

TEXAS BOARD OF WATER ENGINEERS

Durwood Manford, Chairman  
R. M. Dixon, Member  
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MEMORANDUM REPORT OF  
PRELIMINARY GROUND-WATER INVESTIGATION  
of  
SHELBY COUNTY, TEXAS

By

Joe W. Dillard, Geologist  
Texas Board of Water Engineers

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The following is a memorandum report on the results of a brief investigation of available data on ground-water occurrence in Shelby County. This investigation was conducted in response to an inquiry regarding information on the quantity and quality of ground water within the county. The following conclusions are indicated by this study:

1. Ground water may be obtained in appreciable quantities only from the Wilcox formation which outcrops in most of the county.
2. There is insufficient data available for a conclusive quantitative evaluation of water supplies in Shelby County. A carefully planned test drilling program will be required to determine the water-bearing characteristics of Wilcox aquifer.
3. The completion of wells which individually yield large quantities of water is difficult in this area because of the absence of thick clean sand sections. Sand sections are lenticular, and available subsurface data indicate they have a limited lateral extent.
4. The quality of water varies with locale and depth, but the water analyses on which records were available indicate a range in total dissolved solids from 468 to 2,580 ppm, with an increase in mineralization downdip. (See Table 1). Principal constituents are sodium, bicarbonate, and chloride ions.

## Geology

The Wilcox group outcrops over the entire county with the exception of a small area in the northwest corner adjacent to the Rusk County line in which the Wilcox is overlain by the Carrizo and younger formations. The occurrence of these younger beds here is a result of the Mount Enterprise fault system which begins in the west side of Rusk County and extends eastward into Shelby County.

The Wilcox and older formations are affected by the Sabine uplift which is evident in the east and northeast part of the county, (see Fig. 1 and 2), and by a syncline - anticline complex in the west part of the county. The Wilcox dips to the south, except where affected by the Sabine uplift and the folds in the west, at about 100 feet per mile or one degree. (See Fig. 2).

The Wilcox was deposited in a continental environment which includes swampy conditions. The formation is composed predominately of sand and shale, lensing and interfingering to such an extent that it is not possible to trace a sand bed or shale bed for any appreciable distance. (See Fig. 1). Lignite and "iron rock" stringers are present throughout the formation. A map showing the thickness of the Wilcox formation in the county was prepared on the basis of electrical logs of oil tests. (See Fig. 3). These logs indicate a range in thickness from about 300 feet in the northeast corner of the county to about 1,900 feet in the southwest corner of the county. At Center, the Wilcox reaches a total thickness of about 1,000 feet. Approximately 45 per cent of the total thickness of the formation is water-bearing sand as indicated by electric log interpretations.



## Ground Water

Few wells which produce large quantities of water have been drilled in the area. The cities of Tenaha and Timpson each have city wells, but the pumpage is small. The Tenaha city well is 519 feet deep, and is capable of pumping 200 gallons per minute with a specific capacity of 5 gpm per foot of drawdown. This is sufficient for the city's needs, but this type of well would not supply large pumping requirements unless a large number of wells were drilled. Ground-water movement in the Wilcox is slowed by the lensing of the sand sections. A thick section of sand found suitable for production of water in one part of the county may not be continuous to other parts of the county. An appraisal of the producing capacities of the various sand units of the Wilcox in Shelby County has not been made, and any such quantitative evaluation would require a carefully planned test-drilling program with a study of selective pumping tests. No pumping test data have been developed on present wells in the county.

## Quality

The quality of water in the Wilcox varies from one locale to another and with depth. However, one fact seems to hold for all conditions and that is the high sodium bicarbonate content which makes the water bubbly and which makes it seem to have gas or air inclusions. Chloride content is high in some of the samples on which analyses are available and increases with depth. The water at the base of the Wilcox has 3,000 ppm or less total dissolved solids except in the syncline in the southwest corner of the county. There 3,000 ppm is encountered at about 300 feet above the base. The color of the water from the Wilcox may be objectionable due to the lignite stringers within the formation. (See Table 1 and Fig. 4 for water analyses).

