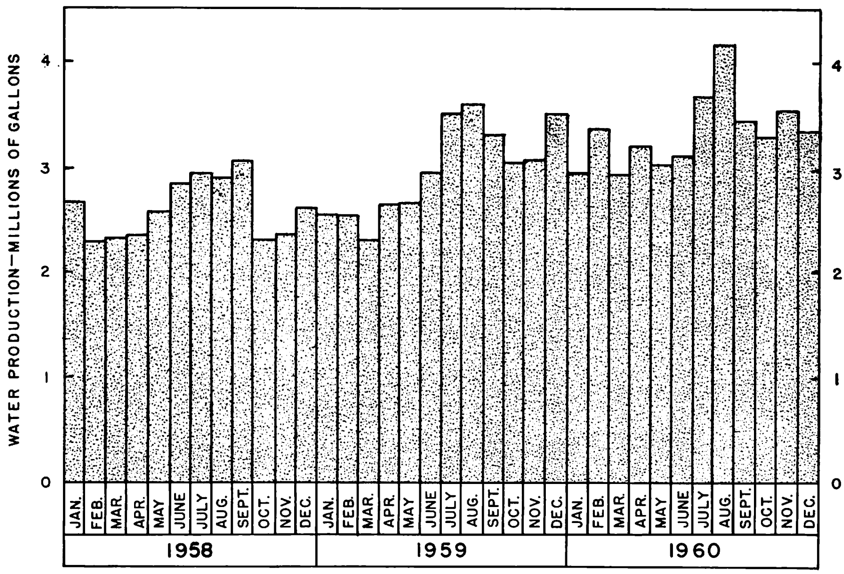

Figure 25.—Municipal pumpage for Calhoun City, 1958-1960.

CALHOUN CITY

Calhoun City (pop. 1,714) is supplied by two municipal wells (K1, K2), which are developed in the Gordo formation. The oldest well (K1) was drilled in 1928 to a total depth of 1,902 feet. The second well (K2), drilled to a total depth of 1,899 feet, was completed in 1954 in order to meet a general increase in water needs accentuated by the location of a garment factory in the town. Water storage is provided by a 50,000 gallon elevated tank located at the old well just west of the town square. Another 50,000 gallon elevated tank, which is located at the new well near the garment factory, is used as a reservoir for the fire protection system of the plant. Monthly pumpage for the years 1958, 1959 and 1960 is given in Figure 25. The diagram is a compilation of production data registered on the town's water meters. Monthly figures are conservative inasmuch as they do not account for water used by various city departments. The information presented, however, is believed to be at least 90 percent of the total water used. On this basis the total average daily pumpage for 1960 is estimated at about 120,000 gallons. The largest single draw is the garment plant which uses an average of 6,000 gallons daily. Water used for public supply is treated by fluoridation.

DERMA

Derma (pop. 578) is supplied by one well (K4), which was drilled in 1956 to a total depth of 1,993 feet and developed in the Gordo formation. Water storage is provided by a 5,000 gallon ground pressure tank. Average daily pumpage is reported to be 15,000 gallons. The largest single draw is a furniture factory, which is reported to use an average of about 10,000 gallons per month. There is no treatment of the water.

PITTSBORO

Pittsboro (pop. 205) is supplied by one municipal well (G2), which is presently under lease to the town. The well was drilled in 1955 to a total depth of 1,771 feet and developed in the Eutaw formation. Prior to the drilling of the municipal well, water was obtained from privately owned shallow dug or bored wells, and from nearby springs. Present water storage is provided by a 4,000 gallon ground pressure tank. In 1960 the average daily pumpage was about 22,000 gallons. No treatment of the water is used.

VARDAMAN

Vardaman (pop. 637) is supplied by one municipal well (L3), which was drilled in 1957 and developed in the Coker formation. The town has been supplied, however, by two other wells in the past. The first well (L1) drilled in 1912 was developed in the Eutaw formation, but has long been abandoned. The second well (L2), made in the Coker formation, was drilled in 1931. It is at present not serviceable. Water storage is provided by a 25,000 gallon elevated tank. Average daily pumpage is reported to be about 60,000 gallons. The largest single draw, which is seasonal, is several potato washers located in the town. There is no treatment of the water.

QUALITY OF WATER

The quality of water may limit its use for various purposes. Some water requires treatment to remove undesirable constituents before it is suitable for a particular use. An excellent discussion on water quality and use is given by Lang and Boswell[58].

Certain data on the chemical and physical properties of water from 17 selected wells are given in Table 4. Five wells (D1, K1, K2, K4 and L2) are in the Tuscaloosa; five wells (E33, G1, G2, L5 and O4) are in the Eutaw; two wells (E12 and E25) are in the Ripley; and five wells (A18, A21, F7, J4 and N27) are in the Wilcox. As a basis for comparison, the limits for several constituents (expressed in parts per million) in drinking water recommended by the U. S. Public Health Service[59] are given.

U. S. Public Health Service Drinking Water Standards

Total solids	500 ppm
Magnesium (Mg)	125 ppm
Iron (Fe)	*0.3 ppm
Fluoride (F)	1.5 ppm
Chloride (Cl)	250 ppm
Sulfate (SO_4)	250 ppm

*Limit for iron and manganese together.

TABLE 4
ANALYSES OF WATER SAMPLES BY THE MISSISSIPPI STATE BOARD OF HEALTH
(CHEMICAL CONSTITUENTS IN PARTS PER MILLION)

Well No.	Owner	Date of Collection	Water-bearing Unit	Depth of Well (feet)	Turbidity	Color	Temperature (°F)	Total solids	Total hardness ($CaCO_3$)	Alkalinity (P)	Alkalinity (M)	Calcium (Ca)	Magnesium (Mg)	Iron (Fe)	Carbon dioxide (CO_2)	pH	Fluoride (F)	Chloride (Cl)	Sodium (Na) & Potassium (K) calculated as Sodium	Silica (SiO_2)	Sulfate (SO_4)
[a]A18	H. D. Massey	4-12-61	Ew	127	2	....	62	153.36	6.8	....	128	2.72	0	Tr	2	8.2	0.1	3	60.03	2.72	4.77
A21	Columbia Gulf Trans. Co.	4-12-61	Ew	286	2	....	64	144.81	8.8	....	125	2.72	0.49	0.1	4	7.8	0.1	3	57.27	2.0	3.79
D1	Town of Bruce	9-15-59	Ktg	1,862	....	0	......	543.97	51.6	....	116	14.93	2.13	[b]0.3	4	7.8	0.1	241	188.28	27.6	0
E12	Fred Burt	4-12-61	Kr	553	10	....	63.5	489.32	33.2	....	422	8.81	3.72	0.1	12	7.9	4.0	14	184.92	16.8	2.63
E25	D. R. Davis	4-12-61	Kr	485	10	....	63.5	508.42	47.2	....	400	11.38	4.57	0.5	13	7.8	4.0	14	187.91	9.6	35.39
E33	A. C. Brasher	4-12-61	Ke	1,386	2	....	63	405.67	11.2	22	179	4.48	0	0.1	0	8.8	0.6	118	162.61	12.0	0
F7	Mary Stewart	4-12-61	Ew	175	....	....	63	160.49	24	....	122	6.4	1.94	0.8	17	7.2	0.1	6	51.06	16.0	5.76
G1	E. L. Bruce Co.	[c]....	Ke	1,723	2	0	[e]89	534.75	40.6	....	125	11.64	1.71	0.1	27.1	7.0	0.2	238	195.27	12.8	0
G2	Town of Pittsboro	[c]....	Ke	1,771	2	0	[e]85	583.84	19.0	....	192	5.45	0.78	Tr	3.2	8.0	0.6	210	217.35	34.4	0
J4	O. S. Wells	4-12-59	Ew	112	2	....	63	194.27	120.0	....	179	29.0	11.57	0.5	8	7.4	0.1	5	30.36	9.2	0.66
K1	Calhoun City	9-15-59	Ktg	1,902	....	0	......	649.58	54.8	....	131	15.97	2.22	0.2	10	7.5	[d]....	308	237.36	17.2	0
K2	Calhoun City	9-15-59	Ktg	1,899	....	0	[e]89	654.08	43.0	....	150	12.36	1.45	0.3	5	7.8	[d]....	298	245.13	16.8	0
K4	Town of Derma	[c]....	Ktg	1,993	2	0	[e]89	618.11	67.6	....	124	19.99	2.63	Tr	8.5	7.5	0.2	296	221.26	3.6	0
L2	Town of Vardaman	[c]....	Ktc	1,857	2	0	[e]85	514.94	72.4	....	120	20.47	3.16	Tr	13.1	7.3	0.2	222	174.57	12.8	9.71
L5	J. R. Penick, Jr.	4-12-61	Ke	1,222	2	....	71	506.76	11.6	6.0	312	3.04	0.97	0.2	0	8.3	1.6	101	206.31	5.6	0
N27	Charles P. Lovorn	4-12-61	Ew	130	2	....	63.5	128.76	65.2	....	75	12.02	8.55	11.0	100	6.2	0.3	8	13.27	4.4	26.01
O4	Eli Reedy	4-12-61	Ke	1,608	2	....	66	504.26	18.8	....	273	5.13	1.46	0.75	6	8.0	1.2	123	196.19	12.0	0

[a]Individual well data given in Table 5; locations on Plate 2.
[b]Well was not in service and had been idle for over a week before sampling. Iron probably lower than indicated.
[c]Sample analyzed 5-6-59.
[d]Fluorides not recorded due to point of introduction of fluorides into well discharge.
[e]Temperatures by U. S. Geological Survey in Mississippi Geol. Bull. 90, p. 63.

Most of the samples analyzed fall within the range of soft water (total hardness of less than 60 ppm), except from four wells (J4, K4, L2 and N27) which are classed as moderately hard (total hardness of from 60 to 120 ppm). The highest value is 120 ppm for the sample from well (J4) in the Wilcox.

