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HARRISON COUNTY, TEXAS

WATER RESOURCES

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WATER RESOURCES OF HARRISON COUNTY, TEXAS

By

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GROUND WATER

By

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INTRODUCTION

This report contains records of 195 wells and 5 springs, drillers' logs of 53 wells, summary descriptions of electrical logs of 5 wells, and results of partial chemical analyses of water from 141 wells and 5 springs in Harrison County, Texas. It includes 2 maps; one showing the location of the wells and springs, and the other a geologic map of Harrison County and adjacent or nearby counties to the north and west (figure 1), copied from the geologic map of Texas which was compiled in 1937 by the U. S. Department of the Interior, Geological Survey. It also includes a page of graphs (figure 2) reproduced from the electrical logs of 5 oil tests in Harrison County. The numbers shown on the well map and in figure 2 correspond to those in the tables of well records, drillers' logs, and analyses.

The records were obtained between October 17, 1941 and February 14, 1942 in connection with a state-wide program of ground-water investigation in Texas conducted by the State Board of Water Engineers in cooperation with the Geological Survey, United States Department of the Interior.

The water analyses were made by W. W. Hastings, chemist of the Quality of Water Division of the Federal Geological Survey, and by chemists employed by the Work Projects Administration under the supervision of Mr. Hastings and Dr. E. P. Schoch, Director of the Bureau of Industrial Chemistry of The University of Texas. The results of the analyses, relating only to the mineral constituents in the water and not to its sanitary character, are tabulated in parts per million on pages ~~44~~ to ~~50~~. For the convenience of those who prefer a different form of expression, the analyses of 20 samples are given in milligram equivalents per liter on page ~~51~~. 18

TOPOGRAPHY, POPULATION AND INDUSTRIAL DEVELOPMENT

Harrison County is in the timbered region of northeast Texas adjacent to the Texas-Louisiana border, about 150 miles east of Dallas. The surface of the county is gently rolling to hilly and in general rises from east to west. The maximum altitude above sea level is about 500 feet and the minimum about 200 feet.

According to the census of 1940, Harrison County had a population of 50,900, and Marshall, the county seat and trading center, had 18,410. The chief industries of Marshall include the railroad shops, car-wheel foundry, brick plant, flour mill, cottonseed oil mill, cotton compress, milk products plant and basket and crate factory. Other towns in the county and their population in 1940 are Hallsville, 1,000; Waskom, 564; and Karnack, 70.

The economic development of Harrison County is diversified. A part of the area is covered with second growth loblolly and short-leaf yellow pine and hardwood which support a thriving lumber industry. Other natural resources that have been more or less extensively developed include gas, brick-clay and lignite. The chief farm crops are cotton, corn, hay, ribbon cane, fruits, berries and vegetables. Dairying is an important livestock industry, although beef cattle and hogs are raised for market.

RAINFALL

According to records of the United States Weather Bureau, the average annual rainfall at Marshall during 41 years was 45.55 inches. The precipitation is not evenly distributed throughout the year, being lowest in the late summer and fall and highest in the winter and spring. Among the wettest years were 1895, 62.65 inches; 1896, 61.48 inches; 1933, 58.64 inches; 1940, 55.28 inches; and 1941, 58.62 inches. The driest years include 1909 and 1910 with an average of 33.62 inches; 1916, 1917 and 1918 with an average of 34.13 inches; 1924, 30.33 inches; 1936, 29.92 inches and 1938, 38.26 inches. The table on the following page gives the U. S. Weather Bureau records of precipitation at Marshall.

Precipitation, in inches 1893 to 1899 and 1908 to 1942 at Marshall, Texas

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	Annual
1893	*0.38	*1.82	*2.88	*1.67	5.40	9.00	T	1.85	2.20	0.55	9.55	1.65	36.95
1894	4.30	*3.40	*7.07	5.30	2.60	1.95	5.15	4.75	5.25	1.85	1.80	2.60	46.02
1895	7.66	4.64	3.60	1.00	11.80	4.00	11.75	1.45	.70	4.25	5.70	6.10	62.65
1896	15.40	13.10	5.15	*2.09	*2.42	*3.41	*3.78	1.47	*3.30	*6.66	*2.15	*2.55	61.48
1897	*5.19	* .30	9.79	3.51	3.26	4.42	*3.03	*1.70	*2.16	2.48	.97	7.66	44.47
1898	7.88	3.19	4.10	1.28	2.82	9.00	.70	2.32	3.75	1.90	4.28	*2.55	43.77
1899	2.33	2.53	2.04	3.24	*6.87	*4.94	*1.81	.83	* .43	*5.60	*1.86	*4.20	36.68
1908	*2.57	*5.79	*2.62	*4.96	*10.30	*2.05	3.75	4.87	6.98	.17	1.73	*3.02	48.81
1909	* .45	*3.74	*3.18	1.85	2.86	2.95	1.56	1.76	.90	4.67	1.94	8.47	34.33
1910	2.40	4.22	1.63	4.69	4.55	1.08	.72	3.16	.19	1.32	2.70	6.26	32.92
1911	.74	1.91	2.61	10.53	.95	.46	7.51	4.60	.61	1.24	1.24	8.35	40.75
1912	4.13	2.19	10.64	7.17	2.42	5.89	1.60	8.52	.97	.55	.18	4.72	48.98
1913	3.51	5.12	5.27	5.12	2.29	2.03	2.78	.75	13.63	5.67	1.12	6.23	53.52
1914	1.21	5.15	6.59	4.24	5.68	.68	1.01	8.19	1.66	.15	6.15	9.78	50.49
1915	5.91	4.50	2.33	5.07	1.17	3.45	1.61	14.11	2.20	1.86	6.41	1.87	50.49
1916	7.36	.05	1.64	3.43	5.28	1.70	2.77	1.12	2.34	2.41	3.41	2.91	34.42
1917	3.32	3.05	3.12	3.56	2.18	1.02	9.47	4.59	1.75	1.11	1.25	1.09	35.51
1918	2.99	.78	2.20	7.37	1.23	3.10	.06	3.74	.77	2.06	4.67	3.50	32.47
1919	4.09	4.26	2.66	3.93	2.97	5.80	2.59	5.40	2.13	10.37	6.85	2.37	53.42
1920	5.75	2.52	3.61	4.25	5.45	2.94	3.66	4.17	1.55	3.02	3.97	5.49	46.38
1921	*3.14	2.65	3.85	16.20	1.41	5.69	4.82	2.44	1.50	.75	1.15	4.83	49.43
1922	5.32	6.35	9.25	6.85	2.27	5.30	4.54	2.26	2.09	.77	3.09	1.80	49.89
1923	4.69	7.39	2.88	6.95	1.51	2.64	1.10	.87	4.43	2.56	2.77	8.70	46.49
1924	5.07	3.85	4.60	3.43	6.31	.97	T	1.10	.77	.06	1.92	2.25	30.33
1925	5.68	1.24	3.10	2.03	3.45	.85	4.01	.84	2.68	5.27	11.61	2.07	42.83
1926	4.75	.97	9.51	4.22	2.91	6.92	6.40	2.72	1.01	4.17	1.52	7.75	52.85
1927	2.31	3.80	5.17	10.71	5.18	4.53	6.08	1.34	2.02	4.61	1.83	4.74	52.32
1928	.87	3.48	3.56	9.59	4.41	8.26	5.09	.40	.71	4.65	4.91	4.67	50.60
1929	4.36	2.57	3.49	*5.42	*6.50	*3.01	*1.23	.20	2.91	*2.44	*4.81	*4.35	41.30
1930	3.20	4.50	1.70	.66	8.31	.93	1.05	2.55	2.71	7.02	5.86	4.70	43.19
1931	2.91	4.93	3.45	2.67	1.46	3.40	3.41	4.53	1.22	3 50	4.69	12.74	48.91
1932	13.13	7.53	5.30	2.45	2.40	2.58	1.14	.72	2.04	1.51	3.15	8.68	50.63
1933	8.68	4.58	7.38	4.39	8.20	T	13.01	1.13	.56	2.40	1.02	7.29	58.64
1934	4.03	3.30	6.02	4.80	3.20	1.12	1.34	1.24	1.24	.50	9.73	2.95	39.48
1935	2.32	3.46	4.30	3.34	10.83	6.40	1.60	.69	2.19	5.28	2.93	4.54	47.88
1936	.68	1.82	2.57	1.95	6.87	.74	1.61	1.30	1.01	3.66	3.81	3.90	29.92
1937	7.76	1.93	3.96	2.49	.60	1.84	2.38	.78	3.15	4.03	8.58	7.60	45.10
1938	3.07	2.86	3.20	3.89	2.11	3.10	6.27	2.15	1.72	.51	5.34	4.04	38.26
1939	7.02	7.56	1.19	2.37	2.94	3.73	2.56	1.83	.16	.49	7.03	4.45	41.33
1940	1.48	2.56	3.28	4.75	3.04	6.96	2.14	7.00	.58	3.23	10.65	9.61	55.28
1941	3.41	3.52	4.82	5.15	6.38	6.83	5.63	2.11	5.30	4.65	5.64	5.18	58.62
1942	1.15	.60	3.16	6.00	3.46	5.58	.30	9.05	3.19	1.45	1.36	3 68	38.96

* Estimated from surrounding stations.

GENERAL PRINCIPLES OF THE OCCURRENCE AND MOVEMENT OF GROUND WATER

For detailed discussions of the general principles of the occurrence and movement of ground water, the reader is referred to papers by Meinzer 1/.

The two general physical characteristics of rocks commonly considered in connection with the occurrence and movement of ground water are specific yield, the amount of water ~~which~~ that is free to drain out of a material, in percentage of the total volume of the ~~rock~~ material, and permeability, the capacity of the rock to transmit water.

Fine-grained sediments such as clay or silt are likely to have a relatively high porosity or capacity to store water but because of the small size of the pores the molecular attraction is high, and they do not yield nor transmit water readily under pressures commonly found in nature, and are said to be impermeable. Coarse-grained sediments such as sand commonly have less porosity than clay or silt but the pore spaces are larger, water drains from and moves through them with more or less freedom in response to any hydraulic gradient, and they are said to be permeable. (The degree of permeability differs very widely with the porosity and especially with the size of the interstices.) Water absorbed at the surface from precipitation or from surface streams moves downward through the sand until it reaches the zone of saturation, in which all of the interstitial openings are filled with water. The top of this zone is known as the water table. The water table is not a level surface, but has irregularities being high under intake areas and low under discharge areas. The land surface, in places, is lower than the water table in adjacent areas and some of the ground water emerges as springs, or, where drainage is poor, as swamps or lakes.

On the outcrops of water-bearing sands the water is usually unconfined and does not rise in wells above the level at which it is first encountered, but in areas where the water-bearing sands dip beneath impermeable beds the water is confined under hydrostatic pressure and in a well will rise above the top of the sand. If the altitude to which the water will rise is greater than the altitude of the land surface, flowing artesian wells may be obtained.

The ground-water reservoirs are being replenished continually by rains that fall on the outcrops of the sand. The water moves slowly down the dip of the formation until it is either intercepted by wells or is discharged through some natural outlet, or it may escape by slow movement into overlying beds.

The principal ground-water reservoirs in Harrison County occur in sands of the Wilcox group, the Carrizo sand, and the Queen City sand member of the Mount Selman formation.

ROCK FORMATIONS AND THEIR WATER-BEARING PROPERTIES

Except for the alluvium of the river valleys and thin deposits of silts, sands, and gravels, all of the rocks that crop out in Harrison County are of Eocene age (see figure 1) and belong to the following geologic subdivisions:

1/ Meinzer, O. E., The occurrence of ground water in the United States: U. S. Geol. Survey Water-Supply Paper 489, 321 pp. 1923; Outline of ground-water hydrology: U. S. Geol. Survey Water-Supply Paper 494, 71 pp., 1923; Movements of ground water: Am. Assoc. Petroleum Geologists Bull., vol. 20, pp. 704-725, June 1936. Physics of the Earth, vol. 9 on Hydrology pp. 1-31.

Wilcox group, Carrizo sand, Mount Selman formation (Reklaw member, Queen City sand member, and Weches greensand member), and Sparta sand. A part of the information given below is based on recent field investigations by the writer and others, and a part is taken from the report by Sellards and others 2/ to which the reader is referred for detailed descriptions of the rock formations. In the discussion below, beginning with the Wilcox group, the rocks are listed in the order in which they were deposited or in age from oldest to youngest. This is the order in which they are successively crossed in traveling across Harrison County from southeast to northwest.

Wilcox group (undifferentiated)

The Wilcox group, designated Ewi on the map, crops out in the eastern and southern parts of Harrison County and in general dips northwestward into the East Texas syncline. The group consists of several hundred feet of clay or shale, sandy clay, sands and thin beds of lignite. The sands are medium to fine-grained and in places are 50 feet or more in thickness. In general, however, the individual beds of sand are lenticular and, therefore, are difficult to correlate between wells only a short distance apart. Relatively large quantities of potable water have been obtained from sands in the Wilcox group; but due to the extreme variations in the physical characteristics of the beds, only rough estimates can be made as to the quantity of water available to wells in unexplored parts of the county.

According to well logs the sandy phase of the Wilcox group is underlain by 700 to 1,000 feet of clay, shale and marl belonging to the lower part of the Wilcox group and the underlying Midway group. Below this clay section a sand of considerable thickness, presumably the Nacatoch sand of the Navarro group of Cretaceous age, is recorded in the logs of several oil tests (see table of drillers' logs). According to the meager information that is available the water from the sand (Nacatoch) in Harrison County is salty.

Carrizo sand

The Carrizo sand, which lies unconformably above the Wilcox group, crops out in the east-central and southern parts of the county in a narrow crescent-shaped belt (see figure 1). According to available well logs, the average thickness of the sand is between 50 and 60 feet, but the thickness varies considerably within short distances due in part to the uneven floor on which it was deposited. In the outcrop area the Carrizo consists mostly of medium-grained quartz sand but contains some yellowish clay and ferruginous cementing material. The position of the sand in the geologic section can be identified from electrical logs of some of the wells in the area, but it is difficult to distinguish the Carrizo from sands of the Wilcox below, and the Reklaw above from descriptions given in drillers' logs. In many parts of Texas the Carrizo sand yields large quantities of water of good quality to wells. In Harrison County the water contains considerable iron in areas on or near the outcrop where the formation can be identified in wells. Thus far development of wells in the formation has been small.

2/ Sellards, E. H., Adkins, W. S., and Plummer, F. B., The geology of Texas, vol. 1, Stratigraphy: Texas Univ. Bull. 3232 pp. 519-655, 1932.

Mount Selman formation

Reklaw member:-- The Reklaw member of the Mount Selman formation overlies the Carrizo sand and crops out in a belt about 2 to 5 miles in width adjoining the outcrop of the Carrizo sand on the west and northwest. It is about 100 feet in thickness and consists mostly of shale and sandy clays but in some localities contains beds of glauconite, glauconitic sand and sandstone. Its outcrop is characterized by bright red clay soils. In general the Reklaw yields only small amounts of somewhat highly mineralized water to wells.

Queen City sand member:-- The outcrop area of the Queen City sand member occupies approximately the northwestern one-third of the county. The member has a maximum thickness of about 200 feet in this area and is composed mostly of light-gray, cross-bedded, medium to fine-grained quartz sand, but contains some silt and clay, bentonite, greensand and impure lignite. It weathers into a light-colored sandy loam. Shallow dug wells in the outcrop of this sand member yield soft fresh water in sufficient quantities and of suitable quality for domestic use and stock. No deep wells are known to have been completed in the Queen City sand member in Harrison County.

