TEXAS
WATER
DEVELOPMENT
BOARD

REPORT 56

AVAILABILITY AND QUALITY OF GROUND WATER IN FAYETTE COUNTY, TEXAS

August 1967

Second Printing
September 1975

TEXAS WATER DEVELOPMENT BOARD

REPORT 56

AVAILABILITY AND QUALITY OF GROUND WATER IN FAYETTE COUNTY, TEXAS

By

Lowell Thompson Rogers
Texas Water Development Board

Prepared by the Texas Water Development Board
in cooperation with
Fayette County
and the
Lower Colorado River Authority

August 1967

Second Printing
September 1975

Published and distributed
by the
Texas Water Development Board
Post Office Box 12386
Austin, Texas 78711

TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	3
Location and Extent of Area	3
Purpose and Scope of Investigation	3
Methods of Investigation	5
Previous Investigations	5
Well-Numbering System	6
Acknowledgements	8
GEOGRAPHY	8
Climate	8
Topography and Drainage	8
Population and Economy	11
GEOLOGY	11
Geologic History	11
Stratigraphy	12
Structure	12
Physical Characteristics and Water-Bearing Properties of Geologic Units	16
Midway Group	16
Wilcox Group	16
Claiborne Group	17
Carrizo Sand	17
Reklaw Formation	17

Page

Queen City Sand.. 17

Weches Greensand... 18

Sparta Sand.. 18

Cook Mountain Formation.................................. 18

Yegua Formation.. 19

Jackson Group.. 19

Frio Clay.. 20

Catahoula Tuff... 20

Oakville Sandstone and Lagarto Clay...................... 20

Alluvium... 29

GROUND-WATER HYDROLOGY................................... 29

Hydrologic Cycle... 29

Source and Occurrence of Ground Water.................... 29

Recharge, Discharge, and Movement........................ 32

Water Levels... 32

Well Construction and Well Yields........................ 33

Aquifer Characteristics.................................. 34

Carrizo Sand... 34

Queen City Sand.. 35

Sparta Sand.. 35

Yegua Formation.. 36

Jackson Group.. 36

Catahoula Tuff... 36

Oakville Sandstone and Lagarto Clay...................... 36

Use and Development of Ground Water...................... 36

Public Supply.. 37

TABLE OF CONTENTS (Cont'd.)

Page

Industrial Use.. 39

Irrigation.. 39

Rural Domestic Use.. 39

Livestock Use... 39

CHEMICAL QUALITY OF GROUND WATER............................. 39

Quality Standards... 40

Treatment... 43

Water Quality in Fayette County............................. 45

Carrizo Sand.. 45

Sparta Sand... 45

Yegua Formation... 46

Jackson Group... 46

Catahoula Tuff.. 49

Oakville Sandstone and Lagarto Clay......................... 50

Alluvium.. 50

AVAILABILITY OF GROUND WATER................................. 50

General Assumptions... 51

Ground Water Available for Future Development............... 52

Carrizo Sand.. 52

Sparta Sand... 53

Catahoula Tuff, Oakville Sandstone, and Lagarto Clay... 53

Other Formations.. 54

REFERENCES... 55

TABLES

1. Stratigraphic units and their water-bearing properties............ 15

TABLE OF CONTENTS (Cont'd.)

		Page
2.	Aquifer characteristics	35
3.	Use of ground water in Fayette County, 1964	37
4.	Records of wells	57
5.	Drillers' logs of wells	85
6.	Chemical analyses of water from wells	102
7.	Oil and gas tests selected as data-control points	113

FIGURES

1.	Map of Texas Showing Location of Fayette County	4
2.	Diagram of Well-Numbering System	7
3.	Graph Showing Annual Precipitation at La Grange, Flatonia, and Schulenburg	9
4.	Graph Showing Average Monthly Precipitation at La Grange, Flatonia, and Schulenburg	10
5.	Regional Geologic Map of Fayette County and Vicinity	13
6.	Map Showing Approximate Altitude of the Top of the Carrizo Sand	21
7.	Map Showing Approximate Altitude of the Top of the Queen City Sand	23
8.	Map Showing Approximate Altitude of the Top of the Sparta Sand	25
9.	Map Showing Approximate Altitude of the Base of the Catahoula Tuff	27
10.	Diagram of the Hydrologic Cycle	30
11.	Graph Showing Use of Ground Water for Public Supply, 1955-64	38
12.	Diagram for the Classification of Irrigation Waters	44
13.	Map Showing Approximate Altitude of the Base of Fresh to Slightly Saline Water	47
14.	Geologic Map of Fayette County Showing Location of Wells	119
15.	Geologic Section A-A'	121

TABLE OF CONTENTS (Cont'd.)

Page

16. Geologic Section B-B'.. 123

17. Geologic Section C-C'.. 125

A V A I L A B I L I T Y   A N D   Q U A L I T Y
O F   G R O U N D   W A T E R   I N
F A Y E T T E   C O U N T Y ,   T E X A S

ABSTRACT

Fayette County, located on the upper Gulf Coastal Plain of east-central Texas, has an area of 936 square miles and a population of 20,384 in 1960. The economy of the county is diversified and includes livestock and crop production, light manufacturing and processing industries, and mineral production.

Fresh to slightly saline ground water occurs in several geologic formations beneath Fayette County. The ground water presently used in the county is pumped principally from the Sparta Sand, Yegua Formation, sands in the upper part of the Jackson Group, the Catahoula Tuff, Oakville Sandstone, and Lagarto Clay. Alluvium yields small quantities of water to wells for domestic and livestock purposes, but is restricted mainly to the Colorado River flood plain and some of its tributaries. The Carrizo Sand, Queen City Sand, and sands of the Wilcox Group also contain fresh to slightly saline water, mainly in the western and northwestern part of the county, but are presently not utilized due to the occurrence of shallower ground water of good quality in sufficient quantities to supply most needs.

About 1,193 million gallons or 3,663 acre-feet of ground water was produced in Fayette County for all purposes in 1964. About 1,106 acre-feet of water was pumped for public supplies in 1964, about 592 acre-feet for irrigation, and 3.7 acre-feet for industrial purposes. The remainder, over 50 percent, was pumped for livestock and rural domestic uses.

Ground water presently pumped in the county is generally of good quality and suitable for most purposes. A number of wells produce water that is not suitable for irrigation, due mainly to high salinity and sodium hazards.

Water of a given quality is not peculiar to any geologic formation or to any part of the county. However, the quality of water tends to deteriorate with distance downdip from the respective formation outcrops.

In general, the water-bearing formations in Fayette County are capable of yielding many times the present production of fresh to slightly saline water. It is estimated that the sands of the Catahoula Tuff, Oakville Sandstone, and Lagarto Clay could transmit 19,000 acre-feet of water from their outcrops to wells, under certain assumed ideal conditions. This figure is five times the quantity of ground water pumped for all purposes in Fayette County in 1964.

In addition, it is estimated that the Sparta Sand is capable of transmitting up to 16,000 acre-feet of water annually.

The Carrizo Sand, which is presently undeveloped in Fayette County, is also capable of transmitting large quantities of ground water--about 20,000 acre-feet annually. However, it is likely that future development from the Carrizo will occur in updip areas in adjoining counties, where the formation is shallower and generally contains water of better quality.

Quantitative estimates on the amount of water available from the Yegua Formation, Jackson Group, and alluvium could not be made during this investigation. It is believed that these formations, especially the Yegua, are capable of yielding many times the amount of water presently pumped from them.

AVAILABILITY AND QUALITY OF GROUND WATER IN FAYETTE COUNTY, TEXAS

INTRODUCTION

Location and Extent of Area

Fayette County, 936 square miles in area, is in the Gulf Coastal Plain in east-central Texas (Figure 1). Bordering counties are: Bastrop on the northwest; Lee, Washington, and Austin on the north and northeast; Colorado on the east-southeast; and Lavaca and Gonzales on the south and southwest. La Grange, the county seat, is near the center of the county on U.S. Highway 77 and State Highway 71, about 60 miles southeast of Austin and 100 miles west of Houston.

Purpose and Scope of Investigation

The Fayette County ground-water study was commenced November 1964 as a cooperative project of Fayette County, the Lower Colorado River Authority, and the Texas Water Development Board.

The purpose of this study was to determine and describe sources of underground water in Fayette County, and its availability, dependability, quantity, and chemical quality, in order that communities, industries, and individuals in the county may derive maximum benefits from the available ground-water resources.

The scope of the investigation included the following:

1. Collection, compilation, and analysis of data relating to the ground-water resources of Fayette County.

2. Determination of the location and extent of fresh water-bearing strata.

3. Determination of the hydrologic characteristics of the fresh water-bearing strata.

4. Determination of the location and extent of present development, the quantity of water presently being withdrawn from the aquifers of Fayette County, and the effects of these withdrawals upon water levels and water quality.

5. Determination of the possible effects of future development on water levels and chemical quality.

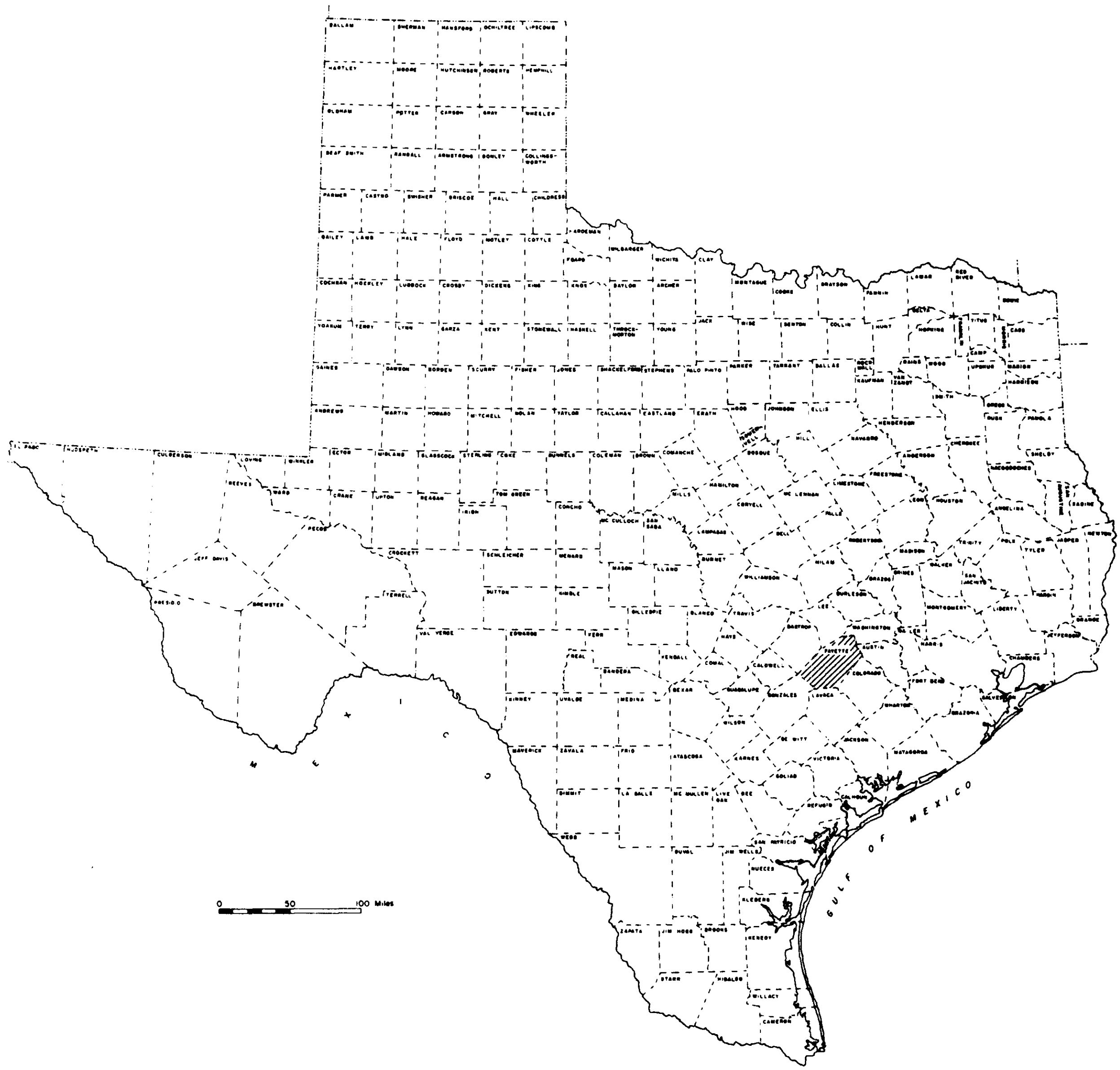

Figure 1

Map of Texas Showing Location of Fayette County

Texas Water Development Board in cooperation with Fayette County and the Lower Colorado River Authority

6. Estimation of the quantity of fresh water available from the important aquifers in the county.

7. Determination of the chemical quality of the underground waters in Fayette County, and evaluation of the quality with respect to its usability.

This study was made under the general direction of John J. Vandertulip, Chief Engineer, and Richard C. Peckham, director, Ground Water Division; and under the direct supervision of Bernard B. Baker, assistant director in charge of Availability Programs.

Methods of Investigation

Fieldwork consisted of well inventory, collection of water samples for chemical analysis, the measurement of water levels where possible, pump testing, and logging selected wells with a gamma-ray logger.

Four hundred and twenty-nine water wells were inventoried, including all municipal, industrial, and irrigation wells and wells used for recreation purposes. In addition, representative farm and ranch domestic and livestock wells were investigated (Table 4).

Aquifer tests were conducted on nine wells to determine the hydraulic characteristics of the water-bearing sands.

Water samples were collected from 266 wells for chemical analysis (Table 6).

Previous geologic and ground-water investigations in the county were reviewed, and useful information from these studies is incorporated into this study.

A geologic map was compiled from previous geologic investigations in the county, and reconnaissance-type geologic mapping using aerial photographs was accomplished for those areas where no previous geologic mapping was available.

Electric logs of more than 100 oil and gas tests were examined and used for subsurface correlation of formations and evaluation of their water-bearing properties (Table 7). In addition, nine wells were logged with a gamma-ray logger to obtain additional subsurface data.

Climatological records were collected and compiled.

Finally, from this material, maps, cross sections, graphs, and tables were prepared presenting the geology, hydrology, climate, and water-quality data.

Previous Investigations

Prior to this investigation little study had been made of the underground water resources of Fayette County. Previous investigations were for the most part general or regional in scope, or were compilations of uninterpreted data.

Early descriptions of the geology and underground waters of the Gulf Coastal Plain of Texas, which includes Fayette County, were given by Taylor (1907) and Deussen (1914, 1924).

Cromack (1943) presented records of wells, drillers' logs, and chemical analyses of water from wells in Fayette County.

Sundstrom, Hastings, and Broadhurst (1948) described public water supplies in eastern Texas, including Fayetteville, Flatonia, La Grange, and Schulenburg in Fayette County.

Cromack and White (1942) described the general availability of ground water in the West Point-Flatonia area of Fayette County.

Wood (1956) discussed the general geology and the availability, use, and quality of ground water in the Gulf Coast region of Texas. Wood, Gabrysch, and Marvin (1963) presented the results of a reconnaissance investigation of the ground-water resources of the Gulf Coast region.

Mount and others (1967) presented information on the occurrence, availability, and chemical quality of ground water in the Colorado River basin of Texas, which includes most of Fayette County.

Well-Numbering System

Water wells, oil wells, and test holes in this report are numbered in accordance with the statewide well-numbering system adopted by the Texas Water Development Board.

The well-numbering system, illustrated in Figure 2, is a grid system based on division of the State into quadrangles of 1 degree of latitude and longitude. Each 1-degree quadrangle is assigned a 2-digit number (01 to 89). Fayette County lies in 1-degree quadrangles 58, 59, 66, and 67.

Each 1-degree quadrangle is divided into sixty-four $7\frac{1}{2}$-minute quadrangles, which are assigned 2-digit numbers (01 to 64) from left to right, beginning in the upper left-hand corner of the 1-degree quadrangle.

Each $7\frac{1}{2}$-minute quadrangle is divided into nine $2\frac{1}{2}$-minute quadrangles, numbered 1 to 9.

Each well within a $2\frac{1}{2}$-minute quadrangle is assigned a 2-digit number, usually in the order in which it is inventoried.

As an example, well 66-02-702 (a standby public-supply well at La Grange) is in the 1-degree quadrangle number 66, in the $7\frac{1}{2}$-minute quadrangle 02, in the $2\frac{1}{2}$-minute quadrangle 7, and was the second well (02) inventoried in that $2\frac{1}{2}$-minute quadrangle.

In addition to the 7-digit well number, a 2-letter prefix may be used to identify the county. The prefixes for Fayette and adjoining counties are shown on page 8.

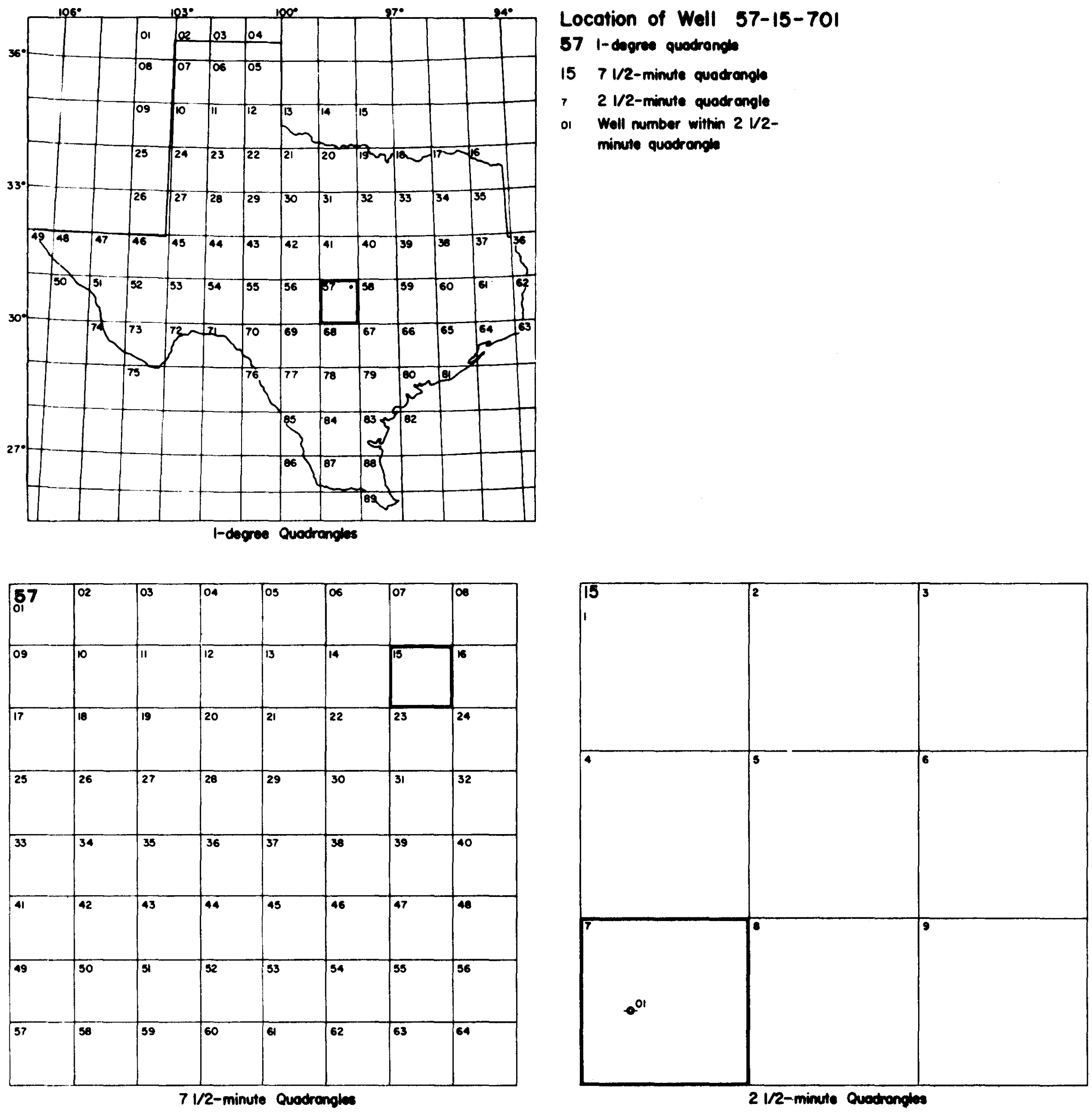

Figure 2

Well - Numbering System

Texas Water Development Board in cooperation with Fayette County and the Lower Colorado River Authority

Austin...........AP	Gonzales.........KR
Bastrop..........AT	Lavaca...........RY
Colorado.........DW	Lee..............RZ
Fayette..........JT	Washington.......YY

Since only wells in Fayette County are discussed in this report, the county prefix is omitted herein.

Acknowledgements

The writer is indebted to many individuals in Fayette County, including city officials and employees, well owners, water well drillers, oil field workers, realtors, ranchers, and farmers, who facilitated in many ways the collection and compilation of data for this study.

Thanks are also extended for advice given by geologists Alfred E. Wright, B. Coleman Renick, Rowion Blumburg, Dr. Robert L. Folk, and Shapleigh G. Gray.

The writer wishes to acknowledge those organizations which contributed information utilized in this report. These include the U.S. Soil Conservation Service, The University of Texas Bureau of Economic Geology, The University of Texas Department of Geology, Mobil Oil Company, and Shell Oil Company.

GEOGRAPHY

Climate

The climate of Fayette County is characterized by long hot summers and short mild winters. The average maximum July temperature is 96°F and the average minimum January temperature is 42°F based on 55 years of record at Flatonia. The maximum temperature on record is 111°F, recorded on August 23, 1917. The minimum temperature recorded was 4°F on January 18, 1930. The growing season in Fayette County is about 259 days.

The average annual precipitation for 50 years of record (1911-47, 1951-59, 1961-64) at La Grange and 57 years (1908-64) at Flatonia is 37.8 inches and 35.7 inches, respectively. From 24 years of record (1941-64), Schulenburg has 37.1 inches average annual precipitation (Figure 3).

Precipitation in Fayette County is rather evenly distributed throughout the year. The highest and lowest average monthly precipitation at Flatonia occur in May and January with 4.2 and 2.3 inches, respectively. The highest and lowest average monthly precipitation at La Grange occur in May and August with 4.1 and 2.4 inches, respectively. At Schulenburg, the highest average monthly precipitation occurs in April with 4.6 inches and the lowest is in January with 2.2 inches (Figure 4).