Total dissolved solids are high in waters from all wells in the Tuscaloosa (D1, K1, K2, K4 and L2), four of the wells in the Eutaw (G1, G2, L5 and O4) and one of the wells in the Ripley (E25). Dissolved solids in all wells range from about 130 to 650 ppm.

The iron content is consistently low in the samples from wells in the Tuscaloosa. Iron is high in one well in the Eutaw (O4), one well in the Ripley (E25) and three wells in the Wilcox (F7, J4 and N27). The value of 11.0 for iron content in water from a well (N27) in the Wilcox was the highest. A pH of 6.2 for this sample indicates a corrosive water which suggests that iron is being dissolved from the piping.

Fluoride is present in small amounts in most of the waters analyzed, but is excessive in water from one well in the Eutaw (L5) and two wells in the Ripley (E12 and E25). The analyses show 4.0 ppm for waters from both wells in the Ripley.

Chloride is high in waters from three wells made in the Tuscaloosa (K1, K2, and K4).

WATER LEVELS

No comparative water levels are available for Calhoun County to show water-level fluctuations. The reported water levels with respect to land surface datum (lsd) are summarized.

Wilcox—range from above to 250 feet below lsd, but are more commonly between 0 and 50 feet below lsd.

Ripley—range from 1.5 to 126 feet below lsd, but are more commonly between 20 and 100 feet.

Eutaw—range from 30 to 200 feet below lsd, but are more commonly between 50 and 150 feet.

Tuscaloosa—range from 38 to 165 feet below lsd, but are more commonly between 30 and 60 feet.

At the lower elevations, several wells made in the Wilcox flow continuously. The general areas of probable artesian flow are shown in Figure 22.

TABLE 5.—WATER WELL RECORDS

Well: Well designations correspond to those on Plate 2 which shows well locations and Table 4 which shows chemical analyses of selected wells. On Plate 2 the letter indicates a grid area and the numeral refers to the individual well number within a grid area.

Water-bearing units: Qal, alluvium; Em, Meridian; Ew, Wilcox group (undifferentiated); Pan, Naheola; Kr, Ripley formation; Ke, Eutaw formation; Ktg, Gordo formation; Ktc, Coker formation.

Altitude of lsd: Altitude of land surface datum determined from contour maps or aneroid barometer.

Water level: Levels shown in feet are reported by owner or driller; those recorded in feet and tenths were measured on the dates given.

Method of lift: A, airlift; C, cylinder; F, natural flow; J, jet; M, manual; N, none; P, pitcher; T, turbine; S, submersible.

Use of water: D, domestic; I, industrial; P, public supply; S, stock.

Remarks: Pertinent remarks are given concerning the use and yield of water. Most wells are rotary drilled—the exceptions are noted.

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
A1	George Peden	Charles P. Lovorn	1950	180	2	Ew	......	30	1950	J	D	
A2	H. D. Lamar	C. E. Hill	1949	220	4	Ew	......	30	1949	J	D	
A3	A. H. Edwards	J. W. Webb & Sons	1946	260	4	Ew	......	20	1946	C	D	
A4	W. E. Price	Charles P. Lovorn	1960	220	2	Ew	......	30	1960	J	D	
A5	A. H. Edwards	do	1956	175	2	Ew	......	30	1956	J	D	
A6	K. H. Castleberry	C. E. Hill	1956	200	4	Ew	......	38	1956	J	D	

A7	Doyle Covington	Charles P. Lovorn	1959	240	4	Ew	......	45	1959	J	D	
A8	Lela Van Winkle	do	1959	225	4	Ew	......	50	1959	J	D	Supplies 2 families.
A9	C. A. Costner	do	1954	233	2	Ew	......	40	1954	J	D	
A10	Freeman C. Wilson	do	1960	295	4	Ew	......	55	1960	J	D	
A11	J. M. Fullerton	do	1958	227	4	Ew	......	85	1958	J	D,S	Supplies 5 families.
A12	Rural Zinn	C. E. Hill	1954	240	4	Ew	......	......	....	J	D	
A13	Thomas Smith	Charles P. Lovorn	1952	147	2	Ew	......	15	1952	J	D	
A14	G. E. Stewart	C. E. Hill	1957	160	4	Ew	......	60	1957	J	D	
A15	R. C. Ledbetter	Charles P. Lovorn	1956	177	2	Ew	......	+	1956	F	D,S	Well flows; pump necessary for water distribution.
A16	Baptist Parsonage	do	1959	175	2	Ew	......	+	1959	F	D	Water level at lsd; pump necessary for water distribution.
A17	H. D. Massey	do	1958	145	2	Ew	......	+	1958	F	D,S	Well flows; pump necessary for water distribution.
A18	H. D. Massey	do	1952	127	2	Ew	......	+	1952	F	D,S	Well flows.
A19	J. S. Massey	do	1948	180	2	Ew	......	30	1948	J	D	
A20	Columbia Gulf Transmission Co.	Layne-Central Co.	1954	283	12x6	Ew	......	......	....	S	I	
A21	Columbia Gulf Transmission Co.	do	1954	286	12x6	Ew	......	......	....	S	I	
A22	L. H. Camp	Paulk Bros.	1954	500	4	Ew	......	75	1954	C	D,S	
A23	Hicks Lay		1960	33	......	Em	......	29	1960	M	D	Bored well.
B1	Wayne Davis	C. E. Hill	1955	220	2	Ew	......	50	1955	C	D	
B2	H. H. Quarles	Ray Leeper	1958	280	2x1½	Ew	......	50	1958	C	D	
B3	G. W. Edwards	C. E. Hill	1954	350	2	Ew	......	50	1954	C	D	
B4	Hollis Cain		1945	300	3	Ew	......	50	1945	J	D,S	Supplies residence & dairy barn.

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
B5	C. F. Cain	C. E. Hill	1954	130	2	Ew	......	40	1954	C	D,S	
B6	Jim Howell	Tom Maxie	1957	200	4	Ew	......	100	1957	C	D,S	Supplies 2 families and dairy barn.
B7	J. A. Turner	C. E. Hill	1952	127	4	Ew	......	16	1952	J	D	
B8	J. A. Turner	do	1957	140	4	Ew	......	10	1957	J	D	Supplies residence and service station.
B9	J. A. Turner	do	1952	120	4	Ew	......	20	1952	J	D	
B10	Edsel Blount		1950	240	......	Ew	......	......	....	C	D	
B11	W. J. Crutchfield	C. E. Hill	1954	210	4	Ew	......	......	....	J	D,S	Supplies residence and dairy barn.
B12	Ernest Massey	do	1954	150	4	Ew	......	50	1954	J	D	
B13	C. R. Dixon	do	1954	180	2	Ew	......	30	1954	J	D	
B14	G. M. Edwards	do	1954	210	2	Ew	......	35	1954	C	D	
B15	S. L. Cooper		1955	75	......	Ew	......	66.2	1-20-61	M	D	Bored well.
B16	J. C. Helms		1958	41	......	Ew	......	34	1961	J	D	Dug well.
B17	W. J. Quarles		1935	51	......	Ew	......	46.1	1-20-61	M	D	Bored well.
B18	L. B. Gray		1955	33	......	Pan	......	25	1961	J	D	Bored well.
C1	J. R. Turner	Charles P. Lovorn	1960	220	4	Ew	......	84.3	12- 9-60	J	D	

C2	Jack Pearson	do	1959	198	4	Ew	......	45	1959	J	D	
C3	C. R. Gullick	C. E. Hill	1954	170	2	Ew	......	45	1954	J	D	
C4	Jim Collins	Charles P. Lovorn	1952	235	2	Ew	......	65	1952	C	D	
C5	Inis Roane	C. E. Hill	1957	220	2	Ew	......	100	1957	C	D	
C6	I. M. Vick	Charles P. Lovorn	1955	220	2	Ew	......	45	1955	J	D	
C7	A. M. Miles	Tom Maxie	1954	212	4	Ew	......	55	1954	C	D	Supplies 2 residences and chicken houses.
C8	Hubert Barefield	do	1955	137	2	Ew	......	......	....	C	D	
C9	D. B. Thomas	Charles P. Lovorn	1960	132	4x2	Ew	......	40	1960	J	D	Supplies 2 residences.
C10	Oval Walls	C. E. Hill	1951	150	3	Ew	......	......	....	C	D	Supplies 2 residences
C11	C. V. & T. W. Plunk	Robert E. Ratliff	1952	120	4	Ew	......	50	1952	J	D	Supplies 2 residences
C12	C. R. Stribling	Charles P. Lovorn	1948	226	2	Ew	305	60	1948	C	D	
C13	C. W. Cox	do	1958	175	2	Ew	325	40	1958	J	D	
C14	B. V. Thomas	Smith	1954	210	4	Ew	290	......	....	C	D	Supplies 2 residences.
C15	Stanley Williams	Tom Davis	1940	196	2	Ew	280	40	1940	C	D	Supplies 3 residences and store.
C16	L. C. Webb	Charles P. Lovorn	1952	205	2	Ew	280	30	1952	C	D,S	
C17	E. L. Collins, Sr.	Tom Davis	1918	226	2	Ew	......	40	1918	J	D,S	
C18	L. C. Webb	do	1929	245	2	Ew	......	26	1929	P	D	
C19	P. H. Miller	Charles P. Lovorn	1948	140	2	Ew	......	0	1948	P	D	Well once flowed.
C20	B. B. McPhail	do	1960	89	2	Ew	......	+	1960	F	D	Well flows; pump necessary for water distribution; supplies residence and dairy barn.
C21	J. H. Jenkins	do	1949	214	2	Ew	......	50	1949	J	D,S	Supplies 2 families.
C22	H. L. Morris	do	1958	201	2	Ew	......	35	1958	J	D	
C23	T. W. Spratling	do	1953	250	2	Ew	......	50	1953	J	D	
C24	Roy M. Davis	do	1957	372	2	Ew	......	70	1957	C	D,S	
C25	E. E. Dunn	do	1960	308	2	Ew	......	40	1960	J	D	