Weches greensand member:-- The Weches greensand member has a maximum thickness of about 50 feet in Harrison County. It caps the hills and ridges or crops out along their slopes in the western and northwestern parts of the county. It contains iron ore in considerable quantities but is not known to yield water to wells except in small quantities.

Sparta sand

The Sparta sand, overlying the Weches, caps a few of the isolated hills in the northwestern part of the county and because of its small areal extent and lack of thickness it is not economically important as a source of ground water.

PRESENT DEVELOPMENT OF WATER SUPPLIES FROM WELLS

The public and industrial water supplies of Marshall and the public supplies of Hallsville, Waskom and Karnack are obtained from wells. Most of these wells are from 150 to 470 feet in depth and draw water from sands in the Wilcox group. A few industrial wells at Marshall are less than 100 feet in depth. These shallow wells and the city well at Hallsville, 200 feet in depth, draw water from the Carrizo sand.

Most of the wells that were recorded in the rural areas are less than 50 feet in depth and furnish small supplies of water for county schools, farms and small town domestic use. Such supplies can be obtained almost anywhere in the county from shallow wells in Eocene sand or alluvial deposits. In the western part of the county most of the wells are dug; some of them are lined with tile or brick but some are open holes. In the eastern and southeastern parts of the county many of the farm wells are bored or drilled; a few of them are about 100 feet in depth and are finished with 6-inch tile or galvanized iron casing.

The position of the water-bearing sands and the development of ground water in different parts of the county are briefly discussed below.

Northwestern part of county

All of the water wells that were recorded in this part of the county are dug and are less than 50 feet in depth. Such wells have furnished sufficient water for domestic use and stock and as there has been no industrial development in the area requiring large quantities of water, no deep water wells have been drilled. However, in Upshur County, a few miles west of this area wells that yield relatively large quantities of good water have been developed from sands ranging in depth from 200 to 600 feet below the surface.

Two test holes nos. 199 and 200, about 1,000 feet in depth were found at distances of 13 and 11 miles respectively northwest of Marshall. (See map). The electrical log of well 199 from 50 to 865 feet, reproduced in figure 2, shows sands or sandy zones at 50 to 180, 280 to 350 and 700 to 750 feet. The electrical log of well 200 from 30 to 827 feet shows sands or sandy zones at 70 to 130, 200 to 300 and 660 to 680 feet. These sands or sandy zones, having a combined thickness of about 250 feet in well 199 and 180 feet in well 200, are believed to represent a part of the Queen City sand member, the Carrizo sand and sands of the Wilcox group.

According to data furnished by the East Texas Geological Society the Wilcox group ranges in thickness from about 600 to about 700 feet in the western and northwestern parts of Harrison County, and the overlying Carrizo sand, dipping northwestward at the rate of about 15 feet per mile, increases in thickness from about 50 feet on the outcrop near Hallsville to more than 100 feet in the northwest corner of the county near the axis of the East Texas syncline. The Queen City sand crops out at the surface and inasmuch as all 3 formations underlie most of this part of the county, the prospects should be fairly good for obtaining ground-water in the area in sufficient quantities to meet moderate industrial demands. The evidence afforded by existing wells in the surrounding area indicates that no important fresh-water sands are to be expected at depth greater than about 800 feet or below the sandy phase of the Wilcox group.

Southwestern part of county in vicinity of Hallsville

The city of Hallsville is supplied with about 15,000 gallons of water a day from well 107. The well was drilled in 1939 to a depth of 613 feet, and according to the driller's log sands were encountered at 162 to 200, 275 to 285, and 501 to 592 feet. Samples of water that were obtained at 275 and 500 feet, during the drilling of the well, apparently were not acceptable for municipal supply as the well was plugged back to 201 feet. The well is equipped with a deep-well turbine pump driven by a 10-horsepower electrical motor. It is reported that the static water level was 90 feet below the surface when the well was drilled, and that the drawdown during a pumping test was 35 feet after the well had been pumped at the rate of 100 gallons a minute for 10 hours. On this basis the specific capacity of the well (yield in gallons a minute per foot of drawdown) is about 3. The water is very soft and comparatively low in total dissolved solids. A well drilled for the city in 1938 to a depth of 932 feet about one-fourth mile from this well was considered a failure and was abandoned.

Two farm wells, nos. 104 and 105, about 3 miles east of Hallsville, 272 and 250 feet in depth, respectively, yield water from a sand at about 215 feet. The wells are equipped with cylinder pumps driven by small electrical motors. Well 104 is said to have a yield of 50 to 75 gallons a minute. The water is moderately soft and low in total dissolved solids. The sample from well 104, however, contained 2.7 parts per million of iron which is considered high for domestic use.

Well 122, a drilled farm well 6½ miles west of Hallsville, is 304 feet in depth and supplies a small quantity of fresh soft water for domestic purposes and stock. This well is also equipped with a cylinder pump driven by a small electrical motor. Most of the rural domestic requirements in the area are supplied from shallow dug wells.

Records were obtained of three oil tests in this part of the county, wells 128, 132 and 137. A partial electrical log of well 132, about 3½ miles southeast of Hallsville, shows sands from about 310 to 340 and 590 to 680 feet and mostly clay or shale from 680 feet to the bottom of the logged section of the well at 1,200 feet. In well 137, in the Sabine River bottoms about 7½ miles southeast of Hallsville, sands were reported by the driller at 30 to 60, 185 to 200, and 1,665 to 1,676 feet. The well has an estimated natural flow of 15 gallons of water a minute two feet above the ground which is said to come from the sand at 185-200 feet. The water is very soft but contains 684 parts per million of dissolved solids, principally sodium bicarbonate. It is used for stock. Well 128, reported to be 3,000± feet deep, is in the Sabine River bottoms about 6 miles south of Hallsville. The well has a very small flow of water at ground level and the water contains 1,340 parts per million of dissolved solids chiefly sodium bicarbonate and chloride. The log of the well could not be obtained and the depth of this water-bearing formation is unknown.

In this part of the county, the Queen City sand member is relatively thin or absent and the Carrizo sand is present only in its outcrop area and to the north of the outcrop. The Wilcox group which is about 600 to 700 feet in thickness in this area, crops out along the Sabine River and dips northwestward. On the whole the evidence afforded by existing wells does not appear very encouraging for obtaining moderately large to large supplies of ground water of low mineral content in the area. Conditions are believed to be the most favorable in the area north and northwest of Hallsville.

Central part of county in vicinity of Marshall

Ten municipally owned wells, nos. 61 to 70 inclusive, ranging in depth from 200 to 473 feet, supply the city of Marshall with about 1,000,000 gallons of water a day. The wells are equipped with deep-well turbine pumps driven by electrical motors, and yield from 88 to 210 gallons a minute each; their maximum combined yield amounts to about 2,000,000 gallons a day. Six of the wells, nos. 61 to 66, drilled at different times from 1906 to 1936 inclusive, are at the old water works pumping station in the valley of a small creek about three miles northeast of the city. Some of the wells are reported to have had a natural flow when drilled but the static water level was about 20 feet below the surface in November 1941. Four of the municipal wells, nos. 67 to 70, are within the city limits and were drilled during the three-year period 1936 to 1938. A large part of the city water supply is obtained from these four wells and as a result the water levels in the wells have declined considerably. The water levels in wells 68 and 69 were reported to have been 100 feet below the surface when the wells

were drilled, but in November 1941, after the pumps had been shut down for several days, the measured water levels were 181 feet below the surface. The water from the wells both at the old plant and within the city is soft and low in total dissolved solids (see table of analyses).

Exploratory wells at Marshall about 1,000 feet in depth failed to find any appreciable supply of water below 500 feet. Logs of 5 of the city wells and 6 core tests put down by the city are given in the table of drillers' logs.

Seven wells, nos. 90 to 96, inclusive, supply the Darco Corporation plant near the western city limits of Marshall with about 400,000 gallons of water a day. The wells range from 50 to 248 feet in depth and the yield of the individual wells range from 22 to about 130 gallons a minute. Though the water is low in total dissolved solids it is hard and high in iron.

Altogether an average of about 2,000,000 gallons of water a day is pumped from about 20 wells in or near the city of Marshall. By proper location and construction of wells, additional supplies of considerable magnitude should be obtainable in this part of the county.

Northeastern part of county in vicinity of Karnack

No large supplies of ground-water have been developed in this part of the county. Water wells have been drilled near Karnack, ranging in depth from 100 to 430 feet, but have encountered only a relatively small amount of water-bearing sand. Well 29, put down in February 1942 for the town of Karnack was originally drilled to a depth of 430 feet but was partly filled in and completed at 306 feet, the principal sand being between 200 and 230 feet (see log). A yield of 30 gallons a minute was obtained during the development of the well. The static water level was about 71 feet below the surface in March 1942.

Well 30, at the Longhorn Ordnance Works plant in Karnack, is 133 feet in depth. The log shows 31 feet of sandy shale (reported as water bearing) from 75 to 106 feet and 25 feet of sand from 108 to 133 feet. The maximum yield of the well is reported to be 20 gallons a minute.

Well 36, at the Caddo Lake State Park, 1½ miles northwest of Karnack, is 315 feet in depth and the water level was 163 feet below the surface in October 1941. The yield is reported to be 8 gallons a minute.

There is a considerable variation in the chemical character of water from the wells in this area, although the water in most of the shallow wells is acceptable for domestic purposes.

Electrical logs of 2 oil tests, nos. 26 and 39, 3 miles southwest and 4 miles northeast of Karnack, respectively, are shown in figure 2. According to an interpretation of the logs, the base of the sandy zone of the Wilcox was reached at about 270 feet below the surface in well 26 and at about 125 feet in well 39, which is somewhat farther up the dip. About 900 feet of clay or shale occurs below this sandy zone in both wells.

Three oil tests in the area, wells 27, 35 and 52, have small flows of water. The water from two of them, wells 27 and 52, is soft and fresh but the water from well 35, which is reported to be about 1,000 feet in depth, is very salty and is believed to come from the Nacatoch sand.

Only small quantities of water of low mineral content are expected to be developed from wells in this area.

South-central part of county

Most of the wells that were recorded in this area are drilled, range in depth from about 40 to 350 feet and furnish small supplies of water for domestic use and stock.

Well no. 138, in Panola County, 14½ miles southwest of Marshall, is 343 feet in depth and flows about 50 gallons a minute 2.5 feet above the surface. The water is very soft but contains 1,225 parts per million of dissolved solids principally sodium bicarbonate and chloride. It supplies industrial and domestic requirements at a saw mill.

Well no. 165, about 9 miles southeast of Marshall, is 150 feet in depth and yields about 7 gallons a minute. It supplies water for the Humble Pipe Line pump station. Several wells ranging in depth from 40 to 150 feet were drilled on farms of the Government negro resettlement project about 8 to 14 miles south of Marshall, but the farmers reported that the water was not suitable for domestic use. The well logs show that lignite was encountered at depth of from 30 to 60 feet.

Large quantities of water of low mineral content are not expected to be developed from wells in this area.

Southeastern part of county in vicinity of Waskom

Several attempts have been made to develop ground-water supplies in and near Waskom, some of which were successful and others were not. Well 179, about 3 miles southwest of Waskom, an unused well about 270 feet in depth, is said to have had a very small yield, but well 180, a nearby unused well 164 feet in depth, formerly provided sufficient water for the operation of oil drilling rigs. Well 188, east of Waskom, about 400 feet in depth, is reported to be a "dry hole," but well 189, about 100 yards away and 200 feet in depth, yields about 100 gallons a minute. Wells 186 and 187, 150 feet in depth, yield about 100 gallons a minute each and supply the town of Waskom. Well 190, one mile southeast of Waskom, is 200 feet in depth and yields about 150 gallons a minute. It supplies water for the Waterman Lumber Company.

The mineral content of the water from the wells in this area varies materially. In most of the shallow wells the water is soft and low in dissolved solids, but in few it is very hard and contains more than 1,000 parts per million of dissolved solids.

Drillers' logs of several gas wells (not included in this report) in the gas field south of Waskom indicate that the base of the sandy zone of the Wilcox group is about 250 feet below the surface, and that a sand (probably Nacatoch) carrying salty water was encountered approximately 1,000 feet below the surface. Wells that yield relatively large quantities of water of low mineral content may be developed in some places but in general no large supplies of good water are to be expected in the area.

SURFACE WATER

By

S. D. Breeding

Harrison County is drained by numberous small streams mainly tributary to the Sabine River, which forms a part of the southern boundary of the county, and by Little Cypress Creek, which passes through the northwestern part of the county. No continuous records of stream-flow have been obtained on any streams within or bordering the county except the Sabine River near Tatum, where a gaging station has been maintained since January 1939. These records are of too short duration to be of much value when compared with longer records collected nearby and will, therefore, not be used here.

Continuous records of the flow of Cypress Creek have been obtained from July 1924 to date at a gaging station in Marion County, 8 miles west of Jefferson. Continuous records of the flow of the Sabine River have been obtained at two points upstream from the west boundary of Harrison County, one near Longview, where a gaging station was maintained from January 1904 to December 1906, and from October 1923 to December 1932; and the other at Gladewater, where measurements have been made from October 1932 to date. These records were collected by the Surface-Water Division of the U. S. Geological Survey in cooperation with the Texas Board of Water Engineers, and have been published annually in Geological Survey Water-Supply Papers. Copies of these records may be obtained at the Washington office of the Geological Survey or at the Austin office of the Survey and Texas Board of Water Engineers.

The Cypress Creek drainage basin above the gaging station near Jefferson has an area of 848 square miles in Marion, Upshur, Morris, Camp and Titus counties and probably has an annual rainfall comparable with that in Harrison County. The records of the discharge of the creek for the period 1925 to 1941, show an average annual runoff of 406,000 acre-feet (an acre-foot is the amount of water required to cover one acre to a depth of one foot and is equivalent to about 326,000 gallons). This amounts to a runoff of 479 acre-feet per square mile, or a depth of 8.98 inches. During the same period the average annual rainfall over the basin, according to records at Jefferson, Mount Pleasant and Naples (Finley), was about 45 inches. The minimum flow during any 12 consecutive months occurred from May 1939 to April 1940, and amounted to 91,510 acre-feet, representing 108 acre-feet per square mile, or a depth of 2.02 inches. The minimum flow during any 6 consecutive months occurred from July to December 1939, when the runoff was 4,330 acre-feet, representing 5.1 acre-feet per square mile, or a depth of 0.10 inch. There were periods of no flow in 1925 and 1939 - the longest being 45 days from September 24, to November 8, 1939. During the 17-year period, the flow was less than 10 second-feet at times in every year except 1927 and 1941 and was less than 5 second-feet at times in every year except 1927, 1928, and 1941.

A study of the available data indicates that the relation between the annual rainfall and runoff in Cypress Creek basin above the gaging station has been about as follows:

Relation between rainfall and runoff in Cypress Creek Basin, 1925 to 1941

Annual rainfall (in inches)	Annual runoff	
	Depth in inches	Acre-feet per sq. mi.
25	1.2	64
30	2.4	128
35	4.0	213
40	6.2	331
45	9.0	480
50	12.3	656
55	15.9	848

The runoff resulting from a given amount of rainfall depends to a considerable extent upon the distribution and intensity of the rainfall whereas the above figures are based on the average annual runoff resulting from varying amounts of annual rainfall during the 17-year period. However, the figures are believed to give a fair indication of the annual surface-water yield that may be expected from large areas in Harrison County.

The following table gives a few pertinent facts obtained from the records of the daily flow of the Sabine River near Longview and Gladewater about 6 miles and 18 miles, respectively, upstream from the western boundary of Harrison County.

