

# Public Water Supplies In Western Texas

By W. L. BROADHURST, R. W. SUNDSTROM, AND D. E. WEAVER

---

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1106

*Prepared by Water Resources  
Division, in cooperation  
with the Texas State Board  
of Water Engineers*



This copy is **PUBLIC PROPERTY** and is not to  
be removed from the official files. PRIVATE  
POSSESSION IS UNLAWFUL (R. S. Sup. Vol. 2, pp. 380,  
Sec. 749)

UNITED STATES DEPARTMENT OF THE INTERIOR

Oscar L. Chapman, *Secretary*

GEOLOGICAL SURVEY

W. E. Wrather, *Director*

## CONTENTS

---

	Page
Abstract .....	1
Introduction .....	2
Extent of area and scope of report .....	2
Acknowledgments .....	3
Ground water .....	3
Area A .....	4
Area B .....	4
Area C .....	4
Area D .....	5
Area E .....	5
Municipalities and probable source of supply .....	5
Surface water .....	8
Chemical character of water .....	9
Analyses of water .....	9
Mineral constituents in solution .....	10
Hardness .....	12
Alkalinity .....	13
Hydrogen-ion concentration .....	13
Selected bibliography .....	14
Published reports .....	14
Unpublished reports .....	15
Public water supplies .....	15
Andrews County .....	15
Andrews .....	15
Armstrong County .....	17
Claude .....	17
Bailey County .....	17
Muleshoe .....	17
Brewster County .....	18
Alpine .....	18
Briscoe County .....	19
Quitaque .....	19
Silverton .....	20
Carson County .....	21
Groom .....	21
Panhandle .....	21
Skellytown .....	22
White Deer .....	23
Castro County .....	24
Dimmitt .....	24
Childress County .....	24
Childress .....	24
Cochran County .....	28
Morton .....	28

## Public water supplies—continued

Page

Coke County .....	28
Bronte .....	28
Robert Lee .....	29
Collingsworth County .....	30
Dodsonville .....	30
Wellington .....	30
Cottle County .....	31
Paducah .....	31
Crane County .....	32
Crane .....	32
Crockett County .....	34
Ozona .....	34
Crosby County .....	35
Crosbyton .....	35
Lorenzo .....	36
Ralls .....	36
Culberson County .....	37
Van Horn .....	37
Dallam County .....	37
Dalhart .....	37
Texline .....	39
Dawson County .....	40
Lamesa .....	40
Deaf Smith County .....	44
Hereford .....	44
Dickens County .....	44
Dickens .....	44
Spur .....	46
Donley County .....	47
Clarendon .....	47
Hedley .....	48
Ector County .....	49
Odessa .....	49
Edwards County .....	61
Rocksprings .....	61
El Paso County .....	61
El Paso .....	61
Fabens .....	65
Tornillo .....	66
Ysleta .....	66
Fisher County .....	67
Roby .....	67
Rotan .....	67
Floyd County .....	69
Dougherty .....	69
Floydada .....	69
Lockney .....	70
South Plains .....	71

	Page
Public water supplies—continued	
Gaines County -----	71
Seagraves -----	71
Seminole -----	73
Garza County -----	74
Post -----	74
Gray County -----	77
Lefors -----	77
McLean -----	78
Pampa -----	79
Hale County -----	80
Abernathy -----	80
Hale Center -----	81
Petersburg -----	81
Plainview -----	82
Hall County -----	82
Estelline -----	82
Memphis -----	83
Turkey -----	84
Hansford County -----	85
Gruver -----	85
Hitchland -----	85
Morse -----	86
Spearman -----	86
Hartley County -----	87
Channing -----	87
Hartley -----	88
Hemphill County -----	88
Canadian -----	88
Hockley County -----	89
Anton -----	89
Levelland -----	90
Howard County -----	91
Big Spring -----	91
Coahoma -----	95
Forsan -----	95
Hudspeth County -----	96
Fort Hancock -----	96
Sierra Blanca -----	96
Hutchinson County -----	97
Borger -----	97
Pringle -----	98
Stinnett -----	99
Irion County -----	99
Barnhart -----	99
Mertzou -----	99
Jeff Davis County -----	100
Valentine -----	100
Kent County -----	101
Jayton -----	101

## Public water supplies—continued

Lamb County .....	101
Amherst .....	101
Littlefield .....	102
Olton .....	102
Sudan .....	103
Lipscomb County .....	104
Booker .....	104
Follett .....	104
Higgins .....	105
Lubbock County .....	105
Idalou .....	105
Lubbock .....	106
Slaton .....	109
Lynn County .....	110
O'Donnell .....	110
Tahoka .....	111
Martin County .....	112
Stanton .....	112
Midland County .....	113
Midland .....	113
Mitchell County .....	117
Colorado City .....	117
Moore County .....	119
Dumas .....	119
Motley County .....	120
Matador .....	120
Roaring Springs .....	121
Nolan County .....	122
Roscoe .....	122
Sweetwater .....	122
Ochiltree County .....	123
Perryton .....	123
Oldham County .....	124
Adrian .....	124
Vega .....	125
Wildorado .....	125
Parmer County .....	126
Farwell .....	126
Friona .....	126
Pecos County .....	127
Fort Stockton .....	127
Imperial .....	128
Iraan .....	128
Potter County .....	129
Amarillo .....	129
Presidio County .....	135
Marfa .....	135
Presidio .....	136

	Page
Public water supplies—continued	
Randall County .....	136
Canyon .....	136
Reagan County .....	138
Big Lake .....	138
Santa Rita .....	139
Texon .....	139
Reeves County .....	141
Balmorhea .....	141
Pecos .....	141
Toyah .....	143
Roberts County .....	144
Miami .....	144
Schleicher County .....	144
Eldorado .....	144
Scurry County .....	145
Hermleigh .....	145
Snyder .....	146
Sherman County .....	148
Stratford .....	148
Stonewall County .....	148
Aspermont .....	148
Sutton County .....	149
Sonora .....	149
Swisher County .....	150
Happy .....	150
Tulia .....	151
Terrell County .....	151
Sanderson .....	151
Terry County .....	154
Brownfield .....	154
Tom Green County .....	155
Christoval .....	155
San Angelo .....	155
Sanatorium .....	156
Upton County .....	157
McCamey .....	157
Rankin .....	158
Val Verde County .....	159
Del Rio .....	159
Ward County .....	160
Barstow .....	160
Grandfalls .....	160
Monahans .....	161
Wheeler County .....	162
Shamrock .....	162
Wheeler .....	163

	Page
Public water supplies—continued	
Winkler County -----	163
Kermit -----	163
Yoakum County -----	165
Plains -----	165
Denver City -----	165
Literature cited -----	166
Index -----	167

---

## ILLUSTRATION

---

	Page
PLATE 1. Index map showing location and type of public water supplies and ground-water subdivisions in western Texas-----	10

## PUBLIC WATER SUPPLIES IN WESTERN TEXAS

---

By W. L. BROADHURST, R. W. SUNDSTROM, and D. E. VEAVER

---

### ABSTRACT

This report gives a summarized description of the public water supplies in a region comprising 81 counties of western Texas and lying generally west of the hundredth meridian. It is the fourth and last of this series of reports concerning the public water supplies of the State. It gives the available data for each of 142 communities, as follows: The population of the community; the name of the official from whom the information was obtained; the ownership of the waterworks, whether private or municipal; the source of supply, whether ground water or surface water; the amount of water consumed; the facilities for storage; the number of customers served; the character of the chemical and sanitary treatment of the water, if any; and the chemical analyses of the water. Where ground water is used the following also are given: Records of wells, including drillers' logs; character of the pumping equipment; and yield of the wells and water-level records where they are available.

Of the 142 public supplies, 133 are obtained from ground water, 5 from surface water, and 4 from a combination of both. The total amount of water used for public supply in the region averages about 78,000,000 gallons a day. Of this about 61,000,000 gallons a day is ground water and about 17,000,000 gallons a day is surface water.

The ground-water resources of the region from which public water supplies are drawn are in rocks that range in age from Permian to Quaternary. The Ogallala formation of Tertiary age (Pliocene), which covers about 35,000 square miles of the High Plains in Texas, is the most important ground-water reservoir in the region. The formation furnishes water for 78 public supplies and for irrigating about 1,000,000 acres of land. The amount of water used for irrigating amounted to about 1,000,000 acre-feet in 1948. The Trinity and Fredericksburg groups of Lower Cretaceous age supply ground water in the western part of the Edwards Plateau, which constitutes an area of more than 22,000 square miles. These formations furnish small to large supplies to 20 municipalities. Sands of the Dockum group of Triassic age furnish meager to moderate supplies of water for 10 municipalities in areas east of the southern part of the High Plains and in the northern Pecos Valley in Texas. Local alluvial, bolson, or volcanic deposits furnish ground water in small to large amounts in scattered localities in the remainder of the region. The Permian rocks are of little importance as a source of ground water for public supply, owing to the highly mineralized water in them.

The results of the chemical analyses of 206 samples of water obtained from the public supplies of the region are given in this report. The analyses are reported in parts per million and in equivalents per million for those ions entering into ionic balance. Of the samples analyzed 57 percent contained silica in excess of 20 parts per million; about 9 percent contained iron in excess of 0.3 part per million; 78 percent had hardness in excess of 200

parts per million; about 18 percent contained sulfate in excess of 250 parts per million; 10 percent contained chloride in excess of 250 parts per million; 3 percent contained nitrate in excess of 20 parts per million; 37 percent contained fluoride in excess of 2 parts per million; and 12 percent contained dissolved solids in excess of 1,000 parts per million.

## INTRODUCTION

### EXTENT OF AREA AND SCOPE OF REPORT

This report gives a summarized description of the public water supplies in a region comprising 81 counties of western Texas and lying generally west of the hundredth meridian. It is the fourth and last of a series of reports on the public water supplies of Texas (Sundstrom, Hastings, and Broadhurst, 1948; Sundstrom, Broadhurst, and Dwyer, 1949; and Broadhurst, Sundstrom, and Rowley, 1950)<sup>1</sup> prepared by the United States Geological Survey in cooperation with the Texas State Board of Water Engineers.

The need for certain basic data in the study of quantitative and qualitative problems of public water supply has long been apparent. This has been brought into sharper focus in Texas in recent years by the great increase in the demands for water for public and industrial supply. The phenomenal growth of many Texas cities has resulted in the need from time to time for expanding or rebuilding the waterworks systems. Some of the municipalities still use the original source of supply, some have developed additional sources of ground water, and others have replaced inadequate supplies of ground water with surface water.

This report gives in condensed form the available data for each municipality, as follows: Population of the community; name of the official from whom the information was obtained; ownership of the waterworks, whether private or municipal; source of supply, whether ground water or surface water; amount of water consumed; facilities for storage; number of service connections; character of the chemical and sanitary treatment of the water, if any; and the chemical analyses of the water. Where ground water is used the following also are given: Records of wells, including drillers' logs; character of the pumping equipment; and yield of the wells and water-level records where they are available. Unfortunately, many of the municipalities have kept poor records and some no records at all, and the information given for such municipalities necessarily is incomplete. The lack of data regarding the amount of water pumped and the resulting changes in

---

<sup>1</sup> Names of authors, with dates, in parentheses refer to publications listed in the Literature Cited, p. 166.

water level or artesian pressure in the wells since they were drilled is unfortunate. Such information is of great importance, particularly in areas where the draft on the underground supplies approaches the practical limits of development.

Five of the 81 counties in the region have no public water supplies. The region has an area of 107,272 square miles, and in 1940 it had a population of 892,418. About half the people live in communities served by the public water supplies described in this report. The total amount of water pumped by these communities averages about 78,000,000 gallons a day. Of this amount about 61,000,000 gallons is ground water and about 17,000,000 gallons is surface water. Ground water is used at 133 localities, surface water at 5, and a combination of ground and surface water at 4.

#### ACKNOWLEDGMENTS

The data presented in this report were collected by engineers and geologists of the Federal Geological Survey and the Texas Board of Water Engineers who are engaged in ground-water studies in Texas. The field work was done by J. R. Barnes, R. L. Cushman, J. H. Dante, W. C. Ellis, D. B. Knowles, J. W. Lang, E. R. Leggatt, R. A. Scalapino, and the writers. This report was prepared and written jointly by W. L. Broadhurst and R. W. Sundstrom, except for the section on the analyses of water which was written by D. E. Weaver. The analyses of water were made in the laboratory of the Geological Survey at Austin. Assistance given by city officials and well drillers, who furnished most of the information, is gratefully acknowledged.

#### GROUND WATER

The ground-water reservoirs of the region from which the public-water supplies are drawn occur in rocks that range in age from Permian to Quaternary. The Permian rocks are of minor importance as a source of public water supply in Texas, owing to the highly mineralized water in them. The city of Paducah in Cottle County is believed to be the only city in the region using ground water from the Permian rocks, and the water it uses is highly mineralized. The most important sources of ground water are the Dockum group of Triassic age, which furnishes ground water for 10 localities; the Trinity and Fredericksburg groups of Lower Cretaceous age, which supply 21 localities; the lavas of Tertiary age, which are believed to supply 3 localities; the Ogallala formation of Tertiary age, which supplies 78 localities; and al-

luvial and bolson deposits of Quaternary age, which supply 27 localities.

For convenience in summarizing the sources of ground water, the region has been divided into five areas as shown in plate 1.

*Area A.*—In Area A the ground-water supplies are obtained principally from the Ogallala formation of Tertiary age, and in a few localities in the southern part of the area some ground water for public supply is obtained from the underlying sands of Cretaceous age. The Ogallala formation, which covers about 35,000 square miles of the High Plains in Texas, is by far the most important ground-water reservoir in the region. It not only furnishes water for 78 public supplies in Area A, but approximately 1,000,000 acre-feet of water was pumped from about 8,500 irrigation wells to irrigate about 1,000,000 acres of land in 1948. The sediments were deposited by wind action and by streams, some of which long ago in geologic time had their headwaters in the Rocky Mountains. The Ogallala rests on an uneven floor of older rocks which were eroded into valleys and ridges before the Ogallala was deposited. However, owing to subsequent erosion, it has been completely removed from the valleys of the Pecos and Canadian Rivers. The formation ranges from a feather edge to nearly 600 feet in thickness, but in most places it is between 200 and 300 feet thick. It is composed chiefly of silt and fine-grained sand but contains some coarse sand and gravel. The coarser sediments, which usually yield water freely to wells, are present at all horizons but are most prominent in the lower part of the formation. The cities that probably draw some water from the underlying sands of the Cretaceous in the southern part of Area A are Lubbock, Lamesa, Seagraves, and Seminole.

*Area B.*—Area B lies eastward from the High Plains escarpment. Along the border of the escarpment and in the southwestern part of the area, ground-water supplies are obtained from sandstones in the Dockum group of Triassic age in six localities, but these sandstones generally yield only meager supplies to wells. In the remainder of the area all the ground-water supplies are obtained from shallow alluvial deposits, except at Paducah where highly mineralized water is drawn from Permian rocks. Alluvial deposits furnish ground water for public supply in 15 localities, but in general these deposits are thin, and ground water suitable for public supplies and in large quantities is difficult to obtain in most of the area.

*Area C.*—Area C extends southward from Areas A and B. It covers about 22,000 square miles and includes the western part

of the Edwards Plateau. Sands and limestones of the Trinity and Fredericksburg groups, of Lower Cretaceous age, furnish all the public water supplies in the area. Del Rio uses water from San Felipe Springs, which issue from these rocks. The amount of ground water that can be obtained from the Lower Cretaceous rocks in the area varies greatly from place to place. In parts of the area erosion has formed deep valleys, and much of the ground-water reservoir has been drained; in some places the sands of the Trinity group are thin or have a low permeability, or both; but in other places large supplies are furnished from both the sands of the Trinity group and limestones of the Fredericksburg group.

*Area D.*—Area D constitutes a large part of the region lying west of Area C. The ground-water reservoirs that furnish water for public supply in the area are found in the alluvial and bolson outwash deposits of Quaternary age, except in the northeastern part of the area where the public supplies of Pecos, Barstow, Kermit, Monahans, and Imperial are obtained from ground-water reservoirs in the Dockum group of Triassic age. The amount of ground water that can be obtained from the alluvial and bolson deposits varies greatly from place to place, and in many places the ground water in these deposits is highly mineralized. The Triassic rocks yield water acceptable for domestic purposes but the reservoirs generally do not yield large quantities of water to wells.

*Area E.*—In Area E, which lies within Area D, ground water for public supply is obtained in part from volcanic lavas of Tertiary age, and perhaps in part from Cretaceous rocks that underlie the lava and from alluvium.

#### MUNICIPALITIES AND PROBABLE SOURCE OF SUPPLY

The following table lists 127 of the municipalities in the region covered by this report that obtain their public water supplies in whole or in part from ground water and gives the probable water-bearing formation or groups of formations from which the water is drawn. For 10 of the 137 communities using ground water in whole or in part the source of the water is not known.

*Municipalities and probable water-bearing formation from which water is drawn*

Adrian.....	Ogallala formation.
Alpine.....	Tertiary volcanic lava.
Amarillo.....	Ogallala formation.
Amherst.....	Do.

Andrews.....	Ogallala formation.
Anton.....	Do.
Barnhart.....	Trinity group.
Barstow.....	Dockum group.
Big Lake.....	Trinity group.
Big Springs.....	Alluvium.
Booker.....	Ogallala formation.
Borger.....	Do.
Bronte.....	Alluvium.
Brownfield.....	Ogallala formation.
Canadian.....	Alluvium.
Canyon.....	Dockum group.
Channing.....	Ogallala formation.
Childress.....	Alluvium.
Clarendon.....	Ogallala formation.
Claud.....	Do.
Coahoma.....	Do.
Colorado City.....	Alluvium.
Crane.....	Do.
Cristoval.....	Trinity group.
Crosbyton.....	Ogallala formation.
Denver City.....	Do.
Dickens.....	Dockum group.
Dimmit.....	Ogallala formation.
Dodson.....	Alluvium.
Dougherty.....	Ogallala formation.
Dumas.....	Do.
Eldorado.....	Fredericksburg group.
El Paso.....	Alluvium and bolson deposits.
Estelline.....	Alluvium.
Fabens.....	Bolson deposits.
Farwell.....	Ogallala formation.
Floydada.....	Do.
Follett.....	Do.
Forsan.....	Trinity group.
Fort Hancock.....	Bolson deposits.
Fort Stockton.....	Trinity group.
Friona.....	Ogallala formation.
Grandfalls.....	Alluvium.
Groom.....	Ogallala formation.
Gruver.....	Do.
Hale Center.....	Do.
Happy.....	Do.
Hartley.....	Do.
Hedley.....	Do.
Hereford.....	Do.
Hermleigh.....	Dockum group.
Higgins.....	Ogallala formation.
Hitchland.....	Do.
Idalou.....	Do.

Imperial	Dockum group.
Iraan	Trinity group.
Jayton	Alluvium.
Kermit	Dockum group.
Lamesa	Ogallala formation and Trinity group.
Lefors	Ogallala formation.
Levelland	Do.
Littlefield	Do.
Lockney	Do.
Lorenzo	Do.
Lubbock	Ogallala formation and Trinity group.
McCamey	Trinity group.
McLean	Ogallala formation.
Memphis	Do.
Mertzou	Trinity group.
Miami	Ogallala formation.
Midland	Do.
Monahans	Dockum group.
Morse	Ogallala formation.
Morton	Do.
Muleshoe	Do.
Odessa	Trinity group.
O'Donnell	Ogallala formation.
Olton	Do.
Ozona	Trinity group.
Paducah	Permian rocks.
Pampa	Ogallala formation.
Panhandle	Do.
Perryton	Do.
Petersburg	Do.
Plainview	Do.
Plains	Do.
Post	Do.
Pringle	Do.
Quitaque	Alluvium.
Ralls	Ogallala formation.
Rankin	Trinity group.
Roaring Springs	Alluvium.
Robert Lee	Do.
Rock Springs	Trinity group.
Roscoe	Ogallala formation.
Rotan	Dockum group.
Sanatorium	Alluvium.
Sanderson	Trinity group.
Santa Rita	Do.
Seagraves	Ogallala formation and Trinity group.
Seminole	Do.

Shamrock.....	Ogallala formation.
Silverton.....	Do.
Skellytown.....	Do.
Slaton.....	Do.
Snyder.....	Alluvium and Dockum group.
Sonora.....	Fredericksburg group.
South Plains.....	Ogallala formation.
Spearman.....	Do.
Spur.....	Alluvium.
Stanton.....	Ogallala formation.
Stinnett.....	Do.
Stratford.....	Do.
Sudan.....	Do.
Tahoka.....	Do.
Texline.....	Do.
Texon.....	Trinity group.
Tornilla.....	Bolson deposits.
Tulia.....	Ogallala formation.
Turkey.....	Alluvium.
Van Horn.....	Bolson deposits.
Vega.....	Ogallala formation.
Wellington.....	Alluvium.
Wheeler.....	Ogallala formation.
White Deer.....	Do.
Wilderado.....	Do.
Ysleta.....	Bolson deposits.

### SURFACE WATER

In the region covered by this report only five municipalities use surface water exclusively, and four use a combination of ground and surface water. The total amount of surface water used by the nine municipalities amounts to an average of about 17,000,000 gallons a day. Of this amount San Angelo uses an average of about 6,000,000 gallons a day from reservoirs on the North, South, and Middle forks of the Concho River; El Paso uses an average of about 5,000,000 gallons a day from a diversion canal on the Rio Grande, and also uses about 11,000,000 gallons a day of ground water; Big Spring uses an average of about 1,300,000 gallons a day from reservoirs on Powell and Moss Creeks, and also uses about 1,000,000 gallons a day of ground water; and Sweetwater uses an average of about 2,300,000 gallons a day from reservoirs on Sweetwater and Bitter Creeks. Small amounts of surface water are used by Aspermont, Roby, Robert Lee, and Bronte, at the last two in combination with ground water.

## CHEMICAL CHARACTER OF WATER

## ANALYSES OF WATER

The analyses given in this report show the chemical quality but not the sanitary fitness of the waters. However, with the exception of the water supply at Roby, all the surface supplies and many of the ground-water supplies are reported to be chlorinated.

A single sample is ordinarily representative of a well water, as the chemical character of ground waters usually shows no material change in quality over long periods of time. Surface waters vary in chemical quality with rainfall and runoff. For this reason a single sample of a surface source is only an indication of the general nature of the water furnished to the public. Variation in quality of water from lakes is usually less than that from streams.

Water used for public supplies must be potable and should be low in mineral content so as to be free from tastes and any physiological reactions. All natural waters contain some dissolved mineral matter, because water is a very good solvent and soluble material is widely distributed in the atmosphere and in the ground. In addition to the exact limits set for concentrations of toxic salts, the United States Public Health Service drinking-water standards give the following limits for concentrations of other minerals quite commonly found in natural water:

Iron (Fe) and manganese (Mn) together should not exceed 0.5 part per million.

Magnesium (Mg) should not exceed 125 parts per million.

Chloride (Cl) should not exceed 250 parts per million.

Sulfate (SO<sub>4</sub>) should not exceed 250 parts per million.

Total solids should not exceed 500 parts per million for water of good chemical quality. However, if such water is not available, total solids of 1,000 parts per million may be permitted.

Sometimes water that exceeds the recommended limits is used when no other water supply is available.

Water passes through a natural cycle beginning with precipitation from clouds, followed by percolation into the ground or runoff into surface streams and thence into the sea, and, finally by evaporation into the atmosphere. The chemical quality of surface water is determined by the solubility of the material of the watershed over which it passes. Therefore, the amount of dissolved solids in surface waters differs greatly. For example, the water from Cottonwood Creek at Roby in Fisher County has more than 4,000 parts per million of dissolved solids, whereas the other surface waters used for public supplies in western Texas are relatively low in dissolved solids.

In general, ground waters are somewhat more highly mineralized than surface waters. Some minerals, such as iron, are found in much greater amounts in ground waters than in surface waters. Ground waters that derive their chemical content from igneous rocks usually have a relatively high alkalinity, low hardness, and considerable silica, and sometimes they contain iron and manganese. Waters derived from sedimentary rocks are more variable in composition and usually contain bicarbonates of calcium and magnesium and some chloride. Chloride and sulfate are often the predominant anions in waters from formations containing deposits of salt and gypsum. Most of the ground-water supplies of cities in western Texas come from sedimentary rocks.

The most important considerations in evaluating the quality of the water supplies are hardness, alkalinity, and total mineral content. The hardness of natural waters is caused largely by compounds of calcium and magnesium and sometimes iron and aluminum. The alkalinity of natural waters is caused by carbonates, bicarbonates, hydroxides, and, occasionally, silicates, borates, and phosphates.

The analyses are reported in parts per million, except for pH, and also in equivalents per million for those ions entering into ionic balance. Methods of analysis are those in general use by the United States Geological Survey (Collins, 1928; Amer. Pub. Health Assoc. 1946).

#### MINERAL CONSTITUENTS IN SOLUTION

Silica ( $\text{SiO}_2$ ) is found in most natural waters. It probably occurs in the form of very finely divided particles in colloidal suspension. In the more alkaline waters some of the silica may be present in ionic form. Silica has no effect on the use of water for irrigation or domestic purposes, but it causes a hard boiler scale if present in appreciable quantities in boiler-feed water. In low-pressure boilers the scale formation results in inefficient heat transfer, and in high-pressure boilers the scale may cause overheating and boiler-tube failure. Fifty-seven percent of the waters analyzed had more than 20 parts per million of silica; the greatest quantity was 80 parts per million, the lowest 5 parts per million.

Iron (Fe) found in natural waters is usually in the form of ferrous bicarbonate or ferrous or ferric sulfate. In the presence of oxygen these iron compounds are converted to ferric oxide and precipitated; hence, in surface water the iron content seldom is high. Iron is commonly found in ground water because of the wide distribution of iron in nature as hematite and its ready



olution in those waters containing carbonic acid. In public water supplies iron is objectionable, because it causes stains on plumbing fixtures and on clothing washed in the iron-bearing water. Iron is particularly troublesome in water used for many industrial purposes. In the water supplies from wells examined in western Texas, the average iron content was 0.23 part per million, and in about 9 percent of the supplies it was above the limit of 0.3 part set by the United States Public Health Service standards. Concentrations of iron above 2 parts per million were noted in Dallam, Dickens, and Reagan Counties. The surface-water samples averaged 0.35 part per million.

Calcium (Ca) and magnesium (Mg) in natural waters are usually derived from limestone, dolomite, gypsum, and, in places such as the Permian basin in western Texas, from bedded salt deposits containing chlorides and other salts of calcium and magnesium. Calcium and magnesium are objectionable because they are the principal causes of hardness.

Sodium (Na) and Potassium (K) salts are highly soluble and are present in many rocks. The more saline waters usually contain high proportions of sodium and a relatively small amount of potassium. Large amounts of these elements will cause "foaming" in boiler operations. Low sodium content is important in irrigation water, owing to the formation of "black alkali" in the soil by high-sodium waters. Sodium in water for irrigation use should not exceed 60 percent of the equivalents per million of the positive ions (Wilcox, 1948).

In public supplies of western Texas the content of sodium and potassium ranged from 12 to 400 parts per million. In 87 percent of the supplies the sodium percentage was less than 50.

Sulfate ( $\text{SO}_4$ ) is dissolved in large quantities from gypsum beds and occasionally from alkali deposits of sodium sulfate and from iron pyrite ores. Sulfate in waters that contain much calcium and magnesium contributes to the formation of hard scale in steam boilers and may increase the cost of softening. In the absence of air certain bacteria reduce sulfates to hydrogen sulfide, which is objectionable because of its offensive odor and corrosiveness to iron pipes. In 18 percent of the water supplies analyzed the sulfate content exceeded 250 parts per million.

Chloride (Cl) has little effect on the utility of water except when present in large amounts. However, when chloride is in equilibrium with calcium and magnesium, it may increase the corrosiveness of water. Water having a chloride content above about

500 parts per million will taste salty to most people. Chloride exceeded 250 parts per million in 10 percent of the public water supplies of western Texas, and 100 parts per million in more than 21 percent.

Nitrate ( $\text{NO}_3$ ) is the final oxidation product of organic nitrogen compounds. Generally, in mineral analyses of ground waters, nitrate has no sanitary significance, but at times nitrate in shallow wells is due to human or animal contamination.

Recent studies made in Illinois indicate that nitrate in excess of 70 parts per million may contribute to the ailment methemoglobinemia, "blue babies" (Faucett and Miller, 1946 p. 593). Further investigations are being made in Texas by the Texas State Department of Health in areas where nitrate is high. Examination of the public supplies listed showed the highest nitrate to be 35 parts per million, and only 3 percent of the supplies have nitrates exceeding 20 parts per million.

Fluoride (F) is found in natural waters obtained from regions where fluor spar and cryolite occur. It has been identified as the causative agent of mottled tooth enamel, and the evidence indicates that its action on the teeth occurs during their period of formation (Smith, Smith, and Foster, 1936). The United States Public Health Service has established a fluoride limit of 1.5 parts per million when the water is to be used on interstate carriers. Approximately 1 part per million of fluoride in water is thought to be desirable as a preventative of tooth decay (Dean, 1938, p. 1443). Some of the western Texas ground-water supplies contain undesirable amounts of fluoride; analyses showed that 37 percent of the ground-water supplies contained more than 2 parts per million and 11 percent contained more than 4 parts per million of fluoride.

The dissolved solids represent the residue on evaporation of the total mineral content and organic matter present and may include some water of crystallization. More than 1,000 parts per million of dissolved solids is likely to produce a noticeable taste or in other respects to make the water undesirable for public supply. The average dissolved solids found in west Texas water supplies examined was 638 parts per million. The dissolved solids was in excess of 1,000 parts per million in only 12 percent of the supplies.

#### HARDNESS

A hard water requires a relatively large quantity of soap to form lather. Hardness is caused for the most part by the bicarbonates and sulfates of calcium and magnesium. Temporary or

carbonate hardness is that part of the hardness which can be removed by boiling. It is caused principally by the presence of bicarbonates of calcium and magnesium. Permanent or noncarbonate hardness is caused by the combination of calcium and magnesium with sulfate, chloride, and nitrate.

Water having less than 50 to 75 parts per million of hardness is generally considered as sufficiently soft for ordinary use in a public water supply. Water having 75 to 150 parts per million of hardness is considered moderately hard, but still not sufficiently hard to interfere seriously in its uses or to cause much public demand for water softening. Hardness above 150 parts per million is noticed by most persons, and where the hardness is above 200 parts per million many users employ household softeners. The average hardness of public supplies in western Texas is about 350 parts per million. Only 22 percent of the ground-water supplies showed less than 200 parts per million of hardness. In the surface supplies the average hardness found, with one exception, was 115 parts per million. At Roby, not included in the average, the hardness was 2,310 parts per million.

#### ALKALINITY

Carbonate ( $\text{CO}_3$ ), bicarbonate ( $\text{HCO}_3$ ), and occasionally borate, silicate, and phosphate are responsible for the alkalinity of natural waters. Bicarbonate in natural waters results from the action on carbonate rocks of the carbon dioxide dissolved in water. Aside from its effect on the palatability of the water when present in excessive amounts, bicarbonate is of little significance in public water supplies. Carbonate is found in some samples that have been in contact with glass sampling bottles for some time, owing to the solvent action of water on soft glass.

#### HYDROGEN-ION CONCENTRATION (pH)

The pH of a solution is a direct measure of its chemical activity and may also have some bearing on the utility of the supply for domestic or industrial purposes. Knowledge of hydrogen-ion concentration is used in waterworks, principally in chemical control of purification. The degree of acidity or alkalinity of the water, as indicated by the hydrogen-ion concentration, or pH, has an important bearing on the corrosiveness of water. Values lower than 7.0 denote increasing acidity and values higher than 7.0 denote increasing alkalinity. Acid waters are generally more corrosive than alkaline waters. Raw water in most west Texas wells and streams has a pH greater than 7.0.