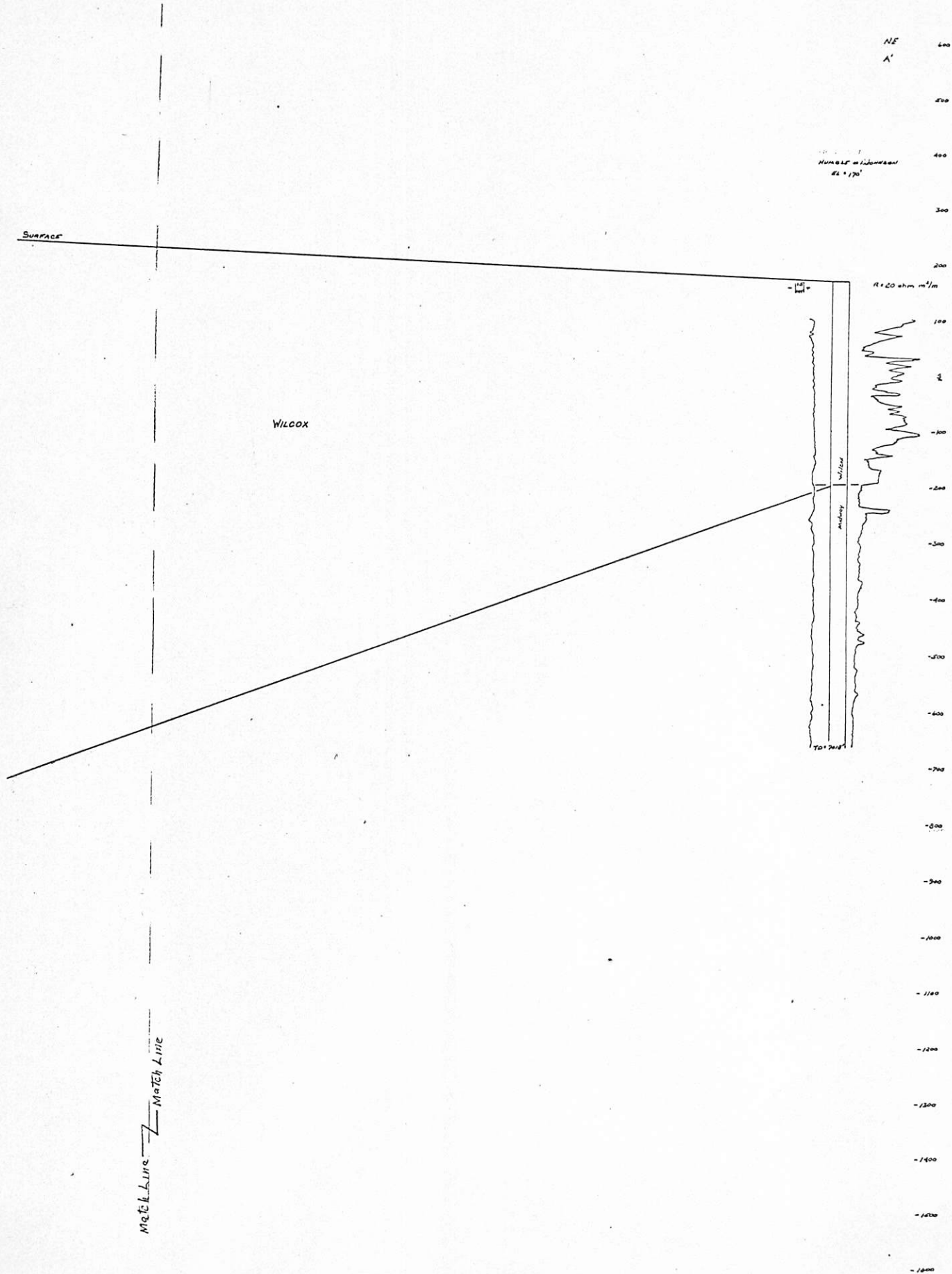
Table 1,--Analyses of Water From Wells in Wilcox Formation in Shelby County

