Water Resources of Mississippi

THAD N. SHOWS

BULLETIN 113

MISSISSIPPI GEOLOGICAL, ECONOMIC AND
TOPOGRAPHICAL SURVEY

WILLIAM HALSELL MOORE
DIRECTOR AND STATE GEOLOGIST

JACKSON, MISSISSIPPI
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LETTER OF TRANSMITTAL

Office of the Mississippi Geological, Economic and
Topographical Survey
Jackson, Mississippi
August 6, 1970

Mr. S. F. Thigpen, Jr., Chairman, and
Members of the Board
Mississippi Geological, Economic and Topographical Survey

Gentlemen:

Herewith is Mississippi Geological Survey Bulletin 113, "Water Resources of Mississippi," by Thad N. Shows.

Bulletin 113 answers a long standing need of generalized information on both the surface water and ground water of the State. The information in this bulletin will enable private citizens, industry and governmental agencies to determine the water resources of their area of interest at a glance. This bulletin will be helpful in determining the wisest use of our valuable water resources.

Respectfuly submitted,

William H. Moore
Director and State Geologist

WHM:js

WATER RESOURCES OF MISSISSIPPI

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BULLETIN 113

WATER RESOURCES OF MISSISSIPPI

by

THAD N. SHOWS

ABSTRACT

One of the most important natural resources in Mississippi is water. Large quantities of water are available for industrial, municipal and domestic purposes. Only a small part of the available water is presently being used.

All of the municipal water supplies in the State use ground water with the exception of Columbus, Jackson and Meridian (partly supplied by wells). A large number of industrial and irrigational supplies are from ground water sources. The fresh water section extends to a maximum thickness of about 3,500 feet in Smith County in central Mississippi. Most areas are underlain by at least one or more aquifers.

Aquifers vary with the geographic location in the State. The northeast corner of the State is underlain by Cretaceous and Paleozoic aquifers. The Cretaceous aquifers are the major source of supply in northeast Mississippi. The north central part of the State is underlain by the Claiborne and Wilcox aquifers. The Alluvium, Claiborne and Wilcox aquifers underlie northwest Mississippi. The Citronelle, Hattiesburg, Catahoula, Claiborne and Wilcox aquifers underlie central Mississippi. South Mississippi is underlain by the Citronelle, Graham Ferry, Pascagoula, Hattiesburg, and Catahoula aquifers.

Well yields vary according to need with most municipal and industrial wells yielding about 500 gpm (gallons per minute). Record yields of up to 5,000 gpm have been recorded in certain locations of the State. Numerous rural water systems and commercial catfish farm supply wells have been installed throughout the State in recent years. Water levels have not declined at a rapid rate except near areas of heavy pumpage and the average decline is 1 to 2 feet per year in those areas.

The quality of ground water is good for most general purposes, although some minor problems are present at particular locations. High iron concentration, low pH, excessive carbon dioxide content, and color are problems associated with some of the water. Minor to moderate treatment is generally satisfactory to correct most of the problems except for colored water.

A large volume of surface water is available for use from the various streams in the State. Streams vary in size, drainage area, and amount of stream flow. The cities of Jackson, Columbus and Meridian use surface water for their primary source of water supply. Numerous large industries use surface water at a number of locations in the State.

The major river systems in the State include the Tombigbee, Pascagoula, Pearl, Homochitto, Big Black and Yazoo rivers. A large number of smaller streams form a dendritic drainage pattern throughout most of the State. The streams have winding meanders, broad, wooded flood plains, with many oxbow lakes along the larger rivers.

Streamflow is usually the highest during the winter and spring seasons which coincides with the usual heavy rainfall. Occasional flooding occurs along the flood-plains of most unregulated streams. Low flows normally occur on the streams in late summer and fall. Storage facilities should be considered on streams where the draft will exceed the low flow. A number of large lakes and reservoirs have been constructed in the State.

Natural quality of surface water is good with most of the water meeting the mineral quality criteria for use in industry. Industrial and municipal pollution is a problem on a number of the streams or certain reaches of the streams. Pollution by pesticides and herbicides is reported in some of the streams and lakes of the agricultural area of northwestern Mississippi. Remedial practices are currently proposed to correct some of the pollution problems in the streams.

Large industrial development will probably continue to depend on surface water supplies while most domestic, municipal and small industrial development will continue to use ground water.

WATER IN MISSISSIPPI

Mississippi has an abundance of ground and surface water available for municipal, industrial and agricultural use. Mississippi is considered water-rich because of the rainfall and favorable geologic conditions which are present in the State. Too much water or not enough water is a common complaint during certain seasons of the year. Mississippi has an average annual rainfall of above 53 inches, but most of this comes in the winter and spring months. Aquifers, any formations, beds, or zones which contain, transmit and yield water readily to wells, underlie practically the entire State. At particular areas of need thick aquifers may be missing or may contain water that is poor in quality. Wells that furnish a dependable water supply may be completed in most aquifers fairly inexpensively by water well contractors.

The high average rainfall within the State completely fills the aquifers and the rejected rainfall flows to the sea in the form of surface water (fig. 1). Several large river systems are scattered throughout the State. Surface and ground water are related, as ground water furnishes most of the water to the streams during times of drought and streams in turn supply water to aquifers.

WATER USE

The majority of water used in Mississippi is by industry and the public. Total water use in Mississippi in 1965 was estimated to be 2,030 mgd (million gallons per day). This use represents only a fraction of the total amount of ground and surface water available. The Mississippi River, which forms the western boundary of the State, discharges an average of 360 bgd (billion gallons per day) into the Gulf of Mexico. Numerous aquifers capable of yielding 2,000 gpm (gallons per minute) or more to wells are found in almost three-fourths of the counties. Mississippi's most plentiful and important natural resource is water.

All municipal water supplies, with the exception of three, Jackson, Columbus and Meridian, are from ground water sources. A large percentage of industrial cooling water is from surface water sources. Several large steam generating plants are in

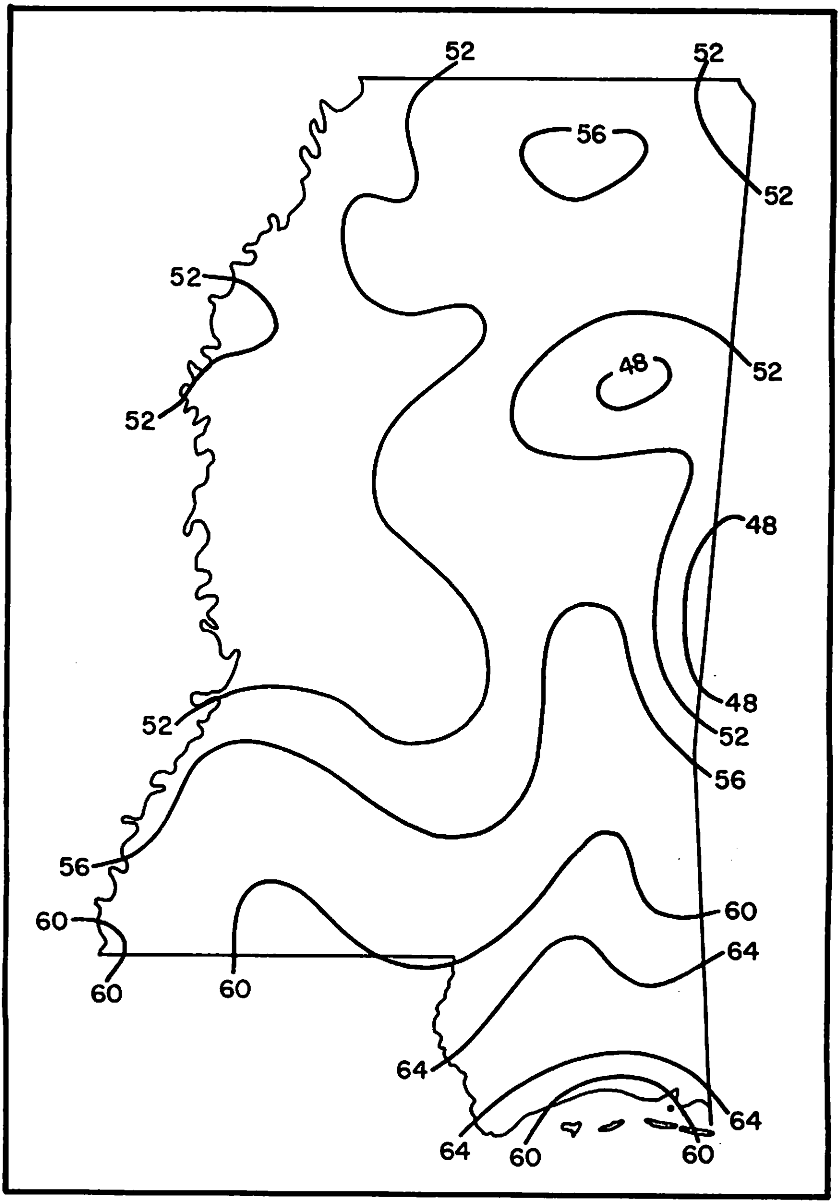


Figure 1.—Mean annual precipitation, in inches. Extracted from U. S. Weather Bureau, 1959, "Climates of the States." Based on 25 year period 1931-55.

operation in the State which use large volumes of surface water and some ground water. In 1965 it was estimated that these plants used 730 mgd of water in generating electrical current for use in the State. Quality requirement for this type of use for surface water is usually lower than for most other industrial uses. One large generating plant in Harrison County uses saline water in its operation.

MISSISSIPPI CONTROLS ON WATER

State agencies have been set up by the Mississippi Legislature to control pollution, allocate surface water, safeguard public drinking supplies, investigate the availability of water, and license water well drillers. Some of the general responsibilities of the various State agencies in regard to water are listed below.

The Board of Water Commissioners is empowered to allocate surface water based on certain rules and regulations established by law. A primary function of this agency is to protect the present surface water user and control the future appropriation of water to insure its most advantageous use. A permit from the Board of Water Commissioners is required before water can be withdrawn from a stream, watercourse or lake. The Board also licenses water well contractors which operate within the State. Water well contractors are required by law to file a drillers log on each completed water well with the Board of Water Commissioners within 30 days from date drilled.

The Mississippi Air and Water Pollution Control Commission (1966) has the authority to control pollution in the surface streams. The Commission has classified most streams and reaches of streams as to priority use. Regulations have been adopted which require a permit to construct or operate a facility that discharges waste material in any stream in Mississippi.

The State Oil and Gas Board is concerned with the promotion, development, and utilization of the oil and gas resources in the State. The Air and Water Pollution Control Commission has delegated to the State Oil and Gas Board the responsibility of protecting the fresh-water aquifers from salt-water pollution by the petroleum industry. The State Oil and Gas Board issues permits for the construction of salt-water disposal wells in the petroleum industry.

The Mississippi State Board of Health is responsible for the safety of public water supplies in the State. Public water supplies have to meet certain laboratory standards of purity before the water may be used or sold. Numerous well owners submit water for purity and chemical tests to this agency. The Mississippi State Board of Health collects regular bacteriological analyses of public water supplies and maintains a file of chemical analyses on most public water supplies within the State.

The Mississippi State Game and Fish Commission is responsible for the protection of aquatic life in the streams. Their responsibility includes the propagation of fish and aquatic life and wildlife. Recreation and related activities are an important economic resource, and the Commission is interested in providing fishing and recreational opportunities throughout the State.

The Mississippi Geological Survey is basically a research organization. The Survey is instructed by law to examine the mineral natural resources, including the metalliferous deposits, petroleum, natural gas, as well as building stones, clays, coals, cements, waters, and all other mineral substances of value. The Survey's water responsibility includes the investigation, mapping and compilation of reports on the water supplies and water power of the State with reference to their application to irrigation, protection from overflow and other purposes. The end product of most investigations or studies is a report or bulletin which sets forth the findings of the Survey.

The various state agencies cooperate in determining the most beneficial use and protection of the water resources of the State. The agencies involved realize that the well being and growth of the State depends on how well we manage this important resource.

FRESH WATER IN MISSISSIPPI

The base of fresh water varies from about sea level to more than 3,000 feet below sea level in the central section of the State (fig. 2). The map was prepared from previously published maps (Cushing and Newcome) which were based on information from electrical logs of oil and gas test wells. The varying depths of fresh water across the State may be attributed to the absence of certain aquifers or containers or the degree of aquifer-flushing of the trapped brackish connate water.

Fresh water is defined as water with less than 1,000 ppm (parts per million) total dissolved solids. Concentrations of certain minerals in water may render it unsuitable for particular uses. The Mississippi State Board of Health recommends that water containing more than 250 ppm chloride not be used for drinking water. Usually the water containing high total dissolved solids contains sodium chloride or salt, bicarbonate and other minerals. Water containing slightly high total dissolved solids may be utilized for certain industrial uses. Treatment of brackish or slightly saline water will probably become economical if water treatment technology continues to develop.

RURAL WATER SYSTEMS IN MISSISSIPPI

Numerous rural water systems are being or have been installed throughout most areas in Mississippi. These systems use ground-water for their source of water either by drilling wells or purchasing water from an existing municipal supply. The Farmers Home Administration approves loans to groups or small towns once a need is proven and money is available. There are 431 completed rural water systems in the State as of March, 1970. An additional 30 to 40 systems have been approved and are in some stage of construction.

The Farmers Home Administration encourages communities and small towns to band together and form an association or district and incorporate as such. The association or district then constructs a water system including a well or wells with a distribution system and a water-treatment plant if necessary. The government insures the loan which is usually amortized over a 40-year period.

GROUND WATER

INTRODUCTION

Large quantities of fresh ground water are available at relatively shallow depths throughout most of Mississippi. Municipal, industrial, irrigation and domestic water supplies are from ground water sources. A relatively new demand is for supplying numerous commercial catfish producers across the State. Industrial development continues to demand greater quantities of water for various manufacturing plants and paper mills.

Large volumes of ground water may be pumped out of the ground at a relatively small investment when considering the dependability and average life of a well. Industrial and municipal wells have been known to last up to 50 years although the average life probably is 15 to 18 years. The temperature of ground water remains constant which is beneficial for cooling, industrial and municipal use. Quality of ground water is generally good, and when poor quality water is encountered only minor treatment is required.

The abundance and availability of ground and surface water will continue to be helpful in promoting the industrial growth of Mississippi.

GROUND WATER

OCCURRENCE

Ground water is the most widely used natural resource in Mississippi. Ground water is defined as any water found beneath the surface of the ground that is in the zone of saturation. The zone of saturation is that portion of the earth's upper crust in which pores, joints and openings are filled with water. The ground water zone is generally referred to as that portion of the earth which contains fresh water or marginal fresh water. Ground water may seep out onto the surface and become surface water and vice versa. Both ground water and surface water are interrelated and a basic understanding of each will be helpful in a study of either resource. Ground water and surface water are ultimately dependent on precipitation. Precipitation effect on ground water is slow, whereas surface water is affected in a short time by a lack or excess of precipitation.

Ground water reservoirs or containers are commonly called aquifers. An aquifer is any water-bearing unit that contains, transmits, or readily yields water to wells. The three main functions of an aquifer are to filter, transmit and store water. Water is filtered as it passes into the intake of the aquifer which is usually the outcrop area or adjacent permeable beds and through the aquifer material to the point of withdrawal. The water is slowly moving within the aquifer at the rate of a few feet per year from the intake or recharge area until it is discharged at wells, springs, seeps or other aquifers which represent an underground pipeline. The aquifer acts as a large underground

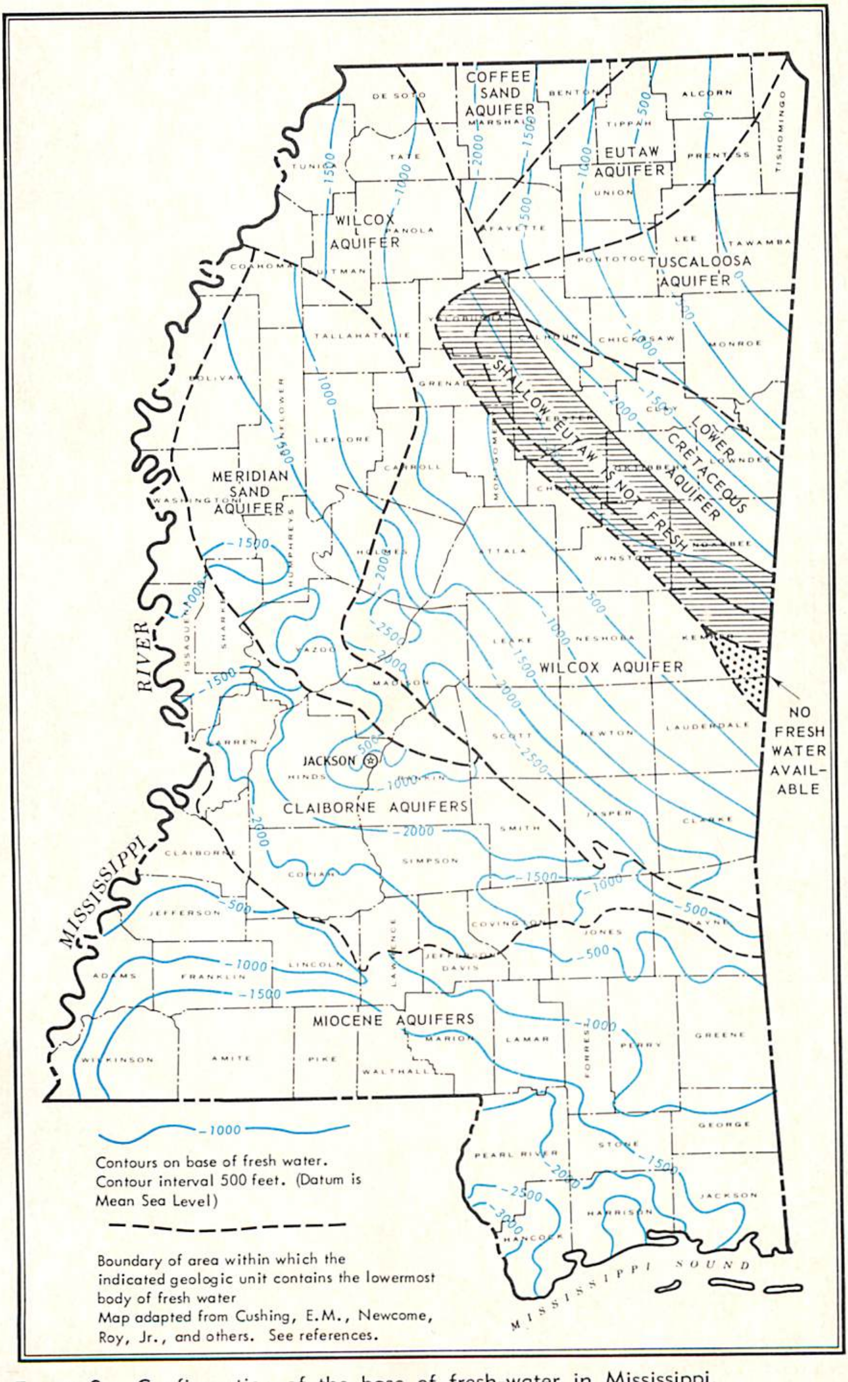


Figure 2.—Configuration of the base of fresh-water in Mississippi.

reservoir by storing the water until it is discharged or used. Many geologic units have a relatively large capacity to store water, but their pipeline or conduit function is so limited that they cannot transmit water to wells at sufficient rates to be useful. The ease with which water passes through the aquifer material is determined by the shape, size, assortment and degree of compaction of the aquifer material. Figure 3 shows the distribution of the major aquifers in the State.

Generally, aquifers are composed of unconsolidated sand, gravel, and silt or mixtures of these. The Paleozoic aquifers in northeastern Mississippi are composed of sandstone, limestone and chert which are semi-consolidated to consolidated. A number of aquifers near the outcrop are lenticular and are not continuous over a very large area. The lenticular nature of these aquifers reflects the depositional history of the aquifer material.

Water enters the permeable geologic units and moves down the dip in a generally west and southwesterly direction toward areas of discharge. A reversal of this general condition may be present in areas of heavy withdrawal. Water levels are lowered in the aquifers in the vicinity of discharge or withdrawal, and the water levels change the direction of ground-water movement.

Aquifers are classed as water-table or artesian depending on whether the water level is within the aquifer and unconfined or whether it is confined. Water in a water-table well stands at about the same level as in the aquifer outside the well. Water-table aquifers, such as the alluvial aquifer in northwestern Mississippi, receive recharge mainly from local precipitation and streams. This condition results in a seasonal fluctuation of the water level. The base flow of streams is supplied in part from the discharge of water-table aquifers. The terrace deposits that cap the hills and the alluvium along the streams are helpful in maintaining the base flow of the streams.

Most of the other aquifers are classed as artesian or semi-artesian aquifers. Artesian aquifers are confined by impermeable beds, usually clay, and the water in wells will rise above the top of the water-bearing material. Artesian wells imply flowing wells but this is a mistaken idea according to the above definition. Artesian wells located in the deeper stream valleys, in northwestern Mississippi, and along the coastal counties usually have water levels above the surface and flow.

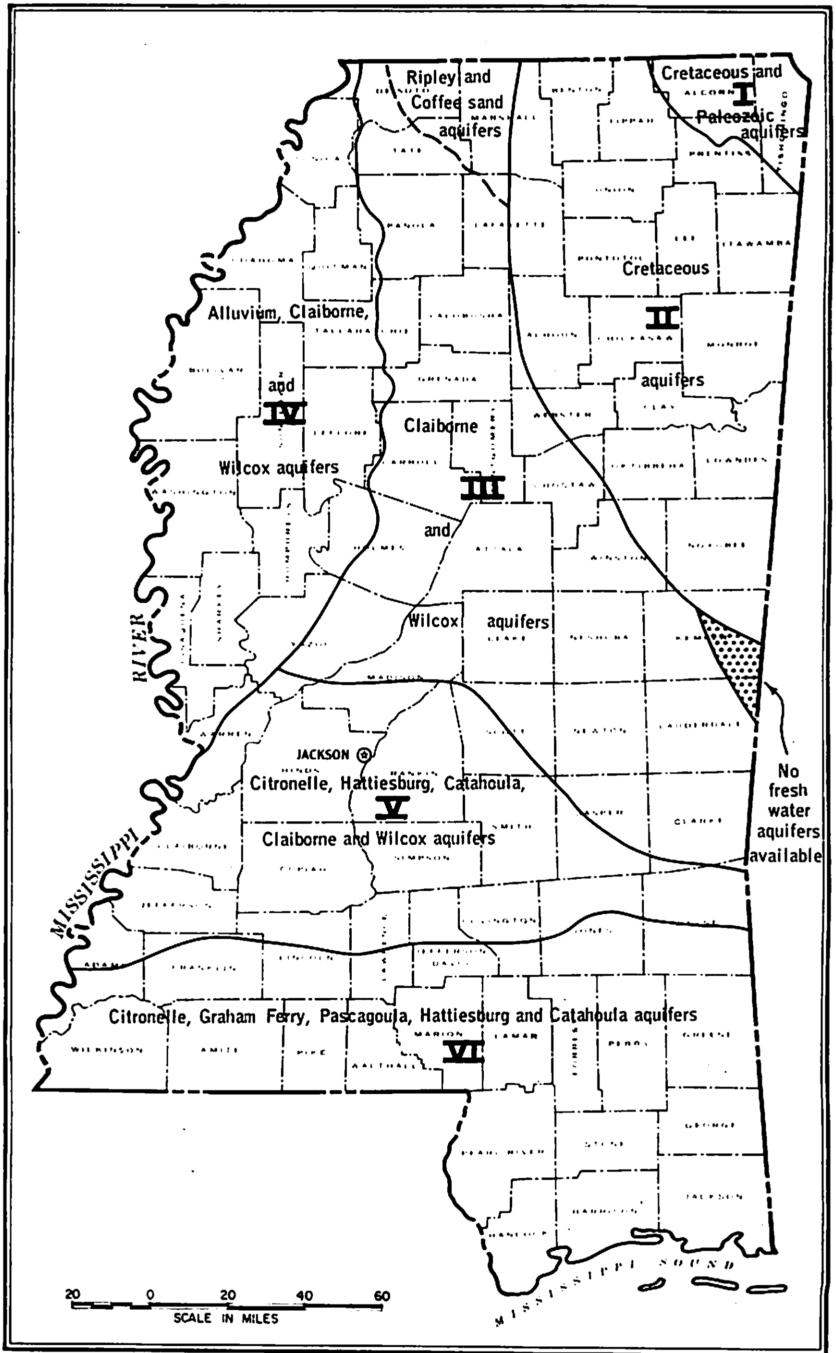


Figure 3.—Distribution of major ground-water aquifers.

Water quality changes as the water moves down the dip from the outcrop to areas of discharge. Most shallow water up to 100 feet deep generally has low dissolved solids, low pH (hydrogen ion concentration) and high carbon dioxide (CO_2). Dissolved solids content usually increases down the dip as more mineral matter is dissolved by the water and the type of the water changes from calcium to sodium bicarbonate. The deeper water is usually softer because the calcium and magnesium content, which indicates hardness, has been decreased by ionic exchange for sodium. The pH of the water generally increases in the deeper aquifers and iron concentrations are reduced. Some of the aquifers, such as the Kosciusko aquifer at some locations in central Mississippi and some Miocene aquifers on the Coast, contain colored water at particular locations, but this is usually not a regional problem.

Temperature of ground water remains constant throughout the year. Water from some of the shallow water-table aquifers may vary a few degrees but not so much as surface water. Water of a constant temperature is advantageous for most cooling purposes and industrial uses. The temperature of shallow ground water ranges from about 60° to 65°F. (Fahrenheit). The geothermal gradient increases 1°F. for every 65 to 100 feet of depth. The temperature of the water from about 2000 feet along the Mississippi Coast is 90° to 100°F. To determine accurate water temperature measurements, the water temperature should be measured in a large capacity well that has been pumping a sufficient time for the temperature to equalize in the well.

WATER WELLS

Water wells vary in size, type of material, construction, and depth. Well production varies for reasons which include pump size, casing size, screen size and openings, pump setting, water level and the amount of water that the aquifer is capable of yielding. Well production is generally based on immediate need and provides no more than a hint of the aquifer potential. The full potential of an aquifer is seldom developed, thereby limiting the information on available water from properly constructed wells.

Well yields are in direct relationship to the pump size and horsepower requirements, and depth to water level. The diameter of the casing generally determines the size and yield of the pump. Generally, a well with a 2-inch casing diameter will yield up to 15 gpm, a 4-inch well will yield up to 30-50 gpm, and a 6-inch well will yield up to 125-150 gpm. Higher yields are possible from larger wells.

Wells yielding 5,000 gpm have been constructed in northwestern Mississippi and in Hancock County in southern Mississippi. Most municipal and industrial wells are designed to yield from 500 to 1,000 gpm, but individual wells are known to yield up to 2,000 gpm. The rural water system wells are usually smaller than the municipal or industrial wells and yield from 50 to 150 gpm. The irrigation and commercial catfish-farm supply wells in northwestern Mississippi are built to yield several thousand gallons per minute.

Depth of wells varies according to the particular aquifer or aquifers underlying the area. The deepest water well presently in use in the State is reported to be 2,410 feet deep in Calhoun County in northeast Mississippi. Deeper wells may have been drilled but records are not available on these wells.

Water well specifications for one location will not necessarily fit another location. Information on well depths, quality of water, water levels, aquifer thickness, potential yields, and any unusual conditions present are some of the factors to be considered before writing well specifications at a particular site. Test holes which include pumping tests, electrical logs and water sampling should be considered in areas that require detailed information when the information is not available from other sources. The requirement for providing a specified yield is the responsibility of the contractor in most Mississippi water well contracts. There are some locations where an aquifer is not capable of yielding the required amount of water and this type of contract does not seem equitable. A bonus should be given in this type contract for providing more water than is required in the specifications. This would encourage proper development of wells. Proper well development is generally lacking in Mississippi. Once the required yield is reached the well is assumed to be developed. This reflects on the well construction industry as a whole. Only a few well specifications are written with proper well development included.

QUALITY OF WATER

The ground water in Mississippi is of good quality for most purposes (Table 1). At certain locations minor quality problems exist such as excessive color, high iron content (greater than 0.3 ppm), low pH (hydrogen ion concentration) or acidic water and excessive total dissolved solids (Table 2). The quality of ground water reflects contact with minerals within the aquifer material.

The most persistent complaint concerning quality of groundwater throughout Mississippi is low pH and excessive iron. Neither of these problems is unsolvable by minor treatment. Generally, areation with pH adjustment will solve these problems unless concentrations of iron exist in excess of 2 ppm. Organic color in water is a problem in certain aquifers, notably the Kosciusko and Cockfield aquifers at some locations across the central portion of the State, and some of the deeper Miocene aquifers along the Coast. Color originates from organic material and lignite or lignitic material within the aquifer. Large concentrations of organic material, trees, leaves, roots and plants, were buried along with the sand, silt, and clay deposits. Color may be removed from water by treating with alum, but the cost is prohibitive in most cases. Other shallower or deeper aquifers are usually present that can be utilized or another location may be found where the water from the same aquifer is without color.

Water containing total dissolved solids greater than 1000 ppm is present in some of the deep Cretaceous aquifers in north-central Mississippi. The major constituent in the water is usually sodium chloride or other salts which impart a salty or bitter taste and corrode metal. Removal of excessive dissolved solids by treatment is economically unfeasible at the present time.

Table 1.—Source and significance of common mineral constitutents and physical properties and characteristics of water.

Silica (SiO_2).—Silica, dissolved from practically all rocks, does not affect use of water for domestic purposes. It affects industrial use of water because it contributes to formation of boiler scale and helps cement other scale-forming substances which may cause damage. Water from wells generally contains more silica than water from lakes and streams.

Iron (Fe).—Iron is dissoved from practically all rocks and soils, and nearly all natural water contains some iron. Water having a low pH tends to be corrosive and may dissolve iron in objectionable quantities from pipes. Iron precipitates on exposure of water to air, forming an insoluble hydrated oxide which causes reddish-brown stains on fixtures and on clothing washed in iron-bearing water. In large amounts iron imparts a taste and makes water unsuitable for manufacture of food, paper, ice, and other products used in food processing. Iron may cause trouble by supporting growth of bacteria, which clog screens and gravel packing around wells. U. S. Public Health Service standards set a limit of 0.3 ppm Fe and 0.05 ppm Mn in water used for interstate carriers. Iron can be removed by aeration, precipitation, and filtration; by precipitation during removed of hardness; or by ion exchange.

Calcium (Ca) and Magnesium (Mg).—Calcium and magnesium are dissolved mostly from limestone, dolomite, calcareous sand, and gypsum by water containing available hydrogen ions. Calcium and magnesium are the principal cause of hardness of water and contribute to the formation of scale in pipes, boilers, and hot-water heaters and form an objectionable curd with soap.

Sodium (Na) and potassium (K).—Compounds of sodium and potassium are abundant in nature and are highly soluble in water. Some ground water that is hard may, in passing through rock formations, undergo base exchange and become soft at greater depths.

Bicarbonate (HCO_3) and carbonate (CO_3).—Bicarbonate and carbonate in natural water result from the action of carbon-dioxide-bearing water on rock materials, principally limestone and dolomite. Carbonate is present in only a few natural waters. Bicarbonate is of little significance in public supplies except where the alkalinity affects the corrosiveness of water.

Sulfate (SO_4).—Sulfate is dissolved mostly from soils and beds of shale and gypsum. In combination with calcium and magnesium, sulfate contributes in formation of hard scale and affects industrial use of water.

Chloride (Cl).—Chloride is in nearly all water in varying amounts. The chlorides of calcium, magnesium, sodium, and potasium are readily soluble. Drainage from sewage, salt springs, and oil fields and other industrial wastes may add large amounts of chloride to streams and ground-water reservoirs. Small quantities of chloride have little effect on the use of water. Chloride imparts a salty taste with threshold varying with the individual.

Fluoride (F).—In nature fluoride occurs in fluorspar, cryolite, and some other minerals. Most natural water contains a little fluoride. U. S. Public Health Service drinking water standards recommend a limit varying from 0.7 to 1.0 ppm in areas having an annual average maximum daily temperature of 70.7 to 79.2 deg. F. According to Dean (1936), fluoride in large amounts may cause mottling of children's teeth; however, water having about 1 ppm of fluoride may substantially reduce tooth decay in children who have used the water during calcification of their teeth.

Nitrate (NO_3).—Nitrate in water represents the final oxidation product of organic nitrogen compounds. Its presence may indicate pollution, and in high concentration it may be an indication of sewage or other organic matter. A National Research Council report by Maxcy (1950) concludes that water having a nitrate content in excess of 44 ppm should be regarded as unsafe for infant feeding. It may be a contributing factor to natrate cyanosis ("blue-baby disease") in such unusual amounts.

Dissolved solids.—Although the residue on evaporation to dryness does not coincide completely with the original material in solution, it is generally used synonymously with dissolved solids. Residue on evaporation includes organic matter and some water of crystallization. Few industrial processes can tolerate water containing an excess of 1,000 ppm dissolved solids.

PHYSICAL PROPERTIES AND CHARACTERISTICS

Color.—Color refers to the appearance of water that is free of suspended matter. It results from extraction of coloring matter from decaying organic materials such as roots and leaves in bodies of surface water or in the ground. Natural color of 10 units or less usually goes unnoticed and even in larger amounts is harmless in drinking water; however, for many industrial purposes color is objectionable. It may be removed from water by coagulation, settling, and filtration.

Hydrogen-ion concentration (pH).—The pH is a measure of the activity of hydrogen ions in solution. A pH of 7.0 indicates a neutral solution. Values progressively lower than 7.0 denote increasing acidity, and those above 7.0 denote increasing akalinity. As pH increases, the corrosiveness of water normally decreases, although excessively alkaline water may be corrosive to some metal surfaces. pH has an important bearing on the utility of the water for many industrial purposes.

Specific conductance (micromhos at 25° C.).—Specific conductance is a measure of the ability of water to conduct an electric current, and it furnishes a rough measure of the mineral content of the water. It gives no indication of the relative quantities of the different constituents in solution. It is useful in making comparisons of the estimated total mineral content of different waters, and of following changes in such content of water in a stream.

Temperature.—The temperature shown in tables of analyses is in degrees Fahrenheit and represents the temperature of the water at the time of sampling. Most ground-water measurements were made at the well head after sufficient water had been withdrawn to represent the approximate temperature in the formation. Ground water in a given locality is generally of constant temperature. The average temperature of water at shalow depths generally is about the same as the mean annual air temperature. It increases with depth at the rate of 1° for each 65 to 100 feet.