Topography and Drainage

Topography in Fayette County consists of rolling to hilly uplands, and flat flood plains along the major streams. Flood-plain terraces, river flats,

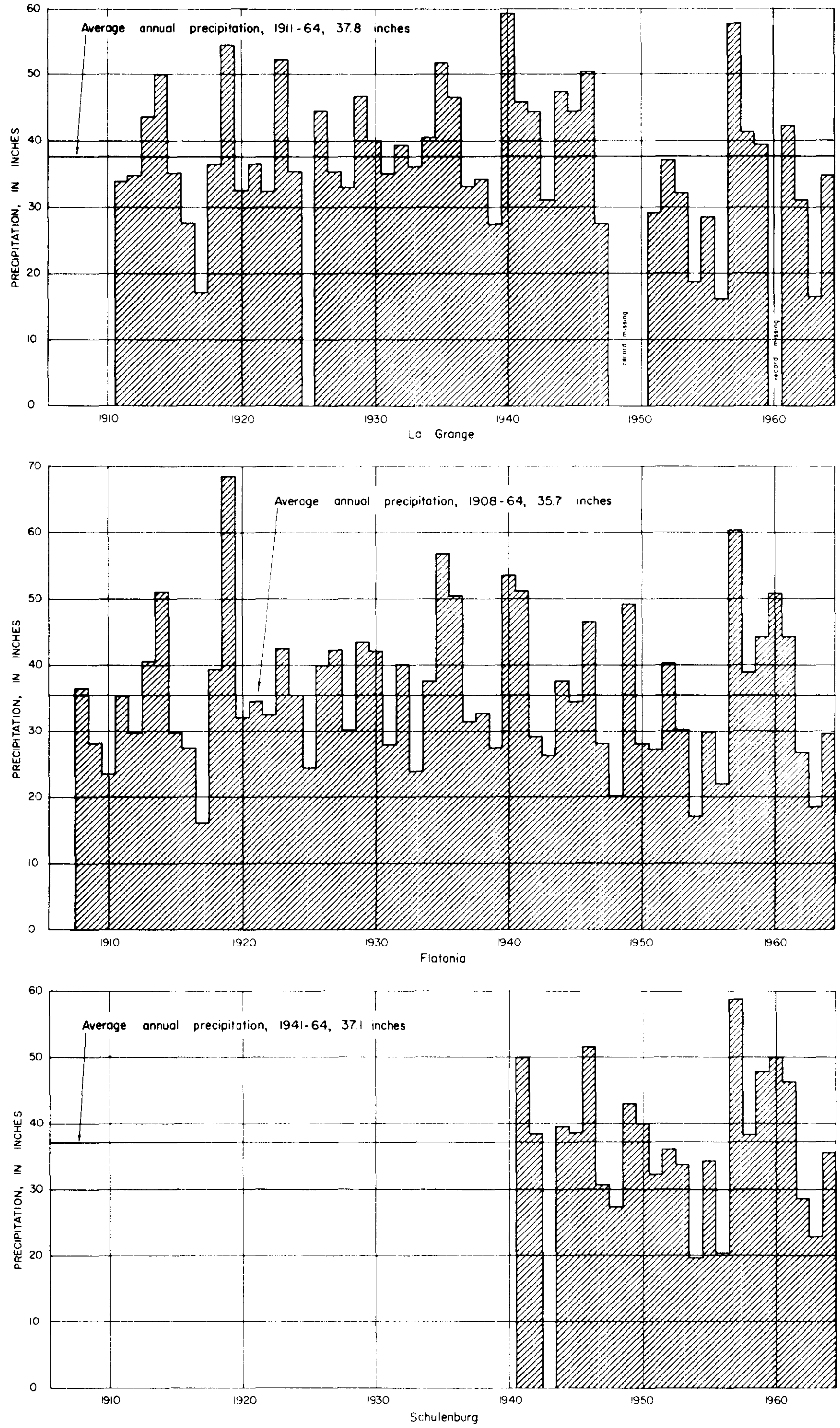

Figure 3

Annual Precipitation at La Grange, Flatonia, and Schulenburg, Fayette County

(Based on records of the U. S. Weather Bureau)

Texas Water Development Board in cooperation with Fayette County and the Lower Colorado River Authority

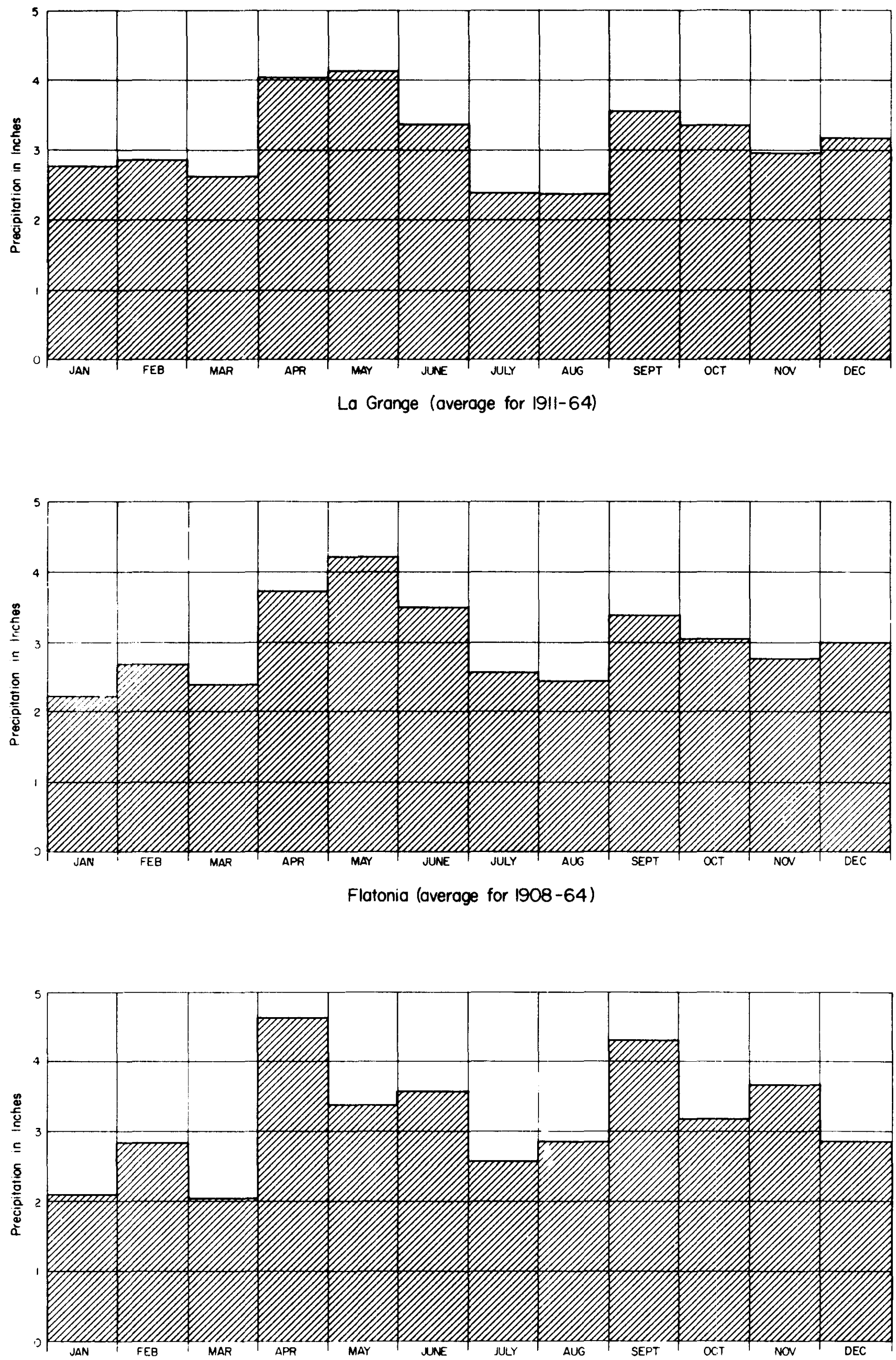

Figure 4

Average Monthly Precipitation at La Grange, Flatonia, and Schulenburg, Fayette County

(Based on records of the U. S. Weather Bureau)

Texas Water Development Board in cooperation with Fayette County and the Lower Colorado River Authority

and marshes typify the valley bottoms. Elevation ranges from about 200 feet above sea level where the Colorado River crosses the Fayette-Colorado County line to over 550 feet in the southwest and northeast parts of the county. Most of the county is drained by the Colorado River and its tributaries. Major tributaries of the Colorado River draining Fayette County include Rabbs, Buckners, and Cummins Creeks. The southern part of the county is drained by the east and west branches of the Navidad River and their tributaries, and the westernmost corner of the county is drained by Peach Creek, a tributary of the Guadalupe River.

Population and Economy

According to the United States Bureau of the Census, Fayette County had a total population of 20,384 in 1960 and 24,176 in 1950.

The 1960 populations for the principal urban centers of Fayette County are as follows: La Grange, 3,623; Schulenburg, 2,207; Flatonia, 1,009; Fayetteville, 550; and Ellinger, 219.

Fayette County has a diversified economy including livestock, poultry, crop production, manufacturing industries, and recreation. Cattle raising is a major agricultural industry in the county and includes both beef and dairy cattle. Major crops include feed grains such as sorghum, corn, barley, and grazing grasses, and cash crops such as peanuts, watermelons, tomatoes, cucumbers, and cotton.

According to statistics presented by Gillett and Janca (1965, p. 123), the major ground-water irrigated crops in 1958 were oats and barley and miscellaneous cash crops while in 1964 the main crops were orchards and deciduous trees, pasture crops, sorghum, and other miscellaneous crops. Ground water was used to irrigate 150 acres in Fayette County in 1958, and 364 acres in 1964. The major increases in acreage and pumpage were in pasture crops.

Manufacturing and processing industries include sawmills, machine shops, furniture manufacturing, dairy products, cottonseed oil, feed mills, meat processing, mattress manufacturing, bottling, charcoal production, and cotton gins.

Mineral production includes petroleum, road metal, bentonite, fuller's earth, kaolin, lignite, brick, clay, and some natural gas production.

GEOLOGY

Geologic History

The occurrence, distribution, and character of the geologic formations of the Texas Gulf Coastal Plain are related to the depositional history of the region. Fluctuations of the Gulf Coast shoreline during Tertiary time, as a result of continued subsidence of the Coastal Plain and periodic uplift in land areas accompanied by rapid erosion and influx of sediment, resulted in an alternating sequence of marine and continental deposits. The marine sediments, consisting principally of clay, silt, and minor amounts of sand, are generally poor aquifers. Deposits laid down in a continental or near-shore environment, principally sand and gravel with lesser amounts of clay and silt, constitute the principal water-bearing formations in the Gulf Coast region and Fayette County.

Stratigraphy

The geologic formations discussed in this report range in age from Paleocene to Recent. Table 1 lists the geologic units from youngest to oldest, their approximate thickness, and a brief description of their lithology and water-bearing properties. Outcrop areas of the various stratigraphic units are shown on the regional geology map (Figure 5) and the geologic and well-location map of Fayette County (Figure 14). Figures 15, 16, and 17 illustrate the stratigraphic sequence of the rocks and structural attitude in cross section.

Most of the formations in Fayette County will yield some water, but only the sands of the Sparta Sand, Yegua Formation, Jackson Group, Catahoula Tuff, and Oakville Sandstone yield fresh to slightly saline water (having less than 3,000 parts per million dissolved solids) in significant quantities. The Carrizo Sand, sands of the Wilcox Group, the Queen City Sand, and the Quaternary alluvium are also capable of yielding water in the county; however, these contain usable quality water over limited areas of the county or occur at relatively great depths in comparison to other fresh water-bearing formations and consequently are not developed in Fayette County. Neither the Queen City Sand nor the Wilcox Group is known to yield water to wells in Fayette County. The Weches Greensand and Cook Mountain Formation generally do not yield usable quality water in sufficient quantities to constitute a supply.

Structure

Except for surficial deposits of Quaternary alluvium, geologic formations of the Gulf Coastal Plain crop out in north- and northeast-trending belts generally paralleling the Gulf Coast (Figure 5). In general, the formations dip southeast toward the Gulf at angles somewhat greater than the slope of the land surface. Thus, the older formations crop out further inland to the northwest and at higher elevations. Generally, the formations thicken and the angle of their dip increases downdip. In Fayette County, the Oakville Sandstone and Lagarto Clay dip about 75 to 100 feet per mile to the southeast, while the older and deeper Carrizo Sand may dip locally over 250 feet per mile.

The Sparta Sand crops out in the extreme western part of Fayette County and is the oldest formation occurring at the surface in the county. Older rocks occur in the subsurface, however. The oldest stratigraphic unit which contains water of usable quality in Fayette County is the Wilcox Group (Table 1). The Wilcox crops out across northwestern Bastrop County and dips southeast; it is encountered in Fayette County at depths ranging from about 1,400 to 6,000 feet.

The regional structure is interrupted by numerous faults associated with the Mexia-Luling-Talco fault system which consists of a series of normal, en echelon faults extending from south-central to northeast Texas. The faults are described as "up-to-the Coast faults," that is, the southeast or Gulf Coast side of the faults are upthrown relative to the northwest side.

Table 1.--Stratigraphic units and their water-bearing properties in Fayette County

System	Series	Group	Formation	Approximate thickness (feet)	Character of rocks	Water-bearing characteristics
Quaternary	Pleistocene and Recent		Alluvium	0 to 60±	Deposited along the rivers and major tributaries; some gravel deposits on hilltops. Gravel, sand, sandy silt, clay, silty clay, and muddy gravel.	Yields fresh to moderately mineralized water in small quantities.
Tertiary	Miocene and Miocene(?)		Oakville Sandstone and Lagarto Clay	0 to 950	Massive, cross-bedded sand and gravel lenses at base, grading upward into thinner-bedded sandy shale and clay.	Yields fresh to slightly saline water in small to moderate quantities. A principal aquifer. Supplies rural homes, irrigation, industrial, and city wells.
	Miocene(?)		Catahoula Tuff	0 to 500	Tuffaceous sand and sandstone interbedded with clay, silt, and tuff.	Yields fresh to moderately minerlized water in small to large quantities. Supplies city of La Grange.
	Oligocene(?)		Frio Clay	0 to 520	Principally clay and shale.	Not known to yield water to wells in Fayette County.
	Eocene	Jackson		0 to 1,100	Clay, silt, volcanic ash, tuffaceous sand and shale, and bentonic clay.	Yields fresh to moderately minerlized water in moderate quantities, principally from sands in the uppermost part of the group.
		Claiborne	Yegua	0 to 1,000	Non-persistent beds of fine- to medium-grained sand, alternating with shale and sandy shale and thin beds of lignite and gypsum.	Yields widely varying quantities and quality of water for industrial, irrigation, livestock, and domestic purposes in and near the outcrop.
			Cook Mountain	0 to 500	Predominantly clay and shale, with thin sandstone, limestone, glauconite, and gypsum lenses interbedded.	Not known to yield water to wells in Fayette County.
			Sparta Sand	0 to 275	Massive to cross-bedded, generally well sorted, fine- to medium-grained sand. A few thin beds of lignitic and micaceous shale occur throughout.	Yields small to moderate quantities of fresh to moderately saline water. Supplies domestic, livestock, irrigation, and public supply wells in Fayette County.
			Weches Greensand	75 to 150	Glauconitic shale and interbedded glauconitic sand and marl.	Not known to yield water to wells in Fayette County.
			Queen City Sand	480 to 750	Very fine grained sandstone interbedded with silt and silty shale in upper part. The lower portion is predominantly shale.	Not known to yield water to wells in Fayette County. Yields small to moderate amounts of fresh to saline water in Bastrop County.
			Reklaw	225 to 400	Glauconitic sandstone interbedded with shale in lower part. Shale and clay in upper part.	Not known to yield water to wells in Fayette County. Sand in lower part of formation probably contains fresh to slightly saline water locally.
			Carrizo Sand	200 to 300	Fine- to coarse-grained, massive, cross-bedded, well sorted sand.	Yields small to large quantities of fresh water in Bastrop and adjoining counties. Undeveloped in Fayette County, but probably capable of yielding moderate to large quantities of fresh to slightly saline water in western Fayette County.
		Wilcox		2,400 to 3,800	Fine- to medium-grained sand and sandstone, interbedded with clay and sandy clay and thin beds of lignite.	Not known to yield water to wells in Fayette County. Appears to be capable of yielding small to moderate quantities of slightly saline water.
	Paleocene	Midway		900 to 950	Shale, clay, and marl, with thin sand streaks.	Not known to yield water to wells in Fayette County.

Some of the major faults in Fayette County and adjacent areas are shown on Figures 5 and 14. There are undoubtedly numerous unmapped faults in Fayette County, but these are probably of small displacement and of little significance to the availability of ground water.

Physical Characteristics and Water-Bearing Properties of Geologic Units

Midway Group

Rocks of the Midway Group crop out in a northeast-trending belt, 2 to 3 miles wide, along the Bastrop-Travis County line and dip southeast toward the Gulf Coast. They underlie Fayette County at depths ranging from about 3,800 feet (well 67-14-901) to over 9,100 feet (well 66-18-402).

The Midway consists principally of shale, clay, and a few thin sand lenses. The thickness of the Midway Group in Fayette County is about 900 to 950 feet.

No water wells and only a few oil tests penetrate the Midway in Fayette County. The Midway generally does not yield usable quality water in significant quantities, even in its outcrop area, and is well below the base of fresh to slightly saline water in Fayette County.

Wilcox Group

Rocks of the Wilcox Group crop out in a northeast-trending belt, 9 to 15 miles wide, across northwestern Bastrop and adjoining counties (Figure 5). The Wilcox unconformably overlies the rocks of the Midway Group and unconformably underlies the Carrizo Sand of the Claiborne Group. The Wilcox is stratigraphically below all other aquifers in Fayette County and is the deepest rock unit containing fresh to slightly saline water.

The Wilcox consists of horizontally discontinuous beds of clay, silt, fine- to medium-grained sand and sandstone, sandy shale, and thin beds of lignite. The thickness of the Wilcox Group in Fayette County ranges from about 2,400 to 3,800 feet. The depth to the top of the Wilcox Group in Fayette County ranges from 1,400 to about 6,000 feet.

Although the Wilcox Group occurs in the subsurface at varying depths throughout Fayette County, only that portion underlying the western and northwestern part of the county is believed to contain water of usable quality. The sands of the Wilcox Group contain fresh to slightly saline water at depths ranging from about 2,400 to over 3,800 feet in the county. The deepest fresh to slightly saline water in the Wilcox is east of Winchester and near the Lee County line (Figure 13). No water wells are known to penetrate the Wilcox Group in Fayette County, and the portion of the aquifer believed to contain fresh to slightly saline water is defined by interpretation of electric logs of oil tests penetrating the Wilcox.

Carrizo Sand

The Carrizo Sand crops out in a northeast band parallel to the Bastrop-Fayette County line about 4 to 5 miles wide through Bastrop and Lee Counties (Figure 5).

The Carrizo Sand lies unconformably on the Wilcox Group and underlies the Reklaw Formation. In the outcrop, the Carrizo is a white to gray, fine- to coarse-grained, massive sand containing abundant cross-beds and very thin laminae of carbonaceous material. Its thickness ranges from 200 to 300 feet. The top of the formation is about 500 feet below sea level in the northwest part of the county and about 5,500 feet below sea level in the southeast part of the county; the dip of the beds is variable, ranging from about 160 to over 250 feet per mile to the southeast. The configuration of the top of the Carrizo Sand and the approximate downdip limit of fresh to slightly saline water are shown on Figure 6.

Although the Carrizo is capable of yielding moderate to large quantities of water to wells, and is extensively developed in many areas of the State, only one well (67-16-404), yielding slightly saline water, is known to produce from the Carrizo in Fayette County.

Reklaw Formation

The Reklaw Formation conformably overlies the Carrizo Sand and crops out in a narrow belt, 1 to 1½ miles wide, across Bastrop, Lee, Gonzales, and adjoining counties (Figure 5). The formation dips southeast and occurs in the subsurface throughout Fayette County.

The Reklaw consists of glauconitic sandstone interbedded with shale in the lower part of the formation and mainly clay and shale in the upper part. The thickness of the Reklaw ranges from about 225 to 400 feet in Fayette County. The upper, shaly part of the Reklaw probably correlates with the Marquez Shale Member of Stenzel (1938, p. 71-78), and the lower part with the Newby Sand Member of Stenzel (1938, p. 67-71).

In places in Fayette County the lower sands are very well developed and apparently are in hydrologic connection with the underlying Carrizo Sand. Although no wells are known to obtain water from the Reklaw in Fayette County, the lower sands probably contain fresh to slightly saline water in the northwestern part of the county.

Queen City Sand

The Queen City Sand conformably overlies the Reklaw Formation and is overlain conformably by the Weches Greensand. The Queen City crops out in Bastrop and Lee Counties and dips southeast toward the Gulf Coast at about 150 feet per mile (Figure 7).

The Queen City ranges from about 480 to 750 feet in thickness in Fayette County. Electric logs of oil tests penetrating the formation in Fayette County indicate that the formation consists of two or three 60-foot thick sands, usually near the top of the formation, separated by relatively thick sequences of thin sands interbedded with clay and sandy clay.

No water wells are known to be completed in the Queen City in Fayette County. However, the formation yields small to moderate quantities of water to wells in adjoining counties and provides a supply for the cities of Smithville and Giddings in adjoining Bastrop and Lee Counties, respectively. Small to moderate supplies of water could probably be developed in the northwestern part of Fayette County, but the water is very likely to be more mineralized than that from shallower formations such as the Sparta Sand and Yegua Formation.

The downdip extent of fresh to slightly saline water in the Queen City Sand is shown in Figure 7.

Weches Greensand

The Weches Greensand conformably overlies the Queen City Sand and crops out in a northeast-trending belt about 1 mile wide in southeastern Bastrop County.

The Weches consists of about 75 to 150 feet of glauconitic shale with a few interbedded glauconitic sand and marl stringers. The Weches is relatively impermeable and is not known to yield water to wells in Fayette County.

Sparta Sand

The Sparta Sand is exposed in a band 1 to 2 miles wide from the west corner of Fayette County to near Smithville in Bastrop County generally paralleling the Fayette-Bastrop County line (Figure 5).