Runoff of Sabine River near Gladewater and Longview, Texas

Station	Period of record	Average during period (acre-feet per day)	Average during minimum 12 consecutive months (acre-feet per day)	Minimum day (acre-feet)
Gladewater	1932-41	3,132	628	11
Longview	1902-06 1924-32	4,047	617	28

Based on the records given in part in the above table the annual runoff of the river near Longview during the years 1902-06 and 1924-32 averaged 1,478,000 acre-feet from an area of 3,013 square miles and the minimum runoff during a period of 12 consecutive months amounted to 225,160 acre-feet. The annual runoff near Gladewater during 1932-41 averaged 1,143,150 acre-feet from an area of 2,846 square miles and the minimum runoff during a period of 12 consecutive months amounted to 229,500 acre-feet. In the 6 driest years of record the daily runoff was less than 30 acre-feet (9,775,000 gallons) during the following number of days: 1925, 6 days; 1934, 18 days; 1936, 34 days; 1938, 13 days; 1939, 70 days; 1940, 7 days.

The data indicate that abundant supplies of surface water are available in Harrison County from Little Cypress Creek and the Sabine River and some of their larger tributaries but if a large dependable continuous supply of good water is to be obtained storage will have to be provided.

SUMMARY

Three geologic formations or groups of formations containing extensive water-bearing sands crop out in Harrison County. Listed in the order of their age from oldest to youngest and in the order in which they are encountered in travelling across the county from southeast to northwest they are as follows: Wilcox group, Carrizo sand and Queen City sand member of the Mount Selman formation (see fig. 1). In general the beds in these formations dip toward the north and northwest. Water of quality suitable for domestic use, stock and for many industrial uses is obtainable from wells throughout the county.

Conditions for the development of large quantities of ground water of good quality are believed to be most favorable in the northwestern part of the county and in the Marshall area in the central part of the county. They are less favorable in the eastern part of the county, where the Wilcox sands alone are present and are not very thick but where adequate supplies nevertheless are available for domestic use and stock.

Surface water is available from Sabine River and Little Cypress Creek and some of their larger tributaries but storage will have to be provided if a dependable supply of good water of considerable magnitude is obtained. In some areas, if the requirements are not too high, it may be possible to use a combination supply of ground water and surface water.

Records of wells and springs in Harrison County, Texas
All wells are drilled unless otherwise stated in remarks

Well	Distance from Hallsville	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
1	18¼ miles northwest	John Walker	--	1910	16	48	3.0
2	14¾ miles northwest	E. L. Carrington	--	Old	35	36	2.2
3	12¾ miles northwest	Morton School	--	--	32	48	0
4	15¾ miles northwest	Smyrna School	--	--	39	36	.5
5	13¾ miles north	Smyrna Colored School	--	Old	13	48	3.0
6	12 miles north	Harleton School	--	1935	23	24	2.5
7	9 miles north	D. D. Croft	--	1941	61	30	3.0
8	9¼ miles northeast	C. A. Clark	--	1910	34	36	7.0
9	8¼ miles northeast	New Zion Colored School	--	Old	22	42	3.5
10	12¼ miles northeast	Piney School	--	--	Spring	--	--

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
11	11 miles northwest	Friendly School	George Reese	1932	57	36	0
12	7⅞ miles northwest	St. James School	--	--	Spring	--	--
13	do.	Hickory Grove Rosenwall School	--	Old	16	--	3.0
14	4¾ miles northwest	Macadonia School	--	--	37	36	2.8
15	4¾ miles northeast	Henderson School	--	Old	16	36	.5
16	8 miles north	Woodlawn Independent School	--	1935	26	60	2.8
17	10¼ miles north	Frank Davis	--	Old	16	42	3.5
18	11½ miles northeast	Ware School	--	1930	30	36	--
19	12¼ miles northeast	Beckham Colored School	--	1938	15	36	3.0
20	9¾ miles northeast	W. H. Nesbett	--	1939	45	36	3.0
21	do.	Mrs. C. C. Bohler	Corona Oil Co.	1931	3,097	--	--

a/ Plus (+) indicates water level is above ground.
b/ T, turbine; A, air, steam or natural gas lift; H, hand pump or bucket and rope; C, cylinder; G, gasoline; E, electric; W, windmill. Number indicates horsepower.

Chemical analyses of water from some of these wells and springs are shown in a table of analyses on pages 44 to 51.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
1	11.61	Jan. 29, 1942	H	D	Dug well.
2	27.61	do.	C	D	Do.
3	27.0	do.	C,E	P	Do.
4	27.6	do.	H	P	Do.
5	8.70	do.	H	P	Do.
6	17.42	do.	C,E	P	Do.
7	61.04	do.	H	D,S	Do.
8	21.00	do.	C,E	D,S	Do.
9	18.22	Jan. 30, 1942	H	P	Do.
10	--	--	--	P	Temperature 60.5° F.
11	54.00	Jan. 29, 1942	H	P	Dug well.
12	--	--	--	P	
13	6.6	Jan. 30, 1942	H	P	Dug well.
14	10.8	do.	H	P	Do.
15	7.6	Mar. 10, 1942	C,E	P	Do.
16	15.90	Nov. 3, 1941	C,E	P	Do.
17	15.34	Feb. 11, 1942	H	D,S	Do.
18	--	--	H	P	Do.
19	5.07	Feb. 11, 1942	H	P	Do.
20	43.38	do.	H	D,S	Do.
21	--	--	--	--	Oil test. See log.

c/ P, public supply; D, domestic; S, stock; Ind, industrial; N, not used.
d/ Water level reported by driller or owner.

Records of wells and springs in Harrison County--Continued

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
22	8¾ miles northeast	Edmond Key	--	1910	34	36	2.5
23	6½ miles northeast	Nancy Harris	--	1916	32	36	3.3
24	9¼ miles northeast	W. T. Slater	--	1936	17	24	0

Well	Distance from Karnack	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
25	3 miles southwest	T. J. Taylor	A. G. Foster	1940	130	--	--
26	3 miles southwest	do.	--Thurman	1935	5,853	--	--
27	3½ miles southwest	do.	A. G. Foster	1931	64	12	2
28	1½ miles southeast	Geo. Washington Carver Colored School	B. F. Eddington	1940	105	6	--
29	¾ mile southwest	T. J. Taylor	do.	1942	306	12, 6	1.0
30	½ mile east	Longhorn Ordnance Works	do.	1942	133	6	--
31	In Karnack	Karnack Independent School	do.	1940	105	6	--
32	¼ mile northwest	Miss Elizabeth Baker	--	1890	18	24	2.8
33	½ mile northwest	A. G. Foster	A. G. Foster	1941	137	4	0
34	¾ mile west	V. H. Moore	do.	1940	228	4	0
35	1¾ miles northwest	Caddo Lake State Park	--	1905	1,000±	6-5/8	0
36	1¼ miles northwest	do.	C. C. C.	1935	315	7	1.0
37	2¼ miles north	W. E. Hartzo	A. G. Foster	1941	133	4	--
38	2¾ miles northeast	Fred R. Mayfield	do.	1940	100	4	--
39	4¼ miles northeast	-- Smith	Barnwell and Dowlearn	1938	2,598	7-7/8	--
40	4 miles northeast	Gus Noble	B. F. Eddington	1940	103	6	--
41	do.	Johnson Ranch	A. G. Foster	1940	103	4	--
42	do.	Dallas-Caddo Hunting Club	do.	1941	125	4	--
43	4 miles east	-- Moore	-- Moore	--	301	4	1.0

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
22	32.92	Feb. 11, 1942	H	D	Dug well.
23	34.31	Feb. 10, 1942	H	D	Do.
24	10.53	Feb. 11, 1942	H	D,S	Do.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
25	--	--	None	N	See log.
26	--	--	--	--	Oil test. Electric log from 100 to 2,050 feet in files of the Texas State Board of Water Engineers shows base of sandy zone at 270 feet.
27	+	Oct. 28, 1941	Flows	D,S	Oil test. Measured flow, 1.5 gallons a minute. Temperature 68° F. See figure 2.
28	--	--	C,E	P	
29	71.58	Mar. 10, 1942	--	Ind,P	Measured yield 30 gallons a minute when drilled. Supplies town of Karnack. See log.
30	d/ 25	Mar. 1942	C,E	P	Reported yield, 20 gallons a minute, with drawdown of 42 feet when drilled. See log.
31	--	--	C,E	P	Sand reported from 80 to 105 feet.
32	10.81	Oct. 27, 1941	C,E	D,S	Dug well.
33	54.26	Feb. 10, 1942	None	N	See log.
34	78.92	Oct. 28, 1941	None	N	Sand reported from 98 to 107 and 219 to 229 feet.
35	+	--	Flows	N	Oil test.
36	164.27	Oct. 27, 1941	A,E, 4	P	Reported yield, 8 gallons a minute.
37	--	--	C,E	D	Reported yield, 8 gallons a minute. See log.
38	--	--	T,E	D	Reported yield, 18 gallons a minute. Temperature 67° F.
39	--	--	--	--	Oil test. Electric log from 117 to 1,450 feet in files of the Texas State Board of Water Engineers, shows base of sandy zone at 125 feet. See figure 2.
40	d/ 18	June 1940	C,E	D	Sand reported from 98 to 103 feet.
41	--	--	C,E	D	Sand reported from 92 to 102 feet.
42	--	--	C,E	D	Sand reported from 105 to 125 feet.
43	14.54	Nov. 3, 1941	None	N	Supply reported insufficient for domestic use.

Records of wells and springs in Harrison County--Continued

Well	Distance from Karnack	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
44	5¼ miles east	Johnson Bros.	A. G. Foster	1941	358	4	--
45	4 miles southeast	Lake Chapel Colored School	--	1936	36	36	2.0
46	6½ miles southeast	Pleasant Hill School	--	1937	18	24	2.0
47	10 miles southeast	Mt. Zion Colored School	--	1939	18	30	2.0
48	11¼ miles southeast	Old Border School and Church	--	Old	21	36	0
49	9 miles south	Hart School	--	--	17	42	3.0
50	9 miles south	Shilo Baptist Church	--	Old	19	30	.5
51	5¾ miles southeast	D. V. Blocker	-- Benson	1933	205	10, 6	--
52	4¾ miles southeast	Mrs. A. C. Baldwin	-- Mason	1930	1,900±	12	2.0
53	5¼ miles southwest	Annie Glade School	--	1932	13	36	2.0

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
54	8½ miles northeast	-- Colored School	--	Old	11	24	2.0
55	4¾ miles east	Rock Hill Colored School	--	1925	31	36	3.0
56	5 miles northeast	William Jones	Charles Watson	1938	17	36	1.5
57	2½ miles southeast	O. H. Clark	Core Drill Corp.	1937	300	6, 4	--
58	2 miles southeast	S. E. Wood	--	1929	362	--	--
59	2 miles east	Paul Whaley	Paul Whaley	1932	155	6	--
60	do.	George Pendergast	do.	1932	155	6	--
61	3 miles northeast	City of Marshall	Ed Mills	1906	200	10	2.0
62	do.	do.	do.	1936	240	8	--
63	do.	do.	do.	1932	300	10	2.3
64	do.	do.	do.	1925	300	10	2.8
65	do.	do.	Fred Fielder and Ed Mills	1928	300	8	--
66	do.	do.	Fred Fielder	1927	300	8	--

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
44	--	--	C,E	N	See log.
45	8.06	Feb. 12, 1942	H	P	Dug well.
46	8.85	do.	H	P	Do.
47	7.90	do.	H	P	Do.
48	12.30	do.	H	P	Do.
49	10.04	do.	H	P	Do.
50	9.35	do.	H	P	Do.
51	--	--	C,E	D,S	Reported yield 7 gallons a minute.
52	+	Feb. 12, 1942	Flows	--	Oil test. Estimated flow, 1 gallon of water a minute.
53	6.55	do.	H	P	Dug well.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
54	4.80	Feb. 13, 1942	H	P	Dug well.
55	18.85	Feb. 9, 1942	H	P	Do.
56	6.70	Feb. 11, 1942	H	D,S	Do.
57	--	--	C,E, 3	D	Measured yield, 10 gallons a minute. Supplies water for five residences.
58	--	--	None	N	See log.
59	--	--	C,E	D	Sand reported from 140 to 155 feet.
60	--	--	C,E	D	
61	15.97	Nov. 17, 1941	T,E, 20	P	Measured yield, 88 gallons a minute. See log.
62	--	--	T,E, 20	P	Measured yield, 145 gallons a minute. Temperature 65° F. See log.
63	24.50	Nov. 12, 1941	T,E, 15	P	Measured yield, 132 gallons a minute. Temperature 64.5° F.
64	22.48	do.	T,E, 15	P	Measured yield, 145 gallons a minute. Temperature 64.5° F.
65	--	--	T,E, 15	P	Measured yield, 120 gallons a minute.
66	--	--	T,E, 25	P	Measured yield, 145 gallons a minute.

Records of wells and springs in Harrison County--Continued

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
67	In Marshall	City of Marshall	Layne-Texas Co.	1937	473	16, 8	--
68	do.	do.	do.	1937	375	16, 8	1.0
69	do.	do.	I. B. White	1936	351	18, 12	.5
70	do.	do.	Layne-Texas Co.	1938	422	16, 8	--
71	do.	do.	--	1936	376	--	--
72	do.	do.	Core Drill Corp.	1937	970	8	--
73	do.	do.	do.	1937	385	--	--
74	do.	do.	do.	1937	360	--	--
75	do.	do.	do.	1937	400	--	--
76	do.	do.	--	1936	496	8½	--
77	do.	Texas and Pacific R.R. Co.	--	--	286	--	--
78	do.	do.	--	--	417	--	--
79	do.	do.	--	--	444	--	--
80	do.	do.	--	--	433	--	--
81	do.	Southwestern Gas and Electric Co.	--	1906	580	8	--
82	do.	do.	Layne-Texas Co.	1926	450±	--	--
83	do.	do.	do.	1936	458	12	2.0
84	do.	Independent Ice Co.	J. C. Boling	1936	323	12, 8	--
85	do.	Babblin Brook Dairy	Walter A. Meller	1929	300±	10	1.0
86	1/4 miles west	Darco Corp.	Layne-Texas Co.	1937	806	--	--
87	do.	do.	do.	1937	765	--	--
88	do.	do.	--	1936	180	--	--
89	do.	do.	--	1936	185	--	--
90	do.	do.	--	1926	248	6	--
91	do.	do.	--	1927	192	6	--
92	do.	do.	--	1927	201	6	--

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
67	d/114	June 1937	T,E, 40	P	Measured yield, 210 gallons a minute. See log.
68	181.90	Nov. 12, 1941	T,E, 30	P	Measured yield, 198 gallons a minute. Temperature 69° F. See log.
69	182.29	do.	T,E, 30	P	Measured yield, 145 gallons a minute. See log.
70	--	--	T,E, 30	P	Measured yield, 158 gallons a minute. Temperature 71° F. See log.
71	--	--	--	--	City test well 2. See log.
72	--	--	--	--	City test well 4. See log.
73	--	--	--	--	City test well 5. Measured yield, 18 gallons a minute. See log.
74	--	--	--	--	City test well 6. Measured yield, 50 gallons a minute. See log.
75	--	--	--	--	City test well 7. Measured yield, 41 gallons a minute. See log.
76	--	--	--	--	City test well. See log.
77	--	--	None	N	Owner's well 1. See log.
78	--	--	None	N	Owner's well 2. See log.
79	--	--	None	N	Owner's well 3. See log.
80	--	--	None	N	Owner's well 4. See log.
81	d/ 90	1940	A,E, 35	Ind	Owner's well 1. Measured yield, 120 gallons a minute with a reported drawdown of 50 to 60 feet.
82	--	--	None	N	Owner's well 2.
83	131.58	Nov. 18, 1941	None	N	Owner's well 3. Well is not equipped with pump. Originally yielded 90 gallons a minute.
84	--	--	A,E, 20	Ind	Reported yield, 42 gallons a minute. See log. Temperature 67° F. See log.
85	74.83	Nov. 17, 1941	None	N	Reported originally yielded 150 gallons a minute.
86	--	--	--	--	Test well 1. See log.
87	--	--	--	--	Test well 2. See log.
88	--	--	--	--	Lignite prospect test hole 1. See log.
89	--	--	--	--	Lignite prospect test hole 2? See log.
90	--	--	A	Ind	Reported yield, 80 gallons a minute.
91	--	--	A	Ind	Reported yield, 80 gallons a minute. See log.
92	--	--	A	Ind	Reported yield, 60 gallons a minute. See log.