## SELECTED BIBLIOGRAPHY

## PUBLISHED REPORTS

- Alexander, W. H., 1946, Ground-water resources of the areas southwest of Amarillo, Texas: Texas State Board of Water Engineers (mimeographed).
- Baker, C. L., 1915, Geology and underground waters of the northern Llano Estacado: Texas Univ. Bull. 57.
- Barnes, J. R., and others, 1949, Geology and ground water in the irrigated region of the southern High Plains in Texas: Texas State Board of Water Engineers, Progress Rept. 7 (mimeographed).
- Broadhurst, W. L., 1946, Ground water in the High Plains of Texas: Texas State Board of Water Engineers, Progress Rept. 6 (mimeographed).
- Gould, C. N., 1906, The geology and water resources of the eastern portion of the Panhandle of Texas: U. S. Geol. Survey Water-Supply Paper 154.
- 1907, The geology and water resources of the western portion of the Panhandle of Texas: U. S. Geol. Survey Water-Supply Paper 191.
- Johnson, W. D., 1901, The High Plains and their utilization: U. S. Geol. Survey 21st Ann. Rept., pt. 4, pp. 609-741.
- 1902, The High Plains and their utilization: U. S. Geol. Survey 22d Ann. Rept., pt. 4, pp. 637-669.
- Knowles, D. B., 1947, Preliminary report on the geology and ground-water resources of Reeves County, Texas: Texas State Board of Water Engineers (mimeographed).
- Lang, J. W., 1945, Ground water in the High Plains of Texas: Texas State Board of Water Engineers, Progress Rept. 5 (mimeographed).
- Livingston, Penn, and Bennett, R. R., 1944, Geology and ground-water resources of the Big Spring area, Texas: U. S. Geol. Survey Water-Supply Paper 913.
- National Resources Planning Board, 1942, The Pecos River Basin joint investigation.
- Sayre, A. N., and Livingston, Penn, 1945, Ground-water resources of the El Paso area, Texas: U. S. Geol. Survey Water-Supply Paper 919.
- White, W. N., Broadhurst, W. L., and Lang, J. W., 1946, Ground water in the High Plains of Texas: U. S. Geol. Survey Water-Supply Paper 889-F.
- White, W. N., Gale, H. S., and Nye, S. S., 1941, Geology and ground-water resources of the Balmorhea area, western Texas: U. S. Geol. Survey Water-Supply Paper 849-C.

In addition to the above-listed reports, mimeographed publications containing records of wells and springs, driller's logs, partial chemical analyses of water from wells and springs, and a map showing the location of wells have been published by the Texas State Board of Water Engineers for the following counties in the region:

Andrews	Edwards	Ochiltree
Armstrong	Floyd	Oldham
Bailey	Gaines	Parmer
Briscoe	Hale	Pecos
Carson	Hansford	Potter
Castro	Hartley	Randall
Childress	Hockley	Robert
Collingsworth	Howard	Scurry
Crosby	Irion	Swisher
Dallam	Lamb	Terry
Dawson	Lubbock	Tom Green
Deaf Smith	Martin	Val Verde
Donley	Midland	Winkler
Ector	Nolan	Yoakum

### UNPUBLISHED REPORTS

The following typewritten reports giving results of ground-water investigations are available for reference in the offices of the Geological Survey and the Texas Board of Water Engineers at Austin:

- 1942, Ground-water resources of the Toyah area, Reeves County.
- 1944, Midland city water supply.
- 1944, Ground-water conditions in the Roby-Camp Springs area.
- 1944, Progress report on the ground-water supply of the El Paso area.
- 1945, Exploration for ground water for city of Childress.
- 1945, Water resources of the Lubbock district.
- 1945, Progress report on ground-water resources of the El Paso area.
- 1946, Ground water in the vicinity of Paducah, Cottle County.
- 1948, Ground water in the area northwest of Lubbock.

### PUBLIC WATER SUPPLIES

#### ANDREWS COUNTY

##### ANDREWS

Population in 1940: 611.

Source of information: H. T. Wilson, president, Andrews County Independent School District, Nov. 27, 1946.

Source of supply: Four wells.

Well 1. Nine miles north of Andrews; drilled in 1946 by G. L. Taylor; depth, 190 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; pump set at 120 feet; static water level, 73 feet below land surface April 1946; yield reported, 200 gallons a minute.

Well 2. A quarter of a mile east of well 1; drilled in March 1946 by G. L. Taylor; depth, 200 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; pump set at 120 feet; static water level, 86 feet below land surface April 1946; yield reported, 300 gallons a minute.

Well 3. A quarter of a mile east of well 2; drilled in March 1946 by G. L. Taylor; depth, 200 feet; diameter, 13½ inches; deep-well turbine pump and 15-horsepower electric motor; pump set at 120 feet; static water level, 72 feet below land surface April 1946; yield reported, 300 gallons a minute.

Well 4. A quarter of a mile east of well 3; drilled in March 1946 by G. L. Taylor; depth, 200 feet; diameter, 13½ inches; deep-well turbine pump and 20-horsepower electric motor; pump set at 120 feet; static water level, 72 feet below land surface April 1946; yield reported, 300 gallons a minute.

Pumpage (estimated): Average, 115,000 gallons a day.

Storage: Elevated tank, 50,000 gallons; elevated tank, 100,000 gallons; two concrete ground reservoirs, 100,000 gallons each.

Number of customers: 350.

Treatment: Chlorination.

### Analysis

[Composite sample of all wells. Collected Nov. 27, 1946. pH is 8.0. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	21		Sulfate (SO <sub>4</sub> )	75	1.56
Iron (Fe)	.12		Chloride (Cl)	66	1.86
Calcium (Ca)	41	2.05	Fluoride (F)	5.2	.27
Magnesium (Mg)	42	3.45	Nitrate (NO <sub>3</sub> )	1.2	.02
Sodium (Na)	67	2.91	Dissolved solids	494	
Potassium (K)	8.0	.20	Total hardness as CaCO <sub>3</sub>	275	
Bicarbonate (HCO <sub>3</sub> )	298	4.88			

### Driller's logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Surface soil	3	3	Hard rock	20	95
Red sand	9	12	Medium-grained water-bearing sand.	95	190
Pack sand	63	75			
<b>Well 2</b>					
Surface soil	3	3	Hard rock	20	95
Red sand	9	12	Medium-grained water-bearing sand.	105	200
Pack sand	63	75			
<b>Well 4</b>					
Surface soil	2	2	Fine-grained water-bearing sand.	55	155
Red sand	6	8	Medium-grained water-bearing sand.	45	200
Pack sand	22	30			
Sand	47	77			
Hard rock	23	100			

## ARMSTRONG COUNTY

## CLAUDE

Population in 1940: 761.

Source of information: H. G. Nave, water superintendent, Dec. 4, 1947.

Ownership: Municipal.

Source of supply: Two wells.

Well 1 Drilled in 1930 by D. L. McDonald; depth, 250 feet; diameter, 18 inches; deep-well turbine pump and electric motor; yield, 60 gallons a minute.

Well 2. Drilled in 1930 by D. L. McDonald; depth, 250 feet; diameter, 18 inches; deep-well turbine pump and electric motor; yield, 40 gallons a minute.

Pumpage: Average, 68,000 gallons a day.

Storage: Two elevated storage reservoirs, 60,000 gallons each; elevated tank, 175,000 gallons.

Number of customers: 247.

Treatment: None.

*Analysis*

[Composite sample of wells 1 and 2. Collected Dec. 4, 1947. pH is 7.9. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per millior	Equivalents per million
Silica (SiO <sub>2</sub> )	50		Sulfate (SO <sub>4</sub> )	41	0.85
Iron (Fe)	.02		Chloride (Cl)	16	.45
Calcium (Ca)	31	1.55	Fluoride (F)	3.2	.17
Magnesium (Mg)	36	2.96	Nitrate (NO <sub>3</sub> )	7.9	.13
Sodium (Na)	40	1.76	Dissolved solids	374	
Potassium (K)	3.2	.08	Total hardness as CaCO <sub>3</sub>	226	
Bicarbonate (HCO <sub>3</sub> )	290	4.75			

## BAILEY COUNTY

## MULESHOE

Population in 1940: 1,327 (estimated 2,000 in 1944).

Source of information: W. E. Young, water superintendent, Mar. 2, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1936; depth, 100 feet; diameter, 16 inches; deep-well turbine pump and electric motor; pumping level, 23.15 feet below land surface while pumping 250 gallons a minute; yield, 250 gallons a minute; temperature, 64° F.

Well 2. Drilled in 1940; depth, 100 feet; diameter, 16 inches; deep-well turbine pump and electric motor; static water level, 19.10 feet below land surface on March 2, 1945; yield, 800 gallons a minute.

Pumpage (estimated): 200,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 380.

Treatment: None.

*Analysis, well 1*

[Collected Mar. 7, 1947. pH is 7.7. Analyzed by M. L. Begley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	46		Sulfate (SO <sub>4</sub> )	251	5.23
Iron (Fe)	08		Chloride (Cl)	129	3.64
Calcium (Ca)	81	4.04	Fluoride (F)	3.0	.16
Magnesium (Mg)	83	6.83	Nitrate (NO <sub>3</sub> )	5.4	.09
Sodium (Na)	60	2.61	Dissolved solids	845	
Potassium (K)	11	.28	Total hardness as CaCO <sub>3</sub>	544	
Bicarbonate (HCO <sub>3</sub> )	283	4.64			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	2	2	Brown clay	6	40
Chalk and clay	15	17	Gray packed sand	5	45
Water sand	1	18	Red water sand	30	75
Gray clay	6	24	Packed sand	10	85
White water sand	4	28	Gray water sand	9	94
Gray shale	4	32	Red clay	6	100
Lime rock	2	34			

**BREWSTER COUNTY****ALPINE**

Population in 1940: 3,866.

Source of information: John Stovell, city engineer, Aug. 9, 1948.

Ownership: Municipal.

Source of supply: Four wells.

**East Well.** On north side of Southern Pacific Railroad, 1 mile east of depot; drilled in 1927; depth, 580 feet; (no water reported below 170 feet); deep-well turbine pump and 30-horsepower electric motor; static water level, 65.1 feet below land surface June 28, 1948; yield, 235 gallons a minute.

**College well.** On campus of Sul Ross State College; drilled in 1940; depth, 300 feet; deep-well turbine pump and 15-horsepower electric motor; yield, 70 gallons a minute.

**Well 3.** On Alpine Hill southwest of Southern Pacific Railroad depot; drilled in 1924 by Tony Hess; depth, 385 feet; diameter, 10 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 165 feet below land surface Aug. 1948; yield, 200 gallons a minute.

**Well 4.** On Alpine Hill southwest of Southern Pacific Railroad depot; drilled in 1929; depth, 700 feet; diameter, 10 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 210 feet below land surface June 1948; yield, 200 gallons a minute.

Pumpage (estimated): 300,000 gallons a day.

Storage: Concrete ground reservoir on Alpine Hill, 1,250,000 gallons.

Treatment: None.

*Analysis, well 3*

[Collected Nov. 10, 1947. pH is 7.2. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	18	0.37
Iron (Fe)	.00		Chloride (Cl)	25	.71
Calcium (Ca)	47	2.35	Fluoride (F)	.4	.02
Magnesium (Mg)	12	.99	Nitrate (NO <sub>3</sub> )	16	.26
Sodium (Na)	37	1.60	Dissolved solids	312	
Potassium (K)	3.7	.09	Total hardness as CaCO <sub>3</sub>	167	
Bicarbonate (HCO <sub>3</sub> )	224	3.67			

*Driller's log of abandoned city well*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soft brown soil and subsoil	5	5	Hard blue and black rock, water bearing	30	160
Brown clay and gravel	15	20	Red and brown clay and gravel	5	165
Gravel and clay	13	33	Blue and black conglomerate	10	175
Gravel, water	3	36	Hard black and blue rock	35	210
Gravel and boulders, water	4	40	Soft red clay	8	218
Hard brown rock	20	60	Soft pink, red, and blue soapstone	7	225
Brown and yellow clay and soapstone	10	70	Blue and green sandy shale	5	230
Pink shale	5	75	Blue sandy rock	10	240
Hard red, brown, blue and black rock, water bearing	40	115	Hard red rock	18	258
Soft brown shale	5	120	Green shale and conglomerate	12	270
Hard black rock	5	125	Green shale and hard rock	10	280
Chocolate-colored shale	5	130	Green sandy shale	20	300

## BRISCOE COUNTY

## QUITAQUE

Population in 1940: 763.

Source of information: W. Middleton, water superintendent, Sept. 2, 1946.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. About 2 miles northeast of Quitaque; drilled in 1923; depth, 100 feet; diameter, 14 inches; deep-well turbine pump and 15-horsepower electric motor; pump set at 90 feet below land surface; static water level, 51 feet below land surface on Sept. 2, 1946; yield reported, 200 gallons a minute with a drawdown of 20 feet.

Well 2. Five hundred feet north of well 1; drilled in 1928; depth, 100 feet; diameter, 14 inches; deep-well turbine pump and 15-horsepower electric motor; pump set at 90 feet below land surface; yield reported, 200 gallons a minute.

*Average pumpage, in gallons a day*

	1945	1946		1945	1946
January	24,000	50,000	July	78,400	113,600
February	34,500	41,500	August	100,000	127,500
March	33,000	36,500	September	75,100	
April	42,300	66,500	October	53,500	
May	39,000	80,500	November	39,000	
June	60,100	116,000	December	36,100	

Storage: Ground reservoir, 54,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 206.

Treatment: Chlorination.

*Analysis of finished water, wells 1 and 2*

[Collected Mar. 28, 1947. pH is 7.4. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	24		Sulfate (SO <sub>4</sub> )	184	3.83
Iron (Fe)	.26		Chloride (Cl)	122	3.44
Calcium (Ca)	66	3.29	Fluoride (F)	3.6	.19
Magnesium (Mg)	44	3.62	Nitrate (NO <sub>3</sub> )	11	.18
Sodium (Na)	170	7.40	Dissolved solids	826	
Potassium (K)	6.9	.18	Total hardness as CaCO <sub>3</sub>	346	
Bicarbonate (HCO <sub>3</sub> )	418	6.85			

**SILVERTON**

Population in 1940: 684.

Source of information: Mr. Summers, city secretary, Aug. 27, 1946.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Fifty feet north of City Hall; drilled in 1929; depth, 200 feet; diameter, 12 inches; cased to 142 feet below land surface; deep-well cylinder and 5-horsepower electric motor; cylinder set at 165 feet; static water level reported, 120 feet below land surface; yield reported, 90 gallons a minute.

Well 2. Three-fourths mile southeast of City Hall; drilled in 1933 by Leo McDade; depth, 202 feet; diameter, 9 inches; not cased; deep-well turbine pump and 15-horsepower electric motor; pump set at 160 feet below land surface; yield reported, 70 gallons a minute.

Well 3. Fifty feet east of City Hall; drilled in 1939 by J. F. Davis; depth, 200 feet; diameter, 16 to 8 inches; deep-well turbine pump and 3-horsepower electric motor; static water level, 116.9 feet below land surface in August 1946; yield reported, 50 gallons a minute.

Pumpage: Average, 100,000 gallons a day.

Storage: Elevated tank, 50,000 gallons; ground reservoir, 50,000 gallons.

Number of customers: 200.

Treatment: None.

*Analysis*

[Composite sample of all wells. Collected Aug. 27, 1946. pH is 7.5. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	60		Sulfate (SO <sub>4</sub> )	40	0.83
Iron (Fe)	.01		Chloride (Cl)	24	.68
Calcium (Ca)	40	2.00	Fluoride (F)	3.6	.19
Magnesium (Mg)	34	2.80	Nitrate (NO <sub>3</sub> )	2.5	.04
Sodium (Na)	35	1.51	Dissolved solids	387	
Potassium (K)	6.0	.15	Total hardness as CaCO <sub>3</sub>	240	
Bicarbonate (HCO <sub>3</sub> )	288	4.72			

## CARSON COUNTY

## GROOM

Population in 1940: 475.

Source of information: V. L. McCoy, water superintendent, June 25, 1948.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1946 by H. H. Heiskell; depth, 518 feet; diameter, 9 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 280 feet below land surface in 1946; yield, 105 gallons a minute.

Well 2. Drilled in 1929 by C. Meeker; depth, 450 feet; diameter, 6½ inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 270 feet below land surface in 1945; yield, 35 gallons a minute.

Well 3. Drilled in 1923; depth, 302 feet; diameter, 5½ inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 285 feet below land surface in 1945; yield, 20 gallons a minute.

Pumpage: 65,000 gallons a day.

Storage: Ground storage reservoir, 58,000 gallons; elevated tank, 55,000 gallons.

Number of customers: 204.

Treatment: None.

*Analysis, well 1*

[Collected June 25, 1948. pH is 7.7. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	34		Sulfate (SO <sub>4</sub> )	16	0.33
Iron (Fe)	42	00	Chloride (Cl)	5.5	.16
Calcium (Ca)	42	2.10	Fluoride (F)	4	.02
Magnesium (Mg)	28	2.30	Nitrate (NO <sub>3</sub> )	3.8	.06
Sodium (Na)	21	.91	Dissolved solids	295	
Potassium (K)	3.6	.09	Total hardness as CaCO <sub>3</sub>	220	
Bicarbonate (HCO <sub>3</sub> )	290	4.75			

## PANHANDLE

Population in 1940: 978.

Source of information: Kelly M. Bender, water superintendent, Nov. 20, 1947.

Ownership: Municipal.

Source of supply: Two wells near waterworks plant in city. System connected to Santa Fe Railroad.

Well 1. Drilled in 1924; depth, 524 feet; diameter, 24 inches; air pump; static water level, 300 feet below land surface in 1937; yield, 350 gallons a minute; not used at present.

Well 2. Drilled in 1926; depth, 580 feet; diameter 24 inches; pumped with same compressor as well 1; static water level, 300 feet below land surface in 1937; yield, 360 gallons a minute.

Pumpage: Average, 150,000 gallons a day.

Storage: Ground storage reservoir, 65,000 gallons; elevated tank, 75,000 gallons.

Number of customers: 380.

Treatment: Chlorination.

*Analysis, well 2*

[Collected Dec. 1, 1938. Analyzed by E. W. Lohr]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Calcium (Ca).....	52	2.60	Chloride (Cl).....	10	0.28
Magnesium (Mg).....	28	2.30	Fluoride (F).....	1.1	.06
Sodium and potassium (Na+K).....	12	.52	Nitrate (NO <sub>3</sub> ).....	.0	.00
Bicarbonate (HCO <sub>3</sub> ).....	293	4.80	Dissolved solids.....	266	-----
Sulfate (SO <sub>4</sub> ).....	20	.42	Total hardness as CaCO <sub>3</sub> .....	248	-----

*Driller's log, Panhandle and Santa Fe R.R. well in Panhandle*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sandy soil.....	5	5	Water sand.....	7	352
Yellow clay and sand.....	111	116	Sandrock.....	28	380
Fine-grained dry sand.....	29	145	Sand.....	5	385
Clay.....	30	175	Sand and clay.....	15	400
Clay and gravel.....	3	178	Sandrock.....	20	420
Sand and soapstone.....	4	182	Yellow clay.....	20	440
Fine-grained sand.....	18	200	Sand and clay.....	20	460
Sandrock.....	4	204	Sandrock.....	5	465
Hard-packed clay and sand.....	19	223	Sand and clay.....	15	480
Dry sand.....	47	270	Sandrock.....	20	500
Clay.....	5	275	Clay and rock.....	15	515
Clay and gravel.....	30	305	Sandrock.....	29	544
Sandrock.....	40	345	Sand.....	6	550

**SKELLYTOWN**

Population in 1940: 650.

Source of information: T. E. Morgan, operator, Oct. 5, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Well owned by the Santa Fe Railroad; drilled in 1927 by Tye Brothers; depth, 418 feet; diameter, 14 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 300 feet below land surface in 1947; yield, 260 gallons a minute.

Pumpage (estimated): 50,000 gallons a day.

Storage: Elevated tank, 100,000 gallons.

Number of customers: 250.

Treatment: None.

*Analysis*

[Collected Oct. 5, 1948. pH is 7.5. Analyzed by J. R. Avrett]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	21	-----	Sulfate (SO <sub>4</sub> ).....	27	0.562
Iron (Fe).....	.05	-----	Chloride (Cl).....	13	.367
Calcium (Ca).....	43	2.146	Fluoride (F).....	.6	.032
Magnesium (Mg).....	23	1.891	Nitrate (NO <sub>3</sub> ).....	10	.161
Sodium (Na).....	13	.565	Dissolved solids.....	282	-----
Potassium (K).....	4.8	.123	Total hardness as CaCO <sub>3</sub> .....	202	-----
Bicarbonate (HCO <sub>3</sub> ).....	220	3.606			

*Driller's log*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil.....	3	3	White packed sand.....	35	260
Red bed.....	4	7	White sandrock.....	27	287
Brown clay, some sand.....	21	28	Light-brown sand.....	33	320
Yellow clay and sand.....	2	30	Coarse gravel and sand (water).....	6	326
Yellow clay, sand and gravel.....	30	60	Fine gravel and coarse sand.....	14	340
Soft yellow sand, some gravel and clay.....	15	75	Fine gravel and coarse brown sand.....	10	350
Yellow packed sand, soft and dry.....	20	95	Coarse white sand and very fine gravel.....	21	371
Red packed sand and lime gravel.....	28	123	Yellow clay, some gravel.....	9	380
Red packed sand.....	37	160	Brown clay.....	15	395
Brown sand, soft and dry.....	15	175	Red clay and sand.....	18	413
Brown sand and clay.....	15	190	Brown quicksand (second water).....	5	418
Light fluffy clay, soft.....	8	198			
Packed sand, dry.....	27	225			

## WHITE DEER

Population in 1940: 733.

Source of information: R. M. Smith, water superintendent, June 24, 1948.

Ownership: Municipal.

Source of supply: Two wells at elevated tank.

Well 1. Drilled about 1925; depth, 382 feet; diameter, 10 inches; deep-well cylinder and pump jack and 15-horsepower electric motor; yield, 50 gallons a minute.

Well 2. Drilled about 1925; depth, 400 feet; diameter, 10 inches; deep-well turbine pump and 30-horsepower electric motor; yield, 150 gallons a minute.

Pumpage (estimated): 150,000 gallons a day.

Storage: Elevated tank, 55,000 gallons.

Number of customers: 204.

Treatment: None.

*Analysis, well 2*

[Collected June 24, 1948. pH is 7.4. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	30	-----	Sulfate (SO <sub>4</sub> ).....	18	0.375
Iron (Fe).....	.05	-----	Chloride (Cl).....	9.0	.253
Calcium (Ca).....	41	2.064	Fluoride (F).....	.2	.011
Magnesium (Mg).....	20	1.645	Nitrate (NO <sub>3</sub> ).....	5.1	.082
Sodium (Na).....	26	1.131	Dissolved solids.....	285	-----
Potassium (K).....	3.2	.082	Total hardness as CaCO <sub>3</sub> .....	185	-----
Bicarbonate (HCO <sub>3</sub> ).....	258	4.229			

*Driller's log, Panhandle and Santa Fe R.R. well in White Deer*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil.....	10	10	Water, gravel.....	3	348
Yellow clay.....	86	96	Sandy red clay.....	2	350
Brown caving sand.....	9	105	Red clay.....	12	362
Sandy yellow clay.....	95	200	Sandy red clay.....	38	400
Yellow clay.....	40	240	Red clay.....	95	495
Sandy yellow clay.....	56	296	Red water sand.....	20	515
Lime rock.....	10	306	Red clay.....	5	520
Red clay.....	26	332	Red sand.....	13	533
Red sandrock, water.....	3	335	Red sand, "bad" water.....	24	557
Sandy red clay.....	10	345	Red clay.....	5	562

## CASTRO COUNTY

## DIMMITT

Population in 1940: 943.

Source of information: Glen Smith, water superintendent, Mar. 7, 1941.

Ownership: Municipal.

Source of supply: Well one block east of courthouse; drilled in 1929 by D. L. McDonald; depth, 206 feet; diameter, 16 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 600 gallons a minute; temperature, 63° F.

Pumpage (estimated): Summer, 400,000 gallons a day; winter, 100,000 gallons a day.

Storage: Concrete reservoir, 250,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 250.

Treatment: None.

## Analysis

[Collected Mar. 7, 1941. pH is 7.6. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	44		Sulfate (SO <sub>4</sub> )	38	0.79
Iron (Fe)	.16		Chloride (Cl)	19	.54
Calcium (Ca)	55	2.75	Fluoride (F)	2.2	.12
Magnesium (Mg)	33	2.71	Nitrate (NO <sub>3</sub> )	.2	.00
Sodium (Na)	13	.55	Dissolved solids	353	
Potassium (K)	6.2	.16	Total hardness as CaCO <sub>3</sub>	273	
Bicarbonate (HCO <sub>3</sub> )	288	4.72			

## Driller's log of abandoned well 160 feet east of city well

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil	4	4	Lime rock	6	218
Caliche	11	15	Water sand and sandrock	60	278
Red sand	5	20	Lime rock	12	290
Sandrock	15	35	Water sand and sandrock	38	328
Sand and sandrock	63	98	Hard sandrock	17	345
Hard sand	52	150	Water sand and sandrock	49	394
White lime	10	160	Yellow clay	8	402
Water sand	4	164	Lime rock	13	415
Sandrock	4	168	"Red Beds"	2	417
Water sand and sandrock	44	212			

## CHILDRESS COUNTY

## CHILDRESS

Population in 1940: 6,464.

Source of information: Witt Johnson, city manager, Sept. 16, 1947.

Ownership: Municipal.

Source of supply: Eleven wells and Lake Childress.

Well 1. In Michie Sand Hill Well Field about 8 miles southwest of Childress; drilled by Layne-Texas Co. in 1947; depth, 80 feet; diameter 8½ inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 31 feet below land surface Feb. 15, 1947; measured drawdown, 19 feet while pumping 64 gallons a minute on Aug. 30, 1947.

- Well 2. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 140 feet; diameter, 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 63.5 feet below land surface on Mar. 13, 1947; measured drawdown, 7.5 feet while pumping 166 gallons a minute on Aug. 30, 1947.
- Well 3. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 201 feet; diameter, 16 to 5 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 90 feet below land surface on Mar. 11, 1947; measured drawdown, 20 feet while pumping 190 gallons a minute on Aug. 30, 1947; temperature, 67° F.
- Well 4. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 120 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 42.5 feet on Aug. 30, 1947; measured drawdown, 7.5 feet while pumping 272 gallons a minute on Aug. 30, 1947.
- Well 5. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 133 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 53 feet below land surface on Aug. 30, 1947; measured drawdown, 8 feet while pumping 120 gallons a minute on Aug. 30, 1947.
- Well 6. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 107 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 32 feet below land surface on Aug. 30, 1947; measured drawdown, 14 feet while pumping 160 gallons a minute on Aug. 30, 1947; temperature, 66° F.
- Well 7. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 92 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 34 feet below land surface on Aug. 30, 1947; measured drawdown, 6 feet while pumping 214 gallons a minute on Aug. 30, 1947.
- Well 8. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 111 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 36 feet below land surface on Mar. 11, 1947; measured drawdown, 9 feet while pumping 226 gallons a minute on Aug. 30, 1947.
- Well 9. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 87 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 36 feet below land surface on Mar. 11, 1947; measured drawdown, 4.5 feet while pumping 350 gallons a minute on Aug. 30, 1947.
- Well 10. In Michie Sand Hill Well Field; drilled by Layne-Texas Co. in 1947; depth, 132 feet; diameter, 16 to 8 $\frac{5}{8}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 62 feet below land surface on Aug. 30, 1947; measured drawdown, 13 feet while pumping 180 gallons a minute on Aug. 30, 1947.
- 62 Ranch Well. About 14 miles west of Childress on 62 Ranch; drilled in 1942; depth, 443 feet; diameter, 10 inches; deep-well turbine pump and 25-horsepower electric motor; pumping level, 346 feet below land surface on Sept. 16, 1947; static water level, 296 feet below land surface in January 1943 and 334 feet below land surface on Sept. 20, 1945; yield, 480 gallons a minute.

Lake Childress. Dam constructed in 1943; drainage area, about 12 square miles; lake floods 322 acres; average depth, 15 feet; capacity, 4,830 acre-feet.

*Average pumpage in gallons a day*

	1946	1947		1946	1947
January.....	603,000	502,000	July.....	886,000	1,301,000
February.....	606,000	489,000	August.....	852,000	
March.....	691,000	519,000	September.....	561,000	
April.....	821,000	538,000	October.....	510,000	
May.....	819,000	601,000	November.....	507,000	
June.....	699,000	734,000	December.....	498,000	

Storage: Ground reservoir, 1,000,000 gallons; ground reservoir, 1,500,000 gallons; elevated tank, 75,000 gallons.

Number of customers: 2,146.

Treatment: Chlorination.

*Analysis*

[Collected Sept. 17, 1947. pH: well 3, 7.2; well 6, 7.7. Analyzed by B. C. Dwyer]

	Well 3		Well 6	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	20		16	
Iron (Fe).....	.04		.25	
Calcium (Ca).....	97	4.84	74	3.69
Magnesium (Mg).....	20	1.64	22	1.81
Sodium (Na).....	33	1.42	54	2.35
Potassium (K).....	7.0	.18	5.8	.15
Bicarbonate (HCO <sub>3</sub> ).....	226	3.70	266	4.36
Sulfate (SO <sub>4</sub> ).....	85	1.77	84	1.75
Chloride (Cl).....	54	1.52	44	1.24
Fluoride (F).....	.2	.01	.8	.04
Nitrate (NO <sub>3</sub> ).....	67	1.08	38	.61
Dissolved solids.....	504		470	
Total hardness as CaCO <sub>3</sub> .....	324		275	

[Collected Sept. 17, 1947. pH: raw water, 7.2; finished water, 7.8. Analyzed by B. C. Dwyer]

	Lake Childress			
	Raw water		Finished water	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	8.0		17	
Iron (Fe).....	.18		.17	
Calcium (Ca).....	184	9.18	93	4.64
Magnesium (Mg).....	23	1.89	23	1.89
Sodium (Na).....	2.5	.11	70	3.04
Potassium (K).....	3.2	.08	6.0	.15
Bicarbonate (HCO <sub>3</sub> ).....	84	1.38	230	3.77
Sulfate (SO <sub>4</sub> ).....	456	9.49	161	3.35
Chloride (Cl).....	12	.34	70	1.97
Fluoride (F).....	.2	.01	.4	.02
Nitrate (NO <sub>3</sub> ).....	2.5	.04	38	.61
Dissolved solids.....	802		592	
Total hardness as CaCO <sub>3</sub> .....	558		326	

## Drillers' Logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Sandy soil.....	4	4	Fine-grained cemented sand..	30	80
Sand and boulders.....	46	50			
<b>Well 2</b>					
Sandy soil.....	3	3	Clay.....	5	98
Sandy clay.....	12	15	Fine-grained cemented sand..	25	123
Fine-grained cemented sand	65	80	Clay.....	5	128
Clay.....	3	83	Fine-grained cemented sand..	10	138
Fine-grained sand.....	10	93	Clay.....	2	140
<b>Well 3</b>					
Top soil.....	3	3	White sand and fine gravel..	100	200
Red sand.....	52	55	Red beds.....	1	201
Gray sand.....	45	100			
<b>Well 5</b>					
Surface soil.....	6	6	Fine to coarse-grained sand..	91	132
Red sand.....	32	38	Red beds.....	1	133
Clay.....	3	41			
<b>Well 6</b>					
Surface soil.....	5	5	Sandy clay.....	20	95
Red sand.....	40	45	Coarse-grained brown sand..	10	105
Brown sand.....	18	63	Red beds.....	2	107
Coarse-grained sand.....	12	75			
<b>Well 7</b>					
Surface soil.....	4	4	Coarse sand and gravel.....	45	91
Red sand.....	42	46	Red beds.....	1	92
<b>Well 8</b>					
Surface soil.....	6	6	Gravel and coarse-grained	32	89
Red sand.....	39	45	sand.....		
Coarse-grained sand.....	12	57	Sand and gravel.....	6	95
			Red beds.....	16	111
<b>Well 9</b>					
Surface.....	4	4	Coarse-grained sand.....	8	53
Red sand.....	36	40	Coarse-grained sand and	33	86
Medium coarse-grained sand..	5	45	gravel.....		
			Red beds.....	½	86½
<b>Well 10</b>					
Surface soil.....	2	2	Sandy clay and gravel.....	21	119
Red sand.....	43	45	Gravel.....	12	131
Soft brown sand.....	35	80	Red and blue clay.....	1	132
Gravel and sand.....	18	98			

## COCHRAN COUNTY

## MORTON

Population in 1940: 1,137.