The Sparta Sand lies conformably on the Weches Greensand and grades upward into the sandy shale base of the Cook Mountain Formation.

The Sparta consists of fine- to medium-grained sand interbedded with a few lignitic shale beds. The thickness of the Sparta ranges from 0 to 275 feet and averages about 150 feet in Fayette County. The Sparta dips southeast at about 175 feet per mile. The structural attitude of the formation and the downdip extent of fresh to slightly saline water are shown on Figure 8.

The Sparta yields small to moderate quantities of fresh to moderately saline water to wells near the outcrop in western and northwestern Fayette County.

Cook Mountain Formation

The Cook Mountain Formation overlies the Sparta Sand and crops out in the extreme western and northwestern part of Fayette County (Figure 14). The Cook Mountain consists of clay, shale, and a few thin lenses of sandstone, limestone, glauconite, and gypsum.

The Cook Mountain ranges in thickness from 0 to 500 feet in Fayette County. The Cook Mountain is not known to yield water to wells in the county.

Yegua Formation

The Yegua Formation crops out in a $3\frac{1}{2}$ to 5 mile wide band across western Fayette County. The trend of the outcrop is northeast, the median line of which extends generally from Winchester to about $2\frac{1}{2}$ miles south of Elm Grove in the southwest portion of the county (Figure 14).

The Yegua Formation conformably and semi-gradationally overlies the Cook Mountain Formation and conformably underlies the Jackson Group. Local disconformities between the Yegua and Jackson have been observed but are not of regional extent (Renick, 1936, p. 21).

The Yegua Formation consists of alternating beds of fine- to medium-grained clay, silt, thin beds of lignite, and small quantities of gypsum. Thickness of the individual sand beds ranges up to 2 or 3 feet where observed but generally is much thinner. Some bentonite occurs in the upper beds.

Total thickness along the outcrop ranges from about 500 to 700 feet (Ferguson, 1958, p. 51). Downdip in Fayette County the thickness increases, ranging from 600 to over 1,000 feet (Figures 15, 16, and 17). Over most of the area in which fresh water occurs, the total sand thickness ranges from 300 to 430 feet and is about 40 to 50 percent of the total formation thickness. The formation dips to the southeast approximately 150 feet per mile, attaining a depth of 2,800 feet below sea level at the southeast edge of the county.

The Yegua yields small to large quantities of water to wells in Fayette County for industrial, irrigation, livestock, and rural domestic purposes. All wells presently pumping from the Yegua in the county are in the outcrop or less than 4 miles downdip.

Jackson Group

The Jackson Group conformably overlies the Yegua Formation of the Claiborne Group and crops out in a band 4 to 6 miles wide trending northeast across central Fayette County (Figure 14). The Jackson consists mainly of clay, silt, and volcanic ash, interbedded with a few relatively thin lenticular beds of tuffaceous sandstone. The thickness of the Jackson in Fayette County ranges from 0 at the updip extent of the formation to a total thickness of from 600 to 1,100 feet. The strata comprising the Jackson Group dip toward the Gulf Coast at about 150 feet per mile, coincident with the general regional structure.

The Jackson Group yields moderate quantities of water to wells, principally for livestock and rural domestic purposes in the outcrop areas. The most productive strata consist of about 50 to 185 feet of tuffaceous sands in the uppermost part of the group. These upper Jackson sands apparently yield water of usable quality some distance downdip from the outcrop and are generally developed in conjunction with the overlying Catahoula Tuff.

Frio Clay

The Frio Clay does not crop out in Fayette County, but overlies the Jackson Group unconformably in the subsurface and is in turn overlain and overlapped by the Catahoula Tuff (Figures 15, 16, and 17). The Frio Clay consists principally of clay and shale interbedded with a few thin sand beds. The Frio ranges in thickness from 0 at its updip pinchout to over 520 feet in southeast Fayette County. The Frio Clay is not known to yield water to wells in Fayette County.

Catahoula Tuff

The Catahoula Tuff overlies the upper part of the Jackson Group near its outcrop, but downdip in the southeastern part of Fayette County the Catahoula overlies the Frio Clay which occupies a position stratigraphically between the Catahoula Tuff and the Jackson Group.

The Catahoula crops out in a belt approximately ½ to 4 miles wide across central Fayette County trending northeast through Flatonia, La Grange, and Carmine (Figure 14).

In Fayette County, the Catahoula consists of tuffaceous sand and sandstone interbedded with clay, silt, and tuff. The thickness ranges from 0 to over 500 feet. The Catahoula yields small to large quantities of water to wells in central and southeastern Fayette County for municipal, industrial, and irrigation as well as livestock and rural domestic purposes. The structural attitude of the Catahoula is illustrated on Figure 9.

Oakville Sandstone and Lagarto Clay

The Oakville Sandstone overlies the Catahoula Tuff and is in turn overlain by the Lagarto Clay. The approximate outcrop areas of these units are shown on the regional geology map (Figure 5). Because the contact between the Oakville and Lagarto is difficult to distinguish in Fayette County, these formations are considered as a single unit in this report and are not differentiated on the county geologic map (Figure 14).

In general, the Oakville Sandstone consists of laterally discontinuous sand and gravel lenses interbedded with shaly sand, sandy shale, shale, and clay. Massive cross-bedded sandstone beds at the base grade upward into more thinly bedded sandy shale and clay near the top. The Lagarto Clay, in turn, consists mainly of massive clay interbedded with calcareous sand and shale.

The combined thickness of the Oakville and Lagarto ranges from 0 to over 950 feet.

The Oakville and Lagarto yield small to moderate quantities of water to wells for municipal, industrial, irrigation, livestock, and rural domestic purposes.

Alluvium

Alluvial deposits of Quaternary age in Fayette County occur as a broad band $\frac{1}{2}$ to 6 miles wide coinciding generally with the flood plain of the Colorado River and along some of its major tributaries (Figure 14). Terrace gravel deposits, also of Quaternary age, occupy the tops of some of the hills adjoining the Colorado River flood plain, but these have not been mapped and probably are not important as a source of ground water in Fayette County.

The alluvial deposits consist of sand, gravel, black clay, sandy clay, and shale. Maximum thickness of the alluvial deposits is not known but where observed in stream cuts does not exceed 60 feet. Shallow wells completed in the alluvium yield small quantities of water for livestock and rural domestic purposes.

GROUND-WATER HYDROLOGY

The following discussion has been included to acquaint the reader with the basic fundamentals of ground-water hydrology and to define the terms used in this report.

Hydrologic Cycle

The hydrologic cycle is the sum total of processes and movements of the earth's moisture from the sea, through the atmosphere, to the land, and eventually, with numerable delays en route, back to the sea. Figure 10 illustrates the courses that the water may take in completing the cycle. All water occurring in Fayette County, whether surface water or underground water, is derived from precipitation. Moreover, precipitation in this area is derived for the most part from water vapor carried inland from the Gulf of Mexico.

Source and Occurrence of Ground Water

Ground water is contained in the interstices or voids of pervious strata. Two rock characteristics of fundamental importance in the occurrence of ground water are porosity, the amount of open space contained in the rock, and permeability, the ability of the porous material to transmit water. In clastic sedimentary rocks, such as the Tertiary and Quaternary rocks in Fayette County, the porosity is a function of the shape, sorting, and degree of cementation of the grains.

Fine-grained sediments, such as clay and silt, commonly have high porosity but owing to the small size of the voids they do not readily yield or transmit water. Therefore, in order for a formation to be an aquifer it must be porous, permeable, and water bearing. An aquifer is defined by Meinzer (1923b, p. 30) as a geologic formation, group of formations, or part of a formation that is water bearing. General usage, however, has restricted the application of the term to those water-bearing units that yield water in sufficient quantities to constitute a usable supply. A geologic unit that is incapable of transmitting significant quantities of water is called an aquiclude. The term "sands" as used in this report refers to distinct layers or beds of sand through which water is most readily transmitted.

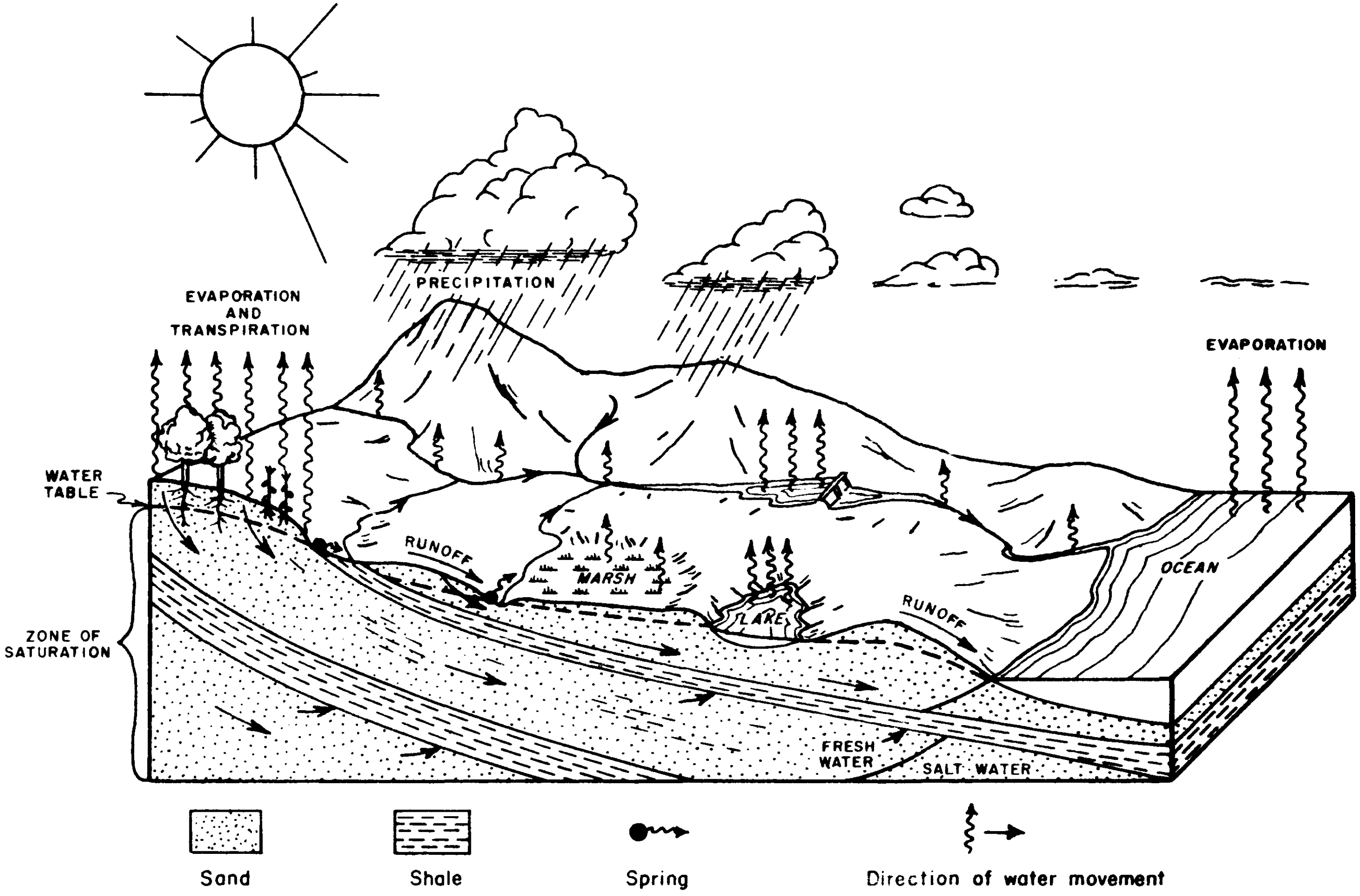

Figure 10

Hydrologic Cycle

Texas Water Development Board in cooperation with Fayette County and the Lower Colorado River Authority

Water in an aquifer may occur under water-table or artesian conditions. In the outcrop area of an aquifer, ground water generally occurs under water-table conditions; that is, the water is unconfined and is at atmospheric pressure. The hydraulic gradient in an unconfined aquifer is the slope of the water table. Downdip from the outcrop or recharge area, ground water occurs under artesian conditions where the water in a permeable stratum is confined between relatively impermeable beds. The water is then under sufficient pressure to rise above the top of the confining bed if the water-bearing stratum is penetrated by a well. The level to which water will rise in wells completed in an artesian aquifer is called the piezometric surface. If the elevation of land surface at the well is lower than the elevation of the piezometric surface, the well will flow. Water in the deeper aquifers of Fayette County are under greater pressure than the water in the shallow aquifers because the deeper aquifers crop out at higher elevations. Because of this pressure-head differential, there is vertical leakage upward through the confining beds. The loss of water from an artesian aquifer by natural means of discharge downdip causes a loss in hydrostatic pressure, so that the piezometric surface is at a progressively lower elevation in a downdip direction. The hydraulic gradient of an artesian aquifer is determined by the slope of the piezometric surface.

The water-producing capability of an aquifer depends upon its ability to store and transmit water. Although the porosity of a rock is a measure of its capacity to store water, not all of this water in storage may be recovered by pumping. Some of the water stored in the interstices is retained because of molecular attraction of the rock particles for water. The amount of water in cubic feet that will be released from or taken into storage by a vertical column of the aquifer having a base 1 foot square when the water level or hydrostatic pressure is lowered or raised 1 foot is termed the coefficient of storage. In an aquifer under water-table conditions, the coefficient of storage is essentially equal to the specific yield, which is the ratio of the volume of water a saturated material will yield under the force of gravity to the total volume of material drained. In an artesian aquifer ground water is withdrawn from storage without draining the water-bearing rocks. As water is pumped from the artesian aquifer the hydrostatic pressure is lowered. The weight of the overlying sediments, which are partly supported by the hydrostatic pressure, compresses the water-bearing material and the confining media, and the water expands, causing some water to be released from storage.

An aquifer's ability to transmit water is measured by its coefficient of transmissibility. It is defined as the amount of water in gallons per day that will pass through a vertical strip of the aquifer 1 foot wide under a hydraulic gradient of 1 foot per foot.

The coefficients of storage and transmissibility are determined from pumping tests of wells that screen a water-bearing formation. The term "screen" is used to define the zone or zones in the casing that are open to the aquifer by means of well screens or other similar openings through which water enters the well. A pumping test consists of pumping a well at a constant rate for a period of time and making periodic measurements of water levels in the pumping well and if possible in one or more observation wells. The recovery of the water level is also measured after pumping stops. From the data obtained, the coefficients of transmissibility and storage can be calculated by means of certain formulas. If the coefficients of transmissibility and storage of an aquifer are known, the amount of water that will pass through a segment of an aquifer under various hydraulic gradients and the amount of water that will be released from storage can be calculated. The coefficients of transmissibility and storage may be used in computing the effects that pumping from a well will have on water levels in the aquifer at various times and at various distances from the well.

Recharge, Discharge, and Movement

Recharge is the addition of water to an aquifer. The principal source of ground-water recharge in Fayette County is precipitation that falls on the outcrop of the various aquifers. In addition, seepage from streams and lakes located on the outcrop and possibly interformation leakage are sources of ground-water recharge. Recharge is a limiting factor in the amount of water that can be developed from an aquifer, as it must balance discharge over a long period of time or the water in storage in the aquifer will eventually be depleted. Among the factors that influence the amount of recharge received by an aquifer are: the amount and frequency of precipitation; the areal extent of the outcrop of intake area; topography, type and amount of vegetation, and the condition of soil cover in the outcrop area; and the ability of the aquifer to accept recharge and transmit it to areas of discharge. On aquifer outcrops where vegetation is dense, the removal of underbrush and non-beneficial plants will reduce evaporation and transpiration losses, making more water available for ground-water recharge.

Discharge is the loss of water from an aquifer. The discharge may be either artificial or natural. Artificial discharge takes place from flowing and pumped water wells, drainage ditches, gravel pits, and other excavations that intersect the water table. Natural discharge occurs as effluent seepage, springs, evaporation, transpiration, and interformational leakage.

Ground water moves from the areas of recharge to areas of discharge or from points of higher hydraulic head to points of lower hydraulic head. Movement is in the direction of the hydraulic gradient just as in the case of surface-water flow. Under normal artesian conditions, as in Fayette County, movement of ground water usually is in the direction of the aquifer's regional dip. Under water-table conditions, the slope of the water table and consequently the direction of ground-water movement usually is closely related to the slope of the land surface. However, for both artesian and water-table conditions, local anomalies are developed in areas of pumping and some water moves toward the point of artificial discharge. The rate of ground-water movement in an aquifer is usually very slow, being in the magnitude of a few feet to a few hundred feet per year.

Water Levels

Changes in water levels are due to many causes. Some are of regional significance whereas others are extremely local. The more significant causes of water-level fluctuations are changes in recharge and discharge. When recharge is reduced, as in the case of a drought, some of the water discharged from the aquifer must be withdrawn from storage and water levels decline. The water levels may be lowered sufficiently to dry up springs or shallow wells. However, when adequate rainfall resumes, the volume of water drained from storage in the aquifer during the drought may be replaced and water levels will rise accordingly.

When a water well is pumped, water levels in the vicinity are drawn down in the shape of an inverted cone with its apex at the pumped well. The development or growth of this cone of depression depends on the aquifer's coefficients of transmissibility and storage, and on the rate of pumping.

Where intensive development has taken place in ground-water reservoirs, each well superimposes its own individual cone of depression on the cone of neighboring wells. This results in the development of a regional cone of depression. When the cone of one well overlaps the cone of another, interference occurs and an additional lowering of water levels occurs as the wells compete for water by expanding their cones of depression. The amount or extent of interference between cones of depression depends on the rate of pumping from each well, the spacing between wells, and the hydraulic characteristics of the aquifer in which the wells are completed.

Water levels in some wells, especially those completed in artesian aquifers, have been known to fluctuate in response to such phenomena as changes in barometric pressure, tidal force, and earthquakes. However, the magnitude of the fluctuations is usually very small.

Water levels measured in wells in Fayette County during this investigation range from above ground level (flowing wells) to depths more than 175 feet below land surface. Most of the wells measured penetrate the artesian portions of the various water-bearing strata; consequently, the depth of water in a well depends upon the elevation of the land surface and the hydrostatic pressure of the water-bearing strata penetrated by the well.

Depths to water in wells measured during this and previous investigations are shown in Table 4. The locations of flowing wells are indicated on Figure 14, and water levels of flowing wells are indicated in Table 4 in feet above land surface.

Measurements of water levels in wells have not been made at regular intervals in Fayette County; consequently, long-term records of water-level fluctuations are not available.

In 1961, personnel of the then Texas Board of Water Engineers, conducting a statewide reconnaissance of underground water resources, measured a number of water levels in Fayette County. During the present investigation 12 of these wells were remeasured. Six of the wells showed a decline in water levels and the remainder showed a rise. In most cases the changes were small and insignificant, and probably reflect differences in pumpage or recharge rates and do not represent a long-term trend. Moreover, the changes in water levels in the artesian part of the aquifer represent changes in hydrostatic pressure and do not represent a dewatering of the water-bearing strata.

Well Construction and Well Yields

Construction of water wells and well yields vary greatly in Fayette County depending upon the intended uses and demands of the user. Most of the wells in the county are constructed for rural domestic and livestock purposes. These are drilled wells of small diameter, with 3- or 4-inch diameter steel casing, or shallow hand-dug wells, 24 to 48 inches in diameter and lined with stone, brick, or concrete curbing. These wells are equipped with jet or submersible pumps powered by electricity, or cylinder pumps powered by windmills or by hand. Yields of these wells are generally small, usually 5 to 20 gpm (gallons per minute).

Wells in the county used for public supply also vary in size and construction. Some are straight-wall wells, lined with 4- to 8-inch diameter steel casing. More commonly the wells are constructed with 10- to 18-inch diameter surface casing with 8-inch liners, equipped with well screens set opposite the producing horizons. The well bores are underreamed to a diameter of 20 or 30 inches opposite the producing horizons and the annulus is gravel packed. The public supply wells are equipped with turbine or submersible pumps and powered by electric motors of 15 to 60 horsepower. Yields of wells used for public supply in the county range from 15 to 584 gpm but most range from 150 to 400 gpm.

Wells used for irrigation in the county range widely in size, construction, and yield. They are straight-wall wells with casing diameter ranging from 4 to 12 inches. The casing is generally slotted opposite the producing zones, and in some wells the annulus is filled with gravel. Unlike public supply wells, in which the most productive zones are selectively screened and developed, casing of the irrigation wells usually is slotted continuously throughout the producing intervals so that slots are opposite clay as well as sand. In at least two wells, casing is reportedly set only to the top of the producing interval, leaving the producing horizons open directly to the well bore. Such construction is not common in Fayette County, however, because the sand strata are generally only loosely consolidated and walls of the well bore are subject to caving. Yields range from as little as 28 gpm to 700 gpm. Irrigation wells in the county are equipped with turbine pumps powered with electric, butane, or gasoline motors.

Aquifer Characteristics

Aquifer tests were conducted in seven wells during this investigation to determine the coefficients of transmissibility and storage. The results of these tests, and the results of two additional tests conducted during reconnaissance studies of the Colorado River basin (Mount and others, 1967), are presented in Table 2.

Coefficients of transmissibility and storage may be used to predict future drawdown of water levels caused by pumping. They are also used to estimate the amount of water that can be transmitted through the formation under various conditions, thus enabling an estimate to be made of the amount available for future development.

Carrizo Sand

No pumping tests were conducted on the Carrizo Sand in Fayette County. However, aquifer tests conducted on the formation in adjacent counties indicate the Carrizo has a high coefficient of transmissibility. In Lee County, at the town of Lexington, two tests conducted on wells screening only a portion of the sand indicated that the total sand thickness had a coefficient of transmissibility of about 40,000 gpd (gallons per day) per foot, and a coefficient of storage of 0.0002 (Thompson, 1966, p. 37). Four aquifer tests conducted on the

Carrizo Sand in western Gonzales County showed coefficients of transmissibility ranging from 39,000 to 65,000 gpd per foot and averaging about 50,000. The storage coefficient from one test was 0.00016 (Shafer, 1965, p. 26).