Records of wells and springs in Harrison County--Continued

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
93	1¾ miles west	Darco Corp.	Walter A. Meller	1934	111	16, 9	--
94	do.	do.	--	1940	50	48	--
95	do.	do.	B. F. Eddington	1941	128	10	--
96	do.	do.	do.	1941	125	10	--
97	1¼ miles north	O. D. Hays	William H. Atkinson	--	1,000±	10	--
98	2 miles northwest	Pyle Lumber Co.	B. F. Eddington	1939	276	6	--
99	2¾ miles west	Frank Granbery	Richard Houston	1940	254	4	.5
100	4 miles northwest	Ebenezer Colored School	--	1910	30	36	--
101	5¾ miles west	Potter's Creek Colored School	--	1932	23	36	3
102	4½ miles southwest	P. B. Bailey	--	1934	30	60	2.5
103	7½ miles southwest	Rose Hill Colored School	--	--	25	48	3.0

Well	Distance from Hallsville	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
104	3 miles east	E. H. Lowry	B. F. Eddington	1941	272	7	--
105	do.	U. C. Lowry	do.	1941	250	7	--
106	¾ mile southeast	Brooks Colored High School	Mack Alford	1941	17	--	1.5
107	In Hallsville	City of Hallsville	Layne-Texas Co.	1939	201	10	--
108	do.	do.	do.	1938	932	--	--
109	4¼ miles northeast	-- Young	Buck Coleman	1941	26	--	2.5
110	6¼ miles north	E. L. Barnes	E. L. Barnes	1930	27	48	--
111	6½ miles north	Cartersville Colored School	--	1941	20	36	2.6
112	8 miles northwest	Hebron Colored School	--	1930	16	36	3.0
113	10 miles northwest	Seff Davis	--	--	23	48	2.5
114	9 miles northwest	J. Bussey	--	1910	21	36	--
115	8¾ miles northwest	A. J. Page	--	1871	27	36	--

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
93	--	--	A	Ind	Reported yield, 80 gallons a minute. See log.
94	--	--	C,E, 10	Ind	Dug well. Reported yield, 22 gallons a minute. See log.
95	--	--	T,E, 7½	Ind	Reported yield, 130 gallons a minute. See log.
96	--	--	T,E, 7½	Ind	Do.
97	--	--	C,E	D	Oil test. Plugged back to 1,000 feet and used as a water well. See log.
98	--	--	C,G	N	Reported yield, 20 gallons a minute.
99	56.57	Nov. 17, 1941	C,G	N	
100	--	--	H	P	Dug well.
101	17.84	Feb. 17, 1942	H	P	Do.
102	13.25	Jan. 28, 1942	C,E	D	Do.
103	18.56	do.	H	P	Do.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
104	--	--	C,E	D,S	Reported yield, 50 to 75 gallons a minute.
105	--	--	C,E	D,S	
106	12.57	Jan. 27, 1942	H	P	Dug well.
107	d/ 90	1939	T,E, 10	P	Reported yield, 100 gallons a minute. See log.
108	--	--	None	N	Supply reported insufficient for city use.
109	23.21	Feb. 17, 1942	H	D,S	Dug well.
110	--	--	H	D,Ind	Dug well. Supplies cotton gin.
111	5.47	Jan. 30, 1942	H	P	Dug well.
112	14.98	Jan. 29, 1942	H	D	Dug well. Temperature 59° F.
113	21.90	do.	H	D,S	Dug well.
114	20.50	June 17, 1936	H	D	Do.
115	24.80	do.	H	D,S	Do.

Records of wells and springs in Harrison County--Continued

Well	Distance from Hallsville	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
116	7 miles northwest	Lily Hill School	Sam Bridges	1938	20	36	3.7
117	3¾ miles northwest	W. H. Schaffer	--	1936	30	36	3.2
118	do.	Noonday Camp Ground	--	--	Spring	--	0
119	4¼ miles northwest	--	--	--	--	--	--
120	3½ miles northwest	Johnson Colored School	--	--	25	36	2.5
121	3 miles west	Mrs. Nora Davis	--	--	35	--	--
122	6½ miles west	Dell Everett	J. C. Boling	1937	304	10, 5	--
123	4¾ miles southwest	E. G. Barker	--	Old	36	24	0
124	3¾ miles southwest	Maple Springs School	C. I. Southerland	1936	16	24	0
125	7 miles southwest	Gum Springs School	--	1932	22	48	--
126	7¼ miles southwest	Friendship Colored School	--	1941	23	48	3.0
127	7½ miles southwest	J. K. Bivens Farm Co.	J. E. Wesson	1937	18	--	--
128	6¼ miles south	do.	--	--	3,000±	14	1.5
129	4¼ miles southwest	John W. Scott	--	1927	27	40	2.0
130	2¼ miles southwest	J. B. Cullen	Henry Alford	1940	32	36	3.8
131	3 miles southeast	George Welch Est.	--	1910	26	21	2.0
132	3½ miles southeast	R. Bonner No. 1	Bay Oil Corp.	1941	3,000	7¾	--
133	3¾ miles southeast	Sweet Home Colored School	--	1936	20	--	2.5
134	6 miles southeast	Red Oak School	--	1939	26	48	2.5
135	7 miles southeast	Atlas Colored School	--	--	18	48	2.5
136	4¾ miles southeast	Cooperville Colored School	Bob Newhouse	1925	28	40	3.0
137	7 miles southeast	Will T. Cock	E. O. Butler	1935	2,548	--	2.0

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
116	14.90	Jan. 29, 1942	H	P	Dug well.
117	19.83	Jan. 28, 1942	H	D,S	Do.
118	+	do.	Flows	D	Estimated yield, 2 gallons a minute. Temperature 64° F.
119	--	--	--	--	Oil test. See partial log.
120	26.30	Jan. 28, 1942	H	P	Dug well. Temperature 64° F.
121	--	--	C,W	D,S	Dug well.
122	--	--	C,E	D,S	See log.
123	24.87	Jan. 27, 1942	H	D,S	Dug well.
124	5.38	do.	H	P	Do.
125	--	--	C,E	P	Do.
126	19.82	Jan. 27, 1942	H	P	Do.
127	--	--	H	D	
128	+	--	Flows	S	Oil test used as water well for stock.
129	18.43	Nov. 4, 1941	C,E	D	Dug well.
130	27.74	Jan. 27, 1942	H	D,S	Do.
131	13.47	do.	C,G	D,S	Do.
132	--	--	--	--	Oil test. Electric log in files of the Texas State Board of Water Engineers shows sands from 310 to 340, 590 to 680, and mostly clay from 680 to 1,200 feet. See figure 8.
133	7.80	Jan. 28, 1942	H	P	Dug well.
134	19.65	do.	H	P	Dug well. Temperature 64½° F.
135	16.57	do.	H	P	Dug well.
136	22.1	Jan. 27, 1942	H	P	Do.
137	+	Nov. 14, 1941	Flows	S	Oil test used as water well for stock. Estimated flow 15 gallons a minute. See log.

Records of wells and springs in Harrison County--Continued

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
138	14¼ miles southwest	Lingo Lumber Co.	A. G. Foster	1941	343	4	2.5
139	11 miles southwest	Cave Spring School	--	Old	--	24	--
140	9¼ miles southwest	Fairpoint Colored School	--	--	25	48	2.0
141	8¼ miles southwest	D. C. Driskell	--	--	Spring	--	0
142	8½ miles south	E. T. Roseborough Sr.	--	Old	350	--	--
143	5½ miles southwest	M. G. Blalock	L. C. Houston	1941	225	8, 4	--
144	4¼ miles southwest	Grange Hall Independent School	--	1940	28	36	3.4
145	do.	W. M. Dinkle	--	1910	250	4	--
146	3 miles south	Fairview School	--	--	--	--	--
147	4 miles southeast	K. H. Power	--	Old	24	36	0
148	5½ miles south	Van McClellen	--	1910	43	36	1.5
149	8¼ miles southeast	Lewis Anderson	V. E. West	1937	63	3	--
150	9½ miles southeast	Johnnie Tatum	do.	1937	120	3	--
151	9¼ miles southeast	L. C. Mitchell	do.	1937	40	3	--
152	9¼ miles south	Dudley Morgan	do.	1937	175	3	--
153	10¾ miles south	Sidney Reed	do.	1937	92	3	--
154	11 miles south	Willie Mitchell	do.	1937	112	--	--
155	do.	Arthur Fisher	do.	1937	105	3	--
156	11¼ miles south	E. V. Williams	Sabine Drilling Co.	1925	2,508	12	0
157	11¼ miles southeast	Mrs. Barrett Gibson	--	1918	91	4½	--
158	do.	do.	The Texas Co.	1919	2,600±	12	--
159	12¼ miles southeast	do.	--	1924	73	10	--
160	13¾ miles southeast	Community Center	A. E. Fawcett	1940	147	--	--
161	do.	do.	Buck Lebon	1939	321	--	--
162	10 miles southeast	John Wood	--	1912	--	6	0.5
163	8 miles southeast	Blocker Est.	Atlas Pipe Line Co.	1932	73	10	1.5

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
138	+	Feb. 14, 1942	Flows	Ind	Estimated flow, 50 fallons a minute. See log.
139	--	--	H	P	Dug well.
140	21.16	Jan. 28, 1942	H	P	Dug well. Temperature 63° F.
141	+	Feb. 14, 1942	Flows	--	Estimated yield, 5 gallons a minute. Sold for medicinal purposes.
142	--	--	None	N	See log.
143	--	--	C,G	D,S	Measured yield, 6 gallons a minute. Temperature 67° F.
144	20.50	Nov. 4, 1941	C,E	P	Dug well.
145	--	--	C,E	D,S	
146	--	--	H	P	Dug well.
147	12.55	Feb. 17, 1942	C,E	D	Do.
148	6.41	do.	H	D,S	Do.
149	--	--	H	D	See log.
150	--	--	H	N	Do.
151	--	--	H	N	Do.
152	--	--	H	D	Do.
153	--	--	H	N	Do.
154	--	--	H	D	Do.
155	--	--	H	N	Do.
156	+	Nov. 4, 1941	Flows	--	Oil test. Estimated flow, ½ gallon of water a minute. Temperature 67° F.
157	--	--	H	N	
158	--	--	--	--	Oil test.
159	--	--	H	D,S	
160	--	--	C,G, 3	P	See log.
161	--	--	None	N	Do.
162	+	Nov. 4, 1941	Flows	N	Oil test. Estimated flow, 1 gallon a minute. Temperature 68° F.
163	25.76	Feb. 13, 1942	H	D	

Records of wells and springs in Harrison County--Continued

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
165	8¾ miles southeast	Humble Pipe Line Co.	-- Applebaum	1931	150	5	--
166	10 miles southeast	H. W. Scott	--	1840	35	30	4.5
167	12¼ miles southeast	Claude Mercer	--	1919	32	36	3.0
168	14¾ miles southeast	Jess Woodley	Woodley and Collins	1926	3,003	--	--

Well	Distance from Waskom	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
169	10½ miles southwest	Elysian Fields School	L. C. Houston	1937	204	4	--
170	7½ miles southwest	W. L. Rudd	--	Old	17	36	0
171	6¾ miles southwest	--	--	--	13	36	1.5
172	7½ miles west	Long Ridge School	--	--	33	30	2.5

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
173	7½ miles southeast	Verhalen Nursery	--	Old	98	--	--
174	7¼ miles southeast	do.	--	1930	27	108	4
175	7¾ miles east	do.	--	1935	28	120	--
176	8¼ miles east	do.	--	1920	40	36	--

Well	Distance from Waskom	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
177	7¼ miles northwest	Webb Rogers	--	--	Spring	--	0
178	4 miles west	Gulf Service Station	R. Priester	1940	30	--	--
179	2¾ miles southwest	Rex Drilling Co.	H. D. Rogers	1939	272	--	--
180	2½ miles southwest	do.	do.	1939	164	6	--
181	2¼ miles southwest	W. B. Taylor	Dixie Gulf Gas Co.	1926	260	8	--

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
165	--	--	C,E, 5	D,Ind	Reported yield, 7 gallons a minute.
166	9.9	Feb. 17, 1942	C,E	D	Dug well.
167	18.35	do.	H	D,S	Do.
168	--	--	--	--	Oil test. See partial log.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
169	--	--	C,E	P	
170	1.7	Feb. 13, 1942	H	D,S	Dug well.
171	3.99	do.	None	N	Do.
172	7.40	do.	H	P	Do.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
173	--	--	None	N	See log.
174	8.4	Feb. 9, 1942	C,E	D	Dug well.
175	--	--	C,E	D,Ind	Do.
176	--	--	H	D	Do.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
177	+	Feb. 13, 1942	Flows	D,S	Estimated yield 5 to 10 gallons a minute.
178	--	--	C,E	Ind	
179	--	--	None	N	
180	--	--	None	N	Formerly used by several oil companies for drilling operations.
181	--	--	None	N	

Records of wells and springs in Harrison County--Continued

Well	Distance from Waskom	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
182	2¼ miles southwest	United Gas Pipe Line Co.	Dixie Gulf Gas Co.	1926	92	6	1.5
183	do.	do.	do.	1926	90	8	--
184	1 mile southwest	Arkansas Fuel Oil Co.	W. A. Meller	1940	90	7	--
185	do.	do.	do.	1940	90	7	--
186	In Waskom	Allen Thomas	W. M. Waterman	1924	151	6-5/8	--
187	do.	do.	do.	1925	150	7	3.3
188	¾ mile southeast	Waterman Brick and Tile Co.	H. D. Rogers	1940	404	--	--
189	do.	do.	--	--	200	12½	--
190	1 mile southeast	Frost Lumber Co.	W. M. Waterman	1924	200	6	--
191	do.	United Gas Pipe Line Co.	Magnolia Petroleum Co.	1927	165	6	--
192	do.	do.	do.	1927	170	6	--
193	do.	do.	do.	1927	161	6	--
194	4¼ miles south	Gainesville Colored School	--	1925	22	24	2.5
195	5 miles southwest	Edwin Spears	--	Old	36	30	0
196	7 miles southwest	Don B. Long	Don B. Long	1940	112	4	--
197	do.	do.	--	Old	25	36	1.0
198	6 miles south	Willow Wayside Colored School	--	1940	21	30	0

Well	Distance from Marshall	Owner	Driller	Date completed	Depth of well (ft.)	Diameter of well (in.)	Height of measuring point above ground (ft.)
199	11 miles northwest	Lee Ragon	Edson Petroleum Corp.	1939	1,000	--	--
200	13 miles northwest	Al Oney	do.	1939	995	--	--

a/ Plus (+) indicates water level is above ground.

b/ T, turbine; A, air, steam or natural gas lift; H, hand pump or bucket and rope; C, cylinder; G, gasoline; E, electric; W, windmill. Number indicates horsepower.