Corrosiveness.—A water that attacks metal is said to be corrosive. It frequently results in "red water," caused by precipitation of iron; however, not all red water is the result of corrosion. Water from some formations contains considerable iron in solution, which on being exposed to the air, precipitates readily and gives a red-water effect. Acidic waters are capable of causing corrosion of water pipes and water-heating systems. Preventive measures involve control of these active agents or minimizing their effects, and includes maintaining proper pH of the treated water. Electrolysis control inside steel reservoirs and protective coating on metal surfaces also are used for protection against corrosion. Free carbon dioxide and other gases normally are removed by aeration and, if necessary neutralized by the addition of either lime or soda ash.

Hardness.—In the development of a water supply hardness is one of the most important single factors to be considered. It is caused principally by the calcium and magnesium in solution and is generally reported as the calcium carbonate equivalent. Carbonate hardness or "temporary hardness' is hardness equivalent to the bicarbonate and carbonate. "Permanent" or noncarbonate hardness is caused by the combination of calcium and magnesium with other ions. Scale caused by carbonate hardness usually is porous and easily removed, but that caused by non-carbonate hardness is hard and difficut to remove. Hardness is usually recognized in water by the increased quantity of soap required to make a permanent ather. As hardness increases, soap consumption rises sharply, and an objectionable curd is formed. Water having a hardness of 60 ppm or less is soft; 61 to 120 ppm is moderately hard; and more than 120 ppm is hard.

Most shallow ground water in Missisippi is acidic in nature. The low pH and excessive concentration of carbon dioxide causes the water to be corrosive to metal in the well and plumbing which results in iron in the water. A large number of the iron problems occur in this way. A common complaint among well owners is that a new well will last only about one year before iron is noticed in the water. This time corresponds to the length of time in which the corrosive water will dissolve the galvinized coating on the casing. The problem may be eliminated by using a corrosive resistant material such as plastic pipe or coating for the casing and plumbing system. A plastic screen is also used in many instances where the ground water is acidic and attacks metal screens.

Table 2.—Water-quality tolerance for industrial application.

(American Water Works Association, 1950, Water quality and treatment, p. 67, table 3-4. Remarks: A, no corrosiveness; B, no slime formation; C, conformance to Federal drinking water standards: D, Al_2O_3 less than 8 ppm, SiO_2 less than 25 ppm, Cu less than 5 ppm. Chemical constituents in parts per million.)

Industrial Use	Turbidity	Color	Fe	Mn	Fe + Mn	Hardness	Alkalinity	pH	Total solids	Remarks
Air conditioning 1/	...	...	0.5	0.5	0.5	...	...	...	...	A,B
Baking	10	10	.2	.2	.2	(?)	...	...	...	C
Boiler feed:										
0-150	20	80	...	...	...	75	...	8.0+	3000-1000	
150-250	10	40	...	...	...	40	...	8.5+	2500-500	
250 psi and up	5	5	...	...	...	8	...	9.0+	1500-100	
Canning:										
Legumes	10	...	0.2	0.2	0.2	25-75	...	...	...	C
General	10	...	0.2	0.2	0.2	...	...	...	...	C
Carbonated beverages 3/	2	10	0.2	0.2	0.3	250	50	...	850	C
Confectionery	...	...	0.2	0.2	0.2	...	...	(4)	100	...
Cooling 5/	50	...	0.5	0.5	0.5	50	...	...	...	A,B
Ice (raw water) 6/	1-5	5	0.2	0.2	0.2	...	30-50	...	300	C
Laundering	...	...	0.2	0.2	0.2	50	...	...	...	
Plastics, clear, uncolored	2	2	.02	.02	.02	...	...	...	200	
Paper and pulp 7/										
Groundwood	50	20	1.0	0.5	1.0	180	...	...	...	A
Kraft pulp	25	15	0.2	0.1	0.2	100	...	...	300	
Soda and sulfite	15	10	0.1	.05	0.1	100	...	...	200	
Light paper, HL-grade	5	5	0.1	.05	0.1	50	...	...	200	B
Rayon (viscose) pulp:										
Production	5	5	.05	.03	.05	8	50	...	100	D
Manufacture	0.3	...	0.0	0.0	0.0	55	...	7.8-8.3	...	
Tanning 8/	20	10-100	0.2	0.2	0.2	50-135	135	8.0	...	
Textiles:										
General	5	20	.25	.25	...	20	...	...	...	
Dyeing	5	5-20	.25	.25	.25	20	...	...	...	
Wool scouring 10/	...	70	1.0	1.0	1.0	20	...	...	...	
Cotton bandage	5	5	0.2	0.2	0.2	20	...	...	...	

1/ Waters with algae and hydrogen sulfide odors are most unsuitable for air conditioning.
2/ Some hardness desirable.
3/ Clear, odorless, sterile water for syrup and carbonation. Water consistent in character. Most high-quality filtered municipal water not satisfactory for beverages.
4/ Hard candy requires pH of 7.0 or greater, as low value favors inversion of sucrose, causing sticky product.
5/ Control of corrosion is necessary as is also control of organisms, such as sulfur and iron bacteria, which tend to form slimes.
6/ $Ca(HCO_3)_2$ particularly troublesome. $Mg(HCO_3)_2$ tends to greenish color. CO_2 assists to prevent cracking. Sulfates and chlorides of Ca, Mg, Na should each be less than 300 ppm (white butts).
7/ Uniformity of composition and temperature desirable. Iron objectionable since cellulose absorbs iron from dilute solutions. Manganese very objectionable, clogs pipelines and is oxidized to permanganates by chlorine, causing reddish color.
8/ Excessive iron, manganese, or turbidity creates spots and discoloration in tanning of hides and leather goods.
9/ Constant composition; residual alumina less than 0.5 ppm.
10/ Calcium, magnesium, iron, manganese, suspended matter, and soluble organic matter may be objectionable.

WASTE DISPOSAL IN DEEP WELLS

Presently numerous salt-water disposal wells are in use, particularly in southern Mississippi. Most of these wells are located at or near oil fields or salt domes used for storage purposes. These wells should be completed in deep aquifers below the fresh-water zone.

Industrial waste-disposal wells will probably be constructed in the near future. Deep saline aquifers offer a great potential for the proper disposal of industrial wastes. Care should be exercised in the planning and constructing of either type well because of the danger of polluting the fresh ground-water aquifers. The Air and Water Pollution Control Commission must approve the plans and application before any type of industrial disposal well is constructed within the State. Detailed construction plans should be included in any application. The Oil and Gas Board must approve the plans and application for any salt-water disposal well in the State.

WATER-BEARING UNITS

Geologic and hydrologic conditions and quality of ground water varies throughout the State. The State is divided into six areas (fig. 4) for the ground water discussion. In each area a summary is given on the general ground-water and quality of water present, a table is given listing the major aquifers and the water resources of each unit present, and tables are included with selected wells and available chemical analyses of ground water. Maps are included showing location of water wells and the Mississippi Survey's Groundwater number (MSG). Information previously published on wells was not generally included in this report. References listing the major publications on ground water in the State are listed at the end of the report.

GROUND-WATER

AREA I

Northeast Mississippi (Area I, fig. 5) is not generally a good area for large ground-water development. The aquifers are listed in Table 3 which gives a summary of their water-bearing characteristics. Aquifers underlie the area but are not as continuous or permeable over a large area as in other sections of the State. Primary aquifers in northeast Mississippi include the Paleozoic, sometimes referred to as Paleozoic chert, and Upper Cretaceous deposits. The Cretaceous deposits overlie the Paleozoic rocks but are thin over a large portion of the area. The Cretaceous deposits are missing in northeastern Tishomingo County where the Paleozoic rocks are on the surface.

The general dip of the beds is west and the strike is in a north-south direction. The dip ranges up to 30-40 feet per mile for

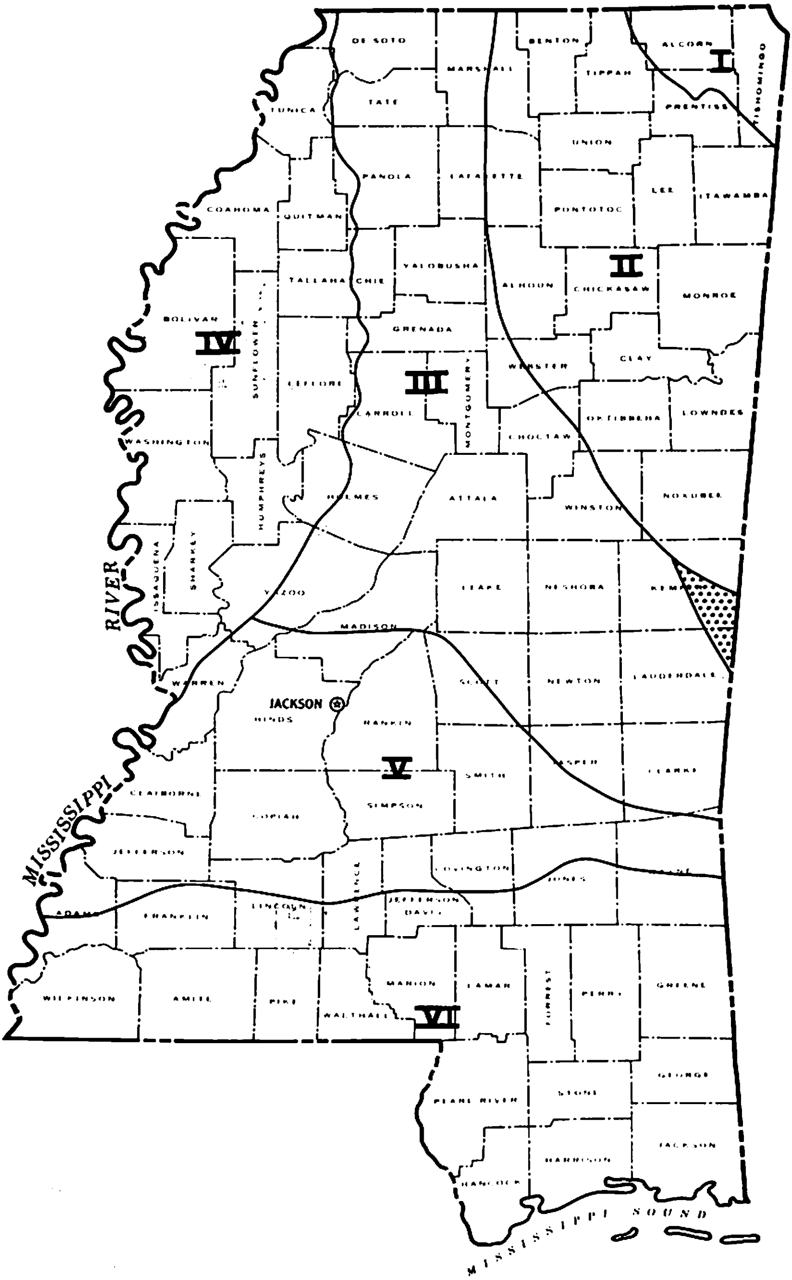
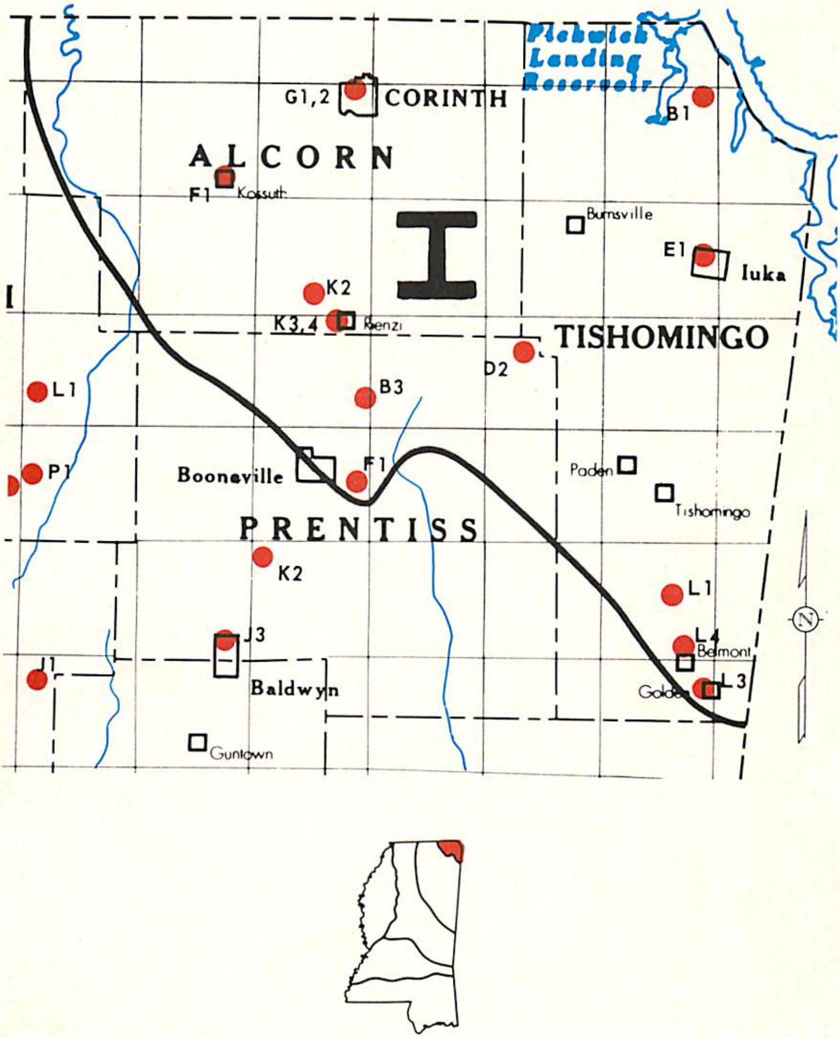


Figure 4.—Major ground-water divisions of the State for this report.

Table 3.—Stratigraphic column and water resources in Area I.

ERA	SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
Mesozoic		Holocene		Alluvium	0-20	Generally not an aquifer. Supplies some domestic wells along the streams. The alluvium is probably thicker in the flood plain of the Tennessee River.
		Pleistocene		Terrace Deposits	0-100	Not an important aquifer. A few wells in the area may utilize this aquifer. A thick deposit of sand and gravel caps the hills parallel to the Tennessee River. Most of these deposits are not potential aquifers because they are present at high elevations only.
	Cretaceous		Selma	Ripley	0-500±	Not an important aquifer. The aquifer is the source of water supply for shallow domestic wells in the western part of Alcorn County. Quality of water is fair from this aquifer. The water has a low pH and iron content may be high.
				Demopolis chalk		Not an aquifer.
				Coffee sand		A source of supply for shallow domestic wells in Alcorn and Prentiss Counties. Higher yielding wells may be possible at certain locations. Water quality is generally poor. The water has a low pH and contains excessive iron concentration at a number of locations.
				Eutaw: Tombigbee sand		An important aquifer in most of Tishomingo and all of Alcorn and Prentiss Counties. Numerous shallow domestic, industrial and municipal wells are completed in the Eutaw aquifer in this area. Quality of water is generally fair. The water usually has a low pH and iron content may be a problem.
				Eutaw: Lower		
				Tuscaloosa		A transitional type deposit between the underlying Paleozoic rocks and the overlying Eutaw deposits. A large number of wells completed in the base of the Eutaw may be considered to be in the Tuscaloosa provided the aquifer consists of coarse sand and gravel. A number of rural water supply wells in the southern part of the area are producing from the Tuscaloosa aquifer. Quality of water is fair to poor from this aquifer. Iron content and low pH are the major problems associated with this water.
Paleozoic	Devonian, Mississippian, and Pennsylvanian			Undifferentiated Rocks	1000±	An important aquifer in Alcorn, northern Prentiss and Tishomingo counties. This aquifer supplies the municipal water for Corinth and Iuka. Other public, industrial and domestic wells are completed in this aquifer in Alcorn and northern Tishomingo Counties. Yields from this aquifer are up to 900 gpm in the vicinity of Corinth. Quality of water is generally good. The pH of the water is 7 or above and the iron content is usually low. The hardness is fairly high and mineralization of the water is moderate.



EXPLANATION

A1

Water well with MSG number

Figure 5.—Location of selected wells in Area I.

most of these deposits. Local variations may occur and the beds may dip steeply.

PALEOZOIC AQUIFERS

The Paleozoic rocks are exposed at the surface in the vicinity of Pickwick Lake on the Tennessee River and are the oldest rocks exposed in the State. The Paleozoic rocks usually are not good aquifers and typically consist of dense, hard, consolidated limestone or sandstone which has very little permeability. The top of the Paleozoic rock in the subsurface throughout most of the area is distinguished by a weathered chert zone. This weathered Paleozoic chert marks the unconformable contact between the Paleozoic rocks and the overlying Cretaceous beds. The chert is deeply weathered with fractures and fissures at some locations and resembles a chert-gravel deposit. The weathered chert is an important aquifer and a potentially important aquifer throughout parts of Tishomingo, Alcorn and northern Prentiss Counties. The aquifer will yield large volumes of water to wells where permeability has been sufficiently developed in this zone. The permeability is low at some locations and faulting is associated with the unit in the vicinity of Corinth.

Depth of the Paleozoic aquifer is relatively shallow throughout most of northeast Mississippi. The weathered chert occurs from a depth of 160 feet in section 1, Township 2 South, Range 10 East in Tishomingo County to about 450 feet deep at Corinth in Alcorn County, with thicknesses varying from 20 feet to about 100 feet.

Large capacity wells, up to 900 gpm, have been completed in the weathered chert at Corinth and rural water association wells yielding 100-150 gpm are developed in this aquifer in northern Tishomingo County (Table 4 and fig. 5). A well for the Town of Iuka, (E 1), 366 feet deep was completed in 1965 in the Paleozoic aquifer and pumped 750 gpm. This is very unusual to have a high yield from this depth in the Paleozoic rocks other than in the weathered chert zone. Prediction of well yields is difficult because of the varying conditions which resulted in high or low permeability in this unit. Test drilling along with pumping tests should be used to determine the quantity of water available at specific locations from this aquifer.

Table 4.—Records of selected wells in Area 1.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables, and pumping test tables.

Majority of wells are rotary drilled.

Water Level: M, Measured; R, Reported.

Elevation: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Well: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Alcorn County										
F 1	Kossuth High School	1961	442	6	485	91	1961	P	88	1961	
G 1	City of Corinth, Well No. 11	1967	492	12	445	123	1967	P	750	1967	Paleozoic aquifer
G 2	City of Corinth, Well No. 10	1967	500	12	480	145	1967	P	700	1967	Paleozoic aquifer
K 2	State Highway Department, Roadside Park	1968	240	4	450	70	1968	P	10	1968	
K 3	Rienzi Water Association, Well No. 2	1969	400	8	480	126	1970	P	145	1970	
K 4	Rienzi Water Association, Well No. 1	1968	370	10	445	132	1968	P	130	1968	
	Prentiss County										
B 3	New Candler Water Assoc.	1968	460	8	540	190	1968	P	130	1968	
D 2	Holcut-Cairo Water Assoc.	1969	305	8	590	146	1969	P	250	1969	Tuscaloosa aquifer
F 1	Big "V" Water Assoc.	1966	503	8	532	201	1966	P	220	1966	
F 2	Big "V" Water Assoc.	1969	472	4	540			T	15	1969	

Table 4.—Records of selected wells in Area I.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Tishomingo County						
B 1	Short-Coleman Utility Dist.	1968	290	8	620	152	1968	P	200	1968	Paleozoic aquifer
E 1	Town of Iuka	1965	366	12	580	74	1965	P	750	1965	Paleozoic aquifer
L 1	Dennis Water Association	1967	151	10	600	80	1967	P	100	1967	
L 2	Dennis Water Association	1968	159	10	600	80	1968	P	65	1968	
L 3	Golden Water Association	1965	115	10	556			P	80	1965	
L 4	Town of Belmont	1969	130	10	580	45	1969	P	100	1969	

Water levels of the Paleozoic aquifer range from 35 feet to 150 feet below land surface depending on elevation and amount of pumpage in the area. The water is under artesian pressure, but no flowing wells are reported because of the elevation of the land surface. A slight depression in the water level is present at Corinth due to the large withdrawal of water from the Paleozoic aquifer.

CRETACEOUS AQUIFERS

Cretaceous deposits are exposed on the surface to the west and south of the Paleozoic rocks. Cretaceous beds in this area are relatively thin and are deposited on the Paleozoic rocks. Cretaceous deposits are generally unconsolidated and consist of sand, silt, clay, gravel, chalk and mixtures of these sediments.

Thickness of the Cretaceous deposits increases toward the south and west as the depth of the Paleozoic rocks increases. The beds range from the surface to about 500 feet deep in the western and southern part of the area. Aquifers of Cretaceous age include the Tuscaloosa, Eutaw, Coffee sand, and the Ripley (including the McNairy sand member). Chalk members are present but are not aquifers.

The Eutaw aquifer is important in the western and southern part of Area I. Municipal, industrial and domestic wells utilize the Cretaceous aquifers throughout the southern and western section of the area. Large capacity wells completed in the Eutaw aquifer are possible, but most wells are for domestic use with small yields. The Eutaw is recognizable in the subsurface in central and western Alcorn and Prentiss Counties. Tuscaloosa deposits may be present in the zone immediately above the Paleozoic rocks in the southern and western part of Area I. The Tuscaloosa is usually coarser and probably is only 50 feet thick at the maximum in northern Prentiss, southern Alcorn and southern Tishomingo Counties.

The Coffee Sand and Ripley (McNairy sand) occur at high elevations throughout much of the area. Numerous domestic wells are completed in these aquifers. Wells yielding 100-200 gpm may be constructed in these aquifers at certain locations, provided the aquifers are coarse and thick enough to yield large amounts of water.

Water levels for wells in the Cretaceous aquifers are from flowing wells 2 to 5 feet above land surface to nearly 200 feet below land surface. The general elevation in northeast Mississippi is from 420 to 806 feet.

QUALITY OF WATER

Most of the ground-water in extreme northeast Mississippi is of good quality for general use (Table 5). Some constituents may require removal by treatment before the water is used for a specific purpose. Iron content is slightly higher in the Cretaceous aquifers than in the underlying Paleozoic aquifer.

Water from the Paleozoic aquifer is alkaline or neutral (pH-7), fairly hard water (60 to 120 ppm) and moderately mineralized. Iron concentrations are generally low in this aquifer. Chloride concentrations in water from some wells are from 70 to 125 ppm, which is slightly high.

The shallow Cretaceous aquifers usually contain water that has a low pH (acidic) to moderate pH depending on location, aquifer, and depth. Mineralization is low and iron concentration is usually not a problem except for the Coffee sand, Ripley (including McNairy) and the Tuscaloosa aquifers. Water from the Ripley has a low pH and contains a high iron concentration at most locations. A rural water supply well for Holcut-Cario (D 2, MSG) in Prentiss County was completed in the Tuscaloosa aquifer and had an iron concentration of 20 ppm.

Water treatment for low pH or high iron content is fairly inexpensive and simple. Standard treatment includes aeration and pH adjustment with lime. Iron removal equipment would have to be used on concentrations of above 2 or 3 ppm.

GROUND WATER

AREA II

Northeast Mississippi is underlain by several important aquifers of the Cretaceous system (fig. 6). Large quantities of water are available from the thick permeable aquifers which underlie this area (Table 6). This area is one of the largest ground-water provinces in Mississippi as it includes parts of twenty counties.

Table 5.—Chemical analyses of water from wells in Area I.

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
							Alcorn County			Analyses by Mississippi State Board of Health (ppm)					
F 1	442	1-9-68		0.75						7			94	6.9	
G 1	492	4-29-68	3.2	.1	23.64	7.53	97.55*		13.17	125	0.6	337.92	90	7.8	65
G 2	500	4-29-68	1.2	.2	23.64	7.53	95.57*		11.73	123	.6	329.90	90	7.8	65
K 3	400	12-3-69		.2						5			150	7.6	
K 4	370	11-24-69	0	.25	38.46	8.99	8.69	2.50	16.29	0	0	157.76	133	7.8	62
							Prentiss County								
B 3	460	9-26-68	2.4	.3	44.87	7.77	15.50*		20.25	6	0	185.63	144	7.8	63
D 2	305	7-15-69		20						3			26	6.3	62
D 2	230	7-15-69		8.0						4			78	6.4	61
F 1	503	7-9-68		1.0						6			124	7.1	64
F 2	472	9- -69		.9						6	0		140	7.1	64
							Tishomingo County								
B 1	290	11-3-69	0	0	1.60	1.21	0	2.75	0	2	0	12.96	9	5.3	61
E 1	366	6-17-65	8.8	.1	1.52	1.02	7.77*		0	7	0	35.22	8	5.4	61
L 1	151	11-18-68	1.6	.1	2.0	.48	1.20	.25	0	2	0	11.60	7	5.3	62
L 2	159	11-3-69	0	0	2.40	.73	1.2	2.0	0	3	0	14.73	9	5.2	62
L 3	115	6-23-67	3.2	Trace	4.80		11.15*			20	.2	43.95	12	5.2	61

*Sodium and Potassium as Na

Table 6.—Stratigraphic column and water resources in Area II.

ERA	SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
Cenozoic	Quaternary	Holocene		Alluvium	0-60	Not an extensive aquifer. Supplies local domestic wells along some of the major streams.
		Pleistocene		Terrace Deposits	0-50	A local potential aquifer provided the deposit contains sands of sufficient thickness. Some local domestic wells utilize this aquifer.
	Tertiary	Paleocene	Midway	Naheola	0-150	Supplies a few wells in Kemper County, but is generally not an aquifer.
				Porters Creek clay	200-500	Not an aquifer.
				Clayton	30	Not an aquifer.
Mesozoic	Cretaceous	Gulf	Selma	Prairie Bluff chalk and Owl Creek	40	Generally not an aquifer. The Owl Creek may supply a few wells in the northern part of area.
				Ripley	50-450	An important aquifer in Tippah, eastern Benton, and northern Union Counties. The McNairy sand member ranges up to 250 feet thick and is the unit which most of the wells utilize in the Ripley. Quality is good except for hardness.
				Demopolis chalk	500	Not an aquifer.
				Coffee sand	250	Yields water to domestic and small municipal and industrial yielding wells in the northern part of the area. A fairly good aquifer in Prentiss, Tippah, Union, northern Pontotoc, eastern Lafayette, and northwestern Lee Counties. Water quality is poor to fair.
				Mooreville chalk	0-200	Not an aquifer.
				Eutaw: Tombigbee sand; Lower	0-200	One of the most important and utilized aquifers throughout the area. Many municipal, industrial and domestic water wells are completed in this aquifer. Quality of water is good. Water becomes highly mineralized in the southern and western part near the boundary line of Area III.
				Mc Shan	0-200	An important aquifer in the southern two-thirds of the area. Many domestic and some public supplies are from this aquifer. Water quality is generally excellent to good from this aquifer.
			Tuscaloosa	Tuscaloosa	500-1500	An important aquifer and source of public and industrial water supplies throughout most of the area. Aquifer is capable of yielding large volumes of water from the highly permeable aquifer material. The better zones are near the top and bottom of this aquifer. This unit is subdivided into the Gordo (Upper), Coker (Middle) and Massive sand (Lower) by some authors. Quality of water is good. Iron concentration may be a problem near the outcrop.
	Lower Cretaceous (Undifferentiated)	Comanche			1000'	A potential source of water supplies in parts of Clay, Calhoun, Oktibbeha, Lowndes, Noxubee and northern Kemper Counties. The availability of shallower aquifers and the depth (1,500-2,000 feet) has limited the development of this aquifer. Quality of water should be good and be similar to the water in the Tuscaloosa aquifer.

Fresh-water is present in aquifers to a depth of 2,500 feet below sea level in the southern part (fig. 2). The southern and slightly western part (shaded area) is underlain by fresh-water in the depper Tuscaloosa aquifers but the overlying Eutaw aquifer is not fresh. The Eutaw aquifer at Electric Mills in northern Kemper County is not fresh at a depth of 1,388 feet while the deeper aquifer in the lower Tuscaloosa is fresh at a depth of 2,410 feet. This was proven by a test hole (K 2) drilled in 1968 (Table 7).

Table 7.—Records of selected wells in Area II.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables and pumping test tables.

Majority of wells are rotary drilled.

Water Levels: M, Measured; R, Reported.

Elevations: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Wells: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Benton County										
H 1	City of Ashland, Well No. 3	1968	920	10, 6	613	214	1968	P	25	1968	C
	Calhoun County										
B 6	Serepta Water Association	1968	1,887	8, 7, 6	450	220	1968	P	150	1968	C
C 1	Mount Comfort Water Association	1966	1,925	10, 6	395	135	1966	P	150	1966	C
D 4	Town of Bruce	1968	1,850	12	330	128	1968	P	350	1968	C
E 1	Paris Community Water Association	1968	1,715	6, 3			1968	P	75	1968	C
G 1	Macedonia Community Water Assoc.	1966	2,040	8, 4	367	155	1966	P	100	1966	C
H 4	New Liberty Water Assoc.	1967	1,830	8, 4		90	1967	P	160	1967	C
J 1	Big Creek Water Association	1966	2,410	10, 6	300	60	1967	P	180	1967	C
K 1	Duncan Hill Water Assoc.	1966	1,875	6, 3	350	142	1966	P	85	1966	C
L 1	Midway Water Association	1966	1,445	6, 2½	318	98	1966	P	60	1966	C
N 2	Slate Springs Water Works	1964	2,250	6, 4	340	110	1964	P	80	1964	C
O 4	Bently-Montevista Water Assoc.	1968	2,019	10, 8, 6	403	160	1968	P	150	1968	C
	Chickasaw County										
F 1	Natchez Trace Parkway	1965	977	6, 3	400	185	1965	P			
G 1	Girl Scouts of America	1968	1,043	8, 4	460	258	1968	P	100	1968	
L 1	Bernice Thompson	1967	660	5	350	160	1968	D	5	1968	
L 2	Southeast Water Assoc.	1969	720	8	310	150	1969	P	200	1969	
N 1	William Gunn	1967	380	5	251	65	1967	D	5	1967	
O 1	Bill Johnson	1967	880	4, 2	345	150	1967	D	5	1967	

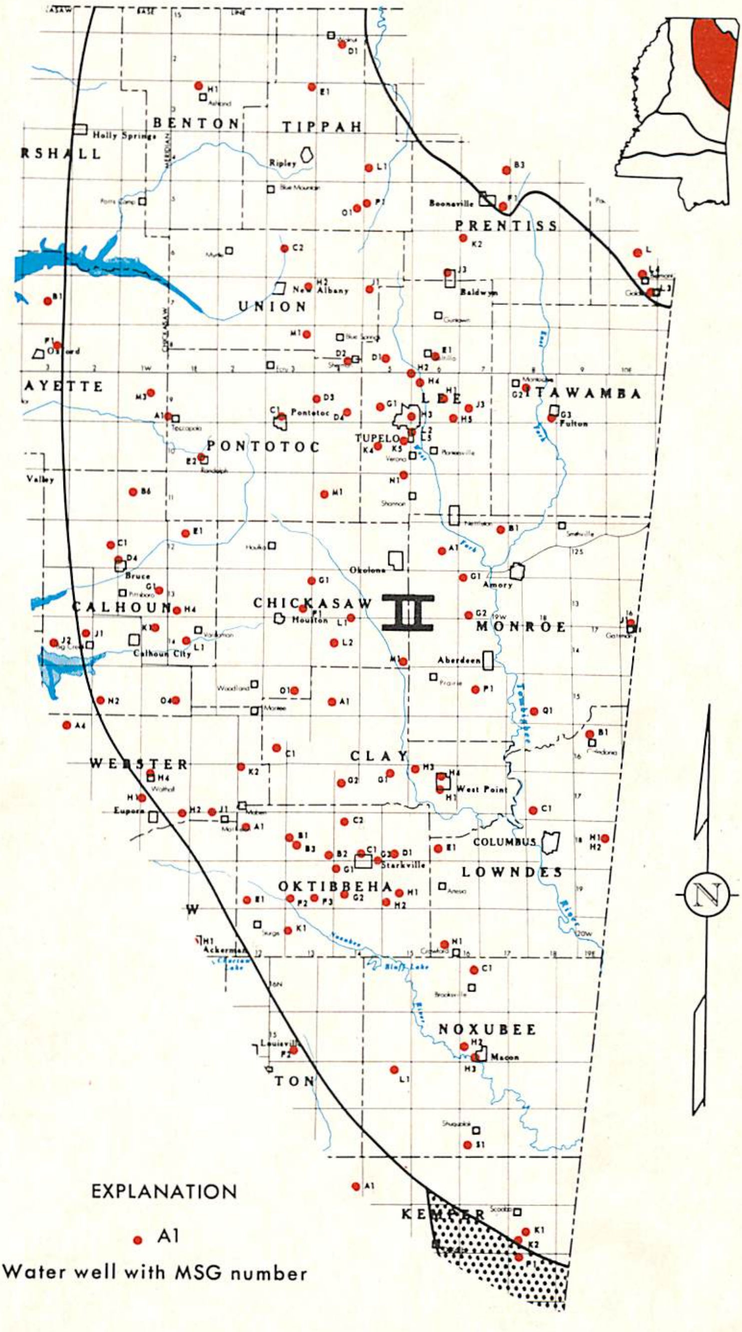


Figure 6.—Location of selected wells in Area II.