Source of information: O. D. Vernon, water superintendent, March 5, 1947.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1933 and drilled deeper in 1947; depth, 152 feet in 1933, 233 feet in 1947; diameter, 12 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 132 feet below land surface in 1946; yield, 750 gallons a minute.

Well 2. Drilled in 1941 by Carl Williams; depth, 207 feet; diameter, 10 inches; deep-well turbine pump and 35-horsepower electric motor; drawdown, 108 feet while pumping 350 gallons a minute, 130 feet while pumping 600 gallons a minute; static water level, 95 feet below land surface on August 2, 1941; normal yield reported, 350 gallons a minute.

Pumpage (estimated): 100,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 500.

Treatment: None.

*Analysis, Well 2*

[Collected Mar. 5, 1947. pH is 7.6. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	200	4.16
Iron (Fe)	.04		Chloride (Cl)	60	1.69
Calcium (Ca)	37	1.85	Fluoride (F)	4.0	.21
Magnesium (Mg)	51	4.19	Nitrate (NO <sub>3</sub> )	4.5	.07
Sodium (Na)	103	4.47	Dissolved solids	654	
Potassium (K)	12	.81	Total hardness as CaCO <sub>3</sub>	302	
Bicarbonate (HCO <sub>3</sub> )	286	4.69			

*Driller's Log, Well 2*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	6	6	Fine sand (little water)	18	108
Sandy caliche	8	14	Fine sand (some clay)	17	125
Pack sand and caliche	21	35	Gravel (some lime)	7	132
Fine packed sand	30	65	Yellow clay and gravel	23	155
Hard limestone	10	75	Yellow clay and sand	5	160
Fine packed sand	5	80	Sand with some clay	20	180
Hard limestone	5	85	Sand and gravel	12	192
Fine packed sand	5	90	Sand	15	207

## COKE COUNTY

## BRONTE

Population in 1940: 754.

Source of information: O. W. Chapman, city secretary, May 8, 1946.

Ownership: Municipal.

Source of supply: One well and two lakes.

Well: Two miles south of Bronte about 60 feet north of the north bank of the Colorado River; dug in 1932; depth, 20 feet; diameter, 8 feet; jet pump and 5-horsepower electric motor; pump yields 60 gallons a minute, but pump runs dry in 40 minutes; well recovers in about 15 minutes.

Lake Chapman: About 1.2 miles southeast of Bronte; catchment area, 800 acres; lake supply inadequate in dry periods.

Lake Kaierim: About .6 mile east of Bronte; constructed in 1922; lake supply inadequate in dry periods.

Pumpage: Average, 45,000 gallons a day.

Storage: Elevated tank, 30,000 gallons.

Number of customers: 225.

Treatment: Aeration, sedimentation, and filtration.

### Analysis

[Composite sample from lakes. Collected May 8, 1946. pH is 7.2. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	5.6		Sulfate (SO <sub>4</sub> )	17	.354
Iron (Fe)	1.0		Chloride (Cl)	4.0	.113
Calcium (Ca)	30	1.497	Fluoride (F)		.000
Magnesium (Mg)	7.1	.584	Nitrate (NO <sub>3</sub> )	1.0	.016
Sodium and potassium (Na + K)	5.8	.254	Dissolved solids	135	
Bicarbonate (HCO <sub>3</sub> )	113	1.852	Total hardness as CaCO <sub>3</sub>	104	

### ROBERT LEE

Population in 1940: 662.

Source of information: Fred O. Green, city secretary, May 9, 1946.

Ownership: Municipal.

Source of supply: Lake and well.

Lake: About 1½ miles southeast of Robert Lee; catchment area, 800 acres. Does not furnish sufficient water during dry period.

Well: Dug in 1943 on G. W. Hill Estate below city lake; depth, 24 feet; diameter, 5 feet; centrifugal pump and gasoline engine; static water level, 14.9 feet below land surface, May 19, 1946; yield, 30 gallons a minute.

Pumpage: Average, 40,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 200.

Treatment: Coagulation, sedimentation, and filtration.

### Analysis of water from well

[Collected May 9, 1946. pH is 7.4. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	16		Sulfate (SO <sub>4</sub> )	269	5.60
Iron (Fe)	.14		Chloride (Cl)	68	1.92
Calcium (Ca)	132	6.59	Fluoride (F)	.2	.01
Magnesium (Mg)	48	3.95	Nitrate (NO <sub>3</sub> )	8.8	.14
Sodium (Na)	49	2.15	Dissolved solids	338	
Potassium (K)	14	.36	Total hardness as CaCO <sub>3</sub>	527	
Bicarbonate (HCO <sub>3</sub> )	328	5.38			

## COLLINGSWORTH COUNTY

## DODSONVILLE

Population in 1940: 357.

Source of information: Arthur Weaver, pump operator, June 22, 1948.

Ownership: Municipal.

Source of supply: Well 2 miles northeast of Dodsonville on top of hill at concrete reservoir; drilled in 1948; depth, 130 feet; diameter, 8 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 50 gallons a minute.

Pumpage: No record.

Storage: Concrete ground reservoir, 50,000 gallons.

Number of customers: About 200.

Treatment: None.

*Analysis*

[Collected June 22, 1948. pH is 7.9. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	29		Sulfate (SO <sub>4</sub> )	23	.48
Iron (Fe)	.00		Chloride (Cl)	6.1	.17
Calcium (Ca)	67	3.34	Fluoride (F)	.8	.04
Magnesium (Mg)	21	1.73	Nitrate (NO <sub>3</sub> )	17	.27
Sodium (Na)	9.2	.40	Dissolved solids	320	
Potassium (K)	5.2	.13	Total hardness as CaCO <sub>3</sub>	254	
Bicarbonate (HCO <sub>3</sub> )	290	4.75			

## WELLINGTON

Population in 1940: 3,308.

Source of information: B. O. Handley, water superintendent, June 22, 1948.

Ownership: Municipal.

Source of supply: Eleven wells 2½ miles northeast of Wellington.

Well 1. Drilled in 1932; depth, 45 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; static water level, 15 feet below land surface June 1938; yield, 50 gallons a minute.

Well 2. About 450 feet from well 1; drilled in 1932; depth, 45 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; yield, 50 gallons a minute.

Well 3. About 450 feet from well 2; drilled in 1932; depth, 45 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; yield, 50 gallons a minute.

Well 4. About 450 feet from well 3; drilled in 1926; depth, 50 feet; diameter, 8 inches; concrete casing and screen; vertical centrifugal pump and 5-horsepower electric motor; yield, 50 gallons a minute.

Well 5. About 450 feet from well 4; drilled in 1926; depth, 50 feet; diameter, 8 inches; concrete casing and screen; vertical centrifugal pump and 5-horsepower electric motor; yield, 50 gallons a minute.

Well 6. About 450 feet from well 5; drilled in 1934; depth, 40 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; yield, 50 gallons a minute.

Well 7. About 450 feet from well 6; drilled in 1926; depth, 50 feet, diameter, 18 inches; concrete casing and screen; vertical centrifugal pump and 5-horsepower electric motor; yield, 50 gallons a minute.

Well 8. About 500 feet from well 7; drilled in 1926; depth, 50 feet; diameter, 18 inches; concrete casing and screen; deep-well cylinder pump and electric motor; yield, 20 gallons a minute.

Well 9. About 500 feet from well 8; drilled in 1926; depth, 50 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; yield, 75 gallons a minute.

Well 10. About 500 feet from well 9; drilled in 1946; depth, 45 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; yield, 100 gallons a minute.

Well 11. About 500 feet from well 10; drilled in 1946; depth, 45 feet; diameter, 8 inches; gravel-walled; deep-well turbine pump and 3-horsepower electric motor; yield, 100 gallons a minute.

Pumpage: Average, 250,000 gallons a day in winter and 600,000 gallons a day in summer.

Storage: Ground storage reservoir, 25,000 gallons; elevated tank, 100,000 gallons; ground storage reservoir under construction, 200,000 gallons.

Number of customers: 1,100.

Treatment: None.

### Analysis

[Composite sample of all wells. Collected June 22, 1948. pH is 7.4. Analyzed by F. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	82		Sulfate (SO <sub>4</sub> )	66	1.37
Iron (Fe)	.00		Chloride (Cl)	30	.85
Calcium (Ca)	82	4.09	Fluoride (F)	.6	.03
Magnesium (Mg)	18	1.48	Nitrate (NO <sub>3</sub> )	9.7	.16
Sodium (Na)	71	3.10	Dissolved solids	496	
Potassium (K)	4.0	.10	Total hardness as CaCO <sub>3</sub>	278	
Bicarbonate (HCO <sub>3</sub> )	388	6.86			

## COTTLE COUNTY

### PADUCAH

Population in 1940: 2,677.

Source of information: J. A. Carroll, water superintendent, Sept. 16, 1947.

Ownership: Municipal.

Source of supply: Four wells in field 8 miles west of Paducah near South Pease River.

Well 2. Drilled about 1931; depth, 225 feet; diameter, 7 inches; and 35.6 feet below land surface on Sept. 16, 1947; deep-well turbine pump and 7½-horsepower electric motor; static water level, 24.9 feet below land surface on October 25, 1945, yield reported, 120 gallons a minute.

Well 3. Drilled about 1931; depth, 130 feet; diameter, 7 inches; static water level, 21.1 feet below land surface on October 25, 1945, and 38.3 feet below land surface on Sept. 6, 1947; pumped with air; yield reported, 150 gallons a minute; temperature, 67° F.

Well 4. Drilled about 1931; depth 130 feet; diameter, 7 inches; static water level, 35.8 feet below land surface on Sept. 16, 1947; pumped with air; yield reported, 150 gallons a minute.

Well 5. Drilled about 1931; depth, 127 feet; diameter, 7 inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 28.2 feet below land surface on October 25, 1945, and 33 feet below land surface on Sept. 16, 1947; yield reported, 150 gallons a minute.

*Average pumpage in gallons a day*

	1944	1945	1946	1947
January-----		129,000	123,000	119,000
February-----		114,000	124,000	117,000
March-----	108,000	117,000	160,000	147,000
April-----		149,000	207,000	222,000
May-----	137,000	230,000	203,000	162,000
June-----	214,000	263,000	279,000	256,000
July-----	244,000	214,000	336,000	331,000
August-----	281,000	251,000	200,000	351,000
September-----	150,000	202,000	176,000	-----
October-----		271,000	140,000	-----
November-----	143,000	143,000	130,000	-----
December-----	124,000	130,000	124,000	-----

Storage: Concrete reservoir at well field, 286,000 gallons; ground storage reservoir 3 miles west of Paducah, 250,000 gallons; elevated tank, 100,000 gallons.

Number of customers: 680.

Treatment: Chlorination.

*Analyses*

[Collected Oct. 25, 1945. Analyzed by B. C. Dwyer and J. H. Rowley.]

	Well 3		Well 5	
	Parts per million	Equivalents per million	Parts per millior	Equivalents per million
Calcium (Ca)-----	354	17.67	534	26.65
Magnesium (Mg)-----	101	8.31	144	11.84
Sodium and potassium (Na + K)-----	13	.57	337	14.65
Bicarbonate (HCO <sub>3</sub> )-----	202	3.31	224	3.67
Sulfate (SO <sub>4</sub> )-----	1,090	22.69	1,370	28.52
Chloride (Cl)-----	18	.51	730	20.59
Nitrate (NO <sub>3</sub> )-----	2.8	.05	1.2	.02
Dissolved solids-----	1,680	-----	3,240	-----
Total hardness as CaCO <sub>3</sub> -----	1,300	-----	1,920	-----

CRANE COUNTY

CRANE

Population in 1940: 1,420.

Source of information: Albert Wright, water superintendent, Dec. 13, 1946.

Ownership: Municipal.

Source of supply: Five wells about 6¼ miles northwest of Crane, (sec. 35, blk. 31, University of Texas.) This well field was not in operation on Dec. 13, 1946.

Well 2. Drilled in September 1946 by W. O. Bower; depth, 79 feet; diameter, 8 inches; casing perforated from 54 to 79 feet; deep-well turbine pump and 3-horsepower electric motor, pump set at 69 feet; static water level reported, 40 feet below land surface when drilled; yield reported, 60 gallons a minute when drilled.

Well 3. Drilled in November 1946 by W. O. Bower; depth, 82 feet; diameter, 8 inches; casing perforated from 52 to 82 feet; deep-well turbine pump and 3-horsepower electric motor, pump set at 72 feet; static water level reported, 42 feet below land surface when drilled; yield reported, 65 gallons a minute when drilled.

Well 4. Drilled in November 1946 by W. O. Bower; depth, 92 feet; diameter, 8 inches; casing perforated from 62 to 92 feet; deep-well turbine pump and 3-horsepower electric motor, pump set at 82 feet; static water level reported, 45 feet below land surface when drilled; yield reported, 70 gallons a minute when drilled.

Well 6. Drilled in November 1946 by W. O. Bower; depth, 90 feet; diameter, 14 inches; deep-well turbine pump and 3-horsepower electric motor; static water level reported, 43 feet below land surface when drilled; yield reported, 50 gallons a minute when drilled.

Well 7. Drilled in September 1946 by W. O. Bower; depth, 92 feet; diameter, 14 inches; casing perforated from 62 to 92 feet; deep-well turbine pump and 3-horsepower electric motor; pump set at 82 feet; static water level reported, 40 feet below land surface when drilled; yield reported, 80 gallons a minute when drilled.

*Average pumpage in gallons a day*

	1945	1946		1945	1946
January		52,370	July		91,994
February		63,048	August		111,565
March		58,410	September		89,542
April		79,855	October		62,926
May		75,907	November		58,306
June		92,324	December	60,250	

Storage: Elevated tank, 50,000 gallons; surface storage reservoir, 210,000 gallons.

Number of customers: 500.

Treatment: Zeolite softening and chlorination.

*Analysis*

[Composite sample of five wells. Collected Dec. 13, 1946. pH is 7.6. Analyzed by C. B. Cibulka]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	48		Bicarbonate (HCO <sub>3</sub> )	95	1.557
Iron (Fe)	50		Sulfate (SO <sub>4</sub> )	15	.312
Calcium (Ca)	32	1.597	Chloride (Cl)	8	.226
Magnesium (Mg)	5.2	.428	Fluoride (F)	1.4	.074
Sodium (Na)	8.4	.364	Dissolved solids	199	
Potassium (K)	2.1	.054	Total hardness as CaCO <sub>3</sub>	101	

*Driller's logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 2</b>					
Surface sand.....	13	13	Red sand.....	6	59
White caliche.....	20	33	Coarse brown sand and gravel, water.	11	70
Pink flint rock.....	4	37	Fine brown sand, water.....	9	79
Brown sand.....	10	47	Red rock.....	1	80
Sand, little water.....	6	53			
<b>Well 3</b>					
Surface sand.....	16	16	Brown sand, more water.....	3	54
Caliche, white.....	24	40	Sand and gravel, coarse.....	24	78
Brown sand.....	6	46	Red rock.....	1	79
Brown sand, water.....	5	51			
<b>Well 4</b>					
Surface sand.....	14	14	Sand, rock shell, brown.....	1	61
Caliche, white.....	21	35	Brown sand, water.....	4	65
Sandy red rock.....	20	55	Coarse sand and gravel.....	20	85
Red rock.....	5	60	Red rock.....	2	87
<b>Well 6</b>					
Surface sand.....	12	12	Fine brown sand.....	9	60
Caliche, white.....	14	26	Coarse sand and gravel.....	5	65
Flint rock.....	2	28	Coarse sand.....	16	81
Brown sand.....	20	48	Coarse sand and gravel.....	6	87
Red rock.....	3	51	Red rock.....	3	90

**CROCKETT COUNTY****OZONA**

Population in 1940: 2,150.

Source of information: W. D. Cooper, manager, July 22, 1947.

Owner: Crockett County Water Control and Improvement District No. 1.

Source of supply: Three wells.

Well 1. Drilled in 1941 by J. C. Crowder; depth, 450 feet; diameter, 10 inches; deep-well turbine pump and 50-horsepower electric motor; static water level reported, 365 feet below land surface in July 1947; drawdown reported, 7 feet after pumping several hours at a rate of 450 gallons a minute.

Well 2. 125 feet southwest of well 1; drilled in 1941 by J. C. Crowder; depth, 450 feet; diameter, 10 inches; deep-well submersible turbine pump and 30-horsepower electric motor; yield reported, 225 gallons a minute.

Well 3. 125 feet west of well 1; well not completed July 22, 1947.

Pumpage (estimated): Average 500,000 gallons a day.

Storage: Ground reservoir, 200,000 gallons.

Number of customers: 673.

Treatment: None.

*Analyses*

[Composite sample of wells 1 and 2. Collected July 22, 1947. pH is 7.7. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	15		Sulfate (SO <sub>4</sub> )	16	.33
Iron (Fe)	.16		Chloride (Cl)	22	.62
Calcium (Ca)	72	3.59	Fluoride (F)	.8	.04
Magnesium (Mg)	17	1.40	Nitrate (NO <sub>3</sub> )	7.8	.13
Sodium (Na)	11	.46	Dissolved solids	301	
Potassium (K)	5.0	.13	Total hardness as CaCO <sub>3</sub>	250	
Bicarbonate (HCO <sub>3</sub> )	272	4.46			

**CROSBY COUNTY****CROSBYTON**

Population in 1940: 1,615.

Source of information: C. R. Saffel, water superintendent, Mar. 6, 1945.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1938 by L. A. Peeples; depth, 301 feet; diameter, 10 inches; deep-well turbine pump and 40-horsepower electric motor; yield, 190 gallons a minute.

Well 2. Drilled in 1938 by L. A. Peeples; depth, 312 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 225 gallons a minute.

Well 3. Drilled in 1939 by Ed. Ballard; depth, 314 feet; diameter, 10 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 350 gallons a minute.

Pumpage (estimated): 150,000 gallons a day.

Storage: Ground reservoir, 110,000 gallons; elevated tank, 55,000 gallons.

Number of customers (estimated): 400.

Treatment: None.

*Analysis, well 3*

[Collected April 1939. pH is 7.5. Analyzed by State Health Dept.]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	53		Chloride (Cl)	21	0.59
Calcium (Ca)	40	2.00	Fluoride (F)	2.8	.15
Magnesium (Mg)	31	2.55	Nitrate (NO <sub>3</sub> )	1.3	.02
Sodium (Na)	69	3.00	Dissolved solids	477	
Bicarbonate (HCO <sub>3</sub> )	369	6.05	Total hardness as CaCO <sub>3</sub>	227	
Sulfate (SO <sub>4</sub> )	41	.85			

*Driller's log, well 2*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	3	3	Red clay	31	208
Hard white caliche	42	45	Sand and white pebbles,	37	245
Soft red caliche	22	67	water at 208 feet.		
Sticky red clay	36	103	Fine-grained yellow sand	15	260
Sandy clay	67	170	Coarse-grained yellow sand	35	295
Hard sand rock	7	177	Blue shale	17	312

## LORENZO

Population in 1940: 616.

Source of information: Wm. W. Mitchell, city secretary, Mar. 21, 1947.

Ownership: Municipal.

Source of supply: Well under elevated tank; drilled in 1927 by W. G. Hamlin; depth, 223 feet; diameter, 12 inches, cased to 79 feet; deep-well turbine and 10-horsepower electric motor; static water level reported, 80 feet below land surface in 1939; yield, 100 gallons a minute.

Pumpage: Minimum, 36,000 gallons a day; maximum, 134,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 160.

Treatment: None.

*Analysis*

[Collected Mar. 21, 1947. pH is 7.4. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	35	0.73
Iron (Fe)	.09		Chloride (Cl)	20	.56
Calcium (Ca)	39	1.95	Fluoride (F)	3.2	.17
Magnesium (Mg)	39	3.21	Nitrate (NO <sub>3</sub> )	3.2	.05
Sodium (Na)	39	1.70	Dissolved solids	386	
Potassium (K)	10	.26	Total hardness as CaCO <sub>3</sub>	258	
Bicarbonate (HCO <sub>3</sub> )	342	5.61			

## RALLS

Population in 1940: 1,512.

Source of information: Water superintendent, Mar. 6, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. At elevated tank; drilled in 1924; depth, 225 feet; diameter, 12 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 75 gallons a minute.

Well 2. Five blocks west of well 1; drilled in 1927; depth, 285 feet; diameter, 8 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 145 gallons a minute.

Pumpage: Average, 125,000 gallons a day.

Storage: Two ground storage reservoirs, 50,000 gallons each; elevated tank, 50,000 gallons.

Number of customers: 213 in 1936.

Treatment: None.

*Analysis, well 2*

[Collected Aug., 1944. pH is 7.7. Analyzed by State Health Dept.]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Iron (Fe)	0.15		Chloride (Cl)	21	0.59
Calcium (Ca)	42	2.10	Fluoride (F)	3.5	.18
Magnesium (Mg)	36	2.96	Nitrate (NO <sub>3</sub> )	4.4	.07
Sodium (Na)	61	2.65	Dissolved solids	394	
Bicarbonate (HCO <sub>3</sub> )	372	6.10	Total hardness as CaCO <sub>3</sub>	253	
Sulfate (SO <sub>4</sub> )	48	1.00			

## CULBERSON COUNTY

## VAN HORN

Population in 1940: 1,250.

Source of information: G. N. Langdon, mayor, Aug. 13, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1948 by Layne-Texas Co.; depth, 600 feet; diameter, 12 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 490 feet below land surface Aug. 1948.

Well 2. Drilled in 1931; depth, 602 feet; diameter, 12 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 490 feet below land surface May 1944; yield, 170 gallons a minute with drawdown of 40 feet; temperature, 80° F.

Pumpage: Average, 100,000 gallons a day.

Storage: Ground reservoir, 117,000 gallons; elevated tank, 50,000 gallons; elevated tank, 102,000 gallons.

Number of customers: 320.

Treatment: None.

*Analysis, well 2*

[Collected July 24, 1943. pH is 8.2. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	26		Sulfate (SO <sub>4</sub> )	78	1.62
Iron (Fe)	.02		Chloride (Cl)	22	.62
Calcium (Ca)	19	.95	Fluoride (F)	2.8	.15
Magnesium (Mg)	8.0	.66	Nitrate (NO <sub>3</sub> )	8.0	.13
Sodium (Na)	112	4.87	Dissolved solids	413	
Potassium (K)	9.2	.24	Total hardness as CaCO <sub>3</sub>	80	
Bicarbonate (HCO <sub>3</sub> )	256	4.20			

*Driller's log, well 2*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil and sand	20	20	Hard adobe clay	414	494
Sand and clay	30	50	Clay and gravel	12	506
Clay and some sand	30	80	River-bed gravel (water)	96	602

## DALLAM COUNTY

## DALHART

Population in 1940: 4,682.

Source of information: V. R. Wilson, water superintendent, Mar. 16, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Five wells at Southwestern Public Service Co. power plant.

Well 11. Drilled in 1929 by Layne-Texas Co.; depth, 547 feet; diameter, 10 inches, cased to 520 feet; deep-well turbine pump and 60-horsepower electric motor; static water level, 244 feet below land surface No. 1929; yield, 366 gallons a minute with drawdown of 37 feet.

Well 12. Drilled in 1938 by L. E. McDade; depth, 526 feet; diameter, 12½ inches, cased to 489 feet, 36 feet perforated; deep-well turbine pump and 50-horsepower electric motor; static water level, 264 feet below land surface Dec. 1938; yield, 340 gallons a minute with drawdown of 78 feet after pumping 24 hours.

Well 13. Drilled in 1942 by H. H. Heiskell; depth, 542 feet; diameter, 12½ inches, 57 feet of perforations; deep-well turbine pump and 50-horsepower electric motor; static water level, 257.7 feet below land surface Aug. 1942; yield, 400 gallons a minute with drawdown of 74 feet.

Well 14. Drilled in 1943 by H. H. Heiskell; depth, 555 feet; diameter, 26 inches; deep-well turbine pump and electric motor; static water level, 264 feet below land surface; yield, 195 gallons a minute with drawdown of 58 feet.

Well 15. Drilled in 1943 by H. H. Heiskell; depth, 550 feet; diameter, 12½ inches; deep-well turbine pump and electric motor; static water level, 267 feet below land surface; yield, 43 gallons a minute with drawdown of 104 feet after pumping 137 hours.

Pumpage: Maximum, 1,650,000 gallons a day; minimum, 550,000 gallons a day.

Storage: Elevated tank, 200,000 gallons; two ground reservoirs, 200,000 gallons each.

Number of customers: 1,598.

Treatment: Chlorination.

### Analysis, well 13

[Collected Mar. 16, 1948. pH is 7.2. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	30		Sulfate (SO <sub>4</sub> )	43	0.90
Iron (Fe)	.05		Chloride (Cl)	13	.37
Calcium (Ca)	38	1.90	Fluoride (F)	1.4	.07
Magnesium (Mg)	31	2.55	Nitrate (NO <sub>3</sub> )	6.0	.10
Sodium (Na)	20	.87	Dissolved solids	302	
Potassium (K)	1.6	.04	Total hardness as CaCO <sub>3</sub>	222	
Bicarbonate (HCO <sub>3</sub> )	238	3.90			

### Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 11</b>					
Surface soil	19	19	Clay	10	195
Sand	31	50	Sand	7	202
Sandy clay	2	52	Clay	55	257
Rock	6	58	Sand	22	279
Packed sand, gravel	24	82	Sand, boulders, and sandrock	3	282
Packed sand	61	143	Hard sand, clay streak	9	291
Sand	10	153	Sand	70	361
Clay	20	173	Water sand	53	414
Sand	12	185	No record	133	547

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 12</b>					
Surface soil.....	4	4	Hard-packed sand.....	35	331
Sandy clay.....	181	185	Fine sand, some gravel, clay, water.	28	357
Sand and gravel.....	10	195			
Gravel, hard rock.....	10	205	Yellow clay.....	50	407
Sand, gravel, weak water.....	67	272	Fine to coarse sand, thin layers sandrock, water cavities.	119	526
Clay.....	18	290			
Gravel, little water.....	6	296			

<b>Well 13</b>					
Surface soil.....	3	3	Fine sand, water.....	10	320
Sandy clay.....	47	50	Coarse sand, gravel.....	15	335
Caliche.....	15	65	Clay.....	18	353
Sandy clay.....	30	95	Hard sandstone.....	7	360
Sand, little water.....	3	98	Fine sand.....	10	370
Clay.....	7	105	Coarse sand.....	22	392
Dry sand.....	5	110	Clay.....	5	397
Sandy clay.....	12	122	Fine sand.....	8	405
Clay and gravel.....	8	130	Yellow sandy clay.....	10	415
Sandy clay.....	20	150	Sand.....	25	440
Dry sand and gravel.....	75	225	Yellow clay.....	5	445
Sandy clay.....	10	235	Sandy clay.....	15	460
Brown clay.....	5	240	Clean coarse sand.....	11	471
Muddy water sand.....	32	272	Hard sand, clay.....	19	490
Yellow clay.....	16	288	Fine sand.....	30	520
Water sand, gravel.....	12	300	Coarse sand, gravel.....	20	540
Broken sand, clay.....	10	310	Brown clay.....	2	542

<b>Well 14</b>					
Sand and clay.....	68	68	Clay, gravel.....	60	435
Hard caliche.....	17	85	Yellow clay, sand.....	20	455
Sand, clay.....	175	260	Coarse water sand.....	42	497
Coarse sand, gravel.....	70	330	Hard shale, sand, gravel.....	33	530
Loose gravel, sand.....	45	375	Coarse sand, gravel.....	25	555

<b>Well 15</b>					
Top soil.....	3	3	Dry sand.....	103	248
Caliche.....	7	10	Coarse sand, hard shells.....	52	300
Red sand.....	10	20	Coarse sand, gravel.....	102	402
Caliche.....	27	47	Clay, gravel.....	15	417
White clay.....	33	80	Clean sand, gravel.....	51	468
Hard brown sand.....	5	85	Gravel, coarse sand, shells.....	52	550
Dry sand, clay.....	60	145			

### TEXLINE

Population in 1940: 385.

Source of information: Mr. Greer, Mar. 17, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Two wells at power plant.

Well 1 (East well). Drilled in 1922; depth, 260 feet; diameter, 8 inches; static water level, 76 feet below land surface; yield, 62 gallons a minute; not used for a year; new pump to be installed.

Well 2 (West well). Drilled in 1922; depth, 297 feet; diameter, 8 inches; deep-well turbine pump and electric motor; static water level, 76 feet below land surface; yield, 250 gallons a minute, drawdown 20 feet.

Pumpage: Average, 150,000 gallons a day.

Storage: Elevated tank, 150,000 gallons.

Number of customers: 145.

Treatment: None.

*Analysis, well 2*

[Collected Mar. 17, 1948. pH is 7.2. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	12		Sulfate (SO <sub>4</sub> )	42	0.87
Iron (Fe)	2.2		Chloride (Cl)	8	.23
Calcium (Ca)	32	1.60	Fluoride (F)	1.0	.05
Magnesium (Mg)	27	2.22	Nitrate (NO <sub>3</sub> )	.0	.00
Sodium (Na)	30	1.30	Dissolved solids	298	
Potassium (K)	3.6	.09	Total hardness as CaCO <sub>3</sub>	191	
Bicarbonate (HCO <sub>3</sub> )	244	4.00			

*Driller's log of railroad well in Texline*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay and sand	25	25	Water sand	20	250
Packed sand	45	70	Hard rock	5	255
Quick sand	20	90	Soft blue clay	5	260
Hard rock	10	100	Coarse sand	25	285
Blue clay	130	230	Hard rock	10	295

## DAWSON COUNTY

## LAMESA

Population in 1940: 6,038.

Source of information: G. M. Roberts, city manager, Sept. 12, 1947.

Ownership: Municipal.

Source of supply: Eighteen wells.

Well 1. Drilled in 1929; depth, 300 feet; diameter, 10 to 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 175 gallons a minute.

Well 2. Drilled in 1929; depth, 160 feet; diameter 10 to 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 100 gallons a minute; temperature, 66½° F.

Well 3. Drilled in 1929; depth, 160 feet; diameter 10 to 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 125 gallons a minute.

Well 4. Drilled in 1935; depth, 150 feet; diameter, 10 to 8 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 72.2 feet below land surface on Dec. 21, 1945, and 82.33 feet below land surface on Sept. 12, 1947; yield, 60 gallons a minute; temperature, 67° F.

Well 5. Drilled in 1924; depth, 300 feet; diameter 10 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 125 gallons a minute.