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
182	18.70	Oct. 31, 1941	A	D	
183	--	--	A	N	
184	--	--	A	N	
185	--	--	A	N	
186	--	--	T,E, 5	P	Partially supplies the City of Waskom.
187	82.50	Oct. 29, 1941	T,E, 3	P	Do.
188	--	--	None	N	See log.
189	--	--	A	D,Ind	Estimated yield, 100 gallons a minute.
190	--	--	T,E, 10	D,Ind	Estimated yield, 150 gallons a minute. Temperature 67° F.
191	--	--	A	Ind	
192	--	--	A	Ind	
193	--	--	A	Ind	Combined yield of wells 191, 192 and 193 was 43 gallons a minute October 31, 1941.
194	17.11	Feb. 13, 1942	H	P	Dug well.
195	9.2	do.	H	D,S	Do.
196	--	--	None	N	
197	4.0	Feb. 13, 1942	C,E	D	Dug well.
198	16.73	do.	H	P	

Well	Water level: Below measuring point (ft.) a/	Water level: Date of measurement	Method of lift b/	Use of water c/	Remarks
199	--	--	None	N	Core test. Electrical log from 50 to 865 feet in files of the Texas State Board of Water Engineers shows sandy zones from 50 to 180 and 280 to 350 feet and shale or clay with thin sands from 350 to 865 feet. See figure 2.
200	--	--	None	N	Core test. Electrical log from 30 to 827 feet in files of the Texas State Board of Water Engineers shows sandy zones from 70 to 130 feet and 200 to 300 feet and shale or clay with thin sands from 300 to 827 feet. See figure 2.

c/ P, public supply; D, domestic; S, stock; Ind, industrial; N, not used.
d/ Water level reported by driller or owner.

Table of Drillers' Logs, Harrison County, Texas

	Thickness (feet)	Depth (feet)
Well 21, partial log		
Mrs. C. C. Bohler, 9¼ miles northeast of Marshall. Corona Petroleum Co., driller.		
Clay	15	15
Sand and lignite	55	70
Gumbo and sand	100	170
Sand rock	4	174
Gumbo and sand	46	220
Rock	5	225
Gumbo and sand	45	270
Rock	2	272
Sand	28	300
Gumbo and sand	50	350
Rock	2	352
Sand with streaks of shale	21	373
Rock	4	377
Shale	23	400
Sand and shale	50	450
Gumbo and sand	88	538
Rock	3	541
Sand and boulders	20	561
Gumbo and sand	30	591
Shale and boulders	78	669
Chalk rock	1	670
Rock	4	674
Shale and sand	166	840
Gumbo, shale and boulders	577	1417
Sand	5	1422
Shale	14	1436
Rock	2	1438
Sand	27	1465
Shale	105	1570
Shale and sand	175	1745
Chalk and lime with shale breaks	65	1810
TOTAL DEPTH		3097
Well 25		
On ridge, T. J. Taylor, 3 miles southwest of Karnack. A. G. Foster, driller.		
Sand and clay	45	45
Quicksand	15	60
Dark-gray sand	23	83
Shale	47	130
Well 29		
On Hilltop, T. J. Taylor, ¾ mile southwest of Karnack. B. F. Eddington, driller.		
Surface soil	22	22
Blue shale	33	55
Sand	11	66
Shale	34	100
Sandy shale	37	137
Rock	1	138
Sandy shale	22	160
Lignite	5	165
Shale	38	203
Shale with streaks of sand	87	290
Rock	1	291
Gumbo and shale	139	430
Well 30		
Flat. Longhorn Ordnance Works, ½ mile east of Karnack. B. F. Eddington, driller.		
Surface soil	15	15
Sand, fine brown gravel and iron ore	30	45
Blue shale	30	75
Sandy shale, water-bearing	31	106
Rock	2	108
Sand	25	133
Well 33		
Lowland. A. G. Foster, ½ mile northwest of Karnack. A. G. Foster, driller.		
Clay	92	92
Sand	18	110
Sandy shale	7	117
Dark-gray sand	13	130
Shale	1	131
Yellow sand	32	163
Well 37		
Lowland. W. E. Hartzo, 2¼ miles north of Karnack. A. G. Foster, driller.		
Surface soil	62	62
Hard gray rock	1	63
Sandy shale	15	78
Water sand	27	105
Rock	1	106
Sand	27	133

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 44		
Edge of Caddo Lake. Johnson Bros., 5¼ miles east of Karnack. A. G. Foster, driller.		
Sand and clay	28	28
Shale	81	109
Hard sand	16	125
Shale	51	176
Medium-grained hard sand	4	180
Shale	12	192
Medium-grained sand	10	202
Shale	2	204
Sand	2	206
Shale	152	358
Well 58		
On ridge. S. E. Wood, 2 miles southeast of Marshall. Elevation, 364.5 feet.		
Surface sand	16	16
Water sand	27	43
Gumbo	3	46
Lignite	4	50
Gumbo	10	60
Gray sand with streaks of lignite	158	218
Shale	90	308
Rock	22	330
Sand	32	362
Well 61		
Creek bottoms. City of Marshall, 3 miles northeast of Marshall. Ed Mills driller.		
Surface soil	1	1
Sand and clay	11	12
Red and yellow rock	14	26
Lignite	1	27
Gray sand	17	44
Gray clay	23	67
Soft dark-brown clay	8	75
Lignite	5	80
Clay	4	84
Lignite	8	92
White clay	8	100
Sandstone	1	101
Gray clay	11	112
Gray sand	4	116
Lignite	1	117
Gray clay	4	121
Sandstone	3	124
Gray clay	6	130
Lignite	1	131
Gray sand	8	139
Hard rock	21	160
Sand and clay	12	172
Lignite	3	175
Sand and gray clay	15	190
Lignite	3	193
White sand	17	210
Lignite	1	211
Gray sand	26	237
Not given	1	238
Sandstone	1	239
Gray clay	3	242
Coarse-grained sand	7	249
Lignite	4	253
White sand, water	4	257
Lignite	1	258
Gray sand	17	275
Lignite	5	280
Gray clay and sand	10	290
Gray sand	20	310
Clay and lignite	10	320
Gray clay	10	330
Lignite	2	332
Sand and clay	1	333
"Shelly" rock	3	336
Sharp sand	31	367
Soft gray sand rock	51	418
Hard sand rock	1	419
Soft gray rock	86	505
Hard rock	3	508
Sand rock	2	510
Sand and clay	10	520
Hard rock	6	526
Pipe clay	22	548
Hard rock	1	549
Gray sand	28	577
Pipe clay	6	583
Lignite	1	584
Gray sand rock	11	595
Lignite, clay and sand	15	610
Well 62		
Creek bottoms. City of Marshall, 3 miles northeast of Marshall. Ed Mills, driller.		
Surface soil	3	3
Blue gumbo	21	24
Quicksand	6	30
Sand, gravel and water	10	40
Sand and water	20	60
Lignite	2	62

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 62--Continued		
Gray gumbo	82	144
Water sand	8	152
Gray gumbo	5	157
Water sand	3	160
Lignite	1	161
Gray gumbo	57	218
Unknown	22	240
Well 67		
City of Marshall, in Marshall. Layne-Texas Co., driller.		
Rotary	5	5
Surface soil	3	8
Red clay	12	20
Gray sandy shale	26	46
Soft rock	1	47
Soft gray shale	15	62
Lignite, shale and sand	47	109
Fine-grained silty sand	15	124
Soft shale	16	140
Hard rock	1	141
Soft shale	9	150
Soft rock	1	151
Hard gray shale	35	186
Soft shale and silty sand	29	215
Hard shale	12	227
Fine-grained silty sand	16	243
Soft shale with layers of lignite and fine-grained sand	30	273
Fine-grained sand and blue shale	28	301
Rock	1	302
Fine-grained dark-colored sand	45	347
Fine-grained sand and shale	22	369
Rock	2	371
Soft blue shale with some sand	68	439
Rock	1	440
Soft shale with layers of fine-grained sand	44	484
Rock	1	485
Soft shale	41	526
Well 68		
City of Marshall, in Marshall. Layne-Texas Co., driller.		
Rotary	4	4
Surface soil and red clay	2	6
White sand	47	53
Loam, white sand and lignite	17	70
Lignite	15	85
Sand and shale	14	99
Rock	1	100
Gray sand and mica	20	120
Silty sand with layers of shale	70	190
Sand with layers of shale	53	243
Fine-grained sand with layers of lignite	25	268
Rock	1	269
Fine-grained dark-gray sand	45	314
Rock	3	317
Dark-gray sand	47	364
Soft rock	1	365
Coarse-grained sand	18	383
Rock	1	384
Soft shale	92	476
Well 69		
City of Marshall, in Marshall. I. B. White, driller.		
Surface soil	12	12
White sand	14	26
Shale and lignite	24	50
Gummy shale with streaks of lignite	35	85
Shale and boulders	20	105
Fine-grained gray sand	13	118
Shale	39	157
Rock	3	160
Shale	14	174
Rock	1	175
Shale and boulders	10	185
Fine-grained gray sand and boulders	15	200
Shale	35	235
Dark-gray fine-grained sand	18	253
Rock	1	254
Sand and shale	10	264

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 69--Continued		
Fine-grained gray sand and boulders	15	200
Shale	35	235
Dark-gray fine-grained sand	18	253
Rock	1	254
Sand and shale	10	264
Gray water sand	87	351
Sand and shale	20	371
Well 70		
City of Marshall, in Marshall. Layne-Texas Co., driller.		
Red clay	26	26
Coarse-grained loose gray sand	38	64
Fine-grained gray sand and shale	87	151
Rock	1	152
Sand	5	157
Lignite	3	160
Soft blue shale and fine-grained sand	42	202
Rock	5	207
Hard brown shale with layers of sand	33	240
Lignite	5	245
Fine-grained silty sand	17	262
Soft shale and fine-grained dark-gray sand	67	329
Fine-grained dark-gray sand and shale	37	366
Sand	6	372
Hard rock	1	373
Dark-gray sand	30	403
Rock	2	405
Sticky brown shale	74	479
Well 71		
City of Marshall, in Marshall. Elevation 340.5 feet.		
Surface sand and clay	15	15
Fine-grained sand	15	30
Lignite and shale	63	93
Rock	2	95
Hard lignite with streaks of sand	22	117
Lignite	8	125
Sand	30	155
Sand and lignite	10	165

	Thickness (feet)	Depth (feet)
Well 71-Continued		
Sand rock	1	166
Gummy shale and boulders	19	185
Gumbo and streaks of lignite	20	205
Fine-grained sand and boulders	10	215
Shale and lignite	20	235
Lignite and shale	40	275
Shale	10	285
Sand and shale mixture	35	320
Gray water sand	56	376
Well 72		
City of Marshall, in Marshall. Core Drill Corp., driller.		
Surface sand	10	10
Good light-colored water sand	50	60
Sand with streaks of shale	95	155
Rock	1	156
Light-colored tight sand	114	270
Hard rock	2	272
Tight gray sand	138	410
Sand with streaks of shale	180	590
Hard rock	2	592
White sand	78	670
Rock with streaks of sand	10	680
Sand	30	710
Sand and shale	30	740
Shale	10	750
Sand and shale	20	770
Rock	10	780
Sand and shale	90	870
Shale with boulders	10	880
Sand and shale	10	890
Shale and rock	10	900
Shale	30	930
Shale and rock	10	940
Shale and sand	10	950
Shale, sand, and small boulders	20	970

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 73		
City of Marshall, in Marshall. Core Drill Corp., driller. Elevation, 349.3 feet.		
Surface soil and sand	10	10
Sand	40	50
Lignite	20	70
Sand	20	90
Rock	10	100
Shale and gumbo	50	150
Shale	10	160
Sandy shale	10	170
Sand and shale	10	180
Sand, shale, and sand rock	10	190
Hard shale	10	200
Sand	50	250
Broken boulders	10	260
Gumbo	31	291
Good water sand	19	310
Hard sand	10	320
Boulders and tight sandstone	65	385
Well 74		
City of Marshall, in Marshall. Core Drill Corp., driller. Elevation, 328.54 feet.		
Surface sand and clay	40	40
Sand	30	70
Lignite	22	92
Hard sand	18	110
Rock	10	120
Gray sand	30	150
Sand, shale and lignite	110	260
Shale and sand	19	279
Hard rock	1	280
Sandy shale	50	330
Hard rock	1	331
Good water sand	29	360
Well 75		
City of Marshall, in Marshall. Core Drill Corp., driller. Elevation, 337.06 feet.		
Clay and surface rock	10	10
Sand	72	82
Lignite	18	100
Sand	50	150
Sand rock	5	155
Sand	45	200
Rock	6	206
Sand	14	220
Hard rock	5	225
Sand	55	280
Sand and shale	35	315
Hard rock	5	320
Sandy shale	20	340
Hard rock	12	352
Sandy shale	48	400
Well 76		
City of Marshall, in Marshall. Elevation, 326.3 feet.		
Surface sand and clay	15	15
Fine-grained gray sand	20	35
Gummy shale	15	50
Fine-grained sand	15	65
Shale	15	80
Lignite and shale	25	105
Shale with streaks of sand	35	140
Lignite	25	165
Shale and boulders	20	185
Lignite	20	205
Gummy shale	21	226
Lignite and streaks of sand	24	250
Sand and shale mixed	20	270
Gummy shale and boulders	21	291
Fine-grained gray water sand	87	378
Shale and sand mixed	72	450
Coarse-grained sand	15	465
Gummy shale	31	496
Well 77		
Texas & Pacific R.R.Co., in Marshall. Elevation, 336 feet.		
Surface clay	10	10
Sand	43	53
Lignite	22	75
Shale and sand	198	273
Rock	2	275
Shale	11	286
Well 78		
Texas & Pacific R. R. Co., in Marshall. Elevation, 333 feet.		
Surface clay	10	10
Sand	40	50
Lignite	15	65
Sand and shale	111	176
Rock	2	178

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 78--Continued		
Sand and shale	48	226
Sand	60	286
Sand and sha	65	351
Shale	14	365
Sand	41	406
Shale	11	417
Well 79		
Texas & Pacific R. R. Co., in Marshall. Elevation, 337 feet.		
Surface clay	10	10
Sand	44	54
Lignite	18	72
Sand	63	135
Shale	15	150
Sand	175	325
Rock	2	327
Sand	42	369
Rock	2	371
Sand	51	422
Shale	22	444
Well 80		
Texas & Pacific R. R. Co., in Marshall. Elevation, 335 feet.		
Surface clay	8	8
Sand	46	54
Lignite	15	69
Sand	21	90
Shale	22	112
Sand	56	168
Shale	11	179
Sand	11	190
Shale	172	362
Rock	2	364
Sand	55	419
Shale	14	433
Well 83		
Slope. Southwestern Gas & Electric Co., in Marshall. Layne-Texas Co., driller. Elevation, 385.0 feet.		
Surface clay	10	10
Rock	3	13
Clay	10	23
Sandy clay	22	45
Shale	90	135
Rock	3	138
Shale	25	163
Lignite	10	173
Shale	6	179