Table 7:—Records of selected wells in Area II.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Clay County						
A 1	Mississippi State Forestry Commission	1968	569	4	528	320	1968	D	7	1968	
C 1	Walker's Gin Water Assoc.	1966	1,120	6, 3	250	120	1966	P	50	1966	C
G 1	Siloam Water Association	1966	565	6, 4	220	60	1966	P	60	1966	C
G 2	C. E. Brewer	1969	940	5		120	1969	D	5	1969	
H 1	Bryan Brothers Packing Co. Well No. 4	1967	501	12	218	106	1967	I	350	1967	C
H 3	Lone Oak Water Association	1969	381	10	220	96	1970	P	175	1970	
H 4	City of West Point	1962	810	8, 6	237	28	1962	P	430	1962	C
					Itawamba County						
G 2	Tombigbee Water District	1968	344	8	370	99	1968	P	175	1968	C
G 3	Town of Fulton	1969	171	12	295	10	1969	P	400	1969	C
					Kemper County						
K 1	Kemper County Board of Supervisors	1968	1,348	6, 3		61	1968	I	185	1968	C
K 2	Kemper County Test Project Farmers Home Administration	1968	2,410	4	190	30	1968	T	45	1968	C
K 2	Kemper County Test Project Farmers Home Administration	1968	1,718	4	190	31	1968	T	20	1968	C
P 2	Mississippi State Highway Dept. Rest Area # 75	1968	1,515	4	223	61	1968	P	20	1968	C

Table 7.—Records of selected wells in Area II.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (↑) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Lafayette County										
M 3	Lafayette Springs Water Assoc. Well No. 2	1968	1,650	8, 6	430	207	1968	P	100	1968	C
	Lee County										
D 1	North Lee Water Association	1968	606	10, 6	300	67	1968	P	200	1968	C
E 1	Trace Water Association	1968	510	8	400	160	1968	P	175	1968	C
G 1	City of Tupelo	1969	686	16, 10	340	153	1969	P	500	1969	
H 1	Auburn Water Association	1967	310	8, 4	370	135	1967	P	150	1967	C
H 2	Natchez Trace Parkway	1966	490	8, 4	325	95	1966	P	110	1966	
H 3	City of Tupelo, Well No. 13	1966	541	16, 10	280	167	1966	P	500	1966	C
H 4	North Lee Water Association	1967	596	4	290	67	1967	P	200	1967	C
H 5	Mooreville Water Association	1969	360	10	315	128	1969	P	200	1969	
J 3	Mooreville-Richmond Water Assoc.	1967	395	10	450	205	1967	P	200	1967	C
K 4	Palmetto Water Association	1968	619	8, 4	340	174	1968	P	200	1968	C
K 5	City of Tupelo, Well No. 15	1968	570	8	335	193	1968	P	350	1968	C
L 2	Pennsylvania Tire Company	1966	580	12, 8	270			I	250	1966	
L 5	Pennsylvania Tire Company	1967	560	12, 8	263	161	1967	I	500	1967	
N 1	Mr. Dupree	1967	420	5	257	68	1967	D	5	1967	

Table 7.—Records of selected wells in Area II.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Lowndes County										
B 1	Town of Caledonia	1965	323	8	330	108	1965	P	110	1965	C
C 1	Dixie Land and Water Co., Inc. Holly Hills Subdivision	1965	620	8	260	84	1965	P	175	1965	C
E 1	Golden Triangle Vocational Technical Center	1968	549	6, 3	200	50	1968	P	100	1968	
H 1	East Lowndes Water Association Well No. 2	1965	468	10	302	105	1965	P	350	1965	C
H 2	East Lowndes Water Association Well No. 1	1965	460	10	301	105	1965	P	350	1965	C
N 1	Crawford Water Association	1967	1,175	8, 4	320	143	1967	P	131	1967	C
	Monroe County										
A 1	Wren Water Association	1969	360	8, 4	330	132	1969	P	130	1969	
B 1	Cason Water Association	1968	325	10, 6	350	140	1968	P	168	1968	C
G 1	Wren Water District	1966	348	8	385	80	1966	P	125	1966	C
G 2	Coontail Water Association	1967	270	12	250	70	1967	P	200	1967	C
J 1	Gattman Water Association	1967	124	18, 8	291	19	1967	P	110	1967	C
P 1	International Mineral and Chemical Company	1968	460	4, 2	280	83	1968	I	30	1968	
Q 1	Hamilton Water Association	1968	315	8, 4	230	68	1968	P	169	1968	
	Noxubee County										
C 1	Black Belt Experiment Station	1966	1,288	8, 4	282	110	1966	D	80	1966	
H 2	Piney Woods Water Association	1966	1,785	8, 4	210	+3	1967	P	80	1967	
H 3	Town of Macon	1969	1,857	16, 10		22	1970	P	1235	1970	
L 1	Mashulaville Water Association	1968	1,832	8, 4	175	75	1968	P	150	1968	C
S 1	Naval Air Staion, Auxiliary Field Alpha	1968	2,113	8, 6	240	34	1969	D	60	1970	C

Table 7.—Records of selected wells in Area II.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (↑) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Oktibbeha County										
A 1	Double Springs Water Association	1969	2,150	10, 6	500	258	1969	P	200	1969	
B 1	Center Grove Water Association	1965	1,841	6, 3	406			P	50	1965	C
B 2	Adaton Water Association	1965	1,594	6, 2½	290			P	50	1965	C
B 3	Adaton Water Association	1965	1,645	6, 2½	313	87	1965	P	100	1965	C
C 1	City of Starkville	1965	1,521	16, 10	380	174	1965	P			C
C 2	Trimcane Water Association	1968	1,404	6, 3	230	31	1968	P	65	1968	C
D 1	Clayton Village Water Association	1968	989	8, 5	263	80	1968	P	250	1968	
E 1	Wake Forest Water Association	1967	2,040	8	508	220	1967	P	150	1967	C
F 2	Bradley Water Association	1968	1,696	8	330	132	1969	P	150	1968	C
F 3	Longview Water Association	1963	1,759	10, 4		80	1964	P	100	1964	C
G 1	Bluefield Water Association	1965	1,468	8, 4	298	97	1965	P	100	1965	C
G 2	Talking Warrior Water Assoc.	1968	1,426	8, 4	290	90	1968	P	150	1968	C
G 3	University Heights Corporation	1962	1,310	6, 4	315	114	1964	P			U.S.G.S. information
H 1	Sessums Community Water Assoc.	1965	1,230	8, 4	280	76	1965	P	150	1965	C
H 2	Oktoc Water Association	1968	1,234	8, 4	330	137	1968	P	150	1968	C
K 1	Craig Spring Water Association	1966	1,940	6, 3	330	100	1966	P	75	1966	C

Table 7.—Records of selected wells in Area II.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Pontotoc County						
A 1	Toccopola Water Association	1964	1,575	10, 6	400	140	1964	P	150	1964	
C 1	City of Pontotoc	1967	1,188	12, 8	480	330	1968	P	500	1968	C
D 2	Town of Sherman	1968	850	10	390	155	1968	P	200	1968	C
D 3	East Pontotoc Water Association	1969	1,030	8	501	301	1969	P	200	1969	C
D 4	East Pontotoc Water Association	1969	826	8	400	301	1969	P	200	1969	C
E 2	Randolph Water District	1966	1,565	8, 4	531	310	1966	P	128	1966	C
M 1	Troy Water Association	1968	1,060	8, 4	490	293	1968	P	120	1968	C
					Prentiss County						
J 3	City of Baldwyn Well No. 3	1965	420	10, 6	350	48	1965	P	240	1965	C
K 2	Wheeler-Frankstown Water Assoc.	1966	442	10, 6	370	48	1966	P	220	1966	C
					Tippah County						
D 1	Chalybeate Water System Assoc. Well No. 1	1966	861	8	540	180	1966	P	125	1966	C
E 1	Town of Faulkner, Well No. 1	1964	1,120	8, 6	465	120	1964	P	250	1964	C
L 1	Mitchell Water Association	1968	671	8	629	285	1968	P	100	1968	C
O 1	Dumas-Pinegrove Water Assoc.	1968	940	8	660	315	1968	P	150	1968	C
P 1	Dumas-Pinegrove Water Assoc.	1968	690	4	680		1968	T	30	1968	C

Table 7.—Records of selected wells in Area II.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Union County						
C 2	North Haven Water Assoc.	1969	856	8, 4	460	178	1969	P	150	1969	C
H 2	East New Albany Water Assoc.	1969	1,117	8, 4		285	1969	P	195	1968	C
J 1	Alpine Water Association	1968	700	8	430			P	150	1968	C
M 1	S. C. Rakestraw	1967	685	4, 2	490			D			
					Webster County						
H 2	Sapa Community	1965	2,198	8, 4	420	197	1966	P	100	1965	C
H 4	Walthall Water Association	1964	2,410	10	440	250	1964	P	180	1964	C
J 1	Town of Mathiston, No. 1-D	1965	2,235	10, 6	421	204	1965	P	317	1965	
K 2	Cumberland Water Association	1968	1,024	8, 4	460	224	1968	P	150	1968	

The Cretaceous deposits (Upper Cretaceous sands) are exposed in the area. The beds outcrop in a general north-south belt with younger beds exposed to the west and south. The beds dip gently at the rate of 20-35 feet per mile from their outcrop and the trend or strike is in a north-south direction. Cretaceous beds which occur near the surface in Lowndes and Monroe counties would be 2,500 to 3,000 feet deep in northwestern Kemper County.

The Cretaceous deposits are unconsolidated sediments consisting of sand, silt, gravel, limestone and chalk or mixtures of these. Thickness of the Cretaceous deposits is up to 2,500 feet in the southern part of the region.

LOWER CRETACEOUS AQUIFERS

Lower Cretaceous deposits are present in the southern portion of the area. The Lower Cretaceous deposits have the potential of producing large amounts of water in this region but are secondary in importance to the shallower Upper Cretaceous aquifers. The Lower Cretaceous deposits separate the underlying Paleozoic rocks from the Upper Cretaceous series. These deposits underlie Calhoun and Chickasaw Counties, and the northeastern part of Clay County and southward. The northern edge of the Lower Cretaceous deposit is irregular and the unit thickens rapidly south and westward to a maximum thickness of about 1,000 feet in western Winston and southeastern Noxubee Counties. Only the upper portion, 100 to 300 feet, contains fresh water, particularly in the southern part.

The Lower Cretaceous aquifer has not been tapped for water in this area because of the availability of shallower aquifers and the depth to the aquifer, 1,500 to 2,500 feet. Electrical logs of oil tests indicate the presence of thick water-bearing zones in the Lower Cretaceous in Calhoun, Clay, Oktibbeha, Lowndes, and Noxubee Counties.

UPPER CRETACEOUS AQUIFERS

All major ground-water development in northeast Mississippi is from aquifers in the Upper Cretaceous. The Upper Cretaceous deposits overlie the Paleozoic rocks in the northern portion of Area II and overlie the Lower Cretaceous deposits in the southern portion.

The Upper Cretaceous deposits are divided into several formations or groups which include in ascending order the Tuscaloosa Group which is subdivided into the Massive sand, (Lower Tuscaloosa), Coker (Middle Tuscaloosa), and Gordo (Upper Tuscaloosa) by some authors; the Eutaw formation which includes the McShan; and the Selma Group which includes the Mooreville chalk, Coffee sand, Demopolis chalk, Ripley, Prairie Bluff chalk, and the Owl Creek (Table 6). The aquifers in the Upper Cretaceous include the Tuscaloosa, McShan and Eutaw, and the Coffee sand and Ripley of the Selma Group.

TUSCALOOSA AQUIFER

The Tuscaloosa group, which includes the Massive sand, Coker and Gordo aquifers, is an important source of water throughout most of northeast Mississippi. Drilling contractors rely on the diagnostic pink or red color of horizons in the deposits to locate the Tuscaloosa aquifer in the subsurface.

The Tuscaloosa Group is from 500 feet thick near the outcrop in southeastern Monroe County to about 1,500 feet thick in southern Kemper County. Most of northeast Mississippi is underlain by all or part of the Tuscaloosa Group. Numerous municipal, industrial and domestic wells are completed in these aquifers. The Tuscaloosa aquifers are second to the Eutaw aquifer in potential ground-water development over this wide area.

The Tuscaloosa group consists of coarse sand, angular and rounded gravel and clay. The 100 to 200 foot thick sand and gravel deposits are capable of yielding 500 to 2,000 gpm to properly developed wells (Table 7).

Fresh-water is present in the Tuscaloosa further south than fresh water is found in the overlying Eutaw aquifer. A test well (K 2) at Electric Mills in northern Kemper County proved that the lower Tuscaloosa aquifer was fresh.

EUTAW AND McSHAN AQUIFER

The Eutaw aquifer is the most widely used and has the greatest potential for ground-water development throughout northeast Mississippi. The Eutaw is exposed at the surface in a wide belt from central Lowndes County to Tishomingo County. The base of fresh-water in the Eutaw is from 1,200 to 1,600 feet in the southern part of Area II. The fresh-water boundary of the Eutaw extends to the east and north of the fresh-water limit of the Tuscaloosa aquifer. The Eutaw overlies the Tuscaloosa Group in all areas except in Area I where it overlies the Paleozoic rocks.

The thickness of the Eutaw, including the McShan formation, is up to 400 feet. The Eutaw sediments consist of sand, silt and clay.

Usually, the Eutaw is distinguished by the abundance of the mineral glauconite in the sand and the consistency of the fine-to medium sand.

Domestic and other small wells are completed in the Eutaw aquifer throughout much of the area. Large capacity wells for municipal and industrial use have been completed in the Eutaw at many locations. The average yield from this aquifer is about 250 to 500 gpm, although slightly greater yields are possible at some locations. A number of industrial and municipal wells are drilled through the Eutaw sand to reach the coarse sand and gravel of the underlying Tuscaloosa aquifers.

COFFEE SAND AQUIFER

The Coffee sand is located above the Mooreville chalk and below the Demopolis chalk. The Coffee sand is an important aquifer in Alcorn, Prentiss, Tippah, Union, northern Pontotoc, eastern Lafayette, and northwestern Lee Counties. The Coffee sand is exposed at the surface in a belt from central Lee County to the Tennessee line above Alcorn County.

Thickness of the Coffee sand in the subsurface averages about 250 feet. Sediments of the Coffee sand include sand, sandy clay, and calcareous sandstone. Glauconite is present in the sand but is not as abundant as in the Eutaw. The depth is relatively shallow in the area of potential use and most of the wells are completed at less than 1,000 feet.

Potential yields from the Coffee sand are from 200-300 gpm maximum. This yield is low in comparison to other aquifers in the area.

RIPLEY AQUIFER

The Ripley formation, which in the northern part of the area includes the McNairy sand member, contains important aquifers in the northern and central part of Area II. The Ripley formation overlies the Demopolis chalk and underlies the Prairie Bluff chalk and the Owl Creek formation.

Thickness of the Ripley is from 50 to 460 feet and includes the 200 foot thick McNairy member in the north-central portion of the area. The McNairy sand member is an excellent source of ground water in Marshall, Benton, Tippah, Union, northern and eastern Lafayette and northern Pontotoc Counties.

The Ripley includes sand, clay, limestone and chalk with the McNairy being the only major sand unit. Fresh-water is present in the Ripley to a depth of about 1,000 feet below sea level in the western part of the area.

Wells in the McNairy aquifer will yield moderate to high quantities of water throughout most of the area of potential use. The availability of the shallower Wilcox aquifers in the western part of northeast Mississippi has limited the amount of drilling to the McNairy aquifer.

Water levels in northeast Mississippi are from flowing wells with 44 feet of head to as much as 250 feet below the land surface. Flowing wells are common along the Tombigbee River and its tributaries and tributaries of the Mississippi River located in northeastern Mississippi. Heavy pumpage in local industrial or municipal areas results in a cone of depression being developed in the water levels at certain locations. Large concentrations of ground water pumpage are located at Amory, Aberdeen, Tupelo, West Point and Columbus in Area II (fig. 6).

QUALITY OF WATER

Generally, the ground-water in northeast Mississippi is of good quality for must purposes. Most of the water from the Cretaceous aquifers is soft and low in mineral content (Table 8). Excessive iron is present in some of the aquifers particularly the Tuscaloosa in the eastern part of the region near the outcrop. Moderately hard water is present in the Ripley across the northern counties.

Table 8.—Chemical analyses of water from wells in Area II.

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Benton County															
H 1	920	9-26-68	5.2	0.6	44.07	12.15	2.59*		12.02	6	0.1	167.87	160	7.4	72
Calhoun County															
B 6	1,887	8-8-68	3.2	.75	30.45	10.69	194.23*			310		611.60	120	7.9	71
C 1	1,925	8-30-67	13.2	.3	16.83	6.56	176.91*			250		524.12	69	7.9	90
D 4	1,850	3,28-68		.3						242			29		
E 1	1,715	8-8-68	4.8	1.0	14.02	7.78	175.70*			230	.1	499.53	67	8.0	75
G 1	2,040	8-30-67	8.4	.4	14.42	5.59	235.63*			315	.1	655.27	59	7.9	90
H 4	1,830	10-24-67	19.6	.2	15.22	3.89	182.82*			235	.1	528.56	54	7.8	86
J 1	2,410	9-7-67	23.6	.5	20.83	3.89	314.41*			440	.2	881.36	68	7.8	96
K 1	1,875	10-24-67	10.4	.2	8.81	2.67	204.30*			227	.2	546.22	33	8.0	86
L 1	1,445	10-24-67	11.2	.2	2.80		186.84*			127	.7	473.36	13	8.2	79
N 2	2,250	1-25-65	25.2	.3	6.41	2.43	276.42*			315	.8	736.74	26	8.0	
O 4	2,019	8-8-68	2.4	.8	11.22	6.80	197.44*		14.16	240	.1	541.65	56	7.9	88
Chickasaw County															
L 2	720	12-30-69	1.2	.1	5.21	1.22	106.18	1.75		72	.5	280.00	18	8.3	71

Table 8.—Chemical analyses of water from wells in Area II.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Clay County															
C 1	1,120	6-23-67	6.8	0.2	4.80		215.70*			116	3.5	531.67	12	8.2	74
G 1	565	10-17-66	8.4	.05	4.41	1.94	158.87*			88	.6	406.33	19	8.3	69
H 1	501	9-4-68	6.8	.05	7.21	2.92	61.74*		17.45	22	.2	187.15	30	8.0	67
H 4	810	7-5-62	7.3	9	12.17	3.2	16.84*		15.6	7		88.29	43	6.3	
Itawamba County															
G 2	344	10-31-68		2.0						24			32	6.3	
G 3	171	11- -69		10	8.81	1.22			2.50	4			27	6.2	63
Kemper County															
K 1	1,348	12-3-68	2.8	0.1	4.81	0.97	420.0	3.60		445	2.4	1068.71	16	7.9	(color 60)
K 2	2,410	12-3-68	2.0	.75	16.02	1.94	208.0	3.60		280	.7	615.27	48	7.6	90
K 2	1,718	12-3-68	1.6	1.0	9.61	2.43	448.0	6.00		615	3.2	1248.91	34	7.8	85
P 2	1,515	7-31-68	8.8	.2	7.21	4.13	534.74*		13.50	625	1.6	1376.25	35	8.1	

Table 8.—Chemical analyses of water from wells in Area II.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Lafayette County															
M 3	1,650	12-11-68	3.2	.3	27.24	2.19	92.0	3.60	4.28	132	.1	331.97	77	8.1	82
Lee County															
D 1	606	3-20-69	4.4	.6-1.0	44.87	13.61	101.50	6.00	4.12	200	.1	440.53	166	8.4	66
E 1	510	3-20-69	3.2	.3	32.85	5.35	31.72	3.25	3.46	45	.1	190.86	104	7.9	65
H 1	470	6-10-67		trace						72			94	7.5	
H 1	400	6-20-67		trace						21			68	7.7	
H,2	490	1966	12	.09	36	8.0	.34	3.4	7.2	63	.0	234	123	7.6	64
H 3	541	2-10-67		.3	31.25	7.78	82.63*			131	.1	315.69	110	7.8	66
H 4	596	4-4-68	2.0	0	25.64	6.56	41.83*		30.12	61	.1	228.38	91	8.2	65
J 3	395	12-20-67		trace						55			80	7.8	
K 4	619	9-26-68	4.4	.2	24.84	8.02	60.81*		13.33	83	.1	253.22	95	7.9	69
K 5	570	5-13-69		.1	30.85	3.16	54.50	4.00	3.13	76	0	234.74	90	7.9	67
Lowndes County															
B 1	323	1965		4.5						5			24	6.2	
C 1	620	5-8-67	3.6	6.0	8.01	3.16	6.78*		4.61	4	0	64.97	33	6.6	67
H 1	468	5-8-67	1.2	10	12.02	3.40	10.72*		3.95	5	0	90.71	44	6.6	66
H 2	460	5-8-67	1.2	10	11.22	5.10	134.6*		1.81	7	0	97.21	49	6.8	66
N 1	1,175	10-24-67	.8	.3	3.20		49.36*			25	.1	126.38	8	8.0	77

Table 8.—Chemical analyses of water from wells in Area II.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Monroe County															
B 1	325	12-11-68	1.2	3.5	15.22	3.89	2.75	1.25	7.24	7	0	69.32	54	6.5	65
G 1	348	12-20-67	1.2	0	16.43	4.37	53.18*		5.76	55	0	189.36	59	8.2	65
G 2	270	12-20-67	3.6	trace	12.42	3.89	83.29*		8.06	82	0	255.69	47	8.2	65
J 1	124	2-5-68	4.8	.3	3.20		6.51*			9	0	30.11	8	5.3	64
Noxubee County															
L 1	1,832	12-30-68	6.8	.6	11.22	.73	250.00	3.20		340	.6	712.19	31	8.3	86
S 1	2,113	3-27-69		.4						165			45	7.9	
Oktibbeha County															
B 1	1,841	8-13-65	1.2	.75	6.41	2.43	207.82*			253	.3	544.54	26	8.3	
B 2	1,594	8-13-65	2.8	.4	10.41	2.91	188.23*			237	.2	512.08	38	8.3	
B 3	1,645	8-13-65	1.2	.75	10.01	2.43	170.83*			208	.2	461.25	35	8.2	
C 1	1,521	11-21-66	1.6	.3	3.60	4.86	35.43*		20.57	16	0	119.28	29	7.4	78
C 2	1,404	5-20-68		.8	8.81	2.93	33.25*			15		112.41	34	7.4	76
E 1	2,040	5-20-68	2.8	0.3	6.41	1.93	33.47*			350	1.2	550.67	24	8.2	90
F 2	1,696	3-10-69	4.0	.2	9.61		251.68	3.25		325	.4	663.77	24	8.0	86
F 3	1,759	9-11-63	12.4	.2	10.26	3.40				271	0		29	7.9	80
G 1	1,468	11-21-66		.1	3.20	2.43	48.27*			142	0	259.53	18	8.0	78
G 2	1,426	3-10-69	3.2	.2	8.81		161.52	2.75		182	.4	430.91	22	8.1	78

Table 8.—Chemical analyses of water from wells in Area II.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Oktibbeha County (continued)															
H 1	1,230	11-21-66		.05	3.20	3.16	38.41*			23	0	110.99	21	7.8	77
H 2	1,234	10-10-69	6.4	.1	6.41		54.12	2.00		15	.1	138.11	16	8.1	77
K 1	1,940	5-8-67	1.2	.4	9.62	2.43	274.33*			330	.2	713.62	34	8.0	90
Pontotoc County															
C 1	1,188	1-13-69	10.4	.1	22.44	5.35	64.80	4.00		102	0	261.11	78	7.9	73
D 2	850	4-2-68		trace	25.64	9.96	62.81*		22.71	80	.1	264.15	105	8.0	68
D 3	1,080	6-20-69	3.2	trace	22.84	4.13	56.90	3.00	6.58	60	0	222.68	74	8.2	71
D 4	826	3-20-69	1.2	.3	24.04	3.16	81.26	2.75	7.41	62	.2	246.65	73	8.2	69
E 2	1,565	10-17-65	5.2	.4	11.21	3.40	128.02*			137	.2	361.69	42	8.2	82
M 1	1,060	11-18-68	4.0	.1	12.02	1.94	67.50	4.00	5.60	62	.2	220.22	38	8.2	73
Prentiss County															
J 3	420	6-16-67	3.2	.05	29.65	6.80	25.05*		16.65	22	0	168.18	102	8.0	64
K 2	442	6-16-67	2.4	.1	30.45	7.29	26.00*		13.32	19	0	164.49	106	7.9	64

Table 8.—Chemical analyses of water from wells in Area II.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Tippah County															
D 1	861	10-24-67		0.2	24.03	13.12	18.95*		17.28	5	0	156.41	114	7.8	70
E 1	1,120	1-26-65	4.4	.2	39.66	15.01	90.65*		45.42	145	.2	404.17	160	7.6	73
L 1	671	9-25-69	3.2	.2	46.47	7.05	15.12	3.00	15.31	4	0	181.18	145	7.7	65
O 1	940	9-25-69	4.8	trace	35.25	4.62	27.05	3.00	32.26	11	.2	190.61	107	7.8	65
P 1	690	6-3-68		.1						11			98	7.8	65
Union County															
C 2	856	1969	4.8	.1	8.01		59.80	2.75	10.21	2	0	171.60	20	8.2	67
H 2	1,117	1969	3.2	.1	29.65	1.46	82.32	4.5	6.58	80	.2	209.42	80	8.0	68
J 1	700	3-10-69	2.4	.2	33.25	7.05	74.26	5.0	16.13	100	0	308.32	112	8.0	66
Webster County															
H 2	2,198	11-20-67	2.0	.2	15.22	2.65	259.75*			350	.3	701.65	49	7.9	92
H 4	2,410	3-18-65	1.2	.5	9.21	1.45	280.67*			322	.7	726.28	29	8.0	92
J 3	2,235	11-20-67	2.4	.3	15.22	2.67	244.90*			330	.2	664.82	49	7.9	91

* Sodium and Potassium as Na

Mineralization of the water increases with depth and southward along the strike. The Eutaw aquifer contains water too highly mineralized for domestic use along the southern and western periphery of the region. The lower Tuscaloosa (massive sand) yields water of the best quality throughout most of the region. Water from the Eutaw is good and is widely used for municipal, industrial and domestic wells in the area.

Flouride is present in the water from some of the Cretaceous aquifers. Locally the flouride content may be excessive and is up to 7 ppm in some places.

GROUND WATER

AREA III

The area of north central and central Mississippi is underlain by aquifers in several geologic units (fig. 7). Most of the aquifers are shallow and outcrop within the area. The amount of available water in the aquifers varies with location, depth and geologic conditions.

Multiple aquifers are present at most locations and the water supplies are from various aquifers in the region. The major aquifers underlying the region (or parts) are the Coffee sand and Ripley of Cretaceous age; the Wilcox, Meridian sand and Kosciusko of Eocene age (Table 9). The Neshoba sand, Tallahatta, Winona and Cockfield of Eocene age are minor aquifers in Area III with limited areal extent and use.

The aquifers generally consist of varying thicknesses of sand separated by clay layers. The sands are present at various positions within the particular unit or may comprise the entire unit. Some of the geologic units are lenticular in nature (particularly the Wilcox near the outcrop) and the sand thickness is difficult to predict.

Most water supplies at the present time utilize shallow aquifers and the deeper aquifers are generally not extensively used. The potential use of the aquifers extends over a large area and generally the limiting factor is the downdip extent of fresh water.

Fresh-water is present in Area III to more than 3,000 feet below sea level. The deepest fresh-water is in the Wilcox aquifer

Table 9.—Stratigraphic column and water resources in Area III.

ERA	SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
Cenozoic	Quaternary	Holocene		Alluvium	0-60	Not an important aquifer. Supplies a few domestic wells along some of the major streams.
		Pleistocene		Loess	0-108	Not an aquifer.
				Terrace Deposits	0-50	Generally not an aquifer. Some local domestic wells utilize this aquifer. The deposits may have thick sands developed at some locations.
	Tertiary	Eocene	Claiborne	Cockfield	0-150	Supplies water to wells along the southern boundary of Area III and along the outcrop area.
				Cook Mountain	0-100	Not an aquifer.
				Kosciusko	0-800	An important aquifer through the central part and to the west and southwest of the outcrop. Supplies water systems and other smaller wells in the western and southern part of the area. Quality is generally good. Low pH and iron concentration may be a problem at some locations.
				Zilpha	0-150	Not an aquifer.
				Winona	0-30	Not an important aquifer. A few domestic and some municipal wells are completed in this aquifer.
				Tallahatta: Neshoba Sand and Basic City	0-140	Supplies a number of domestic wells near the outcrop area. Some public and industrial water wells are completed in this aquifer at certain locations. The aquifer is more important in the northern and central part than in the southern part. Water quality is generally good.
				Tallahatta: Meridian sand	0-150	An important aquifer underlying much of the area. A large number of wells are completed in this aquifer. Difficult to separate from underlying Wilcox when both units have sands at the contact.
			Wilcox	Undifferentiated	125-2000	One of the most widely used aquifers throughout the area. Many large water supplies are from the Wilcox. Quality of water is generally good. Colored water is a problem in some of the local areas.
		Paleocene	Midway	Naheola	100-150	Not an aquifer.
				Porters Creek clay	200-500	Not an aquifer.
				Clayton	30	Not an aquifer.
Mesozoic	Cretaceous	Gulf	Selma	Prairie Bluff chalk and Owl Creek	40	Generally not an aquifer. A few domestic wells are completed in the Owl Creek in Marshall County.
				Ripley	300-400	An important aquifer in Marshall, DeSoto and Tate Counties. One well was completed in this aquifer at a depth of 1620 feet in Marshall County (D1). Quality of water is good.
				Demopolis chalk	500	Not an aquifer.
				Coffee sand	150-250	A fair aquifer for domestic wells in Marshall and eastern DeSoto Counties. Depth (2000 feet or more) and availability of shallower aquifers have limited the utilization of this aquifer. Quality of water is fair.

in central Scott and Jasper Counties (fig. 2). The Cretaceous aquifers in the extreme northern part of the region contain fresh water to a depth of 2,000 feet below sea level. The shallowest fresh waters are present along the eastern part of the region to a depth of 500 feet below sea level in the Wilcox.

Most of the geologic units are thin near the outcrop and thicken downdip toward the west and southwest. The thicker sands are capable of supplying higher yields to wells but generally the mineralization of the water increases with depth.

COFFEE SAND AND RIPLEY AQUIFERS

The northern part of Area III is underlain by fresh water aquifers in the Cretaceous. Fresh water is present in the Coffee sand to a depth of 2,000 feet below sea level across western Marshall, eastern DeSoto and northwestern Lafayette Counties. The Cretaceous aquifers are generally not used for water supplies at the present time, and these aquifers are important for their potential use in the future. The availability of the shallow Wilcox, Meridian, and Kosciusko aquifers has limited the use of the deeper Cretaceous aquifers.

The Coffee sand is presently unused in Area III although wells are completed in the Coffee sand in eastern Lafayette County. Depth to the top of the Coffee sand ranges from about 1,400 feet at Potts Camp to about 2,300 feet at Byhalia. Thickness of this unit is estimated to be 150 to 200 feet. Thick sands capable of yielding large quantities of water are unlikely in the Coffee sand in this region. Quality criteria for certain domestic wells may justify investigating the Coffee sand aquifer in the northern part of Area III.

The Ripley is a potential aquifer in the northern part of Area III (fig. 3). The Ripley formation lies above the Coffee sand. This unit overlies the Demopolis chalk and is located below the Prairie Bluff and Owl Creek formations. Wells are completed in the Ripley aquifer in Marshall and eastern Lafayette Counties.

Depth to the top of the Ripley ranges from 800 feet at Potts Camp to 1,540 feet at Byhalia (Well No. D1) (Table 10 and fig. 7). Thickness of the Ripley is estimated to be about 400 feet and individual sand beds are as much as 200 feet thick. The

Table 10.—Records of selected wells in Area III.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables and pumping test tables.

Majority of wells are rotary drilled.

Water Level: M, Measured; R, Reported.

Elevation: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Well: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Attala County						
K 2	Sallis Community Water System	1966	621	10, 6	360	65	1966	P	150	1966	C
L 2	McAdams Water Association	1966	541	10, 6	340	40	1966	P	150	1966	C
M 3	City of Kosciusko	1969	439	18	455	141	1969	P	770	1969	
S 2	Traco Water Association	1968	600	10	430	115	1969	P	150	1969	C
U 2	Zama Water Association	1968	520	8, 4	570	170	1968	P	150	1968	C
					Calhoun County						
J 2	C. G. Steele	1967	246	4, 2	275	42	1967	D	8	1967	
					Carroll County						
B 1	Dave George	1966	469	4, 2	342	160	1966	D	5	1966	
B 3	Howard James	1969	310	4	380	186	1969	D	8	1969	
D 1	Kenneth Walls	1967	475	4	340	170	1967	D	8	1967	
F 1	McCarley Water Association	1967	426	6	325	138	1967	P	100	1967	C
F 4	Town of North Carrollton	1969	727	10	250	28	1969	P	250	1969	
M 2	Black Hawk Water Association	1968	986	6; 3	300	90	1968	P	50	1968	C

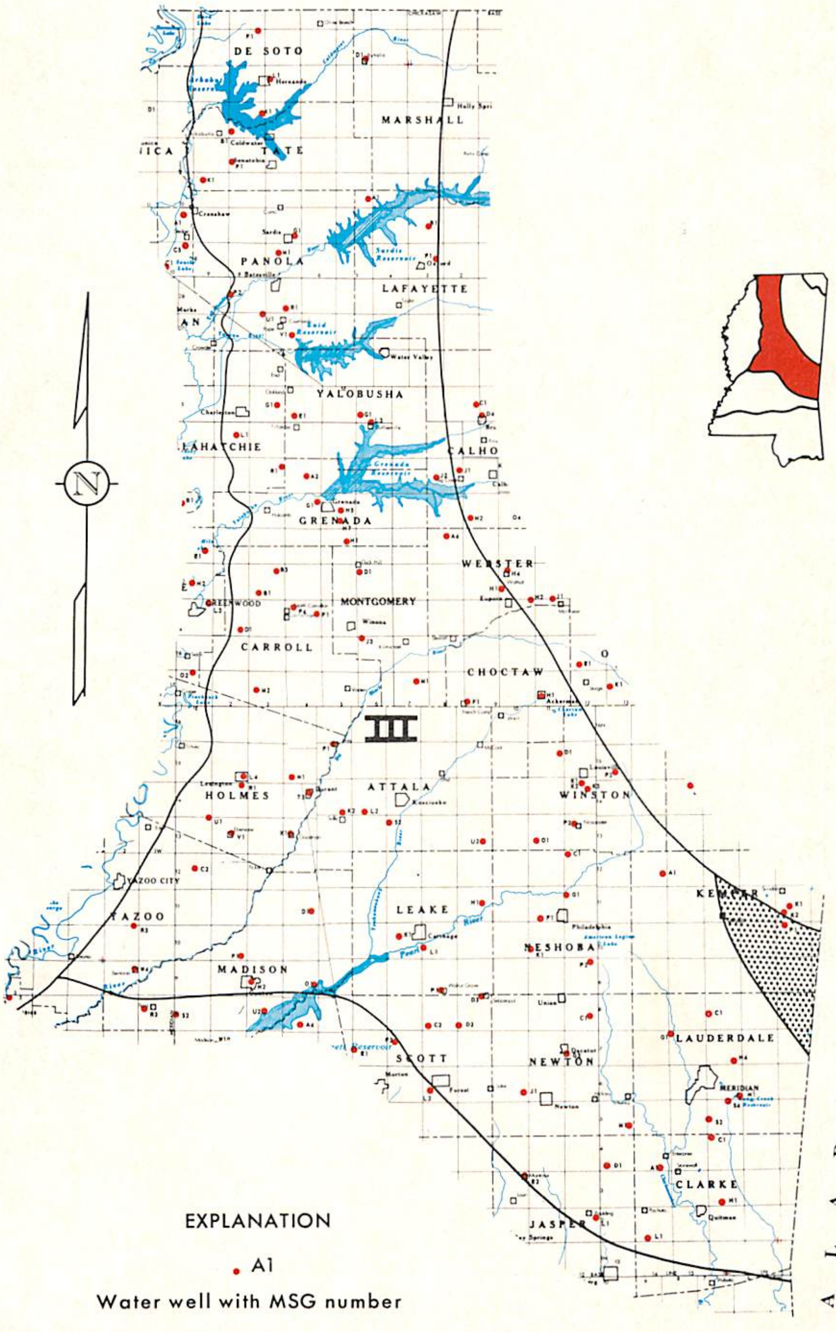


Figure 7.—Location of selected wells in Area III.