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
C26	C. V. Vanlandingham	do	1948	147	2	Ew	......	50	1948	C	D	Supplies 2 families.
C27	Tom Lamar	do	1948	311	2	Ew	......	60	1948	C	D	
C28	A. D. Henley	do	1955	286	2	Ew	......	80	1955	C	D,S	
C29	J. G. Brower	do	1955	320	2	Ew	......	80	1955	J	D,S	
C30	J. G. Brower	do	1957	324	2	Ew	......	70	1957	M	D	
C31	Tom Lamar	do	1948	256	2	Ew	......	50	1948	C	D	
C32	A. P. Newsom	do	1954	200	2	Ew	......	15	1954	J	D,S	
C33	Tom Cox	do	1956	180	2	Ew	......	50	1956	J	D	
C34	L. R. Dickerson	do	1948	150	2	Ew	......	50	1948	C	D	
C35	C. O. Womack	do	1959	318	2	Ew	......	70	1959	J	D	
C36	Roy Tutor	do	1958	208	2	Ew	......	50	1958	J	D	
C37	Tobe Clark	C. E. Hill	1958	250	4	Ew	......	3	1958	J	D,S	
C38	Archie Thompson	Charles P. Lovorn	1953	203	2	Ew	......	7	1953	J	D	
C39	B. W. Miller	do	1959	198	2	Ew	......	40	1959	J	D	
C40	Emmett Rasberry	do	1952	210	2	Ew	......	32	1952	J	D	
C41	J. B. Rasberry	do	1956	212	2	Ew	......	30	1956	J	D	
C42	H. P. Bollinger	do	1960	200	2	Ew	......	50	1960	J	D	
C43	Powell Mills	Smith	1955	220	5	Ew	......	30	1955	C	D,S	

C44	L. C. Cowsert	Charles P. Lovorn	1952	206	2	Ew	......	50	1952	J	D,S	
C45	Baxter Mills	Smith	1956	220	......	Ew	......	......	......	J	D	
C46	L. J. Henry	Charles P. Lovorn	1952	192	2	Ew	......	30	1952	J	D,S	
C47	V. F. W. Club	do	1960	200	2	Ew	......	50	1960	C	D	
C48	N. T. Wortham		1935	54	......	Ew	320	24.0	2- 6-61	M	D	Bored well.
D1	Town of Bruce	Layne-Central Co.	1959	1,862	16x10	Ktg	315	......	......	T	P	Reported yield 350 gpm in 1959.
D2	E. C. Bratton	C. E. Hill	1954	170	2	Ew	......	......	......	C	D	
D3	R. E. Dye	do	1953	240	2	Ew	......	......	......	C	D,S	
D4	G. E. Ward	do	1954	180	2	Ew	......	80	1954	C	D	Well abandoned.
D5	Doyle Bagwell		1949	32	......	Ew	......	27.5	1-20-61	J	D	Bored well.
D6	E. T. Tims		1948	20	......	Ew	......	1.4	1-20-61	M	D	Bored well.
D7	R. D. Logan		1959	47	......	Ew	......	37	1959	J	D	Bored well.
D8	C. C. Patterson		1954	18	......	Qal	......	2.2	1-20-61	J	D	Dug well.
D9	E. R. Ferguson		......	19	......	Ew	......	16.1	1-20-61	J	D,S	Dug well.
D10	S. T. Hawkins		1950	32	......	Pan	......	29	1950	J	D	Dug well. Supplies 2 families and dairy barn.
D11	Brooks Brasher	R. N. & H. C. Lovelace	1955	1,360	4x2	Ke	......	100	1955	C	D,S	
D12	R. E. Swanson	Ray Leeper	1955	1,400	4x2	Ke	......	30	1955	C	D	
E1	Earl Aron	Robert S. Ashby	1946	450	4	Kr	......	......	......	M	D	
E2	Roy Young	do	1948	400	4	Kr	......	......	......	M	D	
E3	B. J. Collums	do	1959	405	4	Kr	......	20	1959	J	D	Supplies 2 families.
E4	J. M. Murphy		1940	450	4	Kr	......	......	......	J	D,S	Supplies 4 families.
E5	Roy Chrestman	C. E. Hill	1955	450	4	Kr	......	20	1955	J	D,S	
E6	Clarence Holder	Tom Maxie	1947	460	4	Kr	......	......	......	J	D	
E7	W. L. Moore	C. E. Hill	1955	450	4	Kr	......	35	1955	J	D,S	
E8	R. P. Clarke	Robert S. Ashby	1956	420	4	Kr	......	8	1956	J	D,S	Supplies 3 families and dairy barn.
E9	C. Y. Clarke	Henry Hill	1945	500	4	Kr	......	30	1945	J	D	

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
E10	W. W. Murphree	Smith	1952	640	2	Kr	......	70	1952	J	D	
E11	J. A. Sadler	C. E. Hill	1953	750	4	Kr	......	......	......	C	D	
E12	Fred Burt	Robert S. Ashby	1944	553	4	Kr	......	13	1947	C	D	
E13	D. E. Burt	Tom Maxie	1951	554	4x2	Kr	......	25	1951	J	D	Supplies 3 families.
E14	Delma Williams		1941	455	4	Kr	......	......	......	J	D,S	Supplies residence and dairy barn.
E15	Otis Campbell	C. E. Hill	1955	480	4	Kr	......	......	......	J	D	Supplies 2 families.
E16	Newt Lineberry	Robert S. Ashby	1941	380	4	Kr	......	1.5	1941	M	D	Well once flowed at various times.
E17	H. W. Thorn	R. N. & H. C. Lovelace	1949	574	5	Kr	......	35	1949	C	D,S	Supplies 2 families.
E18	E. G. Lyles	Robert S. Ashby	1936	403	4	Kr	......	20	1936	J	D	Supplies 3 families and store.
E19	J. F. Burt	do	1945	425	4	Kr	......	60	1945	J	D	
E20	J. D. Clark	Henley	1927	375	4	Kr	......	20	1927	J	D	
E21	Van James	Henry Hill	1937	430	4	Kr	......	25	1937	J	D	
E22	W. C. Bailey	Robert S. Ashby	1945	460	4	Kr	......	65	1945	J	D,S	
E23	S. W. Burt	do	1944	600	4	Kr	......	......	......	M	D	
E24	J. A. Burt	do	1926	525	4x2	Kr	......	60	1926	C	D	Supplies 5 families.

E25	D. R. Davis	R. N. & H. C. Lovelace	1952	485	4	Kr	......	31	1952	C	D,S	
E26	Ish Stevenson	do	1948	525	4	Kr	......	100	1948	C	D	
E27	E. E. Chrestman	do	1956	520	4	Kr	......	126	1956	C	D	
E28	J. M. Hannaford	Smith	1960	1,442	4x2	Ke	......	200	1960	C	D	
E29	Webb McCormack	J. W. Webb & Sons	1955	1,443	4x2	Ke	......	200	1955	C	D,S	Supplies 3 families.
E30	Elvis Logan	Ray Leeper	1955	1,410	4x2	Ke	......	......	......	C	D,S	
E31	A. C. Swanson	do	1955	1,410	4x2	Ke	......	40	1955	C	D	
E32	C. R. Easley	do	1957	1,300	4x2	Ke	......	......	......	C	D	
E33	A. C. Brasher	T. M. Parks	1960	1,386	4x2	Ke	......	159	1960	C	D,S	
F1	T. Z. Massey	Charles P. Lovorn	1948	130	2	Ew	305	50	1948	C	D	Supplies 4 families.
F2	G. R. Countiss	do	1956	132	2	Ew	302	50	1956	J	D,S	
F3	G. R. Countiss	do	1957	240	4	Ew	300	65	1957	J	D,S	
F4	Joe Grist	Tom Davis	1936	180	2	Ew	260	12	1936	P	D	
F5	Walter Blaylock	do	1939	180	2	Ew	280	30	1939	C	D,S	
F6	Charlie Clark	Charles P. Lovorn	1959	175	2	Ew	260	8	1959	J	D	
F7	Mary Stewart	do	1960	175	2	Ew	250	12	1960	P	D	Supplies 2 families.
F8	Silas Campbell	do	1945	150	2	Ew	250	12	1945	P	D	
F9	Lester Stone	do	1950	150	2	Ew	253	12	1950	P	D	
F10	Arlis Jenkins	do	1945	145	2	Ew	252	12	1945	J	D	Supplies 2 families.
F11	G. C. Cooner	do	1955	200	4	Ew	252	5	1955	J	S	
F12	G. S. Cox	Everett Smith	1950	160	4	Ew	262	12	1950	J	D,S	
F13	S. T. Wooten		1956	17	......	Qal	250	13.1	1-30-61	J	D	
F14	L. A. Goudelock	Ray Leeper	1958	265	4	Ew	280	28	1958	J	D,S	
F15	N. A. Collins	Charles P. Lovorn	1953	215	2	Ew	280	30	1953	C	D	
F16	S. H. Davis		1960	18	......	Ew	255	8.0	1-30-61	J	D,S	Supplies 4 families and shop.
F17	A. H. Bounds	Robert E. Ratliff	1953	480	2	Ew	445	250	1953	C	D	
F18	R. R. Terry	Luther Ratliff	1955	230	2	Ew	360	40	1955	C	D	Supplies 2 families.
F19	J. M. Stone	Everett Smith	1957	160	4	Ew	385	60	1957	J	D	
F20	T. C. Terry, Sr.	do	1957	160	4	Ew	320	30	1957	J	D	