	Thickness (feet)	Depth (feet)
Well 83--Continued		
Sand	37	216
Shale	66	282
Sand	31	313
Shale	47	360
Sand	15	375
Shale	30	405
Rock	4	409
Shale	7	416
Gumbo	29	445
Sand	13	458
Well 84		
Independent Ice Co., in Marshall. J. C. Boling, driller.		
Sand and quicksand	68	68
Blue shale	5	73
Water sand	2	75
Brown shale	12	87
Blue shale	5	92
Water sand	8	100
Limestone	2	102
Brown shale	17	119
Water sand	16	135
Brown shale	10	145
Gumbo	33	178
Blue shale	6	184
Water sand	3	187
Blue shale	3	190
Sandy shale	5	195
Water sand	35	230
Blue sandy shale	20	250
Gray shale	18	268
Water sand	12	280
Sandy shale	40	320
Gumbo	3	323
75 feet of 23-inch surface casing; 250 feet of 8-inch; 80 feet of 6-inch liner extending 7 feet up inside 8 inch.		
Well 86		
Darco Corp. 1¾ miles west of Marshall. Layne-Texas Co., driller.		
Red clay and sand	22	22
Red sand	16	38
Gray water sand	33	71
Hard gray sand and lignite	15	86
White sand	8	94
Hard brown shale	33	127
Lignite	7	134
Blue shale	30	164

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 86--Continued		
Rock	1	165
Shale	5	170
Fine-grained light-gray sand	11	181
Brown shale and lignite	47	228
Rock	1	229
Gray shale and lignite	43	272
Rock	1	273
Soft gray shale	26	299
Lignite	5	304
Fine-grained white sand	11	315
Fine-grained gray sand, shale and lignite	22	337
Fine-grained light-gray sand, mica and shale	24	361
Shale	22	383
Hard blue shale	14	397
Soft blue shale and thin layers of fine-grained sand	33	430
Hard blue shale	29	459
Fine-grained sand	12	471
Soft shale	17	488
Soft brown shale	45	533
Rock	1	534
Hard shale	25	559
Soft shale	23	582
Rock	1	583
Soft brown shale	134	717
Soft brown shale and boulders	89	806
Well 87		
Darco Corp., 1¾ miles west of Marshall. Layne-Texas Co., driller.		
Surface soil	2	2
Red clay	20	22
Soft brown shale	12	34
Rock	1	35
Hard red sand	8	43
Loose red sand	15	58
Rock	1	59
Red sand	7	66
Gray water sand and thin layers of rock	41	107
Rock	1	108
Well 87--Continued		
Gray water sand and thin layers of hard water sand	13	121
Shale	3	124
White water sand	16	140
Lignite	2	142
Soft shale	12	154
Rock	1	155
Soft shale	8	163
Rock	1	164
Soft shale	4	168
Rock	2	170
Lignite	13	183
Soft blue shale	28	211
Hard fine-grained gray sand	25	236
Soft blue shale	16	252
Lignite	4	256
Soft brown shale	65	321
Hard rock	1	322
Soft shale	22	344
Lignite	4	348
Shale, fine gray water sand and lignite	36	384
Soft shale	4	388
Fine-grained sand and shale	16	404
Soft gray shale	81	485
Hard shale	35	520
Hard dark-colored fine-grained sand	16	536
Hard brown shale	12	548
Rock	1	549
Hard sticky shale	22	571
Hard shale and boulders	35	606
Soft gray shale	36	642
Hard rock	4	646
Hard gray shale	92	738
Hard rock	1	739
Hard gray shale	26	765
Well 88		
Darco Corp., 1¾ miles west of Marshall. Layne-Texas Co. driller.		
Red clay	8	8
Blue clay	9	17
Surface water sand	4	21
Yellow sandy clay	18	39
Black sand	20	59
Gray packsand	10	69
Sandy shale	20	89

(Continued on next page.)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 88--Continued		
Water sand	11	100
Peat and rotten lignite	3	103
Packsand	7	110
Sandy shale	18	128
Water sand	10	138
Black sand	12	150
Blue shale	4	154
Brown shale	3	157
Black gumbo	4	161
Lignite	2	163
Black gumbo	2	165
Lignite and peat	3	168
Brown shale	6	174
Blue sandy shale	6	180
Well 89		
Darco Corp., 1¾ miles west of Marshall.		
Red clay	12	12
Yellow sandy clay	13	25
Gray sand and boulders	35	60
Water sand	24	84
Packsand and boulders	26	110
Sandy shale and boulders	16	126
Water sand	9	135
Sandy shale	15	150
Gray sand and boulders	18	168
Lignite	4	172
Black gumbo	6	178
Lignite and peat	3	181
Blue shale	3	184
Water sand	1	185
Well 91		
On slope, Darco Corp., 1¾ miles west of Marshall.		
Red clay	7	7
Water sand	6	13
Packsand	5	18
Sandstone	1	19
Yellow and brown sand	21	40
Rock	2	42
Poor water sand	7	49
Rock	1	50
Packsand	3	53
Brown sand	7	60
Gray sand	7	67
Sandy shale and boulders	25	92

	Thickness (feet)	Depth (feet)
Well 91--Continued		
Water sand	13	105
Packsand	8	113
Faulty lignite	5	118
Gumbo	18	136
Faulty lignite	12	148
Gumbo	2	150
Sandy shale	24	174
Gumbo	5	179
Water sand	13	192
CASING: 192 feet of 6-inch. Screens from 90 to 110 and 142 to 192 feet. 6-inch casing in 18-inch hole, annular space filled with washed gravel.		
Well 92		
On slope. Darco Corp., 1¾ miles west of Marshall.		
Surface clay	6	6
Water sand	6	12
Blue clay	2	14
Loose sand	15	29
Water sand	17	46
Rock	1	47
Gray sand	16	63
Sandy shale and boulders	25	88
Water sand	6	94
Sand and boulders	10	104
Sandy shale and gumbo	5	109
Sand and boulders	3	112
Iron ore, rock	4	116
Sand	3	119
Gumbo	4	123
Water sand	11	134
Faulty lignite	14	148
Gumbo	4	152
Shale	2	154
Gumbo	11	165
Shale	5	170
Gumbo	6	176
Water sand	9	185
Gumbo	11	196
Brown shale	5	201
CASING: 201 feet of 6-inch. Screen from 75 to 201 feet. 6-inch casing in 18-inch hole, annular space filled with washed gravel.		

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 93		
On slope. Darco Corp., 1¾ miles west of Marshall. Walter A. Meller, driller.		
Surface clay	7	7
Surface sand	16	23
Gravel	8	31
Mealy water sand	22	53
Rock	1	54
Sand	6	60
Shale	6	66
Sand	16	82
Gumbo	5	87
Water sand	15	102
Gumbo	9	111
CASING: 111 feet of 16 inch, 111 feet of 9 inch. Screens from 32 to 53 and 71 to 111 feet, annular space between casings filled with washed gravel.		
Well 94		
Darco Corp., 1¾ miles west of Marshall.		
Top soil	1	1
Red clay	8	9
Gravel	1	10
Gray gumbo	5	15
Red sandy clay	10	25
Gray water sand	16	41
Red sand rock	6	47
Red sand	3	50
CASING: 50 feet of 48 inch. One foot annular space outside of casing filled with washed gravel.		
Well 95		
On slope. Darco Corp., 1¾ miles west of Marshall. B. F. Eddington, driller.		
Surface clay	26	26
Red water sand	28	54
Green water sand	61	115
Salt and pepper sand and lignite	13	128
Well 96		
On slope. Darco Corp., 1¾ miles west of Marshall. B. F. Eddington, driller.		
Red clay	6	6
Red water sand	59	65
Green water sand	38	103
White water sand	12	115
Lignite	2	117
Sand and lignite	8	125

	Thickness (feet)	Depth (feet)
Well 97		
Creek bottoms below pond. O. D. Hays, 1¼ miles north of Marshall. William H. Atkinson, driller.		
Surface material	80	80
Water sand	30	110
Clay	87	197
Shale and boulders	308	505
Shale and shells	415	920
Shale	625	1545
Chalk	15	1560
Shale	210	1770
Chalk	25	1795
Broken chalk	125	1920
Chalk	350	2270
Shale	160	2430
Sand	60	2490
Shale and shells	90	2580
Shale	120	2700
Hard shale	107	2807
Shale	43	2850
Hard lime	20	2850
Well 107		
City of Hallsville, in Hallsville. Layne-Texas Co., driller.		
Sandy white clay	3	3
Yellow clay	10	13
Sticky black shale	106	119
Rock	1	120
Shale and boulders	22	142
Sandy shale	20	162
White sand	38	200
Blue shale	44	244
Rock	1	245
Sandy shale	7	252
Black sand	17	269
Sandy shale	6	275
Sand	10	285
Sandy shale	33	318
Brittle shale	68	386
Black shale	69	455
Sandy shale	46	501
Fine-grained gray sand	91	592
Shale	10	602
Rock	1	603
Shale and lignite	10	613
Well plugged back at 201 feet.		
Well 119, partial log		
Owner --, 4¼ miles northwest of Hallsville.		
Surface sand and clay	110	110

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 119, partial log--Continued		
Sand and boulders	60	170
Gumbo	13	183
Shale and boulders	62	245
Sand and boulders	47	292
Rock	3	295
Shale	5	300
Rock	1	301
Shale	759	1060
TOTAL DEPTH		Unknown

Well 122

On slope. Dell Everett, 6½ miles west of Hallsville. J. C. Boling, driller.

Quicksand	129	129
Sandy shale	21	150
Sand, muddy	15	165
Sandy shale	45	210
Sand, muddy	10	220
Sandy shale	18	238
Water sand	42	280
Shale	24	304

Well 137

River bottoms. Will T. Cock, 7½ miles southeast of Hallsville. E. O. Butler, driller.

Soil	5	5
Clay	25	30
Sand	30	60
Shale	110	170
Lime	15	185
Sand	15	200
Lime	15	215
Shale	185	400
Shale and boulders	25	425
Shale	625	1050
Sandy shale	450	1500
Hard shale	160	1660
Lime	5	1665
Sand	10	1675
Shale	175	1850
Chalk	520	2370
Shale	143	2513
Lime	4	2517
Sand and shale	31	2548

Well 138

River bottoms. John N. Lingo, 14¼ miles southwest of Marshall. A. G. Foster, driller.

Surface material	28	28
Lignite	9	37
Shale	200	237
Sand	31	268
Shale	32	300
Sand	43	343

10½-inch hole. Set 20 feet of perforated pipe in upper sand, 43 feet set in bottom.

Well 142

On ridge. E. T. Roseborough, Sr., 8½ miles south of Marshall.

Unknown	20	20
Lignite	5	25
Water-bearing sand	175	200
Lignite	25	225
Water-bearing sand	125	350

Well 149

Lewis Anderson 8¼ miles southeast of Marshall. V. E. West, driller.

Yellow sandy shale	8	8
Yellow and blue shale mixed	8	16
Sand	4	20
Yellow shale	7	27
Gravel	3	30
White sand	6	36
Yellow shale	3	39
Blue sand	3	42
Blue shale	12	54
Dark-colored sand	9	63

Well 150

Johnnie Tatum, 9½ miles southeast of Marshall. V. E. West, driller.

Sandy shale	10	10
Red and blue shale	8	18
Yellow shale	5	23
Sand	5	28
Yellow shale and gravel mixed	10	38
Blue shale	4	42
Dark-colored sand	5	47
Blue shale	6	53
Dark-colored sand	3	56
Blue shale	16	72
Dark-colored sand	3	75
Blue shale	9	84
Dark-colored sand	3	87

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 150--Continued		
Blue shale	19	106
Dark-colored sand	13	119
Blue shale	1	120
Well 151		
L. C. Mitchell, 9¾ miles southeast of Marshall. V. E. West, driller.		
Sandy shale	6	6
Yellow shale	8	14
White sand	4	18
Yellow shale	3	21
White sand	4	25
Blue sand	4	29
Lignite	11	40
Well 152		
Dudley Morgan, 9¼ miles south of Marshall. V. E. West, driller.		
Sandy shale	12	12
Blue shale	21	33
Hard lignite	10	43
Blue shale	7	50
Light-blue sandstone	9	59
Light-colored soft sandstone	11	70
Blue shale	11	81
Lignite	8	89
Red shale	8	97
Light-gray shale	11	108
Sand	3	111
Blue shale	13	124
Sand	6	130
Blue shale	28	158
Hard sandstone	3	161
Blue shale	4	165
Blue sand with shale breaks	10	175
Well 153		
On level. Sidney Reed, 10¾ miles south of Marshall. V. E. West, driller.		
Sandy shale	7	7
Light-blue shale	11	18
Sandstone	5	23
Yellow shale	4	27
Blue shale	5	32
Lignite	1	33
Blue shale	9	42
Dark-colored sand	6	48
Blue shale	19	67
Dark-colored sand	3	70
Blue shale	7	77
Dark-colored sand	7	84
Shale	2	86
Dark-colored sand	6	92
Well 154		
On level. Willie Mitchell, 11 miles south of Marshall. V. E. West, driller.		
Red sandy shale	5	5
Yellow shale	9	14
Yellow sand	14	28
Coarse-grained white sand	10	38
Blue shale, sand breaks	4	42
Blue shale	12	54
Dark-colored sand	2	56
Blue shale	11	67
Dark-colored sand	3	70
Blue shale	6	76
Dark-colored sand	3	79
Blue shale	11	90
Lignite	4	94
Blue shale	2	96
Lignite	4	100
Blue shale	5	105
Fine-grained sand	3	108
Blue shale	4	112
Well 155		
On slope. Arthur Fisher, 11 miles south of Marshall. V. E. West, driller.		
Yellow sandy shale	7	7
Blue shale	6	13
Coarse gravel	2	15
Blue shale	13	28
Fine-grained sand	6	34
Blue shale	7	41
Fine-grained sand	2	43
Blue shale	4	47
Fine-grained sand	7	54
Blue shale	6	60
Fine-grained dark-colored sand	3	63
Blue shale	4	67
Dark-colored sand	3	70
Blue shale	8	78
Fine-grained dark-colored sand	4	82
Blue shale	5	87
Dark-colored sand	7	94

(Continued on next page)

Table of Drillers' Logs, Harrison County--Continued

	Thickness (feet)	Depth (feet)
Well 155--Continued		
Blue shale	3	97
Dark-colored sand	8	105
Well 160		
On level. Community Center, 13¾ miles southeast of Marshall. A. E. Fawcett, driller.		
Top soil and clay	10	10
Blue shale	10	20
Lignite and rock	2	22
Dark-colored shale	5	27
Sand	13	40
Dark-colored shale	53	93
Sand and sandy shale, tested for water, no good	22	115
Dark-colored shale	14	129
Good water sand	18	147
Well 161		
Community Center, 13¾ miles southeast of Marshall. Buck Lebon, driller.		
Top soil	3	3
Yellow clay	18	21
Blue clay	7	28
Rock	6	34
Dark-colored shale	16	50
Dark-colored hardpan	6	56
Sandy shale	26	82
Dark-colored shale	6	88
Sandy shale	5	93
Fine-grained sand	8	101
Hard rock	2	103
Soft sandy shale	40	143
Shale and boulders	8	151
Sandy shale, boulders	23	174
Hard rock	7	181
Fine-grained gray water sand	55	236
Shale	70	306
Sand	15	321
Well 168, partial log		
Jess Woodley, 14¾ miles southeast of Marshall. Woodley and Collins, drillers. Elevation, 312 feet.		
Surface clay and sand	31	31
Lignite	3	34
Sand	40	74
Rock	1	75
Sand	19	94
Shale	5	99
Sand	41	140
Hard sand rock	22	162
Sand	65	227
Rock	2	229
Sand	26	255
Hard rock	1	256
Sand with hard streaks	119	375
Shale and boulders	95	470
Rock	1	471
Gummy shale	11	482
Shale and boulders	98	580
Gummy shale	20	600
Shale and boulders	30	630
Rock	1	631
Shale and boulders	140	771
Rock	1	772
Shale and boulders	208	980
Lime rock	1	981
Shale with streaks of sand	3	984
Shale with streaks	7	991
Brown lime	2	993
Shale	60	1053
Sandy shale	32	1085
Gumbo	30	1115
TOTAL DEPTH		3003
Well 173		
On ridge. Verhalen Nursery, 7½ miles southeast of Marshall.		
Red clay	12	12
Fine-grained sand	12	24
Blue shale	5	29
Dark-colored sand	24	53
Hard gumbo	7	60
Lignite	1	61
Gumbo	4	65
Gray sand	11	76
Gumbo	4	80
Gray sand	18	98
Well 188		
Waterman Brick and Tile Co., ¾ mile southeast of Waskom. H. D. Rogers, driller.		
Surface material	17	17
Sand	3	20
Gumbo	330	350
Boulders	30	380
Gumbo	24	404