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Choctaw County						
F 1	French Camp Water Association	1968	690	10, 6	460	85	1968	P	154	1968	C
H 1	Town of Ackerman	1968	96	18, 10	518	11	1968	P	420	1968	C
					Clarke County						
A 1	Southern Natural Gas Company Well No. 2	1967	1355	10	260	+30	1967	I	380	1967	
C 1	Clarkdale Water Association Well No. 3	1965	1270	10	540	247	1965	P	164	1965	
H 1	East Quitman Water Association	1968	368		340			T			C
L 1	Barnett Water Association	1968	330	4	310	80	1968	P	40	1968	C
					DeSoto County						
F 1	Horn Lake Water Association	1965	470	8, 6	340	124	1965	P	215	1965	C
K 1	Walkem Development Corporation	1966	433	8, 6	320	116	1966	P	500	1966	
L 1	Town of Hernando	1968	335	10	385	160	1968	P	750	1968	
					Grenada County						
A 2	Geeslin Corner Water Association	1968	653	8, 4	195	+6	1968	P	150	1968	C
G 1	Holiday Inn	1967	662	6	250			P	90	1967	
H 1	Elliot Community Water Association	1966	466	8	221	29	1966	P	137	1966	C
H 5	Knox Hill Water Association	1968	482	8	280	41	1968	P	85	1968	

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above ( ) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Holmes County										
F 1	Town of West	1968	1,340	6	275	+	1968	P	75	1968	C
L 4	Harthcock Grocery	1970	1,155	4	205	+	1970	I	50	1970	
N 1	West Hill Water Association	1967	939	8, 4	400	140	1968	P	100	1967	C
R 1	Sweet Home Water Association	1965	1,130	10, 6	300	90	1965	P	200	1965	C
T 3	Town of Durant, Lamar St. Well	1968	670	18	265	+	1968	P	500	1968	
U 1	Harland Creek Community Water Assoc.	1966	1,270	6, 3	340	142	1967	P	145	1967	C
V 1	Ebenezer Water Association	1967	1,396	10, 6	348	90	1967	P	300	1967	C
X 1	Holmes Junior College	1968	1,030	10, 6	300	32	1968	P	300	1968	
	Jasper County										
D 1	Rose Hill Water System	1967	886	8	390	97	1967	P	200	1967	C
E 2	Montrose Water Association	1968	603	4, 2½		162	1968	P	80	1968	C
L 1	Paulding Water Association	1968	810	10, 8	525	247	1969	P	305	1969	C
	Kemper County										
A 1	North Kemper Water Association	1969	276	10	515	80	1969	P	200	1969	
	Lafayette County										
A 1	Harmontown Water Association	1969	352	8	420	156	1969	P	230	1969	C
B 1	Hurricane Water Association	1967	240	6	520	180	1968	P	100	1968	C
F 1	Campground Water Association	1966	190	8	560	154	1967	P	120	1967	C

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Lauderdale County										
C 1	North Lauderdale Water Assoc.	1966	700	8, 6	520	232	1968	P	250	1968	C
G 1	Okatibbee Dam Site - West Bank	1968	541	2	390	85	1968	T	50	1968	C
H 4	Lockheed Aircraft Corporation	1969	758	10, 6	470	211	1969	I	520	1969	
N 1	Long Creek Water Association Well No. 2	1965	947	10, 6	545	285	1965	P	183	1965	C
S 2	Clarkdale Water Association	1965	1,195	10, 6	580	310	1965	P	151	1965	
S 4	Long Creek Water Association Well No. 1	1966	1,020	10, 6	565	288	1966	P	150	1966	C
	Leake County										
H 1	Edinburg Community Water Assoc.	1966	849	8, 6	385	29	1966	P	157	1966	C
K 1	Pilgrim Rest Water Association	1967	776	6	390	74	1967	P	136	1967	C
L 1	Freeny Water Association	1969	613	10	465	140	1969	P	300	1969	
L 1	Freeny Water Association	1969	254	10	465	116	1969	P	254	1969	C
P 1	Town of Walnut Grove	1961	368	6, 4	360			P	115	1961	
	Madison County										
D 1	Camden Water Association	1968	476	8	320	97	1968	P	100	1968	C
F 1	Big Black Water Assoc., Well No. 1	1967	923	10	222	50	1967	P	100	1968	C
N 2	Canton Municipal Utilities	1969	930	18, 10	210	68	1969	P	1016	1969	
O 1	Pearl River Valley Authority Ratliff's Ferry Well	1970	314	4, 2	300	37	1970	P	24	1970	

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Marshall County						
D 1	Town of Byhalia	1969	1,620	10, 8	360	+13	1969	P	350	1969	C
					Montgomery County						
D 1	Slodgetown-Eskridge Water Assoc.	1966	530	8, 4	280	41	1966	P	105	1966	C
J 2	South Winona Water Association	1969	926	2	450	170	1967	P	50	1969	C
M 1	Poplar Creek Water Association	1966	952	6, 4	409	90	1966	P	50	1967	C
					Neshoba County						
C 1	North Pearl River Water Assoc.	1968	690	8, 6		140	1968	P	200	1968	C
F 1	Kentawka Valley Water Association	1966	727	10	530	156	1966	P	125	1967	C
G 1	Central Water Association	1968	650	8, 6		87	1968	P	225	1968	C
K 1	Southwest Water Association	1968	390	8, 6		162	1968	P	228	1968	C
P 2	House Water Association	1968	950	8, 6	610	240	1968	P	275	1968	C
					Newton County						
C 1	Beulah-Hubbard Water Association	1968	965	8, 6	555	205	1968	P	200	1969	C
G 3	Town of Decatur	1966	306	12, 8	415	82	1966	P	212	1966	
J 1	Lawrence Water Association	1968	496	8, 6	493	175	1968	P			C
M 1	Chunky Water Association	1970	125	8	280	13	1970	P	50	1970	

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Panola County						
G 1	Town of Sardis	1967	1,141	12, 8	360	167	1967	P	750	1967	C
M 1	Hebron Water Association	1968	1,100	8, 6	320	140	1969	P	135	1969	C
P 2	ELC Water Association	1968	1,164	8, 6	174	+10	1969	P	250	1969	C
R 1	Mississippi State Highway Department Rest Area	1968	922	4, 2	303			P	30	1968	
U 1	Independence Water Association	1968	240	8	320	145	1968	P	155	1968	C
V 1	Liberty Hill Water Association	1967	522	8	360	130	1967	P	165	1967	C
					Scott County						
C 2	H. & H. Water Assoc., Well No. 1	1968	939	10	423	110	1968	P	360	1968	
D 2	Steele Ringold Water Association North Well	1968	1,170	10, 6	470	150	1968	P	300	1968	C
D 3	Sebastopol Water Association	1969	576	16, 8	443	95	1969	P	650	1969	C
					Tallahatchie County						
G 1	Spring Hill Water Association	1967	560	6		150	1968	P	135	1967	C
L 1	Paynes Community Water System	1967	1,312	8, 6	280	120	1967	P	150	1967	C
R 1	Pea Ridge Water Association	1969	1,070	4	388	182	1969	P	110	1969	C

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Tate County						
B 1	Town of Coldwater	1967	158	20, 12	280	58	1968	P	1220	1968	
F 1	Strayhorn Water Association	1968	900	10, 6	340	120	1968	P	200	1968	C
K 1	Strayhorn Water Association	1968	1,600	8, 6	320	136	1968	P	150	1968	C
					Webster County						
A 4	Cadaretta Water Association	1969	272	8, 4	300	79	1969	P	71	1969	
H 1	Mt. Zion Water Association	1967	370	10	480	158	1967	P	80	1967	C
H 3	LeGrange Water Association	1969	149	8	355	46	1969	P	76	1969	
					Winston County						
D 1	High Point Water Association	1966	412	10, 6	593	173	1966	P	160	1966	C
F 2	Bond Community Water System	1965	206	10, 6	520	76	1966	P	159	1966	C
K 1	City of Louisville	1967	354	12	510	115	1967	P	692	1967	C
K 2	City of Louisville	1967	2,725	4	513	302	1967	T	23	1967	C
K 3	Southeast Water Association	1965	210	10	554	124	1965	P	160	1965	C
O 1	Liberty-Plattsburg Water Assoc.	1967	505	10	494	98	1967	P	160	1967	C
P 2	Town of Noxapater	1969	525	8		155	1969	P	91	1969	C
					Yalobusha County						
E 1	Tillotoba Water Association	1964	1,020	8, 4	325	110	1964	P	189	1964	C
G 1	Cypress Creek Water Association	1967	244	6, 4	350	140	1967	P	100	1967	C
L 3	Town of Coffeeville	1968	458	10, 6	235	12	1968	P	400	1968	C

Table 10.—Records of selected wells in Area III.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Yazoo County						
C 2	Midway Community Water Association	1968	1,920	10, 6	310	62	1969	P	250	1969	
R 3	Mississippi State Forestry Comm.	1968	834	4, 2	381	266	1968	D	10	1968	
W 4	Cathey-Willford-Jones	1968	540	4, 3	180	75	1968	D	5	1968	

McNairy sand member is an excellent source of ground water development in extreme northern Mississippi. Most of the ground water development in the Memphis area is in the McNairy aquifer. Large quantities of water are available from the Ripley throughout most of northern Mississippi. The availability of shallower aquifers in the Wilcox has deemed it unnecessary to drill to the Ripley in most places. Recently (1969) a municipal well (D1) was completed at Byhalia (Marshall County) in the Ripley and the water is of excellent quality from this well.

Water levels in the Cretaceous aquifers range from flowing wells to about 350 feet deep. Flowing wells should be possible in some of the major stream valleys. The deeper water levels would be located at high elevations on the tops of hills. Information on water levels is scarce throughout extreme northern Mississippi because of the few wells completed in these aquifers. Elevations are high throughout most of the northern part of the region with some elevations of 700 feet.

WILCOX AQUIFER

The Wilcox is an important aquifer throughout most of Area III. Numerous industrial, municipal and domestic wells are completed in the Wilcox aquifer. The Wilcox is a potential aquifer in the entire region and to the west in Area IV.

The Wilcox outcrops along the eastern part of the region. The Wilcox underlies the Tallahatta Group and is located above the Midway Group. Thickness of the Wilcox is from 900 to 2000 feet and individual sand beds are up to 200 feet thick. Thickness of the unit increases from the outcrop in the direction of dip which is west-southwest. Sand beds generally are present near the top and bottom but may be present at any position within the unit.

The Wilcox, in the northern part of the area, outcrops in the east and is nearly 1,000 feet deep (bottom) at Byhalia in the west. The bottom of the Wilcox is about 1,200 feet deep near Carrollton in Carroll County in the central part of the region. The Wilcox aquifer is from 1,670 to 1,963 feet deep at Midway in Yazoo County. A well would have to be drilled to over 3,000 feet in central Scott and Jasper Counties to penetrate the fresh-water section of the Wilcox. Most wells completed in the Wilcox are shallow to intermediate in depth within Area III. The availability of shallow aquifers in the Tallahatta, Kosciusko and Cockfield deposits has limited the use of the deeper Wilcox sands.

Fresh water is available in the Wilcox throughout Area III and extends to a maximum depth of 3,000 feet below sea level in Scott and Jasper Counties (fig. 2). Across central Tunica and eastern Quitman counties, the Wilcox is fresh to a depth of 1500 feet below sea level. Fresh water is present in the Wilcox to 1,000 feet below sea level in the northern part. The base of fresh water is up to 500 feet below sea level across central Montgomery, eastern Attala, western Winston, eastern Neshoba, southwestern corner of Kemper, and central Lauderdale Counties.

Most wells completed in the Wilcox are shallow to intermediate in depth and generally are located in the eastern and southern part of Area III. Some wells in the Wilcox have been drilled to a depth of 1,500 feet across the central part of the region. Very few wells have been drilled to the base of fresh water particularly in the central and southern parts. A deep hole 1,974 feet deep) has been contracted (1970) at Quitman in central Clarke County to test the lower part of the Wilcox.

Well yields from the Wilcox range from small to intermediate in most of the region. The majority of wells are for domestic or rural water systems and for municipal wells in the central and northern part. Most yields from the Wilcox have not exceeded 500 gpm. The town of Louisville has several wells which yield up to 750 gpm from the Wilcox at a depth of about 350 feet (Table 9). Predicted yields are higher in the central and southern region and properly constructd wells should yield up to 2,000 gpm at some locations in this region.

Water levels in the Wilcox range from near the surface or flowing in the deeper stream valleys, to several hundred feet deep at high elevations. Most water levels are from 100 to 150 feet deep. A large percentage of the land surface throughout Area III is 300 to 500 feet in elevation.

CLAIBORNE AQUIFERS

A large number of municipal, industrial and domestic wells are completed in the Claiborne aquifers in Area III. The Meridian sand, Tallahatta, and Kosciusko are the major aquifers in the Claiborne Group. The Neshoba sand, Winona, and the Cockfield are Claiborne aquifers with limited areal distribution and use.

The Claiborne Group overlies the Wilcox and is located beneath the Jackson. Thickness of the Claiborne ranges from 2,500 to 3,000 feet and individual formations are several hundred feet thick. The beds increase in thickness in the direction of dip. The general dip is about the same as the underlying Wilcox (30-35 feet per mile). The Claiborne is fresh throughout Area III and has the potential of furnishing large quantities of water.

MERIDIAN SAND AQUIFER

The Meridian sand is the basal part of the Tallahatta formation and is also basal Claiborne. The Meridian sand supplies a large number of the water systems in the central part of the area. Municipal wells at West, Durant, Winona, Carrollton, Grenada, Water Valley, Oakland and Batesville are completed in the Meridian sand. Well yields range up to several hundred gallons per minute from this aquifer. A large number of small to intermediate yielding wells are completed in the Meridian sand across the northern and central part of the region.

The depth of the Meridian sand varies with location within the region. The top of the unit is 400 feet at Byhalia, Marshall County, in the northern part of the region and 800 feet deep at Black Hawk in Carroll County, in the central part of the region. The top of the Meridian sand is estimated to be 1,200 feet in central Jasper County in the southern part of the region.

Thickness of the Meridian sand ranges from 30 to 150 feet. The unit is thick in the northern and central part of Area III and thins in the southern part. The Meridian sand is difficult to recognize at certain locations where the Meridian lies on sands of the Wilcox.

The Meridian sand is potentially an important aquifer throughout much of Area III. The yields from individual wells vary from small to intermediate (20 to 500 gpm). At specific locations the sand may be replaced or nearly replaced by clay beds.

Water levels in the Meridian are about the same as in the underlying Wilcox aquifers. Water levels range from flowing wells to about 200 feet deep. Heavy pumpage may have produced deeper than normal water levels at particular locations in the region.

KOSCIUSKO AQUIFER

The Kosciusko (Sparta sand) is located about the middle of the Claiborne Group. The Kosciusko overlies the Zilpha and is beneath the Cockfield formation. The Kosciusko is an important source of water across the southern and western part of Area III.

The Kosciusko is generally composed of varying thicknesses of sand separated by clay beds. Thickness of the sand intervals varies from a few feet to several hundred feet. The position of the sand layers may be at the top, middle or bottom of the formation but usually the thicker and coarser sands are located near the base of the unit. Thickness of the Kosciusko is from about 200 to 800 feet with the thickest section occurring in the western part of Area III.

Fresh water is present in the Kosciusko aquifer throughout the region (fig. 2). Most of the wells which utilize the Kosciusko aquifer are shallow (100 to 400 feet) except along the western edge and southern part (Table 10). The Kosciusko is exposed across the central and western part of the region. Well yields are small to intermediate from this aquifer. Larger yields are indicated at certain locations as thick sands are available at sufficient depths for large withdrawals. The Kosciusko furnishes water to numerous municipal, industrial and domestic wells in the western part of Area III. Well fields producing from the Kosciusko aquifer are located at Forest (Scott County), Canton (Madison County), Yazoo City (Yazoo County), Como and Sardis (Panola County), Coldwater and Senatobia (Tate County), and Hernando, Olive Branch and Southaven (DeSoto County).

Water levels in the Kosciusko are generally deep in Area III. Some flowing wells are present in the deeper stream valleys. Water levels are up to 200 feet below the surface and even deeper near areas of heavy pumpage. Elevations in Area III are in the 300 to 500 foot range except in the stream valleys.

MINOR AQUIFERS

The Neshoba sand, and Basic City (Tallahatta undifferentiated) are aquifers in the Tallahatta formation (Table 6). The Neshoba sand is present in the central part of Area III. The Neshoba sand is not recognized southeast of Newton County or north of the Yalobusha River in Grenada County. Some water wells are completed in the Neshoba sand but yields are fairly low from this aquifer.

The Tallahatta undifferentiated or Basic City is an aquifer in northern Mississippi. A few wells are completed in these aquifers but are not significant because of the limited use and distribution.

The Winona is a minor aquifer in the north central part of Area III. The Winona overlies the Tallahatta and is beneath the Zilpha. The Winona has a characteristic green color which is from the abundance of the mineral glauconite. Some small wells are completed in this aquifer but generally large quantities of water are not available.

The Cockfield is a potential aquifer across the west central part of Area III. The Cockfield overlies the Cook Mountain formation and is located beneath the Jackson Group. The Cockfield is used for domestic and some municipal wells in parts of Yazoo, Madison, Scott, Newton, Jasper, and Clarke Counties. Numerous small wells are completed in the Cockfield in northern Madison and Yazoo Counties and in Holmes County.

QUALITY OF WATER

Generally, the ground water is of good quality within Area III. Minor quality problems are present in water from several of the aquifers throughout the area but, the problems may be corrected with treatment. Some of the usual quality problems are low pH, excessive iron concentration and carbon dioxide content (Table 11). Treatment of these problems is relatively simple and generally involves aeration, pH adjustment and settling.

Most of the water contains low dissolved solids and is soft. The water is a sodium or calcium bicarbonate type and may be used for most general purposes. Water from wells 500 feet deep or less usually has a low pH (5-6.5 pH) and contains high (50-80 ppm) carbon dioxide.

Table 11.—Chemical analyses of water from wells in Area III.

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Attala County															
K 2	621	11-1-66		0.5						7			31	7.0	
L 2	541	9-22-66		.8										6.4	
S 2	600	1-17-69		3.5						7			158	6.7	
U 2	520	11-18-68		.7	30.04	3.65	19.50	2.70	19.42	22		158.75	90	6.4	68
Carroll County															
F 1	426	8-21-68	6.4	5.0	12.82	6.08	51.91*		22.38	62	0.1	207.41	57	6.3	67
M 2	986	8-21-68	9.6	.2	2.0		65.22*		30.94	5		181.79	5	8.3	74
Choctaw County															
F 1	690	7-12-68		trace	4.41	1.46	53.70*			9		141.20	17	7.5	72
H 1	96	3-28-68		1.5						9			18	5.7	
Clarke County															
H 1	368	2-25-69		.3	14.02	1.70	15.75	1.50		2	.4	81.29	42	6.1	70
L 1	330	11-4-68	2.8	.2	2.00	.97	108.00	3.20		14		294.66	9	8.2	68
DeSoto County															
F 1	470	10-31-67		.6	6.41	2.92	8.46*		2.80	6		47.60	28	5.7	63

Table 11.—Chemical analyses of water from wells in Area III.—(Contniued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Grenada County															
A 2	653	8-21-68	9.6	0.1	3.20		162.54*			64		396.00	8	8.4	69
H 1	466	1-5-67	7.2	.1	2.4	.5	125.27*			30	0.4	308.23	8	8.4	68
Holmes County															
F 1	1,340	5-24-68		.2			160.32*			40	.1	375.59		8.1	80
N 1	939	2-25-69		1.0	8.01	1.70	36.00	2.50		3		116.44	27	7.0	
R 1	1,130	4-3-67	3.2	.2			80.06*		21.96	15		198.25	trace	7.8	76
U 1	1,270	4-3-67	7.2	.2	2.00	1.22	322.49*			8	.6	756.68	10	7.9	75
V 1	1,396	4-15-69	4.8	0			84.12	0	9.38	5		202.94		8.5	82
Jasper County															
D 1	886	9-27-67	3.2	.2	2.00		149.45*		24.36	6		363.08	5	8.7	71
E 2	603	4-3-68		.4						32			350	7.2	
L 1	810	9-12-68		.4						12			150	7.9	
Lafayette County															
A 1	352	7-29-69	4.2	0	3.2		1.39	0				15.39	8	5.6	62
B 1	240	1-13-69	4.0	.1	2.40	.73	2.00	0		3		17.63	9	5.5	62
F 1	190	1-9-68		0	1.20	.50	3.22*			5			5	5.3	62

Table 11.—Chemical analyses of water from wells in Area III.—(Contniued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Montgomery County															
D 1	530	8-21-67	11.6	trace	1.60	1.94	61.68*		1.03	7	.1	165.88	14	8.2	69
J 2	926	7-29-69	3.2	4.0	13.62	1.0	7.59	2.00	9.05	7	.2	74.38	38	6.2	
M 1	952	5-7-68	4.0	4.0	11.21	2.92	18.38*		14.32	7	.4	103.85	40	6.7	68
Neshoba County															
C 1	690	5-7-68	3.6	3.0	7.21	3.64	24.63*		12.51	6	.2	96.61	31	6.1	
F 1	727	5-24-67	1.2	.2	16.02	5.10	44.27*			5		161.63	61	7.7	71
G 1	650	5-7-68		10+						8			22	6.1	
K 1	390	2-25-70		2.0	8.81	4.13	6.82	3.75	8.56	3		66.48	39	6.2	66
P 2	950	7-29-69	4.4	7.0	15.22		11.41	4.50	5.43	7			38	6.1	
Newton County															
C 1	965	3-4-70	3.2	1.0	12.02	1.94	38.85	2.75	6.58	5	.1	131.99	38	7.3	73
J 1	496	3-4-70	4.8	2.0	38.46	5.83	27.46	1.80	8.07	4		168.46	120	6.4	67

Table 11.—Chemical analyses of water from wells in Area III.—(Contniued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Lauderdale County															
C 1	700	1-6-67		3.0						33			22	6.1	
G 1	541	10-2-68		0						4				8.4	
N 1	947	12-27-67	3.6	1.2	9.62	3.16	41.43*		5.60	13		140.64	37	6.7	73
S 4	1,020	12-27-67	6.4	1.8	8.81	1.94	39.84*		8.89	11	.2	135.70	30	6.6	74
Leake County															
H 1	849	11-16-66		.2						11			40	7.9	75
H 1	181	10-27-66		.4						8			42	6.2	
K 1	776	7-29-68	2.4	.2	2.40		67.22*		13.50	5		163.15	6	7.4	
L 1	254	8-7-69		.1						5			7	5.5	
Madison County															
D 1	476	9-17-68	2.4	3.0					15.31	8	0.1		20	6.1	
F 1	918	8-7-68		.75						10			12	6.9	
Marshall County															
D 1	1,620	10-10-6	2.4	.2	2.40		196.45	1.20	3.95	5	.6	465.30	6	8.5	74

Table 11.—Chemical analyses of water from wells in Area III.—(Contniued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Panola County															
G 1	1,141	1-9-68	2.0	0	3.20		88.98*			18		213.02	8	8.3	
M 1	1,100	11-8-68		trace						18			5	8.4	70
P 2	1,164	12=30=69	2.4	0			162.98	1.00		72	0.2	390.80	trace	8.5	74
U 1	240	5-13-69	1.2	.05	4.01	1.22	10.75	0	9.88	4		44.92	15	5.6	63'
V 1	522	1-9-68		6.0	6.81	4.13	6.54*			11		54.50	34	6.3	67
Scott County															
D 2	1,170	2-5-69	4.0	trace			117.50	0	10.32	6	.1	314.59	0	8.9	
D 3	573	9-10-69		.1						6			6	8.4	71
Tallahatchie County															
G 1	405	1967	3.2	10.0	13.62	7.29	18.08*		31.10	8		128.11	64	6.3	
G 1	560	7-26-67		5.0						5			10	6.0	
L 1	1,312	6-20-69	4.8	.1			267.10*			182		648.42	trace	8.3	75
R 1	1,070	5-8-67	2.4	.6 to 3.0	21.63		413.39	4.0		465	.2	1087.43	54	8.0	73
Tate County															
F 1	900	2-12-69		6.0	9.21	2.91	3.75	0	5.43	2	.2	56.51	35	6.4	
K 1	1,600	2-12-69		.2	3.20		102	0		31	.4	252.06	80	8.3	79

Table 11.—Chemical analyses of water from wells in Area III.—(Contniued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Webster County															
H 1	370	10-24-67	4.4	0.1	2.00	1.46	156.89*			56	0.5	384.62	11	8.2	67
Winston County															
D 1	412	10-11-68	3.2	0.75	12.01	3.16	32.56*		18.11	7	0.2	127.06	43	6.2	69
F 2	206	10-11-68	4.8	0			11.37*			8	.1	22.97	trace	5.4	66
K 1	354	8-5-68	.8	3.0+	4.00	1.93	13.25*		6.58	7		51.57	18	5.7	
K 2	2,725	5-24-67	1.2	.7	8.01	5.35	272.47*			620	.5	1,064.30	42	7.8	99
K 3	210	3-10-69	2.0	4.0+	5.21	2.19	6.95	3.00	11.85	7		57.81	22	5.9	66
O 1	505	3-10-69	1.6	.4	31.65	5.59	13.68	2.00	11.52	3		139.88	102	7.5	71
P 2	525	1969		4.0	8.81	2.92	14.69	2.5	5.60	8		70.73	34	6.0	
Yalobusha County															
E 1	1,020	11-2-65	2.0	.1	.80	.48	99.41*			25		238.83	4	8.3	
G 1	244	3-8-68	6.0	0	2.00	2.18	17.63*		18.60	12		66.01	14	5.4	63
L 3	458	5-27-68		trace						16			6	7.7	

*Sodium and potassium as sodium.

Water from the Meridian aquifer in northern Grenada, Tallahatchie, and Yalobusha Counties may have excessive iron concentration. The deeper Wilcox generally has good quality of water but the aquifer is not as productive as the Meridian in the northern part of Area III.

Water from the shallow Wilcox and other aquifers may contain excessive iron (1 to 5 ppm). The water from the deep Ripley aquifer (in northern Mississippi) is thought to contain low dissolved solids. Water from the Kosciusko in the central and southern part of Area III may be colored at certain locations. Colored water may be present in some of the Wilcox, or Claiborne aquifers in the central and southern part of the region. The color is derived from organic material such as trees, leaves, roots, etc., or lignite deposited along with the aquifer material. Color may be removed by using alum but the treatment cost is high. Colored water is not harmful to drink and an aquifer may yield colored water at one location and not at another location a few hundred or thousand feet away.

GROUND WATER

AREA IV

Northwestern Mississippi, commonly called the Mississippi Delta, is an important ground-water region. An abundance of ground-water is present at shallow depths and wells yielding large amounts are common throughout most of the region. This region is an important agricultural area and large farms are numerous.

Fresh-water is available in Area IV from 1,000 to 2,000 feet below sea level. The northern part, including parts of DeSoto, Tunica, Tate, Panola, Quitman, and Coahoma Counties, is underlain by fresh-water in the Wilcox Group to a maximum depth of 1,000-1,500 feet below sea level (fig. 2). The southern part is underlain by fresh-water sands in the Tallahatta and Cockfield aquifers to a maximum depth of 1,000 to 2,000 feet below sea level. The base of fresh water is shallowest (1,000 feet below sea level) in an area which parallels the Mississippi River from central Issaquena County to central Coahoma County. Some slightly saline water is encountered in the Cockfield aquifer south of Greenville in the vicinity of Wayside.

The principal deep water-bearing Tertiary units in Area IV in ascending order are: the Wilcox Group, Meridian sand of the Tallahatta formation, Tallahatta undifferentiated, Kosciusko (Sparta sand), Cockfield and the Alluvium (Table 12). The shallow (100 to 200 feet depth) Alluvium of Recent age is the most important aquifer for yielding large quantities of water to wells. Multiple aquifers are present at most locations in Area IV and the water quality usually determines which aquifer will be utilized (Table 12 and fig. 8).

The Tertiary deposits are exposed generally to the east of Area IV with a few units exposed along the edge of the Loess hills. The Alluvial deposits blanket the entire area and the topography is flat throughout the Delta. The general dip of the Tertiary beds is toward the west at 15-35 feet per mile and the strike is in a north-south direction. The formations thicken toward the Mississippi River which is the approximate axis of the Gulf Coast Embayment.

WILCOX AQUIFER

The Wilcox aquifer is an important source of ground-water in the northern part of northwestern Mississippi. Fresh water is present in the Wilcox to 1,500 feet below sea level across Quitman and Tunica Counties (fig. 2).

The Wilcox is above the Midway and contains the oldest fresh water aquifers in the region. The depth to the top of the Wilcox is from 700 feet below sea level at Crenshaw to 1,100 feet below sea level due west at the Mississippi River. Most wells are completed near the base of the unit.

Wells in the Wilcox supply water to several towns in Area IV, particularly the northern part of the Delta. The City of Memphis has wells and well fields completed in the Wilcox aquifer. The Wilcox supplies water to Tunica in Tunica County, Lake Cormorant in DeSoto County, Sledge in Quitman County, Crenshaw in Panola County, Coahoma Junior College in Coahoma County, and Greenwood in Leflore County.

Depth of Wilcox wells is from 1,700 to 1,860 feet at Tunica. Two wells are 1,404 and 1,420 feet deep at Crenshaw which is on the eastern edge of the Delta. A well 1,560 feet deep located

Table 12.—Stratigraphic column and water resources in Area IV.

ERA	SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
Cenozoic	Quarternary	Holocene		Alluvium	0-200	Yields large volumes of water to shallow wells (less than 200 feet) throughout most of the area. Large capacity wells yielding 3,000 to 5,000 gpm are common in the area. This aquifer supplies numerous irrigation, industrial and some municipal water systems. Recently (1970) a large number of commercial catfish farm supply wells have been installed. Quality of water from this aquifer is poor.
	Tertiary	Oligocene		Forest Hill	150-200	An aquifer in parts of Warren, Sharkey, and Yazoo Counties. This aquifer supplies a number of domestic wells in these counties. Quality of water is generally good.
		Eocene	Jackson	Yazoo clay	500	Not an aquifer.
				Moodys Branch	20-30	Not an aquifer.
			Claiborne	Cockfield	350-500	Supplies a large number of wells in the southern part and along the Mississippi River. The municipal supply at Greenville, Wayside, Leland, Lamont, Scott, Benoit, Rosedale and Gunnison is from this aquifer. Quality of water is fair to good. Some of the water is amber colored.
				Cook Mountain	170	Not an aquifer.
				Kosciusko	100-800	An important aquifer throughout most of the area. Numerous municipal, industrial, and domestic wells are completed in this aquifer. Quality of water is generally good.
				Zilpha	50-200	Not an aquifer.
				Winona	35-50	Not extensively used as an aquifer.
				Tallahatta: Tallahatta Undifferentiated	170-400	An important aquifer throughout most of the central and northern part of this area. Most of the wells are for domestic use and a few larger wells utilize this aquifer. This aquifer is difficult to separate from the underlying Meridian sand, when both units are sands. Quality of water is generally good from this aquifer.
				Tallahatta: Meridian sand	175-250	Supplies a large number of wells throughout the entire area. A number of municipal, industrial, and domestic wells are completed in this aquifer. Quality of water is good.
			Wilcox	Undifferentiated	600-700	An important aquifer in the northern and eastern part of the area. Large volumes of water are pumped from this aquifer for municipal and industrial purposes. Quality of water is good.

at Lake Cormorant is completed in the Wilcox. Most domestic and other municipal wells in this area are completed in the shallower Kosciusko or Meridian sand aquifers.

Well yields from the Wilcox aquifer are from small to moderate. Yields from the Wilcox average about 200 gpm in the existing wells. Higher yields may be possible from the Wilcox as municipalities outside the area are pumping 500-550 gpm from individual wells (Table 13).

Table 13.—Records of selected wells in Area IV.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables and pumping test tables.

Majority of wells are rotary drilled.

Water Level: M, Measured; R, Reported.