Table 2.--Aquifer characteristics

Well	Water-bearing unit	Coefficient of transmissibility (gpd per foot)	Coefficient of storage	Screened interval (feet)
59-57-904	Yegua Formation	5,900	--	--
59-57-906	do	1,663	--	348-418
66-01-904	Catahoula Tuff	5,290	--	219-307
66-10-501	Oakville Sandstone and Lagarto Clay	3,816	--	411-491
66-17-601	do	5,850	0.00013	154-176 230-262
66-17-602	do	5,910	--	177-212 242-270
67-08-801	Yegua Formation	1,690	--	231-261 353-437 459-498
67-24-406	Catahoula Tuff	4,200	.018	--
67-24-407	do	4,125	--	110-155 172-207

Queen City Sand

Water wells completed in the Queen City Sand supply the cities of Smithville and Giddings in adjoining Bastrop and Lee Counties, respectively. Tests conducted at Giddings show a possible range of transmissibility from 6 to 700 gpd per foot, and a permeability of approximately 43.7 gpd per square foot. The storage coefficient is 0.00020 (Thompson, 1966, p. 37).

Sparta Sand

No pumping tests were conducted on the Sparta Sand in Fayette County. However, in Lee County, an estimated transmissibility coefficient of 14,000 gpd per foot was calculated from tests conducted at Dime Box. The storage coefficient calculated from the test was 0.0004 (Thompson, 1966, p. 41). A pumping test conducted on a well penetrating the Sparta Sand at Bryan, in Brazos County, gave an estimated transmissibility coefficient of 12,000 gpd per foot (Cronin and others, 1963, p. 103). Although aquifer tests were not conducted in the

Sparta Sand in Fayette County, the above coefficients of transmissibility and storage are probably characteristics of the formation in Fayette County.

Yegua Formation

Aquifer tests conducted on three wells penetrating the Yegua Formation in Fayette County showed coefficients of transmissibility of 5,900, 1,663, and 1,690 gpd per foot, respectively (Table 2). Reliable storage coefficients could not be determined from the tests due to the lack of suitable, nearby observation wells.

It must be emphasized that the transmissibilities are representative of only that portion of the aquifer screened. Permeabilities of the formations at two of the locations were calculated to be 11 and 18 gpd per square foot. Permeabilities of the individual sands in the Yegua are very likely to vary within wide limits, and selection of a value as typical is extremely hazardous. However, assuming an average permeability of 15 gpd per square foot, and further assuming that 45 percent (360 feet) of the total formation thickness is sand capable of producing water, the average transmissibility for the formation would be 5,400 gpd per foot.

Jackson Group

Because of the lack of suitably equipped water wells screening only the Jackson Group sands, aquifer tests were not performed during this investigation. The sand units are not uniform in thickness or persistence, and consequently will vary horizontally in their water-bearing and transmitting characteristics.

Catahoula Tuff

Three aquifer tests were conducted on the Catahoula Tuff. Transmissibilities of the screened section were 4,200, 4,125, and 5,290 gpd per foot. A storage coefficient of 0.018 was determined at one location (Table 2). Permeabilities of the screened section calculated at two locations were 51.5 and 60 gpd per square foot.

Oakville Sandstone and Lagarto Clay

Coefficients of transmissibility determined from three aquifer tests in Fayette County were 3,816, 5,850, and 5,910 gpd per foot. Storage coefficient at one location was 0.00013 (Table 2).

Use and Development of Ground Water

Approximately 1,193 million gallons or 3,663 acre-feet of ground water was used for all purposes in Fayette County during 1964 (Table 3). Public supply and industry water-use figures were compiled from reports provided by the respective municipalities and industries. Pumpage for irrigation was determined by an inventory of Texas irrigation conducted by the U.S. Soil Conservation Service and other agencies in 1964 (Gillett and Janca, 1965). Calculations of water consumption by livestock are based upon agricultural statistics of the U.S. Department of Commerce and on water requirements of livestock by Anderson (1964, p. 38).

Table 3.--Use of ground water in Fayette County, 1964

Use	Millions of gallons	Acre-feet
Public supply	360	1,106
Industry	1.2	3.7
Irrigation	193	592
Rural domestic	145	445
Livestock	494	1,516
Total	1,193.2	3,662.7

Table 4 provides data for 429 water wells in Fayette County. During this investigation every effort was made to locate and obtain data on every public supply, industrial, and irrigation well in the county, as well as a representative sampling of the water wells used for livestock and rural domestic purposes. Locations of these wells are shown on Figure 14.

Public Supply

Ground water pumped for public supply at La Grange, Schulenburg, Flatonia, Fayetteville, Ellinger, and Cistern totaled 1,106 acre-feet in 1964, about 30 percent of the total ground-water use in the county. During the 10-year period 1955-64, ground-water use for public supply in the county has increased from about 860 to 1,106 acre-feet (Figure 11). During this period, public-supply pumpage in the county ranged from a low of 824 acre-feet in 1957 to a high of 1,300 acre-feet in 1963. The annual fluctuations in the quantities of ground water pumped for public supply reflect the variation in annual precipitation, with the quantity pumped increasing during years of low precipitation and declining during years of above average precipitation.

La Grange, the largest user of ground water for public supply, pumped 550.5 acre-feet in 1964, or nearly 50 percent of the total amount of water pumped for public supply. La Grange derives its supply from six wells screening the Catahoula Tuff.

Schulenburg, the second largest public supply user in the county, pumped 290 acre-feet of water in 1964 or about 26 percent of the total pumped for public supply. The supply at Schulenburg is derived from five wells, two screening the Catahoula Tuff and sands in the upper Jackson Group, and three screening sands in the Oakville Sandstone and Lagarto Clay.

Flatonia, Fayetteville, Ellinger, and Cistern pumped 201, 36, 25, and 3.6 acre-feet of ground water, respectively, in 1964, collectively accounting for about 25 percent of the total pumped that year for public supply.

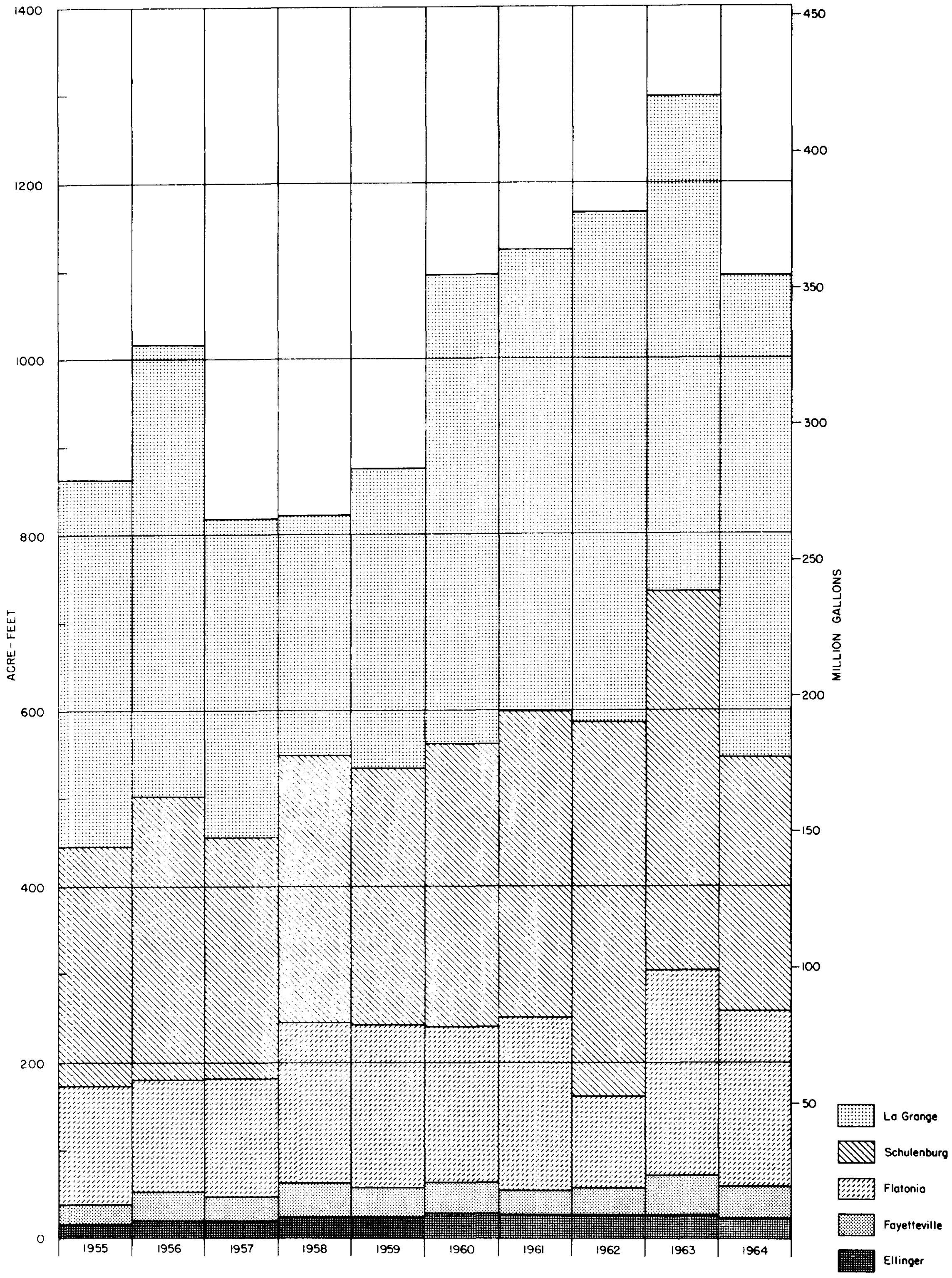

Figure 11

Use of Ground Water for Public Supply, 1955–64

Texas Water Development Board in cooperation with Fayette County
and the Lower Colorado River Authority

The city of Flatonia derives its supply from five wells, two of them screening the Catahoula Tuff, two the Jackson Group, and one screening both the Jackson and Catahoula (Table 4). The city of Fayetteville pumps water from one well completed in the Catahoula Tuff and Oakville Sandstone. Ellinger pumps water from three wells completed in the Oakville, and Cistern has one well completed in the Sparta Sand.

Industrial Use

Pumpage of ground water in Fayette County for industrial purposes is comparatively small, totalling about 3.7 acre-feet in 1964.

Irrigation

Irrigation of crops in Fayette County is supplemental in nature, and pumpage is likely to vary greatly from year to year.

According to an irrigation inventory (Gillett and Janca, 1965), about 592 acre-feet of ground water was pumped for irrigation purposes in Fayette County during 1964 (Table 3). Most of the pumpage was for pasture irrigation and forage sorghum. Irrigation accounted for about 16 percent of the total ground water pumped during 1964 in Fayette County.

Rural Domestic Use

About 445 acre-feet was pumped for rural domestic purposes in Fayette County during 1964. This estimate is based on a rural population of 11,384 people and an average use of 35 gallons of water per day per person. Practically all rural domestic supply of water in Fayette County is from wells.

Livestock Use

The largest single use of water in Fayette County is for watering livestock. About 1,516 acre-feet of ground water was used for this purpose in 1964. This estimate is based upon U.S. Department of Commerce statistics of livestock population of the county, and upon water requirements of livestock by Anderson (1964, p. 38). This estimate may be somewhat high since it could not be determined how much of the livestock population is dependent entirely or partly upon surface water in tanks and streams.

CHEMICAL QUALITY OF GROUND WATER

All ground water contains minerals carried in solution, and the chemical constituents of ground water are derived principally from soil and rock through which the water has moved. When water comes in contact with the various minerals which make up the soils and rocks of the earth, it begins to dissolve the minerals and carry them into solution. Consequently, the chemical character of ground water reflects in a general way the mineral content of the rock through which it moves.

Factors which determine the kinds and amount of chemical constituents in ground water include solubility of the minerals, the length of time the water has been in contact with the rocks and soil, the amount of free carbon dioxide in the water, and the temperature of the water-bearing formation. Generally speaking, the concentration of dissolved solids in ground water is greater where movement of the water is restricted. The temperature of water at or near the land surface is about the same as the mean air temperature, but generally increases with depth.

Uncontaminated ground water, unlike surface water, maintains a relatively constant quality and constant year-round temperature which make it highly desirable for many purposes, particularly for industrial processes which require rigid water-quality control.

Chemical quality of ground water can be affected adversely by manmade conditions such as:

a. Highly mineralized water permitted to enter a fresh water-bearing stratum through inadequately constructed wells.

b. Seepage of brine from disposal pits, which have been used to dispose of highly mineralized water produced with oil.

c. Disposal of raw sewage or animal wastes into the ground or onto aquifer recharge areas.

Quality Standards

Principal chemical constituents found in water are calcium, magnesium, sodium, potassium, iron, silica, bicarbonate, carbonate, sulfate, chloride, and minor amounts of manganese, nitrate, fluoride, and boron.

The suitability of a water supply depends upon the contemplated use, and water-quality standards are based on such criteria as temperature, odor, color, turbidity, chemical constituents, and bacteria content.

The dissolved-solids content is a major limiting factor on the use of water. The content of dissolved solids is generally expressed as parts of dissolved solids per million parts of water, by weight (parts per million, ppm).

The following is a general classification of water based on dissolved-solids content (Winslow and Kister, 1956, p. 5). This classification is used in this report to.describe the general chemical quality of ground water.

Description	Dissolved-solids content (ppm)
Fresh	Less than 1,000
Slightly saline	1,000 to 3,000
Moderately saline	3,000 to 10,000
Very saline	10,000 to 35,000
Brine	More than 35,000

Water used for public supplies should be colorless, odorless, palatable, and where possible be within the limits set by the U.S. Public Health Service (1962) for drinking water used on interstate carriers. Some of these standards are listed below.

Substance	Concentration (ppm)
Chloride (Cl)	250
Fluoride (F)	(*)
Iron (Fe)	.3
Manganese (Mn)	.05
Nitrate (NO_3)	45
Sulfate (SO_4)	250
Total dissolved solids	500

*See table on next page.

Although many public supplies in Texas do not meet the Public Health Service standards for use on interstate carriers, the water has been consumed for many years without apparent adverse affect on the users. These standards, however, are useful in judging water quality.

When fluoride is present naturally in drinking water the concentration should not exceed the appropriate upper limit shown in the following table.

Annual average of maximum daily air temperatures (computed for a minimum of 5 years (°F)	Recommended control limits of fluoride concentration (ppm)		
	Lower	Optimum	Upper
50.0 - 53.7	0.9	1.2	1.7
53.8 - 58.3	.8	1.1	1.5
58.4 - 63.8	.8	1.0	1.3
63.9 - 70.6	.7	.9	1.2
70.7 - 79.2	.7	.8	1.0
79.3 - 90.5	.6	.7	.8

Excessive concentrations of fluoride in drinking water may cause mottling of teeth in young children. The optimum fluoride concentration depends upon climatic conditions, since climate determines the amount of water (and fluoride) injested by children. The annual average of maximum daily air temperatures at Flatonia is about 80.7 °F. According to U.S. Public Health Service standards the recommended control limits of fluoride for this area range from 0.6 to 0.8 ppm.

Concentration of nitrate in excess of 45 ppm has been related to infant cyanosis or "blue baby" disease (Maxey, 1950, p. 271). Nitrate in excess of 50 ppm may indicate pollution from organic matter, especially when accompanied by high chloride concentration (Hem, 1959, p. 118).

Concentrations of iron and manganese in excess of 0.3 ppm are likely to cause reddish brown precipitates which discolor clothes and stain plumbing fixtures.

Water having a chloride content in excess of 250 ppm may taste salty, and sulfate in water in excess of 250 ppm may have a laxative effect.

Hardness, due primarily to calcium and magnesium, causes an increase in soap consumption and formation of scale in hot water heaters and pipes. The following commonly accepted classification for hardness is used in this report:

Hardness range (ppm)	Classification
Less than 60	Soft
61 to 120	Moderately hard
121 to 180	Hard
More than 180	Very hard

Water-quality requirements for industrial purposes are varied depending upon the intended use, and each industry generally has its own specific standards. Suggested water-quality tolerances for a number of industries are presented by Hem (1959, p. 253) and Moore (1940, p. 271).

Factors determining the suitability of water for irrigation include the general chemical makeup of the water, adequacy of drainage, type of soil to which it is applied, climatic conditions, crops grown, and quantity of water required.

The chemical characteristics of water quality which determine its suitability for irrigation are (1) total concentration of soluble salts, (2) percentage of sodium in relation to magnesium and calcium cations, (3) residual sodium carbonate, and (4) concentration of boron or other toxic elements.

The importance of dissolved mineral matter is dependent upon the amount which may accumulate in the soils. Consequently, well drained, porous, sandy soils which permit a "flushing" of the soil zone can be irrigated with water carrying a greater concentration of mineral matter than a tight, poorly drained soil. Also, certain crops are more salt tolerant than others.

A classification proposed by the U.S. Salinity Laboratory Staff (1954, p. 69-82) commonly used for judging the suitability of water for irrigation is shown on Figure 12. The classification is based on (1) the salinity hazard as measured by the electrical conductivity of the water (specific conductance), and (2) the sodium hazard as measured by the sodium-adsorption ratio (SAR). The sodium-adsorption ratio is computed by the following formula, where the ion concentrations are expressed in equivalents per million:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{++} + Mg^{++}}{2}}}$$

Wilcox (1955, p. 15) states that the system of classification proposed by the U.S. Salinity Laboratory Staff "...is not directly applicable to supplemental waters used in areas of relatively high rainfall." Wilcox (1955, p. 16) indicates that generally water can be used safely for supplemental irrigation if its conductivity is less than 2,250 micromhos per centimeter at 25°C and its SAR is less than 14 (Figure 12).

Most of the irrigation in Fayette County is supplementary in nature and is required only during long periods of drought. It appears that the general guidelines stated by Wilcox are adequate in judging the quality of water for irrigation purposes in Fayette County. The suitability of water for irrigation from selected wells in Fayette County may be judged by plotting SAR and conductivity values shown in Table 6 on the classification chart, Figure 12.

Treatment

Water which does not meet quality requirements for human consumption or industrial use can usually be treated so that it is acceptable.

Common treating methods include softening, aeration, filtration, cooling, blending, dilution, or addition of chemicals. The type of treatment depends upon the intended use.

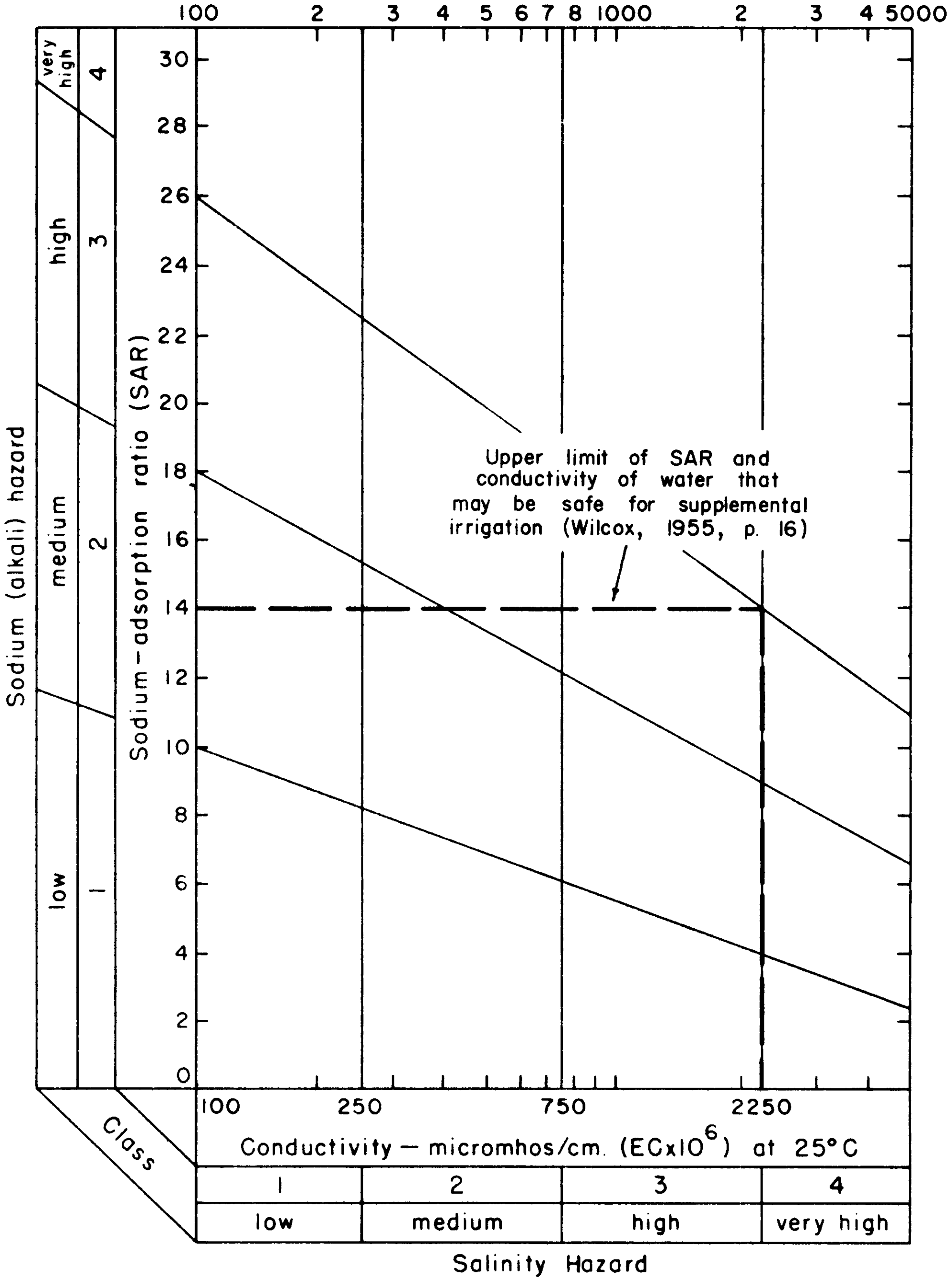

Figure 12

Diagram for the Classification of Irrigation Waters

(After United States Salinity Laboratory Staff, 1954, p. 80)

Texas Water Development Board in cooperation with Fayette County and the Lower Colorado River Authority

Once a treatment for a particular supply is selected it will probably not need to be changed, because the quality of the raw ground water will generally be constant.

Water Quality in Fayette County

Over 260 samples of water were collected from wells in Fayette County during this investigation. Chemical analyses of these and previously collected samples are shown in Table 6. These samples were collected from wells penetrating every water-bearing formation of consequence in the county, and are believed representative of the presently developed extent of the aquifers.

Water in the various formations tends to become more mineralized with depth and with distance from the outcrop areas. The downdip extent of fresh to slightly saline water in various aquifers is shown on Figures 6, 7, and 8, and the altitude of the base of fresh to slightly saline water in the county is shown on Figure 13. These are based on interpretations of electric logs of oil and gas tests which have penetrated the formations and should be considered approximate.