Well 6. Drilled in 1924; depth, 300 feet; diameter, 6 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 125 gallons a minute.

Well 7. Drilled in 1940; depth, 160 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 66 feet below land surface on Sept. 17, 1941, and 76 feet below land surface on Feb. 5, 1946; yield 175 gallons a minute.

Well 8. Drilled in 1940; depth, 151 feet; diameter, 10 to 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 125 gallons a minute.

Well 9. Drilled in 1940; depth, 160 feet; diameter 10 to 8 inches; deep-

well turbine pump and 15-horsepower electric motor; yield, 35 gallons a minute.

Well 10. Drilled in 1945; depth, 163 feet; diameter, 12 inches; static water level, 95.2 feet below land surface on Sept. 13, 1947; deep-well turbine pump and 10-horsepower electric motor; yield, 270 gallons a minute.

Well 11. Drilled in 1945; depth, 160 feet; diameter, 12 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 100 gallons a minute; temperature, 66½° F.

Well 12. Drilled in 1945; depth, 160 feet; diameter, 12 inches; static water level, 69 feet below land surface on March 13, 1946; deep-well turbine pump and 5-horsepower electric motor; yield, 100 gallons a minute.

Well 13. Drilled in 1946; depth, 168 feet; diameter 12 to 10 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 175 gallons a minute.

Well 14. Drilled in 1946; depth, 197 feet; diameter, 12 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 130 gallons a minute.

Well 15. Drilled in 1946; depth, 220 feet; diameter, 12 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 100 gallons a minute.

Well 16. Drilled in 1946; depth, 255 feet; diameter, 12 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 75 gallons a minute.

Well 17. Drilled in 1947; depth, 182 feet; diameter, 14 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 90 gallons a minute.

Well 18. Drilled in 1947; depth, 138 feet; diameter, 12 inches; pump not installed.

Pumpage (estimated): Minimum, 450,000 gallons a day; maximum, 1,500,000 gallons a day.

Storage: Ground reservoir, 250,000 gallons; two ground reservoirs, 200,000 gallons each; ground reservoir, 100,000 gallons; elevated tank, 200,000 gallons; elevated tank, 100,000 gallons.

Number of customers: Estimated, 2000.

Treatment: Chlorination.

### Analyses

[Collected Sept. 13, 1947. pH: well 6, 8.0; well 13, 7.5. Analyzed by B. C. Dwyer]

	Well 6		Well 13	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	30		72	
Iron (Fe).....	0		.06	
Calcium (Ca).....	28	1.40	74	3.69
Magnesium (Mg).....	26	2.14	75	6.17
Sodium (Na).....	260	11.29	54	2.34
Potassium (K).....	13	.33	8.2	.21
Bicarbonate (HCO <sub>3</sub> ).....	440	7.21	402	6.59
Sulfate (SO <sub>4</sub> ).....	200	4.16	160	3.33
Chloride (Cl).....	124	3.50	70	1.97
Fluoride (F).....	5.2	.27	4.4	.23
Nitrate (NO <sub>3</sub> ).....	2.5	.02	18	.29
Dissolved solids.....	905		760	
Total hardness as CaCO <sub>3</sub> .....	177		493	

	Composite sample from 13 wells			Composite sample from 13 wells	
	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	37		Sulfate (SO <sub>4</sub> )	193	4.02
Iron (Fe)	.03		Chloride (Cl)	130	3.67
Calcium (Ca)	38	1.90	Fluoride (F)	5.6	.29
Magnesium (Mg)	57	4.69	Nitrate (NO <sub>3</sub> )	2.5	.04
Sodium (Na)	164	7.15	Dissolved solids	843	
Potassium (K)	25	.64	Total hardness as CaCO <sub>3</sub>	330	
Bicarbonate (HCO <sub>3</sub> )	388	6.36			

*Driller's logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 4</b>					
Caliche	30	30	Sand	20	80
Rock	10	40	Water sand	10	90
Sand	8	48	Sand	52	142
Water sand	10	58	Water sand	8	150
Sandrock	2	60	Red beds		150
<b>Well 5</b>					
Red clay	4	4	Sand	90	190
Caliche	46	50	Porous sandrock, water	10	200
Cap rock	10	60	Red beds and thin-bedded blue shale streaks.	100	300
Sand	30	90			
Water sand	10	100			
<b>Well 7</b>					
Surface soil	3	3	Coarse-grained sand, water	8	81
Sand and caliche	4	7	Sandy clay	2	83
Pack sand	8	15	Fine-grained sand, water	16	99
Hard sand	8	23	Brown clay	4	103
Sand and caliche rock	8	31	Fine packed sand	12	115
Sand and rock, light	10	41	Coarse-grained sand, water	20	135
Sand and rock, dark	7	48	Packed sand, tight	5	140
Coarse sand and fine gravel	9	57	Pink clay	11	151
Fine-grained sand, dry	4	61	Coarse-grained sand, water	6	157
Fine-grained sand and fine gravel, dry.	7	68	Coarse water sand and some pea gravel.	3	160
Packed sand	5	73			
<b>Well 8</b>					
Surface soil	3	3	Sand and fine gravel, water	27	90
Packed sand	5	8	Clean sand and fine gravel, water.	8	98
Sand	7	15	Packed sand	12	110
Hard sand	5	20	Pink clay	9	119
Hard limestone	4	24	Packed sand	14	133
Hard sand	21	45	Coarse sand and gravel	18	151
Gravel, medium	8	53			
Sand	10	63			
<b>Well 9</b>					
Surface soil	3	3	Sandy clay	2	77
Hard caliche	7	10	Sand and gravel	18	95
Packed sand and rock	6	16	Packed sand	15	110
Sand and rock	30	46	Pink clay	10	120
Coarse sand and gravel	9	55	Sand, water	10	130
Sand and fine gravel	5	60	Sand and pea gravel, water	10	140
Packed sand	5	65	Coarse sand and pea gravel	12	152
Coarse sand and gravel, water	10	75	Red beds	8	160

	Thickness (feet)	Depth (feet)		Th'ckness (feet)	Depth (feet)
<b>Well 10</b>					
Surface soil.....	3	3	Sand, dry.....	8	128
Sand and shale.....	52	55	Sand, medium fine grained, water	20	148
Gravel.....	8	63	Red clay.....	15	163
Sand, water.....	45	108			
Pink shale.....	12	120			
<b>Well 11</b>					
Surface soil.....	4	4	Sand, dry.....	10	90
Shale.....	11	15	Sand, water.....	17	107
Caliche.....	10	25	Pink shale.....	28	135
Sand.....	5	30	Sand, dry.....	10	145
Hard white rock.....	15	45	Sand, water.....	15	160
Sand.....	15	60	Red clay.....	5	165
Sand and gravel.....	20	80			
<b>Well 13</b>					
Top soil, caliche and clay.....	58	58	Clay.....	55	130
Coarse gravel.....	7	65	Sand and fine gravel.....	20	150
Sand and fine gravel.....	10	75	Red beds.....	18	168
<b>Well 14</b>					
Surface soil.....	4	4	Red shale.....	23	148
Shale.....	6	10	Yellow, sandy shale.....	17	165
Rock.....	11	21	Sand and gravel.....	27	192
Sandy shale.....	29	50	Red shale.....	4	196
Sand and gravel.....	75	125	Rock.....	1	197
<b>Well 15</b>					
Surface soil.....	4	4	Caliche.....	25	160
Caliche.....	36	40	Red shale.....	20	180
Sandy shale.....	55	95	Blue sandy shale.....	5	185
Sand.....	10	105	Sand.....	33	218
Sand and gravel, water.....	30	135	Red shale.....	2	220
<b>Well 16</b>					
Surface soil.....	2	2	Sand and gravel.....	6	135
Rock.....	18	20	Caliche.....	35	170
Sandy shale.....	35	55	Sand.....	15	185
Rock.....	20	75	Caliche.....	17	202
Sandy shale.....	26	101	Red shale.....	20	222
Sand and gravel.....	20	121	Sand.....	31	253
Hard rock.....	8	129	Yellow clay.....	2	255
<b>Well 17</b>					
Surface soil.....	3	3	Hard rock.....	9	127
Hard rock.....	19	22	Sand and gravel.....	6	133
Sandy shale.....	36	58	Caliche.....	34	167
Rock.....	19	77	Sand.....	6	173
Sandy shale.....	21	98	Caliche.....	9	182
Sand and gravel.....	20	118			
<b>Well 18</b>					
Unknown.....	70	70	Solid rock.....	8	121
Solid rock.....	17	87	Open cavity.....	3	124
Coarse gravel.....	8	95	Water-bearing sand.....	11	135
Water-bearing sand.....	18	113	Red beds.....	3	138

## DEAF SMITH COUNTY

## HEREFORD

Population in 1940: 2,584.

Source of information: O. Carroll, water superintendent, March 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 2. At pumping station 7 blocks southeast of post office; dug to 50 feet and drilled from 50 to 200 feet; diameter, 14 inches; deep-well turbine pump and 50-horsepower electric motor; static water level reported, 60 feet below land surface in 1938; yield, 1,000 gallons a minute.

Well 3. 150 feet northeast of well 2; drilled in 1939 by Bradford Supply Co.; depth, 160 feet; diameter, 20 inches; deep-well turbine pump and 50-horsepower electric motor; static water level reported, 65 feet below land surface in 1939 and 75 feet below land surface in 1941; yield, 1,325 gallons a minute.

Pumpage (estimated): 600,000 gallons a day.

Storage: Ground reservoir, 120,000 gallons; elevated tank, 175,000 gallons.

Number of customers: 750.

Treatment: None.

*Analyses*

[Collected Mar., 1945. pH: well 2, 7.6; well 3, 7.8. Analyzed by B. C. Dwyer and J. H. Rowley]

	Well 2		Well 3	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	59		61	
Iron (Fe)	.02		.08	
Calcium (Ca)	46	2.30	54	2.70
Magnesium (Mg)	66	5.43	59	4.85
Sodium (Na)	32	1.40	60	2.61
Potassium (K)	9.5	.24	15	.38
Bicarbonate (HCO <sub>3</sub> )	340	5.57	311	4.90
Sulfate (SO <sub>4</sub> )	139	2.89	207	4.31
Chloride (Cl)	22	.62	30	.85
Fluoride (F)	3.5	.18	3.6	.19
Nitrate (NO <sub>3</sub> )	7.0	.11	5.5	.09
Dissolved solids	557		648	
Total hardness as CaCO <sub>3</sub>	386		373	

## DICKENS COUNTY

## DICKENS

Population in 1940: 465.

Source of information: Cecil Meadors, mayor, Feb. 5, 1946.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. At 7th and Davis Streets; drilled in 1936 by L. A. Peeples; depth, 90 feet; diameter, 6 inches; deep-well turbine pump and 3-horsepower electric motor; static water level, 77.0 feet below land surface in 1936; yield, 10 gallons a minute.

Well 2. At O'Neal Street and State highway; drilled in 1936 by L. A. Peeples; depth, 156 feet; diameter, 6 inches; deep-well turbine pump and 3-horsepower electric motor; yield, 18 gallons a minute.

Well 3. Forty feet east of well 2; drilled in 1945; depth, 150 feet; diameter, 6 inches; deep-well turbine pump and 3-horsepower electric motor; yield, 30 gallons a minute.

Well 4. One block north and two blocks west of court house; drilled in 1935 by L. A. Peebles; depth, 110 feet; diameter, 12 to 8 inches; deep-well turbine pump and electric motor; static water level, 89.82 feet below land surface on Sept. 16, 1947; yield, 50 gallons a minute; temperature, 66½° F.

Pumpage: No record.

Storage: Standpipe, 52,000 gallons.

Number of customers: 115.

Treatment: None.

### Analyses

(Collected Feb. 21, 1946. pH: well 1, 7.6; well 2, 7.4; well 3, 7.5; well 4, 7.4. Analyzed by C. B. Cibulka)

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalent per millions
Silica (SiO <sub>2</sub> )	16		14	
Iron (Fe)	2.2		.03	
Calcium (Ca)	68	3.39	74	3.69
Magnesium (Mg)	17	1.40	20	1.64
Sodium (Na)	39	1.71	38	1.65
Potassium (K)	3.1	.08	4.6	.12
Bicarbonate (HCO <sub>3</sub> )	258	4.23	303	4.97
Sulfate (SO <sub>4</sub> )	47	.98	49	1.02
Chloride (Cl)	44	1.24	30	1.02
Fluoride (F)	1.0	.05	.4	.02
Nitrate (NO <sub>3</sub> )	4.7	.08	4.5	.07
Dissolved solids	373		399	
Total hardness as CaCO <sub>3</sub>	240		266	

	Well 3		Well 4	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	18		16	
Iron (Fe)	39		.06	
Calcium (Ca)	76	3.79	86	4.29
Magnesium (Mg)	20	1.64	25	2.06
Sodium (Na)	41	1.79	23	1.04
Potassium (K)	3.5	.09	3.8	.10
Bicarbonate (HCO <sub>3</sub> )	282	4.62	246	4.03
Sulfate (SO <sub>4</sub> )	61	1.27	55	1.15
Chloride (Cl)	47	1.33	60	1.69
Fluoride (F)	.6	.03	.8	.04
Nitrate (NO <sub>3</sub> )	3.8	.06	30	.48
Dissolved solids	414		450	
Total hardness as CaCO <sub>3</sub>	272		318	

### Driller's logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well 1					
Gray sand	7	7	Sand rock	3	77
Soft sand rock	3	10	Coarse-grained sand and gravel	3	80
Gray sand	5	15	Rock	2	82
Red sticky clay	12	27	Sand and gravel	3	85
Coarse-grained yellow sand, dry	26	53	Hard rock	1	86
Soft sand rock	1	54	Sand and gravel	4	90
Coarse-grained sand and gravel, dry	20	74			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 2</b>					
Top soil.....	4	4	Sticky, dense blue clay.....	11	94
Red sticky clay.....	8	12	Fine-grained water sand.....	6	100
Blue clay and sand.....	15	27	Sticky, dense blue clay.....	22	122
Dry sand.....	29	56	Blue water sand.....	13	135
Hard rock.....	1	57	Blue clay.....	2	137
Sand.....	3	60	Coarse-grained blue water sand and gravel.	19	156
Hard rock.....	1	61			
Dry sand.....	22	83			

### SPUR

Population in 1940: 2,136.

Source of information: J. H. Cowan, city secretary, Feb. 18, 1946.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. Dug in 1940; depth, 51 feet; diameter, 18 inches; turbine pump and 15-horsepower electric motor; static water level, 29.8 feet below land surface Feb. 18, 1946; yield, 250 gallons a minute; temperature, 64½° F.

Well 2. Dug in 1943; depth, 40 feet; diameter, 18 inches; turbine pump and 15-horsepower electric motor; static water level, 13.48 feet below land surface Feb. 18, 1946; yield, 200 gallons a minute.

Well 3. Dug in 1945; depth, 49 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 15.34 feet below land surface Feb. 18, 1946; yield, 200 gallons a minute.

Well 4. Dug in 1942; depth, 32 feet; diameter, 18 inches; deepened to 45 feet in 1947; deepwell turbine pump and 15-horsepower electric motor; yield, 150 gallons a minute; temperature, 63½° F.

### Average pumpage in gallons a day

	1942	1943	1944	1945	1946	1947
January.....	115,000	109,000	135,000	124,000	140,000	163,000
February.....	107,000	105,000	130,000	124,000	138,000	171,000
March.....	123,000	120,000	135,000	137,000	193,000	200,000
April.....	111,000	140,000	171,000	258,000	274,000	245,000
May.....	-----	161,000	175,000	258,000	251,000	224,000
June.....	215,000	170,000	178,000	219,000	340,000	371,000
July.....	246,000	189,000	207,000	249,000	415,000	393,000
August.....	161,000	254,000	238,000	304,000	425,000	413,000
September.....	133,000	-----	169,000	230,000	225,000	-----
October.....	137,000	166,000	145,000	134,000	193,000	-----
November.....	130,000	176,000	137,000	132,000	170,000	-----
December.....	106,000	131,000	128,000	131,000	200,000	-----

Storage: Concrete reservoir and elevated tank, total capacity, 200,000 gallons.

Number of customers: 730.

Treatment: Chlorination.

Analyses

[Collected Feb. 18, 1946, and Sept. 16, 1947. pH for each well is 7.7. Analyzed by C. B. Cibulka and B. C. Dwyer]

Well 1		Well 4	
Parts per million	Equivalents per million	Parts per million	Equivalents per million
17	129	17	39
Iron (Fe)	Calcium (Ca)	124	6.19
	Magnesium (Mg)	73	6.00
	Sodium (Na)	100	4.36
	Potassium (K)	9.2	.23
	Bicarbonates (HCO <sub>3</sub> )	270	4.43
	Sulfate (SO <sub>4</sub> )	263	5.48
	Chloride (Cl)	236	6.66
	Rhloride (R)	2.8	.15
	Nitrate (NO <sub>3</sub> )	3.8	.06
	Dissolved solids	984	
	Total hardness as CaCO <sub>3</sub>	610	

Driller's logs

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

Well 1

Sandy loam	1	Coarse sand and gravel	2
Blue gumbo	5	Coarse sand	16
Clay	5		5
Quicksand	19		

Well 2

Sandy loam	4	Quicksand	29
Blue gumbo	5	Coarse sand	5
Clay	3		7
Sand	1		

Well 3

Sandy loam	3	Water sand	16
Gypsum	2		8
Clay	8		

DONLEY COUNTY  
CLARENDON

Population in 1940: 2,431.

Source of information: J. H. Casey, water superintendent, Dec. 4, 1947.

Ownership: Municipal.

Source of supply: Five wells.

Well 1. At Second and Park Streets; drilled in 1927 by Smith and Whitney; depth, 240 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 60 feet below land surface; pumping level, 90 feet below land surface when pumping 150 gallons a minute; yield, 150 gallons a minute.

Well 2. At Sully and White Streets; drilled in 1929; depth, 302 feet; diameter, 24 inches; pumped with air and 60-horsepower electric motor; yield, 225 gallons a minute.

Well 3. At North Front and Jefferson Streets; drilled in 1945 by Leonard Reid; depth, 165 feet; diameter, 8 inches; deep-well turbine pump and 1-horsepower electric motor; yield, 125 gallons a minute.

Well 4. At Taylor Avenue and Rosenfield Street; drilled in 1945 by A. H. Moore; depth, 202 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 225 gallons a minute.

Well 5. At North Front and Ellerbe Streets; drilled in 1946 by A. H. Moore; diameter, 16 inches; deep-well turbine pump and 40-horsepower electric motor; yield, 130 gallons a minute.

Pumpage: Average, 225,000 gallons a day.

Storage: Ground storage reservoir, 276,000 gallons; standpipe, 150,000 gallons.

Number of customers: 800.

Treatment: Chlorination.

### Analysts

[Composite sample of five wells. Collected Dec. 4, 1947. pH is 7.5. Analyzed by B. C. Dwyer]

Parts per million	Parts per million	Parts per million	Parts per million	Parts per million	Parts per million
27	19	0.40	0.00	0.73	0.24
Silica (SiO <sub>2</sub> )	Sulfate (SO <sub>4</sub> )	Iron (Fe)	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )
88	4.39	11	0.90	0.26	0.08
Calcium (Ca)	Chloride (Cl)	Magnesium (Mg)	Fluoride (F)	Dissolved solids	Total hardness as CaCO <sub>3</sub>
3.2	0.08	6.0	0.26	357	264
Potassium (K)	Sulfate (SO <sub>4</sub> )	Sodium (Na)	Dissolved solids		
260	4.26	3.2	0.08		
Bicarbonate (HCO <sub>3</sub> )	Total hardness as CaCO <sub>3</sub>				

### Driller's log, well 2

Thickness (feet)	Depth (feet)	Thickness (feet)	Depth (feet)
27	4	46	4
Clay and caliche	Clay	46	46
26	54	54	54
5	80	80	80
Red beds	Sand and silt	85	85
	Coarse-grained sand and gravel		
180	108	120	120
12	122	122	122
2	302	302	302
Thickness (feet)	Depth (feet)	Thickness (feet)	Depth (feet)

### HEDLEY

Population in 1940: 637.

Source of information: J. P. Devine, former water superintendent, Apr. 26, 1948.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Two miles west of Hedley; drilled in 1925 by Bill Miller; depth,

112 feet; diameter, 8 inches; deep-well cylinder pump and 5-horsepower electric motor; static water level, 45 feet below land surface June, 1936;

yield, 20 gallons a minute.

Well 2. About 50 feet north of well 1; drilled in 1925 by Bill Miller; depth, 100 feet; diameter, 6 inches; deep-well cylinder pump and 3-horsepower electric motor; yield, 10 gallons a minute.

Well 3. About 100 feet west of well 1; drilled in 1927 by Carlisle; depth, 115 feet; diameter, 8 inches; deep-well turbine pump and 3-horsepower electric motor; yield, 100 gallons a minute.

Pumpage: Average, 30,000 gallons a day.

Storage: Ground storage reservoir, 14,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 200.

Treatment: None.

*Analysis, well 1*

[Collected May 19, 1943. pH is 8.4. Analyzed by J. H. Rowley]

Parts per million	Equivalents per million	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids	Total hardness as CaCO <sub>3</sub>	Parts per million	Equivalents per million
13	15	---	---	---	---	---	---	31	---
72	9.5	3.59	---	---	---	---	---	13	---
53	---	.78	---	---	---	---	---	20	---
320	---	5.25	---	---	---	---	---	218	---
---	---	---	---	---	---	---	---	383	---
---	---	---	---	---	---	---	---	1.6	---
---	---	---	---	---	---	---	---	0.87	---
---	---	---	---	---	---	---	---	0.56	---

*Driller's log, city test well*

Thickness (feet)	Depth	Loam	Packed sand	Water-bearing sand	Thickness (feet)	Depth
---	4	---	---	---	13	90
---	26	---	---	---	8	98
---	35	---	---	---	14	112
---	12	---	---	---	---	---
---	77	---	---	---	---	---

ECTOR COUNTY

ODESSA

Population in 1940: 9,573 (estimated 30,000 in 1947).

Source of information: A. L. Write, water superintendent, July 19, 1948.

Ownership: Municipal.

Source of supply: Fifty-two wells in secs. 4 and 9, blk. 2, T. 2, Texas and Pacific Railway Co. Survey and secs. 44 and 45, blk. 42, T. 1, Texas and Pacific Railway Survey.

Well 1. Southwest corner of sec. 9; drilled in January 1944 by Hines

Water Well Co.; depth, 145 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 159 gallons a minute with drawdown of 68 feet.

Well 2. About 1,000 feet east of well 1; drilled in February 1944 by Hines Water Well Co.; depth, 150 feet; diameter, 7 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 74 feet; below pump base February 1947, 80.2 feet below pump base

Sept. 26, 1947; yield, 250 gallons a minute with drawdown of 16 feet.

Well 3. About 1,000 feet east of well 2; drilled in March 1944 by Hines Water Well Co.; depth, 156 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 86.18 feet

below pump base Sept. 30, 1947; yield, 167 gallons a minute.

Well 4. About 1,000 feet east of well 3; drilled in March 1944 by Hines Water Well Co.; depth, 148 feet; diameter, 10 inches; deep-well turbine pump and 3-horsepower electric motor; static water level, 81.24 feet below pump base Sept. 26, 1947; yield, 130 gallons a minute with draw-down of 32 feet.

Well 5. About 1,000 feet east of well 4; drilled in August 1944 by Hines Water Well Co.; depth, 150 feet; diameter, 10 3/4 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 78.07 feet below pump base Sept. 26, 1947; yield, 110 gallons a minute. Well 6. About 1,000 feet east of well 5; drilled in March 1944 by Hines Water Well Co.; depth, 155 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 130 gallons a minute.

Well 7. Drilled in March 1944 by Hines Water Well Co.; depth, 139 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 230 gallons a minute when drilled; measured yield, 41 gallons a minute Oct. 18, 1947.

Well 8. About 1,450 feet north of well 2; drilled in March 1944 by Hines Water Well Co.; depth, 140 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 77.05 feet below pump base Sept. 26, 1947; pumping level, 109.13 feet below pump base Sept. 29, 1947; yield, 46 gallons a minute.

Well 9. About 1,000 feet east of well 8; drilled in 1944 by Hines Water Well Co.; depth, 148 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; measured yield, 74 gallons a minute Oct. 12, 1947.

Well 10. About 1,000 feet east of well 9; drilled in 1944 by Hines Water Well Co.; depth, 156 feet; diameter, 7 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 87.86 feet below pump base Sept. 26, 1947; pumping level, 107.37 feet below pump base Sept. 26, 1947.

Well 11. About 1,000 feet east of well 10; drilled in January 1945 by Hines Water Well Co.; depth, 150 feet; diameter, 10 1/2 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 109.0 feet below pump base Sept. 26, 1947; pumping level, 109.0 feet below pump base Sept. 29, 1947; reported yield, 150 gallons a minute in 1945.

Well 12. About 1,000 feet east of well 11; drilled in March 1944 by Hines Water Well Co.; depth, 155 feet; diameter, 7 inches; deep-well turbine pump and 5-horsepower electric motor; reported yield, 95 gallons a minute in 1944.

Well 13. About 250 feet east and 500 feet south of well 3; drilled in March 1945 by Hines Water Well Co.; depth, 135 feet; diameter, 12 1/2 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 82.82 feet below pump base Sept. 30, 1947; pumping level, 103.5 feet below pump base Sept. 29, 1947; yield, 35 gallons a minute.

Well 14. About 200 feet south of well 13; drilled in 1945 by Hines Water Well Co.; depth, 135 feet; diameter, 12 1/2 inches; deep-well turbine pump and 7 1/2-horsepower electric motor; yield, 38 gallons a minute. Well 15. About 500 feet east and 1,000 feet north of well 9; drilled in May 1945 by Hines Water Well Co.; depth, 180 feet; diameter, 10

- inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 87.14 feet below pump base Sept. 26, 1947; pumping level, 132.7 feet below pump base Sept. 29, 1947.
- Well 16. About 1,000 feet north of well 15; drilled in May 1945 by Hines Water Well Co.; depth, 150 feet; diameter, 10 $\frac{3}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 88.76 feet below pump base Sept. 26, 1947; pumping level, 140.13 feet below pump base Sept. 29, 1947; yield, 95 gallons a minute.
- Well 17. About 1,000 feet north of well 16; drilled in June 1945 by Hines Water Well Co.; depth, 165 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 78.9 feet below pump base Sept. 26, 1947; pumping level, 103.5 feet below pump base Sept. 29, 1947; yield, 110 gallons a minute in 1945.
- Well 18. About 1,100 feet west of northeast corner of sec. 4; drilled in June 1945 by Hines Water Well Co.; depth, 175 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 47.16 feet below pump base Sept. 26, 1947; pumping level, 95.8 feet below pump base Sept. 29, 1947; yield, 140 gallons a minute in 1945.
- Well 19. About 1,500 feet east of well 17; drilled in August 1945 by Hines Water Well Co.; depth, 155 feet; diameter, 10 inches; deep-well turbine pump and 7 $\frac{1}{2}$ -horsepower electric motor; static water level, 81.32 feet below pump base Sept. 26, 1947; pumping level, 138.8 feet below pump base Sept. 29, 1947; yield, 90 gallons a minute in 1945.
- Well 20. About 1,200 feet north and 1,450 feet east of the southeast corner of sec. 4; drilled in August 1945 by Hines Water Well Co.; depth, 175 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 120 gallons a minute in 1945.
- Well 21. About 1,350 feet north of well 20; drilled in January 1946 by Hines Water Well Co.; depth, 160 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 62.30 feet below pump base Sept. 26, 1947; yield, 180 gallons a minute in 1946.
- Well 22. About 417 feet east and 316 feet south of the northwest corner of sec. 45; drilled in December 1945 by Bethel and Matthews; depth, 164 feet; diameter, 10 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 56.35 feet below pump base Sept. 29, 1947; pumping level, 119.4 feet below pump base Sept. 26, 1947; yield, 300 gallons a minute in January 1946.
- Well 23. About 378 feet east and 61 feet north of the southwest corner of NW $\frac{1}{4}$  sec. 45; drilled in January 1946 by Bethel and Matthews; depth, 156 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 54.65 feet below pump base Sept. 29, 1947; pumping level, 99.42 feet below pump base Sept. 29, 1947; yield, 180 gallons a minute in 1946.
- Well 24. About 1,200 feet northeast of well 23; drilled in January 1946 by Bethel and Matthews; depth, 156 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 53.75 feet below pump base Sept. 29, 1947; pumping level, 97.35 feet below pump base Sept. 29, 1947; yield, 221 gallons a minute.

- Well 25. About 258 feet west and 279 feet north of the southeast corner of the NW  $\frac{1}{4}$  sec. 45; drilled in February 1946 by Bethel and Matthews; depth, 164 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 55.21 feet below pump base Sept. 26, 1947; reported yield, 254 gallons a minute.
- Well 26. About 269 feet west and 1,150 feet south of the northeast corner of the NW  $\frac{1}{4}$  sec. 45; drilled in February 1946 by Bethel and Matthews; depth, 174 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 54.89 feet below pump base Sept. 29, 1947; pumping level, 92.12 feet below pump base Sept. 29, 1947; yield, 257 gallons a minute.
- Well 27. About 831 feet north of well 23; drilled in February 1946 by Bethel and Matthews; depth, 158 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 58.35 feet below pump base Sept. 29, 1947; yield, 192 gallons a minute.
- Well 28. About 1,040 feet west of well 20; drilled in May 1946 by Bethel and Matthews; depth, 150 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 79.19 feet below pump base Sept. 26, 1947; pumping level, 121.0 feet below pump base Sept. 29, 1947; reported yield, 170 gallons a minute.
- Well 29. About 1,260 feet south of well 18; drilled in May 1946 by Bethel and Matthews; depth, 150 feet; diameter, 10 inches; deep-well turbine pump and 7  $\frac{1}{2}$ -horsepower electric motor; static water level, 46.77 feet below pump base Sept. 29, 1947; pumping level, 68.4 feet below pump base Sept. 29, 1947; reported yield, 250 gallons a minute.
- Well 30. About 1,000 feet west of northeast corner of sec. 44; drilled in November 1946 by Bethel and Matthews; depth, 160 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 60.09 feet below pump base Sept. 29, 1947; pumping level, 94.9 feet below pump base Sept. 29, 1947; yield, 211 gallons a minute.
- Well 31. Drilled in December 1946 by Bethel and Matthews; depth, 160 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 55.01 feet below pump base Sept. 29, 1947; pumping level, 89.44 feet below pump base Sept. 29, 1947; yield, 210 gallons a minute December 1946.
- Well 32. About 1,500 feet west of well 30; drilled in December 1946 by Bethel and Matthews; depth, 160 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 65.31 feet below pump base Sept. 29, 1947; pumping level, 107.6 feet below pump base Sept. 29, 1947; yield, 251 gallons a minute.
- Well 33. About 1,300 feet south of well 32; drilled in December 1946 by Bethel and Matthews; depth, 147 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 54.12 feet below pump base Sept. 29, 1947; pumping level, 102.52 feet below pump base Sept. 29, 1947; yield, 178 gallons a minute.
- Well 34. About 1,500 feet west of well 32; drilled in January 1947 by Bethel and Matthews; depth, 150 feet; diameter, 10  $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 58.86 feet below pump base Sept. 29, 1947; pumping level, 100.25 feet below pump base Sept. 29, 1947; yield, 91 gallons a minute.