Elevation: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Well: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Bolivar County						
B 1	Town of Alligator	1969	1,300	8, 4	155	G.L.	1969	P	150	1969	
E 2	Town of Mound Bayou	1969	1,310	12	146	10	1969	P	500	1969	
M 4	Baxter Laboratories	1961	796	10	137	28	1961	I			
M 2	Town of Cleveland	1969	828	18, 12	135	38	1969	P	1250	1969	
P 1	Dan Siligman	1965	1,042	4	127	15	1965	D			
T 2	Choctaw Water Association	1969	1,640	8	122	+10	1969	P	150	1969	C
					Coahoma County						
A 1	Town of Lulu	1968	1,063	10, 6	180	6½	1968	P	200	1968	
B 1	Town of Friars Point	1970	815	8, 6	175	28	1970	P	400	1970	
C 1	Coahoma Utilities Association	1969	1,075	8, 4	175	10	1969	P	150	1969	C
E 1	W. P. McCaughan	1965	1,151	4, 2½	173	+	1965	D			
K 1	J. H. Prett	1963	108	14	163	15	1963	D	1200	1965	
O 1	Roy Flowers	1965	952	3, 2	160			D			

Table 13.—Records of selected wells in Area IV.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Humphreys County										
B 3	C and M Water Association	1970	978	8, 6	105	12	1970	P	150	1970	
C 1	D. D. Fielder	1967	851	4, 2	115	+12	1967	D	20	1967	
E 1	H. C. Parks	1967	973	4, 2	105			D	20	1967	
G 2	L. B. Herring	1968	1,505	4, 2½	110	+	1968	D	50	1968	
K 1	Town of Louise	1967	807	8	100	16	1967	P			
K 2	Board of Supervisors	1966	1,023	4, 2	103	8	1966	I	25	1966	
	Issaquena County										
B 2	Mr. Mabus	1968	958	4, 2½	100	7	1968	D			
C 1	Harold Ashmore	1970	926	4, 2	100	19	1970	D	60	1970	
	Leflore County										
A 2	F. T. Leavell	1969	1200	4, 3	130	+	1969	D			
B 1	B. B. Provine	1967	800	4, 3, 2	140	+	1967	D	25	1966	
C 1	Schlater WAter Association	1966	1,132	8	130	+	1966	P	100	1966	C
E 1	B. L. Everett	1964	662	3, 2	130	+	1964	D			
G 1	Four-Fifths Plantation	1969	920	4, 3, 2	135	+	1969	D			
H 2	T. Y. Gardner	1968	735	4, 3, 2	120	+	1968	D			
J 2	G. F. Aust	1965	1,162	4, 2	120	+	1965	D			
L 3	Chapman Subdivision	1964	709	4,3,2	124	+	1964	P			
M 1	Morgan City Community Water Assoc.	1966	1,206	6	121	+42	1966	P	75	1966	C
O 2	Charles Meyers	1965	565	3, 2	122	+	1965	D			

Table 13.—Records of selected wells in Area IV.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Quitman County										
A 1	Norfleet Utility Association	1968	1,498	8, 4	171	+	1968	P	150	1968	C
C 1	Darling Water Association	1967	1,529	8, 4	168	24	1967	P	150	1967	C
C 5	Ned Star	1969	1,383	4, 3	165	+	1969	D	70	1969	
E 1	Town of Marks	1967	1,470	12, 8	163	+30	1968	P	500	1968	C
E 2	Bigfield Water Association	1967	655	8, 4	162	+ 6	1967	P	150	1967	C
H 1	Robert Coo	1965	926	4, 3, 2	157	+	1966	D	15	1965	
	Sharkey County										
A 1	R. P. Casselli	1967	700	4, 2	112	16	1967	D			
C 1	M. C. Ewing	1967	1,830	4, 2	106	+	1967	D	70	1967	
G 1	Bellgrade Lumber Company	1965	976	4, 2½	101	G.L.	1965	I			
G 2	Town of Cary	1965	1,105	6, 4	103	8	1965	P			C
G 3	Bellmont Gin Company	1968	993	4, 2		+ 7	1968	I			
	Sunflower County										
B 1	Clayridge Planting Company	1968	1,176	4, 3	146	1	1968	I	40	1968	
F 2	Town of Ruleville	1968	1,356	10	135	+ 5	1968	P	500	1968	
J 1	Vince Muzzi	1967	975	4, 2	125	18	1967	D	10	1967	
L 3	Turner Avant	1967	1,062	4, 3, 2	123	+	1967	D	30	1967	
N 1	City of Indianola	1966	1,748	12	122	+29	1966	P	928	1966	C
N 2	City of Indianola	1968	1,655	12, 8	123	+29	1968	P			
O 1	Town of Sunflower	1965	1,270	8, 4	121	+14	1965	P			C

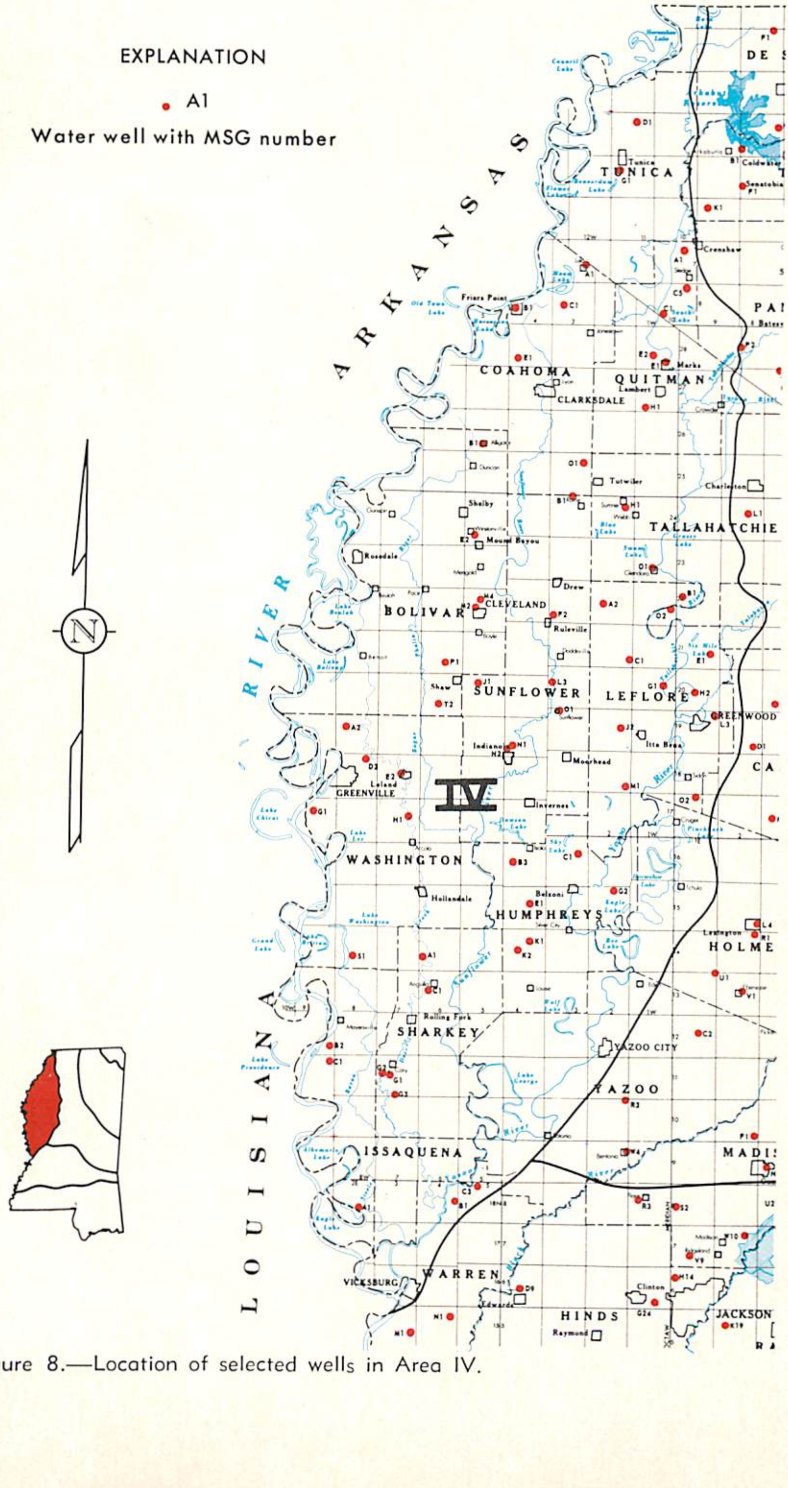


Figure 8.—Location of selected wells in Area IV.

Table 13.—Records of selected wells in Area IV.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Tallahatchie County						
H 1	Highway Subdivision	1967	1,004	6, 4, 2½	150	5	1967	P			
O 1	Town of Glendora	1967	874	8, 4	145	+	1967	P	100	1967	C
O 2	John Sanders	1967	839	4, 3, 2	137	+	1967	D	35	1967	
					Tunica County						
D 1	Hollywood Water Association	1968	1,830	7, 4	195	6	1968	P	100	1968	C
G 1	Town of Tunica, Industrial Park	1969	1,755	10	190	3	1969	P	400	1969	
					Warren County						
A 1	Eagle Lake Water District	1968	154	10	95	16	1968	P	200	1968	C
B 1	Allied Chemical Company	1967	841	6, 4	105	12	1967	I	50	1967	C
C 3	C. H. Mayeaux	1969	1,042	2	87	+	1969	D			
					Washington County						
A 2	Winterville Water Association	1968	504	8, 4	134	58	1968	P	150	1968	C
D 2	City of Greenville	1969	666	18, 10	120	76	1967	P	1200	1969	C
E 2	City of Leland, Well No. 3	1967	646	18, 10	125	44	1967	P			C
G 1	National Packing Company	1967	568	10, 6	115	63	1967	I	500	1967	
H 1	Harry Branton	1968	440	4, 2		24	1968	D	30	1968	
S 1	Glen Alan Water Association	1967	1,006	8	110	+28	1967	P	175	1967	C

Thickness of the Wilcox ranges from 650 to 700 feet in the northern part of the Delta. The Wilcox strata are composed of interbedded clay, silt, sand, and thin tongues of limestone and calcareous-cemented sandstone. Lignite or organic material is commonly interbedded with the clay and may occur as individual beds. Thick to thin sands separated by clay layers are typical in the Wilcox.

Water levels are relatively high in wells completed in the Wilcox aquifers. Water levels are 8 to 56 feet above the land surface in most of the Area. A well 1,680 feet deep at Greenwood in the Wilcox had a reported water level of 95 feet above land surface in 1938. Wells completed in the Wilcox aquifers in northern DeSoto County have water leve's 15 to 20 feet below land surface. This lower water level is a result of the large withdrawals from the Wilcox in the Memphis area.

CLAIBORNE AQUIFERS

MERIDIAN SAND AQUIFER

Most of northwest Mississippi is underlain by the Meridian sand aquifer of the Tallahatta formation. The base of fresh water ranges from 1,000 to 2,000 feet in the Meridian sand in the central and south central part of Area IV. The Meridian sand is the basal unit in the Claiborne Group and overlies the Wilcox Group. Sufficient depths to penetrate the Meridian sand range from 700 feet below sea level at Greenwood, in the eastern part, to 2,000 feet at Leland, in the western part. The base of the Meridian sand ranges from 1,100 feet below sea level at Tunica in the north to 2,000 feet at Yazoo City in the south.

A large number of industrial, municipal and domestic water supplies in northwestern Mississippi are from the Meridian sand aquifer. The Meridian sand is from about 250 feet thick in the western part of the region to 175 feet in the eastern part. Generally, the unit is composed of sand with small amounts of silt and clay present. The sand has been replaced with sandy clay or clay at a few locations in the region. The dip and strike of the beds are similar to the underlying Wilcox.

The Meridian sand aquifer has the potential of supplying large yields to wells throughout most of northwestern Mississippi. Pumping rates of wells developed in the Meridian sand range up to nearly 3,000 gpm.

Water levels in the Meridian sand aquifer are above the land surface or near the land surface in Area IV. A well in the Meridian sand at Eden, Yazoo County, which is 1,735 feet deep, had a water level of 140 feet above the land surface in 1954. Water levels are at land surface or slightly below in wells completed in the Meridian sand in the vicinity of Greenwood where large withdrawals are from this aquifer.

TALLAHATTA, UNDIFFERENTIATED AQUIFER

The Tallahatta is comprised of Neshoba sand and the Basic City, but for the purpose of this study these are included in the Tallahatta, undifferentiated. The Tallahatta, undifferentiated is not as consistant in thickness or areal distribution as the underlying Meridian sand. The sands range from thin to thick and usually are fine- to medium-grained. The unit is composed of clay or claystone with very little sand at a number of locations.

Some municipal and industrial wells are completed in the sands of the Tallahatta, undifferentiated. Generally, the aquifer is the source of domestic water supplies throughout northwestern Mississippi.

Water levels in these aquifers are about the same as the underlying Meridian sand. Most wells flow above the land surface.

KOSCIUSKO AQUIFER

The Kosciusko formation contains thick water-bearing sands throughout much of northwestern Mississippi. Municipal, industrial and domestic wells are completed in the Kosciusko aquifers in the region. The base of fresh water is present in the Kosciusko or Cockfield in the area that parallels the Mississippi River to about Coahoma County in the north.

The Kosciusko formation overlies the Zilpha and underlies the Cook Mountain formation. The Zilpha consists of dark-brown clay and the Cook Mountain is a clay or marl and neither unit is an aquifer. The Kosciusko consists of several sands separated by clays and some quartzite. The sands are not continuous over a large area. The Kosciusko and other members of the Claiborne Group usually contains more sand in the northern part of the region.

Depth of the Kosciusko varies from directly underlying the Alluvium in the vicinity of Greenwood and along the eastern edge of the Delta to 1,600 feet below sea level north of Vicksburg in the southern edge of the Delta. Wells sufficiently deep to penetrate the Kosciusko are from 400 feet below sea level at Tunica in the north, to 2,400 feet north of Vicksburg, in the south. The base of the Kosciusko in the west is from 600 feet below sea level at Friars Point in the north to 1,200 feet at Mayersville in the south. Thickness of the Kosciusko ranges from 800 feet in the extreme southern part to about 500 feet over the remainder of the area. Erosion of the top of the Kosciusko has taken place along the eastern edge of the region and the thickness is 100 to 200 feet.

Water levels are generally below land surface in the Kosciusko and flowing wells are limited to the extreme southern part of the region. Heavy pumpage throughout the area has caused the once flowing wells to have water levels 10-30 feet below land surface.

COCKFIELD AQUIFER

The Cockfield formation is an important source for municipal, industrial, and domestic water supplies. This includes a narrow area bordering the Mississippi River from central Washington County to Coahoma County. The Cockfield underlies other areas of northwestern Mississippi but usually is shallow and in contact with the overlying alluvial deposits. Eight municipalities or communities along the Mississippi River in the central part of Area IV have wells completed in the Cockfield aquifer (Wayside, Greenville, and Leland in Washington County, and Lamont, Scott, Benoit, Rosedale and Gunnison in Bolivar County).

Well depths in the Cockfield are 430 feet at Wayside (Washington County) to 469 feet at Gunnison (Bolivar County). A well in the Cockfield is 657 feet deep at Benoit (Bolivar County) and the average depth is 500 feet at Greenville (Washington County). The lower part of the Cockfield contains high total dissolved solids in the vicinity of Wayside and slightly south of Greenville along the Mississippi River.

Thickness of the Cockfield is about 500 feet along the Mississippi River but thins south of Greenville. The Cockfield consists of clay, with lignite beds and sands of varying thickness. The clay is usually lignitic and irregularly bedded.

Water levels in the Cockfield throughout much of the region are from 10 to 30 feet below land surface. Water levels in the Greenville area are 70-75 feet below land surface because of the heavy withdrawals.

ALLUVIAL AQUIFER

The Mississippi River Alluvium is one of the most prolific and widespread aquifers in northwestern Mississippi. Alluvial deposits blanket and underlie the entire Yazoo Delta.

Thickness of the alluvial deposits are from a few feet to 200 feet thick and average about 140 feet (Harvey, 1956). Generally, the thicker alluvium extends parallel to the Loess or Bluff Hills, and the thinner alluvium extends along the Mississippi in Washington and Bolivar Counties (Brown, 1947, p. 54).

The alluvium is composed of silt, clay and loam in the upper part and coarse sand and gravel in the lower part. Thickness of the lower highly permeable zone averages nearly 100 feet over most of the region.

Well depths are from 140 feet up to 200 feet in the Alluvial aquifer. Yields from this aquifer are exceptionally high with individual wells producing up to 5,000 gpm. Most large diameter industrial, municipal and irrigation wells yield from 1,000 to 3,000 gpm. Well fields in the alluvial aquifer furnish water to several municipalities and electrical power generating plants in Area IV. Numerous irrigation wells have been completed in Area IV and recently a large number of wells for commercial catfish farms are being installed in the Delta.

Water levels are shallow in the alluvium and are from 5 to 30 feet below the surface. Deeper water levels exist near areas of heavy pumpage as in Bolivar County. Water levels are cyclic and reflect climatic conditions of the area. Water levels recover seasonally in the Alluvium whereas water levels in the deeper Tertiary aquifers are slow to react to climatic changes. The Alluvium is generally replenished or recharged by the winter and spring rains.

QUALITY OF WATER

Generally, the deeper aquifers contain the better quality water. The deeper Tertiary aquifers are used for most municipal and domestic water supplies throughout Area IV. Irrigation, cooling water and industrial water supplies are from the shallow Alluvial aquifer. The water from the Alluvial aquifer is of poor quality. Generally, the water from the Alluvium contains excessive iron and carbon dioxide content, and the pH of the water is low. Iron concentrations are up to 20 ppm in some of the water from the Alluvium (Table 14).

Iron concentrations may be a problem in some of the deeper Tertiary aquifers at some locations. At Greenville and Leland the water from the Cockfield is an amber color.

GROUND WATER

AREA V

Central Mississippi is underlain by the Wilcox, Kosciusko, Cockfield, Forest Hill, Catahoula, Hattiesburg and Citronelle aquifers (Table 15). The Claiborne Group includes the Kosciusko (Sparta) and the Cockfield aquifers which are important across the northern part of this area. The Forest Hill is an important local aquifer in the vicinity of Jackson. Toward the south the Claiborne aquifers thin, permeability decreases, and color is more prevalent. Numerous municipal, industrial and domestic wells are completed in either the Cockfield or Kosciusko aquifers across Central Mississippi (Table 16 and fig. 9).

The Wilcox is fresh along the northern border of Area V. The deepest water in the State is present in central Smith County (below 3,000 feet) in the Wilcox. The development of the Wilcox aquifer has been limited by the extreme depth, 2,000-3,000 feet, and the availability of aquifers at shallower depths. A few small wells have been completed in the top of the Wilcox aquifer in Hinds, Madison and Rankin Counties, but nothing significant. The Wilcox is shallower in western Rankin and eastern Hinds County because of the affect of the Jackson dome. The potential of the Wilcox is large in these areas.

Miocene aquifers which include the Catahoula and Hattiesburg are relatively shallow and underlie the southern part of

Table 14.—Chemical analyses of water from wells in Area IV.

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Bolivar County															
T 2	1,640	1969	18.4	0.1	1.20		203.32	2.75		13	0.4	496.77	3	8.2	84
Coahoma County															
C 1	1,075	10-8-69		0.1						106			9	8.0	
Leflore County															
C 1	1,132	4-29-68	5.6	.05			190.23*			40	.5	444.52	trace	8.3	
M 1	1,206	6-3-68	2.0	trace			98.67*		3.29	8	.1	208.80	0	8.3	80
Quitman County															
A 1	1,498	11-18-68		.05	1.2		98.0	2.25		35		238.49	3	8.3	79
C 1	1,529	12-11-68	2.4	.05			176	.70		107	.3	458.75	0	8.4	78
E 1	1,470	12-20-67	8.8	1.0						225			6	8.3	78
E 2	655	1-9-68	.8	.3			54.88*			8		128.51	trace	8.4	68
Sharkey County															
G 2	1,105	6-28-65		3.0									0	8.9	

Table 14.—Chemical analyses of water from wells in Area IV.—(Continued)

(Analyses by Mississippi State Board of Health, ppm)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
Sunflower County															
N 1	1,748	2-6-68	14.4	0.6			197.21*			16	0.4	471.31	trace	8.2	
O 1	1,270	9-7-65	17.2	.2			108/99*					269.44	0	8.2	77
Tallahatchie County															
O 1	874	1969	4.4	.2	4.0		122.38	2.0	8.88	25		307.12	10	8.1	74
Tunica County															
D 1	1,830	4-15-69	2.8	.3			69.82	0		14		170.85	trace	8.4	76
Warren County															
A 1	154	9-18-68		10+	98.16	40.10				6			410	6.8	
B 1	841	1-4-68	2.4	.1			240.03*		66.17	46	0.4	575.92	trace	8.5	
Washington County															
A 2	504	7-12-68	1.2				118.01*			28	.1	277.46	0	8.6	71
D 2	666	7-14-69		.1						35	.4		trace	8.5	
E 2	646	7-12-68	2.0	0			148.34*			40	.8	350.00	0	8.6	72
S 1	1,006	7-12-68	4.0	0			280.10*			88	.8	383.71	trace	8.6	81

*Sodium and Potassium as Na

Table 15.—Stratigraphic column and water resources in Area V.

ERA	SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
Cenozoic	Quaternary	Holocene		Alluvium	0-100	Not an extensive aquifer. Some local domestic wells are completed in this aquifer. Large yielding wells may be possible at certain locations along the major streams. Wells yielding up to 2,000-3,000 gpm are possible along the Mississippi River in Warren, Jefferson, and Adams Counties. Water quality is generally poor from this aquifer.
		Pliestocene		Terrace Deposits	0-100	Some local domestic water supplies are completed in this aquifer. May be a potential source for large ground water development at isolated locations.
				Citronelle	0-100	Supplies municipal, industrial and domestic water supplies in the vicinity of Crystal Springs and some other locations. The water usually has low pH and low dissolved solids content.
	Tertiary	Miocene		Hattiesburg	0-200	An aquifer in the southwestern part of the area. The wells are generally shallow and mostly used for domestic purposes. Quality of water is fair to good in this aquifer. Iron concentration and low pH may be problems at some locations.
				Catahoula	0-900	An important aquifer throughout the southern half of the area. Numerous municipal industrial, and domestic water wells are completed in this aquifer. The deposit is typically lens-shaped near the outcrop and a particular sand is not continuous over a large region. Quality of water is good.
		Oligocene	Vicksburg	Undifferentiated	0-160	Generally not an aquifer. A number of shallow domestic wells are completed in certain zones (Mint Spring) across the State south of the outcrop.
				Forest Hill	0-250	Supplies large volumes of water to wells in the vicinity of Jackson. A number of large water supplies utilize this aquifer in western Rankin and Hinds Counties. Quality of water is good, but color is a local problem.
		Eocene	Jackson	Yazoo clay	0-525	Generally not an aquifer. A zone near the bottom supplies domestic and rural water supplies in eastern Wayne County.
				Moodys Branch	10-45	Generally not an aquifer. Some domestic wells utilize this aquifer south of the outcrop, particularly in Yazoo County.
			Claiborne	Cockfield	80-550	An important aquifer in the northern half of the area. Numerous water supplies are from this aquifer across the area. Quality of water is generally good. High color, iron concentration and hydrogen sulfide is a problem at some locations.
				Cook Mountain	100-250	Not an aquifer.
				Kosciusko	110-800	An important aquifer across most of the area. Numerous municipal, industrial and domestic wells yield large volumes of water from this aquifer. Quality is good in the northern and central part of the area. Colored water and low permeability are present at some locations in the southern part of the area.
				Zilpha	250-500	Not an aquifer.
				Winona	10-40	Not an aquifer.
				Tallahata	75-300	Not an aquifer.
			Wilcox	Undifferentiated	1150-3500	A potential aquifer immediately south of the northern boundary line of the area. The availability of shallower aquifers and the depth has limited the number of wells drilled in this aquifer. A few wells have been drilled in the vicinity of Jackson and northern Rankin County. Quality of water is probably good in the northern part of the area. Some of the water may be colored at particular locations.

Table 16.—Records of selected wells in Area V.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables and pumping test tables.

Majority of wells are rotary drilled.

Water Level: M, Measured; R, Reported.

Elevation: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Well: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

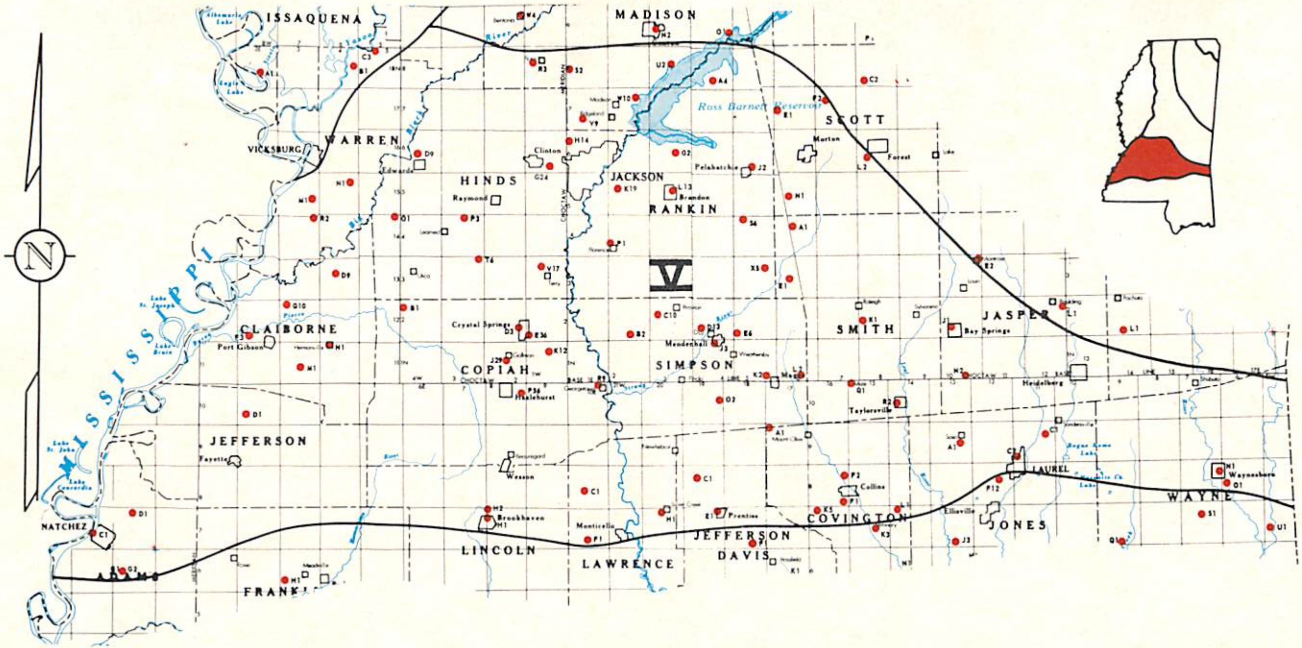
Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Adams County						
C 1	International Paper Company Well No. 26	1970	156	26, 20	65	22	1970	I	3,500	1970	
D 1	Adams County Water Association	1966	542	12	260	155	1966	P	500	1966	C
G 1	Adams County Water Association	1966	267	10	220	62	1966	P	300	1966	C
G 2	Adams County Water Association	1966	267	10	260	62	1966	P	300	1966	
					Claiborne County						
D 9	Natchez Trace Parkway	1968	515	6	288	209	1968	T			C
F 3	Anderson Walker, Jr.	1968	116	4	225	88	1968	D	3	1968	
G 10	C., S. and I. Water Association	1968	405	6	250	170	1968	P	150	1968	C
M 1	Pattison Water Association	1967	220	2	201	83	1967	T			
N 1	Hermanville Water Association	1966	480	10, 6	224	115	1966	P	180	1966	C

Table 16.—Records of selected wells in Area V.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Copiah County						
B 1	Reedtown Water Association	1968	250	10, 8	198	1	1968	P	162	1968	C
D 3	City of Crystal Springs Well No. 3	1949	108	8	467	72	1968	P	185	1968	C
E 36	Blain Sand and Gravel Company	1968	120	12	470	84	1968	I	554	1968	
J 29	Town of Gallman	1965	215	8, 6	472	82	1965	P	150	1965	C
K 12	Harmony Ridge Water Association	1967	200	9, 6	480	116	1967	P	180	1967	C
P 56	City of Hazlehurst	1966	300	12	435	109	1968	P	350	1966	C
R 9	Town of Georgetown	1965	761	6, 4	236	+	1968	P	100	1968	C
					Covington County						
A 1	W. E. Blain and Sons	1966	240	12		90	1966	I	1000	1966	
F 1	Cold Springs Water Association	1968	825	10, 6	370	157	1968	P	150	1968	
F 2	Salem Water Association	1970	632	10, 6	380	126	1970	P	212	1970	C
K 5	Mississippi Highway Dept., Rest Area No. 17	1968	410	4	291	66	1968	P	34	1968	C
L 1	Transcontinental Gas Pipeline Co.	1968	394	12	438	230	1968	I	1000	1968	
					Hinds County						
D 9	Northwest Hinds Water Association	1968	1,077	10	290	206	1968	P			
G 24	Metropolitan Water Company Well No. WD	1967	1,020	16	404	288	1968	P	600	1967	C
H 14	Metropolitan Water Company Well No. NB	1968	746	16	359	243	1968	P	608	1968	C
O 1	Hubbard Water Association	1968	1,280	8, 6	220	106	1968	P	90	1969	

Table 16.—Records of selected wells in Area V.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Hinds County (continued)						
P 3	Oakley Training School	1966	1,080	4	195	70	1966	P	35	1966	
T 6	South Central Water Association	1968	530	16	360	130	1968	P	400	1968	
V 17	South Central Water Association	.1969	426	16	260	42	1969	P	510	1969	C
					Jasper County						
J 1	City of Bay Springs	1966	1008	12	442	176	1966	P	1005	1966	C
N 2	Stringer Water Association	1965	913	8	405	132	1966	P	215	1969	C
					Jefferson County						
D 1	Lorman Community Water Association	1966	375	8, 4	300	170	1966	P	125	1966	C
					Jefferson Davis County						
C 1	Double Pond Water Association	1969	320	8	520	165	1969	P	200	1969	C
E 1	Town of Prentiss, Test Hole No. 1	1969	525	4, 2	346	81	1969	P	8	1969	
					Jones County						
A 1	Soso Water Association	1969	470	6, 4	315	86	1969	P	138	1969	C
C 1	Erata Water Association	1967	257	6, 4	325	156	1967	P	144	1968	
C 2	City of Laurel, 12th St. Tank Well	1970	410	18	320	227	1970	P	412	1970	



EXPLANATION

• A1

Water well with MSG number

Figure 9.—Location of selected wells in Area V.

Table 16.—Records of selected wells in Area V.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Lawrence County						
C 1	Sontag-Wanilla Water Association	1967	837	10	281	60	1967	P	201	1967	C
F 1	Lawrence County Water Association	1967	864	8		232	1967	P	150	1967	C
H 1	Town of Silver Creek	1965	797	6	380	30	1966	P	115	1966	C
					Lincoln County						
H 1	City of Brookhaven	1963	443	18		165	1963	P	500	1963	C
H 2	Lincoln County Water Association	1969	412	12	485	188	1969	P	200	1969	C
					Madison County						
R 3	Town of Flora	1968	1,228	12, 8	260	137	1968	P	558	1968	C
S 2	Cedar Hill Lake Club	1969	1,146	4, 2	375	178	1969	P			C
U 2	Pearl River Water Supply District, Haystack Landing	1970	502	4, 2	300	86	1970	P	27	1970	
V 9	Livingston Road Water Association	1968	700	6	402	260	1968	P	60	1968	C
W 10	Pearl River Water Supply District, Twin Harbors Subdivision	1969	610	10	308	98	1969	P	307	1969	C
					Rankin County						
A 4	Pisgah Water Association	1966	382	8	385	142	1968	P	164	1968	C
G 2	Langford Water Association	1967	778	8	415	222	1967	P	200	1967	C
J 2	Town of Pelahatchie	1962	997	10	360	137	1962	P	490	1969	C
K 19	Metropolitan Water Company Well No. EB	1968	861	16	287	150	1968	P	602	1968	C
L 13	Town of Brandon	1963	1,283	12	472	283	1964	P	554	1964	C

Table 16.—Records of selected wells in Area V.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Rankin County (continued)										
P 1	Town of Florence	1966	955	8	320	133	1966	P	400	1969	C
S 6	A.C.L. Water Association	1969	1,260	8	550	352	1969	P	125	1969	
X 5	Union Water Association	1968	1,236	6, 4	400	187	1968	P	150	1968	
	Scott County										
E 1	Leesburg Water Association	1968	793	10	390	164	1969	P	210	1969	
F 2	C and C Water Association	1968	1,248	10, 4	416	105	1968	P			C
L 2	City of Forest, Well No. 69-1	1969	1,320	16, 8	480	157	1969	P	820	1970	C
N 1	Homestead Water Association	1967	1,322	10	602	360	1967	P	300	1967	C
	Simpson County										
B 2	Harrisville Water Association	1967	316	10	405	120	1967	P	162	1967	C
C 10	Touchstone Water Association	1968	424	10	508	236	1968	P	155	1968	C
D 13	Town of D'Lo	1969	256	12	300	49	1969	P	100	1969	
E 6	Poplar Springs Water District, Well No. 2	1970	487	12	497	213	1970	P	257	1970	C
J 3	Town of Mendenhall	1967	341	10, 6	383	95	1967	P	342	1967	
K 2	Smith Crossing Water Association	1968	125	18		54	1968	P			C
L 2	Okatoma Water Association	1967	1,620	10	530	330	1968	P	300	1968	C
O 2	Highway 28 Water Association	1968	199	10	552	125	1968	P	225	1968	C

Table 16.—Records of selected wells in Area V.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Smith County										
A 1	Polkville Water Association	1966	645	8, 6	500	238	1966	P	100	1966	C
E 1	White Oak Water Association	1967	880	8, 6		183	1967	P	150	1967	C
K 1	Center Ridge Water Association	1968	1,400	10, 8		280	1968	P	250	1968	C
Q 1	Town of Mize	1965	424	10	292	+	1965	P	175	1965	C
R 2	Town of Taylorsville	1969	346	12	270	22	1969	P	517	1969	C
	Warren County										
M 1	Mississippi Hudson Company	1966	1,243	4, 2½	260	150	1966	I	45	1966	C
N 1	Hill Dale Water District No. 2	1966	437	10	228	150	1966	P	170	1966	C
R 2	Fisher-Ferry Water Dist. No. 2	1968	390	4	155	59	1968	T	40	1968	C
	Wayne County										
N 1	City of Waynesboro	1958	118	10	195	20	1958	P	350	1958	C
O 1	Scotch Plywood Co. of Mississippi	1969	128	4	168	30	1969	I	40	1969	

the area. Large yielding municipal, industrial and domestic wells are completed in the Miocene aquifers. The Miocene deposits are lenticular in outline near the outcrop areas and in the southern part of Area V.

Generally, the beds dip toward the south and the trend or strike is east and west. Thickness of the aquifers may be up to several hundred feet.

Water levels range from flowing wells along some of the streams to about 350 feet below land surface. Deeper water levels may accur on tops of some of the higher hills. A well (L 2) 1,650 feet deep in Simpson County had a reported water level of 330 feet in 1967. Water levels are from 170 to 200 feet below land surface at Hazlehurst.