Carrizo Sand

A chemical analysis of water from the only well tapping the Carrizo Sand in Fayette County (well 67-16-404) shows the water to contain 1,090 ppm dissolved solids. Sodium makes up 457 ppm, and bicarbonate makes up 516 ppm. All other ions total only 117 ppm. The water is alkaline, with a pH of 8.6 (Table 6).

Interpretation of electric logs indicates that the Carrizo Sand contains fresh to slightly saline water over about one-third of the county (Figure 6). The content of dissolved solids may be expected to increase with depth so that, in general, fresher water occurs updip.

Although the single sample of Carrizo water available contains dissolved solids in excess of the U.S. Public Health Service standards, none of the specific ions exceed the concentration limits set and it appears to be a drinkable water. It is soft, low in iron, and apparently suitable for livestock and domestic uses.

The sodium-adsorption ratio is 56.1, and the specific conductivity is 1,740. This water has a very high sodium hazard and high salinity hazard, and is not considered suitable for irrigation purposes, especially on poorly drained soils.

Sparta Sand

The Sparta Sand yields fresh to moderately saline water to wells in the western part of Fayette County, principally near the communities of Elm Grove and Cistern. The dissolved-solids content in 19 samples of water from wells producing from the Sparta ranges from 49 ppm (well 67-07-901) to 3,090 ppm (well 67-14-902). Most of the samples, however, range from 500 to 1,500 ppm dissolved solids. The chloride and sulfate content range from 6 to 660 ppm and 10 to 1,580 ppm, respectively. Although most of the samples exceed the amount of dissolved solids recommended by the U.S. Public Health Service, and eight of the samples exceed recommended concentration limits for one or more of the ions, the water generally is suitable for domestic and livestock use and most would be satisfactory for public supply where no better water is available.

Most of the samples indicate that the water would be suitable for supplementary irrigation. Water from well 58-64-902 (Table 6) has a very high sodium hazard. Waters from wells 67-14-902, 67-15-304, 67-15-504, and 67-15-705 have a high salinity hazard and are probably unsuitable for supplementary irrigation (Figure 12).

Yegua Formation

Fifty-one samples of water were collected for analysis from wells screening the Yegua Formation in Fayette County (Table 6). All wells are on the Yegua outcrop or less than 4 miles downdip. The water quality varies widely, ranging from fresh to moderately saline. The dissolved-solids content ranges from 179 to 7,500 ppm. About 50 percent of the samples contain less than 1,000 ppm dissolved solids, and all but one (well 67-23-203) contain less than 3,000 ppm. The sulfate and chloride concentrations range from 9 to 1,660 ppm and 11 to 3,380 ppm, respectively.

The water analyses indicate that the quality of water from the Yegua is likely to vary widely, both areally and with depth. However, all of the samples of better quality water (500 ppm or less dissolved solids) are from relatively shallow wells on the outcrop.

Only a few of the samples meet all of the standards for public supplies recommended by the U.S. Public Health Service. All but five samples exceed 500 ppm dissolved solids, but more than one-half of the samples contain less than the recommended concentration limits of the individual chemical constituents.

The fluoride content ranges from 0.1 to 1.00 ppm. Most samples contain less than the recommended lower control limit of 0.6 ppm. A very few contain more than the recommended upper control limit of 0.8 ppm (Table 6).

The samples indicate that locally iron occurs in concentrations which would cause staining of clothes and plumbing fixtures.

The suitability of water from the Yegua for irrigation is likely to vary greatly, and each sample must be evaluated on its own merits. Most of the samples taken during this investigation have a high to very high salinity hazard and a few have a high sodium hazard. Twenty of the 50 samples are judged to be unsafe for irrigation purposes.

Jackson Group

Samples of water from 21 wells completed in the Jackson Group were collected for analyses during this investigation (Table 6). The wells sampled are either on the outcrop or completed in sands in the upper part of the

Jackson immediately downdip from the outcrop. The well depths, with one exception, range from 35 to 470 feet. Well 67-16-304, believed to produce principally from the Jackson Group, may also penetrate the Yegua Formation.

The dissolved-solids content in these samples ranges from 297 to 8,200 ppm, and the chloride and sulfate content range from 55 to 3,800 ppm and 19 to 1,610 ppm, respectively. The water is typically hard to very hard, although a few samples are soft to moderately hard. Only three samples meet the standards for public supplies recommended by the U.S. Public Health Service (wells 59-58-505, 66-01-502, and 67-24-103). However, about one-half of the samples contain less than 1,000 ppm dissolved solids and contain sulfate and chloride below the recommended limits of 250 ppm.

The city of Flatonia wells 4 and 5, completed in the Jackson Group, yield water containing 620 and 1,010 ppm dissolved solids, respectively, but the chloride and sulfate content of both wells are well below the recommended upper limits.

The suitability of Jackson water for irrigation purposes varies greatly. Of the 21 samples analyzed, most are suitable for supplemental irrigation. Eight have a high salinity hazard and are judged unfit for irrigation.

The irrigation wells in Fayette County which tap the upper Jackson sands do so in conjunction with the overlying Catahoula Tuff, which generally contains water of better quality than the Jackson Group.

Catahoula Tuff

Water wells screening the Catahoula Tuff in Fayette County commonly are completed in conjunction with the overlying Oakville Sandstone or the sands in the upper part of the Jackson Group. Analyses of water from these wells are shown in Table 6. Forty-three samples of water from wells believed to be completed in the Catahoula exclusively were collected during this investigation.

The total mineral content of the samples ranges from 320 to 2,280 ppm. Thirty-six of the samples, however, are fresh, containing less than 1,000 ppm dissolved solids. Seven of the samples are slightly saline.

The chloride content of the samples ranges from 7 to 900 ppm, and the sulfate content ranges from less than 4 to 192 ppm.

Water from the Catahoula ranges from soft to very hard but is typically very hard.

The fluoride content ranges from 0.3 to 1.2 ppm. Most samples contain less than the recommended lower control limit of 0.6 ppm.

Most of the samples collected from wells screening the Catahoula are suitable for supplementary irrigation. A few have a high salinity hazard and high sodium hazard and are undesirable for irrigation purposes.

Oakville Sandstone and Lagarto Clay

Water from the Oakville Sandstone and Lagarto Clay in Fayette County is generally of excellent quality and suitable for most purposes. The dissolved mineral content in 99 samples from wells screening the Oakville and Lagarto (Table 6) ranges from 199 ppm (well 66-17-102) to 2,700 ppm (well 66-17-501). Eighty-eight of the samples are fresh water, containing less than 1,000 ppm dissolved solids.

The chloride content of the samples ranges from 5 ppm (well 66-17-102) to 1,250 ppm (well 66-17-501). Most of the samples fall in a much narrower range, with 90 containing less than 250 ppm.

The sulfate content of the samples ranges from less than 3 ppm (well 66-09-502) to 308 ppm (well 66-17-501). All but one of the samples contain less than 250 ppm.

Water from the Oakville and Lagarto is typically vary hard, although samples from a few wells are soft or only moderately hard (Table 6).

The fluoride content in the 99 samples ranges from 0.01 to 7 ppm. Most of the samples (76) contain less than the recommended concentration for Fayette County.

Although water from the Oakville and Lagarto is used successfully at several locations in Fayette County for supplemental irrigation, a few of the samples are not of suitable quality for irrigation purposes. Nearly all of the samples have a low mineral content and hence a low salinity hazard. Only eight of the samples have a high sodium hazard.

Alluvium

Water samples from 13 representative wells screening the alluvium in the Colorado River flood plain (Table 6) indicate that the water is of good quality and suitable for most purposes. The dissolved-solids content in the 13 samples ranges from 317 to 1,290 ppm. Although more than one-half of the samples contain over 500 ppm dissolved solids, only one exceeds 1,000 ppm. The ranges of the major chemical constituents, in parts per million, are: calcium, 26 to 194; sodium, 11 to 300; bicarbonate, 126 to 537; chloride, 13 to 368; and sulfate, 6 to 177.

In general, the water is very hard. The hardness ranges from 88 to 590 ppm but more commonly is between 250 and 450 ppm.

AVAILABILITY OF GROUND WATER

It is not possible to determine precisely the amount of water that is present beneath the earth's surface or the quantity that may be produced. However, if certain aquifer conditions are known, it is possible to estimate the amount of water available.

The amount of water available for development from the various aquifers in Fayette County is based on pumpage under assumed conditions and is related primarily to the ability of the aquifer to transmit water from the outcrop to areas of pumping. The amount of water that will move through a segment of an aquifer is dependent upon the aquifer's coefficient of transmissibility, the hydraulic gradient, and the width of the aquifer segment perpendicular to flow. The relationship of the above factors may be expressed by the formula $Q = TIL$, in which Q is the quantity of water in gallons per day, T is the coefficient of transmissibility, I is the hydraulic gradient in feet per mile, and L is the length of the aquifer segment in miles. The equation may be used to determine the amount of water presently moving through the aquifer under the present hydraulic gradient and to predict the quantity of water that the aquifer will transmit under assumed future gradients. In general, the maximum gradient assumed in any case will not be greater than the dip of the top of the aquifer, and will represent the maximum perennial yield of the aquifer segment provided recharge to the aquifer in the outcrop is sufficient to support the pumpage.

The coefficient of transmissibility (T) is determined by aquifer tests, in which water wells screening the aquifer are pumped at a steady rate and the decline of water level in the pumped well or nearby observation wells is observed. The hydraulic gradient (I), or slope of the piezometric surface, is determined for current conditions by direct measurement of water levels in wells. The length of the aquifer segment (L) will vary but is in general laid out parallel to the aquifer outcrop.

Increased development and pumpage will result in a decline of the piezometric surface and an increase in the hydraulic gradient. As can be seen from the formula $Q = TIL$, the increase in gradient will cause more water to be transmitted through a given aquifer segment.

General Assumptions

In order to estimate the quantity of water available from the aquifers in Fayette County, the following general assumptions are made:

1. Water levels will be lowered by development to a maximum depth of 400 feet along a line of discharge, paralleling the formation's outcrop. The line of discharge in each case is entirely within Fayette County.

2. No water moves downward into the aquifer except in the outcrop areas where all recharge is assumed to occur along a line in the middle of the outcrop.

3. Recharge is adequate to maintain present water levels along the line source of recharge.

4. All sands between the line source of recharge and the line source of discharge transmit water from the outcrop to the line of discharge.

5. The hydraulic gradient is the slope of a straight line from the water level at the line source of recharge to the water level along the line source of discharge.

6. The amount of recharge along the line source is sufficient to supply the water that can be transmitted to the line of discharge at the assumed gradient.

7. No water is moving from the downdip side toward the line of discharge.

8. The altitude of water levels is the same and remains the same at all points along the line source of recharge, and along the line of discharge at a depth of 400 feet, and the hydraulic gradient will remain constant.

Ground Water Available for Future Development

Carrizo Sand

Although the Carrizo Sand is undeveloped in Fayette County, and no aquifer tests were conducted to determine the aquifer's coefficients of transmissibility and storage, it appears worthwhile to consider the amount of water that might be developed from the Carrizo in Fayette County under certain assumed conditions. The Carrizo Sand has been found to be remarkably uniform in its water-bearing characteristics when compared to other important aquifers, and since the formation appears to be of similar thickness and character in Fayette and adjoining counties, the results of aquifer tests in Gonzales County are used here to compute the quantity of water available in Fayette County.

Computations of the amount of water that may be available from the Carrizo in Fayette County are based upon coefficients of transmissibility and storage of 40,000 gpd per foot and 0.00016, respectively (Shafer, 1965), and upon the general assumptions stated above. The assumed line of discharge is approximately 25 miles long and extends from the vicinity of Elm Grove to the common corners of Fayette, Bastrop, and Lee Counties.

Under the assumed coefficients of transmissibility and storage and hydraulic gradients established by the 400-foot drawdown, it is estimated that a maximum of 20,000 acre-feet of water per year could be induced to move through the aquifer from its recharge area to wells in Fayette County. An additional 10,000 acre-feet of water would be released from storage during development. Water removed from storage, however, is available only once during development and is not available on an annual basis.

Although the above figures indicate that the amount of water available from the Carrizo in the county is substantial, additional factors which influence the total amount of water ultimately available must be considered. The most important factor is development in the updip portion of the aquifer in adjoining Bastrop and Lee Counties. The figures given here represent the maximum quantity of water that could move through the aquifer under the assumed conditions, and any part of this quantity pumped in Bastrop and Lee Counties would not be available for development in Fayette County. Another factor is the amount of recharge to the aquifer. It is estimated that more than 10 percent of the average annual rainfall would need to be recharged in the outcrop area to sustain the maximum amount of pumpage. The amount of water that can ultimately be developed depends upon the ability of the aquifer to accept recharge in the outcrop. The amount of annual recharge probably would not exceed the amounts of water calculated to be available in Fayette County under the assumed conditions, and is possibly less, thus placing a limit on the total quantity of ground water available.

Sparta Sand

Aquifer tests to determine the Sparta's aquifer coefficients were not conducted in the county during this investigation; consequently, results of aquifer tests made on the Sparta in adjoining counties are used to calculate the quantity of water available from the aquifer in Fayette County.

Coefficients of transmissibility and storage used in computations are 14,000 gpd per foot and 0.0004, respectively. The assumed line of discharge is 25 miles long and situated approximately midway between the outcrop and the downdip extent of fresh water in the Sparta (Figure 8). The hydraulic gradient under conditions established by a drawdown of 400 feet along the line of discharge is 40 feet per mile.

Under the general assumptions previously stated and the above aquifer coefficients it is estimated that about 16,000 acre-feet of water would be available annually in Fayette County. In addition, about 12,000 acre-feet would be released from storage during development and would be available on a one-time basis. About 11 percent of the average annual precipitation, or over 4 inches of precipitation per year, would be required as recharge to the aquifer in order to support the above withdrawals perennially. Again, it must be emphasized that 16,000 acre-feet is a maximum quantity under the assumed conditions and that the aquifer's ability to accept recharge in the outcrop may limit its yield to a lesser amount.

In the absence of aquifer tests in the vicinity of the faults in northwestern Fayette County and southeastern Bastrop County, it is not possible to predict what effect the faults may have on the transmission of water through the aquifer from the areas of recharge to the assumed line of discharge.

Catahoula Tuff, Oakville Sandstone, and Lagarto Clay

One of the principal sources of ground water in Fayette County, and one of the principal sources for future development in the county, are the sands of the Catahoula Tuff, Oakville Sandstone, and Lagarto Clay. Because of the apparent hydrologic similarity of the water-bearing sands, and because wells commonly are screened in sands of more than one of these geologic units, the Catahoula Tuff, Oakville Sandstone, and Lagarto Clay are considered here as a single unit in estimating availability of ground water.

In addition to the general assumptions made in calculating the availability of water from the aquifers in Fayette County, it is further assumed that the water to be developed from the Catahoula-Oakville-Lagarto stratigraphic sequence in Fayette County occurs in a simplified, hypothetical aquifer 800 feet thick, containing 200 feet of net sand thickness in the Catahoula and lower part of the Oakville.

The transmissibility of the sands is 14,000 gpd per foot. The gradient established by lowering the water levels to 400 feet along the assumed line of discharge (approximately along the Fayette-Colorado County line) is 40 feet per mile, and the length of the aquifer segment is 30 miles.

Under the conditions stated above, about 19,000 acre-feet of ground water per year would move through the aquifer and is theoretically available for development in Fayette County. This figure is five times the quantity of ground water pumped from all aquifers in Fayette County in 1964 (Table 3). In addition, about 6,000 acre-feet of water would be released from storage as a result of lowering the water levels to 400 feet along the line of discharge. It must be emphasized, however, that the amount available from storage is available only once during development and is not available on an annual basis.

Other Formations

Quantitative estimates of the amount of water available from the Yegua Formation, Jackson Group, and alluvium could not be made during this investigation. It is believed that these formations, especially the Yegua, are capable of yielding many times the amount of water presently pumped from them.

REFERENCES

Alexander, W. H., Jr., Myers, B. N., and Dale, O. C., 1964, Reconnaissance investigation of the ground-water resources of the Guadalupe, San Antonio, and Nueces River basins, Texas: Texas Water Comm. Bull. 6409.

Anderson, K. E., ed., 1964, Water well handbook: Missouri Water Well Drillers Assoc. handbook.

Bailey, T. L., 1926, The Gueydan, a new Middle Tertiary formation from the southwestern Coastal Plain of Texas: Univ. Texas, Bur. Economic Geology Bull. 2645.

Cromack, G. H., 1943, Records of wells, drillers' logs, water analyses, and map showing locations of wells in Fayette County, Texas: Texas Board Water Engineers duplicated rept.

Cromack, G. H., and White, W. N., 1942, Ground water in West Point-Flatonia area, Fayette County, Texas: U.S. Geol. Survey open-file rept.

Cronin, J. G., Follett, C. R., Shafer, G. H., and Rettman, P. L., 1963, Reconnaissance investigation of the ground-water resources of the Brazos River basin, Texas: Texas Water Comm. Bull. 6310.

Darton, N. H., Stephenson, L. W., and Gardner, Julia, 1937, Geologic map of Texas: U.S. Geol. Survey geol. map.

Deussen, Alexander, 1914, Geology and underground waters of the southeastern part of the Texas Coastal Plain: U.S. Geol. Survey Water-Supply Paper 335.

_______1924, Geology of the Coastal Plain of Texas west of Brazos River: U.S. Geol. Survey Prof. Paper 126.

Eargle, D. H., 1959a, Stratigraphy of Jackson Group (Eocene), south-central Texas: Amer. Assoc. Petroleum Geologists Bull., v. 43, no. 11, p. 2623-2635.

_______1959b, Sedimentation and structure, Jackson Group, south-central Texas: Gulf Coast Assoc. Geol. Soc. Trans., p. 31-39.

Ely, L. M., 1957, Microfauna of the Oakville Formation, La Grange area, Fayette County, Texas: Univ. Texas Master of Arts Thesis.

Ferguson, W. K., 1958, Geology of parts of Bastrop and Fayette Counties, Texas: Univ. Texas Master of Arts Thesis.

Gillett, P. T., and Janca, I. G., 1965, Inventory of Texas Irrigation, 1958 and 1964: Texas Water Comm. Bull. 6515.

Hem, J. D., 1959, Study and interpretation of the chemical characteristics of natural water: U.S. Geol. Survey Water-Supply Paper 1473.

Maxcy, D. F., 1950, Report on the relation of nitrate concentration in well waters to the occurrence of methemoglobinemia in infants: Natl. Research Council Bull. Sanitary Engineering and Environment, p. 265-271, app. D.

Meinzer, O. E., 1923a, The occurrence of ground water in the United States, with a discussion of principles: U.S. Geol. Survey Water-Supply Paper 489.

_______1923b, Outline of ground-water hydrology, with definitions: U.S. Geol. Survey Water-Supply Paper 494.

Moore, E. W., 1940, Progress Report of the committee on quality tolerances of water for industrial uses: New England Water Works Assoc. Jour., v. 54, p. 261-272.

Mount, J. R., Rayner, F. A., Shamburger, V. M., Peckham, R. C., and Osborne, F. L., Jr., 1967, Reconnaissance investigation of the ground-water resources of the Colorado River basin, Texas: Texas Water Devel. Board Rept. 51.

Plummer, F. B., 1932, Cenozoic systems in Texas, in The geology of Texas, v. 1, Stratigraphy: Univ. Texas Bull. 3232, p. 519-818.

Renick, B. C., 1936, The Jackson Group and the Catahoula and Oakville Formations in a part of the Texas Gulf Coastal Plain: Univ. Texas Bull. 3619.

Shafer, G. H., 1965, Ground-water resources of Gonzales County, Texas: Texas Water Devel. Board Rept. 4.

Stenzel, H. B., 1938, The geology of Leon County, Texas: Univ. Texas Bull. 3818.

Sundstrom, R. W., Hastings, W. W., and Broadhurst, W. L., 1948, Public water supplies in eastern Texas: U.S. Geol. Survey Water-Supply Paper 1047.

Taylor, T. U., 1907, Underground waters of the Coastal Plain of Texas: U.S. Geol. Survey Water-Supply Paper 109.

Thompson, G. L., 1966, Ground-water resources of Lee County, Texas: Texas Water Devel. Board Rept. 20.

U.S. Public Health Service, 1962, Public Health Service drinking water standards: Public Health Service Pub. 956.

U.S. Salinity Laboratory Staff, 1954, Diagnosis and improvement of saline and alkali soils: U.S. Dept. Agriculture Handb. 60.

Wilcox, L. V., 1955, Classification and use of irrigation waters: U.S. Dept. Agriculture Circ. 969.

Winslow, A. G., and Kister, L. R., Jr., 1956, Saline water resources of Texas: U.S. Geol. Survey Water-Supply Paper 1365.

Wood, L. A., 1956, Availability of ground water in the Gulf Coast region of Texas: U.S. Geol. Survey open-file rept.

Wood, L. A., Gabrysch, R. K., and Marvin, Richard, 1963, Reconnaissance investigation of the ground-water resources of the Gulf Coast region, Texas: Texas Water Comm. Bull. 6305.