Partial analyses of water from wells and springs in Harrison County, Texas

Analyzed at The University of Texas under the direction of W. W. Hastings, Chemist, U. S. Department of the Interior Geological Survey, and Dr. E. P. Schoch, Director of the Bureau of Industrial Chemistry. Results are in parts per million. Well numbers correspond to numbers in table of well records.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
1	John Walker	16	Jan. 29, 1942	211	6.8	17	36	0.0	97	32	-	22	85
2	E. L. Carrington	35	do.	85	a/	b/	22	12	10	16	-	26	16
3	Morton School	32	do.	328	15	15	90	18	2	196	.1	c/	99
d/ 4	Smyrna School	39	do.	126	21	b/	30	134	3	4.5	.2	c/	55
5	Smyrna Colored School	13	do.	40	8.8	b/	3.7	6	3	14	.2	c/	25
6	Harleton School	23	do.	49	a/	3.2	7.1	12	3	6.0	.2	20	22
7	D. D. Croft	61	do.	105	6.0	4.4	26	37	30	20	.3	c/	33
8	C. A. Clark	34	do.	41	a/	b/	13	6	10	12	-	c/	5
9	New Zion Colored School	22	Jan. 30, 1942	121	a/	b/	37	6	49	20	.2	c/	10
10	Piney School	Spring	Jan. 29, 1942	27	a/	b/	5.1	6	2	4.5	.1	c/	10
d/ 11	Friendly School	57	do.	71	a/	b/	18	6	30	13	.2	c/	16
12	St. James School	Spring	Jan. 30, 1942	22	a/	b/	8.7	12	2	4.5	.1	c/	0
13	Hickory Grove Rosenwall School	16	do.	49	a/	b/	15	6	3	24	.1	c/	11
14	Macadonia School	37	do.	56	a/	b/	17	6	26	8.0	.1	c/	7
15	Henderson School	16	Mar. 10, 1942	40	10	b/	2.1	31	2	2.5	.1	c/	31
16	Woodland Independent School	26	Nov. 3, 1941	42	a/	b/	12	24	10	5.0	.1	c/	11
17	Frank Davis	16	Feb. 11, 1942	35	a/	b/	9.0	12	7	8.5	-	c/	11
18	Ware School	30	do.	29	a/	3.6	4.4	18	2	3.0	.1	c/	17
19	Beckham Colored School	15	do.	18	a/	b/	5.1	12	2	3.0	.1	c/	6
d/ 20	W. H. Nesbett	45	do.	55	14	b/	5.8	55	2	4.5	-	c/	41
22	Edmond Key	34	do.	24	a/	b/	3.0	0	2	4.5	-	c/	11
23	Nancy Harris	32	Feb. 10, 1942	189	6.8	b/	53	12	14	52	-	55	27
24	W. T. Slater	17	Feb. 11, 1942	203	14	16	34	18	7	88	-	35	100

a/ Less than 5 parts per million.
b/ Less than 3 parts per million.
c/ Less than 20 parts per million.
d/ Analyses of water from selected wells and springs are given in milligram equivalents per liter on page 51.

Partial analyses of water from wells and springs in Harrison County--Continued

Results are in parts per million.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
27	T. J. Taylor	64	Oct. 28, 1941	587	a/	b/	234	354	4	168	-	c/	22
d/ 28	George Washington Carver Colored School	105	Oct. 27, 1941	367	24	20	91	262	42	52	.2	c/	142
29	T. J. Taylor	120	Feb. 13, 1942	514	39	19	123	146	120	141	.2	c/	177
29	do.	306	Feb. 21, 1942	375	10	b/	142	299	30	44	.1	c/	31
30	Longhorn Ordnance Works	133	-	446	6.8	3.6	174	360	10	74	.1	c/	32
31	Karnack Independent School	105	Oct. 27, 1941	259	a/	5.4	95	201	15	40	.5	c/	33
32	Miss Elizabeth Baker	18	do.	1,834	236	75	326	268	307	758	.2	c/	901
33	A. G. Foster	137	Feb. 10, 1942	313	6.8	b/	111	159	64	50	.5	c/	27
34	V. H. Moore	228	Oct. 28, 1941	340	a/	4.1	133	256	31	46	-	c/	17
35	Caddo Lake State Park	1,000±	Oct. 27, 1941	5,064	42	11	1,933	122	3	3,015	-	-	152
36	do.	315	do.	320	a/	b/	128	256	25	38	.4	c/	11
37	W. E. Hartzo	133	Nov. 3, 1941	818	a/	b/	330	366	2	302	-	c/	10
38	Fred R. Mayfield	100	Oct. 28, 1941	344	a/	11	120	244	23	66	-	c/	57
d/ 40	Gus Noble	103	do.	305	a/	b/	121	220	23	50	-	c/	11
41	Johnson Ranch	103	Nov. 3, 1941	275	a/	b/	108	201	31	34	.3	c/	11
42	Dallas-Caddo Hunting Club	125	Oct. 28, 1941	369	7.6	9.0	127	171	21	120	.3	c/	56
45	Lake Chapel Colored School	36	Feb. 12, 1942	91	a/	4.9	26	6	17	34	.2	c/	20
46	Pleasant Hill School	18	do.	55	a/	b/	19	12	10	17	.1	c/	5
47	Mt. Zion Colored School	18	do.	104	23	b/	14	85	11	9.5	.1	c/	67
48	Old Border School and Church	21	do.	36	6.4	b/	6.0	24	2	8.0	.1	c/	21
49	Hart School	17	do.	300	118	56	108	232	2	401	.3	c/	525
50	Shilo Baptist Church	19	do.	259	a/	11	81	31	20	129	.2	c/	52

a/ Less than 5 parts per million.
b/ Less than 3 parts per million.
c/ Less than 20 parts per million.
d/ Analyses of water from selected wells and springs are given in milligram equivalents per liter on page 51.

Partial analyses of water from wells and springs in Harrison County--Continued

Results are in parts per million.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
d/ 51	D. V. Blocker	205	Feb. 14, 1942	53	a/	4.9	11	49	2	1.0	.4	c/	20
52	Mrs. A. C. Baldwin	1,900±	Feb. 12, 1942	166	6.8	3.6	58	183	2	4.0	.1	c/	32
53	Annie Glade School	13	do.	137	a/	8.5	38	6	6	79	.2	c/	40
54	-- Colored School	11	Feb. 13, 1942	55	a/	b/	17	12	12	17	.2	c/	10
55	Rock Hill Colored School	31	Feb. 9, 1942	39	a/	6.1	5.1	37	3	4.0	.1	c/	29
56	William Jones	17	Feb. 11, 1942	16	a/	b/	1.2	6	2	3.5	-	c/	12
d/ 57	O. H. Clark	300	Nov. 18, 1941	128	10	5.4	33	104	18	11	.4	c/	48
59	Paul Whaley	155	do.	75	a/	5.4	19	73	2	8.0	-	c/	33
60	George Pendergast	155	do.	93	6.8	6.6	21	79	8	12	-	c/	44
61	City of Marshall	200	Nov. 17, 1941	71	10	5.4	4.3	6	40	8.0	.2	c/	48
62	do.	240	Nov. 12, 1941	67	7.6	9.0	2.5	31	26	6.5	.2	c/	56
63	do.	300	do.	121	10	5.4	2.8	0	96	6.5	0	c/	48
64	do.	300	do.	88	a/	6.6	16	24	42	7.0	.1	c/	39
67	do.	473	do.	328	18	b/	103	177	100	18	.1	c/	51
68	do.	375	do.	276	10	3.9	89	165	77	15	.2	c/	42
69	do.	351	Nov. 13, 1941	302	15	b/	100	189	77	16	.2	c/	40
70	do.	422	Nov. 12, 1941	345	6.0	11	109	195	103	20	0	c/	62
d/ 81	Southwestern Gas & Electric Co.	580	Nov. 18, 1941	448	26	4.1	141	287	100	36	.1	c/	83
84	Independent Ice Co.	323	do.	383	104	9.0	23	275	100	12	.3	c/	296
90	Darco Corp.	248	do.	129	22	9.0	11	0	23	64	-	c/	91
91	do.	192	do.	324	23	24	45	0	50	182	0	c/	155
92	do.	201	do.	400	19	24	84	0	88	185	-	c/	145
93	do.	111	do.	377	20	20	46	0	81	208	-	c/	132
94	do.	50	do.	82	10	b/	17	12	4	42	-	c/	37
95	do.	128	do.	151	20	13	16	85	46	14	.2	c/	103
96	do.	125	do.	247	44	25	5.3	116	100	16	-	c/	210
97	O. D. Hays	1,000+	Nov. 13, 1941	350	12	5.4	118	262	72	14	.1	c/	53
99	Frank Granbery	254	Nov. 17, 1941	156	27	21	2.8	146	22	10	.7	c/	153
100	Ebenezer Colored School	30	Jan. 30, 1942	81	a/	6.1	17	18	20	25	.2	c/	34
101	Potters Creek Colored School	23	Feb. 17, 1942	24	a/	b/	4.4	6	8	5.0	.3	c/	12

a/ Less than 5 parts per million.
b/ Less than 3 parts per million.
c/ Less than 20 parts per million.
d/ Analyses of water from selected wells and springs are given in milligram equivalents per liter on page 51.

Partial analyses of water from wells and springs in Harrison County--Continued

Results are in parts per million.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
102	P. B. Bailey	30	Jan. 28, 1942	116	6.0	4.4	22	0	10	24	-	50	33
103	Rose Hill Colored School	25	do.	37	a/	b/	11	6	3	14	.1	c/	7
104	E. H. Lowery	272	Oct. 17, 1941	197	14	7.3	47	79	69	21	.3	c/	65
105	U. C. Lowery	250	do.	210	9.6	6.1	59	98	69	18	.1	c/	49
106	Brooks Colored High School	17	Jan. 27, 1942	39	a/	b/	11	6	2	10	.1	c/	6
107	City of Hallsville	201	Oct. 17, 1941	331	2.8	1.7	114	156	105	17	-	0	14
109	-- Young	26	Jan. 27, 1942	29	a/	b/	5.1	6	4	4.0	-	c/	11
d/110	E. L. Barnes	27	Jan. 30, 1942	161	a/	3.6	53	0	3	92	-	c/	22
111	Cartersville Colored School	20	do.	32	a/	b/	12	12	3	8.0	.2	c/	0
112	Hebron Colored School	16	Jan. 29, 1942	29	a/	b/	6.7	6	2	11	.1	c/	10
113	Seff Davis	23	do.	108	a/	5.6	29	24	10	34	-	c/	28
116	Lily Hill School	20	do.	33	a/	b/	12	6	3	8.0	.1	c/	0
117	W. H. Schaffer	30	Jan. 28, 1942	32	a/	b/	9.0	6	10	4.0	-	c/	5
118	Noonday Camp Ground Spring		do.	42	a/	b/	16	18	2	14	.1	c/	2
120	Johnson Colored School	25	do.	26	a/	b/	8.3	0	2	5.5	.2	c/	0
121	Mrs. Nora Davis	35	Feb. 9, 1942	55	a/	5.6	9.2	12	8	6.0	-	20	23
d/122	Dell Everett	304	Nov. 4, 1941	220	a/	b/	79	165	46	7.5	.4	c/	22
123	E. G. Barker	36	Jan. 27, 1942	101	a/	b/	30	18	3	22	-	34	12
124	Maple Springs School	16	do.	129	a/	b/	40	18	60	14	-	c/	12
125	Gum Spring School	22	Jan. 28, 1942	24	a/	b/	4.6	12	2	3.5	.1	c/	11
126	Friendship Colored School	23	Jan. 27, 1942	43	a/	b/	11	12	7	11	.3	c/	11
127	J. K. Bivens Farms Co.	18	do.	234	17	13	44	18	10	91	-	50	98
128	do.	3,000±	do.	1,340	6.8	3.6	540	738	3	422	.8	c/	32
d/129	John W. Scott	27	Nov. 4, 1941	22	a/	b/	3.9	6	7	5.0	-	c/	11
130	J. B. Cullen	32	Jan. 27, 1942	32	a/	b/	10	12	2	3.5	-	c/	3

a/ Less than 5 parts per million.

b/ Less than 3 parts per million.

c/ Less than 20 parts per million.

d/ Analyses of water from selected wells and springs are given in milligram equivalents per liter on page 51.

Partial analyses of water from wells and springs in Harrison County--Continued

Results are in parts per million.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
131	George Welch Est.	26	Jan. 27, 1942	313	6.0	7.1	86	6	2	88	1.2	120	44
133	Sweet Home Colored School	20	Jan. 28, 1942	37	a/	b/	12	12	3	12	.1	c/	5
134	Red Oak School	26	do.	25	a/	b/	2.1	6	2	7.5	.1	c/	17
135	Atlas Colored School	18	do.	20	a/	b/	6.9	6	2	3.0	.1	c/	0
136	Cooperville Colored School	28	Jan. 27, 1942	30	a/	3.6	3.5	6	2	5.5	-	c/	17
d/137	Will T. Cock	2,548	Nov. 14, 1941	684	a/	b/	291	695	3	44	-	c/	2
138	Lingo Lumber Co.	343	Feb. 14, 1942	1,225	3	2.0	505	763	5	338	-	0	8
139	Cave Spring School	-	Nov. 4, 1941	48	a/	6.6	6.2	24	2	13	-	c/	34
140	Fairpoint Colored School	25	Jan. 28, 1942	124	a/	3.5	25	0	2	36	.3	50	40
141	D. C. Driskell	Spring	Feb. 14, 1942	1,361	130	83	143	0	899	101	.8	c/	666
143	M. G. Blalock	225	Nov. 18, 1941	100	7.6	7.5	21	85	13	8.5	-	c/	50
144	Grange Hall Independent School	28	Nov. 4, 1941	53	8.0	b/	3.9	18	20	2.5	.4	c/	32
d/145	W. M. Dinkle	250	Nov. 18, 1941	96	11	6.6	16	67	18	11	.3	c/	54
146	Fairview School	-	Feb. 17, 1942	98	a/	b/	35	18	20	32	.2	c/	6
147	K. H. Power	24	do.	308	13	36	36	12	146	69	.1	c/	183
d/148	Van McClellan	43	do.	134	23	3.6	25	122	15	7.0	-	c/	72
149	Lewis Anderson	63	Nov. 14, 1941	29	a/	b/	5.5	24	2	5.0	-	c/	17
152	Dudley Morgan	175	do.	372	24	13	109	311	23	50	-	c/	113
154	Willie Mitchell	112	do.	34	5.6	b/	5.3	24	2	7.5	-	c/	21
155	Arthur Fisher	105	Nov. 4, 1941	352	52	39	35	372	2	41	-	c/	289
156	F. V. Williams	2,508	do.	419	a/	b/	173	433	4	24	-	c/	17
157	Mrs. Barrett Gibson	91	Nov. 14, 1941	544	31	15	174	519	12	57	-	c/	139
158	do.	2,600±	do.	389	30	b/	118	153	7	148	.8	c/	87
159	do.	73	do.	1,883	128	155	364	756	238	620	.1	c/	956
160	Community Center	147	do.	304	7.6	b/	119	317	8	12	.3	c/	26
162	John Wood	-	Nov. 4, 1941	448	a/	b/	186	415	5	50	.3	c/	12
d/163	Blocker Estate	73	Feb. 13, 1942	52	6.4	b/	13	55	2	1.0	-	c/	21

a/ Less than 5 parts per million.

b/ Less than 3 parts per million.

c/ Less than 20 parts per million.

d/ Analyses of water from selected wells and springs are given in milligram equivalents per liter on page 51.