CLAIBORNE AQUIFERS

The Kosciusko and Cockfield formations contain important aquifers throughout the northern part of this region. Depth of these aquifers is from near the surface to about 1,500 feet depending on proximity to the outcrop area and elevation. Wells in the Cockfield and Kosciusko aquifers in the eastern part (Jasper and Wayne Counties) average about 150-500 feet deep while at the Municipal Airport in Rankin County a thick Cockfield sand occurs from 450-620 feet and a sand in the Kosciusko occurs from 960-1,150 feet (Well no. K 27, Rankin Co.).

The Cockfield and Kosciusko formation are fairly uniform but the sand thickness may vary. The Cockfield formation is from 530 feet thick in the vicinity of Jackson to about 80 feet thick in the northeastern part of Wayne County. The Kosciusko is from 800 feet thick in northern Hinds County to about 110 feet thick in northeastern Wayne County.

The Cook Mountain formation, which is not an aquifer, separates the Cockfield and Kosciusko formations. The Cockfield and Kosciusko units are composed of similar sediments of sand, clay and varying amounts of lignite. Generally, the shallower Cockfield sand is finer than the deeper Kosciusko but locally, the Cockfield may contain coarse sand.

Fresh-water is present in the Claiborne aquifers to a depth of more than 2,000 feet below sea level in Copiah, Simpson, Lawrence, and Jefferson Davis Counties (fig. 2).

The permeability of the aquifers is low in the southern part as indicated by pumping tests and electrical logs of oil tests. A few wells in the Kosciusko aquifer have been found to contain colored water across the southern part. A deep test at Hazlehurst in Copiah County and two supply wells at Okatoma in Simpson County yielded colored water and the permeability was found to be low.

Yields from wells completed in the Claiborne aquifers may be as much at 1,200 gpm, with the average about 500 gpm. Numerous municipal, industrial and domestic water supplies are from the Kosciusko and Cockfield aquifers.

CATAHOULA AQUIFER

The Catahoula aquifer is an important source of water supplies in the southern part of Area V. Numerous municipal, industrial, and domestic wells are completed in the Catahoula aquifer in Claiborne, Jefferson, northern Adams, Copiah, northern Lincoln, southern Rankin, Simpson, northern Lawrence, northern Jefferson Davis, Smith, northern Covington, southeastern Jasper, northern Jones and northern Wayne Counties. Large withdrawals of water are made from this aquifer at Laurel, Collins, Taylorsville, Magee, Mendenhall, Prentiss, Monticello, Brookhaven, Hazlehurst, Natchez, and Port Gibson.

Well depths are from less than 100 feet to about 1,000 feet deep across this area. The average depth of the wells would probably be less than 500 feet. Well yields are less than 100 gpm to more than 1,000 gpm from this aquifer.

The Catahoula sands are typically lenticular and the aquifer thickness varies in a small area. Prediction of aquifer thickness at specific locations is difficult because of thickness changes in short distances. Recently (1970) the City of Laurel has drilled several test wells in a small area at the Airport attempting to locate sufficient sand that would yield 700 gpm. Test drilling is recommended throughout this area and definitely should be undertaken before planning any large water withdrawal in a specific area.

HATTIESBURG AQUIFER

The Hattiesburg deposits are on the surface in the southwestern part of Area V. The unit is a fair aquifer in this area and is used mostly for domestic wells. A few larger wells may be completed in this aquifer in the southern part of the area. The sands are typically lenticular and prediction of sand thickness is difficult at most locations. Separation of the Hattiesburg from the underlying Catahoula is extremely difficult.

Very few records of wells are available to determine the water levels in this area. The water level will probably be similar to the water level in the underlying Catahoula aquifer.

CITRONELLE AQUIFER

The Citronelle formation of Pleistocene age, is an important aquifer in the southern part of the region. The Citronelle is generally composed of sand, gravel, silt and clay. The Citronelle generally is present at high elevations (400-500 ft. in the northern part) and caps the hills or is present near the top of the hills throughout much of the area.

The pumping water level is generally near the base of the Citronelle and the wells are usually screened through this zone or slightly below to allow for drawdown. Large capacity wells should have high specific capacities due to the limited amount of available drawdown of this aquifer at most locations. Municipal, industrial and domestic wells are completed in the Citronelle aquifer in the vicinity of Crystal Springs. Generally, deeper aquifers offer a higher potential for water supply except at a few particular locations where favorable conditions exist for using the Citronelle aquifer.

Water levels in the Citronelle aquifer will be shallow at most locations. The pumping water level is near the base of the unit which is about 100 feet maximum thickness. Water levels in wells completed in the Citronelle are from 24 to 86 feet in the vicinity of Crystal Springs.

QUALITY OF WATER

Generally, most of the aquifers contain water that is good. Usually, the shallow water will have a low pH, be soft to moderately hard, contain low dissolved solids and high carbon dioxide content (Table 17). The deeper aquifers usually contain water that is alkaline (high pH), soft and contains higher dissolved solids.

Color in water is a problem at certain locations in particular aquifers throughout the central part of Area V. Color is thought

Table 17.—Chemical analyses of water from wells in Area V.

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Adams County															
D 1	542	10-15-69	6.4	0.6	48.08	35.96	23.10	3.50	5.27	7		313.58	268	6.9	
G 1	267	10-13-69		.1	17.47	7.14	8.57	2.75	7.08	9		97.03	73	6.3	
Claiborne County															
D 9	515	7-9-68		.1						43	3.2		8	8.5	(250 color)
G 10	405	2-9-70	4.8	.1	.80	.49	146.04	4.50		48	.4	356.39	4	7.6	
N 1	480	3-20-67	34	.1	1.20	.73	161.33*		29.29	16	.8	425.82	6	7.9	68
Copiah County															
B 1	250	9-5-68		.2						.7			150	7.5	
D 3	108	1-17-61	.8	trace	18.91		24.75*		25.51	61	.1	145.63	74	5.3	
J 29	215	1-9-67		.15	2.0		13.84*		11.52	10	.3	42.76	5	5.2	
K 12	200	10-4-68	2.4	.2	3.61		6.48	0		10	.1	27.89	9	5.4	
P 56	300	1-13-69		.2	2.80	.49	2.90	0	4.77	4		17.56	9	5.5	
R 9	761	9-14-60	4.4	0			230.87	3.0	14.48	11	.8	559.02	trace	8.6	
Covington County															
F 2	632	3-13-70		0						7			24	7.0	70
K 5	410	6-21-68		1.5						9			58	6.7	

Table 17.—Chemical analyses of water from wells in Area V.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health, ppm)															
Hinds County															
G 24	1,020	12-4-67		.1						7			trace	8.8	88
H 14	746	1968		.1									0	8.7	81
V 17	425	1969		0						9			10	8.4	
Jasper County															
E 2	400	4-3-68		.1						32			350	7.2	
J 1	1,008	9-27-67	4.4	.2	2.40	1.22	93.09*		17.78	7	.1	236.94	11	7.5	80
N 2	913	11-2-65	1.6	.1	2.00	.73	209.46*		83.61	58	.1	532.68	8	7.9	77
Jefferson County															
D 1	370	4-29-66	27.6	1.5	64.10	36.93	16.26*		10.86	4		359.33	312	6.6	
Jefferson Davis County															
C 1	320	11-18-69		.1						4			10	5.8	
C 1	930	11-25-69		.1						30			5	7.3	
Jones County															
A 1	470	4-8-70	2.4	1.0	1.20	1.0	12.50	4.50	11.48	7		53.08	7	5.9	67

Table 17.—Chemical analyses of water from wells in Area V.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature °F.
(Analyses by Mississippi State Borad of Health, ppm)															
Lawrence County															
C 1	837	9-30-68	5.6	0.2			70.19*		36.05	5	.4	182.07	0	7.7	
F 1	864	6-18-68		.4			57.64*		6.75	6	.2	136.49	trace	6.8	
H 1	797	8-3-67		.4			39.97*			7	.2	93.19	trace	7.3	
Lincoln County															
H 1	900	6-20-62		.6	2.31								7	8.3	
H 1	443	5-22-62		.1	4.81	8.46				5			47	6.1	
H 2	412	2-24-70	6.0	.15	4.01	1.22	17.11	1.50	4.61	13	.1	69.06	15	5.7	67
Madison County															
R 3	1,228	8-5-68		.1						7			4	8.5	
S 2	1,146	4-21-69		.2						6			5	8.5	
V 9	700	1-20-69		0									trace	8.4	
W 10	610	7-29-69		.2						15			44	7.3	

Table 17.—Chemical analyses of water from wells in Area V.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health)															
Rankin County															
A 4	382	5-28-69	3.2	2.00	67.30	11.66	42.25	4.25	79.83	34		356.13	216	7.2	
G 2	778	4-1-69	4.0	.75	2.40		81.63	1.75	20.08	14		210.89	6	7.0	78
J 2	997	12-14-62		.1						3			0	8.2	
K 19	861	10-24-67		.1						6			3	8.7	
L 13	1,283	12-2-63		.3	1.36	.5				3			5	8.5	
P 1	955	10-23-67	6.4	.1	1.20	.24	131.00*		40.66	40	.4	330.54	4	8.5	83
Scott County															
F 2	1,248	11-24-69	5.2	.1			138.70	0	11.03		.1	296.58	trace	8.5	
L 2	1,290	1969		.1	1.2		123.14	1.25	17.28	5		294.32	3	8.5	
N 1	1,322	7-29-69	4.8	1.25	15.22		55.52	4.00	15.33	7		185.15	38	7.3	80
Simpson County															
B 2	316	6-27-68		.4	3.20	1.00	85.06*		18.11	22	.3	210.40	12	7.3	67
C 10	424	11-24-69		.15	2.40	1.00	83.00	1.50	52.51	7		223.04	10	7.3	
E 6	487	3-27-70	1.4	.2	6.41		47.70	4.75	24.29	6		145.77	16	6.3	
K 2	125	1969		.1	2.0		11.02	0		17		33.02	5	5.5	66
L 2	620	5-3-68	12.8	0			116.81*		16.79	7	.6	299.86	0	8.6	90 (45 color)
O 2	199	1969		.1	2.40					5		15.21	6	5.5	68

Table 17.—Chemical analyses of water from wells in Area V.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (0°F)
(Analyses by Mississippi State Board of Health)															
Smith County															
A 1	645	4-15-68	4.4	1.2	4.81	3.89	81.18*		53.66	15		240.38	28	6.6	75
E 1	880	4-15-68	5.2	.2			147.21*		82.14	33		375.20	trace	7.7	80
K 1	1,400	11-8-68		.1						6			5	7.9	
Q 1	424	6-22-66	5.2	.1	4.80	3.88	80.97*		6.58	5	1.1	219.58	28	8.3	68
R 2	346	6-26-69		.3						3			28	7.0	
Warren County															
M 1	1,243	12-15-66		2.0						202			7	8.2 (700 color)	
N 1	437	7-29-69	2.4	.5	13.62	2.45	179.63	4.50	3.62	8		466.30	43	7.0	71
R 2	590	2-9-70	4.0	.1	1.20	.73	248.29	5.00		100	.2	608.52	6	8.5	
Wayne County															
N 1	118	1959		.1	31.31	6.2	14.95*		12.51	4			124	7.3	

* Sodium and Potassium as Na

to be associated with the organic material (lignite, leaves, roots, etc.) deposited in the aquifer material. The Kosciusko and Cockfield aquifers are known to contain colored water of varying degrees in the Jackson area, Bay Springs, Waynesboro and other locations.

Treatment for color removal (coagulation with alum) is expensive and uneconomical for most purposes. Aquifers that contain colored water are not recommended for well development provided shallower aquifers are available for use. Most people prefer clear water for domestic use.

An investigation in 1969 determined that the high chlorides in a city well at Prentiss was caused by industrial pollution from a local plant. The situation is serious at that particular area and should not be allowed to continue.

GROUND WATER

AREA VI

South Mississippi is underlain by several thick aquifer systems and at most locations multiple aquifers are present. The aquifers present in Area VI include the Catahoula, Hattiesburg, Pascagoula, Graham Ferry and Citronelle (fig. 10 and Table 18). Recent publications on the ground water resources in Harrison and Hancock Counties referred to "Miocene aquifers" for the fresh water section in those areas. The Graham Ferry aquifer is recognized in Jackson County and is the principal aquifer for industrial and municipal supplies in the vicinity of Pascagoula.

The aquifers in the coastal counties consist of thick beds of sand or gravel separated by clay layers. The sands are generally lenticular, thereby are not continuous over a large area. Most of these aquifers are capable of supplying large volumes of water to wells in the coastal counties.

The base of fresh water is about 500 feet below sea level across the northeastern part of Area VI in Covington, Jones, Wayne and part of Greene and Perry Counties (fig. 2). The deepest fresh water is present in northwestern Hancock and southwestern Pearl River Counties to a depth of 3,000 feet below sea level. Very few water wells have penetrated the entire freshwater section in the southern half of Area VI (Table 19). A number of shallow piercement-type salt domes are located in

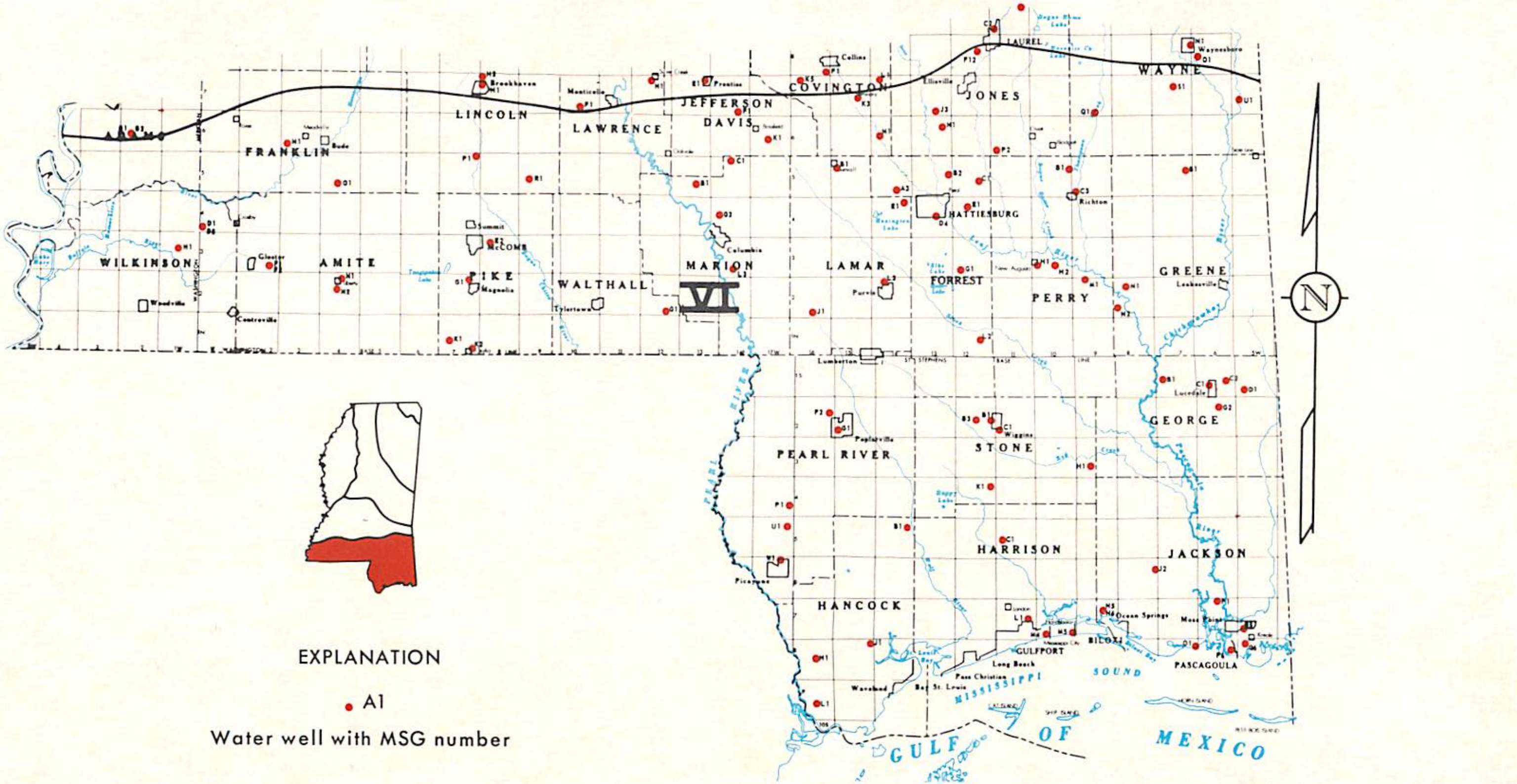


Figure 10.—Location of selected wells in Area VI.

Table 18.—Stratigraphic column and water resources in Area VI.

ERA	SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
Cenozoic	Quaternary	Holocene		Alluvium	0-80	Not an important aquifer. A few large wells may be possible along some of the major streams in local areas. Salt water has intruded this aquifer adjacent to the Mississippi Sound.
		Pleistocene		Terrace Deposits	0-100	Some local wells tap this aquifer, but is not used over a very extensive area. Large quantities of water may be available in the southern part where a number of these deposits are developed in a staircase fashion. Salty water is present along the coast in some of these deposits.
				Citronelle	0-100	Supplies shallow domestic wells throughout most of the area. A few municipal wells are completed in this aquifer. Quality of water is fair. The water usually contains low dissolved solids and has a low pH.
	Tertiary	Pliocene		Graham Ferry	0-200	Main source of water supply for municipal and industrial wells in the vicinity of Pascagoula. A number of wells in western Jackson and eastern Harrison Counties utilize this aquifer. Quality of water is generally good. Water is slightly alkaline and iron is seldom a problem in the wells at Pascagoula.
		Miocene		Pascagoula	0-1000	An important source of water supply for the municipal, industrial and domestic wells in Hancock, Harrison and Jackson Counties. The Pascagoula, Hattiesburg and the Catahoula are difficult to differentiate in the subsurface. Recent publications have placed all of the aquifers into "Miocene aquifers." Quality of water is good from this aquifer. Color is high in a number of wells adjacent to the Mississippi Sound. Hydrogen sulfide content may be a local problem.
				Hattiesburg	0-400	An important source of water supply for the municipal wells at Lucedale. This aquifer has the potential of supplying large volumes of water to wells in Pearl River, Stone and George Counties. Numerous domestic wells tap this aquifer in the central part of the area (southern Forrest, Greene, Perry, Pearl River, Stone and George Counties). The quality of water is generally good.
				Catahoula	500-900	An important source of water in the northern half of the area. The aquifer supplies numerous municipal, industrial, and domestic water supplies as far south as northern Pearl River, Stone and George Counties. The aquifer is fresh farther south but because of the depth and availability of shallower aquifers is not generally used. The quality of water is generally good.

Table 19.—Records of selected wells in Area VI.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables and pumping test tables.

Majority of wells are rotary drilled.

Water Level: M, Measured; R, Reported.

Elevation: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Well: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Amite County						
F 1	Georgia Pacific	1967	400	12	420	147	1967	I	609	1967	
F 2	Town of Gloster, Well No. 3	1964	348	12	420	158	1968	P	835	1968	C
N 1	Leon Kirkland	1968	117	4	415	105	1968	D	8	1968	
N 2	Town of Liberty, Well No. 2	1954	620	10	300	166	1955	P	300	1955	C
					Covington County						
K 3	Town of Seminary	1967	861	8	285	55	1967	P	104	1967	C
N 1	Sanford Community Water System	1966	802	6	205	+3	1966	P	111	1966	C
					Forrest County						
A 3	Jetco, Well No. 3	1968	750	6	254	96	1968	P	150	1968	C
B 2	Eastabuchie Water Association	1968	718	8	240	50	1968	P	200	1968	C
C 1	Barrontown Utilities Association	1967	900	8	295	124	1967	P	150	1967	C
D 4	Merchants Company, Well No. 2	1968	662	10	152	50	1968	P	450	1968	
E 1	Sunrise Utilities Association	1968	854	8	265	130	1968	P	200	1968	C
G 1	McLaurin Water Association	1967	630	6	330	110	1967	P	110	1967	C
L 2	U.S. Forest Service, Ash Nursery	1970	720	6	275	170	1970	IR	25	1970	

Table 19.—Records of selected wells in Area VI.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Franklin County						
H 1	Town of Meadville	1968	244	18	359	155	1969	P	300	1969	
O 1	Sixtown Water Association	1967	250	8	445	142	1967	P	100	1967	C
					George County						
B 1	Bexley Water Association	1966	600	8	185	90	1967	P	300	1967	C
C 1	City of Lucedale	1959	1,008	10	221	110	1960	P	500	1960	C
C 2	Multi Mart Water System	1967	980	8, 6	289	190	1967	P	195	1967	C
D 1	Rocky Creek, Well No. 1	1966	625	8	270	190	1967	P	325	1967	C
G 2	Multi Mart Water System	1966	660	6	270	190	1966	P	85	1966	
					Greene County						
B 1	U. S. Forest Service, Stony Tower	1966	583	5	345	192	1966	P	18	1966	
N 1	Plantation Pipe Line	1969	525	4,2 1/2	142	37	1969	I	15	1969	
N 2	McLain Water Association	1970	176	12	80	+20	1970	P	200	1970	C
					Hancock County						
B 1	Johnson Shaw	1969	1,766	2	120	2	1969	D	22	1969	
H 1	NASA MTF Test Hole No. 1	1967	601	6, 4	15	+9	1967	T			
J 1	Hancock County Airport	1969	660	8, 6	20	+25	1970	P	150	1970	
L 1	Hancock County Port Authority	1969	2,003	12, 8	15	+	1969	P	1,787	1969	

Table 19.—Records of selected wells in Area VI.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Harrison County										
C 1	John C. Allison, Jr.	1968	678	4, 2	120	34	1968	D	20	1968	
L 1	National Tank Company, Well No. 1	1967	584	10, 6	20	•	1967	I	602	1967	
N 4	Keesler Air Force Base, Annex No. 3	1969	870	8, 6	15	19	1969	P	240	1969	
N 5	City of Biloxi	1970	846	16	28	30	1970	P	805	1970	
	Jackson County										
J 2	Leo Byrd	1960	546	2	105	53	1960	D			
N 5	E. V. Shove	1967	1,134	6, 4	46	+9	1967	D			
N 6	Bay Water Works	1967	599	8, 6	39	25	1967	P	250	1967	
O 1	Bacot Subdivision	1968	772	6, 4	11	18	1968	P	150	1968	
P 1	Martins Bluff Water Association	1967	730	6	25	8	1967	P	150	1967	C
P 6	Ingalls Shipbuilding Corporation	1968	788	18	10	55	1968	I	1,200	1968	
Q 5	City of Moss Point, Sue Ellen St. Well	1968	802	16	20	84	1968	P	503	1968	C
Q 6	City of Pascagoula, Sears Town Well	1969	320	12	15	62	1969	P	500	1969	C
	Jefferson Davis County										
F 1	Carson Community Water Association	1965	380	8	505	202	1966	P	201	1966	C
K 1	Lowland Water Association	1969	450	6	453	192	1969	P	150	1969	C

Table 19.—Records of selected wells in Area VI.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Jones County						
F 12	City of Laurel	1970	500	18	230	91	1970	P	770	1970	
J 3	South Miss. Electric Power Assoc.	1969	263	20	220	30	1969	I	1,500	1969	
N 1	Moselle Water Association	1968	754	8	280	135	1968	P	150	1968	
P 2	Cecil Walters	1970	198	4	268	102	1970	D	66	1970	
					Lamar County						
B 1	Town of Sumrall, Well No. 2	1968	358	10	270	66	1968	P	250	1968	
E 1	Arnold Line Water Association	1967	810	8	240	91	1967	P	150	1968	C
J 1	Baxterville Water Association	1967	788	8	416	260	1967	P	60	1967	C
L 3	Progress Community Water System	1968	960	8		219	1968	P	200	1968	C
					Lincoln County						
P 1	Bogue Chitto Water Association	1965	640	8, 6	400	203	1965	P	224	1965	C
R 1	Ruth Water Association	1967	420	8	441	99	1967	P	150	1969	C
					Marion County						
B 1	Goss Water Association	1968	800	8, 6	210	70	1968	P	125	1968	C
C 1	Bunker Hill Water Association	1967	540	6	447	180	1967	P	150	1969	C
G 2	Cedar Grove Community	1968	790	6		70	1968	P	200	1968	C
L 3	Hub Water Association	1968	1,000	6, 4	205	12	1968	P	200	1968	C

Table 19.—Records of selected wells in Area VI.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
					Pearl River County						
F 2	Sunny Oak Water Association	1968	1,010	6, 4	335	220	1968	P	150	1968	C
G 1	City of Poplarville, Well No. 4	1969	530	12	291	165	1969	P	847	1969	C
P 1	Pearl River Central Water Assoc., McNeil Well	1967	860	8	248	132	1968	P	150	1968	C
U 1	Pearl River Central Water Assoc., Carriere Well	1967	660	10	184	78	1967	P	250	1967	C
K 1	City of Picayune	1965	1,218	14	60	42	1965	P			C
					Perry County						
B 1	Good Hope Water Association	1968	520	4	267			T			
C 3	City of Richton, Well No. 4	1968	660	10	160	7	1968	P	457	1968	C
H 1	Town of New Augusta	1968	1,090	8	190	62	1968	P	200	1968	C
H 2	Mississippi Highway Department, Rest Area	1968	810	4, 2	125	+14	1968	P	30	1968	C
N 1	Town of Beaumont	1964	666	10, 6	95	+37	1965	P	450	1965	C
					Pike County						
E 2	Friendship Water Association	1967	594	10	425	170	1967	P	217	1969	C
G 1	North Street Water Association	1968	760	8	400	165	1968	P	100	1968	C
K 1	E. E. Alford and Son	1969	347	8	308	22	1969	IR	500	1969	
K 2	Town of Osyka	1970	240	8, 6	264	38	1970	P	250	1970	

Table 19.—Records of selected wells in Area VI.—(Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Use	Yield: Gallons per Minute	Yield: Date	Remarks
	Stone County										
B 1	City of Wiggins	1966	950	12	280	158	1966	P	700	1966	C
B 3	New Zion Water Association	1968	954	8, 6	272	165	1968	P	130	1968	
C 1	International Paper Company	1969	990	12, 8	245	137	1970	I	715	1969	
H 1	University of Mississippi	1969	379	6, 4	165	140	1969	IR	200	1969	
K 1	McHenry Utility Association	1967	897	8, 6	280	172	1967	P	300	1967	C
	Walthall County										
G 1	Dexter Water Association	1968	419	10	394	165	1968	P	110	1968	C
	Wayne County										
Q 1	U. S. Forest Service, Wausau Fire Tower	1965	630	4	294	96	1965	D	32	1965	
S 1	Clara Water System	1966	342	4	302	114	1966	P	60	1966	C
U 1	Bucatunna Water Association	1965	670	8	152	+8	1965	P	20	1965	C
	Wilkinson County										
D 1	Town of Crosby, Well No. 2	1968	828	10	165	64	1968	P	350	1968	C
D 2	Town of Crosby, Well No. 1	1968	807	10	175	77	1968	P	350	1968	
H 1	Buffalo River Water Association	1970	490	8	240	155	1970	P	150	1970	C

Area VI and to the north in Area V. The base of fresh water is shallow over some of the domes. Therefore caution should be exercised in drilling deep water wells on these structures. Deep aquifers are present in Harrison and Hancock Counties which have the ability of supplying large volumes of fresh water to properly constructed wells. A test well 2,460 feet deep (USGS) located in Gulfport's industrial park had a water level of about 100 feet above land surface.

CATAHOULA AQUIFER

Most of the water supplies in the northern part of Area VI are from the Catahoula aquifer. The wells are generally shallow (100 to 1,000 feet deep) and yield large volumes of water. The aquifer consists of beds of sand or gravel separated by clay layers. The sand and gravel beds thicken toward the Gulf and are several hundred feet thick in south Mississippi.

Numerous municipal, industrial, and domestic water supplies are completed in the Catahoula aquifer across this area. The aquifer is used as far south as northern Pearl River, Stone and George Counties. The use of this aquifer has been limited south of the above mentioned area because of the availability of shallower aquifers. Wells yielding up to 2,000 gpm are possible from this aquifer at some locations such as Carson in Jefferson Davis County and Wiggins in Stone County. The sands are generally lenticular in the northern part of Area VI. Test drilling is recommended for most locations because of the lenticular deposits.

Large volumes of water are pumped from the Catahoula aquifer at Hattiesburg, Richton, Purvis, and McComb. A large number of wells for rural water systems and domestic supplies utilize this aquifer in the northern part of Area VI.

Water levels are above the land surface along some of the streams. Flowing wells are primarily located in the Bogue Chitto, Okatoma Creek, Pearl River, Pascagoula River, Chickasawhay River, and some of the smaller creeks across the area. Some of the deeper water levels reported are from 250 to 380 feet. A well which is 796 feet deep in the Catahoula aquifer at Baxterville, Lamar County, had a water level of 264 feet in 1964. A well 425 feet deep at Bassfield, Jefferson Davis County, had a water level of 380 feet in 1964. Slightly deeper water levels may be expected on tops of high hills. Water levels are depressed in areas of heavy pumpage in a small area such as the Hattiesburg well field located at the new water plant.

HATTIESBURG AQUIFER

The Hattiesburg aquifer is not as widely used as the Catahoula aquifer. The Hattiesburg aquifer has the potential of supplying large wells in the central and southern part of Area VI. A number of shallow domestic and small municipal wells utilize this aquifer in southern Lamar, southern Forrest, Perry and Greene Counties. The municipal wells at Lucedale and two community supply wells north of Lucedale are completed in the Hattiesburg aquifer at a depth of about 1,000 feet. Most of the ground-water development from this aquifer is in Pearl River, Stone and George Counties and slightly north of these counties. The extreme depth is the limiting factor south of these counties. The aquifer is presently being used for ground-water supplies in Wilkinson, Amite, Pike, Walthall, and Marion Counties, which are along the Louisiana boundary.

Separating the Hattiesburg from the underlying Catahoula or the overlying Pascagoula is extremely difficult in the subsurface in Area VI. One solution to this problem is to refer to these units as "Miocene aquifers" and not designate particular aquifers.

Water levels will be similar to those in the Catahoula aquifer. The higher water levels will be located along the streams. A well 1,008 feet deep for the Town of Lucedale had a water level of 100 feet in 1960.

PASCAGOULA AQUIFER

The Pascagoula aquifer is an important source of water supply in the three coastal counties, Hancock, Harrison, and Jackson. Numerous municipal, industrial and domestic wells utilize this aquifer in these counties. Most of the municipalities along the coast have wells completed in this aquifer. Yields from this aquifer are as much as 3,000 gpm at the NASA Test Site. The aquifer consists of thick sands and gravels at a number of locations along the coast. Multiple aquifers or zones of sands are present at most locations.

Water levels are generally above or near the land surface except in areas of concentrated withdrawals. A number of the municipal wells have stopped flowing because of the heavy pumpage in a small area. Most of the ground-water development is parallel to the coast across the three counties.

Some of the water from the Pascagoula aquifer is slightly colored to highly colored in the coastal area. Hydrogen sulfide odor is associated with the water from the deep Pascagoula aquifer at some locations.

CITRONELLE AQUIFER

The Citronelle deposits generally cover the surface of south Mississippi, particularly in the southern part of Area VI. The Citronelle is present at elevations of 300-400 feet in the northern part of Area VI and the thickness varies from 80 to 100 feet unless the unit is missing due to erosion. The Citronelle underlies the terrace deposits along the Coast and is about 100 feet thick at Bayou Casotte in Jackson County. The deposit may be thinner at other locations on the coast.

The Citronelle is generally composed of coarse sand, silt, gravel and bright colored clays, which are typically near the contact with the underlying Miocene deposits. The slope of the Citronelle deposits is generally toward the south at 6 to 25 feet per mile.

A large number of domestic wells and a few municipal wells are completed in the Citronelle aquifer in Area VI. This aquifer has the potential of furnishing large volumes of water at some locations.

QUALITY OF WATER

Water from the Citronelle, Miocene and Pliocene aquifers is generally good for most purposes.

The quality of the water from the Citronelle aquifer is a low pH, soft to moderately hard, and the mineral content is low (Table 20). Water from the shallow Miocene aquifers is acidic to alkaline, soft, and contains low to moderate (below 250 ppm) total mineral content. Colored water may be a problem in some of the deeper aquifers particularly along the coast.

Iron is a problem at several localities and in various aquifers in Area VI. Excessive iron concentration is a problem in water from wells particularly in the southwestern part of Area VI.

Table 20.—Chemical analyses of water from wells in Area VI.