Table 5.--Drillers' logs of wells in Fayette County

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 59-57-906

Owner: J. F. Anderson. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale, sandy	197	197	Sand	29	264
Rock	1	198	Shale	123	387
Sand with shale streaks	24	222	Rock	1	388
Rock	3	225	Sand	90	478
Shale, sandy	10	235			

Well 59-58-401

Owner: R. C. Weishuhn. Driller: -- Strube.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	8	8	Lignite	2	60
Sand, white	15	23	Clay, brown	4	64
Clay, white	2	25	Clay, blue (sticky shale)	5	69
Clay, red	7	32	Shale, brown	17	86
Sand, white, fine	7	39	Shale, blue	2	88
Shale	4	43	Gumbo, black	16	104
Lignite	2	45	Clay, brown	29	133
Sand, blue	6	51	Rock	1	134
Shale, white	2	53	Shale, sandy, water	6	140
Shale, brown	5	58	Sand, blue	20	160
			Shale, blue	2	162

Table 5.--Drillers' logs of wells in Fayette County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 59-59-506

Owner: Ernest Von Minden. Driller: V. Pomykal.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay ----------------	10	10	Shale ----------------	108	258
Rock ----------------	25	35	Sand -----------------	4	262
Shale ---------------	100	135	Shale ----------------	13	275
Sand and shale -------	15	150			

Well 59-59-703

Owner: Walter Weyland Sr. Driller: V. Pomykal.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay ----------------	30	30	Sandy ----------------	10	240
Rock ----------------	50	80	Sand -----------------	16	256
Shale ---------------	150	230			

Well 66-01-602

Owner: Wallace Taylor. Driller: V. Pomykal.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay, red ------------	30	30	Shale ----------------	90	190
Shale, blue ----------	5	35	Sand -----------------	3	193
Sand, blue -----------	7	42	Shale ----------------	37	230
Pea gravel -----------	2	44	Sand -----------------	80	310
Shale, hard ----------	19	63	Shale ----------------	54	364
Sand, fine, blue -----	37	100			

Well 66-01-701

Owner: Herbert C. Graham. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gravel	25	25	Shale	55	225
Shale	101	126	Coal and shale	40	265
Coal	17	143	Shale	25	290
Shale	19	162	Sand	18	308
Sand	8	170	Shale, sandy	30	338

Well 66-01-902

Owner: City of La Grange. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	30	30	Shale	10	150
Gravel and coarse sand	20	50	Shale, sandy, and fine sand	50	200
Sand, coarse, white	20	70	Shale	7	207
Shale, sandy	20	90	Shale and sandy shale	61	268
Shale, blue	18	108	Shale	32	300
Sand, good, coarse	32	140	Shale, sandy	50	350

Well 66-01-904

Owner: City of La Grange. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface	10	10	Shale, blue	32	118
Clay	10	20	Shale, sandy	13	131
Clay and gravel	8	28	Shale, blue	39	170
Gravel and blue shale	50	78	Sand	10	180
Shale, sandy breaks	8	86	Shale, sandy	25	205

(Continued on next page)

Well 66-01-904--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale, black	8	213	Shale	15	283
Sand and lignite	14	227	Lignite and fine gray sand	18	301
Shale, black	3	230	Shale, sandy	48	349
Sand and lignite	38	268			

Well 66-01-905

Owner: City of La Grange. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	10	10	Rock	2	140
Clay	10	20	Shale, blue	19	159
Sand and gravel	10	30	Sand, gray	30	189
Gravel and blue shale	30	60	Shale	34	223
Shale, blue	25	85	Sand, gray	14	237
Shale, sandy breaks	19	104	Shale	15	252
Shale, sandy	11	115	Sand, gray	10	262
Sand	12	127	Shale	21	283
Shale, sandy	11	138			

Well 66-01-906

Owner: City of La Grange. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand	23	23	Shale, blue	2	70
Gravel	1	24	Clay, blue	37	107
Clay	16	40	Sand	38	145
Gravel	10	50	Clay	5	150
Clay, blue	18	68			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 66-01-907

Owner: City of La Grange. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gravel and clay	38	38	Sand, hard packed	28	258
Clay, blue	102	140	Clay, sandy, and lignite	20	278
Sand, gray	10	150	Sand, fine gray	8	286
Clay with rock layers	26	176	Clay and sandy clay	39	325
Clay, sandy	54	230			

Well 66-02-201

Owner: Luther Hill Lutheran Church Camp. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Rock	42	42	Rock	4	181
Clay	46	88	Shale	6	187
Rock	5	93	Rock	2	189
Sand	22	115	Sand	36	225
Clay	62	177	Shale	11	236

Well 66-02-505

Owner: Tom Holmes. Driller: V. Pomykal.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gravel	15	15	Sandy	10	190
Shale, hard	5	20	Shale, soft	53	243
Rock, hard	40	60	Sand and shale	14	257
Shale	70	130	Shale	83	340
Sand and shale	20	150	Sandy	5	345
Sand, hard	15	165	Shale	12	357
Shale	15	180	Sandy	88	445

(Continued on next page)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 66-02-505--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand	10	455	Sand	30	510
Sand, hard	10	465	Sand, hard	10	520
Sandy	15	480	Shale	5	525

Well 66-02-702

Owner: City of La Grange. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	5	5	Shale	27	339
Clay, soft	14	19	Sand, shale, and lignite	15	354
Sand, coarse, and gravel, fine	6	25	Shale	31	388
Shale, green	93	118	Shale, brittle, green	23	411
Rock, soft	3	121	Rock	2	413
Shale, hard	18	139	Shale, soft	18	431
Sand, coarse	5	144	Rock and shale	4	435
Shale	4	148	Shale, soft, green	55	490
Sand	5	153	Lignite and soft shale	30	520
Shale	68	221	Shale, soft	87	607
Rock, soft	4	225	Shale, hard	90	697
Shale	10	235	Shale, soft, brown	27	724
Shale, sand, and lignite	15	250	Shale and thin layer of sand	12	736
Shale, soft, green	29	279	Shale, soft, and thin layer of sand	26	762
Sand, loose, gray	22	301	Rock	1	763
Sand, lignite, and shale	11	312			

(Continued on next page)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 66-02-702--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale, hard, and thin sand layers	22	785	Clay, hard, sticky	63	957
Shale, hard	21	806	Rock	2	959
Shale, soft, and thin sand layer	57	863	Shale, hard, sticky, brown	21	980
Shale, hard	19	882	Shale, hard, flaky	96	1,076
Sand, fine, gray (Tested sulfur water, estimated flow 50 gpm	12	894			

Note: Above well completed at depth of 283 ft.

Well 66-03-105

Owner: J. B. Crowley. Driller: Alvin Harms.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil	2	3	Rock	24	140
Clay	17	20	Clay and shale	125	265
Rock and clay with a little sand	50	70	Rock and sand	44	309
Rock, hard	25	95	Shale	10	319
Clay	21	116			

Well 66-03-804

Owner: City of Fayetteville. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand	10	65	Sand and shale	10	193
Clay	15	80	Shale, hard	192	385
Sand	12	92	Sand	6	391
Shale	91	183	Shale, hard	35	426

(Continued on next page)

Well 66-03-804--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay ----------------	14	440	Shale and gumbo -------	45	637
Shale and gumbo ------	38	478	Gumbo ----------------	7	644
Shale, soft ----------	7	485	Shale and gumbo -------	60	704
Shale, hard ----------	6	491	Shale, soft -----------	32	736
Gumbo ----------------	33	524	Gumbo, tough ----------	32	768
Shale, soft ----------	21	545	Sand, water -----------	28	796
Shale and gumbo ------	25	570	Gumbo -----------------	71	867
Shale and rock --------	22	592	Sand, water -----------	41	908

Well 66-04-106

Owner: Jesse Heinsohn. Driller: V. Pomykal.

Clay ----------------	12	12	Sand -----------------	15	105
Sand ----------------	8	20	Sandy ----------------	3	108
Shale ---------------	42	62	Shale, sandy ----------	4	112
Rock and sand --------	15	77	Shale, blue -----------	2	114
Shale ---------------	13	90			

Well 66-09-102

Owner: Eldon Knappe. Driller: Leroy Richter.

Clay ----------------	95	95	Coal and lignite ------	4	208
Sand ----------------	30	125	Shale ----------------	82	290
Shale, sandy ---------	43	168	Sand -----------------	56	346
Sand ----------------	20	188	Shale ----------------	54	400
Shale ---------------	16	204			

Table 5.--Drillers' logs of wells in Fayette County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 66-09-902

Owner: W. C. Bolling. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	60	60	Clay	150	330
Sand	6	66	Clay, sandy	15	345
Clay, red	94	160	Clay	14	359
Clay, sandy	20	180			

Well 66-10-102

Owner: George Adamcik. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay and gravel	12	12	Shale	496	604
Clay	41	53	Clay	56	660
Rock	55	108	Sand	48	708

Well 66-10-703

Owner: William H. Weaver. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	98	98	Clay, sandy	10	200
Sand Rock	14	112	Clay	65	265
Clay	78	190	Sand	35	300

Well 66-11-204

Owner: City of Ellinger. Driller: L & N Drilling Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil	3	3	Clay, yellow	12	31
Clay, yellow	6	9	Sand and sandy clay	11	42
Clay, sandy	8	17	Clay, yellow	29	71
Clay and gravel	2	19	Clay, blue	16	87

(Continued on next page)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 66-11-204--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand and sandrock	20	107	Sand and sandrock	18	194
Clay, blue	8	115	Clay, blue	13	207
Sand and sandrock	9	124	Sand and sandrock	48	255
Clay, blue	52	176			

Well 66-17-103

Owner: Alfred Gabler. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay, red	50	50	Sandy	21	596
Shale, blue	12	62	Rock	1	597
Sandrock	5	67	Sand	8	605
Rock, hard	1	68	Clay, sandy	34	639
Clay, red and blue	507	575			

Well 66-17-402

Owner: Paul G. Paulus. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	15	15	Clay	60	110
Sand	5	20	Clay, sandy	15	125
Rock and sand streaks	10	30	Clay	95	220
Sand	20	50	Sand	10	230

Well 66-17-601

Owner: City of Schulenburg. Driller: Marcus Ploeger.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface	4	4	Sand, yellow	6	37
Clay, yellow	27	31	Clay, hard, sandy	18	55

(Continued on next page)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well 66-17-601--Continued					
Clay, soft, sandy	11	66	Sand, hard	69	202
Clay, sandy	22	88	Gravel, tight	16	218
Sand	3	91	Sand, fine	54	272
Clay, sandy	42	133			

Well 66-17-602

Owner: City of Schulenburg. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil	3	3	Shale, blue, and sand streaks	20	240
Clay, hard, sandy	12	15	Shale, blue	95	335
Sand, fine, gray	19	34	Sand, fine, gray	45	380
Clay, yellow	14	48	Shale	10	390
Sand, fine, gray	10	58	Sand, fine, gray	29	419
Clay	5	63	Shale, sand, and caliche	61	480
Sand, fine, gray	17	80	Shale, hard, sandy, and lignite	45	525
Clay, black, and sand streaks	20	100			
Clay, black	49	149			
Sand, fine, gray, and clay streaks	71	220			

Note: Above well completed at depth of 272 ft; originally drilled to more than 1,500 ft.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 66-17-611

Owner: Jack Klesel. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	70	70	Shale	21	465
Sand	20	90	Sand	15	480
Clay	200	290	Shale	90	570
Sand	30	320	Sand	60	630
Shale	64	384	Shale	60	690
Sand	26	410	Sand	30	720
Shale	18	428	Shale	35	755
Sand	16	444	Sand	30	785

Well 66-18-404

Owner: W. W. Mikesky. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	58	58	Shale	47	242
Sand	10	68	Sand and rock streaks	31	273
Shale	7	75	Rock	1	274
Sand	10	85	Shale	21	295
Shale	100	185	Shale and rock streaks	27	322
Sand	10	195			

Well 67-07-901

Owner: J. H. Webb. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	20	20	Shale	100	181
Shale	60	80	Rock	1	182
Rock	1	81	Shale	176	358

(Continued on next page)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well 67-07-901--Continued					
Sand, fine, soft	22	380	Sand	52	470
Shale	38	418	Shale	20	490

Well 67-08-801

Owner: Walter Van Wart. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale	80	80	Sand	20	265
Sand	7	87	Shale	115	380
Shale	16	103	Sand	52	432
Sand	15	118	Shale	30	462
Shale	19	137	Sand	30	492
Sand	20	157	Shale	124	616
Shale	88	245			

Well 67-15-203

Owner: Emil V. Janecka. Driller: Johnnie Maresh.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil, black	3	3	Clay, blue	4	125
Clay, light gray	17	20	Clay, dark gray	10	135
Rock	3	23	Rock	2	137
Clay, dark gray	96	119	Clay, dark gray	63	200
Rock	2	121	Sand, water	25	225

Well 67-15-404

Owner: L. A. Harris. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	56	56	Boulders and shale, sandy	20	330
Sand	50	106	Shale	170	500
Shale	14	120	Sand	27	527
Sand	16	136	Rock	1	528
Shale	174	310	Shale, sandy	6	534

Well 67-15-703

Owner: Max Johnson. Driller: Johnnie Maresh.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay, brown	10	10	Clay, gray	7	157
Sand, tan	10	20	Sand	13	170
Clay, tan	7	27	Clay, gray	86	256
Sand, blue	4	31	Sand	4	260
Clay, gray	118	149	Clay, gray	65	325
Rock	1	150	Sand	55	380

Well 67-16-504

Owner: Leonard Cherry. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Rock	24	24	Shale, sandy	70	265
Shale	45	69	Rock	1	266
Sand	22	91	Sand, fine	19	285
Shale	103	194	Rock	1	286
Rock	1	195			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 67-24-203

Owner: W. M. Hill. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	18	18	Shale, sandy	15	140
Sand	4	22	Sand, fine	25	165
Clay	46	68	Shale	35	200
Rock	4	72	Sand	25	225
Shale, blue	53	125			

Well 67-24-302

Owner: A. Bierdoffer. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	65	65	Rock	1	182
Sand	6	71	Shale	28	210
Clay	44	115	Rock	2	212
Sand, fine	7	122	Shale	78	290
Clay	15	137	Rock	3	293
Rock	1	138	Shale and sand streaks	42	335
Shale	43	181			

Well 67-24-402

Owner: City of Flatonia. Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil	4	4	Shale, sandy	254	350
Caliche and sand	80	84	Sand, gray	68	418
Sand	12	96	Shale, sandy	44	462

Well 67-24-405

Owner: City of Flatonia. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil, black	8	8	Shale, sandy	20	215
Sand rock	47	55	Sand, gray	10	225
Sand, gray	25	80	Shale, sandy, with coal streaks	45	270
Shale, sandy	95	175	Shale, sandy	55	325
Sand, blue	12	187	Sand with sandy shale streaks	103	428
Lignite	8	195	Shale	8	436

Well 67-24-507

Owner: August J. Biley. Driller: Johnnie Maresh.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil, black	3	3	Rock	38	78
Clay, white	7	10	Sand, tan	2	80
Sand, white	5	15	Clay, blue	72	152
Clay, white	15	30	Rock	9	161
Rock	5	35	Sand	39	200
Sand rock	5	40			

Well 67-24-611

Owner: James Ferrell. Driller: Leroy Richter.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand rock	20	20	Sand rock	22	157
Clay	10	30	Shale	83	240
Rock and clay	16	46	Hard streaks	25	265
Clay, pink	89	135	Shale, sandy	70	335

(Continued on next page)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)

Well 67-24-611--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale, hard	110	445	Sand rock	12	542
Sand and rock	55	500	Shale	58	600
Shale	30	530			

Well 67-24-701

Owner: Ben Darilek. Driller: Johnnie Maresh.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Topsoil, black	3	3	Clay, white	15	100
Clay, white	35	38	Sand, white	10	110
Sand, white	20	58	Clay, white	10	120
Clay, white	22	80	Clay, blue	20	140
Clay, blue	5	85	Water sand	40	180

Table 6.--Chemical analyses of water from wells in Fayette County

(Analyses are in parts per million except specific conductance, pH, and sodium adsorption ratio.)

Analyses performed by the Texas State Department of Health except as indicated by footnote.

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
								Carrizo Sand										
67-16-404	William Cherry	2,000	Sept. 28, 1965	17	--	3	1	457	516	5	71	1.9	0.4	1,090	13	1,740	8.6	56.1
								Sparta Sand										
58-64-902	R. C. Meier	638	Sept. 21, 1965	13	0.18	2	1	225	294	141	79	0.4	< 0.4	610	9	987	8.1	33
67-07-801	Vencil Vinklarek	430	Sept. 24, 1965	13	--	89	41	150	223	223	208	.3	< .4	830	391	1,400	7.8	3.3
901	J. H. Webb	490	June 9, 1965	4	--	9	1	6	26	10	6	.1	< .4	49	28	86	6.9	.3
08-106	Richards	290	Aug. 26, 1965	15	< .02	100	11	84	281	66	104	.3	40	560	297	955	7.3	2.1
14-602	Dohr Corp.	185	Mar. 31, 1965	20	.36	259	86	74	170	520	328	.6	< .4	1,370	1,000	2,050	6.9	1.0
902	Henry Barnick	260	Sept. 15, 1965	13	< .02	392	190	350	240	1,580	448	.8	< .4	3,090	1,760	3,800	7.4	3.6
15-104	Felix Psencik	399	June 8, 1965	38	.16	59	19	58	154	124	77	.3	< .4	451	227	737	7.2	1.2
202	Max Marburger	425	do	15	--	62	24	94	237	134	99	.3	< .4	550	256	905	7.7	2.5
304	John F. McClanahan	600	Sept. 15, 1965	13	< .02	68	21	420	168	370	462	.6	< .4	1,440	259	2,350	7.4	11.4
402	Community of Cistern	408	*July 31, 1942	14	1.1	57	36	138	236	222	117	.0	1.0	720	290	--	7.9	--
			*July 11, 1961	16	.07	56	31	131	238	232	78	.1	.0	662	267	1,060	7.4	3.3
			Mar. 30, 1965	16	.10	61	33	124	237	216	108	.3	< .4	680	290	1,100	7.7	--
403	Edmund Thiede	464	June 8, 1965	10	--	109	38	213	177	358	280	.4	< .4	1,100	429	1,760	7.6	4.6
404	L. A. Harris	534	do	13	--	123	47	193	195	385	266	.4	< .4	1,120	499	1,760	7.6	2.7
502	Felix Janecka	648	Sept. 15, 1965	15	--	30	20	169	242	144	127	.3	< .4	620	157	1,055	7.7	6.1
503	Kenneth Franz, Sr.	545	Sept. 29, 1965	15	.14	39	26	141	253	130	120	.3	< .4	600	205	992	7.6	4.3
504	do	510	Sept. 15, 1965	15	--	43	32	141	237	213	94	.2	< .4	660	239	1,070	7.7	3.9
702	Clint Sellers	637	Apr. 1, 1965	13	.36	75	24	245	189	246	301	.4	< .4	1,000	286	1,700	7.9	6.2
705	Max Johnson	425	Sept. 15, 1965	10	.02	95	33	364	178	132	630	.6	< .4	1,350	373	2,440	7.4	8.3
23-102	F. A. Collins	500	Sept. 16, 1965	10	< .02	164	54	379	137	385	660	.6	< .4	1,720	630	2,830	7.3	--
								Yegua Formation										
58-64-901	St. Michaels Lutheran Church	175	Apr. 15, 1965	27	--	84	12	423	272	560	280	0.5	<0.4	1,520	260	2,340	7.4	11.4
59-50-903	L. D. Arrington	300	Apr. 16, 1965	80	.58	39	7	163	81	61	256	.2	< .4	650	127	1,085	6.8	6.3

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
59-57-502	J. D. Pyburn	295	Sept. 21, 1965	33	<0.02	57	14	241	349	177	183	0.2	<0.4	880	201	1,440	7.6	7.5
601	Fred Kasper	280	Apr. 15, 1965	40	.52	77	18	179	227	295	127	.3	< .4	850	268	1,300	7.1	4.7
602	Humple Pipeline Co.	280	June 2, 1965	40	--	76	19	144	266	256	84	.2	< .4	750	268	1,155	7.4	3.8
701	Otto Kraatz	108	Aug. 24, 1965	72	3.6	138	33	103	46	327	234	.5	3.5	950	481	1,400	6.2	--
904	C. L. Bryan	550	May 7, 1965	38	--	147	21	270	270	462	260	.5	< .4	1,330	452	2,100	7.3	5.5
906	J. F. Anderson	478	May 10, 1965	27	--	109	12	254	289	352	212	.3	< .4	1,110	321	1,810	7.6	6.3
58-101	William Goldapp	465	Sept. 21, 1965	26	< .02	47	7	197	281	180	117	.3	< .4	710	145	1,154	7.6	7.1
66-01-101	Clara Trosdale	290	May 10, 1965	44	--	34	5	261	289	198	162	.3	< .4	850	104	1,380	7.4	11.3
401	Charles Harbers	285	Mar. 26, 1965	20	--	7	1	212	342	110	54	.5	< .4	750	19	920	8.2	21.4
403	Henry Bartsch	305	do	26	--	9	2	226	344	134	62	.6	< .4	800	29	990	8.1	1.9
406	J. E. Morgan	300	do	27	.62	8	1	227	362	115	67	.6	< .4	810	25	1,000	8.1	20.1
408	do	420	do	27	--	9	1	271	427	89	116	.5	< .4	940	27	1,150	8.1	22.6
67-07-902	Edward Doms	66	Sept. 10, 1965	72	--	145	44	205	63	380	377	.5	7.0	1,260	540	1,950	6.6	3.8
08-202	M. G. Heck	200	Aug. 25, 1965	26	< .02	86	13	810	338	950	570	.7	1.5	2,620	268	3,800	7.4	21.3
303	Arnold Killian	96	do	26	--	28	4	184	378	98	58	.6	< .4	590	89	930	7.7	8.5
402	Alfred Young	678	May 18, 1966	17	--	37	14	181	167	233	129	.3	< .4	690	152	1,284	8.3	6.4
501	Y. J. Jacobs	45	Aug. 26, 1965	60	5.00	168	28	132	334	185	264	.3	1.5	1,010	530	1,600	7.0	2.5
601	E. H. Luck	96	Mar. 29, 1965	70	--	44	11	33	105	42	67	.3	< .4	319	157	470	6.6	1.1
602	Robert E. Harbers	90	Aug. 26, 1965	22	--	79	7	32	284	47	15	.3	< .4	342	227	553	7.4	.9
702	Walter Van Wart	130	Apr. 6, 1965	27	--	41	9	225	301	204	132	.2	< .4	790	141	1,250	7.5	8.3
703	do	533	Sept. 14, 1965	33	--	229	67	454	350	850	132	.6	< .4	2,280	850	3,250	7.4	6.8
704	do	300	June 9, 1965	23	--	37	28	690	318	1,040	485	.6	8	2,570	452	3,569	7.4	14.2
801	do	616	Apr. 8, 1965	28	.46	55	10	373	285	468	211	.4	< .4	1,290	179	1,950	7.6	12.1
15-302	Boehnke Bros.	200	June 14, 1965	17	--	183	57	610	281	840	640	.7	6.5	2,490	690	3,600	7.4	10.1
303	do	30	Sept. 14, 1965	26	--	6	2	29	44	23	11	.5	.9	179	24	197	8.6	2.6
601	Dr. Garrett Ray	56	Sept. 10, 1965	81	3.3	393	119	391	15	1,260	660	.9	13.5	2,930	1,470	3,850	5.5	4.4
602	Roy Roberts	280	Sept. 14, 1965	17	.08	108	32	421	306	520	362	.5	3.5	1,620	404	2,500	7.5	9.1