- Well 35. About 1,300 feet south of well 34; drilled in January 1947 by Bethel and Matthews; depth, 140 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and electric motor; static water level, 58.21 feet below pump base Sept. 29, 1947; yield, 152 gallons a minute.
- Well 36. About 100 feet west and 100 feet south of the northwest corner of the NW  $\frac{1}{4}$  sec. 45; drilled in January 1947 by Bethel and Matthews; depth, 180 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 54.54 feet below pump base Sept. 26, 1947; yield, 310 gallons a minute.
- Well 37. About 1,050 feet southeast of well 22; drilled in January 1927 by Bethel and Matthews; depth, 166 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 56.67 feet below pump base Sept. 29, 1947; pumping level, 119.8 feet below pump base Sept. 29, 1947; yield, 223 gallons a minute January 1947.
- Well 40. About 1,250 feet southwest of well 34; drilled in April 1948 by Bethel and Matthews; depth, 140 feet; well yielded insufficient water and was abandoned. See driller's log.
- Well 41. Along the southern edge of sec. 45 about 3,400 feet from the east line; drilled in April 1948 by Bethel and Matthews; depth, 170 feet; diameter, 15 to 10 $\frac{1}{4}$  inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 60 feet below land surface April 30, 1948; pumping level, 115 feet below land surface after pumping 6 hours at a rate of 150 gallons a minute; yield, 150 gallons a minute.
- Well 42. About 1,200 feet north of well 41; drilled in May 1948 by Bethel and Matthews; depth, 170 feet; diameter, 16 to 10 $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor; static water level reported, 60 feet below land surface when drilled; pumping level, 125 feet below land surface after 4 $\frac{1}{2}$  hours of pumping at a rate of 223 gallons a minute; yield, 223 gallons a minute.
- Well 43. About 1,500 feet east of well 42; drilled in May 1948 by Bethel and Matthews; depth, 130 feet; diameter, 20 to 10 $\frac{1}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor.
- Well 44. About 1,300 feet north of well 43; drilled in June 1948 by Bethel and Matthews; depth, 175 feet; diameter, 16 to 10 $\frac{1}{4}$  inches; deep-well turbine pump and 15-horsepower electric motor; yield, 150 gallons a minute.
- Well 45. About 1,700 feet south of the north line and about 2,000 feet west of the east line of sec. 45; drilled in June 1948 by Bethel and Matthews; depth, 180 feet; diameter, 16 to 10 $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor.
- Well 46. About 1,000 feet south of the north line and 600 feet west of the east line of sec. 45; drilled in June 1948 by Bethel and Matthews; depth, 180 feet; diameter, 16 to 10 $\frac{1}{4}$  inches; deep-well turbine pump and 25-horsepower electric motor; yield, 125 gallons a minute after pumping 8 hours.
- Well 47. About 1,200 feet west of well 1; drilled in June 1948 by Bethel and Matthews; depth, 150 feet; diameter 16 inches; well abandoned because it did not yield sufficient water. See driller's log.

Well 48. About 0.2 mile west and 0.8 mile south of the intersection of Highways 80 and 51 in Odessa; drilled in July 1948 by Bethel and Matthews; depth, 130 feet; diameter, 15 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor; drawdown, 46 feet after pumping 1 hour at a rate of 146 gallons a minute.

Well 49. About 2,200 feet south and 660 feet west of the intersection of Crane Avenue and Clement Street in Odessa; drilled in August 1948 by Bethel and Matthews; depth, 120 feet; diameter, 16 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor; static water level reported, 29 feet below land surface June 1948.

Well 50. About 2,200 feet south of the intersection of Crane Avenue and Clement Street; drilled in August 1948 by Bethel and Matthews; depth, 120 feet; diameter, 16 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor; static water level, 22 feet below land surface August 1948; yield, 243 gallons a minute after 1 hour of pumping.

Well 51. About 1,100 feet south of the intersection of Crane Avenue and Clements Street; drilled in August 1948 by Bethel and Matthews; depth, 125 feet; diameter, 16 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor; static water level, 30 feet below land surface August 1948; yield, 164 gallons a minute after 6 hours of pumping.

Well 52. About 450 feet east of well 1; drilled in August 1948 by Bethel and Matthews; depth, 128 feet; diameter, 16 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor.

Well 53. About 1,100 feet east of well 49; drilled in August 1948 by Bethel and Matthews; depth, 125 feet; diameter, 16 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor.

Well 54. About 1,110 feet east of well 52; drilled in August 1948 by Bethel and Matthews; depth, 120 feet; diameter, 16 to 10 $\frac{3}{4}$  inches; deep-well turbine pump and electric motor.

*Average pumpage in gallons a day*

	1946	1947	1948
January.....		1,417,000	1,680,000
February.....		1,508,000	1,832,000
March.....		1,707,000	2,287,000
April.....			3,139,000
May.....			3,433,000
June.....			
July.....		3,719,070	
August.....		3,477,070	
September.....		2,983,070	
October.....		2,287,070	
November.....		1,641,070	
December.....	1,363,000		

Storage: Surface reservoir, 100,000 gallons; surface reservoir, 70,000 gallons; surface reservoir, 420,000 gallons; two surface reservoirs, 440,000 gallons each; surface reservoir, 500,000 gallons; elevated tank, 100,000 gallons; elevated tank, 500,000 gallons.

Number of customers: 4,141.

Treatment: Chlorination.

## Analyses

[Collected Sept. 22, 1948. pH: well 2, 7.5; well 28, 7.7; well 32, 7.3; well 44, 7.7.  
Analyzed by D. E. Weaver]

	Well 2		Well 28	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	38		32	
Iron (Fe)	.10		.15	
Calcium (Ca)	132	6.59	72	3.59
Magnesium (Mg)	34	2.80	17	1.40
Sodium (Na)	81	3.52	37	.99
Potassium (K)	4.8	.12	1.6	.04
Bicarbonate (HCO <sub>3</sub> )	186	3.05	214	3.51
Sulfate (SO <sub>4</sub> )	255	5.31	72	1.50
Chloride (Cl)	155	4.37	42	1.18
Fluoride (F)	1.4	.07	1.8	.09
Nitrate (NO <sub>3</sub> )	14	.23	17	.27
Dissolved solids	877		406	
Total hardness as CaCO <sub>3</sub>	470		250	

	Well 32		Well 44	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	32		44	
Iron (Fe)	.05		.05	
Calcium (Ca)	74	3.69	66	3.29
Magnesium (Mg)	15	1.23	14	1.15
Sodium (Na)	31	1.35	25	1.09
Potassium (K)	2.0	.05	3.6	.09
Bicarbonate (HCO <sub>3</sub> )	214	3.51	220	3.61
Sulfate (SO <sub>4</sub> )	66	1.37	44	.92
Chloride (Cl)	39	1.10	26	.73
Fluoride (F)	1.0	.05	2.0	.11
Nitrate (NO <sub>3</sub> )	16	.26	12	.19
Dissolved solids	402		362	
Total hardness as CaCO <sub>3</sub>	246		222	

## Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Surface soil	4	4	White sand	17	127
Caliche	41	45	Brown sand	7	134
Brown sand	20	65	Sand	3	137
Sand and gravel	10	75	Blue shale and red beds	8	145
Brown sand	35	110			
<b>Well 2</b>					
Surface soil	4	4	Coarse sand and gravel	17	135
Caliche	36	40	White sand	5	140
Brown sand, water	25	65	Blue shale and red beds	10	150
Sand and gravel, water	53	118			
<b>Well 3</b>					
Soil	10	10	Sand, water	72	148
Caliche	35	45	Blue shale	3	151
Brown sand, dry	25	70	Red beds	5	156
Hard sand	6	76			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 4</b>					
Surface soil.....	5	5	Hard sand.....	8	82
Caliche.....	37	42	Sand, water.....	58	140
Hard sand.....	6	48	Blue shale.....	3	143
Sand, dry.....	22	70	Red beds.....	5	148
Sand, water.....	4	74			
<b>Well 5</b>					
Surface soil.....	10	10	Yellow sand.....	19	90
Caliche.....	25	35	Sand, water.....	55	145
Sand.....	25	60	Red beds.....	5	150
Yellow sand, little water.....	11	71			
<b>Well 6</b>					
Surface soil.....	5	5	Sand, water.....	70	140
Caliche.....	45	50	Brown sand, water.....	10	150
Brown sand.....	20	70	Red beds.....	5	155
<b>Well 8</b>					
Surface soil.....	9	9	Sand.....	32	130
Caliche.....	54	63	Blue shale.....	4	134
Sand, water.....	5	68	Red beds.....	6	140
Sand and gravel.....	30	98			
<b>Well 9</b>					
Surface soil.....	4	4	Hard sand.....	12	72
Caliche.....	36	40	Sand, water.....	66	138
Hard sand.....	10	50	Blue shale.....	7	145
Brown sand, dry.....	10	60	Red beds.....	3	148
<b>Well 10</b>					
Surface soil.....	6	6	White sand, water.....	25	95
Caliche.....	34	40	Yellow sand.....	50	145
Hard sand.....	25	65	Blue shale.....	6	151
Sand, water.....	5	70	Red beds.....	5	156
<b>Well 11</b>					
Surface soil.....	5	5	Blue shale.....	5	145
Caliche.....	60	65	Red beds.....	5	150
Sand, water.....	75	140			
<b>Well 12</b>					
Surface soil.....	5	5	White sand.....	12	80
Caliche.....	35	40	Gravel and sand.....	5	85
Brown sand.....	20	60	Sand, water.....	64	149
Sand, water.....	8	68	Red beds.....	6	155
<b>Well 13</b>					
Sand.....	15	15	Sand, water.....	45	120
Caliche.....	25	40	Blue shale.....	10	130
Clay.....	35	75	Red beds.....	5	135

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 14</b>					
Surface soil.....	2	2	Blue shale.....	5	100
Caliche.....	33	35	Sand, water.....	26	126
Clay.....	10	45	Blue shale.....	4	130
Sand, dry.....	20	65	Red beds.....	5	135
Sand, water.....	30	95			

<b>Well 16</b>					
Surface soil.....	5	5	White sand.....	20	85
Caliche.....	35	40	Brown sand.....	35	120
Red sand.....	20	60	Sand and gravel.....	18	138
Yellow sand.....	5	65	Blue shale and red beds.....	12	150

<b>Well 17</b>					
Surface soil.....	3	3	Yellow clay.....	5	130
Caliche.....	42	45	Sand.....	20	150
Clay.....	15	60	Gravel.....	3	153
Sand.....	60	120	Blue shale.....	3	156
Blue shale.....	5	125	Red beds.....	9	165

<b>Well 18</b>					
Surface soil.....	3	3	Blue shale.....	5	125
Caliche.....	42	45	Sand, water.....	25	150
Clay.....	15	60	Gravel.....	3	153
Brown sand.....	30	90	Red beds.....	12	165
Blue shale.....	5	95	No record.....	10	175
Sand, water.....	25	120			

<b>Well 19</b>					
Surface soil.....	3	3	Sand.....	25	100
Caliche.....	32	35	Blue shale.....	15	115
Clay.....	5	40	Hard sand.....	10	125
Brown shale.....	10	50	Sand and gravel.....	22	147
Brown sand.....	15	65	Red beds.....	8	155
Sand and gravel.....	10	75			

<b>Well 21</b>					
Surface soil.....	4	4	Blue shale.....	5	115
Caliche.....	41	45	Sand and gravel.....	30	145
Brown shale.....	15	60	Blue shale.....	5	150
Sand and gravel.....	40	100	Red beds.....	10	160
Sand.....	10	110			

<b>Well 22</b>					
Caliche.....	50	50	Sand and gravel.....	90	160
Hard sand.....	5	55	Blue shale.....	3	163
Gravel, water.....	10	65	Red beds.....	1	164
Hard sand.....	5	70			

<b>Well 23</b>					
Surface soil.....	4	4	Sand, water.....	5	120
Caliche.....	31	35	Sand and gravel.....	20	140
Sand, dry.....	8	43	Sand.....	11	151
Hard sand, dry.....	7	50	Blue shale.....	3	154
Sand and gravel, water.....	65	115	Red rock.....	2	156

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 24</b>					
Surface soil.....	3	3	Blue shale.....	14	147
Caliche.....	47	50	Gravel.....	7	154
Sand.....	15	65	Red beds.....	2	156
Sand and gravel.....	68	133			
<b>Well 25</b>					
Surface soil.....	3	3	Brown sand.....	8	158
Caliche.....	52	55	Blue shale.....	4	162
Sand and gravel.....	95	150	Red rock.....	2	164
<b>Well 26</b>					
Surface soil.....	3	3	Sand and gravel.....	80	140
Caliche.....	37	40	Brown sand.....	28	168
White sand.....	10	50	Blue shale.....	2	170
Red sand.....	10	60	Red beds.....	4	174
<b>Well 27</b>					
Surface soil.....	3	3	Sand and gravel.....	102	152
Caliche.....	37	40	Blue shale.....	4	156
White sand.....	10	50	Red beds.....	2	158
<b>Well 28</b>					
Caliche.....	28	28	Sand and gravel.....	15	90
Rock.....	17	45	Gravel.....	55	145
Caliche.....	25	70	Blue shale.....	1	146
Rock.....	5	75	Red beds.....	4	150
<b>Well 29</b>					
Surface soil.....	15	15	Yellow clay.....	8	58
Hard caliche.....	15	30	Sand, water.....	72	130
Caliche.....	15	45	Blue shale.....	18	148
Gravel, water.....	5	50	Red beds.....	2	150
<b>Well 30</b>					
Surface soil.....	5	5	Sand and gravel, water.....	97	152
Hard caliche.....	20	25	Blue shale.....	4	156
Sand, dry.....	30	55	Red beds.....	4	160
<b>Well 32</b>					
Surface soil.....	5	5	Sand and gravel, water.....	82	147
Hard caliche.....	20	25	Blue shale.....	8	155
Sand, dry.....	40	65	Red beds.....	5	160
<b>Well 33</b>					
Caliche.....	15	15	Blue shale.....	2	142
Hard sand.....	40	55	Red beds.....	5	147
Sand and gravel, water.....	85	140			
<b>Well 34</b>					
Caliche.....	35	35	Blue shale.....	6	145
Sand.....	25	60	Red beds.....	5	150
Sand and gravel, water.....	79	139			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 35</b>					
Caliche.....	30	30	Blue shale.....	5	135
Yellow sand.....	25	55	Red beds.....	5	140
Sand and gravel, water.....	75	130			
<b>Well 36</b>					
Caliche.....	35	35	Blue shale.....	15	175
Hard sand.....	20	55	Red beds.....	5	180
Sand and gravel, water.....	105	160			
<b>Well 37</b>					
Surface soil.....	4	4	Sand.....	3	83
Caliche.....	11	15	Hard brown lime.....	15	98
Hard rock.....	20	35	Sand and gravel.....	58	156
Yellow sand.....	20	55	Blue shale.....	5	161
Sand and gravel.....	25	80	Red beds.....	5	166
<b>Well 40</b>					
Surface soil.....	5	5	Hard brown sand.....	10	100
Caliche.....	11	16	Hard rock.....	10	110
Hard rock.....	4	20	Blue shale.....	10	120
Hard yellow sand.....	30	50	Hard brown sand.....	10	130
Hard brown sand.....	10	60	Red beds.....	10	140
White sand, water.....	30	90			
<b>Well 41</b>					
Surface soil.....	5	5	Hard lime.....	10	80
Sand.....	15	20	Gravel and sand, water.....	45	125
Caliche.....	30	50	Blue shale.....	5	130
Brown sand.....	15	65	Gravel and sand.....	35	165
Hard sandy lime.....	5	70	Red beds.....	5	170
<b>Well 42</b>					
Surface soil.....	3	3	Gravel and sand.....	85	155
Caliche.....	37	40	Blue shale.....	10	165
Yellow sand.....	30	70	Red beds.....	5	170
<b>Well 43</b>					
Caliche.....	55	55	Sand.....	15	115
Yellow sand and gravel.....	25	80	Blue.....	10	125
Hard white sand.....	20	100	Red beds.....	5	130
<b>Well 44</b>					
Surface soil.....	5	5	Gravel and sand.....	45	135
Caliche.....	35	40	Blue shale.....	10	145
Hard sand.....	20	60	Gravel.....	20	165
Gravel, water.....	15	75	Blue shale.....	5	170
Hard red sand.....	15	90	Red beds.....	5	175
<b>Well 45</b>					
Surface soil.....	4	4	Hard sand.....	20	110
Hard caliche.....	56	60	Gravel, water.....	65	175
Hard sand.....	15	75	Red beds.....	5	180
Gravel, water.....	15	90			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 46</b>					
Surface soil.....	2	2	Sand and gravel.....	30	155
Hard caliche.....	48	50	Blue shale.....	10	165
Yellow sand.....	25	75	Gravel.....	10	175
Gravel, water.....	50	125	Red beds.....	5	180
<b>Well 47</b>					
Surface soil.....	4	4	Blue shale.....	15	125
Caliche.....	12	16	Brown sand.....	15	140
White sand.....	29	45	Blue shale.....	5	145
Rock.....	10	55	Red beds.....	5	150
Brown sand.....	55	110			
<b>Well 48</b>					
Surface soil.....	2	2	White sand.....	20	95
Caliche.....	18	20	Brown sand.....	25	120
Hard rock.....	35	55	Blue shale.....	5	125
Sand and gravel, water.....	10	65	Red beds.....	5	130
Sand, water.....	10	75			
<b>Well 49</b>					
Surface soil.....	5	5	Sand, water.....	70	112
Caliche.....	30	35	Blue shale.....	8	120
Brown sand.....	7	42			
<b>Well 50</b>					
Surface soil.....	5	5	Sand, water.....	72	108
Caliche.....	21	26	Blue shale.....	8	116
Brown sand.....	10	36	Red beds.....	4	120
<b>Well 51</b>					
Surface soil.....	5	5	Sand, water.....	66	110
Caliche.....	25	30	Blue shale.....	11	121
Brown sand.....	14	44	Red beds.....	4	125
<b>Well 52</b>					
Surface soil.....	5	5	Sand, water.....	77	118
Caliche.....	30	35	Blue shale.....	7	125
Red sand.....	6	41	Red beds.....	3	128
<b>Well 53</b>					
Caliche and red sand.....	25	25	Sand and gravel, water.....	70	115
Hard caliche.....	5	30	Blue shale.....	6	121
Hard sand.....	5	35	Red beds.....	4	125
White sand.....	10	45			
<b>Well 54</b>					
Caliche.....	25	25	Blue shale.....	3	115
Red sand.....	15	40	Red beds.....	5	120
Sand and gravel, water.....	72	112			

**EDWARDS COUNTY  
ROCKSPRINGS**

Population in 1940: 1,339.

Source of information: T. Osborne, water superintendent, Sept. 20, 1948.

Ownership: Municipal.

Source of supply: Three wells four blocks south of city hall.

West well. Drilled about 1928; depth, 475 feet; diameter, 8 inches; deep-well turbine pump and 15-horsepower electric motor; static water level reported, 426 feet below land surface in 1945; yield, 100 gallons a minute.

East well. About 65 feet from west well; drilled in 1931 by Layne-Texas Co.; depth, 602 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 443 feet below land surface in 1946; yield, 45 gallons a minute.

New well. About 125 feet east of east well; drilled in 1946 by Thompson and Carr; depth, 480 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 426 feet below land surface in 1946; yield, 60 gallons a minute.

Pumpage (estimated): 200,000 gallons a day.

Storage: Concrete ground storage reservoir, 150,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 370.

Treatment: Chlorination.

*Analyses*

[Collected Sept. 20, 1948. pH of each well is 7.6. Analyzed by D. E. Weaver]

	West well		East well		New well	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	13	-----	12	-----	12	-----
Iron (Fe).....	.05	-----	.05	-----	.05	-----
Calcium (Ca).....	48	2.396	47	2.346	47	2.346
Magnesium (Mg).....	16	1.316	13	1.480	16	1.316
Sodium (Na).....	4.8	.041	4.9	.034	5.2	.080
Potassium (K).....	2.8	.072	3.2	.082	2.8	.072
Bicarbonate (HCO <sub>3</sub> ).....	208	3.409	216	3.541	208	3.409
Sulfate (SO <sub>4</sub> ).....	7.7	.180	9.5	.198	7.2	.150
Chloride (Cl).....	11	.310	10	.282	11	.310
Fluoride (F).....	.4	.021	.4	.021	.4	.021
Nitrate (NO <sub>3</sub> ).....	3.2	.052	2.8	.045	2.5	.040
Dissolved solids.....	215	-----	215	-----	208	-----
Total hardness as CaCO <sub>3</sub> .....	186	-----	191	-----	188	-----

**EL PASO COUNTY**

**EL PASO**

Population in 1940: 96,810.

Source of information: E. J. Umbenhauer, water superintendent, April 1947.

Ownership: Municipal.

Source of supply: Fifteen wells and Rio Grande.

Well 3. Montana and Chelsea Streets; drilled in 1922 by Layne-Texas Co.; depth, 862 feet; diameter, 26 inches; deep-well turbine pump and 100-horsepower electric motor; static water level, 113.62 feet below land surface February 31, 1944; drawdown, 40.69 feet after pumping 100 hours, July 3, 1936; yield, 1,250 gallons a minute.

- Well 4. Madison and White Oak Streets; drilled in 1924 by Layne-Texas Co.; depth, 882 feet; diameter, 24 inches; deep-well turbine pump and 100-horsepower electric motor; static water level, 70.11 feet below land surface February 1944; drawdown, 75 feet when pumping 730 gallons a minute; yield, 730 gallons a minute.
- Well 8. One mile north of Mesa Pumping Plant; drilled in 1928 by Layne-Texas Co.; depth, 715 feet; diameter, 20 inches; deep-well turbine pump and 150-horsepower electric motor; static water level, 207.58 feet below land surface February 1944; yield, 1,370 gallons a minute; temperature, 82° F.
- Well 9. Luna and Pera Streets; drilled in 1928; depth, 802 feet; diameter, 24 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 31.44 feet below land surface April 1944; yield, 700 gallons a minute.
- Well 11. 1.7 miles east of Mesa Pumping Plant; drilled in 1930 by C. R. Jensen; depth, 736 feet; diameter, 20 inches; deep-well turbine pump and 150-horsepower electric motor; static water level, 206.03 feet below land surface May 1, 1939; yield, 1,170 gallons a minute.
- Well 14. San Antonio and Walnut Streets; drilled in 1937 by Layne-Texas Co.; depth, 703 feet; diameter, 36 inches; deep-well turbine pump and 100-horsepower electric motor; static water level, 32.78 feet below land surface July 7, 1939; drawdown, 31.77 feet when pumping 1,500 gallons a minute in 1937; yield, 1,500 gallons a minute.
- Well 15. About 1 mile east of Mesa Pumping Plant; drilled in 1938 by Layne-Texas Co.; depth, 1,055 feet; diameter, 24 inches; deep-well turbine pump and electric motor; static water level, 222.28 feet below land surface when drilled; drawdown, 42.39 feet when pumping 1,800 gallons a minute; yield, 1,800 gallons a minute.
- Well 17. San Antonio and Tornillo Streets; drilled in 1938 by C. R. Jensen; depth, 750 feet; diameter, 12½ inches; deep-well turbine pump and electric motor; static water level, 39.13 feet below land surface February 1944; yield, 1,320 gallons a minute.
- Well 18. Haddock Addition; drilled in 1938 by C. R. Jensen; depth, 902 feet; diameter, 24 inches; deep-well turbine pump and electric motor; static water level, 26.65 feet below land surface Feb. 28, 1940; drawdown, 59.5 feet when pumping 1,180 gallons a minute; yield, 1,180 gallons a minute.
- Well 19. 1.3 miles east-southeast of Mesa Pumping Plant; drilled in 1940 by C. R. Jensen; depth, 425 feet; diameter, 24 inches; deep-well turbine pump and electric motor; yield, 1,100 gallons a minute.
- Well 20. One mile north of Mesa Well Field; drilled in 1941 by Layne-Texas Co.; depth, 909 feet; diameter, 24 inches; deep-well turbine pump and 250-horsepower electric motor; static water level, 206.48 feet below land surface June 21, 1941; yield, 1,550 gallons a minute.
- Well 21. Two miles north of Mesa Well Field; drilled in 1941 by Layne-Texas Co.; depth, 806 feet; diameter, 24 inches; deep-well turbine pump and 250-horsepower electric motor; static water level, 196.91 feet below land surface June 25, 1941; drawdown, 51.09 feet after pumping 24 hours at a rate of 1,585 gallons a minute; yield, 1,585 gallons a minute.

Shallow wells 1, 2, and 3. At Rio Grande surface water treating plant located along canal; depths, about 50 feet; diameters, 24 inches; deep-well turbine pumps and electric motors; combined yield, about 3,000,000 gallons a day; water pumped to treating plant.

Surface water. River treating plant for taking surface water from canal on Rio Grande has a capacity of 10,000,000 gallons a day.

*Average pumpage in gallons a day*

	Ground water		Surface water Rio Grande
	Deep wells	Shallow wells	
1944	9,400,000		3,940,000
1945	10,610,000		4,110,000
1946	10,800,000	2,000,000 (est.)	5,120,000
1947	8,500,000	2,430,000	

Storage: Seven ground reservoirs, total capacity 70,000,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 18,500.

Treatment: Well water, chlorination; surface water, screening, grit separation, chlorination, aeration, primary settling, secondary chlorination, coagulation with activated carbon, soda, ash and lime, flash mixing, flocculation, secondary settling, carbonation, and filtration.

*Analyses*

[Collected Apr. 21 and 22, 1949. Analyzed by D. E. Weaver and J. R. Avrett]

	Well 3		Well 4	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	36		31	
Calcium (Ca)	56	2.80	42	2.10
Magnesium (Mg)	21	1.73	19	1.56
Sodium and potassium (Na + K)	172	7.46	213	9.26
Bicarbonate (HCO <sub>3</sub> )	161	2.64	136	2.23
Sulfate (SO <sub>4</sub> )	76	1.58	144	3.00
Chloride (Cl)	274	7.73	282	7.95
Nitrate (NO <sub>3</sub> )	2.2	.04	2	.05
Dissolved solids	743		817	
Total hardness as CaCO <sub>3</sub>	226		186	

	Well 8		Well 9	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		32	
Calcium (Ca)	45	2.25	15	0.95
Magnesium (Mg)	18	1.48	7.1	.58
Sodium and potassium (Na + K)	55	2.38	76	6.96
Bicarbonate (HCO <sub>3</sub> )	198	3.25	181	2.97
Sulfate (SO <sub>4</sub> )	64	1.33	77	1.60
Chloride (Cl)	48	1.35	135	3.92
Nitrate (NO <sub>3</sub> )	11	.18	6	.00
Dissolved solids	386		524	
Total hardness as CaCO <sub>3</sub>	186		76	

	Well 12		Well 15	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	37		36	
Calcium (Ca)	43	2.14	24	1.20
Magnesium (Mg)	14	1.15	10	.82
Sodium and potassium (Na + K)	60	2.62	129	5.60
Bicarbonate (HCO <sub>3</sub> )	198	3.25	197	3.23
Sulfate (SO <sub>4</sub> )	55	1.15	91	1.89
Chloride (Cl)	50	1.41	86	2.43
Nitrate (NO <sub>3</sub> )	6.0	.10	4.4	.07
Dissolved solids	372		482	
Total hardness as CaCO <sub>3</sub>	160		101	

	Well 17		Well 18	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	30		29	
Calcium (Ca)	67	3.34	55	2.75
Magnesium (Mg)	20	1.64	21	1.73
Sodium and potassium (Na + K)	88	3.83	146	6.33
Bicarbonate (HCO <sub>3</sub> )	197	3.23	159	2.61
Sulfate (SO <sub>4</sub> )	123	2.56	89	1.85
Chloride (Cl)	107	3.02	225	6.35
Nitrate (NO <sub>3</sub> )	.0	.00	.2	.00
Dissolved solids	552		675	
Total hardness as CaCO <sub>3</sub>	249		224	

	Well 19		Well 20	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	40		29	
Calcium (Ca)	24	1.20	34	1.70
Magnesium (Mg)	9.8	.81	13	1.07
Sodium and potassium (Na + K)	134	5.82	43	1.89
Bicarbonate (HCO <sub>3</sub> )	199	3.26	178	2.92
Sulfate (SO <sub>4</sub> )	103	2.14	37	.77
Chloride (Cl)	83	2.34	30	.85
Nitrate (NO <sub>3</sub> )	5.6	.09	7.2	.12
Dissolved solids	502		238	
Total hardness as CaCO <sub>3</sub>	100		138	

### Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 11</b>					
Soil	4	4	Sand and boulders	38	410
Caliche	11	15	Clay	4	414
Sand	55	70	Sand, gravel, and boulders	54	468
Clay	10	80	Clay	3	471
Gravel	20	100	Rock	1	472
Clay	6	106	Sand, gravel, and boulders	22	494
Sand	58	164	Clay	5	499
Clay	6	170	Sand, gravel, and boulders	29	528
Sand	30	200	Clay	5	533
Clay	20	220	Sand, gravel, and boulders	57	590
Sand	40	260	Clay	12	602
Clay	15	275	Sand, gravel, and boulders	26	628
Sand	33	308	Clay	3	631
Clay	4	312	Sand, gravel, and boulders	57	688
Sand and boulders	38	350	Clay	4	692
Rock	1	351	Sand	16	708
Sand	17	368	Sand, gravel, and boulders	50	758
Clay	4	372			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 15</b>					
Sandy soil.....	2	2	Sand.....	23	573
Caliche.....	6	8	Clay.....	27	600
Coarse sand and gravel.....	70	78	Sand.....	24	624
Clay.....	20	98	Clay.....	3	627
Sand.....	20	118	Sand.....	24	651
Layers of sand and clay.....	100	218	Clay.....	16	667
Clay.....	8	226	Rock.....	1	668
Sand.....	18	244	Sand.....	8	676
Clay.....	14	258	Clay.....	12	688
Sandy clay.....	12	270	Sandy clay.....	15	703
Clay.....	17	287	Sand.....	27	730
Sand (water sample).....	25	312	Clay.....	8	738
Clay.....	15	327	Sandy clay.....	10	748
Sand.....	17	344	Sand.....	10	758
Hard sand.....	6	350	Sandy clay.....	44	802
Clay.....	82	432	Sand.....	12	814
Sand.....	15	447	Clay (water sample).....	21	835
Clay.....	4	451	Sand (static head, 226 ft.).....	28	863
Sand.....	10	461	Clay.....	15	878
Sandy clay.....	54	515	Sandy clay.....	50	928
Sand.....	18	533	Sand.....	10	938
Clay.....	6	539	Clay and boulders.....	60	998
Sand (water sample).....	9	548	Sand.....	25	1,023
Clay.....	2	550	Sandy clay.....	55	1,078

**FABENS**

Population in 1940: 2,100.

Source of information: Mrs. L. W. Moore, Bookkeeper, April 9, 1948.

Owner: Fabens Water Co.

Source of supply: Three wells.

Well 1. Drilled in 1938 by Burdick and Burdick; depth, 218 feet; diameter, 6 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 26.24 feet below land surface July 8, 1938; yield, 200 gallons a minute.

Well 2. Drilled in 1938 by Burdick and Burdick; depth, 218 feet; diameter, 6 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 200 gallons a minute.

Well 3. Drilled in May 1947; depth, 247 feet; diameter, 6 inches; deep-well turbine pump and electric motor; yield, 200 gallons a minute.

Pumpage: Average, 140,000 gallons a day.

Storage: Ground storage reservoir, 110,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 590.

Treatment: Chlorination.