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Amite County															
F 2	348	8-29-66	0.8	0.2	1.20	1.21	9.15	1.0		10		32.14	8	5.5	68
N 2	620	2-15-65		.7	10.41	1.50	12.30*			15			32	6.5	
Covington County															
K 3	861	1-5-68	4.8	0			107.23*		9.38	8	.5	256.66	trace	8.7	
N 1	802	6-23-67	4.8	0.2			62.95*		14.77	6	.8	157.15	trace	7.7	70
Forrest County															
A 3	750	9-26-68		.2						4			42	6.4	
B 2	718	8-21-68	3.2	.1			78.52*		25.01	9	.2	189.16	trace	8.1	72
C-1	900	1-11-68	3.2	.1			59.24*		13.33	7	.1	143.80	trace	8.2	
E 1	854	3-13-69	3.2	.1	6.81	2.43	46.00	2.00	7.57	13	[illegible]	143.53	27	8.1	76
G 1	650	10-19-67		.7	6.00	3.65	21.11*	[illegible]	2.47	8	[illegible]	78.45	30	6.3	71
Franklin County															
O 1	250	8-4-67	3.2	.1	1.60	1.46	6.11*			8		27.57	10	5.4	68

Table 20.—Chemical analyses of water from wells in Area VI.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
George County															
B 1	600	8-8-67	4.0	0.1	2.00	4.13	10.10*			85	0.1	222.88	17	8.7	72
C 1	1,008	9-8-66	11.6	.3			55.23*		8.55	15		144.71	trace	7.1	78
C 2	980	2-27-69	3.2	1.1	1.20		42.02	1.25	10.04	7		106.93	3	7.3	(H_2S odor)
D 1	625	9-7-67		.2	1.60	.97	47.53*		3.95	6		118.87	8	8.3	74
Greene County															
N 2	176	3-30-70		0						19			0	8.6	(H_2S odor)
Jackson County															
P 1	730	11-10-67		.2						140			8	8.8	(H_2S odor)
Q 5	802	8-14-68		0						225			trace	(50 color)	
Q 6	320	12-30-69	3.2	0	3.21	2.45	208.78	2.50	1.81	117	.6	613.80	18	8.1	(H_2S odor)
Jefferson Davis County															
F 1	380	7-26-67	2.8	.2	1.20	.49	4.04*			5		17.73	5	5.2	65
K 1	450	5-28-69	1.2	.1	2.00	.72				4		9.14	8	5.4	

Table 20.—Chemical analyses of water from wells in Area VI.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Lamar County															
E 1	810	1-18-68		0.2						4			41	7.5	
J 1	788	9-17-68	2.0	.2	1.20		4.36*			6	0.1	15.96	4	5.2	
L 3	960	11-20-68		2.5	1.60		17.75	2.70	6.58	7		60.94	4	6.3	75
Lincoln County															
P 1	640	10-6-65	.4	.7	2.40	1.21	30.17*		19.09	9	.1	89.49	11	6.1	
R 1	420	4-27-67		.2						10			12	5.6	70
Marion County															
B 1	800	1-14-69	5.2	.5	3.21	1.46	44.00	2.50	6.42	6	.2	131.91	14	7.2	
C 1	540	6-23-67		.3						4			8	5.7	
G 2	790	2-28-68		.2						3			18	7.8	
L 3	1,000	5-6-70	2.4	.3			60.80	1.75	12.18	6	.2	151.01		7.9	76
Pearl River County															
F 2	1,010	5-20-68	1.6	.4	2.80	1.22	59.77*		10.21	8	.2	155.63	12	7.5	76
G 1	530	5-21-69		.4						5			18	6.2	
P 1	860	5-20-68	1.2	.1			73.98*		9.54	7	.2	176.35	0	8.5	76
U 1	690	5-20-68		.4			83.34*		8.88	12	.4	211.86	0	8.4	77
K 1	1,218	4-8-70	1.8	0			78.59*		11.32	5		187.94	0	8.8	

Table 20.—Chemical analyses of water from wells in Area VI.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Perry County															
C 3	660	7-9-68		.5						9			19	6.7	
H 1	1,090	5-13-69		0			176.50	0		137	.4	441.95	trace	8.4	79
H 2	810	5-6-70		.1						1,010			46	7.9	
M 1	666	1965		.2	12.01	5.34	249.59*		34.13	295		685.11	52	7.8	74
Pike County															
E 2	594	2-5-69	3.2	.1			59.50	1.75	11.48	8	.1	129.75	trace	7.0	73
G 1	760	4-4-68		.1	1.20	.72	41.92*		10.70	7	.1	123.36	6	7.5	
Stone County															
B 1	950	3-25-66		.1						7			4	8.2	
K 1	897	1-30-68	10.4	.2			129.69*		24.36	11	.3	320.11	trace	8.2	(H_2S odor)
Walthall County															
G 1	419	9-26-69		.1	1.60		8.23	0		7		24.04	4	5.7	
Wayne County															
S 1	342	11-5-68		.9						7			29	6.5	68
U 1	670	9-20-66	1.2	.1			230.53*			40	1.2	540.03	trace	8.7	74

Table 20.—Chemical analyses of water from wells in Area VI.—(Continued)

Well No.	Depth	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
(Analyses by Mississippi State Board of Health, ppm)															
Wilkinson County															
D 1	828	2-25-70		2.5	6.0	2.19	13.24	3.50	5.60	7	.2	67.64	24	6.2	72
H 1	490	4-8-70	1.8	.8	9.21	2.18	7.80	3.25	11.48	10		58.93	32	5.8	

*Sodium and Potassium as Na

SURFACE WATER

INTRODUCTION

A tremendous volume of surface water is available for use in Mississippi. Surface water is an important natural resource and care should be taken in future utilization, development, and conservation. Adequate knowledge and information concerning the quantity, quality and availability of surface water will be helpful in determining the most beneficial and desired use of this resource. Surface and ground water are interrelated and a knowledge of both furthers a basic understanding of either. Surface water recharges the aquifers through permeable sand and gravel deposits in the stream bottoms. Streamflow at low stages or base flow is mostly attributed to ground-water discharge into the streams.

An adequate source of available surface and/or ground water is often a basic requirement for the selection of sites for industrial plants, commercial fish-ponds, farms and other economic development. Industry is well aware of this requirement and expects to be assured of large amounts of available water in selecting a particular site. Paper mills, generating plants and chemical plants need large volumes of water. One generating plant may use up to 300 mgd (million gallons per day) or more of water and a paper mill may require 50 mgd. Primarily, the largest use of water for these plants is for cooling purposes and quality restrictions are fairly low for this use (saline water is used if available).

The average annual precipitation ranges from 50 inches in the northwest to 65 inches in the southeast (fig. 1). Late summer and early autumn are usually the driest seasons, and winter and early spring the wettest. The distribution of streamflow during the year is related to the rainfall pattern. The highest demand for water usually occurs when the streams are at their lowest flow. Storage facilities should be considered on most of the smaller streams that are considered for a water source.

The northeastern part of Mississippi is drained by streams of the Tennessee River system. The major streams in the northern part include the Tennessee River, Hatchie River, Tuscumbia River, Yellow Creek, and Bear Creek. The western part of the State drains into the Mississippi River primarily by way of the Yazoo, Big Black and Homochitto Rivers. The central and south-

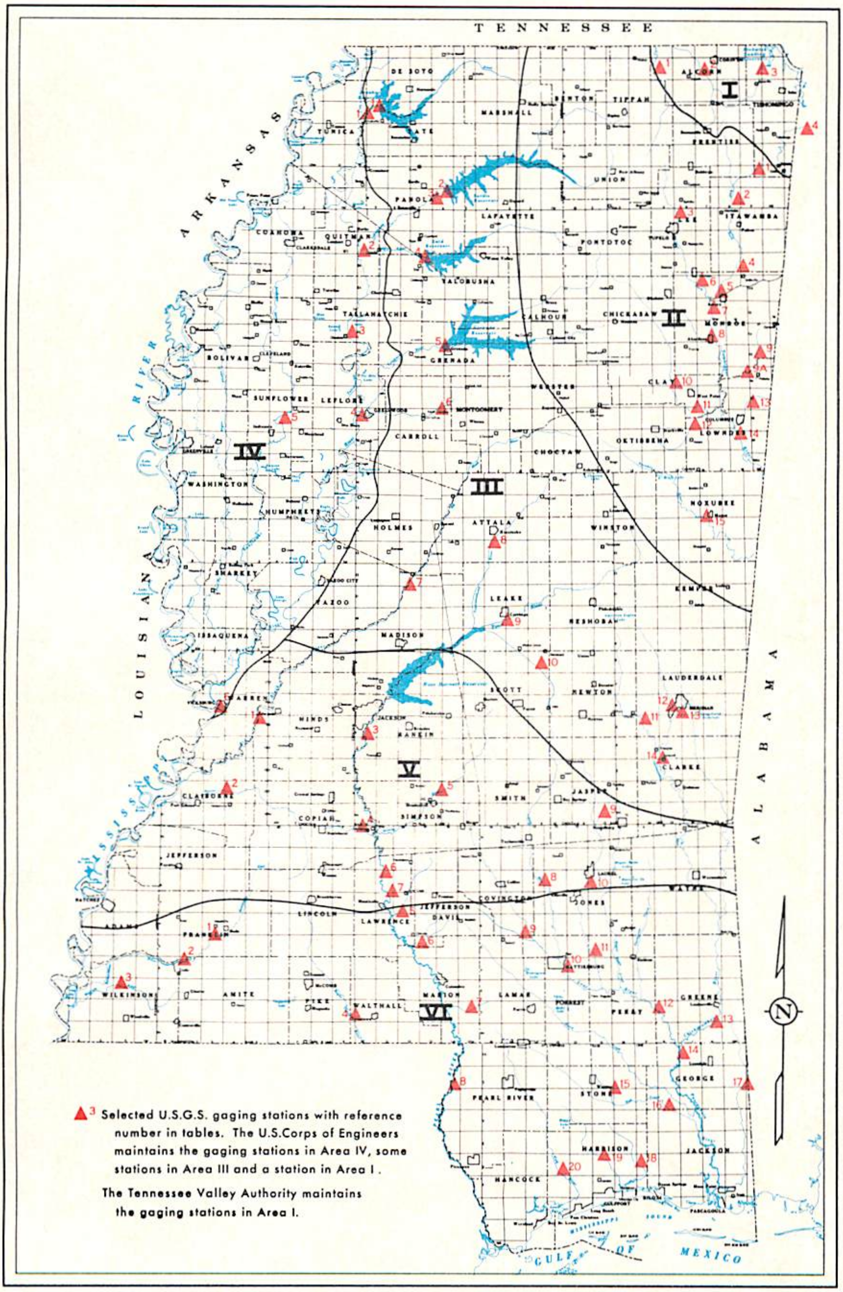


Figure 11.—Location of major streams, selected U.S.G.S. gaging stations, and major surface-water divisions of the State.

ern parts of Mississippi are drained by the Pearl River and its tributaries. The eastern part is drained by the Tombigbee River and tributaries in the north and the Pascagoula River and tributaries in the south. The major streams with their names are illustrated by Figure 11.

Numerous small to medium lakes are located on various small streams throughout the State. Five large flood-control reservoirs are presently in operation within the State with four of these located in the hills above the Delta and one north of Meridian on Okatibbee Creek. The Ross Barnett Reservoir is located on the Pearl River north of Jackson and is for recreational use and water supply rather than for flood protection.

Reservoir name	Storage capacity in acres	Potential storage capacity in acre-feet
Grenada	64,000	1,337,400
Sardis	59,000	1,569,900
Arkabutla	34,000	525,300
Enid	28,000	660,000
Ross Barnett	31,000	305,000
Okatibbee	8,800	124,000

Surface waters are not generally used as a source of water supply in the State but are used extensively for waste dilution and disposal, cooling water for industry, and minor irrigation supply. Two cities, Jackson and Columbus, obtain their water supply from surface water (Pearl River and Luxapallila Creek respectively). Meridian's principal source of water supply is from surface water but the city has two wells to augment the surface water source.

Streamflow is a variable condition and depends on several controlling factors which include climate, geology, topography and runoff. Differences in streamflow exist from basin to basin, within basins and in reaches of individual streams. Similarities exist between streams but no two are identical. Stream-gaging recorders, high water marks and measurements provide records of the history of the streams according to streamflow which includes floods and low flows. The U. S. Geological Survey, Water Resources Division, maintains a network of basic data collecting sites on the streams in the State. The Corps of Engineers has a stream gaging network established primarily in the Delta and in the northeastern part of the State. Predictions of future streamfolw are based on past records and probability of occurrence. Detailed streamflow information is available from the U. S. Geological Survey or Corps of Engineers (in certain areas) on gaging-stations across the State.

The State is divided into 5 regions for this report beginning in the northeastern part with Area I (fig. 11). A brief discussion of the availability, occurrence and quality of water of the major streams is included for each area. Tables are included for each area with a summary of stream-gaging data, available data on lowest mean discharge for 7 consecutive days, and chemical analyses. The summary of stream-gaging data includes drainage area, records available, average discharge, minimum daily discharge, and maximum discharge. Information on lowest mean discharge is included because the minimum flow of streams at any site is the best indication of the amount of water available without storage. Chemical quality information is given and (if available) includes analyses of water at high and low flow. Quality information is often of more concern than quantity in determining the effective utility or value of a water source.

SURFACE WATER

AREA I

Area I, northeast Mississippi, is in the drainage system of the Tennessee River (fig. 11). Most of the streams are small and the drainage is generally toward the north. The principal streams in this region include the Hatchie River (western Alcorn County), Tuscumbia River (central Alcorn County), Seven Mile Creek (eastern Alcorn County), Yellow Creek (western Tishomingo County) and Indian Creek (eastern Tishomingo County). Several small streams drain the eastern part of Tishomingo County and the largest of these is Bear Creek. Table 21 is a summary of the streamflow information available on the streams. Pickwick Lake, on the Tennessee River, is the northeast boundary between Mississippi and Tennessee.

Hatchie River and Tuscumbia River have been canalized and deepened to facilitate drainage in the region. Valuable agricultural land along these streams is protected from flooding to a

Table 21.—Summary of data from selected stream-gaging stations in Area I.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
1	Hatchie River at Walnut (Hwy. 72 crossing)	274	1947-61	15	418					Gaging station maintained by U. S. Corps of Engineers, Memphis, Tennessee, Information from U. S. Geological Survey.
2	Tuscumbia River west of Corinth(Hwy. 72 crossing)	277	1950-61	12	432					Gaging station maintained by U. S. Corps of Engineers, Memphis, Tennessee, Information from U. S. Geological Survey.
3	Yellow Creek at Doskie	143	1937-54	16	208	8	July 9, 1948	19,000	Feb. 13, 1948	Gaging station maintained by Tennessee Valley Authority. Information from TVA stream gaging publication.
4	Bear Creek at Bishop, Ala. (across the line from Mississippi)	667	1926-28 1929-32 1933-68	38	1,066	9.3	Sept. 15-17, 1954	37,000	Mar. 22, 1955	

Records from U. S. Geological Survey,
Water Resources Data for Mississippi, 1962-68.

certain degree by the canalization of the streams. Flooding is a hazard on most of the streams and flooding records should be checked before building structures near the streams.

The mouth of Yellow Creek is located in Pickwick Lake and the discharge of the lower reach of the stream is controlled by the stage of the lake. Yellow Creek is part of the proposed Tennessee-Tombigbee Waterway. The Mississippi legislature recently appropriated funds for the establishment of a port at the mouth of Yellow Creek on the Tennessee River. A number of recreational facilities are located on Pickwick Lake in Mississippi.

Low flows are common on most of the streams during dry periods. Table 22 includes data on the lowest mean discharge for 7 consecutive days (1960) on Tuscumbia River and Yellow Creek. Storage facilities would have to be provided for a dependable surface-water supply on these streams. A number of the smaller streams have very little flow or zero flow during the dry autumn and late summer. Table 21 may be used to compare the daily minimum discharge of the streams. These figures indicate that storage facilities would have to be provided on any of the streams to furnish an adequate supply of water. Most reservoirs are designed for multi-purpose use which includes water supply and recreation.

QUALITY OF WATER

The quality of surface water is generally good in Area I. Most of the water is low in mineralization and the water is soft. Some of the water during low flows may contain high iron concentration. The water is slightly acidic to neutral and the water is not colored. Turbidity and suspended sediments in the water will be high during storm runoff periods. Table 23 is a compilation of chemical analyses of surface water in the area. An analysis is included for comparison of both high and low flows.

Individual water samples at various discharge rates should be analyzed for specific industrial processes. Most industrial water needs vary in the specific water quality requirements. Surface water will probably not be used as a source of public supplies in this area as adequate ground water supplies are available.

Table 22.—Lowest mean discharge for 7 consecutive days at stream-gaging stations in Area I. tions in Area I.

Ref. No.	Stream and Location	Period of Record (years)	Cubic feet per second	Millions of Gallons per day	Year
2	Tuscumbia River near Corinth	8	2.1	1.35	1954
3	Yellow Creek at Doskie	20	10	6.43	1941, 1943, 1954
	MISCELLANEOUS STATIONS				
	Chambers Creek at Kendrick.	16		.06	1949

From a report by Robinson and Shelton, Mississippi Board of Water Commissioners Bulletin 60-1

Table 23.—Chemical analyses of water from streams in Area I.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micro-mhos at 25°C)	pH	Color
	Hatchie River at Walnut (Analysis by Miss. Air and Water Pollution Control Commission Lab.)																			
1	9-25-69		62					3.75	0.75		14.65			.05	160	14		46	6.8	30
	Tuscumbia River West of Corinth (Analysis by Miss. Air and Water Pollution Control Commission Lab.)																			
2	9-25-69		70					30.25	2.51		7.24			65	186.7	39		175	6.9	30
	Yellow Creek Drainage Canal near Burnsville																			
5	Nov. 3, 1959	1.13		9.3	0.61	3.9	2.6	2.0	2.3	25	3.8	2.2	0.1	0.5	39	20	0	55	6.8	35
	May 30, 1960	3.74		1.8	.00	3.0	1.2	2.0	1.1	16	3.6	2.0	.0	.5	23	12	0	40	6.6	15
	Hatchie River near Ripley																			
6	Nov. 3, 1959	9.41		6.4	0.21	1.9	1.8	1.2	1.0	16	0.0	2.2	0.1	0.5	23	12	0	35	6.9	25
	May 30, 1960	10.8		1.8	.00	2.9	1.0	1.1	0.6	14	.8	2.0	.0	.5	18	11	0	30	6.5	25

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-68

SURFACE WATER

AREA II

Most of northeast Mississippi, Area II, is drained by the Tombigbee River system (fig. 11). Part of the northern and western area is drained by the tributary system of the Mississippi River.

Large quantities of water are available from the major streams, particularly the Tombigbee River. Most large industries in the area are located adjacent to an available surface water source. Surface water is used for waste dilution, cooling water, and process water by most industries. Irrigation systems use surface water but there are only a small number of these systems in the area. Only one municipality, Columbus, uses surface water as a source of municipal supply in Area II. The City of Columbus pumps about 3.2 to 3.8 mgd (million gallons per day) from Luxapallila Creek. Treatment of surface water for municipal use is expensive and requires skilled personnel to operate the treatment plant.

The Tombigbee River is the largest stream with a drainage area of 5,600 square miles at the Mississippi-Alabama line. The Tombigbee River is formed by the confluence of the East and West forks of the Tombigbee near Amory. The average flow at Columbus, for 53 years, (1899-1912, 1928-1968) is 6,183 cfs (cubic feet per second) (drainage area of 4,490 square miles). The maximum discharge recorded at the Columbus gage was 148,000 cfs on January 7, 1949 and the minimum discharge was 138 cfs on September 30, 1954. (Table 24). The median flow for the Tombigbee River increases from 630 mgd at Amory to about 1,700 mgd at the Mississippi-Alabama line.

The tributaries of the Tombigbee River vary in shape, size, and amount of discharge. The principal creeks are Mackeys, Bull Mountain, Oldtown, James, Chuquatonchee, Tippah, and Luxapallila Creeks. The main rivers include the Buttahatchee and Noxubee Rivers. Discharge during periods of low flow on the tributaries is important for the supply of water without storage facilities. Most low flow data is presently based on mean flows for various periods, 7, 15, 30, 60, 120 and 183 days. The 7 day period is shown on Table 25. This procedure excludes the point minimum discharge which may occur during a period of a few hours or

Table 24.—Summary of data from selected stream-gaging stations in Area II.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
1.	Mackeys Creek near Dennis	66	1937-68	31	101	8.2	(Since 1944) Sept. 3,4,5, 1954	16,300	Mar. 21, 1955	
2.	Tombigbee River near Fulton	605	1928-68	40	893	12	Aug. 31 to Sept. 2, 1943	82,200	Mar. 22, 1955	
3.	Oldtown Creek at Tupelo	112	1943-46 1951-68	20	175	0	Several times	23,000	Mar. 21, 1955	
4.	Bull Mountain Creek near Smithville	335	1940-68	28	529	19	Aug. 28 to Sept. 3, 1943	40,000	Mar. 22, 1955	
5.	Tombigbee River at Bigbee	1,194	1944-54 1963-68	15	1,973	29	Sept. 15, 1954	52,800	Feb. 15, 1948	
6.	West Fork Tombigbee River near Nettleton	617	1939-68	29	896	0.8	Sept. 14, 15, 1942	151,000	Mar. 22, 1955	
7.	Tombigbee River near Amory	1,941	1937-68	31	2,935	45	Sept. 20, 1954	126,000	Mar. 22, 1955	
8.	James Creek at Aberdeen	28.9	1963-68			0	Several times	4,430	July 9, 1967	

Table 24.—Summary of data from selected stream-gaging stations in Area II. (Continued)

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
9.	Buttahatchee River near Aberdeen	787·	1966-68			148	Aug. 3, 1966	36,300	Dec. 20, 1967	
10.	Chuquatonchee Creek near West Point	514	1943-68	25	751	0	Several times	45,800	Mar. 29, 1951	
11.	Tibbee Creek near Tibbee	928	1928-30 1939-68	31	1,229	0	Several times	75,200	Mar. 29, 1951	
12.	Catalpa Creek at Mayhew	98.2	1942-44 1952-57 1959-60	5	123	0	Aug. 26, 1943	13,200	Dec. 18, 1967	
13.	Luxapallila Creek at Steens	309	1943-47 1949-68	23	469	23	Aug. 14, 1954	14,200	Feb. 23, 1961	
14	Tombigbee River at Columbus	4,490	1899-1912 1928-68	53	6,183	138	Sept. 20, 1954	148,000	Jan. 7, 1949	
15	Noxubee River at Macon	812	1928-32 1938-68	34	923	22	Aug. 25, 26, 1943	52,000	March 30, 1951	

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-68.

during some type of regulation. Table 25 indicates the lowest mean discharge for 7-day periods at selected gaging stations located in Area II.

Streamflow during low stages consists mainly of ground water discharged into the streams. The bottom of a stream is sometimes connected with a highly permeable aquifer and the aquifer or aquifers provide most of the base-flow of streams. The reverse of this is true and at times the streams help in the recharge of the aquifer or aquifers. Most of the low flow of the tributaries in northern Mississippi is derived from those that drain the eastern side of the basin (Table 25). Several of the tributaries draining the western side experience periods of no flow. The explanation of this difference in low flows in the east and west side of the Tombigbee basin is attributed to geologic control. Generally, the Cretaceous beds that outcrop on the western side of the basin are impervious chalk and clays (Demopolis chalk, Ripley clay, Porters Creek clay). These impervious deposits have little storage capacity which results in high flood flows and little runoff during dry weather periods.

Some of the streams in the region have high maximum discharges and high average discharges. Table 24 is included so that several streams may be compared at average, minimum and maximum flows. An industry may judge whether to consider a stream without storage if their maximum draft is lower than the low flow.

Flooding is a serious problem on most of the streams. Extensive flooding has occurred in 1892, 1948, 1949, 1951 and 1955 on the Tombigbee River. Recent publicity (1969) of this problem has resulted in plans being formulated to protect the low lying areas of Columbus with a levee. The danger of flooding at specific locations in or near the flood-plain should be carefully considered. The frequency and height of floods at proposed locations should be considered from past records of floods in the region.

A few small lakes and reservoirs are available for recreational use in the area. Numerous farm ponds are present and afford private fishing.

Surface water use will probably continue to grow as the industrial growth increases in the region. The Tombigbee River

Table 25.—Lowest mean discharge for 7 consecutive days at stream-gaging stations in Area II.

Ref. No.	Stream and Location	Period of Record (years)	Cubic feet per second	Millions of Gallons per day	Year
1.	Mackeys Creek, Dennis	17	8.8	5.68	1954
2.	East Fork, Tombigbee River, Fulton	32	14.9	9.62	1943
3.	Oldtown Creek, Tupelo	11	0	0	Several
4.	Bull Mountain Creek, Smithville	21	19.0	12.27	1943
6.	West Fork, Tombigbee River, Nettleton	21	1.6	1.03	1942
7.	Tombigbee River, Amory	23	51.0	32.95	1943
11.	Tibbee Creek, Tibbee	25	0	0	Many
13.	Luxapallilia Creek, Steens	14	25.3	16.34	1954
14.	Tombigbee River, Columbus	45	141	91.02	1954
	MISCELLANEOUS STATIONS				
	East Fork, Tombigbee River, Marietta	6*	10.0	6.46	1943
	East Fork, Tombigbee River, Beans Ferry	9	16.1	10.40	1943
	Bull Mountain Creek, Tremont	17	5.1	3.30	1954
	Euclautubba Creek, Saltillo	10	0	0	Most years
	Tombigbee River, Aberdeen	32	64.0	41.34	1943
	Buttahatchee River, Caledonia	11	85.0	54.91	1943
	Chookatonchee Creek, West Point	16	0	0	Many

From a report by Robinson and Shelton, Mississippi Board of Water Commissioners, Bulletin 60-1.

is the largest source of surface water in this region and industrial development will probably be in this general area.

QUALITY OF WATER

The quality of surface water is generally good in northeast Mississippi. Generally, the water is low in total dissolved solids, low in iron content, and slightly low pH (acidic) to basic water type. The water in some of the tributaries draining the outcrop area of the chalk is hard. Table 26 is included to illustrate the particular type of water at a particular stage and flow on selected streams. The dissolved solids content of the water is higher during periods of low flow and the suspended material increases during high discharge periods. Turbidity also increases during storm runoff as more suspended material is carried by the water. Treatment of surface water has to be flexible and adjust to the variation of quality of the water at different stages or flows of the streams.

SURFACE WATER

AREA III

North central and central Mississippi, Area III, is drained by streams of the Yazoo, Big Black, Pearl and Pascagoula River systems. The northern part is drained by tributaries of the Yazoo River, the Big Black and Pearl Rivers drain the central part of the area and the eastern part is drained by tributaries of the Pascagoula River.

Most of the streams are small in size and only the Big Black and Pearl Rivers are fairly large near the southern boundary of Area III. Four of the tributary streams of the Yazoo River have flood-control structures for the Mississippi Delta constructed in Area III. A flood-control structure was recently (1969) completed on Okatibbee Creek north of Meridian.

Data from selected stream-gaging stations on streams within the region are included in Table 27. Information on stream size, drainage area, minimum discharge and years of record may be helpful to a potential user.

A large demand for surface-water would require constructing storage facilities on most of the smaller streams. The Pearl River, near the Leake-Madison County line, the Big Black, near

Table 26.—Chemical analyses of water from streams in Area II.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
	Mackeys Creek near Dennis																			
1	Nov. 3, 1959	29		7.0	0.30	2.9	0.9	1.2	1.0	14	1.4	2.0	0.1	0.6	24	10	0	37	6.5	40
	May 30, 1960	35		3.6	.18	2.2	1.3	1.1	.8	13	2.0	1.8	0	.5	20	11	0	29	6.5	25
	East Fork Tombigbee River near Fulton																			
2	Mar. 3, 1959	663		1.9	.04	11	.8	2.3	1.0	31	7.2	3.5	.2	0	56	31	6	79	6.8	10
	Sept. 12, 1962	99		9.1	.01	5.0	.6	1.4	1.3	19	2.8	.9	0	0	30	15	0	46	6.1	10
	Oldtown Creek at Tupelo																			
3	Dec. 6, 1967	11		7.5	0.02	47	1.9	4.8	3.0	126	28	6.8	0.1	0	162	125	22	284	7.0	10
	West Fork Tombigbee River near Nettleton																			
6	Sept. 4, 1962	22		22	.02	41	1.6	7.6	3.2	116	14	13	.3	1.9	167	109	14	276	6.8	5
	Dec. 13, 1963	1,190		20	.02	28	1.2	4.4	2.3	82	13	4.7	.2	2.0	116	75	8	163	6.8	30
	Dec. 5, 1967	429		8.4	0.02	49	2.1	6.0	3.9	135	18	11	0.1	0.1	175	131	20	306	6.8	10
	Tombigbee River near Amory																			
7	Sept. 18, 1963	268		8.8	0.00	13	1.8	4.6	1.7	46	4.4	6.1	0.0	0.3	68	40	2	105	6.7	10
	Jan. 29, 1964	5,000		4.3	.05	15	0.6	3.0	1.3	40	10	3.1	.1	.2	60	40	7	101	6.6	30

Table 26.—Chemical analyses of water from streams in Area II.—(Continued)

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micro-mhos at 25°C)	pH	Color
	Buttahatchie River near Kolola Springs																			
9A	Feb. 26, 1964			9.1	.03	1.9	.1	1.2	.5	4	1.8	1.2	.4	.2	18	5	2	22	5.9	20
	April 30, 1964			5.8	.12	1.4	.1	1.8	1.4	4	3.6	1.3	.2	.6	18	4	1	18	5.9	60
	Catalpa Creek at Mayhew																			
12	Nov. 4, 1959	1.95		4.8	.04	97	2.8	23	5.5	300	35	18	.3	.6	335	254	8	540	7.8	18
	May 31, 1960	1.19		3.5	.00	83	1.2	24	4.2	266	25	16	.3	.3	304	212	0	479	8.0	15
	Luxapallila Creek at Steens																			
13	July 8, 1960	76		4.9	.04	1.9	.6	1.4	.7	9	1.2	2.2	.1	.4	18	7	0	26	6.4	20
	April 30, 1964	3,000		6.5	.20	2.4	0	.7	.4	5	1.2	1.3	.1	.4	15	6	2	22	5.8	80

[a] Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-63.

Table 27.—Summary of data from selected stream-gaging stations in Area III.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
	YAZOO RIVER BASIN									
1,	Coldwater River at Arkabutla Dam	1,000	1937-68	30	1,269	0	Many times up to 1958	30,200	Jan. 22, 1938	Regulated since 1942
2.	Tallahatchie River near Sardis	1,680	1928-42	14	2,093	16	Sept. 19, 1942	65,300	Jan. 15, 1932	Regulated since Sept. 1939
3.	Tallahatchie River at Sardis Dam	1,545	1940-68	28	2,176	0	Many times	5,780	June 24, 1946	Regulated
4.	Yocona River at Enid Dam	560	1928-68	40	812	0	Many times	36,300	Feb. 14, 1948	Regulated
5.	Yalobusha River at Grenada Dam	1,320	1953-68	15	1,703	0	Many times	4,880	Jan. 3, 1958	Regulated
6.	Thompson Creek at McCarley	14.4	1956-64	7	19	1.0	Oct. 1, 1956	2,810	July 16, 1963	
	BIG BLACK RIVER BASIN									
7.	Big Black River at Pickens	1,460	1936-68	32	1,785	27	Aug. 31, Sept.1, 1943	49,400	Mar. 28, 1951	

Table 27.—Summary of data from selected stream-gaging stations in Area III. (Continued)

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
	PEARL RIVER BASIN									
8.	Yockanookany River near Kosciusko	314	1938-68	30	383	2.3	Aug. 20-24, 1943	19,300	Mar. 29, 1951	
9.	Pearl River near Carthage	1,347	1962-68	6	1,310	31	Oct. 30, 1963	18,200	Mar. 19, 1964	
10.	Tuscolameta Creek at Walnut Grove	411	1938-68	30	468	2.4	Oct. 2, 1954	34,600	Jan. 7, 1950	Creek has been canalized
	PASCAGOULA RIVER BASIN									
11.	Chunky River near Chunky	368	1938-68	30	449	1.6	Sept. 28-30, 1954	30,800	Feb. 22, 1961	
12.	Okatibbee Creek near Meridian	239	1938-68	30	287	.48	Sept. 11-13, 1952	27,000	Feb. 22, 1961	Flow regulated 1969
13.	Sowashee Creek at Meridian	51.9	1950-68	18	56.2	.20	Oct. 4, 1954 At times during July, Aug., Sept., 1957	9,530	April 6, 1964	
14.	Chickasawhay River at Enterprise	913	1938-68	30	1,137	18	Sept. 25-30, 1954 Oct. 22,25, 1963	61,700	Feb. 23, 1961	

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-68.

Pickens, and the Chickasawhay River at Enterprise could maintain a fair-sized water supply (11 to 20 mgd) during most of the year. The majority of the smaller streams either have a minimum flow of zero or near zero during the dry periods of summer and fall. Available information on minimum flows at stream-gaging stations is included in Table 28.

Table 28.—Lowest mean discharge for 7 consecutive days at stream-gaging stations in Area III.

Ref. No.	Stream and location	Period of record (years)	Cubic Feet per second	Millions of gallons per day	Year
4.	Yocona River at Enid Dam	23	30	19.3	1931
7.	Big Black River at Pickens	22	31.6	20.3	1943
8.	Yockanookany River near Kosciusko	20	2.4	1.5	1943
10.	Tuscolameta Creek at Walnut Grove	19	3.3	2.1	1954
11.	Chunky River near Chunky	20	1.8	1.15	1954
12.	Okatibbee Creek near Meridian	12	3.8	2.4	1943
13.	Sowashee Creek at Meridian	7	.3	.19	1954,1957
14.	Chickasawhay River at Enterprise	20	18.1	11.7	1954
	MISCELLANEOUS STATIONS				
	Cane Creek near New Albany	10	.1	.06	1954
	Tallahatchie River at Etta	20	6.1	3.9	1942
	Clear Creek near Oxford	10	3.2	2.6	1939
	Yocona River near Oxford	11	5.7	3.7	1954
	Long Creek near Courtland	3	1.9	1.2	1941
	Pigeon Roost Creek near Lewisburg	13	32.4	20.8	1946
	Yalobusha River at Calhoun City	7	0	0	Many times
	Skuna River at Bruce	9	1.1	0.7	1954
	Yalobusha River at Grenada	24	39.7	25.6	1943
	Pearl River at Edinburg	30	2.3	1.5	1956
	Lobutcha Creek near Carthage	19	6.3	4.05	1943
	Noxubee River, Brooksville	19	0	0	Several
	Noxubee River, Macon	27	24.6	15.89	1943
	Cane Creek, New Albany	13	.1	.06	1954
	Tallahatchie River, Etta	23	6.1	3.94	1942

From a report by Robinson and Shelton, Mississippi Board of Water Commissioners, Bulletin 60-1.

Large amounts of surface water are available during maximum flow of the streams in Area III. Maximum flow, in the past, has ranged from 2,810 cfs (1963) on Thompson Creek at McCarley to 65,300 cfs (1932) on the Tallahatchie River near Sardis.

All of these streams are subject to flooding. Flooding may occur rapidly because of the relative short drainage area and the steep gradient of the streams. Flood-control structures have been constructed on the main streams entering the Delta from the hills. Four reservoirs; Arkabutla on Coldwater River, Sardis on Tallahatchie River, Enid on Yocona River, and Grenada on Yalobusha River regulate water that would otherwise flood over the rich agricultural land of the Delta. The regulation of the flows has generally served to maintain higher discharges in the streams during summer and fall months when low flows normally occur and irrigation demand is high in the Delta. All of the reservoirs are designed for multipurpose use and provide recreational areas as well as flood-control. Most of the use for surface water in Area III is for cooling water, irrigation and partially for dilution of wastes near population centers. Some stream pollution may be present in certain reaches of the streams.

QUALITY OF WATER

The quality of surface water is generally good. Analyses of water from selected streams are included in Table 29. The chemical analyses indicate that the water is soft (4-28 ppm) and contains low (36-94 ppm) dissolved solids.