Location of Well	Date of Collection	Depth	Silica (SiO <sub>2</sub> )	Iron (Fe)	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Calcium (Ca)	Magnesium (Mg)	Sodium & Potassium (Na + K)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Solids Dissolved	Hardness as CaCO <sub>3</sub>	Specific Conductance
<u>Tenaha,</u>																
Well 1	1941	519	26	.56	10	151	-	-	-	-	-	2.8	-	971	33	-
<u>Timpson,</u>																
Well 1	7-25-41	677	-	0.06	38	28	6	2	176	397	-	.6	.5	468	23	-
Well 2	7-25-41	421	-	0.1	2	71	5	2	279	634	-	1.4	2.7	772	20	-
<u>Center,</u>																
Well at Center Country Club, 6 mi. N. Center	4-5-60	474	12	.11	51	34	5	1.5	282 1.8	658	-	.5	.0	712	18	1,150
<u>Layne-Texas, Center</u>																
test well (3 analyses)	-	700	-	-	93.5	48	1.4	0.3	374.2	683.2	54.0	-	-	1,335	4.7	-
"	-	990	-	-	10.5	15	2.4	0.4	533.4	617.3	38.4	-	-	1,694	7.6	-
"	-	1,060	-	-	0.0	825.0	6.2	1.0	842.5	805.2	16.8	-	-	2,580	19.6	-