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level		Method of lift	Use of Water	Remarks
								Above (+) or below lsd (feet)	Date of measurement			
F21	Lillie Carter	do	1951	275	2	Ew	370	......	....	C	D	
F22	I. W. Kennedy Estate	Charles P. Lovorn	1953	235	2	Ew	380	90	1953	C	D	
G1	E. L. Bruce Co.	Carloss Well Co.	1927	1,723	8	Ke	270	35	1955	A	I	Well supplied town of Bruce until 1959; reported yield 700 gpm in 1954.
G2	Layne-Central Co.	Layne-Central Co.	1955	1,771	8x6	Ke	385	157	1955	T	P	Well leased to town of Pittsboro; reported yield 105 gpm in 1955.
G3	Sam Vanlandingham		1950	72	......	Ew	440	68.7	1-19-60	M	D	Bored well.
G4	Ernest Sanders		1952	35	......	Ew	310	15.6	2-28-61	J	D	Dug well.
G5	F. M. McDivitt	Charles P. Lovorn	1956	52	2	Ew	260	30	1956	C	D	
G6	Charlie Goodson	C. E. Hill	1957	425	4	Ew	360	60	1957	C	D	
G7	J. Y. Huffman	Charles P. Lovorn	1956	219	4	Ew	345	40	1956	C	D,S	Supplies 3 families.
H1	Clyde Bailey	R. N. & H. C. Lovelace	1952	530	4	Kr	......	100	1952	C	D	
H2	W. E. Fleming	do	1957	494	4	Kr	......	126	1957	J	D	
H3	M. L. Holder	Smith	1960	520	4	Kr	......	......	....	J	D	
H4	James Holder	R. N. & H. C. Lovelace	1948	475	4	Kr	......	100	1948	J	D	

H5	Rifus	Rifus	1946	400	4	Kr	......	50	1946	C	D	
H6	Bob Fox	Smith	1955	420	4	Kr	......	125	1955	C	D	
H7	Floyd Cook	Robert S. Ashby	1953	388	4	Kr	......	......	......	J	D	
H8	Herman Cook	R. N. & H. C. Lovelace	1948	375	4	Kr	......	60	1948	C	D	
H9	D. R. Alexander	Robert S. Ashby	1947	402	4	Kr	......	......	......	C	D	Supplies 3 families.
H10	G. E. Tedder	Smith	1959	375	4	Kr	......	......	......	J	D	Supplies 3 families.
H11	Jack Inmon	R. N. & H. C. Lovelace	1958	387	4	Kr	......	60	1958	J	D	Supplies 2 residences.
H12	W. B. Austin	do	1958	387	4	Kr	......	60	1958	J	D	Supplies 3 families.
H13	J. Vanlandingham	Robert S. Ashby	1956	1,273	4x2	Ke	......	......	......	C	D,S	Supplies 2 families.
H14	J. L. Williams	H. P. Herndon & Son	1960	1,234	4x2	Ke	......	105	1960	S	D,S	Supplies 2 families.
H15	Jasper Gilder	R. N. & H. C. Lovelace	1949	1,235	4x2	Ke	......	80	1949	S	D,S	
H16	R. E. Nichols	T. M. Parks	1958	1,350	4x2	Ke	......	172	1958	C	D,S	Supplies 3 families and potato washer.
H17	H. D. Young	R. N. & H. C. Lovelace	1949	1,400	4	Ke	......	100	1949	C	D,S,	Supplies 1 family and dairy barn.
H18	Travis Blue	T. M. Parks	1958	1,360	4x2	Ke	400	172	1958	C	D,S	Supplies residence and chicken houses.
H19	C. L. Nichols	R. N. & H. C. Lovelace	1958	1,335	4x2	Ke	......	126	1958	J	D	Supplies 2 residences.
H20	E. M. Holder		......	20	......	Pan	......	5.6	1-19-61	C	D	Dug well.
H21	S. B. Alexander		1943	20	......	Pan	......	16.9	1-13-61	J	D	Dug well.
H22	Clifton Bailey		1945	27	......	Pan	......	12.7	1-19-61	J	D,S	Dug well.
H23	Alma Dye		1927	21	......	Pan	......	16.4	1-19-61	M	D	Dug well.
H24	Floyd Murphree		......	33	......	Pan	......	21.4	1-19-61	M	D	Dug well.
H25	T. L. Parker		......	25	......	Pan	......	12.9	1-19-61	J	D	Dug well.
H26	B. F. Parker	Robert E. Ratliff	1960	96	2	Ew	......	......	......	J	D	
H27	Lulu Barnett	Charles P. Lovorn	1958	105	2	Ew	......	......	......	C	D	Supplies 3 families.
H28	J. M. Lester	do	1952	95	2	Ew	......	70	1952	C	D	
J1	C. E. Blaylock	Luther Ratliff	1955	123	2	Ew	248	7	1955	J	D,S	Supplies residence and service station.
J2	H. G. Johnson	do	1960	178	2	Ew	245	12	1960	J	D	

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
J3	Allen Litten	do	1955	170	2	Ew	280	70	1955	J	D,S	
J4	O. S. Wells	George Mitchell	1946	112	2	Ew	262	30	1946	J	D,S	Supplies residence and dairy barn.
J5	O. Y. Parker	Bud Bennett	1925	230	2	Ew	245	15	1925	C	D,S	
J6	T. H. Parker	Charles P. Lovorn	1960	242	2	Ew	238	2	1960	J	D	
J7	I. M. Parker	Bud Bennett	1928	260	2	Ew	258	20	1928	J	D,S	
J8	S. A. McGahee		------	385	2	Ew	280	------	------	C	S	
J9	C. B. Boland	Robert E. Ratliff	1947	400	4	Ew	280	------	------	C	D,S	Supplies 3 families; test hole drilled to 900 feet.
J10	W. E. Chapman	Luther Ratliff	1959	394	2	Ew	325	------	------	J	D,S	
J11	R. C. Burt	do	1958	132	2	Ew	297	------	------	J	D	
J12	J. L. Wyatt	Charles P. Lovorn	1953	210	4x2	Ew	400	40	1953	C	D	
J13	Jewell Wyatt	Cooper & Gregg	1960	110	4	Ew	405	19	1960	J	D	
K1	Calhoun City	Layne-Central Co.	1928	1,902	8x6	Ktg	280	38	1958	T	P	Reported yield 167 gpm in 1954.
K2	Calhoun City	do	1954	1,899	12x8	Ktg	265	45	1958	T	P	Reported yield 250 gpm in 1954.

K3	Calhoun County Bd. of Supervisors		1928	1,807	-----	Ktg	285	-----	-------	---	P	Drilled for school supply at Derma; abandoned in 1956.
K4	Town of Derma	Robert E. Ratliff	1956	1,993	6x4	Ktg	280	60	1956	T	P	Reported yield 162 gpm in 1957.
K5	Doff Sheffield	R. N. & H. C. Lovelace	1952	1,640	4x2	Ke	320	70	1952	C	D	
K6	Tom Taylor	Robert E. Ratliff	1952	1,440	3x2	Ke	270	40	1952	J	D,S	
K7	J. P. Hannaford	Charles P. Lovorn	1954	265	2	Pan	325	100	1954	C	D	
K8	C. M. Pilgreen	do	1956	149	2	Ew	340	45	1956	C	D,S	Supplies 3 families.
K9	Q. R. Troy	Luther Ratliff	1952	125	4	Ew	285	14	1952	J	D	Supplies residence and saw mill.
K10	J. B. Spruill	Charles P. Lovorn	1957	155	2	Ew	280	55	1957	C	D	
K11	H. D. Harrelson	do	1956	132	2	Ew	285	60	1956	C	D	Supplies 2 residences.
K12	J. A. Bryant	do	1954	185	2	Ew	325	40	1954	C	D,S	
K13	R. D. Hutson	do	1956	200	4	Ew	330	60	1956	C	D	Well abandoned.
K14	Glenn Goodson	Luther Ratliff	1956	176	2	Ew	330	75	1956	C	D,S	
K15	R. C. Murphree	do	1956	150	2	Ew	265	50	1956	J	D,S	
K16	Albert Cozart	do	1956	178	2	Ew	325	75	1956	C	D	
K17	Guy Bryars	do	1957	136	2	Ew	284	-----	-------	J	D	
K18	Bryan Griffin	do	1957	120	4	Ew	265	35	1957	J	D	
K19	W. M. Johnson	Charles P. Lovorn	1956	88	2	Ew	245	20	1956	J	D	
K20	Upton Cole	Luther Ratliff	1957	120	2	Ew	255	-----	-------	J	D	
K21	Nell Luther		1960	19	-----	Qal	248	1.0	3- 1-61	N	D	Dug well.
L1	Town of Vardaman		1912	1,195	-----	Ke	325	30	1912	---	P	Well destroyed. W.S.P. 576, pp. 96-97.
L2	Town of Vardaman	Layne-Central Co.	1931	1,857	6x2½	Ktc	-----	43	1940	T	P	Well not in use; reported yield 40 gpm in 1960.

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
L3	Town of Vardaman	Delta Drilling Co.	1957	1,906	8x4	Ktc	......	50	1957	S	P	Reported yield 290 gpm in 1960.
L4	R. R. Gilder, Sr.	R. N. & H. C. Lovelace	1950	1,200	4x2	Ke	......	50	1950	C	D,S	Supplies 4 families, dairy barn and potato washer.
L5	J. R. Penick, Jr.	T. M. Parks	1959	1,222	4x2	Ke	......	172	1959	C	D,S	Supplies 2 families and potato washer.
L6	Charles Penick	R. N. & H. C. Lovelace	1957	1,200	4x2	Ke	......	50	1957	J	D	
L7	J. Blue	do	1953	1,505	4x2½	Ke	280	50	1953	J	D,S	
L8	C. H. Morgan	H. P. Herndon & Son	1958	1,353	4x2	Ke	......	80	1958	J	D,S,	Supplies residence and dairy barn.
L9	Burton Allen	Robert S. Ashby	1956	1,347	4x2	Ke	......	60	1956	C	D,S	Supplies residence and dairy barn.
L10	S. T. Dendy	R. N. & H. C. Lovelace	1954	1,512	4x2	Ke	......	60	1954	J	D,S	
L11	J. E. Morgan	H. P. Herndon & Son	1960	1,260	4x2	Ke	......	150	1960	S	D	Supplies residence and dairy barn.
M1	H. H. Holland	Ross Doolittle	1948	160	2	Ew	340	40	1948	C	D,S	Supplies residence and dairy barn.