SURFACE WATER

AREA IV

Area IV, northwestern Mississippi, is drained by the Yazoo River system. The principal tributaries of the Yazoo River include the Sunflower River, Bogue Phalia, Quiver River, Tallahatchie River and Coldwater River (fig. 11). The tributaries rise in the hills (Area III) to the east of Area IV and flow down through the Delta region. Discharge of the principal streams is regulated by dams located in Area III. A large number of levees, channel improvements and drainage canals are located in Area IV which aids in the control of excess runoff in the streams during the wet season. Water transportation and commerce is of major importance on the Mississippi River. There is an economic advantage in locating plants close to water transportation and manufacturers are aware of this fact.

The flow of the Mississippi River is large during most of the year. The average discharge for 40 years (1928-68) is 551,-

Table 29.—Chemical analyses of water from streams in Area III.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
	Tallahatchie River at Sardis Dam																			
	Oct. 23, 1958	2,850	69	2.0	0.22	4.6	1.5	2.3	2.0	20	5.0	3.0	0.1	0.6	36	18	1	52	6.7	5
3	Mar. 10, 1959	1,960	53	1.6	.10	7.2	1.4	2.8	2.2	26	3.6	3.8	.2	.4	54	24	2	69	6.5	5
	June 22, 1959	4,080	80	1.3	.22	7.2	1.6	3.3	1.8	24	7.6	4.2	.2	1.2	48	24	5	80	6.6	70
	Big Black River at Pickens																			
	Feb. 13, 1958	3,000	45	7.4	0.35	4.6	1.4	5.1	1.9	20	7.8	4.5	0.5	0.8	94	18	1	64	6.3	20
7	June 10, 1958	340	84	8.6	.04	6.9	1.6	5.6	2.7	21	8.2	6.0	.5	1.9	68	24	6	78	6.4	22
	Oct. 22, 1958	179	65	4.6	.49	4.9	3.0	5.5	1.4	34	4.6	6.2	.0	1.0	59	24	0	87	6.8	5
	Yockanookany River near Kosciusko																			
	Dec. 9, 1959	110	44	1.9	0.07	1.1	0.2	2.4	0.5	5	0.0	3.5	0.0	0.5	38	4	0	23	5.5	10
8	May 24, 1960	32.8	77	6.1	.21	3.6	1.7	4.5	.9	17	4.6	5.2	.0	1.3	35	16	2	61	6.5	40
	Feb. 2, 1960	2,770	--	3.9	.15	1.3	1.2	3.6	1.2	6	6.8	2.8	.1	1.2	54	8	3	36	5.4	70
	Okatibbee Creek near Meridian																			
12	Oct. 25, 1967	12		9.4	0.24	5.3	2.1	4.0	2.8	27	3.0	4.8	0.1	0.1	54	22	0	71	6.2	20
	Chickasawhay River at Enterprise																			
14	Oct. 25, 1967	72		11	0.09	7.6	2.2	8.5	3.3	26	11	8.6	0.8	0.1	75	28	7	107	6.0	15

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-68.

100 cfs at Vicksburg with a drainage area of approximately 1,-144,500 square miles (Table 30). The average discharge for the Mississippi River at Memphis for 35 years (1933-68) is 450,700 cfs with a drainage area of approximately 932,800 square miles. These figures indicate the average flow of the river. The increase in flow indicates the amount of water the streams between Memphis and Vicksburg contribute to the flow.

The Yazoo River and its tributaries drain the major portion of Area IV. The average discharge of the Yazoo River at Greenwood (drainage area of 7,450 square miles) is 9,763 cfs for a period of record of 46 years (1907-12, 1927-64). A comparison of the streams drainage area, average flow, minimum and maximum flow may be undertaken by using Table 30. Numerous floods were recorded in Area IV prior to the completion of the flood-control structures on the streams. Presently, floods are not a major threat to this region. Low flows are more or less controlled by the upstream flow-regulating structures. Excess water is usually discharged from the flood-control structures during periods that low flows otherwise would normally occur on the streams. Table 31 is included to indicate the low flows on the Sunflower River and Mississippi River.

A large volume of surface water is used for irrigation throughout the Delta. The small streams dry up during a drought and are not a dependable irrigation source. Most farmers use both wells and streams for irrigation sources provided a fairly large stream is located nearby.

A number of ox-bow lakes are present in this region and afford recreational areas. Numerous private farm ponds are also present.

QUALITY OF WATER

Generally, surface water in Area IV is of fair quality for most users. Table 32 gives information on the chemical quality of the surface water in Area IV. Samples were collected at different rates of flow and will vary according to the amount of discharge at that particular time. Analyses are included on both the high and low rates of flow (if available) for comparison of the chemical quality.

The water is fairly hard (20 to 172 ppm) and the mineralization of the water is higher (40 to 304 ppm) than most surface

Table 30.—Summary of data from selected stream-gaging stations in Area IV.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge, Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
1.	Coldwater River at Arkabutla Dam	1,000	1937-41 1942-68	30	1,269	0	Many times	30,200	Jan. 22, 1938	Regulated
2.	Tallahatchie River near Lambert	1,980	1935-68	33	2,557	59	Oct. 27-29, 1942	32,800	Jan. 30, 1937	Actual measured flow of Coldwater River because Tallahatchie is diverted through a floodway.
3.	Tallahatchie River at Swan Lake	5,130	1929-38 1938-68	30	7,131	213	Oct. 27, 1942	49,200	April 9, 1933	Partly regulated since 1939.
4.	Yazoo River at Greenwood	7,450	1907-12 1927-64	46	9,763	536	Oct. 20, 1943	72,900	Jan. 19, 1932	Tributaries regulated.
5.	Sunflower River at Sunflower	767	1935-68	33	956	81	Aug. 16, 1954 Aug. 9, 10, 1956	11,700	April 28, 1964	Upstream water used for irrigation
6.	Mississippi River near Vicksburg	1,144,500	1928-68	40	551,100	99,400	Nov. 1, 1939	2,080,000	Feb. 17, 1937	

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1961-68.

Table 31.—Lowest mean discharge for 7 consecutive days at stream-gaging stations in Area IV.

Ref. No.	Stream and Location	Period of Record (years)	Cubic feet per second	Millions of Gallons per day	Year
5	Sunflower River at Sunflower,	22	83.0	53.6	1956
6	Mississippi River near Vicksburg,	26	102.4	66.1	1936

From a report by Robinson and Shelton, Mississippi Board of Water Commissioners, Bulletin 60-1.

Table 32.—Chemical analyses of water from streams in Area IV.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micro-mhos at 25°C)	pH	Color
	Yazoo River at Greenwood																			
4	Feb. 3, 1960	18,200	46	0.5	0.0	3.6	2.6	3.4	3.2	22	6.8	3.2	.0	0.9	40	20	0	60	6.6	20
	Sept. 26, 1962	8,110		5.8	0.1	7.1	1.3	3.0	1.7	30	3.0	2.4	.1	.0	52	23	0	72	6.2	0
	Sunflower River at Sunflower																			
5	Mar. 10, 1959	1,020	54	1.3	.00	24	3.3	5.8	5.0	90	9.4	3.5	.3	2.8	122	74	0	167	7.1	5
	Sept. 26, 1962	185		13	.02	37	10	10	4.5	176	7.4	4.0	.1	.4	183	134	0	310	7.0	5
	Mississippi River near Vicksburg																			
6	June 16, 1951	684,000	76	8.3	.03	46	14	32	2.7	154	67	34	.3	3.6	304	172	46	483	7.5	15
	Oct. 18, 1961	311,000		5.9	.19	43	13	15	2.9	146	47	17	.4	.9	242	160	40	396	6.9	20
	MISCELLANEOUS ANALYSES																			
	Quiver River near Doddsville																			
	Nov. 20, 1959	22		6.0	.00	19	7.9	6.8	9.1	94	13	8.0	0.2	0.7	136	80	3	199	7.3	30
	Yazoo River at Redwood																			
	Oct. 19, 1961			4.2	.00	14	5.0	8.0	2.1	70	8.2	8.5	.1	1.2	91	56	0	156	7.1	5
	Nov. 1, 1961			11	.00	271	7.2	19	2.0	128	8.8	19	.2	.2	174	97	0	265	7.0	10

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-68.

water. Turbidity and sediment load is often a problem on the major streams. Some of the streams contain "muddy" or turbid water most of the time.

Insecticides and related poisons used for agricultural purposes have increased in use during the past few years in Area IV. The surface water, including streams and lakes, has become polluted to varying degrees by the build up of these poisons. The aerial application and widespread use of the poisons has intensified this problem in the region.

Some of the streams in the region may contain industrial and/or organic pollution. Effluent from numerous sewage-disposal ponds plus some untreated sewage drains into some of the streams in the vicinity of Yazoo City, Greenwood, Greenville, and Vicksburg.

SURFACE WATER

AREA V

An abundance of available surface water is present in Area V (fig. 11). Numerous streams and rivers drain the region with the largest being the Mississippi River. Other river drainage systems in the region include the Big Black River, Pearl River, and the Pascagoula River. The eastern part of the region is the general headwaters for the Pascagoula River system. Numerous tributaries of the major streams form an intricate drainage system throughout the area.

Several large lakes or reservoirs and many small lakes are present in Area V. The Ross Barnett Reservoir on the Pearl River north of Jackson is the largest lake in the area. The other lakes in the region include Copiah Lake in Copiah County, Roosevelt Lake in Scott County, Lake Mary Crawford in Lawrence County, and Lake Bogue Homa in Jones County.

The greatest amount of available surface water is located in the largest rivers. The flow of the Mississippi River averages more than 550,000 cfs (40 years record at Vicksburg) and the flow is higher at Natchez. The average flow of the Big Black River at Bovina is 3,315 cfs (32 years of record). The Pearl River at Jackson has an average flow of 3,745 cfs (51 years of record) and the average flow increases to 6,014 cfs (30 years of record) at Monticello. The Leaf River at Collins has an average flow of 1,010 cfs (30 years of record). Information at gaging stations on drainage area, years of records, average discharge, minimum and maximum discharges of streams in Area V is tabulated in Table 33.

Table 33.—Summary of data from selected stream-gaging stations in Area V.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
1	Big Black River near Bovina	2,810	1936-68	32	3,315	65	Oct. 2, 1954	63,500	Dec. 20;1961	
2	Bayou Pierre near Willows	653	1959-61* 1961-68	7	712	23	Oct. 13,14,1963	31,300	Oct. 5, 1964	*annual maximum
3	Pearl River at Jackson	3,100	1901-13 1928-68	51	3,745	45	Sept. 18, 1963	85,000	Mar. 31, 1902	Flow regulated to a degree by Ross Barnett Reservoir since Sept. 27, 1961
4	Copiah Creek near Hazlehurst	48.6	1948-65* 1965-68			7.8	Sept. 29,30,1968	22,000	Oct. 4, 1964	*annual maximum
5	Strong River at D'Lo	429	1928-68	40	541	12	Sept. 1, 1954	24,800	Jan. 7, 1950	
6	Bahala Creek near Oma	154	1965-68			15	Oct. 8-15,24,1967 Aug. 12-15,1967	6,380	April 27, 1966	
7	Pearl River near Monticello	5,040	1938-68	30	6,014	269	Oct. 24, 1963	63,500	Dec. 25, 1961	
8	Leaf River near Collins	752	1938-68	30	1,010	55	Aug. 28-30, 1957	48,500	Feb. 23, 1961	
9	Tallahatta Creek near Waldrup	30.7	1965-68			.18	Sept. 30, 1968	2,000	Feb. 16, 1966	
10	Tallahala Creek at Laurel	233	1938-68	30	321	1.8	Nov. 3, 1952 Oct. 21, Nov. 1, 1963	21,100	April 7, 1964	

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1961-68.

Flooding is possible on all of the streams and tributaries in the region. Consideration of the flood hazard within the flood plains of streams is important in the construction of structures. Levees have been built around Flowood on the eastern side of the Pearl River in recent years to prevent flooding in the particular area. The U. S. Geological Survey publishes annually records of floods on a large number of streams over the State.

Low flows are common on most all of the smaller streams and tributaries in this region. The minimum flow of a stream is of considerable importance to many users and potential users. Minimum low flows are often the conrtolling factor in determining the dependability of the water supply available for industrial or municipal development. Table 34 is included for stream-gaging

Table 34.—Lowest mean discharge for 7 consecutive days at stream-gaging stations In Area V.

Ref. No.	Stream and Location	Period of Record (years)	Cubic feet per second	Millions of Gallons per day	Year
1	Big Black River near Bovina	22	67.1	43	1954
3	Pearl River at Jackson	41	80	51.4	1904,1954
5	Strong River at D'Lo	29	17.4	11.2	1954
7	Pearl River near Monticello	20	298.1	191.6	1956
10	Tallahala Creek at Laurel	20	2.6	1.7	1952

From a report by Robinson and Shelton, Mississippi Board of Water Commissioners, Bulletin 60-1.

stations on the lowest mean discharge for seven consecutive days. Storage facilities for a dependable water supply would have to be provided on most of the smaller streams in the area.

QUALITY OF WATER

Most surface water in Area V is of good quality for general use. The water contains low dissolved solids and the pH is slightly acidic. Table 35 is a tabulation of chemical analyses on water from selected streams in the area. Two analyses, where available, are listed for comparison at high and low flow of the streams.

Pollution is a problem on certain streams and reaches of streams across the area. Industrial and municipal pollution is a serious problem on the reach of the Pearl River below Jackson.

Table 35.—Chemical analyses of water from streams in Area V.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micro-mhos at 25°C)	pH	Color
	Big Black River near Bovina																			
1	Oct. 20, 1958	378		4.6	0.55	8.6	4.9	12	3.6	52	6.8	14	0.1	0.9	88	42	0	144	7.0	5
	Feb. 17, 1959	9,910		1.5	.07	4.4	1.9	5.2	3.9	20	7.6	6.0	.2	.2	41	18	2	67	6.4	5
	Bayou Pierre near Willows																			
2	Oct. 11-20, 1961	70		9.1	.06	4.2	1.8	8.3	1.8	25	5.6	8.2	.1	.3	52	18	0	82	6.3	10
	Dec. 11-20, 1961	9,020		7.5	.26	2.6	0.5	2.8	1.9	12	2.8	3.0	.1	.7	28	9	0	40	6.2	10
	Pearl River at Jackson																			
3	Feb. 14, 1958	5,600		6.7	.33	2.6	.8	3.2	1.4	9	4.0	4.2	.3	.9	30	10	2	43	5.8	30
	Sept. 4, 1962	204		9.4	.10	5.0	1.3	3.4	1.3	21	3.4	4.4	.0	.3	40	18	1	64	6.1	0
	Copiah Creek near Hazlehurst																			
4	Feb. 23, 1966	36		14	.01	4.4	1.0	6.4	1.4	15	6.8	6.9	.0	1.7	56	15	3	72	6.0	5
	Aug. 30, 1966	9.1		13	.00	2.3	1.2	10	2.3	26	5.0	8.0	.1	.0	52	11	0	74	5.9	0

Table 35.—Chemical analyses of water from streams in Area V.—(Continued)

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO3)	Sulfate (SO4)	Chloride (Cl)	Flouride (F)	Nitrate (NO3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
	Strong River at D'Lo																			
5	May 20, 1966	3,640		6.5	0.03	4.0	0.5	3.4	2.0	13	6.0	1.7	0.1	0.4	35	12	1	41	5.9	20
	Aug. 29, 1966	46		10	.00	5.0	1.3	8.8	1.8	21	4.8	14	.0	.1	64	18	1	89	6.0	5
	Bahala Creek near Oma																			
6	Nov. 4, 1965	17		12	.01	1.4	1.1	4.1	.9	12	.2	6.5	.0	.0	32	8	0	42	5.9	5
	April 26, 1966	3,910		4.2	.33	1.8	.4	1.8	1.0	6	.0	2.6	.1	.5	16	6	1	25	5.4	80
	Pearl River near Monticello																			
7	May 3, 1966	22,000	70	5.6	.02	4.2	1.3	3.7	1.6	14	7.2	5.1	.1	.2	36	16	5	59	5.9	15
	Sept. 8, 1966	390	84	6.1	.00	4.6	1.4	9.3	2.4	29	8.2	6.5	.1	1.0	54	17	0	86	6.1	5
	Leaf River near Collins																			
8	Mar. 16, 1960	5,920		1.4	.00	2.7	1.0	1.7	.8	9	4.0	2.5	.0	.5	19	10	3	34	6.2	20
	June 24, 1960	114		4.4	.04	3.6	0.8	2.6	.7	13	2.2	4.0	.1	1.6	26	12	2	42	6.3	20
	Tallahattah Creek near Waldrup																			
9	Oct. 20, 1965	10	66															3,000		
	May 23, 1966	43	72															40		
	Tallahala Creek at Laurel																			
10	May 11, 1965	30	72															380		
	Feb. 26, 1965	551	49															88		

Records from U. S. Geological Survey, Water Resources Data for Mississippi 1962-68.

Table 35.—Chemical analyses of water from streams in Area V.—(Continued)

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
	MISCELLANEOUS ANALYSES																			
	Chickasawhay River near Waynesboro																			
	Oct. 21-31, 1963			9.1	.00	28	4.9	78	1.6	57	12	141	.1	.3	389	90	43	580	6.8	10
	Mar. 17-21, 1964			8.4	.17	4.5	2.1	7.6	1.6	18	4.6	13	.1	.5	51	20	5	82	6.9	60
	Mississippi River at Natchez																			
	Oct. 5, 1961			4.2	.00	38	9.1	14	3.8	128	41	14	.2	1.1	159	132	28	308	7.4	10
	Aug. 30, 1962			7.0	.00	55	13	27	3.2	181	54	28	.3	0.4	301	190	41	491	7.1	5

From a report by Gaydos, Michael W., Mississippi Board of Water Commissioners, Bulletin 65-1.

Tallahala Creek below Laurel is polluted by industrial and some municipal waste. Discharge of oil field waste, mostly saline water, is a pollution problem in some of the streams across the area. The City of Jackson is presently planning the construction of a major sewage treatment plant. The Air and Water Pollution Control Commission is working toward solving the pollution problem at various locations on the streams.

SURFACE WATER

AREA VI

Large quantities of surface water are available in Area VI, south Mississippi. The principal drainage systems in this region are the Mississippi, Pearl, Pascagoula, Wolf and Biloxi Rivers. The Pearl and Pascagoula River systems are the largest rivers in the region discounting the Mississippi River. The Homochitto, Buffalo, Amite and Bogue Chitto Rivers are the major streams which drain southwest Mississippi. The Pearl River and tributaries drain the central part of the State. The Pascagoula River and tributaries, along with the Wolf and Biloxi Rivers drain the southern and eastern part of the State.

Table 36 lists the principal streams in Area VI and summarizes available data from stream-gaging stations. The Pearl River at Bogalusa, Louisiana, drainage area of 6,630 square miles, has an average discharge of 8,693 cfs (1938-68 record). The Pascagoula River at Merrill compares with the Pearl River in size and average discharge. The Pascagoula River at Merrill, drainage area of 6,600 square miles, has an average discharge of 9,349 cfs (1930-68 record). Either of these streams could supply large volumes of water (400 to 500 million gallons per day) at these particular locations.

Numerous smaller streams are present in Area VI and several of these have sustained flows of fair size most of the time. The Homochitto River at Rosetta has an average discharge of 977 cfs (1938-68 record) and a daily minimum discharge of 129 cfs. The Bogue Chitto near Tylertown has an average discharge of 777 cfs and a daily minimum discharge of 175 cfs (1944-68 record). The Tallahala Creek near Runnelstown has an average discharge of 881 cfs and a daily minimum flow of 29 cfs (1939-69 record). The Leaf River near McLain has an average flow of 5,153 cfs and a daily minimum flow of 478 cfs (1939-68

Table 36.—Summary of data from selected stream-gaging stations in Area VI.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
1	Homochitto River at Eddiceton	180	1938-68	30	247	28	Sept. 29, 1956 Sept. 2, 4, 1954	30,900	Mar. 29, 1939	
2	Homochitto River at Rosetta	750	1951-68	17	977	129	Sept. 22-25,28-30, 1956	141,000	Oct. 4, 1964	
3	Buffalo River near Woodville	182	1942-68	26	246	16	Aug. 14, 18, 19, 1954, Sept. 28, 1956	44,800	Oct. 4, 1964	
4	Bogue Chitto near Tylertown	502	1944-68	24	777	175	Oct. 31, 1963	45,700	Jan. 7, 1950	
5	Whitesand Creek near Oak Vale	131	1965-68			66	Oct. 29, 1968 Aug 1, 1968	4,490	Feb. 13, 1966	
6	Holiday Creek at Goss	78.5	1965-68			37	July 30 to Aug. 7, 1968, July 12-16, 18-20, 1968	4,440	Feb. 13, 1966	
7	Lower Little Creek near Baxterville	82.6	1961-68	7	129	22	Aug. 19, 1963	7,020	Feb. 12, 1966	
8	Pearl River near Bogalusa, La.	6,630	1938-68	30	8,693	1,020	Oct. 29 to Nov. 1, 1963	88,200	Feb. 23, 1961	
9	Bowie Creek near Hattiesburg	304	1938-68	30	432	83	Aug. 29, 1957	34,800	Feb. 22, 1961	
10	Leaf River at Hattiesburg	1,760	1938-68	30	2,521	318	Oct. 22, 1963	72,200	Feb. 23, 1961	
11	Tallahala Creek near Runnelstown	612	1939-68	29	881	29	Oct. 31, 1963	32,800	Feb. 24, 1961	

Table 36.—Summary of data from selected stream-gaging stations in Area VI. (Continued)

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average discharge in cubic feet per second (cfs): Average Discharge Years	Average Discharge (cfs)	Minimum Daily Discharge (cfs)	Minimum Daily Discharge Date	Maximum Discharge (cfs)	Maximum Discharge Date	Remarks
12	Leaf River near McLain	3,510	1939-68	29	5,153	478	Oct. 22, 1963	128,000	Feb. 26, 1961	
13	Chickasawhay River at Leakesville	2,680	1938-68	30	3,594	160	Oct. 30, 31, 1963	73,600	Feb. 28, 1961	
14	Pascagoula River at Merrill	6,600	1930-68	38	9,349	696	Nov. 3, 1936	178,000	Feb. 27, 1961	
15	Flint Creek near Wiggins	24.8	1953-54 1957-68	11	49.5	12	Dec. 7, 1965	3,670	April 27, 1964	Flow regulated since 1965.
16	Red Creek at Vestry	416	1958-68	10	790	88	Oct. 22, 1963	21,500	Dec. 12, 1961	
17	Escatawpa River near Wilmer, Ala.	506	1945-68	23	930	37	Sept. 2-4, 1954	30,000	June 2, 1959	
18	Tuxachanie Creek near Biloxi	92.4	1952-68	16	177	1.6	Sept. 4, 5, 1954	17,700	Sept. 19, 1957	
19	Biloxi River at Wortham	98.3	1952-68	16	170	1.1	Oct. 21, 1963	8,420	April 27, 1964	
20	Wolf River near Lyman	253	1945-47 1964-68	6	481	25	Nov. 1, 1944	18,500	March 13, 1947	

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1964-68.

record). The Chickasawhay River at Leakesville has an average flow of 3,594 cfs and a minimum flow of 160 cfs (1938-68). The Leaf River at Hattiesburg has an average flow of 2,521 cfs and a daily minimum flow of 318 cfs (1938-68 record).

Other smaller streams drain the region but their flows are relatively small. Storage facilities would have to be provided for a large draft of water to be available. These streams should be considered for water supply as generally the quality of water is superior to some of the larger streams where pollution is a problem. Table 37 includes available information on the lowest mean discharge for 7 consecutive days at stream-gaging stations.

Table 37.—Lowest mean discharge for 7 consecutive days at stream-gaging stations in Area VI.

Ref. No.	Stream and Location	Period of Record (years)	Cubic feet per second	Millions of Gallons per day	Year
1	Homochitto River at Eddiceton	20	29.4	18.9	1956
2	Homochitto River at Rosetta	4	230.6	148.3	1956
3	Buffalo River near Woodville	16	18.1	11.6	1956
4	Bogue Chitto near Tylertown	14	185.6	119.3	1952
9	Bowie Creek near Hattiesburg	20	84.1	54.0	1957
10	Leaf River at Hattiesburg	20	354.6	228	1954
11	Tallahala Creek near Runnelstown	19	33.6	21.5	1954
12	Leaf River near McLain	19	540	347	1952
13	Chickasawhay River at Leakesville	20	212.1	136.2	1952
14	Pascagoula River at Merrill	28	723.4	465.2	1936
18	Tuxachanie Creek near Biloxi	6	1.8	1.1	1954
19	Biloxi River at Wortham	6	2.2	1.4	1954
20	Wolf River near Lyman	4	42.3	27.2	1947

From a report by Robinson and Shelton, Mississippi Board of Water Commissioners, Bulletin 60-1.

Flooding is a potential hazard in the flood plains adjacent to the streams in this region. Most of the streams have unusually wide flood plains that represent ancestral streams which were larger than the present day streams. Notable flooding occurred on the Pascagoula River and tributaries in 1961. Available records of flooding should be checked before building a structure near any of the streams.

QUALITY OF WATER

The chemical quality of surface water is generally good in Area VI. Most of the water contains low dissolved solids. The pH of the water ranges from about 4.5 to nearly 7. Iron concentration is low and well within the maximum limits (.3 ppm) for most uses. Table 38 is a tabulation of selected analyses of surface water in Area VI. Color is high in a number of streams particularly during high flow. Swampy areas are numerous throughout the region. The colored water accumulates in the swamps and drains into the streams during storms and high rainfall.

Pollution is a serious problem on some of the streams. Oil fields are associated with some of the high chlorides and oil-waste pollution at numerous sites in the region. Industrial pollution is apparent on Tallahala Creek south of Laurel to the confluence with the Leaf River near Mahned. Organic pollution resulting from the discharge of untreated sewage is a problem on certain reaches of many streams.

CONCLUSIONS

Ground and surface water will both be important in fulfilling the water supply needs of Mississippi. Generally, surface water will continue to provide the large volumes of industrial water while ground water will be used for municipal, domestic, and small industrial supplies.

Table 38.—Chemical analyses of water from streams in Area VI.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance micro-mhos at 25°C	pH	Color
	Bowie Creek near Hattiesburg																			
9	Sept. 8, 1966	78		9.3	0.00	1.3	0.9	3.8	1.7	12	.6	5.2	0.0	0.2	29	7	0	36	5.7	5
	Mar. 17, 1960	2,030		1.5	.00	.6	.7	1.8	.8	5	2.8	2.5	.0	.4	14	4	0	21	5.9	20
	Leaf River at Hattiesburg																			
10	Nov. 3-11, 1964	629		7.5	.14	5.0	.4	3.7	1.6	12	4.6	5.9	.1	.6	36	14	4	56	5.9	40
	Feb. 14-18, 1965	16,500		3.3	.15	2.4	.5	2.1	.8	6	2.2	3.9	.1	.5	19	8	3	33	5.8	40
	Leaf River near McLain																			
12	Oct. 17, 1958	1,580		4.5	.29	4.3	.9	7.4	1.5	16	3.2	9.8	.1	.8	41	14	0	65	6.6	10
	Feb. 18, 1958	11,100		6.0	.16	3.1	.9	4.9	1.1	10	2.4	7.8	.7	.6	33	11	3	57	5.8	40
	Chickasawhay River at Leakesville																			
13	Aug. 14, 1962	470		7.6	.00	18	2.7	52	2.0	32	5.4	101	.1	.0	253	56	30	401	6.6	5
	Feb. 18, 1958	7,500		7.9	.16	6.9	1.1	7.4	1.1	18	4.8	13	.5	.8	53	22	6	86	6.4	30
	Pascagoula River at Merrill																			
14	Sept. 4, 1968	1,060		8.7	.01	5.6	1.2	68	1.7	14	9.0	107	.2	.3	214	19	8	420	5.9	20
	Jan. 8, 1966	20,600		7.5	.13	5.6	.7	11	1.4	8	5.4	22	.1	.5	85	17	10	103	5.8	70
	Red Creek at Vestry																			
16	May 5, 1959	297		2.8	.04	1.6	.8	6.1	.7	7	.2	10	.0	1.2	44	8	2	51	5.8	25
	Jan. 10, 1961	1,800		4.8	.10	3.1	1.2	11	.4	3	2.0	22	.2	.8	70	12	10	86	5.6	70

Records from U. S. Geological Survey, Water Resources Data for Mississippi 1962-68

Table 38.—Chemical analyses of water from streams in Area VI.—(Continued)

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge cfs	Temperature (°F)	Silica (SiO2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO3)	Sulfate (SO4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
	Homochitto River at Rosetta																			
2	Oct. 13, 1966	275		12	0.07	2.5	1.3	6.8	1.9	15	2.8	11	0.1	0.1	53	12	0	67	6.5	5
	Feb. 23, 1967	838		10	.26	3.8	1.1	8.1	1.4	10	2.8	15	.1	.3	57	14	6	74	6.0	20
	Buffalo River near Woodville																			
3	Oct. 19, 1959	47		8.2	.00	3.8	1.6	15	1.8	19	2.2	24	.1	.5	67	16	0	115	6.7	10
	May 16, 1960	268		.0	.00	2.5	1.5	9.7	0.4	10	5.2	14	.0	.4	39	12	4	73	6.6	20
	Bogue Chitto near Tylertown																			
4	Oct. 14, 1964	392		12	.01	2.0	1.5	7.6	.9	10	.0	14	.0	.1	43	11	3	64	6.2	10
	July 28, 1965	240		9.2	.02	1.9	.8	4.6	.7	10	.6	7.0	.0	.3	30	8	0	47	6.1	5
	Whitesand Creek near Oak Vale																			
5	Oct. 20, 1965	72		9.8	.00	1.1	.8	2.3	.7	8	.0	3.7	.0	.0	28	6	0	27	5.6	5
	Jan. 28, 1966	173		9.6	.01	2.1	.2	3.4	.7	8	.0	4.4	.0	.3	31	6	0	33	6.2	15
	Holiday Creek at Goss																			
6	Oct. 20, 1965	43		9.8	.02	1.3	.4	2.1	.6	7	.4	3.6	.0	.0	26	5	0	24	5.5	10
	May 10, 1966	133		8.9	.13	1.7	.4	1.6	.6	8	.0	3.2	.0	.5	31	6	0	26	6.1	30
	Lower Little Creek near Baxterville																			
7	Oct. 31, 1961	72.4		4.6	.23	1.0	.9	1.6	.6	8	.0	3.0	.1	.7	22	6	0	18	6.5	15
	Pearl River near Bogalusa, La.																			
8	Oct. 21-31, 1963	1040		13	.01	2.0	1.2	7.4	1.1	12	.4	12	.1	.4	44	10	0	65	6.6	10
	Mar. 11-19, 1964	27,500		5.8	.00	3.9	2.0	4.6	1.8	3	15	6.0	.2	3.6	44	18	16	72	6.0	10

Table 38.—Chemical analyses of water from streams in Area VI.—(Continued)

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Dissolved Solids: Residue on evaporation at 180°C	Hardness: Calcium, Magnesium	Hardness: Noncarbonate	Specific conductance (micro-mhos at 25°C)	pH	Color
	Escatawpa River near Wilmer, Ala.																			
17	Oct. 8, 1963									8		4.0				9	2		7.1	
	Tuxachanie Creek near Biloxi																			
18	May 13, 1965	13		8.9	0.16	1.0	0.0	3.2	0.6	3	1.4	4.9	0.1	0.1	21	3	1	29	5.8	30
	Apr. 20, 1960	1,930		1.5	.08	1.3	.0	2.3	.0	1	2.0	2.5	.1	1.2	12	3	2	18	4.7	60
	Biloxi River at Wortham																			
19	May 25, 1960	18		5.9	.12	1.4	.7	2.5	.1	6	2.2	3.5	.1	1.0	20	6	2	26	6.0	30
	Apr. 2, 1960	1,180		3.0	.07	1.0	.2	2.4	.3	4	.8	2.8	.1	1.3	10	4	0	21	5.2	45
	Wolf River near Lyman																			
20	Oct. 26, 1965	45		13	.04	1.5	.3	2.5	.6	5	.4	4.9	.1	.4	26	5	1	29	5.5	20
	Jan. 6, 1966	4,370		5.2	.11	.6	.6	1.4	.4	2	.0	2.5	.1	.2	12	3	1	22	5.0	50
	MISCELLANEOUS ANALYSES																			
	Okatoma Creek at Sanford																			
	Sept. 8, 1966	78		9.3	.00	1.3	.9	3.8	1.7	12	.6	5.2	.0	.2	33	7	0	36	5.7	5
	May 3, 1966	1,090		6.3	.04	2.9	.7	3.3	1.4	12	.0	6.1	.1	.2	43	10	0	43	5.4	20
	Black Creek near Purvis																			
	Oct. 25, 1965	36		15	.03	1.9	.8	11	.8	0	14	12	.1	3.6	59	8	8	92	4.4	15
	Mar. 2, 1966	965		5.9	.12	1.5	.3	.2	.5	2	.4	2.7	.0	.5	14	5	3	21	5.4	50
	Escatawpa River near Hurley																			
	Oct. 28, 1960	274		.9	.00	1.6	.3	3.3	.4	8	2.4	1.5	.1	.1	14	5	0	28	6.0	10
	Jan. 9, 1961	1,330		4.5	.11	.9	1.2	2	.0	4	2.8	4	.1	.8	18	7	4	25	5.8	70

Records from U. S. Geological Survey, Water Resources Data for Mississippi, 1962-68.

Specific areas with an abundance of water (along with other economic factors) should have advantages in attracting industry. Industry demands an adequate water supply at any proposed location in the State.

The Mississippi, Yazoo, Big Black, Pearl, Pascagoula and Tombigbee Rivers at certain locations have the potential of furnishing large water supplies without storage. Smaller streams across the State may contain better quality water but storage will have to be provided for large water demands.

Ample ground-water is available for municipal and small to medium sized industrial use in most areas of the State for the foreseeable future. The aquifers are not seriously being overpumped in any general area and water levels are declining at an average rate of 1 to 2 feet per year in areas of heavy pumpage. Ground water will continue to offer the best quality water and more economical forms of supply for most uses over the State. Large industry and some of the larger municipalities will continue to depend on surface water as their main source of supply. Tremendous volumes of surface water are available for use at particular locations in the State.

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Various agencies willingly provided information on the water resources in the State. The Mississippi State Board of Health provided copies of water analyses on water wells. The Mississippi Board of Water Commissioners provided completion records of numerous wells. The U. S. Geological Survey, Water Resources Division furnished well information on a number of wells which were unavailable from other sources. Various water well contractors provided well data on some specific wells used in the report.

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*General References instead of the usual footnote type references of the Mississippi Geological Survey.