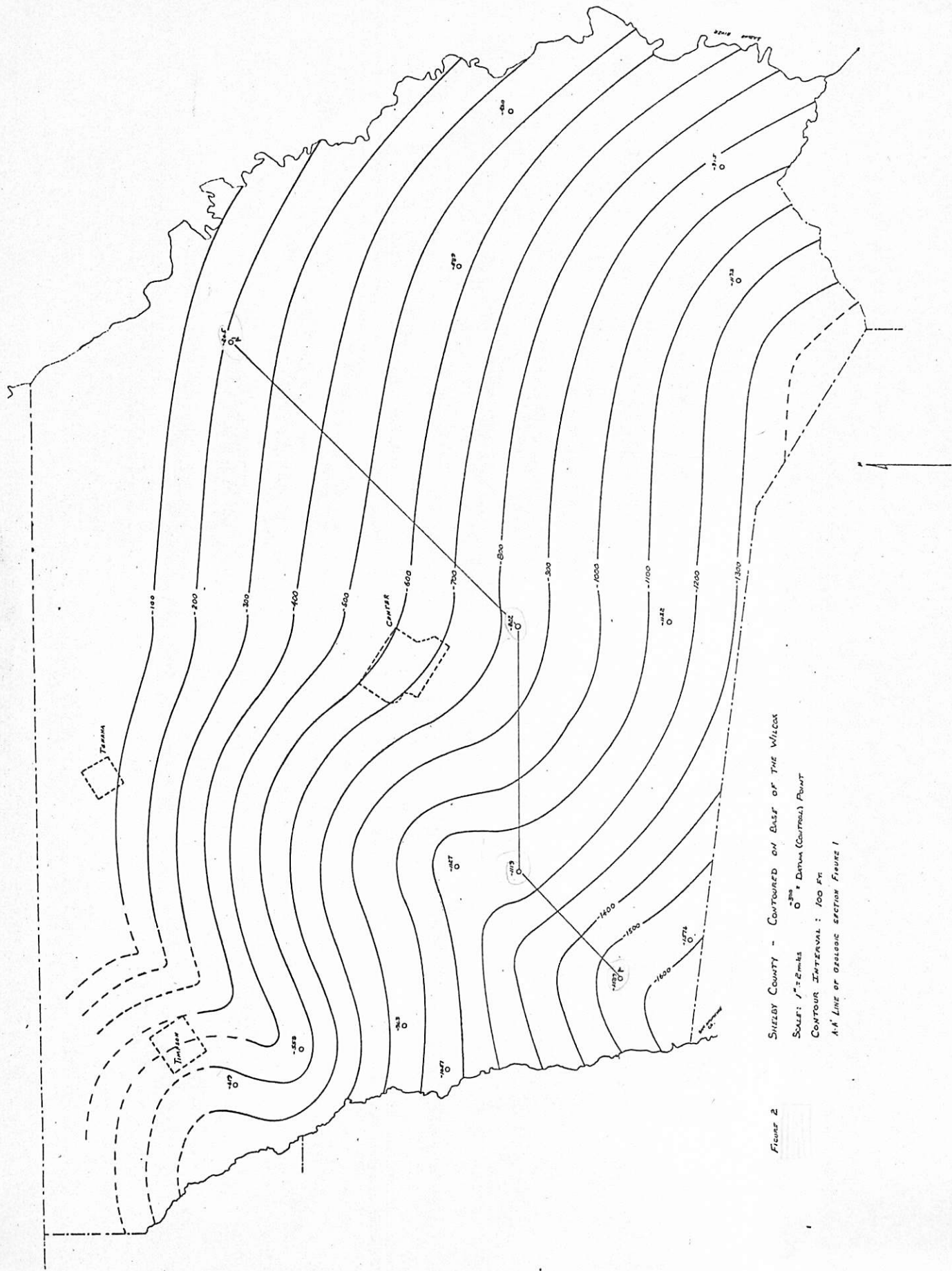


FIGURE 2  
 SHELBY COUNTY - CONTOURED ON BASIS OF THE WILCOX  
 SCALE: 1" = 2 miles  
 O = DENN (COURTESY) POINT  
 CONTOUR INTERVAL: 100 FT.  
 A-A' LINE OF GEOLOGIC SECTION FIGURE 1