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
67-15-703	Max Johnson	380	Apr. 28, 1965	--	30	288	92	457	84	452	1,140	0.5	<0.4	2,500	1,100	4,100	6.8	5.9
902	John L. Frierson	220	Sept. 10, 1965	28	.24	169	36	206	239	191	425	.3	< .4	1,170	570	2,000	7.3	3.8
904	Molly Richardson	140	Sept. 15, 1965	33	.56	16	8	92	157	11	93	.3	< .4	331	72	575	7.2	1.5
16-201	Gene Birge	685	Sept. 14, 1965	24	--	91	19	478	293	570	369	.5	< .4	1,700	304	2,570	7.2	11.9
202	do	203	June 9, 1965	70	--	74	24	152	166	107	274	.3	< .4	780	285	1,340	6.9	3.4
203	do	226	Sept. 14, 1965	22	--	112	27	229	333	340	192	.4	3.0	1,090	393	1,680	7.5	5.0
302	Texaco	297	Mar. 29, 1965	35	--	58	13	169	283	169	121	.2	< .4	700	200	1,140	7.3	5.2
501	Texas & New Orleans Railroad Co.	500	Mar. 30, 1965	19	.58	36	13	233	451	95	130	.2	< .4	750	145	1,250	7.9	8.4
503	Glenn Ray	355	June 8, 1965	28	--	92	25	161	318	294	94	.1	< .4	850	332	1,290	7.5	3.8
504	Lenard Cherry	286	do	35	--	110	28	167	305	297	141	.3	< .4	930	390	1,460	7.4	3.7
704	-- Harkreader	200	May 27, 1965	24	--	77	24	155	343	187	125	.2	< .4	760	293	1,210	7.3	3.9
706	Midhurst Oil Corp.	400	Sept. 10, 1965	33	--	97	29	144	323	115	208	.2	< .4	790	363	1,350	7.4	3.3
23-101	V. J. Derry	360	Sept. 16, 1965	24	.56	224	60	254	323	485	409	.5	< .4	1,620	810	2,440	7.4	3.9
203	Arnim estate	200	Sept. 14, 1965	40	.7	1,236	467	700	--	1,660	3,380	1.0	< .4	7,500	5,000	9,970	4.8	1.4
204	T. Armstrong	33	Sept. 8, 1965	90	--	7	1	49	65	51	16	.5	< .4	247	23	295	6.3	4.5
205	Leroy Best	112	Sept. 16, 1965	38	--	393	76	268	328	980	406	.7	< .4	2,320	1,300	3,100	7.1	3.2
303	Paul Rosas	270	June 11, 1965	70	--	394	52	473	195	1,070	700	.8	5	2,860	1,200	3,591	7.2	6.0
502	Joe Grive	230	Sept. 16, 1965	22	--	112	19	186	337	240	181	.4	< .4	930	361	1,490	7.5	4.2
503	Hanna Simms	65	Sept. 24, 1965	3	--	27	131	345	560	9	660	< .1	< .4	1,450	610	2,670	7.4	6.1
603	Balcones Mineral Corp.	380	May 27, 1965	38	--	364	5	560	198	1,160	580	.7	< .4	2,810	930	3,800	7.2	8.0
604	William Hanna	114	June 11, 1965	53	< .02	254	40	362	195	337	810	.4	< .4	1,950	800	3,200	7.0	5.5
606	Felix Jorek	125	Sept. 8, 1965	72	1.42	233	41	350	134	700	500	.7	< .4	1,960	750	2,850	6.8	--
							Jackson Group											
59-58-201	Edwin Mueller	135	Sept. 21, 1965	63	--	203	50	201	49	800	202	0.6	<0.4	1,540	710	2,100	6.1	3.3
503	Marvin Matejowsky	105	Apr. 16, 1965	55	--	154	9	84	414	53	114	1.3	45	720	422	1,142	7.2	1.8
505	E. T. Radnez	300	do	91	--	48	7	57	117	35	95	.3	< .4	391	150	569	6.5	2.1

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
59-58-506	C. F. Able	332	Sept. 21, 1965	24	--	37	2	240	301	229	102	0.4	<0.4	780	101	1,250	8.0	10.4
66-01-302	Rudy Sulik	35	Aug. 25, 1965	76	--	107	9	173	285	108	183	.5	116	910	306	1,350	6.9	4.3
405	St. Peter and Paul Church	84	Mar. 26, 1965	42	< .02	25	2	175	226	110	110	.4	< .4	690	71	940	7.7	28.6
502	Thorstenberg Co.	470	Aug. 25, 1965	78	.14	2	--	109	160	26	55	.3	1.5	351	6	485	7.4	21.1
606	Ted Houghten	118	do	76	--	13	1	298	520	28	169	.7	1.5	840	39	1,350	7.7	13.5
701	Herbert C. Graham	338	May 4, 1965	49	--	25	2	461	355	459	216	.8	< .4	1,390	73	2,100	7.7	--
802	Jack Taylor	165	June 22, 1965	56	--	147	9	96	300	56	205	.4	23.0	740	404	1,230	7.1	2.1
09-206	-- Bramal	45	Aug. 26, 1965	72	< .02	359	20	191	345	246	610	.7	3.0	1,670	980	2,580	6.9	2.7
67-16-304	Jerry Michal	753	Aug. 27, 1965	36	.46	274	34	476	234	970	447	.7	< .4	2,350	830	3,220	6.9	4.7
506	Nathan Loth	198	Sept. 23, 1965	68	--	231	18	510	231	870	472	.7	3	2,290	650	3,190	6.9	8.7
604	Annie Phillipps estate	54	Aug. 27, 1965	58	--	1,230	210	1,280	--	1,610	3,800	1.6	< .4	8,200	3,950	11,200	3.5	8.1
705	John R. Rader	329	Sept. 23, 1965	8	.10	179	65	452	159	800	510	.5	3	2,100	710	3,080	8.0	7.4
801	W. T. Parker	187	Sept. 10, 1965	50	.04	431	56	850	78	1,220	1,290	1.0	< .4	3,940	1,310	5,500	6.5	14.1
23-605	George Richter	203	June 11, 1965	80	--	228	29	244	166	284	590	.3	< .4	1,540	690	2,500	6.6	4.0
24-101	Milwhite, Inc.	278	May 27, 1965	58	.88	179	11	370	207	550	388	.5	< .4	1,660	490	2,500	7.0	7.3
103	Louis Tenario	39	Sept. 10, 1965	60	--	41	6	43	134	19	62	.2	< .4	297	126	465	6.9	1.7
402	City of Flatonia well 4	462	July, 1952 Mar. 17, 1965	99 91	.84 .18	81 87	10 7	64 72	-- 157	37 52	163 154	.3 .5	< .4 .4	550 620	243 249	-- 620	7.2 6.9	-- 1.9
405	City of Flatonia well 5	436	Mar. 17, 1965	78	< .02	179	9	80	368	117	157	.4	17	1,010	485	1,250	7.1	1.6
									Catahoula Tuff									
59-51-702	Ed Schoenburg	59	Sept. 21, 1965	76	<0.02	88	8	85	357	27	87	0.3	3	550	256	843	7.4	2.3
801	Herbert Noak	150	Apr. 20, 1965	78	--	133	6	75	246	22	208	.4	< .4	640	358	1,070	7.4	1.7
802	Mrs. Willie Plueckham	65	do	16	--	372	25	367	448	153	860	.4	113	2,130	1,030	3,550	7.1	4.9
803	L. W. Siebel	200	May 28, 1965	69	--	437	16	333	434	178	900	.4	132	2,280	1,160	3,650	6.9	4.2
58-501	Earle R. Stork	128	Sept. 21, 1965	45	1.9	213	15	133	339	192	289	.8	< .4	1,060	590	1,700	7.1	2.4
504	E. T. Radnez	70	Apr. 16, 1965	71	--	283	26	224	450	176	520	.6	12	1,530	810	2,480	7.1	5.3
903	T. W. Gregory, Jr.	172	Sept. 21, 1965	56	--	91	6	86	344	21	92	.6	13	540	422	854	7.4	2.4

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
59-58-904	T. W. Gregory, Jr.	334	Sept. 21, 1965	24	--	230	8	69	365	77	155	0.3	213	960	610	1,470	7.3	1.2
59-201	Harold J. Schneider	221	June 24, 1965	56	--	125	3	27	378	12	60	.4	9.0	478	325	710	7.2	.6
506	Ernest Van Minden	275	Apr. 20, 1965	78	--	90	7	41	314	12	51	.4	< .4	433	253	655	7.5	1.1
507	John S. Neilsen	260	June 24, 1965	68	--	101	6	40	318	16	70	.7	< .4	458	278	725	7.8	1.1
702	Waddell Wied	278	Apr. 20, 1965	66	--	98	5	32	328	10	42	.5	< .4	415	265	640	7.3	.8
66-01-902	City of La Grange	350	Sept., 1953	79	.17	29	6	--	--	63	99	.6	--	700	97	--	7.8	--
			Mar. 16, 1965	69	--	26	3	209	433	45	96	.8	< .4	880	77	1,030	7.8	10.4
903	do	325	Sept., 1953	89	.22	8	1	281	--	81	146	.8	--	795	24	--	8.0	--
			Jan., 1960	--	.14	12	1	248	--	46	145	.7	.4	792	35	1,320	7.8	--
			Mar. 16, 1965	73	--	15	1	283	482	44	149	.8	< .4	1,050	41	1,250	8.0	19.3
904	do	349	Jan., 1960	--	.18	8	1	272	--	30	147	.8	.4	804	20	1,340	7.7	--
			Mar. 16, 1965	75	--	6	--	262	443	32	129	1.1	< .4	950	16	1,120	7.7	28.9
905	do	283	Jan., 1960	--	.48	12	2	176	--	45	102	.8	1.3	522	37	870	7.8	--
			Mar. 16, 1965	75	--	8.6	.4	184	322	34	88	.8	< .4	710	24	835	7.7	16.5
906	do	210	Sept., 1953	91	.30	8.0	1	244	--	81	85	1.2	--	690	24	--	7.9	--
			Jan., 1960	--	.01	58	10	122	--	39	63	.5	.4	543	186	905	7.5	--
			Mar. 16, 1965	75	--	7	1	219	403	44	77	1.1	< .4	830	20	925	7.9	21.2
907	do	255	*June 24, 1942	72	.02	18	1.1	194	368	56	77	.3	1.4	603	50	--	--	--
			Sept., 1953	84	.09	9	2	212	--	62	96	.6	--	627	31	--	7.9	--
			Jan., 1960	--	.48	12	2	176	--	45	102	.8	1.3	522	37	870	7.8	--
02-201	Luther Hill Lutheran Church Camp	236	Apr. 21, 1965	35	< .02	142	4	21	403	14	44	.3	2	460	373	755	7.2	.5
503	Elo Tietjen	180	do	69	.62	94	5	43	344	20	36	.4	< .4	437	255	655	7.3	1.2
505	Tom Holmes	525	May 5, 1965	60	--	60	5	120	399	47	89	.3	< .4	550	173	895	7.5	3.9
507	Alvin Harms	260	June 4, 1965	80	--	79	5	49	336	23	31	.2	< .4	441	220	650	7.5	1.4
702	City of La Grange	283	Jan., 1960	--	.38	10	1	186	--	50	81	.3	.4	555	31	925	7.7	--
706	George Adamcik	204	June 24, 1965	47	.36	72	5	77	350	48	21	.4	< .4	442	200	666	7.3	2.4
03-303	S. J. Bonner	690	May 14, 1965	84	--	17	1	230	520	22	68	.5	< .4	680	45	1,020	7.9	15.0
09-104	Joe L. Taylor	32	Aug. 27, 1965	58	.08	188	8	181	320	65	376	.5	26	1,060	500	1,800	7.3	3.5
204	Holy Rosary Church	190	Apr. 9, 1965	71	--	78	6	159	290	29	214	.4	< .4	700	220	1,155	7.4	4.7
205	Arthur Hoffmann	220	Aug. 26, 1965	78	< .02	108	6	75	303	37	131	.5	2	590	294	930	7.2	1.9
302	Henry Kruppa	420	Sept. 23, 1965	56	< .02	64	3	166	381	71	117	.2	2	670	173	1,050	7.6	5.5

See footnotes at end of table.

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
66-09-304	Edwin Freeman	460	Apr. 30, 1965	--	--	34	4	224	451	43	136	0.4	<0.4	660	100	1,140	7.6	9.8
403	Jim Fajkus	40	June 3, 1965	69	--	93	1	37	320	12	18	.4	20	407	237	595	7.3	1.1
504	Mrs. F. H. Kreger	289	June 18, 1965	73	--	112	2	64	328	14	104	.4	< .4	530	290	840	7.3	1.7
10-102	George Adamick	708	June 23, 1965	45	--	11	1	335	610	< 4	173	.7	< .4	870	32	1,420	7.7	25.9
67-16-902	Francis Kreger	200	June 10, 1965	88	--	138	7	62	359	43	125	.7	< .4	640	372	990	7.5	1.4
903	Nelson Holz	350	do	85	<0.02	97	5	79	251	42	143	.8	< .4	580	263	910	7.4	2.1
24-202	Arnold Loth	190	June 11, 1965	68	--	110	4	23	336	18	38	.4	3	429	294	646	7.5	.6
203	W. M. Hill	225	June 15, 1965	78	--	143	6	77	209	50	242	.6	< .4	700	384	1,171	7.2	1.7
301	Louis Otten	335	June 11, 1965	85	--	143	13	155	349	43	314	.3	< .4	930	412	1,505	7.9	3.3
406	City of Flatonia well 6	340	Mar. 17, 1965	69	1.16	102	3	58	356	16	60	.5	< .4	670	266	745	7.3	1.6
407	City of Flatonia well 7	207	do	75	.64	103	1	61	360	20	56	.4	< .4	680	262	760	7.2	1.6
408	Leroy Richter	174	May 27, 1965	90	< .02	139	9	51	351	37	117	.7	< .4	620	384	945	7.3	1.1
409	Ira Syler	203	Sept. 16, 1965	78	--	336	27	115	393	81	560	.7	< .4	1,390	950	2,340	7.4	1.3
701	Ben Derilek	180	June 15, 1965	50	--	72	2	33	294	6	7	.5	4.0	320	188	467	7.4	1.1
	Catahoula Tuff and Oakville Sandstone																	
59-59-703	Walter Weyand, Sr.	256	June 24, 1965	36	--	98	8	34	376	7	23	0.6	7.0	399	277	643	7.2	--
66-03-401	Roger Reed	800	†July 27, 1956	--	--	12	27	194	335	35	106	--	--	769	140	--	--	--
			May 12, 1965	80	--	19	2	213	495	20	82	.3	1.5	660	54	1,023	7.7	--
804	City of Fayetteville	908	*Aug. 8, 1942	60	0.02	5.6	.5	240	534	31	48	.2	--	645	16	--	--	--
			Mar., 1960	--	.62	6	1	232	--	37	48	.7	.4	590	18	984	8.2	--
			Mar. 18, 1965	58	.02	6.4	.3	233	530	27	46	.5	.4	639	17	960	8.3	--
09-602	Mrs. Augusta Heller	203	June 18, 1965	40	--	167	12	146	331	123	253	.7	31.0	940	464	1,550	7.2	--
17-103	Alfred Gabler	639	June 16, 1965	85	--	95	4	81	332	52	88	.3	< .4	570	257	858	7.5	--
201	Robert E. Schaffer	1,010	Apr. 29, 1965	--	--	75	8	108	338	43	104	< .4	.5	510	221	941	7.5	--
605	City of Schulenburg	672	*July 17, 1942	--	--	9.4	1.0	250	513	26	88	1.8	.4	710	--	--	8.0	--
			Apr., 1958	--	.3	8	1	240	--	30	83	.5	.4	676	25	1,127	8.0	--
67-24-201	Henry Loth	159	Mar. 31, 1965	21	--	92	2	40	336	32	12	.4	< .4	364	236	600	7.3	--

See footnotes at end of table.

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
								Oakville Sandstone and Lagarto Clay										
59-58-901	H. E. Zapp	65	June 3, 1965	11	--	497	22	340	342	201	445	0.3	970	2,650	1,330	3,550	7.1	0.9
902	Robin Rauch	100	do	78	0.10	136	3	66	361	30	119	.4	16	630	353	1,000	7.3	1.6
59-302	Lee Wagner	80	June 2, 1965	27	--	92	2	45	343	10	30	.5	5	381	239	635	7.3	1.3
402	Gus Ebner	44	Sept. 21, 1965	50	--	174	5	136	406	59	260	.5	< .4	890	457	1,490	7.3	2.7
505	Dan Nagel	40	Apr. 20, 1965	18	--	154	1	27	306	41	55	.4	100	550	388	850	7.2	.6
601	Otto Markwardt	48	Sept. 22, 1965	42	.02	88	2	40	298	14	26	.3	21	380	229	588	7.4	1.1
701	Lenora Zapp	80	Apr. 20, 1965	24	--	162	4	30	392	22	54	.5	85	580	423	910	7.1	.6
66-02-305	Charles Musse	145	Apr. 21, 1965	49	--	90	4	28	321	9	23	.4	< .4	361	244	570	7.3	.8
402	J. S. Burkett	54	May 27, 1965	64	--	138	6	46	388	36	66	.4	20	570	373	880	7.1	1.0
501	Tom Holmes	400	May 5, 1965	69	--	59	6	101	346	35	68	.3	< .4	510	172	775	7.4	3.3
504	do	350	do	66	2.00	50	4	141	367	25	94	.3	< .4	560	141	900	7.5	5.5
506	Alvin Harms	91	June 4, 1965	31	--	104	1	17	268	30	26	.3	17	358	263	580	7.4	.5
601	Mary Prasifka	175	May 25, 1965	24	.22	97	10	138	376	39	179	.5	< .4	670	285	1,170	7.2	3.5
602	L. M. Lota	26	June 4, 1965	34	--	123	2	22	393	11	12	.6	7	405	316	645	7.3	.5
901	W. D. Ankleman	357	Apr. 21, 1965	38	--	22	8	299	530	9	196	7.0	< .4	830	86	1,400	7.7	14.0
902	do	497	do	71	--	12	1	285	610	31	93	.7	< .4	790	33	1,200	7.9	21.8
904	Edward Roach	145	June 3, 1965	22	--	76	7	148	397	46	135	.6	< .4	630	219	1,090	7.4	4.4
906	Mrs. A. L. Didion	270	Sept. 23, 1965	40	--	14	2	201	455	36	45	.3	2	590	43	873	7.8	13.4
03-102	E. F. Houlec	315	Sept. 22, 1965	81	.10	55	4	132	405	35	55	.4	< .4	560	155	822	7.5	4.6
104	H. Wibbenhorst, Jr.	240	do	78	--	71	7	70	337	26	48	.3	< .4	466	206	691	7.4	2.1
302	S. J. Bonner	370	May 14, 1965	73	--	22	2	231	550	4	93	.5	2	700	66	1,092	7.8	38.7
405	Bryan James	360	†July 3, 1956 May 11, 1965	-- 5	-- --	32 11	18 3	134 135	366 310	45 < 4	70 56	-- .2	-- < .4	665 362	156 39	-- 652	-- 7.9	-- 9.4
602	E. E. Watson	118	June 4, 1965	31	--	104	16	94	322	26	178	.4	< .4	610	326	1,065	7.4	2.3
805	Curtis Nitschke	92	June 24, 1965	30	--	71	7	112	406	42	36	3.0	15	520	204	815	7.6	3.3
806	Raymond Baca	71	do	24	--	132	18	144	456	26	214	1.0	7.0	790	402	1,390	7.0	3.1

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
66-04-105	E. C. Minissen	68	June 2, 1965	24	0.16	124	5	113	320	65	165	0.3	17	670	328	1,150	7.4	2.7
106	Jesse Heinsohn	114	June 24, 1965	28	--	145	7	107	431	77	127	.4	7.0	710	393	1,153	7.0	2.3
203	do	56	do	22	.04	126	8	101	328	47	153	2.8	17.0	640	346	1,089	7.2	2.3
09-401	Bernard Muras	260	June 4, 1965	73	--	126	6	66	279	32	161	.4	< .4	600	338	980	7.3	1.6
501	Eldon Knape	289	*June 27, 1965	80	--	127	12	132	227	37	260	--	.5	784	366	1,350	6.9	2.8
502	F. S. Dullnig	380	May 24, 1965	18	1.8	79	13	147	327	< 3	226	.4	< .4	--	250	1,200	7.4	3.6
503	Joe Nesner	383	Apr. 29, 1965	--	--	94	11	131	311	49	193	.5	< .4	630	279	1,154	7.4	3.4
604	Adolph Matocha	159	June 18, 1965	38	--	189	23	161	356	119	360	.5	< .4	1,070	570	1,800	7.4	2.8
702	Archie Oeding	450	Apr. 9, 1965	27	--	93	4	107	307	39	146	.6	< .4	570	251	985	7.4	2.8
705	Clarence Guentert	80	do	35	--	90	5	32	323	12	13	.9	12	359	245	563	7.3	.8
706	Frank Tilicek	225	May 18, 1965	75	--	103	6	67	328	38	88	.5	< .4	540	283	835	7.5	1.7
801	Ernests Bros.	276	Apr. 22, 1965	73	--	92	7	106	293	46	148	.6	< .4	620	258	985	7.4	2.9
901	Egon Tietjen	138	Apr. 15, 1965	35	.04	82	6	141	444	24	102	1.0	< .4	610	231	1,004	7.3	4.1
902	W. C. Bolling	359	June 22, 1965	36	--	135	12	73	343	31	159	.4	< .4	620	386	1,049	7.2	1.6
10-204	Bill Ruckert	24	Sept. 7, 1965	20	.05	239	21	51	196	127	88	.4	480	1,120	690	1,700	7.2	.8
207	Gus Petras	225	do	30	--	19	5	340	690	37	162	1.1	< .4	930	69	1,550	7.8	56.9
401	Edmund Barner	70	Sept. 9, 1965	36	--	72	12	123	401	29	96	.5	< .4	570	228	940	7.4	3.5
501	Anton A. Solas	491	Apr. 30, 1965	--	--	14	3	386	820	< 4	173	.6	< .4	980	48	1,650	7.8	24.3
502	Joe Muras	484	do	--	--	18	2	421	800	< 4	226	.4	< .4	1,060	53	1,790	7.6	25.3
504	L. F. Vacek	24	June 4, 1965	16	--	110	2	66	417	30	38	.4	< .4	467	281	785	7.5	1.7
702	John A. Bartosch	247	Apr. 15, 1965	38	--	108	18	189	364	100	243	.7	< .4	880	343	1,505	7.3	4.4
704	Frank J. Cernasek	152	Sept. 9, 1965	22	1.32	86	8	114	325	12	152	.9	< .4	560	247	980	7.4	3.2
902	Shapleigh G. Gray	142	Sept. 7, 1965	22	.04	87	11	69	371	34	49	.6	< .4	455	261	750	7.6	1.8
904	Henry Hudec	32	Sept. 8, 1965	26	--	123	7	24	320	17	58	.4	24	436	337	740	7.4	.6
11-102	Alman Gau	380	Sept. 23, 1965	36	--	19	1	463	1,020	< 4	172	.9	2	1,190	54	1,920	7.7	27.8
203	City of Ellinger well 1	125	*June 27, 1960	20	--	23	9.2	270	517	49	144	.4	.8	771	96	1,330	7.4	--
			Mar. 18, 1965	22	--	103	23	296	394	115	391	.4	5	1,350	353	2,000	7.3	6.9