*Analyses*

(Collected Apr. 9, 1948. pH: well 1, 8.1; well 3, 8.2. Analyzed by H. D. Smith)

	Well 1		Well 3	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	31	-----	32	-----
Iron (Fe).....	.05	-----	.10	-----
Calcium (Ca).....	52	2.60	54	2.70
Magnesium (Mg).....	12	.99	12	.99
Sodium (Na).....	109	4.74	105	4.58
Potassium (K).....	10	.26	8.4	.21
Bicarbonate (HCO <sub>3</sub> ).....	220	3.61	236	3.87
Sulfate (SO <sub>4</sub> ).....	115	2.39	110	2.29
Chloride (Cl).....	91	2.57	80	2.26
Fluoride (F).....	.3	.02	.3	.02
Nitrate (NO <sub>3</sub> ).....	.2	.00	2.5	.04
Dissolved solids.....	529	-----	521	-----
Total hardness as CaCO <sub>3</sub> .....	180	-----	184	-----

## TORNILLO

Population in 1940: 250.

Source of information: O. T. Smith, owner, Aug. 3, 1948.

Owner: O. T. Smith.

Source of supply: Well drilled by Jack Dougherty; depth, 320 feet; diameter, 6 inches; Hi-lift pump and 3-horsepower electric motor; static water level, 41.5 feet below land surface Aug. 3, 1948; yield, 50 gallons a minute.

Pumpage (estimated): 30,000 gallons a day.

Storage: Elevated tank, 21,000 gallons.

Number of customers: 82.

Treatment: Chlorination.

## Analysis

[Collected Sept. 14, 1948. pH is 7.8. Analyzed by H. D. Smith]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	30		Sulfate (SO <sub>4</sub> )	287	4.93
Iron (Fe)	30		Chloride (Cl)	588	16.58
Calcium (Ca)	120	5.99	Fluoride (F)	1.0	.05
Magnesium (Mg)	38	3.12	Nitrate (NO <sub>3</sub> )	3.2	.05
Sodium (Na)	358	15.55	Dissolved solids	1,480	
Potassium (K)	8.8	.23	Total hardness as CaCO <sub>3</sub>	456	
Bicarbonate (HCO <sub>3</sub> )	200	3.28			

## YSLETA

[Includes adjacent Rio Grande territory]

Population in 1940: 2,100 (includes the city of Ysleta only).

Source of information: Edward Lang, water superintendent, Sept. 20, 1948.

Owner: El Paso Water Control and Improvement District No. 1.

Source of supply: Four wells.

Well 1. Drilled in November 1946 by Layne-Texas Co.; depth, 704 feet; diameter, 14 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 102 feet below land surface Dec. 18, 1946; yield on test, 380 gallons a minute with drawdown of 62 feet; present yield, 400 gallons a minute.

Well 2. Drilled June 1947 by Layne-Texas Co.; depth, 689 feet; diameter, 14 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 20 feet below land surface; yield on test, 180 gallons a minute with drawdown of 42 feet; present yield, 535 gallons a minute.

Well 3. Drilled in March 1947 by Layne-Texas Co.; depth, 786 feet; diameter, 14 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 50 feet below land surface Feb. 28, 1947; yield on test, 350 gallons a minute with drawdown of 50 feet; present yield, 460 gallons a minute.

Well 4. Drilled in June 1947 by Layne-Texas Co.; drilled to 600 feet and plugged back to 219 feet; diameter, 14 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 52 feet below land surface June 5, 1947; yield on test, 243 gallons a minute with drawdown of 26 feet; well not in use.

Pumpage: Average, 600,000 gallons a day.

Storage: Four elevated tanks, 200,000 gallons each.

Number of customers: 2,100.

Treatment: Chlorination.

*Analysis, well 2*

[Collected Sept. 20, 1948. pH is 7.8. Analyzed by J. R. Avrett]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		Sulfate (SO <sub>4</sub> )	88	1.83
Iron (Fe)	.15		Chloride (Cl)	107	3.02
Calcium (Ca)	26	1.30	Fluoride (F)	.8	.04
Magnesium (Mg)	10	.82	Nitrate (NO <sub>3</sub> )	1.2	.02
Sodium (Na)	122	5.30	Dissolved solids	475	
Potassium (K)	7.2	.18	Total hardness as CaCO <sub>3</sub>	106	
Bicarbonate (HCO <sub>3</sub> )	164	2.69			

## FISHER COUNTY

## ROBY

Population in 1940: 947.

Source of information: J. Ammons, city commissioner, Sept. 15, 1947.

Ownership: Municipal.

Source of supply: Pond on Cottonwood Creek.

Pumpage (estimated): Summer, 130,000 gallons a day; winter, 65,000 gallons a day.

Storage: Standpipe, 65,000 gallons.

Number of customers: 300. (Only a few customers use this source of supply for drinking water.)

Treatment: None.

*Analysis*

[Collected Sept. 15, 1947. pH is 7.8. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	16		Sulfate (SO <sub>4</sub> )	2,170	45.18
Iron (Fe)	.08		Chloride (Cl)	456	12.86
Calcium (Ca)	628	31.35	Fluoride (F)	.8	.04
Magnesium (Mg)	180	14.80	Nitrate (NO <sub>3</sub> )	20	.32
Sodium (Na)	389	16.90	Dissolved solids	4,020	
Potassium (K)	13	.33	Total hardness as CaCO <sub>3</sub>	2,310	
Bicarbonate (HCO <sub>3</sub> )	304	4.98			

## ROTAN

Population in 1940: 2,029.

Source of information: John Price, alderman, Sept. 15, 1947.

Ownership: Municipal.

Source of supply: Nine wells at Camp Springs, 17½ miles west of Rotan, and one well in Rotan.

Well 1. In Camp Springs tract; dug; depth, 97 feet; diameter, 4 feet; jet pump and 1 ¼-horsepower electric motor; pumping level, 83.04 feet below land surface Sept. 15, 1947; yield, 10 gallons a minute; temperature, 70° F.

Well 2. In Camp Springs tract; drilled; depth, 60 feet; diameter, 10 inches; jet pump and 2-horsepower electric motor; yield, 20 gallons a minute; temperature, 70° F.

Well 3. In Camp Springs tract; drilled; depth, 60 feet; diameter, 10 inches; jet pump and 2-horsepower electric motor; yield, 25 gallons a minute.

Well 4. In Camp Springs tract; drilled by Frank Aaron; depth, 238 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric

motor; static water level, 146.7 feet below land surface; yield, 5 gallons a minute.

Well 5. In Camp Springs tract; drilled; depth, 120 feet; diameter, 8 inches; jet pump and 2-horsepower electric motor.

Well 7. In Camp Springs tract; drilled by Frank Aaron; depth, 190 feet; diameter, 8 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 40 gallons a minute.

Well 8. In Camp Springs tract; drilled by Frank Aaron in 1941; depth, 205 feet; diameter, 10 inches; deep-well turbine pump and diesel engine; yield, 150 gallons a minute.

Well 9. In Camp Springs tract; drilled by Sam Henderson in 1944; depth, 160 feet; diameter, 10 inches; deep-well turbine pump and diesel engine; water level, 95 feet below land surface Sept. 15, 1947; yield, 85 gallons a minute.

Well 9a. In Camp Springs tract; dug in 1934; depth, 40 feet; diameter, 12 feet; jet pump and 1-horsepower electric motor; water level, 30.1 feet below land surface Sept. 15, 1947; yield, 10 gallons a minute.

Rotan well. South of Rotan gin, 0.6 mile south of city hall; depth, 55 feet; diameter, 24 feet; deep-well turbine pump and 25-horsepower electric motor; static water level, 25.6 feet below land surface Sept. 15, 1947; yield, 200 gallons a minute.

*Average pumpage in gallons a day*

	1945	1946	1947
January			111,300
February		105,300	138,300
March		106,700	97,200
April		149,500	138,000
May			163,800
June			219,400
July			199,400
August		245,400	243,700
September		146,500	
October		138,600	
November	58,500	115,800	
December	55,000	107,100	

Storage: Concrete ground reservoir, 54,000 gallons; steel ground storage tank, 100,000 gallons.

Number of customers: 758.

Treatment: None.

*Analyses*

[Collected Sept. 15, 1947. pH: well 1, 7.8; well 2, 7.1. Analyzed by B. C. Dwyer]

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	11		8.0	
Iron (Fe)	.04		.06	
Calcium (Ca)	65	3.24	56	4.79
Magnesium (Mg)	34	2.80	13	1.07
Sodium (Na)	28	1.20	6.4	.28
Potassium (K)	2.8	.07	2.0	.05
Bicarbonate (HCO <sub>3</sub> )	304	4.98	118	1.93
Sulfate (SO <sub>4</sub> )	61	1.27	179	3.73
Chloride (Cl)	34	.96	16	.45
Fluoride (F)	1.8	.09	.4	.02
Nitrate (NO <sub>3</sub> )	.8	.01	3.8	.06
Dissolved solids	388		408	
Total hardness as CaCO <sub>3</sub>	302		253	

## FLOYD COUNTY

## DOUGHERTY

Population in 1940: 200.

Source of information: J. E. Newton, water superintendent, Nov. 17, 1945.

Owner: F. M. Dougherty.

Source of supply: Well drilled by D. L. Handley; depth, about 300 feet; diameter, 5½ inches; deep-well turbine pump and oil engine; yield, 37 gallons a minute.

Pumpage: No record.

Storage: Concrete ground reservoir, 50,000 gallons; elevated tank, 35,000 gallons.

Number of customers: 30.

Treatment: None.

*Analysis*

[Collected Nov. 17, 1945. pH is 8.3. Analyzed by J. H. Rowley]

	Parts per million	Equivalent per millior		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	36		Sulfate (SO <sub>4</sub> )	38	0.79
Iron (Fe)	.04		Chloride (Cl)	18	.51
Calcium (Ca)	41	2.05	Fluoride (F)	2.8	.15
Magnesium (Mg)	36	2.96	Nitrate (NO <sub>3</sub> )	4.1	.07
Sodium (Na)	44	1.92	Dissol ed solids	400	
Potassium (K)	10	.26	Total hardness as CaCO <sub>3</sub>	250	
Bicarbonate (HCO <sub>3</sub> )	346	5.67			

## FLOYDADA

Population in 1940: 2,689.

Source of information: Floyd Johnson, water superintendent, Feb. 28, 1945.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1928 by D. L. McDonald; depth, 212 feet; diameter, 16 inches; deep-well turbine pump and electric motor; water level reported, 136 feet below land surface in 1938; yield, 380 gallons a minute; temperature, 64° F.

Well 2. Drilled in 1928 by D. L. McDonald; depth, 200 feet; diameter, 16 inches; deep-well turbine pump and 30-horsepower electric motor; yield, 308 gallons a minute.

Well 3. Drilled in 1920 by D. L. McDonald; depth, 160 feet; diameter, 30 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 150 gallons a minute.

Pumpage: Average, 280,000 gallons a day.

Storage: Ground storage reservoir, 200,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 777.

Treatment: None.

## Analyses

[Collected Feb. 28, 1945. pH: well 1, 7.5; well 3, 7.7. Analyzed by J. H. Rowley]

	Well 1		Well 3	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	53		56	
Iron (Fe)	.02		.02	
Calcium (Ca)	39	1.95	36	1.80
Magnesium (Mg)	41	3.37	37	3.07
Sodium (Na)	26	1.12	41	1.78
Potassium (K)	9.3	.24	8.7	.22
Bicarbonate (HCO <sub>3</sub> )	296	4.85	312	5.11
Sulfate (SO <sub>4</sub> )	39	.81	39	.81
Chloride (Cl)	26	.73	23	.65
Fluoride (F)	4.4	.23	4.0	.21
Nitrate (NO <sub>3</sub> )	3.5	.06	4.0	.06
Dissolved solids	387		404	
Total hardness as CaCO <sub>3</sub>	266		242	

## Driller's log, well 3

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil, caliche, and red clay	27	27	Soft packed red clay	11	136
Clay and rock	14	41	Sandrock	8	144
Clay and sandrock	69	110	Clay and sand	6	150
Water sand	4	114	Clay and sandrock	4	154
Clay and sandrock	6	120	Water sand	6	160
Water sand	5	125			

## LOCKNEY

Population in 1940: 1,350.

Source of information: W. W. Miller, water superintendent, Feb. 28, 1945.

Ownership: Municipal.

Source of supply: Well drilled in 1927 by D. L. Handley; depth, 282 feet; diameter, 16 inches; deep-well turbine pump and oil engine; static water level, 65.67 feet below land surface Feb. 28, 1947; pumping level, 87.65 feet below land surface when pumping 500 gallons a minute; yield, 500 gallons a minute; temperature, 64° F.

Pumpage: Average, 120,000 gallons a day.

Storage: Concrete ground reservoir, 50,000 gallons; elevated steel tank, 75,000 gallons.

Number of customers: 235.

Treatment: None.

## Analysis

[Collected Feb. 28, 1945. pH is 7.4. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	57		Sulfate (SO <sub>4</sub> )	38	0.79
Iron (Fe)	.02		Chloride (Cl)	47	1.33
Calcium (Ca)	46	2.30	Fluoride (F)	3.6	.19
Magnesium (Mg)	45	3.70	Nitrate (NO <sub>3</sub> )	6.8	.11
Sodium (Na)	52	2.25	Dissolved solids	494	
Potassium (K)	13	.33	Total hardness as CaCO <sub>3</sub>	300	
Bicarbonate (HCO <sub>3</sub> )	376	6.16			

## SOUTH PLAINS

Population in 1940: 250.

Source of information: Raymond Upton, owner, Nov. 17, 1945.

Owner: Raymond Upton.

Source of supply: Well drilled by D. L. Handley; depth, 181 feet; diameter, 6 inches; deep-well cylinder and gasoline engine; yield, less than 50 gallons a minute.

Pumpage: No record.

Storage: Elevated tank, 35,000 gallons.

Number of customers: 15.

Treatment: None.

*Analysis*

[Collected Nov. 17, 1945. pH is 6.9. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )-----	50	-----	Sulfate (SO <sub>4</sub> )-----	26	0.54
Iron (Fe)-----	.24	-----	Chloride (Cl)-----	14	.39
Calcium (Ca)-----	42	2.10	Fluoride (F)-----	2.8	.15
Magnesium (Mg)-----	30	2.47	Nitrate (NO <sub>3</sub> )-----	1.2	.02
Sodium (Na)-----	32	1.38	Dissolved solids-----	361	-----
Potassium (K)-----	9.9	.25	Total hardness as CaCO <sub>3</sub>	228	-----
Bicarbonate (HCO <sub>3</sub> )-----	311	5.10			

## GAINES COUNTY

## SEAGRAVES

Population in 1940: 3,225.

Source of information: Don Elder, water superintendent, Oct. 24, 1945.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. At pump station; drilled in 1929 by J. E. Stokes; depth, 192 feet; diameter, 10 inches; deep-well turbine pump and 3-horsepower electric motor; static water level, 75 feet below land surface in 1938; yield, 60 gallons a minute.

Well 2. At pump station; drilled in 1929 by J. E. Stokes; depth, 145 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; static water level, 75 feet below land surface in 1938; yield, 150 gallons a minute.

Well 3. At pump station; drilled in 1938 by W. A. Willis; depth, 183 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 83.3 feet below land surface Aug. 9, 1938; yield, 200 gallons a minute.

Well 4. At pump station; drilled in 1941 by Paul Pierson; depth, 180 feet; diameter, 12 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 200 gallons a minute.

## Average pumpage in gallons a day

	1943	1944	1945
January.....	95,800	103,500	121,700
February.....	86,500	98,300	156,000
March.....	107,200	134,100	178,400
April.....	165,200	176,500	240,300
May.....	158,000	192,800	308,800
June.....	218,100	£10,900	358,200
July.....	237,600	£70,300	255,400
August.....	317,600	£79,800	362,400
September.....	193,500	171,500	-----
October.....	127,500	127,400	-----
November.....	116,300	126,100	-----
December.....	95,800	198,000	-----

Storage: Concrete ground reservoir, 65,000 gallons; elevated tank, 55,000 gallons.

Number of customers: 450.

Treatment: None.

## Analyses

[Collected May 23, 1944. pH is 7.6. Analyzed by W. W. Hastings]

	Well 1		Well 1	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	44	-----	Sulfate (SO <sub>4</sub> ).....	265
Iron (Fe).....	61.05	-----	Chloride (Cl).....	162
Calcium (Ca).....	90	3.04	Fluoride (F).....	2.8
Magnesium (Mg).....	90	7.40	Nitrate (NO <sub>3</sub> ).....	8.0
Sodium (Na).....	89	3.88	Dissolved solids.....	863
Potassium (K).....	13	.33	Total hardness as CaCO <sub>3</sub> .....	522
Bicarbonate (HCO <sub>3</sub> ).....	261	4.28		

[Collected Oct. 24, 1945. pH: wells 3 and 4, each 8.4. Analyzed by C. B. Cibulka]

	Well 3		Well 4	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	48	-----	4 <sup>9</sup>	-----
Iron (Fe).....	60.08	-----	62 <sup>08</sup>	-----
Calcium (Ca).....	60	2.99	92	3.09
Magnesium (Mg).....	87	7.15	91	7.57
Sodium and potassium (Na + K).....	90	3.66	91	3.74
Bicarbonate (HCO <sub>3</sub> ).....	262	4.30	273	4.49
Sulfate (SO <sub>4</sub> ).....	249	5.18	258	5.37
Chloride (Cl).....	142	4.00	14 <sup>9</sup>	4.17
Fluoride (F).....	5.2	.27	5.2	.27
Nitrate (NO <sub>3</sub> ).....	2.8	.05	5.9	.10
Dissolved solids.....	851	-----	95 <sup>9</sup>	-----
Total hardness as CaCO <sub>3</sub> .....	507	-----	533	-----

## Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well 1					
Sandy soil.....	4	4	Sand and rock.....	64	155
Caliche.....	12	16	Yellow clay.....	33	188
Boulders and sand.....	71	87	Hard rock.....	4	192
Sand.....	4	91			
Well 2					
Sandy soil.....	6	6	Boulders.....	4	89
White rock.....	12	18	Water sand.....	6	95
Sand and boulders.....	57	75	Sand and boulders.....	50	145
Hard rock.....	10	85			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 3</b>					
Sandy clay.....	7	7	Hard sandrock.....	10	155
Caliche.....	13	20	Sand, water.....	17	172
Sand.....	25	45	Gravel, water.....	6	178
Hard sandstone.....	10	55	Hard sandrock.....	4	182
Hard sand.....	38	93	Shale.....	1	183
Soft sand, water.....	52	145			

**SEMINOLE**

Population in 1940: 1,761.

Source of information: J. S. Combs, city secretary, Nov. 7, 1945.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Half a block south of courthouse; drilled in 1939; depth, 145 feet; diameter, 10 $\frac{3}{4}$  to 8 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 56 feet below land surface Nov. 8, 1939; drawdown, 47 feet while pumping 145 gallons a minute; yield, 150 gallons a minute.

Well 2. Four blocks south and six blocks west of courthouse; drilled in 1940 by J. E. Stokes; depth, 188 feet; diameter, 12 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 200 gallons a minute.

Well 3. Two blocks south and eight blocks west of courthouse; drilled in 1945 by Gibbons and Taylor; depth, 250 feet; diameter, 13 $\frac{3}{8}$  to 10 $\frac{3}{4}$  inches; deep-well turbine pump and gasoline engine; static water level, 102.8 feet below land surface Oct. 22, 1945; measured drawdown, 55 feet while pumping 280 gallons a minute.

Pumpage (estimated): 250,000 gallons a day.

Storage: Concrete ground reservoir, 100,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 400.

Treatment: None.

**Analyses**

[Collected Nov. 7, 1945. pH: well 1, 8.4.; well 2, 8.5. Analyzed by C. B. Cibulka]

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	45		56	
Iron (Fe).....	.10		.08	
Calcium (Ca).....	57	2.85	65	3.24
Magnesium (Mg).....	45	3.70	54	4.44
Sodium (Na).....	68	2.95	79	3.43
Potassium (K).....	11	.28	11	.28
Bicarbonate (HCO <sub>3</sub> ).....	265	4.35	266	4.37
Sulfate (SO <sub>4</sub> ).....	123	2.56	173	3.60
Chloride (Cl).....	89	2.51	109	3.07
Fluoride (F).....	4.4	.23	4.8	.25
Nitrate (NO <sub>3</sub> ).....	8.3	.13	6.4	.10
Dissolved solids.....	610		732	
Total hardness as CaCO <sub>3</sub> .....	328		384	

## Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well 1					
Top soil.....	2	2	Hard sandy lime.....	11	112
Caliche and sand.....	21	23	Sandy yellow clay.....	5	117
Hard sand and caliche.....	40	63	Fine- to medium-grained sand, water.	26	143
Soft yellow clay.....	7	70	Blue clay.....	2	145
Hard gray sandy lime.....	28	98			
Soft brown lime.....	3	101			
Well 3					
Soil.....	2	2	Hard rock.....	25	135
Caliche and sandrock.....	30	32	Yellow clay.....	5	140
Fine-grained, buff-colored sand.	13	45	Fine-grained, light-yellow, sandy clay.	14	154
Fine-grained, buff-colored sand with hard caliche.	7	52	Fine-grained, light-yellow sand.	28	182
Medium fine grained, light- brown sand with hard caliche.	28	80	Medium fine grained dark- brown sand.	58	240
Medium fine grained, dark- brown sand.	30	110	Sticky pink clay.....	10	250

## GARZA COUNTY

## POST

Population in 1940: 2,046.

Source of information: A. R. Carr, former water superintendent, Sept. 21, 1948.

Ownership: Municipal.

Source of supply: Seventeen wells.

East field, 3.5 miles west of Post:

Well 121. Drilled in 1912; depth, 97.5 feet; diameter, 23 to 9 inches; deep-well turbine pump and 2-horsepower electric motor; yield, 30 gallons a minute.

Well 124. Dug in 1912; depth, 98 feet; diameter, 10 $\frac{1}{2}$  inches; deep-well cylinder pump and 3-horsepower electric motor; yield, 20 gallons a minute.

Well 126. Drilled in 1912; depth, 98 feet; diameter, 10 $\frac{1}{2}$  inches; deep-well cylinder pump and 3-horsepower electric motor; yield, 20 gallons a minute.

Well 135. Drilled in 1916 by J. L. Williams; depth, 94 feet; diameter, 10 $\frac{1}{2}$  inches; deep-well turbine pump and 2-horsepower electric motor; static water level, 80 feet below land surface in 1916; yield, 20 gallons a minute.

West field, 5 miles west of Post:

Well 140. Dug in 1917 and later drilled deeper; depth, 120 feet; diameter of dug well, 20 to 10 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 120 gallons a minute.

Well 146. Drilled in 1926 by D. L. McDonald; depth, 80 feet; diameter, 24 inches; deep-well cylinder pump and 5-horsepower electric motor; yield, 25 gallons a minute.

Well 147. Drilled in 1937 by L. A. Peeples; depth, 97 feet; diameter, 20 to 18 inches; deep-well cylinder pump and 5-horsepower electric motor; yield, 20 gallons a minute.

Well 148. Drilled in 1937 by L. A. Peeples; depth, 201 feet; diameter, 15 to 12 inches; deep-well cylinder pump and 5-horsepower electric motor; yield, 35 gallons a minute.

Well 152. Drilled in 1940 by Layne-Texas Co.; depth, 143 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 3-horsepower electric motor; static water level reported, 80 feet below land surface April 1940; yield, 25 gallons a minute with 5-foot drawdown.

Northwest field, 6 miles northwest of Post:

Well 149. Drilled in 1939 by L. A. Peeples; deep-well turbine pump and 3-horsepower electric motor.

Well 150. Drilled in 1939 by L. A. Peeples; depth, 115 feet; diameter, 12 inches; deep-well turbine pump and 5-horsepower electric motor.

Well 151. Drilled in 1940 by Layne-Texas Co.; depth, 110 feet; pump jack and 3-horsepower electric motor; static water level reported, 85 feet below land surface in 1940; gravel-walled; yield, 35 gallons a minute.

Well 153. Drilled in 1941 by Layne-Texas Co.; depth, 95 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 7 $\frac{1}{2}$ -horsepower electric motor; static water level reported, 73 feet below land surface July 1941; yield, 60 gallons a minute.

Well 154. Drilled in 1944 by Layne-Texas Co.; depth, 98 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level reported, 66 feet below land surface July 1944; gravel-walled; yield, 94 gallons a minute.

Well 155. Drilled in 1945 by Layne-Texas Co.; depth, 97 $\frac{1}{2}$  feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level reported, 63 feet below land surface in June 1945; gravel-walled; yield, 85 gallons a minute.

Well 156. Drilled in 1946 by Layne-Texas Co.; depth, 95 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level reported, 64 feet below land surface July 1946; gravel-walled; yield, 77 gallons a minute.

Well 157. Drilled in 1946 by Layne-Texas Co.; depth, 101 feet; diameter, 10 $\frac{1}{4}$  inches; deep-well turbine pump and 5-horsepower electric motor; static water level reported, 59 $\frac{1}{2}$  feet below land surface July 1946; yield, 133 gallons a minute.

Pumpage: Average, 300,000 gallons a day.

Storage: Ground storage reservoir, 1,600,000 gallons.

Number of customers: 850.

Treatment: Chlorination.

### Analysis

[Composite sample. Collected Nov. 29, 1946. pH is 7.8. Analyzed by C. B. Cibulka]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	56		Sulfate (SO <sub>4</sub> )	81	1.69
Iron (Fe)	.17		Chloride (Cl)	58	1.64
Calcium (Ca)	44	2.20	Fluoride (F)	5.6	.29
Magnesium (Mg)	43	3.54	Nitrate (NO <sub>3</sub> )	2.0	.03
Sodium (Na)	78	3.39	Dissolved solids	544	
Potassium (K)	6.4	.16	Total hardness as CaCO <sub>3</sub>	237	
Bicarbonate (HCO <sub>3</sub> )	344	5.64			

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 126</b>					
Soil and subsoil.....	4	4	Soft red rock.....	14	48
White dirt.....	20	24	Dry, gray sand.....	25	73
White rock.....	4	28	Water sand strata.....	25	98
Hard red rock.....	6	34	Red clay.....	½	98½
<b>Well 135</b>					
Soil.....	4	4	Red sand.....	23	80
Red clay.....	16	20	Sand and water.....	12	92
Red sand.....	30	50	Red clay.....	2	94
Sandstone.....	7	57			
<b>Well 147</b>					
Top soil.....	3	3	Fire dry sand.....	6	71
Caliche.....	24	27	Fine water sand.....	5	76
Clay.....	15	42	Sand and gravel.....	9	85
Sandrock.....	2	44	Gravel.....	4	89
Packed sand.....	21	65	Clay.....	8	97
<b>Well 148</b>					
Top soil.....	3	3	Sand and gravel (water).....	14	89
Clay and white rock.....	43	46	Clay.....	28	117
Sand rock.....	4	50	Packed sand, dry.....	57	174
Clay.....	16	66	Dry sandrock.....	2	176
Caliche rock.....	5	71	Dry clay.....	5	181
Clay.....	4	75	Dry packed sand.....	20	201
<b>Well 149</b>					
Top soil.....	4	4	Sandy clay, caving.....	26	73
Clay and caliche.....	21	25	Coarse sand, soft clay.....	17	90
Caliche.....	22	47	Red clay, joint.....	20	110
<b>Well 150</b>					
Top soil.....	4	4	Rock.....	2	62
Clay and caliche rock.....	19	23	Dry sand.....	8	70
Caliche.....	22	45	Sand, gravel, boulders and clay.....	21	91
Red clay.....	6	51	Red clay, very sticky.....	24	115
Packed sand.....	9	60			
<b>Well 151</b>					
Soil.....	3	3	Hard red clay.....	22	77
Caliche.....	11	14	Quicksand and clay.....	10	87
Sand and caliche.....	3	17	Sand, gravel, boulders and clay.....	15	102
Clay.....	3	20	Hard layers.....	1	103
Sand and clay.....	8	28	Sand, gravel, and clay.....	2	105
Clay.....	5	33	Red clay.....	5	110
Caliche and hard red clay.....	12	45			
Caliche.....	10	55			
<b>Well 152</b>					
Surface soil.....	6	6	Fine soft sand.....	3	54
Clay.....	10	16	Hard layers.....	4	58
Caliche.....	18	34	Fine hard sand—brick dust, small amount.....	33	91
Clay and caliche.....	3	37	Hard sand, more clay.....	9	100
Hard caliche.....	11	48	Hard red clay and caliche.....	35	135
Soft layers fine sand.....	2	50	Clay, little sand.....	8	143
Hard layers.....	1	51			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 153</b>					
Sand and clay.....	20	20	Clay and caliche.....	20	74
Clay and caliche.....	28	48	Sand clay.....	20	94
Sand.....	6	54	Clay.....	1	95
<b>Well 154</b>					
Surface dirt.....	4	4	Fine sand, hard streaks.....	10	66
Yellow sandy clay.....	35	39	Yellow sand, good.....	31	97
Rock with soft streaks.....	17	56	Yellow clay.....	1	98
<b>Well 155</b>					
Top soil.....	3	3	Sand and clay, lost little water.....	11	67
Soft caliche.....	14	17	Good sand, lost much mud.....	25	92
Caliche, hard streaks.....	7	24	Clay and rock.....	3	95
Hard caliche and lime rock.....	9	33	Soft sticky clay.....	9	104
Red clay.....	12	45			
Clay with hard layers.....	11	56			
<b>Well 156</b>					
Surface soil.....	3	3	Red clay streaks, sandy.....	11	50
Sandy clay, streaks of caliche.....	11	14	Sandy clay.....	17	67
Hard caliche.....	3	17	Sand and fine gravel.....	25	92
Caliche, soft streaks.....	16	33	Red clay, sticky.....	3	95
Hard caliche rock.....	6	39			
<b>Well 157</b>					
Surface soil.....	3	3	Hard sandy clay, caliche streaks.....	27	64
Sandy clay, caliche, soft streaks.....	12	15	Fine sand.....	3	67
Hard caliche.....	22	37	Sand and gravel.....	30	97
			Sandy clay.....	4	101

## GRAY COUNTY

## LEFORS

Population in 1940: 809.

Source of information: C. W. Graham, water superintendent, Dec. 2, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. In block 10, Thut Heights Addition; drilled in 1940 by J. T. McCarty; depth, 130 feet; diameter, 15 inches; deep-well turbine pump and 10-horsepower electric motor.

Well 2. In block 11, Thut Heights Addition; drilled by Drake Lard; depth, 130 feet; diameter, 15 inches; deep-well turbine pump and 10-horsepower electric motor.

Pumpage (estimated): 40,000 gallons a day.

Storage: Elevated tank, 5,500 gallons.

Number of customers: 230.

Treatment: None.

*Analysis well 1*

[Collected Oct. 5, 1948. pH is 7.5. Analyzed by J. R. Avrett]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	21		Sulfate (SO <sub>4</sub> )	15	0.31
Iron (Fe)	3.8		Chloride (Cl)	144	4.06
Calcium (Ca)	96	4.79	Fluoride (F)	.7	.04
Magnesium (Mg)	17	1.40	Nitrate (NO <sub>3</sub> )	5.0	.08
Sodium (Na)	42	1.83	Dissolved solids	514	
Potassium (K)	3.6	.09	Total hardness as CaCO <sub>3</sub>	310	
Bicarbonate (HCO <sub>3</sub> )	214	3.51			

**MCLEAN**

Population in 1940: 1,489.

Source of information: Pete Fulbright, water superintendent, June 25, 1948.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1927 by Edwards Well Co.; depth, 156 feet; diameter, 16 inches; 30-foot screen on bottom; deep-well turbine pump and 20-horsepower electric motor; static water level, 105 feet below land surface; yield, 300 gallons a minute.

Well 2. Drilled in 1936 by T. J. McCarty; depth, 167 feet; diameter, 12½ inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 110 feet; yield, 250 gallons a minute.