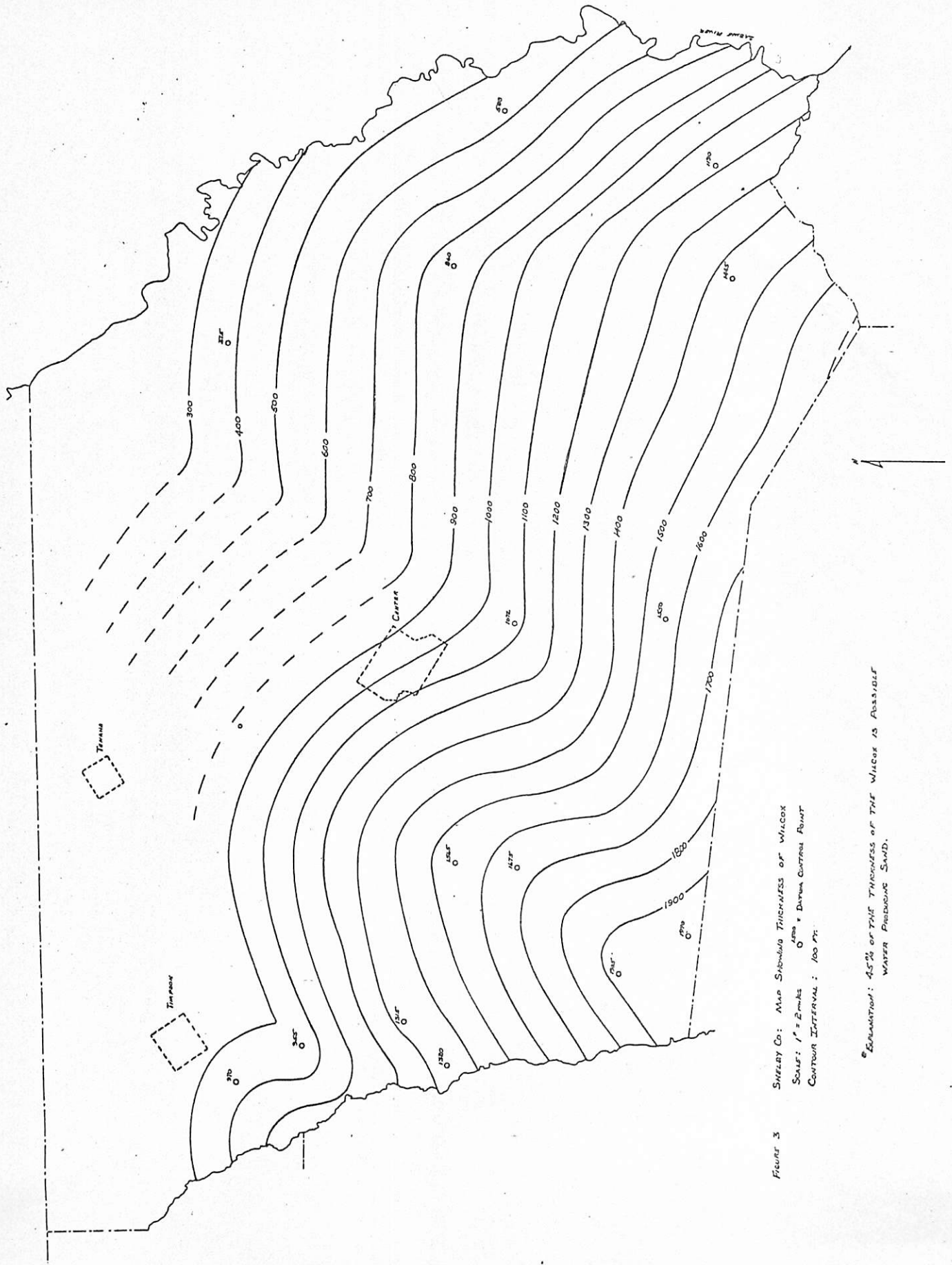


FIGURE 3  
 SHELBY CO. MAP SHOWING THICKNESS OF WILCOX  
 SCALE: 1" = 2 MILES  
 O = DATA CONTROL POINT  
 CONTOUR INTERVAL: 100 FT.

\* ESTIMATION: 45% OF THE THICKNESS OF THE WILCOX IS ASSUMED  
 WATER PRODUCING SAND.

FIG. 4.