M2	Ross Doodlittle	do	1948	85	2	Ew	340	40	1948	C	D,S	
M3	Harry Denton	Charles P. Lovorn	1955	219	2	Ew	275	18	1955	J	D,S	
M4	Ernest Pittman	George Mitchell	1945	155	2	Ew	300	40	1945	C	D,S	
M5	J. M. Denton	Charles P. Lovorn	1945	190	2	Ew	340	60	1945	C	D,S	
M6	Russell Denton	Dolar & Gregg	1960	230	4	Ew	290	30	1960	J	D,S	
M7	N. G. Phillips	Charles P. Lovorn	1950	145	2	Ew	300	40	1950	C	D	Supplies 2 families.
M8	G. V. Bingham	George Mitchell	1946	185	2	Ew	300	60	1946	J	D,S	Supplies 2 families and dairy barn.
M9	Frank Mister	Robert E. Ratliff	1953	324	2	Ew	240	+	2-28-61	F	D,S	Flowing well; pump supplies house pressure.
M10	J. Z. Pryor	Charles P. Lovorn	1956	260	2	Ew	300	70	1956	C	D,S	
M11	William Barnett	do	1956	240	2	Ew	320	40	1956	J	D	Supplies 2 families.
M12	J. W. Black	do	1955	262	2	Ew	345	114	1955	C	D	
M13	Travis England	do	1959	265	2	Ew	305	45	1959	J	D	
M14	J. R. Weeks	Cooper & Dolar	1955	160	2	Ew	340	-----	-------	C	D,S	
M15	W. B. Wright	Charles P. Lovorn	1949	180	2	Ew	305	25	1949	C	D,S	Supplies 7 families and dairy barn.
N1	J. F. May	Charles P. Lovorn	1950	70	2	Ew	360	30	1950	C	D	
N2	Kelso Spencer	J. A. Spencer	1955	150	2	Ew	345	75	1955	C	D,S	
N3	Jerome West	Robert E. Cooper	1957	125	4	Ew	300	40	1957	J	D,S	
N4	H. J. West	Ross Doolittle	1953	108	2	Ew	330	20	1953	J	D,S	Supplies 2 families.
N5	Cecil Dolar	Robert E. Cooper	1952	125	3	Ew	320	35	1952	J	D,S	
N6	L. S. Hamilton	do	1955	148	4	Ew	350	60	1955	J	D,S	
N7	Lee Vance	Ross Doolittle	1953	165	4	Ew	340	-----	-------	J	D	Supplies residence and chicken houses.
N8	Hicks West	Cooper & Gregg	1958	150	4	Ew	285	-----	-------	J	D,S	
N9	A. W. Carrol	Charles P. Lovorn	1960	132	2	Ew	340	40	1960	J	D	Supplies store and Slate Springs post office.

TABLE 5.—(CONTINUED)

Well No.	Owner	Driller	Date Completed	Depth of Well (ft.)	Diameter of Well (in.)	Water-bearing Unit	Altitude of lsd (ft.)	Water Level: Above (+) or below lsd (feet)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
N10	Rufus Hardin	Ross Doolittle	1954	150	4	Ew	340	50	1954	J	D,S	
N11	M. A. Lovorn	Charles P. Lovorn	1950	275	2	Ew	340	50	1950	C	D,S	
N12	John Hardin	Cooper & Gregg	1959	110	4	Ew	262	1.5	1959	J	D	Supplies residence and chiken houses.
N13	O. L. Love	Ross Doolittle	1955	80	2	Ew	263	2	1955	J	D,S	
N14	B. B. Hood	Cooper & Gregg	1959	140	4	Ew	300	60	1959	J	D,S	
N15	H. D. Box	Robert E. Cooper	1958	105	4	Ew	305	----	----	J	D	
N16	Erving Funderburg	Luther Ratliff	1956	120	2	Ew	238	20	1956	J	D	Supplies 2 families.
N17	D. H. McPhail	Charles P. Lovorn	1951	150	2	Ew	250	13	1951	C	D,S	
N18	B. F. Funderburg	do	1960	112	2	Ew	243	20	1960	J	D	Supplies 2 families.
N19	Max Puttman	Spencer & Clayton	1952	272	2	Ew	280	42	1952	J	D,S	
N20	J. G. Barton	Charles P. Lovorn	1946	140	2	Ew	320	60	1946	C	D,S	
N21	Harley Jones	Cooper & Gregg	1960	140	2	Ew	300	2	1960	J	D	
N22	J. G. Puttman	Robert E. Cooper	1948	65	2	Ew	255	1	1948	J	D	
N23	R. P. Shipp	Charles P. Lovorn	1955	135	2	Ew	305	45	1955	J	D,S	Supplies 3 families.
N24	H. O. West	do	1956	152	2	Ew	365	60	1956	J	D	Supplies 2 families.
N25	J. W. McCord	do	1952	143	2	Ew	320	40	1952	J	D	
N26	W. E. Nelms	Cooper & Gregg	1958	107	4	Ew	340	37	1958	J	D	

N27	Charles P. Lovorn	Charles P. Lovorn	1948	130	2	Ew	340	50	1948	C	D	Supplies 2 families.
O1	H. D. Edmondson	R. N. & H. C. Lovelace	1955	1,665	4x2	Ke	......	126	1955	C	D	Supplies 5 families.
O2	Newt Lineberry	do	1954	1,685	4x2	Ke	......	140	1954	C	D	
O3	Eli Reedy	do	1957	1,560	4x2	Ke	......	126	1957	C	D,S	Well abandoned.
O4	Eli Reedy	T. M. Parks	1959	1,608	4x2	Ke	......	180	1959	C	D,S	
O5	J. M. Ferguson	Delta Drilling Co.	1954	2,212	4x2	Ktc	340	165	1954	S	D,S,	Supplies 5 families.
O6	J. E. Wade	H. P. Herndon & Son	1959	1,550	4x2	Ke	......	150	1959	C	D,S	Supplies residence and dairy barn.
O7	Otis Vance	Robert E. Cooper	1957	192	2	Ew	360	60	1957	C	D	
O8	E. A. Enochs	Charles P. Lovorn	1959	133	2	Ew	408	40	1959	J	D	
O9	J. F. Sims	do	1957	99	2	Pan	390	50	1957	J	D	
O10	T. F. Peacock	Robert E. Ratliff	1952	100	4	Pan	290	40	1952	J	D	Test hole drilled to 350 feet.
O11	C. M. Hardin	Ross Doolittle	1953	106	3	Pan	285	30	1953	C	D	Test hole drilled to 450 feet. Supplies 2 families.
O12	Boyce Jones		1915	30	......	Pan	......	20.1	1-13-61	N	D	Dug well.

TEST HOLE RECORDS

Test Hole 1

Location: Southeast of State Highway 9 in the area between a segment of old State Highway 9 and a road south approximately 215 feet south of the junction of these roads and 35 feet west of the road south (NW.¼, SW.¼, Sec.12, T.11 S., R.1 W.).

Elevation: 414 feet (approx.) Date: April 10, 1961

Thickness (feet)	Depth (feet)	Description
2.0	2.0	Soil and subsoil, clay, red-brown, sandy; contains residuum from weathered bauxite in lower part.
		Wilcox group (undifferentiated)
3.5	5.5	Bauxite, hard; consists of tan to brown pisolites in a brownish-black, sandy, ferruginous matrix
1.0	6.5	Bauxite or bauxitic clay, yellow to brown, pisolitic; contains some ferruginous material mixed
3.0	9.5	Bauxitic or kaolinitic clay, white to yellow, soft, pisolitic (?); contains some ferruginous material in upper part
2.0	11.5	Kaolinitic clay, white, soft; stained in part with iron oxide
2.5	14.0	Sandy clay or clayey sand, yellow to red; contains some ferruginous material mixed
13.0	27.0	Clay, bluish-white, kaolinitic, soft; slightly sandy in upper part becoming very sandy in lower part.
		Naheola formation
3.0	30.0	Clay, dark-gray, silty, finely muscovitic.

Test Hole 2

Location: Just southeast of the right-of-way line for State Highway 9 approximately 75 feet northeast of the junction of a segment of old State Highway 9 and a road south and 70 feet southeast of the center line of State Highway 9 (SW.¼, NW.¼, Sec.12, T.11 S., R.1 W.).

Elevation: 419 feet (approx.) Date: April 11, 1961

Thickness (feet)	Depth (feet)	Description
4.5	4.5	Soil and subsoil, clay, red-brown, sandy.
		Wilcox group (undifferentiated)
2.0	6.5	Clay, yellow to brown; contains much ferruginous material mixed; thin ironstone layer at base
2.5	9.0	Bauxitic or kaolinitic clay, light-gray mottled yellow and red, slightly sandy, pisolitic (?)
1.5	10.5	Ironstone, brown, hard

1.5	12.0	Clay, yellow, sandy, bauxitic (?); contains ferruginous material mixed. Cored interval — poor recovery
7.5	19.5	Clay, light-gray to white, kaolinitic, sandy. Cored interval — poor recovery.
		Naheola formation
10.0	29.5	Clay, gray to dark-gray, silty, finely muscovitic
58.0	87.5	Clay or clay shale, dark-gray, very silty, finely muscovitic; contains some very muscovitic fine sand
0.4	87.9	Clay, dark-gray, silty, compact
48.1	136.0	Clay or clay shale, dark-gray, very silty, finely muscovitic; contains some very muscovitic fine sand.
		Porters Creek formation (?)
34.0	170.0	Clay, dark-gray, slightly silty, waxy, compact, sparingly and finely muscovitic.

TEST HOLE 3

Location: On the west side of a house approximately 315 feet west of the center of State Highway 331 and 65 feet north of a road west (SW.¼, SE.¼, Sec.6, T.11 S., R.1 W.).