Well 3. Drilled in 1943 by Layne-Texas Co. for U. S. Prisoner of War Camp; depth, 209 feet; diameter, 10¼ inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 115 feet below land surface; drawdown of 19 feet when pumping 220 gallons a minute Sept. 23, 1943; yield, 250 gallons a minute.

Pumpage: Average, 500,000 gallons a day.

Storage: Ground storage reservoir, 210,000 gallons; elevated tank, 60,000 gallons.

Number of customers: 463.

Treatment: None.

*Analysis well 3*

[Collected June 25, 1948. pH is 7.3. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		Sulfate (SO <sub>4</sub> )	16	0.33
Iron (Fe)	1.4		Chloride (Cl)	24	.68
Calcium (Ca)	70	3.49	Fluoride (F)	.0	.00
Magnesium (Mg)	6.3	.52	Nitrate (NO <sub>3</sub> )	3.2	.05
Sodium (Na)	27	1.17	Dissolved solids	304	
Potassium (K)	1.2	.03	Total hardness as CaCO <sub>3</sub>	200	
Bicarbonate (HCO <sub>3</sub> )	252	4.13			

## Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Clay.....	5	5	Hard sandstone.....	4	122
Sand and clay.....	25	30	Fair water sand and gravel.....	10	132
Fine, loose sand.....	5	35	Coarse sand and gravel.....	3	135
Hard packed sand.....	42	77	Clay.....	6	141
Soft, loose sand.....	18	95	Medium water sand.....	5	146
Sandrock.....	1	96	Soft sandrock.....	1	147
Soft, loose sand.....	14	110	Good water sand.....	4	151
Sand, gravel, little clay.....	4	114	Medium sandrock.....	4	155
Medium sand, gravel.....	4	118	Hard sandrock.....	1	156
<b>Well 3</b>					
Soil and clay.....	20	20	Rock.....	1	130
Sand.....	36	56	Good coarse sand, fine gravel.....	17	147
Hard sand and streaks of clay and gypsum.....	18	74	Rock and gravel.....	3	150
Coarse sand and fine gravel.....	55	129	Coarse white sand.....	53	203
			Red clay.....	6	209

## PAMPA

Population in 1940: 12,895.

Source of information: E. S. Lowery, water superintendent, Nov. 20, 1947.

Ownership: Municipal.

Source of supply: Five wells; another well being drilled.

Well 1, South. Drilled by D. L. McDonald in 1939; depth, 450 feet; diameter, 16 inches; deep-well turbine pump and 125-horsepower electric motor; pump set at 420 feet; static water level, 347 feet below land surface in 1947; drawdown, 23 feet after pumping 600 gallons a minute for 36 hours; yield, 600 gallons a minute.

Well 2, South. Drilled by D. L. McDonald in 1939; depth, 450 feet; diameter, 16 inches; deep-well turbine pump and 125-horsepower electric motor; pump set at 420 feet; static water level, 347 feet below land surface in 1947; drawdown of 23 feet after pumping 600 gallons a minute for 36 hours; yield, 600 gallons a minute.

Well 1, North. Drilled by D. L. McDonald in 1935; depth, 395 feet; diameter, 18 inches; deep-well turbine pump and 60-horsepower electric motor; yield, 315 gallons a minute.

Well 3, North. Drilled by D. L. McDonald; depth, 412 feet; diameter, 18 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 358 feet below land surface in 1947; drawdown of 22 feet after pumping 460 gallons a minute for 36 hours; yield, 460 gallons a minute.

Well 4, North. Drilled by D. L. McDonald in 1945; depth, 414 feet; diameter, 15½ inches; deep-well turbine pump and 75-horsepower electric motor, pump set at 400 feet; static water level, 333 feet below land surface in 1947; drawdown of 40 feet after pumping 520 gallons a minute for 36 hours; yield, 520 gallons a minute.

Pumpage: Maximum, 3,000,000 gallons a day; minimum, 1,000,000 gallons a day; average, 1,500,000 gallons a day.

Storage: Ground storage reservoir, 100,000 gallons; four ground storage reservoirs, 3,360,000 gallons, 440,000 gallons, 220,000 gallons, and 220,000 gallons, respectively.

Number of customers: 4,000.

Treatment: None.

### Analysis

[Composite sample of all wells, collected Nov. 20, 1947. pH is 7.4. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	12		Sulfate (SO <sub>4</sub> )	141	2.94
Iron (Fe)	.16		Chloride (Cl)	132	3.72
Calcium (Ca)	59	2.94	Fluoride (F)	1.2	.06
Magnesium (Mg)	27	2.22	Nitrate (NO <sub>3</sub> )	4.0	.06
Sodium (Na)	113	4.91	Dissolved solids	638	
Potassium (K)	12	.48	Total hardness as CaCO <sub>3</sub>	258	
Bicarbonate (HCO <sub>3</sub> )	230	3.77			

## HALE COUNTY

### ABERNATHY

Population in 1940: 847.

Source of information: O. Rutledge, water superintendent, Nov. 16, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1934; depth, 200 feet; deep-well turbine pump and 25-horsepower electric motor; yield, 300 gallons a minute.

Well 2. Drilled in 1944 by Clowe and Clowan; depth, 226 feet; diameter 15 inches; deep-well turbine pump and 40-horsepower electric motor; yield, 600 gallons a minute.

Pumpage: Average, 150,000 gallons a day in winter; 550,000 gallons a day in summer.

Storage: Elevated tank, 150,000 gallons.

Number of customers: 275.

Treatment: None.

### Analysis

[Composite sample of wells 1 and 2. Collected Nov. 16, 1945. pH is 7.2. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	37		Sulfate (SO <sub>4</sub> )	21	0.44
Iron (Fe)	.04		Chloride (Cl)	30	.85
Calcium (Ca)	49	2.45	Fluoride (F)	2.2	.12
Magnesium (Mg)	33	2.71	Nitrate (NO <sub>3</sub> )	4.0	.06
Sodium (Na)	23	.98	Dissolved solids	358	
Potassium (K)	10	.26	Total hardness as CaCO <sub>3</sub>	258	
Bicarbonate (HCO <sub>3</sub> )	301	4.93			

### Driller's log, well 2

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil		5	Red clay	25	135
Caliche	5	10	Red sandy clay, little water	15	150
Red clay	50	60	Sand and gravel, water	20	170
Red sandy clay	10	70	Red sandy clay	2	172
Sand	10	80	Rock	25	197
Dry red sand	30	110	Yellow sandy clay	29	226

## HALE CENTER

Population in 1940: 836.

Source of information: R. C. Davis, water superintendent, Mar. 3, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1926 by W. G. Sears; depth, 120 feet; diameter, 12 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 51 feet below land surface; drawdown reported, 40 feet below land surface after pumping 543 gallons a minute for 12 hours; yield, 550 gallons a minute; temperature, 64° F.

Well 2. Drilled in 1936 by Garms and Mounts; depth, 123 feet; diameter, 12 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 350 gallons a minute.

Pumpage: Average, 150,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 214.

Treatment: None.

*Analysis, well 2*

[Collected Mar. 3, 1945. pH is 7.6. Analyzed by J. H. Rowley]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	54		Sulfate (SO <sub>4</sub> )	43	0.90
Iron (Fe)	.02		Chloride (Cl)	35	.99
Calcium (Ca)	50	2.50	Fluoride (F)	4.4	.23
Magnesium (Mg)	52	4.28	Nitrate (NO <sub>3</sub> )	5.2	.08
Sodium (Na)	21	.91	Dissolved solids	445	
Potassium (K)	8.8	.23	Total hardness as CaCO <sub>3</sub>	339	
Bicarbonate (HCO <sub>3</sub> )	349	5.72			

## PETERSBURG

Population in 1940: 496.

Source of information: L. A. Peeples, well driller, Nov. 30, 1945.

Ownership: Municipal.

Source of supply: Well drilled in 1945 by L. A. Peeples; depth, 222 feet; diameter, 12 inches; deep-well turbine pump and electric motor; yield, 600 gallons a minute; temperature, 63½° F. Municipal supply still under process of construction.

Pumpage: No record.

*Analysis*

[Collected Nov. 30, 1945. pH is 8.2. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	34	0.71
Iron (Fe)	.06		Chloride (Cl)	17	.48
Calcium (Ca)	36	1.80	Fluoride (F)	3.6	.19
Magnesium (Mg)	40	3.29	Nitrate (NO <sub>3</sub> )	1.2	.02
Sodium (Na)	34	1.50	Dissolved solids	383	
Potassium (K)	11	.28	Total hardness as CaCO <sub>3</sub>	254	
Bicarbonate (HCO <sub>3</sub> )	334	5.47			

## PLAINVIEW

Population in 1940: 8,492.

Source of information: S. E. Bolles, water superintendent, Feb. 28, 1945.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1937 by L. A. Peeples; depth, 301 feet; diameter, 18 inches; deep-well turbine pump and electric motor; yield, 852 gallons a minute with drawdown of 60 feet in 1937; temperature, 64° F.

Well 2. Drilled in 1937 by L. A. Peeples; depth, 301 feet; diameter, 18 inches; deep-well turbine pump and electric motor; yield, 628 gallons a minute with drawdown of 60 feet in 1937.

Well 3. Drilled in 1937 by L. A. Peeples; depth, 301 feet; diameter, 8 inches; deep-well turbine pump and electric motor; yield, 1,086 gallons a minute with drawdown of 63 feet in 1937.

Pumpage: Average, 1,050,000 gallons a day.

Storage: Concrete ground storage reservoir, 500,000 gallons; elevated tank, 200,000 gallons.

Number of customers: 2,127.

Treatment: None.

*Analysis, well 1*

[Collected Feb. 28, 1945. pH is 7.4. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	60		Sulfate (SO <sub>4</sub> )	28	0.58
Iron (Fe)	.00		Chloride (Cl)	18	.51
Calcium (Ca)	44	2.20	Fluoride (F)	3.6	.19
Magnesium (Mg)	37	3.04	Nitrate (NO <sub>3</sub> )	1.2	.02
Sodium (Na)	28	1.23	Dissolved solids	390	
Potassium (K)	8.5	.22	Total hardness as CaCO <sub>3</sub>	262	
Bicarbonate (HCO <sub>3</sub> )	329	5.39			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil	5	5	White sand	21	137
Red caliche	29	34	Red sand	10	147
Hard caliche and nodules	9	43	Hard sand	14	161
Pink gravel	16	59	Sand	15	176
Sandy caliche	2	61	Fine-grained sand	18	194
Red shale	9	70	"Clean" sand	9	203
Sand and gravel	15	85	Gritty sand	10	213
Packed sand	25	110	Coarse-grained sand	88	301
Rock	6	116			

## HALL COUNTY

## ESTELLINE

Population in 1940: 603.

Source of information: H. J. Rogers, co-owner, Mar. 28, 1948.

Owners: A. J. Rogers and H. J. Rogers.

Source of supply: Two wells.

Well 1. At elevated tank; dug in 1929; depth, 47 feet; diameter, 8 feet; deep-well cylinder pump and 5-horsepower electric motor; static water

level, 37.8 feet below land surface Mar. 8, 1947; yield, 40 gallons a minute.

Well 2. About 250 feet south of well 1; drilled; depth, 58 feet; diameter, 8 inches; deep-well cylinder pump and 5-horsepower electric motor; yield, 45 gallons a minute.

*Average pumpage, in gallons a day*

	1945	1946	1947
January		23,800	24,600
February		26,200	25,900
March		19,300	
April		27,000	
May		26,300	
June		37,200	
July		34,200	
August		48,800	
September		29,000	
October		21,300	
November		24,800	
December	25,500	22,400	

Storage: Ground reservoir, 15,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 150.

Treatment: Chlorination.

*Analysis*

[Composite sample of wells 1 and 2. Collected Mar. 28, 1947. pH is 7.6. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	8.8		Sulfate (SO <sub>4</sub> )	77	1.60
Iron (Fe)	.09		Chloride (Cl)	34	.96
Calcium (Ca)	47	2.35	Fluoride (F)	1.0	.05
Magnesium (Mg)	28	2.30	Nitrate (NO <sub>3</sub> )	34	.55
Sodium (Na)	97	4.23	Dissolved solids	538	
Potassium (K)	5.9	.15	Total hardness as CaCO <sub>3</sub>	232	
Bicarbonate (HCO <sub>3</sub> )	358	5.87			

**MEMPHIS**

Population in 1940: 3,869.

Source of information: Roy Fultz, Manager, June 1943.

Owner: Community Public Service Co.

Source of supply: Forty-one shallow wells in three well fields about 6 miles northwest of the city in Donley County, and one well on the Milam farm in Hall County. The Memphis well field in Donley County consists of three batteries of shallow dug wells ranging in depth from 12 to 25 feet. The east battery consists of 9 wells, the middle battery 16 wells, and the west battery 16 wells. Wells flow into collecting reservoirs. The water then flows through pipe lines by gravity into the city of Memphis. Combined yield of all wells, about 200 gallons a minute.

Milam Farm well. Stand-by well; drilled in 1941; depth, 30 feet; diameter, 12 inches; deep-well turbine pump and electric motor; static water level, 10.2 feet below land surface in 1941; yield, 45 gallons a minute.

## Average pumpage, in gallons a day

	1941	1942	1943
January	141,935	135,483	154,888
February	182,142	196,428	160,714
March	119,354	151,612	151,612
April	153,333	176,666	176,666
May	138,709	148,387	-----
June	126,666	186,666	-----
July	154,838	219,354	-----
August	190,322	222,580	-----
September	173,333	223,333	-----
October	164,516	170,967	-----
November	203,333	230,000	-----
December	203,225	161,290	-----

Storage: Ground storage reservoir at Donley County well field, 510,000 gallons; elevated tank.

Treatment: Chlorination.

## Analysis

[Composite sample of 41 wells in Donley County. Collected May 20, 1943. pH is 8.4. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	26	-----	Sulfate (SO <sub>4</sub> )	20	0.42
Iron (Fe)	12	-----	Chloride (Cl)	17	.48
Calcium (Ca)	73	3.64	Fluoride (F)	6	.03
Magnesium (Mg)	10	.82	Nitrate (NO <sub>3</sub> )	5.0	.08
Sodium and potassium (Na + K)	19	.81	Dissolved solids	309	-----
Bicarbonate (HCO <sub>3</sub> )	260	4.26	Total hardness as CaCO <sub>3</sub>	223	-----

## TURKEY

Population in 1940: 930.

Source of information: G. O. Coker, water superintendent, Mar. 28, 1947.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Four and one-half miles southwest of Turkey; drilled in 1928 by S. H. Kimball; depth, 100 feet; diameter, 12 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 40 feet below land surface; yield, 200 gallons a minute.

Well 2. About 300 feet southwest of well 1; drilled in 1928 by S. H. Kimball; depth, 100 feet; diameter, 12 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 150 gallons a minute.

Pumpage: Average, 75,000 gallons a day.

Storage: Ground storage reservoir, 200,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 260.

Treatment: Chlorination.

## Analysis

[Composite sample of wells 1 and 2. Collected Mar. 28, 1947. pH is 7.4. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	26	-----	Sulfate (SO <sub>4</sub> )	374	7.99
Iron (Fe)	1.0	-----	Chloride (Cl)	140	3.95
Calcium (Ca)	152	7.49	Fluoride (F)	1.6	.08
Magnesium (Mg)	56	4.61	Nitrate (NO <sub>3</sub> )	10	.16
Sodium (Na)	93	4.05	Dissolved solids	1,070	-----
Potassium (K)	8.5	.22	Total hardness as CaCO <sub>3</sub>	610	-----
Bicarbonate (HCO <sub>3</sub> )	262	4.29			

## HANSFORD COUNTY

## GRUVER

Population in 1940: 350.

Source of information: Earl Lowe, Southwestern Public Service Co., June 23, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Two wells.

Well 1. Drilled in 1931 by A. H. Masiran; depth, 342 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 158.5 feet below land surface in July 1931; drawdown of 19 feet in 1948.

Well 2. Drilled in May 1948 by H. H. Heiskell; depth, 413 feet; diameter, 13 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 184 feet below land surface; drawdown of 37 feet when pumping 490 gallons a minute.

Pumpage: Average, 100,000 gallons a day.

Storage: Elevated tank, 50,000 gallons; ground storage reservoir to be installed, 100,000 gallons.

Number of customers: 250.

Treatment: None.

*Analysis, well 2*

[Collected June 23, 1948. pH is 7.5. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	33		Sulfate (SO <sub>4</sub> )	67	1.39
Iron (Fe)	1.8		Chloride (Cl)	11	.31
Calcium (Ca)	44	2.20	Fluoride (F)	2.2	.12
Magnesium (Mg)	31	2.55	Nitrate (NO <sub>3</sub> )	7.8	.13
Sodium (Na)	42	1.83	Dissolved solids	376	
Potassium (K)	8.4	.21	Total hardness as CaCO <sub>3</sub>	238	
Bicarbonate (HCO <sub>3</sub> )	302	4.95			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Brown sandy clay	10	10	Red clay	2	320
Light-brown sandy clay	110	120	Very hard sandrock	2	322
Broken sand, rock and clay	60	180	Red clay	2	324
Very fine water sand	10	190	Very hard sandrock	2	326
Light-brown sandy clay	35	225	Sand and gravel, water	14	340
Fine sand	36	261	Very hard sandrock	2	342
Broken rock, sand	57	318			

## HITCHLAND

Population in 1940: 100.

Source of information: E. P. Siler, station agent, June 23, 1948.

Owner: C. R. I. & P. Railroad Co.

Source of supply: Well, which supplies the railroad as well as the city.

Well 1. Drilled by D. L. McDonald; depth, 484 feet; diameter, 10 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 136.0 feet below land surface August 3, 1936.

Pumpage: Average, 25,000 gallons a day.

Storage: Elevated tank, 48,000 gallons.

Number of customers: 7.

Treatment: None.

*Analysis, well 1*

[Collected June 23, 1948 pH is 7.5. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	35		Sulfate (SO <sub>4</sub> )	87	1.81
Iron (Fe)	48		Chloride (Cl)	10	.28
Calcium (Ca)	51	2.55	Fluoride (F)	1.8	.09
Magnesium (Mg)	32	2.63	Nitrate (NO <sub>3</sub> )	8.3	.13
Sodium (Na)	26	1.13	Dissolved solids	373	
Potassium (K)	8.8	.23	Total hardness as CaCO <sub>3</sub>	259	
Bicarbonate (HCO <sub>3</sub> )	254	4.16			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	2	2	Sandy clay	132	155
Soft caliche	8	10	Rock	3	158
Hard caliche	3	13	Sandy clay	32	190
Yellow clay	7	20	Clean sand	85	275
Rock	3	23			

**MORSE**

Population in 1940: 200.

Source of information: Earl Lowe, superintendent, Southwestern Public Service Co., June 23, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Well, drilled in 1931 by W. M. Brown; depth, 354 feet; deep-well turbine pump and 7½-horsepower electric motor; static water level, 159 feet below land surface in spring of 1948; drawdown of 20 feet.

Pumpage: No record.

Storage: Elevated tank, 4,500 gallons.

Number of customers: 15.

Treatment: None.

*Analysis*

[Collected June 23, 1948. pH is 7.8. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	44		Sulfate (SO <sub>4</sub> )	24	0.500
Iron (Fe)	1.2		Chloride (Cl)	8.4	.237
Calcium (Ca)	36	1.797	Fluoride (F)	2.2	.116
Magnesium (Mg)	28	2.303	Nitrate (NO <sub>3</sub> )	5.8	.094
Sodium (Na)	12	.522	Dissolved solids	260	
Potassium (K)	9.6	.246	Total hardness as CaCO <sub>3</sub>	205	
Bicarbonate (HCO <sub>3</sub> )	242	3.967			

**SPEARMAN**

Population in 1940: 1,105.

Source of information: Leo Ducas, city manager, June 23, 1948.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1924 by Ed Wilbanks; depth, 348 feet; diameter, 10 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 256 feet below land surface May 23, 1936; draw-down of 25.2 feet after pumping 180 gallons a minute for 72 hours in 1936.

Well 2. Drilled; depth, 282 feet; diameter, 8 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 256.8 feet below land surface Aug. 14, 1936; drawdown of 22.9 feet after pumping 180 gallons a minute for 15 minutes.

Well 3. Drilled in June 1947 by Ed. Wilbanks; depth, 405 feet; deep-well turbine pump and 120-horsepower natural-gas engine; yield, 650 gallons a minute.

Pumpage: Average, 250,000 gallons a day.

Storage: Ground storage reservoir, 165,000 gallons; elevated tank, 75,000 gallons.

Number of customers: 550.

Treatment: Chlorination.

### Analysis, well 3

[Collected June 23, 1948. pH is 7.5. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	43	0.90
Iron (Fe)	.00		Chloride (Cl)	9.2	.26
Calcium (Ca)	52	2.60	Fluoride (F)	1.2	.06
Magnesium (Mg)	27	2.22	Nitrate (NO <sub>3</sub> )	7.0	.11
Sodium (Na)	16	.70	Dissolved solids	324	
Potassium (K)	1.6	.04	Total hardness as CaCO <sub>3</sub>	241	
Bicarbonate (HCO <sub>3</sub> )	256	4.20			

### Driller's log, well 1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	3	3	Packed sand	202	260
Clay	40	43	Clay	20	280
Cap rock	15	58	Coarse white sand	68	348

## HARTLEY COUNTY

### CHANNING

Population in 1940: 475.

Source of information: D. S. Perkins, Southwestern Public Service Co., June 24, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Three wells.

Well 1. Drilled in 1910 by R. L. Hood; depth, 328 feet; diameter, 6 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 288 feet below land surface; yield, 24 gallons a minute.

Well 2. Drilled; depth, 350 feet; diameter, 4 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 15 gallons a minute.

Well 3. Drilled in September 1946 by H. H. Heiskell; depth, 400 feet; diameter, 10 inches, casing perforated from 334 feet to 365 feet; deep-well turbine pump and 20-horsepower electric motor; static water level, 290 feet below land surface in September 1946; yield, 80 gallons a minute.

Pumpage: 25,000 gallons a day.

Storage: Ground storage reservoir, 20,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 100.

Treatment: None.

### Analysis, well 3

[Collected June 24, 1948. pH is 7.4. Analyzed by D. E. Weaver]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	32		Sulfate (SO <sub>4</sub> )	21	0.437
Iron (Fe)	.49		Chloride (Cl)	13	.367
Calcium (Ca)	43	2.146	Fluoride (F)	.2	.011
Magnesium (Mg)	22	1.809	Nitrate (NO <sub>3</sub> )	13	.210
Sodium (Na)	9.0	.391	Dissolved solids	267	
Potassium (K)	2.4	.061	Total hardness as CaCO <sub>3</sub>	197	
Bicarbonate (HCO <sub>3</sub> )	202	3.311			

### HARTLEY

Population in 1940: 150.

Source of information: R. M. Williams, Dec. 3, 1948.

Owner: E. E. Williams.

Source of supply: Well, drilled by R. Mitchell; depth, 400 feet; diameter, 6 1/4 inches; deep-well turbine pump and 15-horsepower electric motor.

Pumpage (estimated): 10,000 gallons a day.

Storage: Elevated tank, capacity unknown.

Treatment: None.

### Analysis

[Collected Oct. 4, 1948. pH is 7.5. Analyzed by J. R. Avrett]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		Sulfate (SO <sub>4</sub> )	34	0.71
Iron (Fe)	.00		Chloride (Cl)	8.0	.23
Calcium (Ca)	34	1.70	Fluoride (F)	1.2	.06
Magnesium (Mg)	29	2.38	Nitrate (NO <sub>3</sub> )	7.5	.12
Sodium (Na)	29	1.26	Dissolved solids	314	
Potassium (K)	8.0	.20	Total hardness as CaCO <sub>3</sub>	204	
Bicarbonate (HCO <sub>3</sub> )	272	4.46			

## HEMPHILL COUNTY

### CANADIAN

Population in 1940: 2,151.

Source of information: J. C. Reagan, water superintendent, June 24, 1948.

Ownership: Municipal.

Source of supply: Five wells, three at pumping station and two northeast of city along the flood plains of the Canadian River.

Well 1. At pumping plant; drilled in 1925; depth, 72 feet; diameter, 12½ inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 22 feet below land surface in 1935, 35 feet below land surface in 1948; yield, 100 gallons a minute.

Well 2. At pumping plant; drilled in 1932; depth, 69 feet; diameter, 10 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 150 gallons a minute.

Well 3. At city pumping plant; drilled in 1936; depth, 84 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 350 gallons a minute.

Well 4 (owner's new well 1). Along the Canadian flood plains northeast of Canadian; drilled in 1945; depth, 94 feet; diameter, 12 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 405 gallons a minute.

Well 5 (owner's new well 2). About 340 feet from well 4; drilled in 1947; depth, 109 feet; diameter, 12½ inches; deep-well turbine pump and 20-horsepower electric motor; pumping level, 70 feet below land surface; yield, 700 gallons a minute.

Pumpage: Average, 300,000 gallons a day.

Storage: Ground storage reservoir, 189,000 gallons; ground storage reservoir, 104,000 gallons; standpipe, 100,000 gallons.

Number of customers: 700.

Treatment: Chlorination.

### Analyses

[Collected June 24, 1948. pH: well 3, 7.4; well 4, 7.5; well 5, 7.3. Analyzed by D. E. Weaver and H. D. Smith]

	Well 3		Well 4		Well 5	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	29		33		32	
Iron (Fe)	.05		.05		.05	
Calcium (Ca)	78	3.89	52	2.60	53	2.65
Magnesium (Mg)	34	2.80	27	2.22	27	2.22
Sodium (Na)	186	8.07	87	3.78	68	2.96
Potassium (K)	5.6	.14	4.0	.10	3.6	.09
Bicarbonate (HCO <sub>3</sub> )	336	5.51	250	4.20	258	4.23
Sulfate (SO <sub>4</sub> )	104	2.17	44	.52	39	.81
Chloride (Cl)	245	6.91	123	347	99	2.79
Fluoride (F)	1.6	.08	1.2	.06	.8	.04
Nitrate (NO <sub>3</sub> )	14	.23	3.2	.05	3.0	.05
Dissolved solids	841		504		457	
Total hardness as CaCO <sub>3</sub>	334		241		244	

## HOCKLEY COUNTY

### ANTON

Population in 1940: 548.

Source of information: A. H. Vincent, city secretary Mar. 13, 1947.

Ownership: Municipal.

Source of supply: Well; drilled in 1936 by Panhandle Construction Co.; depth, 115 feet; diameter, 12 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 185 gallons a minute.

Pumpage: Average, 220,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 146.

Treatment: None.

### Analysis

[Collected Mar. 13, 1947. pH is 7.2. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	62		Sulfate (SO <sub>4</sub> )	360	7.50
Iron (Fe)	.08		Chloride (Cl)	166	4.68
Calcium (Ca)	104	5.19	Fluoride (F)	2.8	.15
Magnesium (Mg)	107	8.80	Nitrate (NO <sub>3</sub> )	12	.19
Sodium (Na)	33	3.59	Dissolved solids	1,080	
Potassium (K)	18	.46	Total hardness as CaCO <sub>3</sub>	700	
Bicarbonate (HCO <sub>3</sub> )	337	5.52			

### Driller's log

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil	10	10	Fine sand, with some clay	14	56
Gray caliche	10	20	Red clay	9	65
White caliche	8	28	Packed sand and clay	17	82
Fine sand and clay	8	36	Sand (water)	33	115
Sand (water)	6	42			

### LEVELLAND

Population in 1940: 3,091.

Source of information: L. E. Mabe, mayor, Mar. 15, 1947.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. Drilled in 1927; depth, 220 feet; diameter, 12 inches; deep-well turbine pump and 50-horsepower electric motor; yield, 500 gallons a minute.

Well 2. Drilled in 1930; depth, 208 feet; diameter, 10 inches; deep-well turbine pump and 30-horsepower electric motor; yield, 390 gallons a minute.

Well 3. Drilled in 1945 by M. L. Morgan; depth, 220 feet; diameter, 14 inches; deep-well turbine pump and 30-horsepower electric motor; yield, 500 gallons a minute.

Well 4. Drilled in 1946 by M. L. Morgan; depth, 231 feet; diameter, 14 inches; deep-well turbine pump and 30-horsepower electric motor.

Pumpage: Maximum in summer, 1,440,000 gallons a day; minimum in winter, 480,000 gallons a day.

Storage: Elevated tank, 75,000 gallons.

Number of customers: 1,416.

Treatment: Chlorination.

*Analysis, well 1*

[Collected Mar. 5, 1945. pH is 7.3. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	49		Sulfate (SO <sub>4</sub> )	193	4.02
Iron (Fe)	.10		Chloride (Cl)	60	1.69
Calcium (Ca)	63	3.14	Fluoride (F)	3.4	.18
Magnesium (Mg)	69	5.67	Nitrate (NO <sub>3</sub> )	.5	.01
Sodium (Na)	46	2.01	Dissolved solids	673	
Potassium (K)	13	.33	Total hardness as CaCO <sub>3</sub>	440	
Bicarbonate (HCO <sub>3</sub> )	320	5.25			

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Top soil	2	2	Hard rock	3	79
Sand	10	12	Extra soft sand	17	96
Soft clay	33	45	Extra hard rock	7	103
Hard rock	6	51	Sand (water)	20	123
Soft formation	4	55	Soft sandy clay	28	151
Rock	4	59	Sand (water)	47	198
Soft sand formation	17	76			
<b>Well 4</b>					
Top soil	5	5	Sand and gravel, water	8	107
Mixed clay and caliche	12	17	Packed sand	11	118
Red sand	6	23	Brown clay	6	124
Sand, clay	9	32	Sand, water	6	130
Caliche and rock	11	43	Sand and gravel	13	143
Caliche	9	52	Brown clay	2	145
Sandrock	8	60	Sand and gravel, water	75	220
Lime rock	10	70	Gravel	5	225
Loose sand and rock	15	85	Clay	6	231
Sandy clay	14	99			

**HOWARD COUNTY****BIG SPRING**

Population in 1940: 12,604.

Source of information: R. C. Hester, production superintendent, Aug. 21, 1947.

Ownership: Municipal.

Source of supply: Twenty-eight wells in four well fields and two surface water lakes.

Two wells in City Park field, 2.5 miles southwest of city; 13 wells in section 17 well field; 7 wells in section 33 well field; and 7 wells in O'Barr well field in Glasscock County, 21 miles southwest of Big Spring.

Moss Creek Reservoir. Eight miles east of Big Spring; capacity, 2,500 acre-feet.

Powell Creek Reservoir. Twelve miles southwest of Big Spring; capacity 1,600 acre-feet.