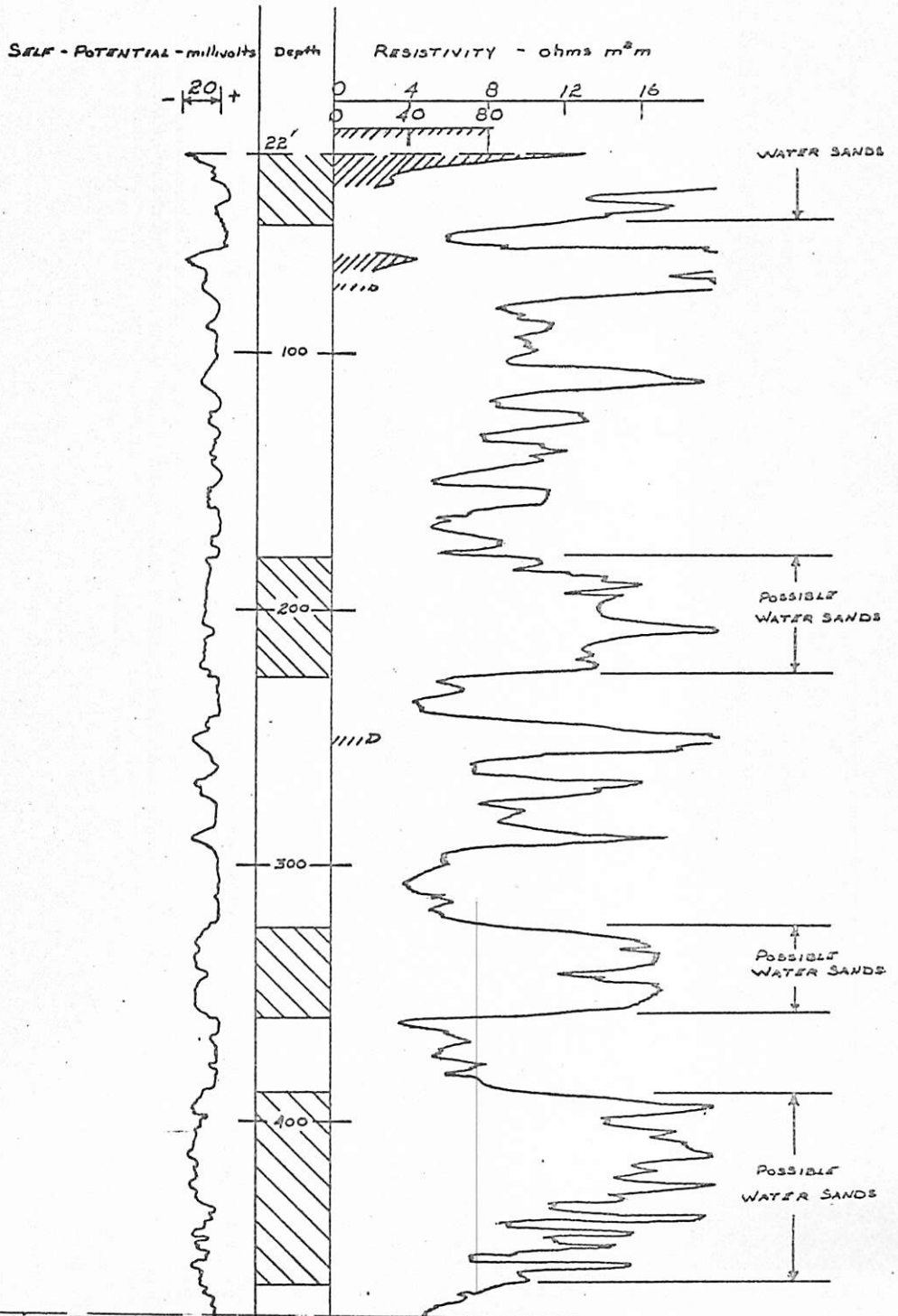
SCHLUMBERGER ELECTRIC LOG

CITY OF CENTER TEST HOLE - SEPTEMBER 12, 1944  
 DRILLED BY LAYNE-TEXAS CO. 4 mi. SOUTH OF CENTER

GROUND LEVEL - 250'± MUD: RESISTIVITY 5.42 @ 86°F.

REMARKS

\* POSSIBLE WATER SANDS - DOES NOT MEAN A DOUBT AS TO EXISTANCE OF WATER - BUT REFERS TO A POSSIBILITY OF COMPLETING A WELL OR OF PRODUCING OF WATER FROM THESE ZONES.





Match Line  
Mark II Line

TOTAL DISSOLVED  
SOLIDS = 1335 ppm  
HARDNESS = 4.7 (CaCO<sub>3</sub>)  
pH = 8.6

IONS		ppm	WATER ANALYSIS
Ca <sup>++</sup>	-	1.4	
Mg <sup>++</sup>	-	0.3	
Na <sup>+</sup>	-	374.2	

HCO <sub>3</sub> <sup>-</sup>	-	683.2
CO <sub>3</sub> <sup>=</sup>	-	54.0
SO <sub>4</sub> <sup>=</sup>	-	93.5
Cl <sup>-</sup>	-	48.0

TOTAL SOLIDS = 1694 ppm  
HARDNESS = 7.6 (CaCO<sub>3</sub>)  
pH = 7.6

IONS		ppm
Ca <sup>++</sup>		2.4
Mg <sup>++</sup>		0.4
Na <sup>+</sup>		533.4

HCO <sub>3</sub> <sup>-</sup>		617.3
CO <sub>3</sub> <sup>=</sup>		38.4
SO <sub>4</sub> <sup>=</sup>		10.5
Cl <sup>-</sup>		15.0

TOTAL SOLIDS = 2580 ppm  
HARDNESS = 19.6 (CaCO<sub>3</sub>)  
pH = 8.4

IONS		ppm	WATER ANALYSIS
Ca <sup>++</sup>		6.2	
Mg <sup>++</sup>		1.0	
Na <sup>+</sup>		842.5	

HCO <sub>3</sub> <sup>-</sup>		805.2
CO <sub>3</sub> <sup>=</sup>		14.8
SO <sub>4</sub> <sup>=</sup>		0.0
Cl <sup>-</sup>		825.0