Elevation: 541 feet (approx.) Date: April 18, 1961

Thickness (feet)	Depth (feet)	Description
3.0	3.0	Soil and subsoil, clay, red-brown, sandy.
		Wilcox group (undifferentiated)
3.0	6.0	Silty clay or clayey silt, yellow to brown, sandy; contains much ferruginous material mixed
6.0	12.0	Silt and fine sand, light-gray to tan, muscovitic; stained yellowish with iron oxide
1.0	13.0	Clay, chocolate, plastic, lignitic
4.5	17.5	Silt and fine sand, light-gray to tan, muscovitic; stained yellowish with iron oxide
3.0	20.5	Clay, chocolate to brownish-black, very lignitic
4.5	25.0	Clay, gray, plastic, silty
9.5	34.5	Silt, greenish-gray, clayey, finely muscovitic; contains streaks of fine sand
0.5	35.0	Clay, brownish-gray, plastic, lignitic
0.8	35.8	Iron carbonate, light-gray, hard; contains 2-inch seam of soft clay in middle of bed
4.2	40.0	Clay, dark-gray, slightly silty, lignitic (leaf bearing)
2.5	42.5	Clay, dark greenish-gray, slightly silty
1.5	44.0	Clay, dark brownish-gray, silty, lignitic, contains thin streaks of lignite
9.0	53.0	Silt and fine sand, dark greenish-gray, clayey

3.0	56.0	Clay, dark-gray to brownish-black, slightly silty, plastic, lignitic; contains thin streaks of lignite
1.0	57.0	Lignite, brownish-black, soft
1.5	58.5	Clay, dark brownish-gray, slightly silty, plastic
17.5	76.0	Clay, greenish-gray, very silty, finely muscovitic
4.0	80.0	Clay, greenish-gray, slightly silty, plastic
2.0	82.0	Lignite, brownish-black, soft
5.0	87.0	Clay, gray, slightly silty, plastic
2.0	89.0	Clay, gray, very silty, sandy, finely muscovitic
6.0	95.0	Sand, gray, fine-grained, very silty, finely muscovitic
5.0	100.0	Clay, gray to brownish-gray, slightly silty, plastic
2.0	102.0	Clay, brownish-black, compact, very lignitic
2.0	104.0	Clay, brownish-gray, slightly silty, plastic, lignitic
6.0	110.0	Clay, dark-gray, silty
5.0	115.0	Clay, greenish-gray, very silty
5.0	120.0	Clay, gray to dark brownish-gray, slightly silty, plastic; contains thin streaks of lignite
4.0	124.0	Clay, gray, slightly silty, plastic
4.0	128.0	Clay, dark-gray to dark brownish-gray, slightly silty, plastic
2.0	130.0	Lignite, brownish-black, soft
1.5	131.5	Clay, dark brownish-gray, slightly silty, plastic
11.5	143.0	Clay, greenish-gray, very silty
7.0	150.0	Clay, gray to dark brownish-gray, slightly silty, plastic; contains thin streaks of lignite
3.0	153.0	Clay, gray, slightly silty, plastic
5.0	158.0	Clay, gray, very silty; contains thin streaks of lignite
2.0	160.0	Sand, gray, fine-grained, very silty
2.0	162.0	Lignite, brownish-black, soft
12.0	174.0	Clay, gray, slightly silty, plastic
5.0	179.0	Clay, gray, silty
5.0	184.0	Clay, gray, very silty, sandy
16.0	200.0	Clay, dark brownish-gray, silty
1.0	201.0	Clay, greenish-gray, silty
3.0	204.0	Sand, dark-gray, fine-grained, very silty, finely muscovitic
3.0	207.0	Clay, dark greenish-gray, sandy
6.0	213.0	Sand, gray, fine- to medium-grained, sparingly muscovitic
10.0	223.0	Sand, gray, fine-grained, silty; contains streaks of gray clay
8.0	231.0	Sand, gray, fine-grained, very silty, muscovitic
9.0	240.0	Clay, dark brownish-gray, muscovitic, slightly silty
15.0	255.0	Clay, dark-gray, silty, muscovitic; greenish-gray waxy clay.
		Naheola formation
64.0	319.0	Clay, dark-gray to black, silty, very muscovitic

1.0	320.0	Iron carbonate, buff, hard
10.0	330.0	Clay, dark-gray to black, silty, very muscovitic.

Test Hole 4

Location: In a clearing at the top of a southwest spur of the main south trending ridge and just north of a large white oak marked by three ax cuts (SE.¼, NE.¼, Sec.11, T.11 S., R.1 W.). The lower part of the spur forms a bluff on the west facing valley wall of a head branch of Otoucalofa Creek just above a lignite outcrop in the branch bottom (See location of lignite on the Head property as described under "Lignite.").

Elevation: 533 feet (approx.) Date: April 21, 1961

Thickness (feet)	Depth (feet)	Description
2.0	2.0	Soil and subsoil, clay, red-brown, sandy.
		Wilcox group (undifferentiated)
2.0	4.0	Silt, gray mottled yellow and red, clayey, finely muscovitic
0.5	4.5	Ironstone, brownish-black, hard
2.5	7.0	Silt, gray mottled yellow to tan, sandy, finely muscovitic
72.0	79.0	Sand, yellow, fine-grained, silty, mealy-textured, muscovitic, speckled with an abundance of black grains
3.0	82.0	Sand, greenish-gray; same as unit above except darker in color
7.0	89.0	Lignite, brownish-black, soft. Cored interval—no recovery. Poor samples indicate that the lower few feet are clayey
3.0	92.0	Clay, gray, silty. Cored interval—good recovery.

Test Hole 5

Location: On the northwest side of a southwest trending dim log road approximately 225 feet southwest from the main south trending ridge road and just northwest of an old house site (NW.¼, NW.¼, Sec.12, T.11 S., R.1 W.). The location is about 0.5 mile south of the old Sarepta to Water Valley road.

Elevation: 548 feet (approx.) Date: April 24, 1961

Thickness (feet)	Depth (feet)	Description
2.5	2.5	Soil and subsoil, clay, red-brown, sandy.
		Wilcox group (undifferentiated)
0.5	3.0	Ironstone, brownish-black, hard
2.0	5.0	Clayey sand or sandy clay, gray mottled tan, finely muscovitic
3.0	8.0	Clay, gray mottled yellow and red, sandy

2.0	10.0	Sand, yellow, fine-grained, silty, muscovitic; contains thin streaks of gray clay; speckled with an abundance of black grains
30.0	40.0	Sand, light-gray to buff, fine-grained, muscovitic; contains streaks of light-gray clay
28.0	68.0	Sand, yellow to tan, fine- to coarse-grained, sparingly muscovitic
1.5	69.5	Lignite, brownish-black, soft
9.5	79.0	Clay, gray, slightly sandy, plastic
9.0	88.0	Clay, dark-gray to black, very silty, lignitic
2.0	90.0	Clay, dark greenish-gray, waxy, silty.

Test Hole 6

Location: At top of hill in the bed of a road south approximately 165 feet south of the junction of this road and a northwest-southeast trending road (SW.¼, SE.¼, Sec.24, T.11 S., R.3 W.).

Elevation: 478 feet (approx.) Date: April 25, 1961

Thickness (feet)	Depth (feet)	Description
2.0	2.0	Soil and subsoil, clay, tan to brown, sandy.
		Wilcox group (undifferentiated)
0.7	2.7	Ironstone, brown, hard
3.3	6.0	Sand, light-gray to tan, fine-grained, silty, finely muscovitic; contains ferruginous material mixed
2.0	8.0	Sand, light-gray, fine-grained, very silty, finely muscovitic
1.0	9.0	Clayey silt or silty clay, light-gray, finely muscovitic
2.0	11.0	Clay, light-gray, silty
1.0	12.0	Clay, chocolate, silty, lignitic
2.0	14.0	Clay, light-gray, silty
1.0	15.0	Clay, gray to dark brownish-gray, slightly sandy, plastic, very lignitic
4.0	19.0	Clay, gray, sandy, plastic
1.0	20.0	Clay, light-gray, mottled yellow, very sandy
3.0	23.0	Sand, light-gray, fine-grained, very silty
4.0	27.0	Clay, tan to chocolate, silty, lignitic
4.0	31.0	Clay, chocolate, silty; contains thin streaks of sand
1.0	32.0	Sand, light-gray, fine-grained, very silty, finely muscovitic
2.0	34.0	Sand, tan, fine-grained, silty, finely muscovitic; streaks of greenish-gray silty clay
4.0	38.0	Clay, gray mottled yellowish, very silty
7.0	45.0	Clay, dark bluish-gray, very silty
1.5	46.5	Iron carbonate, buff, hard
2.5	49.0	Sand, light-gray, fine-grained, very silty, muscovitic
1.0	50.0	Clay, light-gray, silty.

TEST HOLE 7

Location: On the northwest side of a southwest trending road (old Banner to Water Valley road) approximately 20 feet from the center of the road and 120 feet west of the center of the junction of a road northeast (SE.¼, SW.¼, Sec.14, T.11 S., R.3 W.).