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
66-11-204	City of Ellinger	244	June 27, 1965	21	0.00	18	8.7	267	518	47	133	0.6	0.0	751	--	1,290	7.4	6.8
	well 2		Mar. 18, 1965	22	--	105	24	296	398	116	390	.4	5	1,360	362	2,000	7.2	--
205	City of Ellinger well 3	648	Mar. 18, 1965	80	--	19	2	481	1,050	< 4	152	.4	< .4	1,780	54	1,900	7.6	28.6
206	Ed Tobias	268	do	20	--	24	9	277	510	48	157	.3	< .4	1,050	98	1,300	7.8	12.2
702	Ed Rabel	352	Sept. 8, 1965	17	--	13	6	227	377	< 4	161	.5	.4	610	56	1,060	7.8	13.3
17-102	Herbert Friedrich	113	June 11, 1965	13	--	31	2	7	102	11	5	.1	< .4	119	88	189	7.5	.1
104	Calvin F. Schultze	315	June 16, 1965	83	--	112	8	94	311	36	168	.5	< .4	660	312	1,051	7.4	2.5
105	Ed Friedrich	115	do	38	--	99	7	218	220	4	390	.3	< .4	860	276	1,510	7.3	5.2
106	Martin Guentert	458	do	85	--	85	6	104	306	41	115	.5	< .4	590	238	886	7.4	2.5
202	St. Mary's Parish	96	Apr. 9, 1965	25	--	111	5	48	340	17	49	.3	33	455	298	753	7.2	1.2
302	Albert Savera	248	June 16, 1965	25	--	117	1	49	316	14	84	.5	8	454	295	795	7.3	1.2
401	E. J. Bryant	97	Sept. 24, 1965	33	--	100	4	31	317	12	32	.4	9	374	264	612	7.3	.8
403	Fritz Michalke	77	June 16, 1965	30	.02	107	5	72	368	24	71	.4	26	520	287	863	7.4	1.9
501	Robert Kallus	115	do	28	--	630	26	281	353	308	1,250	.4	< .4	2,700	1,690	4,390	7.4	2.9
601	City of Schulenburg	272	Apr., 1958	--	.20	53	6	128	--	38	75	.3	.4	480	134	800	7.4	--
	well 4		Mar. 30, 1965	32	--	47	6	145	336	35	110	.3	< .4	540	142	895	7.6	5.3
602	City of Schulenburg	272	Apr., 1958	--	.50	45	6	128	--	46	96	.3	.4	492	139	820	7.4	--
	well 3		Mar. 16, 1965	31	--	48	7	164	323	20	155	.3	< .4	586	265	1,010	7.6	5.8
604	City of Schulenburg	262	*July 16, 1965	28	.45	48	8.3	127	321	40	82	.3	.5	492	154	836	7.8	--
	well 1		Apr., 1958	--	.10	32	6	154	--	21	94	.4	.4	521	105	868	7.6	--
			Mar. 17, 1965	71	.90	8	--	269	510	38	96	.5	< .4	731	20	1,130	8.1	38.0
607	Jaek Klesel	94	Apr. 28, 1965	--	--	153	8	104	338	49	183	.5	68	730	415	1,280	7.3	2.1
608	Carnation Milk Co. well 2	260	May 27, 1965	27	--	60	7	127	360	24	95	.3	< .4	520	178	880	7.4	4.1
609	Carnation Milk Co.	260	†Dec. 16, 1965	--	--	100	3	237	647	0	177	--	--	1,164	265	1,940	--	--
	well 3		May 28, 1965	27	--	46	6	135	349	28	91	.2	< .4	510	142	854	7.7	4.9
613	Frank Marek	97	June 17, 1965	23	--	98	2	33	270	14	54	.2	< .4	357	251	627	7.5	.9
702	Emil Schwenke	45	Sept. 8, 1965	24	.02	117	4	54	326	20	69	.5	38	487	307	870	7.3	1.3
802	St. John's Parish	260	Apr. 22, 1965	33	.14	100	6	58	287	12	104	.4	< .4	454	275	790	7.4	1.5
803	Henry Huebner	50	Sept. 8, 1965	20	.02	87	2	10	256	11	8	.1	13.5	278	228	465	7.5	.3

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorption ratio (SAR)
66-17-905	L. J. Vacek	340	June 17, 1965	28	--	31	2	166	403	33	60	0.4	<0.4	520	83	834	7.9	7.9
906	Otto Priesmeyer	380	June 16, 1965	28	--	27	4	171	348	45	87	.6	< .4	530	83	875	7.9	8.2
18-101	J. Borgas	114	Sept. 24, 1965	22	0.02	202	15	139	276	52	405	.8	17	990	570	1,770	7.2	2.5
201	Emil Janecek	36	June 4, 1965	20	--	83	1	58	393	12	10	.7	< .4	378	212	630	7.3	1.7
202	Kenneth Hollas	132	Sept. 9, 1965	24	.46	95	2	46	361	7	28	.6	3.0	384	248	635	7.4	1.3
404	W. W. Mikesky	322	June 17, 1965	38	--	107	15	108	261	16	246	.4	< .4	660	330	1,181	7.5	2.5
405	do	100	do	28	--	149	16	70	320	45	208	.5	< .4	670	437	1,177	7.5	1.5
406	George Koniecka	100	do	38	--	127	6	63	398	18	103	.3	< .4	550	343	936	7.7	1.5
701	Melvin C. Surcula	290	do	23	--	27	7	171	376	47	91	.3	< .4	550	98	900	7.8	7.5
67-24-303	Herbert Hoffman	266	June 22, 1965	42	--	154	13	121	304	66	284	.4	< .4	830	437	1,500	7.2	2.5
501	L. V. Miller	120	Apr. 1, 1965	78	--	88	4	30	305	26	19	.3	< .4	395	238	550	7.6	.8
502	do	150	do	78	--	89	3	30	303	21	22	.4	< .4	392	235	560	7.3	.8
503	F. Stryk	50	June 15, 1965	22	--	135	3	23	316	13	70	.4	34	452	353	771	7.3	.2
504	St. Mary's Praha Church	150	Apr. 15, 1965	73	--	101	3	51	350	23	49	.4	< .4	472	264	709	7.3	1.4
505	do	75	do	71	--	101	4	48	348	21	51	.5	< .4	468	271	714	7.3	1.3
506	George Masek	128	June 15, 1965	23	--	160	3	22	282	12	33	.5	15	348	261	590	7.5	.6
507	August J. Biley	200	do	75	< .02	100	2	45	331	25	45	.4	< .4	455	261	654	7.4	1.2
602	Jerry Simek	390	Sept. 16, 1965	74	--	29	3	187	344	56	100	.5	< .4	620	84	936	7.6	8.9
606	Rubin Kalich	235	Apr. 27, 1965	--	--	97	4	46	304	17	66	.5	< .4	380	259	699	7.5	1.2
607	Walter Seidel	200	Apr. 29, 1965	--	--	95	5	35	300	26	43	.5	< .4	353	258	641	7.4	.9
609	W. J. Kopecky, Sr.	30	Mar. 31, 1965	33	--	117	2	41	332	18	56	.5	15	446	302	730	7.5	1.0
611	James Ferrell	600	Sept. 17, 1965	70	--	101	5	81	321	28	101	.5	< .4	550	272	848	7.6	1.8
702	Marvin Hahn	205	June 23, 1965	33	--	104	4	69	340	25	70	.5	25	498	280	820	7.2	1.8
802	E. H. Laine	306	June 15, 1965	53	--	103	9	99	354	56	110	.3	.4	600	292	952	7.5	2.2
901	H. A. Williams	13	Sept. 8, 1965	15	--	98	2	9	272	18	23	.4	< .4	299	253	525	7.6	2.3

See footnotes at end of table.

Table 6.--Chemical analyses of water from wells in Fayette County--Continued

Well	Owner	Depth of well (ft)	Date of collection	Silica (SiO_2)	Iron (Fe)	Cal-cium (Ca)	Magne-sium (Mg)	Sodium (Na)	Bicar-bonate (HCO_3)	Sul-fate (SO_4)	Chlo-ride (Cl)	Fluo-ride (F)	Ni-trate (NO_3)	Dis-solved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH	Sodium adsorp-tion ratio (SAR)
									Alluvium									
66-01-603	Martin Manual	36	June 2, 1965	62	--	81	25	30	376	36	13	0.4	6	438	303	665	7.3	--
604	do	48	June 23, 1965	53	--	71	31	114	537	6	80	.6	< .4	620	306	1,003	7.3	--
605	Alvin Jucmenek	24	Aug. 25, 1965	24	<0.02	119	10	26	320	30	35	.3	62	463	338	715	7.6	--
801	Jack Taylor	91	June 22, 1965	72	--	93	10	66	126	170	97	.4	< .4	570	272	846	7.2	--
10-202	Johnnie Naiser	36	June 4, 1965	27	--	187	31	75	458	50	160	.2	160	920	590	1,450	7.1	--
205	Louis Dopslauf	39	Sept. 7, 1965	17	.10	120	6	17	312	16	46	.2	24	399	324	680	7.5	--
208	Ed Naiser	30	June 4, 1965	27	--	194	13	123	468	25	290	.2	5	910	540	1,600	7.3	--
602	Avie Pajovsky	36	Sept. 7, 1965	20	--	114	4	35	325	39	46	.3	13.0	431	305	730	7.5	--
11-104	Leonard Baca	26	Sept. 23, 1965	22	--	157	12	92	366	100	179	.4	2	740	442	1,230	7.2	--
202	Fred Zapalac	50	do	22	.5	133	33	300	500	177	368	1.8	7	1,290	468	2,040	7.2	--
67-08-105	Victor Ellas and Ann Velasta Horton	28	Apr. 1, 1965	20	--	95	10	13	310	20	12	.3	15	337	278	570	7.3	--
201	Carl Fritsch	31	Aug. 25, 1965	17	--	84	16	11	316	14	10	.5	9	317	275	535	7.5	--
304	Elgin Hart	50	Aug. 24, 1965	30	--	26	6	108	326	16	19	.2	30	368	88	570	7.4	--
305	Jack Young	58	Aug. 26, 1965	24	.20	94	8	12	277	41	18	.3	1.5	335	267	545	7.3	--

* Analysis by U.S. Geological Survey.
† Analysis by Texas A&M University.

Table 7.--Oil and gas tests selected as data-control points

Well	Operator	Lease and well	Survey	Date of log
59-57-501	W. J. Rasnick	Krakosky No. 1	H. Clement	Oct. 2, 1946
801	J. W. Frazier	Zock No. 1	Jas. S. Lester 1/3 League	Dec. 2, 1947
58-701	Seaboard Oil Co., and Standard Oil Co. of Kansas	Alfred A. Pietsch No. 1	J. R. Phillips	Nov. 17, 1947
801	Seaboard Oil Co.	Gus Oeser No. 1	J. G. Wilkinson League	Sept. 22, 1947
802	Justiss-Mears Drilling Co., Inc.	Edward J. C. Weishuhn No. 1	do	Mar. 11, 1952
803	P. G. Lake Inc.	August Pietsch No. 1	J. R. Phillips	Sept. 24, 1949
805	Sohio Petroleum Co.	M. C. Briscoe, et al. No. 1	do	Mar. 1, 1962
59-101	Cuatis Singleton Drilling Co.	John Krause No. 1	Green DeWitt	--
301	C. Andrade III and John R. Less	Eichler No. 1	C. Fleasner 1/3 League	June 2, 1948
501	Colorado Oil Co.	Anders No. 1	Jas. Winn League	Dec. 12, 1950
502	R. T. Wilson	Alfred Levien No. 1	do	Feb. 4, 1944
509	Cockburn Oil Corp.	Bruno Gebhard No. 1	Wm. H. Jack League	Apr. 2, 1947
66-01-503	K. Hughes	J. J. Ryza No. 1	Wm. H. Taylor	Feb. 22, 1948
601	Cable Tool Drilling Co., Delta Drilling Co., and B. G. Byars	Witt No. 1	S. Castlemen 1/2 League	Oct. 3, 1952
804	Kennscott Copper Corp.	Schwartz No. 1	John Castleman 1/2 League	Dec. 15, 1944
901	Burdette Drilling Co.	Wm. Hermes No. 1	John H. Moore 1/2 League	May 14, 1949
02-303	American Liberty Oil Co.	Schlottman No. 1	W. J. Russell League	Mar. 31, 1948
304	Hamman Oil & Refining Co.	Mikes No. 1	Nathaniel Townsend League	Oct. 25, 1954
701	M. M. Miller	J. H. Gleckler, et al., No. 1	Anna Powell League	June 22, 1954
801	American Liberty Oil Co.	Vince Baca No. 1	E. Savage	Apr. 28, 1948
03-402	Ft. Bend Oil Co.	James No. 1	John M. Hensley League	Apr. 10, 1953
605	O. C. Garvey	Antoine Mexer, et al. No. 1	James Murry	Dec. 7, 1940
801	Hamman Oil and Refining Co.	Burnsides No. 1	Lucy Kerr League	Oct. 20, 1954

Well	Operator	Lease and well	Survey	Date of log
66-04-103	Jones Creek Oil Co.	K. B. Krebs No. 1	John Rice Jones League	July 10, 1947
09-201	M. M. Miller and Sons	G. E. Janda No. 1	David Berry League	Jan. 9, 1954
202	H. E. Buckart	Mary A. Brown No. 1	do	Aug. 16, 1951
406	C. B. Hazel and Henry F. Burrow, Jr.	Ehler No. 1	T. O. Berry League	Feb. 18, 1964
601	M. E. Davis	C. M. Janda No. 1	Fayette Co. School Land	Oct. 15, 1945
701	Mound Company	Dieringer No. 1	Richard Smith	Feb. 5, 1957
802	E. & H. Phillips	Otto Kaase No. 1	W. H. Toy League	June 3, 1953
10-601	Fidelity Oil and Royalty Co.	Roy Wegenhoft No. 1	S. A. Pugh League	Feb. 17, 1953
17-101	Gulf Coast Leaseholds, Inc., and J. D. Watzlavick	Harry Vogelsang No. 1	S. K. Knight League	Jan. 27, 1961
18-402	Benedum and Trees, et al.	Ray Kusky No. 1	S. A. Sargent League	June 26, 1944
67-07-602	Thomas Jordan, Inc.	W. A. Rosanky No. 1	Jas. McAllister League	Aug. 28, 1951
802	Continental Oil Co.	A. E. Adamcick No. 1	Thos. Thompson 3/4 League	Feb. 24, 1944
08-101	Rodney Delange - C. Neathery, Jr.	A. C. Lenert No. 1	Wm. Barton	Sept. 22, 1959
301	Hamman Oil & Refining Co. and J. L. Crawford	Harris No. 1	John F. Berry League	Oct. 26, 1951
405	Derring and Abernathy	S. Haynie No. 1	Thomas Chocran	June 15, 1945
701	Coastal Engineering and C. D. Miller	J. F. Faison No. 1	Patrick Breedy 1/3 League	--
705	O. W. Fitz and Associates	Wallace Cherry No. 1	do	Sept. 25, 1959
901	Traders Oil Co.	Fleck No. 1	Rubin Fisher	Aug. 9, 1948
14-601	H. C. Starkey	Anderson-Pearce No. 1	J. Beldon	July 16, 1947
901	Sutton Drilling and E & H Phillips	Tom Cockrell No. 1	S. M. Williams League	Aug. 4, 1952
15-101	Clark & Cowden Drilling Corp.	Oswald Buescher No. 1	Samuel Millet League	Feb. 27, 1947
107	Continental Oil Co.	C. Vinklarek No. 1	do	Aug. 22, 1946
204	Shell Oil Co.	Max Marburger No. 1	W. G. Pierson	Aug. 1, 1955
401	Continental Oil Co.	Fannie Gabitzsch No. 1	J. T. Whitesides League	May 10, 1942

Table 7.--Oil and gas tests selected as data-control points--Continued

Well	Operator	Lease and well	Survey	Date of log
67-15-405	Meco Production Co.	Cochrill No. 1a	J. T. Whitesides League	Sept. 2, 1945
406	Continental Oil Co.	Fannie Gabitzsch No. 2	do	Feb. 4, 1944
407	Meco Production Co.	Cochrell No. 3A	do	Jan. 17, 1945
408	Joe Mellard	Theide No. 1	James Robinson	Dec. 5, 1943
409	Meco Production Co.	Gosch No. 2	J. T. Whitesides League	Mar. 27, 1945
501	Continental Oil Co.	Andrew Thomas No. 1	Peggy Brown League	Jan. 28, 1953
603	Humble Oil & Refining Co.	Enoch Needham No. 1	do	Nov. 20, 1963
701	Jergins of Texas, Ltd.	Mrs. W. C. Ballard No. 1	Jacob Stiffler League	Oct. 25, 1955
706	Amerada Petroleum Corp.	Brown No. 1	do	Mar. 26, 1946
801	Rodney De Lange-O'Neathery, Jr.	E. A. Arnim No. 1	John McGowan	Aug. 21, 1958
901	Hamman Oil & Refining Co. and Continental Oil Co.	Steinhauser No. A-1	F. E. Seller	Aug. 14, 1953
905	Continental Oil Co.	Mary Huff Drenner No. 6	James Parrott 1/3 League	Jan. 21, 1952
906	do	A. L. Price No. 3	J. M. Molina	Feb. 6, 1955
907	do	Otto Steinhauser No. 1	James Parrott 1/3 League	Apr. 3, 1953
908	do	A. F. Steinhauser No. 3	Almon Weaver	June 13, 1951
909	do	Ervine & Bishop No. 1	do	Feb. 9, 1952
910	do	Mary Huff Drenner No. 2	James Parrott 1/3 League	May 3, 1951
16-204	Sutton Producing Co.	Earthen Producing Company No. 3	M. Muldoon League	Mar. 16, 1965
205	do	Earthen Producing Company No. 2	do	Feb. 25, 1965
301	C. G. Glasscock	R. H. Mattingly No. 1	Jessie Bartlett League	Nov. 8, 1951
601	M. M. Miller	Mull No. 1		Dec. 10, 1954
602	do	Joel A. Cole, et al. No. 1	T. O. Berry League	Mar. 19, 1957
701	Hamman Oil & Refining Co.	Weidel No. 1	John Vivien 1/3 League	Nov. 25, 1951

Well	Operator	Lease and well	Survey	Date of log
67-16-702	M. M. Miller	C. Helmcamp No. 1	Jose Maria Molino 1/3 League	Oct. 14, 1941
703	M. M. Miller & Sons	John Kerr, Jr. No. 1	do	--
708	Continental Oil Co.	A. L. Price No. 1	J. B. Tatum 1/3 League	Oct. 31, 1952
709	Sutton Drilling Co.	Cherry No. 18	F. A. Bettinger 1/3 League	Nov. 21, 1952
710	J. S. Michael Co.	Nancy Kerr Johnson	Joseph R. Tatum 1/3 League	Sept. 11, 1965
802	Hamman Oil & Refining Co.	C. O. Speed No. 1	Noah Carnes League	Oct. 18, 1962
23-103	Continental Oil Co.	Arnim No. C-1	Adam Zumwalt League	Aug. 25, 1953
104	Owen & Bentliff	Arnim & Johnson No. 1	do	Feb. 27, 1946
105	Continental Oil Co.	E. A. Arnim No. 1	do	Feb. 19, 1945
201	do	Wm. Bilton No. 5	J. S. Menefee 1/3 League	Dec. 19, 1952
209	do	J. D. Arnim No. 1	Wm. Kuykendall 1/3 League	Nov. 1945
210	do	Louise Paulus No. 1	J. S. Menefee 1/3 League	Nov. 29, 1944
211	do	Ceasar Moore No. 1	do	Sept. 16, 1945
213	Sutton Drilling Co.	B. Kelso No. 1	Geo. Hernandez	Jan. 26, 1954
214	do	Mrs. B. N. Dozier No. 2	Wm. Kuykendall 1/3 League	May 19, 1954
215	do	Arnim No. 1-C	do	Sept. 21, 1953
216	Continental Oil Co.	E. A. Arnim No. 2	J. S. Menefee 1/3 League	Feb. 12, 1949
301	Forney and Winn	A. E. Kelso No. 1	Almon Weaver	Oct. 14, 1953
302	H. J. Hindes	Kerr No. 1	James Parrott	--
304	Kelson and Thompson	Oluga Marcie No. 1	Geo. Hernandez	May 5, 1957
504	Continental Oil Co.	Sanders No. 2	J. S. Menefee 1/3 League	Aug. 18, 1951
505	do	Louise Paulus, et al. No. 5	do	May 18, 1956
506	do	J. Armstrong No. 1	do	Jan. 18, 1951
601	Sutton Drilling Co.	Leon Mirales No. 1	W. A. Matthews 3/4 League	Nov. 10, 1955
602	Palmer Oil Corp.	Alvin Syrinak No. 1	do	Mar. 16, 1944
607	Sutton Drilling Co.	Hanna No. 1	do	Feb. 14, 1955

Table 7.--Oil and gas tests selected as data-control points--Continued

Well	Operator	Lease and well	Survey	Date of log
67-24-508	Parker, McFarland, and Monsanto Chemical Co.	Anton Styrk No. 1	M. Muldoon League 13	Jan. 24, 1956
601	Bankline Oil Co.	J. J. Novak No. 1	do	--
703	Henry F. Burrown, Jr., Sunray DX Oil Co., and Stapp Drilling Co.	Louis Wehmeyer No. 1	George W. Cottle League	Oct. 21, 1964