Partial analyses of water from wells and springs in Harrison County--Continued

Results are in parts per million.

Well	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
165	Humble Pipe Line Co.	150	Feb. 13, 1942	289	a/	b/	115	262	10	28	.1	c/	17
166	H. W. Scott	35	Feb. 17, 1942	561	20	18	140	67	67	127	.2	1,561	126
167	Claude Mercer	32	do.	870	59	52	191	177	19	398	-	64	362
d/169	Elysian Fields School	204	Oct. 29, 1941	125	14	b/	33	122	4	11	.2	c/	47
170	W. L. Rudd	17	Feb. 13, 1942	18	a/	b/	4.6	12	4	1.5	-	c/	6
171	-	13	do.	33	a/	b/	8.7	18	5	7.0	-	c/	11
d/172	Long Ridge School	33	do.	25	a/	b/	4.8	12	4	4.5	.1	c/	12
174	Verhalen Nursery	27	Feb. 9, 1942	46	a/	b/	10	6	2	8.5	-	c/	12
175	do.	28	do.	76	a/	b/	18	12	17	20	-	c/	22
176	do.	40	do.	261	31	13	52	195	26	41	-	c/	133
177	Webb Rogers	Spring	Feb. 13, 1942	22	a/	b/	5.8	.6	2	5.0	.1	c/	5
178	Gulf Service Sta.	30	do.	57	6.8	3.6	11	49	4	8.0	-	c/	32
d/182	United Gas Pipe Line Co.	92	Oct. 31, 1941	84	8.0	b/	22	67	2	16	.1	c/	32
186	Allen Thomas	151	Oct. 29, 1941	540	16	16	172	262	77	130	-	c/	105
d/189	Waterman Brick and Tile Co.	200	do.	297	39	22	44	171	18	90	-	c/	189
190	Frost Lumber Co.	200	do.	1,043	60	11	319	317	192	305	.1	c/	197
192	United Gas Pipe Line Co.	170	Oct. 31, 1941	538	13	15	177	293	77	112	-	c/	94
193	do.	161	do.	502	5.6	9.0	180	268	65	110	-	c/	51
194	Gainesville Colored School	22	Feb. 13, 1942	136	8.4	b/	45	92	10	24	.9	c/	26
d/195	Edwin Spears	36	do.	58	a/	b/	18	12	23	7.5	.1	c/	6
197	Don B. Long	25	do.	268	10	7.3	84	37	8	141	-	c/	55
198	Willow Wayside Colored School	21	do.	77	a/	b/	27	12	2	32	.2	c/	6

a/ Less than 5 parts per million.

b/ Less than 3 parts per million.

c/ Less than 20 parts per million.

d/ Analyses of water from selected wells and springs are given in milligram equivalents per liter on page 451.

Determinations of iron (Fe)

parts per million

Well No.	Iron (Fe)	
29	0.10	
30	0	
51	10	
52	1.1	
69	0.10	
90	35	e/
91	55	e/
92	50	e/
93	55	e/
94	2.5	e/
95	15	e/
96	15	e/
104	2.7	
105	0.05	
126	3	
137	3	
141	5	
158	6.0	
165	0.05	

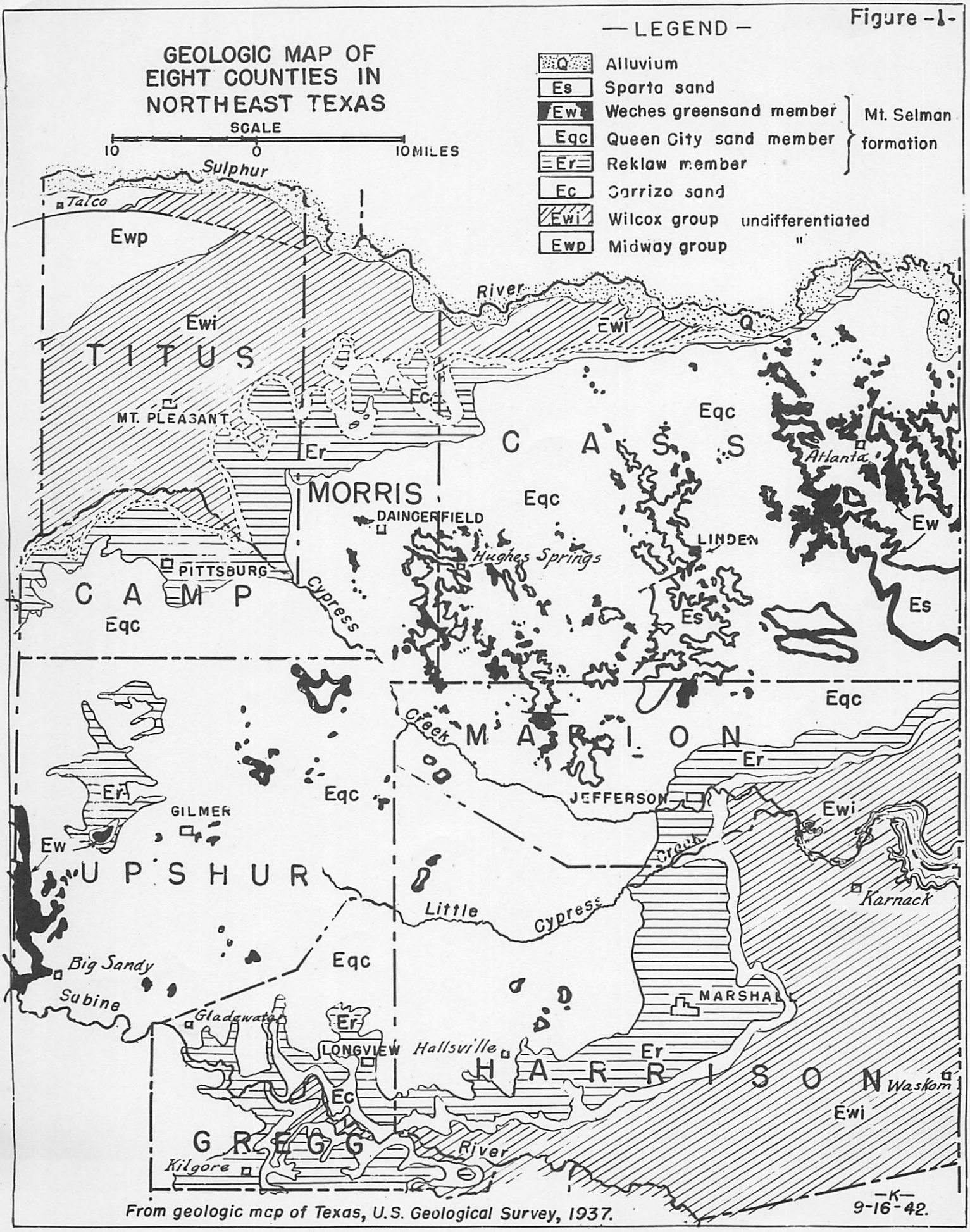
e/ Determination by Darco Corporation.

Chemical Analyses—Continued

Results are in milligram equivalents per liter

Well	Owner	Depth of well (ft.)	Date of collection	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (calc.)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$ (calc.)
4	Smyrna School	39	Jan. 29, 1942	1.04	0.06	1.30	2.20	0.06	0.13	0.01	0.01	1.10
11	Friendly School	57	do.	.16	.16	.79	.10	.624	.37	.01	1.5	.32
20	W. H. Nesbett	45	Feb. 11, 1942	.72	.10	.25	.90	.04	.13	-	.0	.82
28	Geo. Washington Carver Colored School	105	Oct. 27, 1941	1.20	1.64	3.96	4.30	.88	1.47	.01	.15	2.84
40	Gus Noble	103	Oct. 28, 1941	.08	.14	5.27	3.60	.48	1.41	-	-	.22
51	D. V. Blocker	205	Feb. 14, 1942	.0	.40	.49	.80	.04	.03	.02	.0	.40
57	O. H. Clark	300	Nov. 18, 1941	.52	.44	1.44	1.70	.37	.31	.02	-	.96
81	Southwestern Gas and Electric Co.	580	do.	1.32	.34	6.14	4.70	2.08	1.02	.005	-	1.66
110	E. L. Barnes	27	Jan. 30, 1942	.14	.30	2.32	.0	.06	2.59	-	.11	.44
122	Dell Everett	304	Nov. 4, 1941	.20	.24	3.45	2.70	.96	.21	.02	-	.44
129	John W. Scott	27	do.	.08	.14	.17	.10	.15	.14	-	-	.22
137	Will T. Cock	2,500	Nov. 14, 1941	.00	.04	12.67	11.40	.06	1.24	-	.01	.04
145	W. M. Dinkle	250	Nov. 18, 1941	.54	.54	.70	1.10	.37	.31	.015	-	1.08
148	Van McClellan	43	Feb. 17, 1942	1.14	.30	1.07	2.00	.31	.20	-	.0	1.44
163	Blocker Est.	73	Feb. 13, 1942	.32	.10	.57	.90	.04	.03	-	.02	.42
169	Elysian Fields School	204	Oct. 29, 1941	.70	.24	1.45	2.00	.08	.31	.01	-	.94
172	Long Ridge School	33	Feb. 13, 1942	.04	.20	.21	.20	.08	.13	.01	.03	.24
182	United Gas Pipe Line Co.	92	Oct. 31, 1941	.40	.24	.95	1.10	.04	.45	.005	-	.64
189	Waterman Brick and Tile Co.	200	Oct. 29, 1941	1.94	1.84	1.93	2.80	.37	2.54	-	-	3.78
195	Edwin Spears	36	Feb. 13, 1942	.02	.10	.80	.20	.48	.21	.01	.02	.12

Figure -1-



From geologic map of Texas, U.S. Geological Survey, 1937.

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9-16-42.

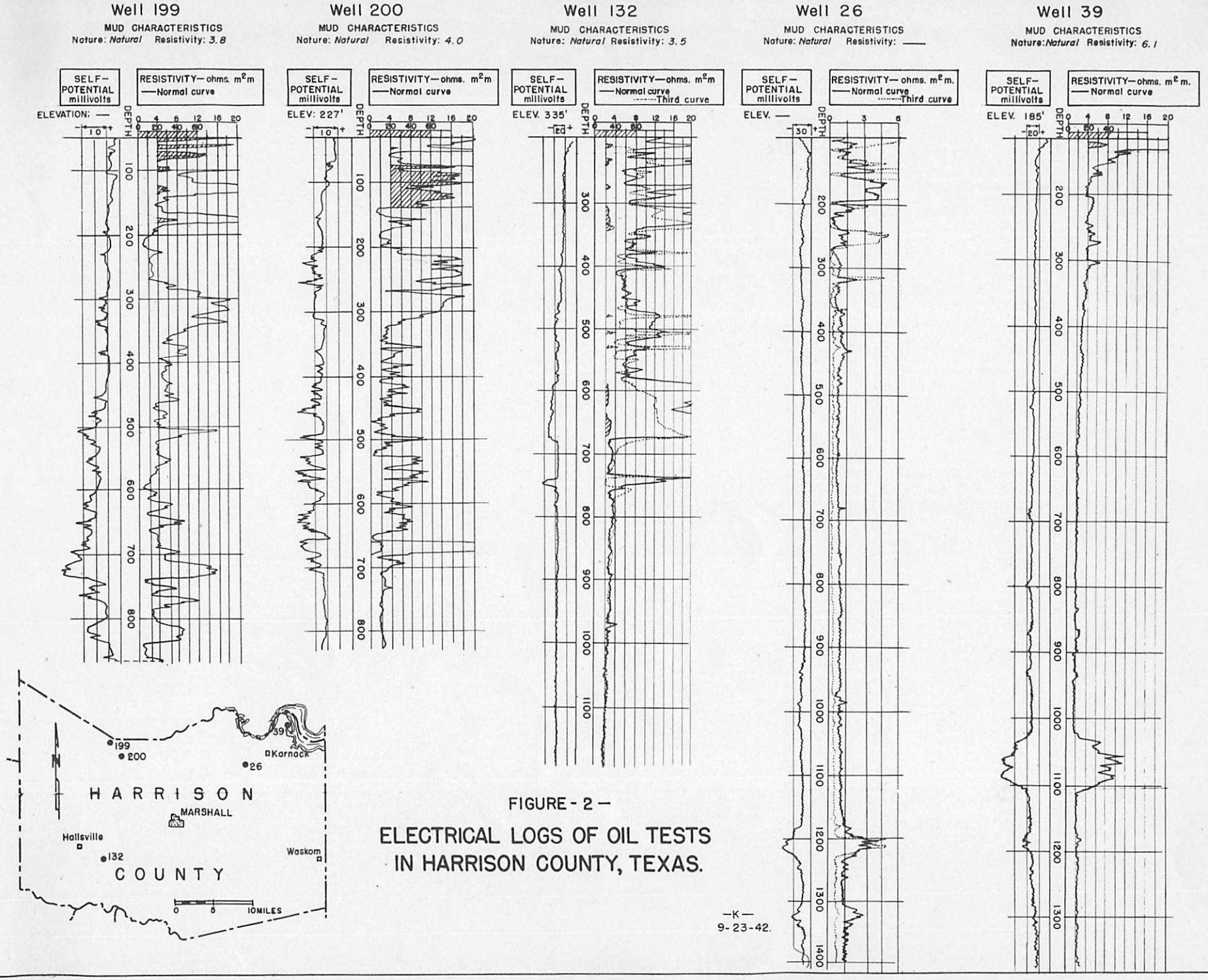

FIGURE - 2 —

ELECTRICAL LOGS OF OIL TESTS IN HARRISON COUNTY, TEXAS.

—K—
9-23-42.

— EXPLANATION —

- WELL WITH HAND PUMP, BUCKET OR BAILER
- WELL WITH WINDMILL OR SMALL POWER PUMP
- FLOWING WELL
- UNUSED WELL
- WELL DRILLED TO TEST FOR OIL OR GAS
- WELL WITH PUMPING PLANT — 5 HORSE POWER OR LARGER
- SPRING

MARION COUNTY
UPSHUR COUNTY
GREGG
HARRISON COUNTY
RUSK COUNTY
PANOLA COUNTY
STATE OF LOUISIANA

Harleton
Hallsville
Woodlawn
MARSHALL
Karnack
Waskom
Elysian Fields
Caddo State Park

BAYOU
LITTLE CYPRESS Creek
Moccasin Creek
Clarks Creek
Hatleys Creek
Potters Creek
Grays Creek
Prewitt Creek
Bayou
Harrison Bayou
Quapaw Creek
Eight Mile Creek
M.E.E. & S.E.
T. & P.
G.C.&S.F.
L.A.&T.
SABINE RIVER
Ferry Lake
CADDO LAKE

61 to 66
77 to 80
86 to 89
90 to 96

TEXAS BOARD OF WATER ENGINEERS
IN COOPERATION WITH
U. S. GEOLOGICAL SURVEY

MAP OF HARRISON COUNTY, TEXAS

SHOWING WATER WELLS AND SPRINGS

SCALE
0 1 2 3 4 5

BASE COMPILED FROM
HIGHWAY PLANNING SURVEY COUNTY ROAD MAP
AND FIELD NOTES

O.G.K.
6-17-42.