Elevation: 508 feet (approx.) Date: May 4, 1961

Thickness (feet)	Depth (feet)	Description
3.0	3.0	Soil and subsoil, sand, red-brown, coarse-grained, silty; contains some ferruginous material mixed.
		Meridian formation
2.5	5.5	Sand, red-brown, coarse-grained
1.5	7.0	Sand, tan, coarse- to very coarse-grained
1.5	8.5	Sand, red-brown, coarse- to very coarse-grained; contains some ferruginous material mixed.
		Wilcox group (undifferentiated) (?)
2.5	11.0	Clay, white mottled yellow to tan, sandy
5.0	16.0	Clay, white mottled red, yellow and purple, sandy
10.0	26.0	Sandy silt or sandy clay, light-gray mottled yellow to tan; becomes a silty sand in lower part
24.0	50.0	Silty sand or sandy silt, gray, very finely muscovitic, clayey
10.0	60.0	Sand, gray, fine-grained, silty
2.5	62.5	Silty sand or sandy silt, gray, very finely muscovitic, clayey
12.5	75.0	Sand, gray, fine-grained; speckled with an abundance of black grains
2.5	77.5	Sand, gray, fine- to medium-grained
12.5	90.0	Sand, tan, medium- to coarse-grained; contains some white clay
9.0	99.0	Sand, light-gray to tan, coarse- to very coarse-grained; contains thin streaks of gray clay
18.5	117.5	Clay, dark-gray, silty; contains streaks of fine gray sand
2.5	120.0	Clay, dark-gray to dark brownish-gray, slightly sandy, lignitic, plastic
2.5	122.5	Clay, dark brownish-gray, slightly silty; contains thin streaks of lignite
2.5	125.0	Clay, dark-gray, slightly sandy, plastic
18.0	143.0	Silt, dark greenish-gray, sandy, finely muscovitic
7.0	150.0	Clay, dark-gray to brownish-black, slightly silty, plastic, very lignitic
5.0	155.0	Clay, greenish-gray, slightly silty, waxy
8.5	163.5	Silt, dark greenish-gray, sandy, finely muscovitic
0.5	164.0	Ironstone, brown, hard

22.5	186.5	Sand, light-gray to tan, fine-grained, silty, finely muscovitic, some parts appear more silty and are stained yellow to red-brown with iron oxide; speckled with an abundance of black grains
111.5	298.0	Clay, silt and sand mixed: Gray to dark-gray, sandy and silty clay; dark-gray to dark greenish-gray, finely muscovitic, clayey silts; streaks of dark-gray to dark greenish-gray very silty sand
0.5	298.5	Iron carbonate, buff, hard
6.5	305.0	Silt, dark-gray, finely muscovitic, clayey, sandy
5.0	310.0	Silt and clay mixed: Greenish-gray clayey silt; green waxy clay
14.0	324.0	Sand, greenish-gray, fine-grained, silty; speckled with an abundance of black grains
5.5	329.5	Clay, gray, silty
5.5	335.0	Lignite, brownish-black, soft
12.0	347.0	Sand, gray, fine-grained, silty; contains streaks of dark-gray silty clay
1.0	348.0	Lignite, brownish-black, soft
18.0	366.0	Clay, gray to dark brownish-gray, silty; greenish-gray waxy clay; streaks of lignite
36.0	402.0	Sand, gray, fine-grained, silty, finely muscovitic
2.0	404.0	Lignite, brownish-black, soft
33.0	437.0	Clay, gray to dark brownish-gray, silty; greenish-gray waxy clay
2.0	439.0	Lignite, brownish-black, soft
4.0	443.0	Sand, gray, fine-grained, silty
5.0	448.0	Clay, green-gray, waxy
11.0	459.0	Sand, gray, fine-grained, silty
5.0	464.0	Clay, greenish-gray, waxy
8.0	472.0	Sand, gray, fine-grained, silty
22.0	494.0	Clay, gray to dark brownish-gray; silty greenish-gray waxy clay; contains thin streaks of lignite
6.0	500.0	Sand, gray, fine-grained

Test Hole 8

Location: Near the top of a rather high hill approximately 70 feet west of the generally north-south trending ridge road and 95 feet south of a dirt road west. (NE.¼, SE.¼, Sec.14, T.13 S., R.1 E.).

Elevation: 472 feet (approx.) Date: May 8, 1961

Thickness (feet)	Depth (feet)	Description
2.0	2.0	Soil and subsoil, clay, tan to red-brown, silty, muscovitic; contains some ferruginous material mixed.
		Naheola formation
7.0	9.0	Clay, silt and sand mixed: Gray silty clays and clayey silts; contains gray and yellowish muscovitic fine sand

22.0	31.0	Clay, silt and sand mixed: Dark-gray silty clay or clay shale and gray clayey silt; contains some yellowish muscovitic fine sand
49.0	80.0	Clay or clay shale: Dark bluish-gray silty clay or clay shale; contains some gray muscovitic fine sand
40.0	120.0	Clay, dark-gray, slightly silty to silty, compact, finely muscovitic.
		Porters Creek formation (?)
30.0	150.0	Clay, gray to dark-gray, compact, waxy; contains occasional thin streaks of white soft iron carbonate clay in upper part.

Test Hole 9

Location: Approximately 50 feet northeast of the center of the junction of the generally north-south trending ridge road and a dirt road east (NE.¼, NE.¼, Sec.24, T.13 S., R.1 W.).

Elevation: 434 feet (approx.) Date: May 10, 1961

Thickness (feet)	Depth (feet)	Description
2.0	2.0	Soil and subsoil, clay, brown, sandy.
		Wilcox group (undifferentiated)
4.0	6.0	Sandy clay or clayey sand, light-gray mottled tan to brown
10.0	16.0	Sand, tan to brown, fine-grained, silty; speckled with an abundance of black grains; contains thin streaks of light-gray clay
13.0	29.0	Sand, light-gray to tan, fine-grained, very silty; speckled with an abundance of black grains
8.0	37.0	Sandy clay or clayey sand, light-gray, silty
45.0	82.0	Sand, light-gray to tan, fine-grained, very silty; speckled with an abundance of black grains; stained in part with iron oxide; contains some ferruginous material mixed
2.0	84.0	Loose sand or a cavity; much ferruginous material
34.0	118.0	Sand, light-gray to white, very fine-grained.
		Naheola formation
70.0	188.0	Clay, silt and sand mixed: Dark-gray silty clays or clay shale; contains some gray muscovitic fine sand
42.0	230.0	Clay or clay shale, silty, compact, contains some gray muscovitic fine sand.
		Porters Creek formation (?)
40.0	270.0	Clay, gray to dark-gray, compact, waxy; contains occasional thin streaks of white soft iron carbonate clay in upper part.

Test Hole 10

Location: On the southwest side of a southeast trending road approximately 0.25 mile southeast of the junction of this road and the road from Pittsboro to Bounds (SW.¼, NE.¼, Sec.25, T.13 S., R.2 W.).

Elevation: 475 feet (approx.) Date: May 16, 1961

Thickness (feet)	Depth (feet)	Description
2.0	2.0	Soil and subsoil, sand, tan to brown, coarse-grained, very clayey.
		Wilcox group (undifferentiated)
2.5	4.5	Clay, light-gray mottled yellow and red, slightly sandy, plastic
10.0	14.5	Silty clay or clayey silt, light-gray to yellow; sandy in part; contains some ferruginous material mixed
4.0	18.5	Silt, brown, clayey, finely muscovitic
9.5	28.0	Clay, gray, silty
0.5	28.5	Lignite, brownish-black, soft
2.0	30.5	Clay, gray to dark-gray, lignitic, slightly silty
8.5	39.0	Clay, greenish-gray, slightly silty
2.5	41.5	Clay, gray to dark-gray, slightly silty, plastic
3.3	44.8	Lignite, brownish-black, soft
1.7	46.5	Clay, gray, silty
2.5	49.0	Clay, light greenish-gray, slightly silty, plastic
5.5	54.5	Clay, greenish-gray, silty, sandy
8.5	63.0	Silt, greenish-gray to dark-gray, clayey, sandy
3.0	66.0	Clay, gray, silty
12.0	78.0	Clay, dark brownish-gray to brownish-black, slightly silty, lignitic
14.5	92.5	Silt, dark greenish-gray, clayey, finely muscovitic
2.5	95.0	Lignite, brownish-black, soft
2.0	97.0	Clay, dark brownish-gray, silty
5.0	102.0	Silt, dark greenish-gray, clayey, finely muscovitic
12.0	114.0	Clay, gray, slightly silty
5.0	119.0	Clay, gray, slightly silty; contains streaks of white soft iron carbonate clay
2.5	121.5	Lignite, brownish-black, soft
2.5	124.0	Clay, gray, silty
6.0	130.0	Clay, dark-gray, very silty
7.0	137.0	Sand, gray, fine-grained, silty
4.5	141.5	Clay, dark-gray, silty, lignitic
4.5	146.0	Lignite, brownish-black, soft
8.0	154.0	Clay, dark-gray to dark brownish-gray, silty, lignitic
5.0	159.0	Clay, dark-gray, slightly silty
1.0	160.0	Lignite, brownish-black, soft

9.0	169.0	Silt, dark-gray, finely muscovitic
9.5	178.5	Clay, dark-gray, slightly silty, lignitic
2.0	180.5	Lignite, brownish-black, soft
3.5	184.0	Clay, dark-gray, silty
16.0	200.0	Clay, greenish-gray, very silty
2.5	202.5	Clay, dark-gray to dark brownish-gray, slightly silty, lignitic
2.5	205.0	Lignite, brownish-black, soft
22.0	227.0	Clay, dark-gray, slightly silty
7.0	234.0	Clay, dark-gray, very silty, finely muscovitic
4.0	238.0	Clay, dark-gray, silty
13.0	251.0	Clay, dark brownish-gray, very silty, finely muscovitic
11.0	262.0	Sand, gray, fine-grained, silty
63.0	325.0	Sand, gray, fine-grained, finely muscovitic.
		Naheola formation
55.0	380.0	Clay, silt and sand mixed: Dark-gray silty clay or clay shale; some very muscovitic fine sand.

Test Hole 11

Location: About 32 feet west of the center of the road from Bounds to Retreat 0.6 mile southwest of Bounds and 0.1 mile south of the junction of a dirt road northwest at Bounds Cave (NW.¼, NW.¼, Sec.4, T.24 N., R.8 E.).

Elevation: 455 feet (approx.) Date: May 21, 1961

Thickness (feet)	Depth (feet)	Description
4.0	4.0	Soil and subsoil, sandy clay or clayey sand, tan to brown, silty.
		Meridian formation (?)
2.0	6.0	Clayey sand, tan to red-brown, very silty
4.0	10.0	Sand, tan to red-brown, fine- to medium-grained, rusty; contains some ferruginous material mixed
10.0	20.0	Sand, yellow to red-brown, fine- to medium-grained; contains some fairly large flakes of muscovite.
		Wilcox group (undifferentiated)
100.0	120.0	Sand, white, fine- to medium-grained; contains some streaks of coarse sand
35.0	155.0	Sand, white, coarse- to very coarse-grained; becomes coarser in lower parts and contains streaks of pink sand. Basal parts are rusty and stained yellowish with iron oxide.
1.5	156.5	Sand, yellow, fine-grained, silty; contains streaks of white sandy silt or clay
0.5	157.0	Ironstone, brownish-black, hard
22.0	179.0	Sand, yellow, fine-grained, silty; contains streaks of red silty sand and white sandy silt or clay

0.5	179.5	Ironstone, brownish-black, hard
85.5	265.0	Sand, yellow, fine-grained, silty; contains streaks of red silty sand and white sandy silt or clay
1.5	266.5	Lignite, brownish-black, soft
19.0	285.5	Clay, gray, silty, sandy
1.5	287.0	Lignite, brownish-black, soft
3.0	290.0	Clay, gray, silty
3.0	293.0	Lignite, brownish-black, soft
7.0	300.0	Clay, greenish-gray, silty
7.0	307.0	Clay, dark-gray, silty
2.0	309.0	Lignite, brownish-black, soft
11.0	320.0	Sandy silt or silty sand, gray to dark-gray, finely muscovitic
10.0	330.0	Silty clay or clayey silt, dark-gray, finely muscovitic
12.0	342.0	Clay, dark-gray, silty
0.5	342.5	Iron carbonate, buff, hard
7.5	350.0	Clay, dark-gray, silty.

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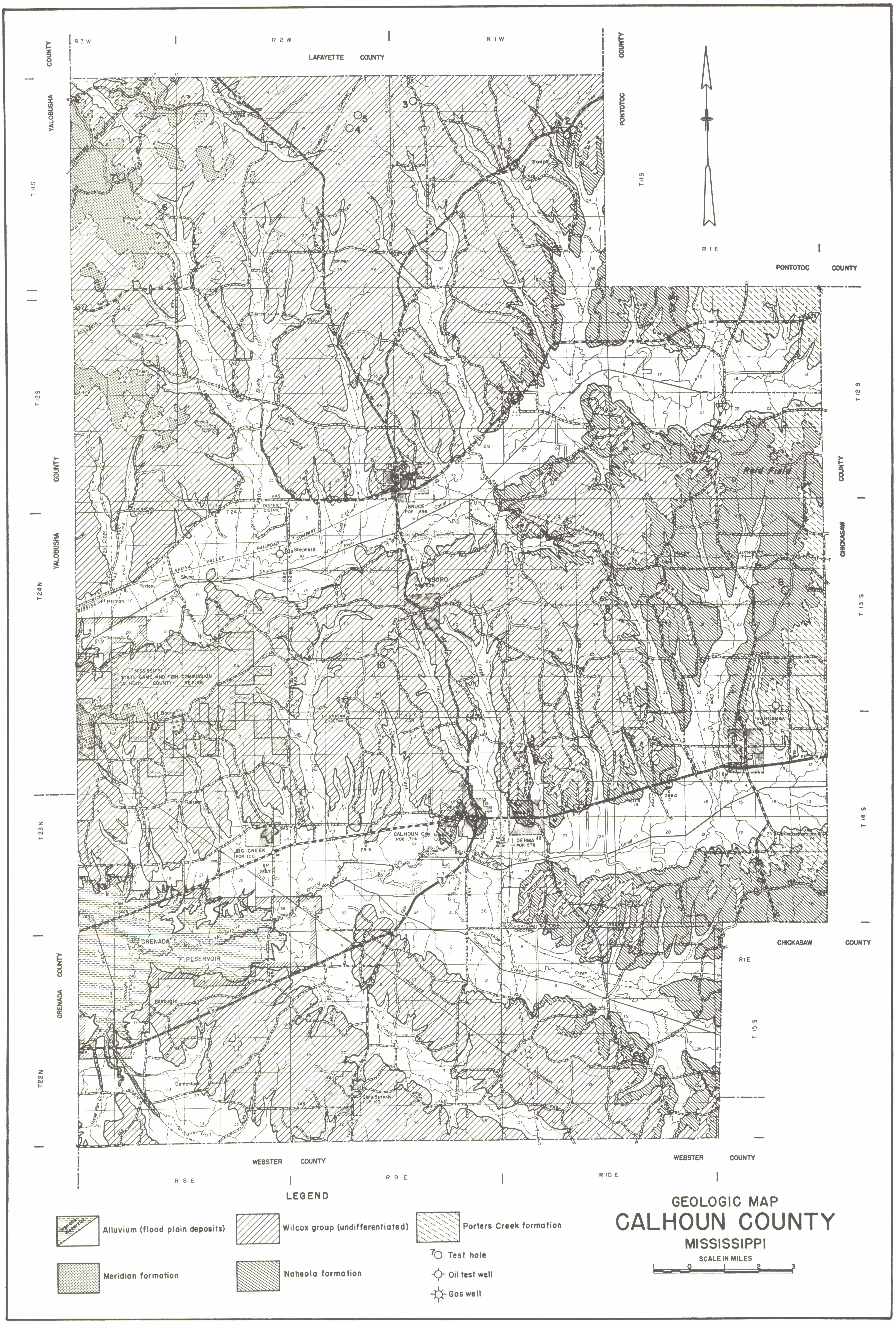
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CHICKASAW COUNTY
GRENADA COUNTY
WEBSTER COUNTY
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BRUCE
POP. 1,698
PITTSBORO
CALHOUN CITY
POP. 1,714
DERMA
POP. 578
BIG CREEK
POP. 100
VARDAMAN
Reid Field
GRENADA
RESERVOIR
MISSISSIPPI STATE GAME AND FISH COMMISSION
CALHOUN COUNTY REFUGE
SKUNA VALLEY
Shepherd
Skuna
Pittman
Banner
Sabougla
Slate Springs
LEGEND
Alluvium (flood plain deposits)
Grenada Reservoir
Wilcox group (undifferentiated)
Porters Creek formation
Meridian formation
Naheola formation
Test hole
Oil test well
Gas well
GEOLOGIC MAP
CALHOUN COUNTY
MISSISSIPPI
SCALE IN MILES
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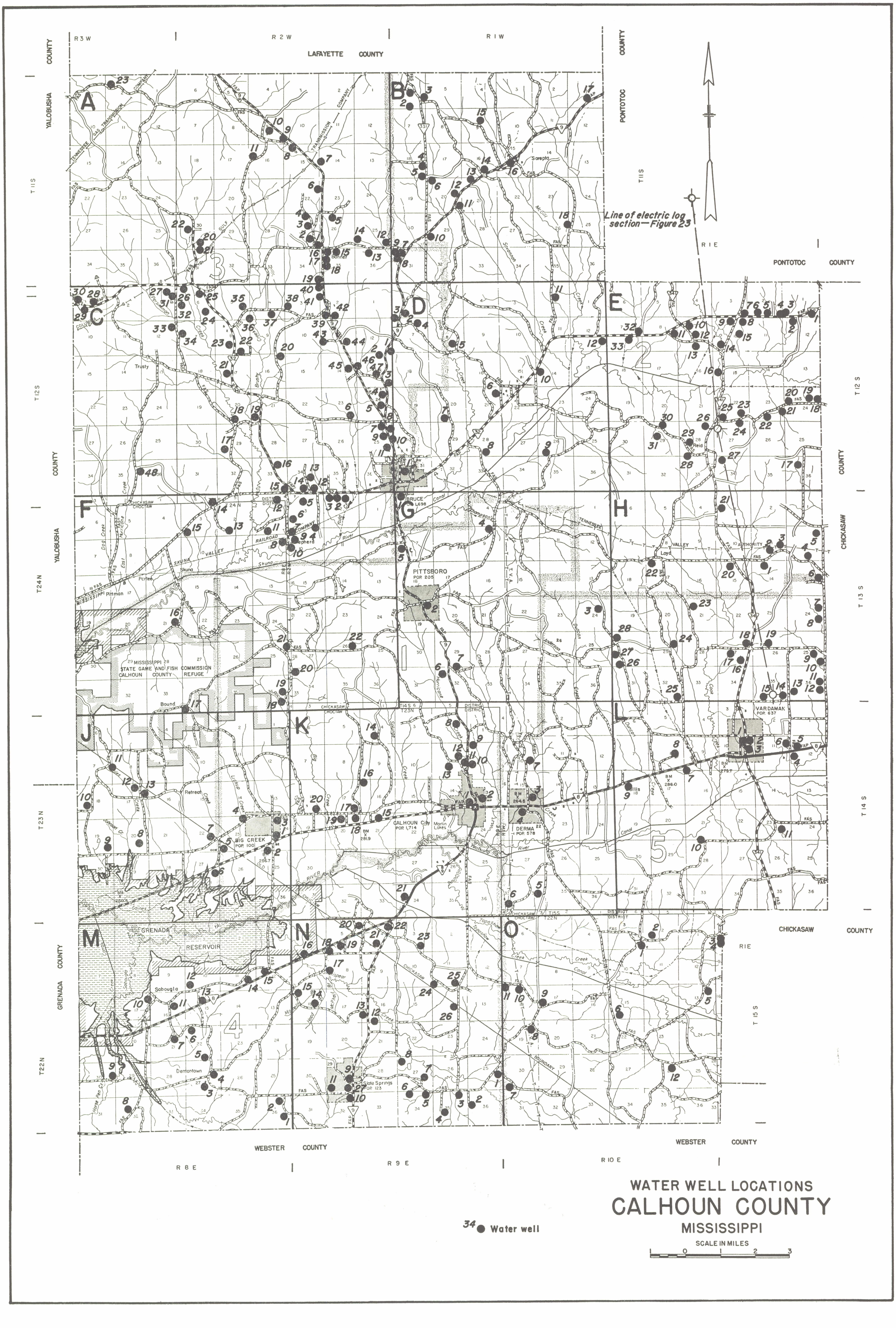

WATER WELL LOCATIONS
CALHOUN COUNTY
MISSISSIPPI