Well records

Well field	Well No.	Date Drilled	Depth (ft.)	Diam-eter (in.)	Horse-power of motor	Static water level (ft.)	Date	Draw-down (ft.)	Yield (g.p.m.)	Tem-perature (°F.)
City Park	1	1925	273	72	15	173.4	9/17/36	}-----	80	-----
	4	1926	283	12	15	247.0 197.8 247.0	9/12/47 9/17/36 9/12/47			
Section 17	9	1926	121	6	5	60.1	9/17/36	20.25	35-40	-----
	13	1928	200	8	5	77.9	1/28/36	75	25	
	16	1928	160	8	5	100.0	9/12/47	}-----	25	
	18A	1926	160	8	5	98.1	1/28/36			
	19	1926	183	6	5	93.3	1/22/36	}-----	25	
	19A	1926	183	6	5	96.3	1/27/37			
	24A	1928	218	8	5	50.0	9/12/47	}-----	25	
	24B	1939	223	8	5	107.9	5/26/37			
	25	1928	235	8	5	80.0	9/12/47	}-----	25	
	40A	1934	277	8	7½	107.9	6/ 9/37			
	43	1926	260	8	5	190.0	9/12/47	}-----	25	
	44	-----	242	8	5	200.0	9/12/47			
	Section 33	47	-----	242	8	5	197.5	3/ 6/36	}-----	
50		1928	223	8	20	220.0	9/12/47	22		23
52		1932	230	8	15	128.9	8/19/37	}-----	100	
53		1932	262	8	10	112	9/12/47			25
53A		1935	316	12½-10	10	120	9/12/47	}-----	25	
54		1934	303	8	15	118	9/12/47			22
59A		1929	300	12-10	40	118	9/12/47	}-----	42	
59C		1932	285	12½	30	120	9/12/47			45
O'Barr		1	1943	129	12	10	88.5	9/ 5/47	}-----	15
		2	1943	125	8	10	82.5	9/ 5/47		
	4	1944	255	12	10	107	8/20/47	}-----	3.5	
	7	1944	208	12	10	85	9/ 5/47			19
	9	1947	150	12	10	77	9/ 5/47	}-----	1.5	
	11	1947	229	12	10	70	8/25/47			2
						65	9/ 5/47	12.5	305	-----

Average pumpage, in gallons a day

	Lakes	Section 17 well field	Section 33 well field	City Park well field	O'Barr well field
1945					
January	78,000	407,000	650,000	45,000	-----
February	561,000	398,000	329,000	25,000	116,000
March	-----	389,000	537,000	35,000	737,000
April	142,000	362,000	149,000	-----	1,493,000
May	165,000	347,000	628,000	31,000	1,553,000
June	128,000	350,000	995,000	103,000	1,490,000
July	616,000	295,000	343,000	54,000	884,000
August	902,000	293,000	241,000	47,000	1,122,000
September	918,000	299,000	210,000	43,000	918,000
October	1,314,000	143,000	-----	13,000	-----
November	1,344,000	64,000	-----	35,000	-----
December	1,268,000	-----	-----	-----	-----

	Lakes	Section 17 well field	Section 33 well field	City Park well field	O'Barr well field
1946					
January	1,250,000	1,000	-----	5,000	-----
February	2,301,000	-----	-----	-----	-----
March	1,389,000	-----	-----	67,000	168,000
April	1,328,000	-----	-----	75,000	750,000
May	1,208,000	-----	57,000	75,000	889,000
June	1,248,000	244,000	327,000	75,000	808,000
July	1,348,000	324,000	472,000	75,000	1,139,000
August	1,261,000	324,000	622,000	75,000	748,000
September	1,243,000	323,000	246,000	75,000	51,000
October	716,000	320,000	377,000	65,000	216,000
November	1,255,000	64,000	88,000	61,000	-----
December	996,000	161,000	193,000	73,000	4,000

	Lakes	Section 17 well field	Section 33 well field	City Park well field†	O'Barr well field
1947					
January.....	1,207,000	160,000	163,000	71,000	16,000
February.....	1,300,000	29,000	-----	72,000	100,000
March.....	1,260,000	241,000	-----	75,000	58,000
April.....	1,236,000	314,000	6,000	75,000	613,000
May.....	1,292,000	311,000	57,000	73,000	619,000
June.....	1,409,000	322,000	364,000	75,000	1,106,000
July.....	1,551,000	316,000	578,000	58,000	968,000

Storage: Three ground reservoirs, each 1,000,000 gallons; two elevated tanks, each 200,000 gallons.

Number of customers: 3,723.

Treatment: Well water, chlorination; lake water, coagulation, filtration, and chlorination.

### Analyses

#### O'Barr field

[Collected Aug. 22, 1947. pH of each well is 7.2. Analyzed by B. C. Dwyer]

	Well 1		Well 4	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	15	-----	20	-----
Iron (Fe).....	.04	-----	.04	-----
Calcium (Ca).....	94	4.69	78	3.89
Magnesium (Mg).....	20	1.64	14	1.15
Sodium (Na).....	11	.49	24	1.03
Potassium (K).....	4.8	.12	4.1	.10
Bicarbonate (HCO <sub>3</sub> ).....	318	5.21	258	4.23
Sulfate (SO <sub>4</sub> ).....	29	.60	32	.67
Chloride (Cl).....	36	1.02	40	1.13
Fluoride (F).....	.6	.03	1.2	.06
Nitrate (NO <sub>3</sub> ).....	5.0	.08	5.0	.08
Dissolved solids.....	372	-----	345	-----
Total hardness as CaCO <sub>3</sub> .....	316	-----	252	-----

#### City Park well field, well 4

[Collected Aug. 21, 1947. pH is 7.2. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	15	-----	Sulfate (SO <sub>4</sub> ).....	40	0.96
Iron (Fe).....	.04	-----	Chloride (Cl).....	44	1.24
Calcium (Ca).....	100	4.99	Fluoride (F).....	1.0	.05
Magnesium (Mg).....	10	.82	Nitrate (NO <sub>3</sub> ).....	5.7	.09
Sodium (Na).....	28	1.20	Dissolved solids.....	400	-----
Potassium (K).....	5.8	.15	Total hardness as CaCO <sub>3</sub> .....	290	-----
Bicarbonate (HCO <sub>3</sub> ).....	294	4.82			

	Raw water		Finished water	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million

**Moss Creek Reservoir**

Collected: Raw sample, Aug. 9, 1945; finished sample, Aug. 21, 1947. pH, finished sample, is 7.7. Analyzed by C. B. Cibulka and B. C. Dwyer]

Silica (SiO <sub>2</sub> )			3.4	
Iron (Fe)			.27	
Calcium (Ca)	30	1.497	40	1.997
Magnesium (Mg)	2.1	.173	6.9	.567
Sodium (Na)	3.5	.152	20	.857
Potassium (K)			3.9	.010
Bicarbonate (HCO <sub>3</sub> )	105	1.721	162	2.655
Sulfate (SO <sub>4</sub> )	2	.042	17	.354
Chloride (Cl)	2.0	.056	14	.395
Fluoride (F)				.011
Nitrate (NO <sub>3</sub> )	.2	.003	1.0	.016
Dissolved solids	114		186	
Total hardness as CaCO <sub>3</sub>	84		128	

	Raw water		Finished water	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million

**Powell Creek Reservoir**

[Collected Aug. 21, 1947. pH: raw water, 7.5; finished water, 7.9. Analyzed by B. C. Dwyer]

Silica (SiO <sub>2</sub> )	7.1		1.0	
Iron (Fe)	.10		.00	
Calcium (Ca)	32	1.597	57	2.845
Magnesium (Mg)	4.1	.337	8.7	.715
Sodium (Na)	12	.516	14	.589
Potassium (K)	3.5	.090	6.4	.164
Bicarbonate (HCO <sub>3</sub> )	132	2.168	156	2.562
Sulfate (SO <sub>4</sub> )	3.8	.079	52	1.083
Chloride (Cl)	10	.282	22	.620
Fluoride (F)	.2	.011	.6	.032
Nitrate (NO <sub>3</sub> )	.0	.000	1.0	.016
Dissolved solids	138		240	
Total hardness as CaCO <sub>3</sub>	97		178	

**Drillers' logs**

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

**O'Barr field, well 1**

Top soil	6	6	Gravel with some yellow clay	11	99
Fine gravel with small amount of yellow clay	18	24	Gravel with some white clay	9	108
Red clay	4	28	Gravel with some yellow clay	10	118
Gravel with small amount of clay	54	82	Apparent cavern (probably water).	2	120
Cavern, first showing of water	3	85	Conglomerate	2	122
Conglomerate	3	88	Dark-red clay	7	129

**O'Barr field, well 2**

Top soil	3	3	Very porous white lime and clay, water bearing.	8	78
Red sandy clay	7	10	Conglomerate	7	85
Red clay	24	34	Soft yellow lime and clay	15	100
Pink clay	6	40	Gravel and sand, some clay	19	119
Soft white lime and clay	30	70	Red beds	183	302

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>O'Barr field, well 4</b>					
Top soil.....	24	24	Sand and gravel, some clay balls.	7	217
Reddish-brown clay.....	11	35	Soft buff sand.....	23	240
Gravel and light-gray clay.....	8	43	Yellow sand.....	5	245
Coarse sand and gravel, clay.....	19	62	Reddish-buff sand and gravel	3	248
Brownish-yellow mud and gravel, water.	10	72	Shale.....	16	264
Sand and gravel.....	40	112	Sandy clay.....	3	267
Conglomerate.....	42	154	Conglomerate.....	17	284
Sand and gravel.....	37	191	Yellow and red gravelly clay and shale.	11	295
Conglomerate.....	19	210			

<b>O'Barr field, well 7</b>					
Top soil.....	10	10	Coarse sand and gravel, some conglomerate.	11	168
Sandy clay.....	29	39	Sandy and gravelly clay.....	6	174
Clayey gravel.....	6	45	Sand and gravel, some boulders and clay.	10	184
Conglomerate.....	15	60	Yellowish-brown to blue sandy mud.	8	192
Clay, sand, and boulders, water.	14	74	Dark-red gravelly and sandy clay with thin beds of sandstone and streaks of yellow and blue clay.	23	215
Conglomerate.....	5	79			
Soft yellow sand.....	11	90			
Coarse sand and gravel.....	64	154			
Yellow sandy and gravelly clay.	3	157			

## COAHOMA

Population in 1940: 574.

Source of information: R. A. Marshall, city secretary, Aug. 22, 1947.

Ownership: Municipal.

Source of supply: Two wells.

Well 2. Dug in 1940; depth, 50 feet; diameter, 4 feet; deep-well turbine pump and 7½-horsepower electric motor; yield, 125 gallons a minute.

Well 3. About 150 feet east of well 2; drilled in 1946 by Ollie Williams; depth, 54 feet; diameter, 8 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 70 gallons a minute.

Pumpage (estimated): 80,000 gallons a day.

Storage: Elevated tank, 55,000 gallons.

Number of customers: 140.

Treatment: None.

## Analysis, well 2

[Collected Aug. 22, 1947. pH is 7.2. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	63		Sulfate (SO <sub>4</sub> ).....	335	6.97
Iron (Fe).....	.08		Chloride (Cl).....	59C	16.64
Calcium (Ca).....	249	12.43	Fluoride (F).....	1.4	.07
Magnesium (Mg).....	94	7.73	Nitrate (NO <sub>3</sub> ).....	2F	.42
Sodium (Na).....	177	7.69	Dissolved solids.....	1.68C	
Potassium (K).....	20	.51	Total hardness as CaCO <sub>3</sub> .....	1.01C	
Bicarbonate (HCO <sub>3</sub> ).....	260	4.26			

## FORSAN

Population in 1940: 400.

Source of information: Tillman Shoults, owner, Aug. 22, 1947.

Owner: Tillman Shoults.

Source of supply: Well; drilled; depth, 280 feet; diameter, 6 inches; deep-well cylinder pump and 3-horsepower electric motor.

Pumpage: No record.

Storage: Elevated tank, 3,200 gallons.

Number of customers: 35.

Treatment: None.

### Analysis

[Collected Aug. 22, 1947. pH is 7.8. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	10		Sulfate (SO <sub>4</sub> )	42	0.87
Iron (Fe)	.54		Chloride (Cl)	46	1.30
Calcium (Ca)	72	3.69	Fluoride (F)	1.0	.05
Magnesium (Mg)	7.6	.62	Nitrate (NO <sub>3</sub> )	8.8	.14
Sodium (Na)	42	1.81	Dissolved solids	352	
Potassium (K)	7.0	.18	Total hardness as CaCO <sub>3</sub>	210	
Bicarbonate (HCO <sub>3</sub> )	234	3.84			

## HUDSPETH COUNTY

### FORT HANCOCK

Population in 1940: 450.

Source of information: J. A. Walton, pump operator, Sept. 20, 1948.

Owner: Texas and New Orleans Railroad.

Source of Supply: Well in southern part of town; drilled; depth, 50 feet; diameter, 12 inches; triplex pump and 25-horsepower gasoline engine; static water level, 9 feet below land surface; yield, 200 gallons a minute.

Pumpage: 100,000 gallons a day.

Storage: Elevated tank, 20,000 gallons.

Number of customers: 73.

Treatment: None.

### Analysis

[Collected Sept. 20, 1948. pH is 7.5. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	38		Sulfate (SO <sub>4</sub> )	502	10.45
Iron (Fe)	.00		Chloride (Cl)	648	18.23
Calcium (Ca)	186	9.28	Fluoride (F)	1.0	.05
Magnesium (Mg)	45	3.70	Nitrate (NO <sub>3</sub> )	2.8	.05
Sodium (Na)	457	19.89	Dissolved solids	2,020	
Potassium (K)	9.6	.25	Total hardness as CaCO <sub>3</sub>	649	
Bicarbonate (HCO <sub>3</sub> )	262	4.29			

## SIERRA BLANCA

Population in 1940: 723.

Source of information: Wm. Melbreth, owner, Sept. 20, 1948.

Owner: Wm. Melbreth.

Source of supply: Two wells.

Well 1. Drilled in 1925 by M. C. Craley; depth, 1,000 feet; diameter, 6 inches; deep-well cylinder pump and 20-horsepower electric motor; static water level reported, 920 feet below land surface; yield, 40 gallons a minute.

Well 2. Drilled in 1942; depth, 1,000 feet; diameter, 6 inches; deep-well cylinder pump and 15-horsepower electric motor; yield, 35 gallons a minute.

Pumpage: Average, 36,000 gallons a day.

Storage: Elevated tank, 180,000 gallons.

Number of customers: 150.

Treatment: Chlorination.

### Analysis, well 2

[Collected July 23, 1943. pH is 7.8. Analyzed by J. H. Rowley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	20		Sulfate (SO <sub>4</sub> )	373	7.77
Iron (Fe)	1.1		Chloride (Cl)	468	13.20
Calcium (Ca)	68	3.39	Fluoride (F)	5.3	.28
Magnesium (Mg)	19	1.56	Nitrate (NO <sub>3</sub> )	16	.26
Sodium (Na)	496	21.57	Dissolved solids	1,655	
Potassium (K)	22	.56	Total hardness as CaCO <sub>3</sub>	248	
Bicarbonate (HCO <sub>3</sub> )	340	5.57			

## HUTCHINSON COUNTY

### BORGER

Population in 1940: 10,018.

Source of information: R. R. Darrell, water superintendent, June 23, 1948.

Owner: Phillips Petroleum Co.

Source of supply: Eight wells at the Plains Water Station in Carson County 13 miles southwest of Borger.

Well 1. Drilled in 1926 by D. L. McDonald; depth, 410 feet; diameter, 18 inches; deep-well turbine pump and 100-horsepower electric motor; static water level, 235 feet below land surface in 1926; yield, 700 gallons a minute; temperature, 62° F.

Well 2. Drilled in June 1927 by D. L. McDonald; depth, 384 feet; diameter, 20 inches; deep-well turbine pump and 100-horsepower electric motor.

Well 3. Drilled in February 1927 by D. L. McDonald; depth, 371 feet; diameter, 18 inches; deep-well turbine pump and 100-horsepower electric motor; yield, 700 gallons a minute.

Well 4. Drilled in May 1927 by D. L. McDonald; depth, 376 feet; diameter, 20 inches; deep-well turbine pump and 100-horsepower electric motor.

Well 5. Drilled in September 1929 by D. L. McDonald; depth, 495 feet; diameter, 20 inches; deep-well turbine pump and 100-horsepower electric motor; static water level, 260 feet below land surface Sept. 10, 1929, and 280.5 feet below land surface July 30, 1947; yield, 700 gallons a minute.

Well 6. Drilled in 1936 by D. L. McDonald; depth, 535 feet; diameter, 20 inches; deep-well turbine pump and 100-horsepower electric motor; static water level, 243 feet below land surface Aug. 1, 1936; yield, 740 gallons a minute with drawdown of 24.5 feet a minute.

Well 7. Drilled in 1937 by D. L. McDonald; depth, 403 feet; diameter, 20 inches; static water level, 195 feet below land surface Apr. 18, 1937; yield, 700 gallons a minute.

Well 8. Drilled in November 1937; depth, 459 feet; diameter, 20 inches; deep-well turbine pump and 100-horsepower electric motor; yield, 800 gallons a minute.

*Average pumpage, in gallons a day*

January.....	698,745	May.....	798,000	September.....	1,278,000
February.....	692,000	June.....	1,041,000	October.....	1,011,000
March.....	695,000	July.....	1,260,000	November.....	820,000
April.....	760,000	August.....	1,479,000	December.....	758,000

Storage: Elevated tank, 20,000 gallons.

Treatment: None.

*Analysis*

[Composite sample, collected Nov. 14, 1947. pH is 8.0. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	28	-----	Sulfate (SO <sub>4</sub> ).....	24	.50
Iron (Fe).....	.04	-----	Chloride (Cl).....	18	.51
Calcium (Ca).....	46	2.30	Fluoride (F).....	.4	.02
Magnesium (Mg).....	20	1.64	Nitrate (NO <sub>3</sub> ).....	3.5	.06
Sodium (Na).....	24	1.03	Dissolved solids.....	295	-----
Potassium (K).....	7.6	.19	Total hardness as CaCO <sub>3</sub> .....	197	-----
Bicarbonate (HCO <sub>3</sub> ).....	248	4.07			

*Driller's log, well 5*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sandrock.....	23	23	Clay and sand.....	22	233
Hard sandrock.....	22	45	Soft sandrock.....	10	293
Soft sandrock.....	23	68	Clay.....	12	305
Hard sandrock.....	21	89	Clay and sand.....	36	341
Medium sandrock.....	23	112	Sandrock.....	6	347
Hard sandrock.....	22	134	Soft sandrock.....	20	367
Soft sandrock.....	20	154	Soft sandrock.....	22	389
Hard sandrock.....	64	218	Soft sandrock.....	21	410
Medium sandrock.....	12	230	Red and blue clay and sand.....	21	431
Soft sandrock.....	10	240	Clay and sandrock.....	23	454
Soft sandrock.....	10	250	Clay and sandrock.....	22	476
Clay and sand.....	11	261			

**PRINGLE**

Population in 1940: 20.

Source of information: S. H. Chisum, county surveyor, June 24, 1948.

Ownership: Municipal.

Source of supply: Well, drilled in 1922; depth, 230 feet; static water level, 215 feet; windmill.

Storage: Elevated tank, 2,500 gallons.

Number of customers: 4.

Treatment: None.

*Analysis*

[Collected June 24, 1948. pH is 7.8. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	46	-----	Sulfate (SO <sub>4</sub> ).....	20	0.416
Iron (Fe).....	.52	-----	Chloride (Cl).....	6.8	.192
Calcium (Ca).....	38	1.897	Fluoride (F).....	1.2	.063
Magnesium (Mg).....	29	2.385	Nitrate (NO <sub>3</sub> ).....	5.8	.094
Sodium (Na).....	4.1	.178	Dissolved solids.....	273	-----
Potassium (K).....	1.6	.041	Total hardness as CaCO <sub>3</sub> .....	214	-----
Bicarbonate (HCO <sub>3</sub> ).....	226	3.704			

## STINNETT

Population in 1940: 635.

Source of information: F. B. Early, city commissioner, June 24, 1948.

Owner: Phillips Petroleum Co.

Source of supply: Eight wells at the Plains Water Station in Carson County, 13 miles southwest of Borger, owned by the Phillips Petroleum Co., which supply Phillips Petroleum Co. and the cities of Borger and Stinnett.

Pumpage: See under Borger.

Storage: See under Borger.

Number of customers: 120.

Treatment: None.

For analysis of water see under Borger.

## IRION COUNTY

## BARNHART

Population in 1940: 250.

Source of information: Floyd Burks, owner, Sept. 10, 1947.

Owner: Floyd Burks.

Source of supply: Two wells.

Well 1. Drilled about 1927; depth, 600 feet; diameter, 6 inches; deep-well cylinder pump and 5-horsepower electric motor; pumping level, 292.8 feet below land surface Sept. 10, 1947.

Well 2. Drilled about 1930; depth, 400 feet; diameter, 6 inches; deep-well cylinder pump and 5-horsepower electric motor; pumping level, 250.8 feet below land surface Sept. 10, 1947.

Pumpage (estimated): 11,000 gallons a day.

Storage: Concrete ground reservoir, 19,000 gallons.

Number of customers: 46.

Treatment: None.

*Analysis*

[Composite sample of wells 1 and 2. Collected Aug. 20, 1947. pH is 7.9. Analyzed by B. C. Dwyer

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	10		Sulfate (SO <sub>4</sub> )	88	1.83
Iron (Fe)	.14		Chloride (Cl)	66	1.86
Calcium (Ca)	74	3.69	Fluoride (F)	1.6	.08
Magnesium (Mg)	35	2.88	Nitrate (NO <sub>3</sub> )	3.8	.06
Sodium (Na)	45	1.96	Dissolved solids	486	
Potassium (K)	7.1	.18	Total hardness as CaCO <sub>3</sub>	328	
Bicarbonate (HCO <sub>3</sub> )	298	4.88			

## MERTZON

Population in 1940: 869.

Source of information: John Clark, owner, Aug. 20, 1947.

Owner: John Clark.

Source of supply: Three wells.

Well 1. East well; depth, 159 feet; diameter, 8 inches; deep-well cylinder pump and 2-horsepower gasoline engine; static water level, 104.3 feet below land surface Aug. 20, 1947.

Well 2. South well; drilled about 1932; depth, 159 feet; diameter, 5 inches; deep-well cylinder pump and windmill; static water level, 104.2 feet below land surface Aug. 20, 1947.

Well 3. West well; drilled in 1941; depth, 150 feet; diameter, 6 inches; deep-well cylinder pump and 3-horsepower gasoline engine; static water level, 105.9 feet below land surface Aug. 20, 1947.

Pumpage (estimated): Average, 4,800 gallons a day.

Storage: Two concrete ground reservoirs, 40,000 gallons each; two elevated tanks, 1,900 and 1,600 gallons, respectively.

Number of customers: 28.

Treatment: None.

### Analysis, well 3

[Collected Aug. 20, 1947. pH is 7.8. Analyzed by B. C. Dwyer]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	5.0		Sulfate (SO <sub>4</sub> )	367	6.39
Iron (Fe)	.58		Chloride (Cl)	182	5.13
Calcium (Ca)	100	4.99	Fluoride (F)	1.4	.07
Magnesium (Mg)	54	4.44	Nitrate (NO <sub>3</sub> )	.8	.01
Sodium (Na)	168	7.30	Dissolved solids	992	
Potassium (K)	11	.28	Total hardness as CaCO <sub>3</sub>	472	
Bicarbonate (HCO <sub>3</sub> )	380	5.41			

## JEFF DAVIS COUNTY

### VALENTINE

Population in 1940: 499.

Source of information: George W. Newton, water superintendent, Aug. 13, 1948.

Ownership: Municipal.

Source of supply: Well; drilled in 1944 by E. Harrell; depth, 870 feet; diameter, 8 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 270 feet below land surface; yield, 80 gallons a minute; temperature, 82° F.

Pumpage (estimated): 20,000 gallons a day.

Storage: Ground reservoir, 30,000 gallons; elevated tank, 23,000 gallons.

Number of customers: 125.

Treatment: None.

### Analysis

[Collected Aug. 13, 1948. pH is 8.2. Analyzed by H. D. Smith]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		Sulfate (SO <sub>4</sub> )	27	0.562
Iron (Fe)	.15		Chloride (Cl)	13	.367
Calcium (Ca)	4.3	0.215	Fluoride (F)	1.3	.068
Magnesium (Mg)	.8	.066	Nitrate (NO <sub>3</sub> )	4.5	.073
Sodium (Na)	71	3.093	Dissolved solids	231	
Potassium (K)	7.6	.194	Total hardness as CaCO <sub>3</sub>	14	
Bicarbonate (HCO <sub>3</sub> )	152	2.498			

## KENT COUNTY

## JAYTON

Population in 1940: 770.

Source of information: Lee Rice, water superintendent, Sept. 15, 1947.

Ownership: Municipal.

Source of supply: Two wells, 2 miles west of town.

Well 1. Dug in 1934; depth, 35 feet; diameter, 16 feet; two deep-well cylinder pumps and 5-horsepower electric motor; static water level, 22.8 feet below land surface Sept. 15, 1947; yield, 60 gallons a minute.

Well 2. Drilled in 1945 by A. T. Leach; depth, 45 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 160 gallons a minute.

Pumpage (estimated): 125,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 148.

Treatment: None.

*Analysis, well 2*

[Collected Sept. 15, 1947. pH is 7.6. Analyzed by B. C. Dwyer]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )-----	23	-----	Sulfate (SO <sub>4</sub> )-----	104	2.17
Iron (Fe)-----	.04	-----	Chloride (Cl)-----	10	.28
Calcium (Ca)-----	117	5.84	Fluoride (F)-----	.4	.02
Magnesium (Mg)-----	11	.90	Nitrate (NO <sub>3</sub> )-----	9.8	.16
Sodium (Na)-----	9.4	.41	Dissolved solids-----	454	-----
Potassium (K)-----	3.8	10	Total hardness as CaCO <sub>3</sub> -----	337	-----
Bicarbonate (HCO <sub>3</sub> )-----	282	4.62			

## LAMB COUNTY

## AMHERST

Population in 1940: 749.

Source of information: E. D. House, water superintendent, Mar. 1, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1936 by J. M. Whitfield; depth, 210 feet; diameter 12½ inches; deep-well turbine pump and 25-horsepower electric motor; yield, 250 gallons a minute.

Well 2. Drilled in 1942; depth, 218 feet; diameter, 12 inches; deep-well turbine pump and electric motor; yield, 250 gallons a minute.

Pumpage (estimated): 150,000 gallons a day.

Storage: Elevated tank, 75,000 gallons.

Number of customers: 200.

Treatment: None.

*Analysis, well 1*

[Collected Mar. 1, 1945. pH is 7.7. Analyzed by M. L. Begley]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )-----	51	-----	Sulfate (SO <sub>4</sub> )-----	93	1.94
Iron (Fe)-----	.08	-----	Chloride (Cl)-----	98	2.76
Calcium (Ca)-----	66	3.29	Fluoride (F)-----	2.0	.11
Magnesium (Mg)-----	52	4.28	Nitrate (NO <sub>3</sub> )-----	6.3	.10
Sodium (Na)-----	41	1.78	Dissolved solids-----	577	-----
Potassium (K)-----	15	.38	Total hardness as CaCO <sub>3</sub> -----	378	-----
Bicarbonate (HCO <sub>3</sub> )-----	294	4.82			

## LITTLEFIELD

Population in 1940: 3,817.

Source of information: W. G. Street, water superintendent, Mar. 1, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Known as East well; drilled; depth, 130 feet; diameter, 15½ inches; deep-well turbine pump and electric motor; yield, 400 gallons a minute.

Well 2. Known as West well; drilled; depth, 130 feet; diameter, 12½ inches; deep-well turbine pump and electric motor; yield, 400 gallons a minute; temperature, 64° F.

Pumpage: Average, 400,000 gallons a day.

Storage: Concrete ground reservoir, 160,000 gallons; elevated tank, 75,000 gallons.

Number of customers: 1,050.

Treatment: None.

## Analysis, well 2

[Collected Mar. 1, 1945. pH is 7.7. Analyzed by M. L. Begley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	77	1.60
Iron (Fe)	.04		Chloride (Cl)	69	1.95
Calcium (Ca)	62	3.09	Fluoride (F)	2.0	.11
Magnesium (Mg)	39	3.21	Nitrate (NO <sub>3</sub> )	1.8	.03
Sodium (Na)	46	2.00	Dissolved solids	502	
Potassium (K)	14	.36	Total hardness as CaCO <sub>3</sub>	315	
Bicarbonate (HCO <sub>3</sub> )	303	4.97			

## Driller's logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Subsoil	3	3	Water sand and gravel with clay balls	5	87
Chalk	3	6	White water sand	11	98
Pink clay	14	20	Water gravel	2	100
Pink sandy clay	6	26	Yellow clay	19	119
Rock	5	31	Water sand	5	124
Caliche	9	40	Water sand and gravel	12	136
Pink sand and caliche	20	60	Yellow clay	12	148
Pink sand, seeps	9	69			
Water sand and gravel	13	82			
<b>Well 2</b>					
Subsoil	4	4	Pink sand, seeps	11	68
Chalk	5	9	Water sand and gravel	12	80
Pink clay	13	22	Pink clay	14	94
Pink sandy clay	5	27	White water sand	4	98
Rock chalk	3	30	Yellow clay	17	115
Caliche	8	38	Water sand and gravel	13	128
Pink sand and caliche	19	57	Yellow clay	2	130

## OLTON

Population in 1940: 782.

Source of information: B. A. Dodson, water superintendent, Mar. 1, 1945.

Ownership: Municipal.

Source of supply: Well at elevated tank; drilled in 1933; depth, 200 feet; diameter 12 inches; deep-well turbine pump and electric motor; yield, 250 gallons a minute.

Pumpage (estimated): 20,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 180.

Treatment: None.

### Analysis

[Collected Mar. 1, 1945. pH is 7.7. Analyzed by M. L. Begley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	33		Sulfate (SO <sub>4</sub> )	22	0.46
Iron (Fe)	12		Chloride (Cl)	20	.56
Calcium (Ca)	59	2.94	Fluoride (F)	2.8	.15
Magnesium (Mg)	29	2.38	Nitrate (NO <sub>3</sub> )	6.8	.11
Sodium (Na)	12	.50	Dissolved solids	335	
Potassium (K)	7.9	.20	Total hardness as CaCO <sub>3</sub>	266	
Bicarbonate (HCO <sub>3</sub> )	289	4.74			

### SUDAN

Population in 1940: 974.

Source of information: Frank White, water superintendent, Mar. 1, 1945.

Ownership: Municipal.

Source of supply: Five wells.

Well 1. Drilled in 1935 by H. J. McCarty; depth, 134 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Well 2. Drilled; depth, 134 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Well 3. Drilled; depth, 134 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Well 4. Drilled; depth, 150 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Well 5. Drilled; depth, 150 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Pumpage (estimated): 100,000 gallons a day.

Storage: Concrete ground reservoir, 100,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 298.

Treatment: None.

### Analysis, well 5

[Collected Mar. 1, 1945. pH is 7.7. Analyzed by M. L. Begley]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	66	1.37
Iron (Fe)	.00		Chloride (Cl)	50	1.41
Calcium (Ca)	82	4.09	Fluoride (F)	1.2	.06
Magnesium (Mg)	23	1.89	Nitrate (NO <sub>3</sub> )	1.5	.02
Sodium (Na)	30	1.31	Dissolved solids	453	
Potassium (K)	7.6	.19	Total hardness as CaCO <sub>3</sub>	299	
Bicarbonate (HCO <sub>3</sub> )	282	4.62			

## LIPSCOMB COUNTY

## BOOKER

Population in 1940: 386.

Source of information: E. E. McKee, water superintendent, June 24, 1948.

Ownership: Municipal.

Source of supply: Two wells at city water tower.

Well 1. Drilled in 1928 by Dade; depth, 310 feet; diameter, 8 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 100 gallons a minute.

Well 2. Drilled in 1940; depth, 315 feet; diameter, 12½ inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 95 feet below land surface in 1940; yield, 250 gallons a minute with drawdown of 21 feet.

Pumpage: Average, 40,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 215.

Treatment: None.

*Analysis, well 1*

[Collected June 24, 1948. pH is 7.3. Analyzed by D. E. Weaver]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	45		Sulfate (SO <sub>4</sub> )	34	0.71
Iron (Fe)	.05		Chloride (Cl)	64	1.81
Calcium (Ca)	69	3.44	Fluoride (F)	.4	.02
Magnesium (Mg)	30	2.47	Nitrate (NO <sub>3</sub> )	5.1	.08
Sodium (Na)	26	1.13	Dissolved solids	411	
Potassium (K)	3.6	.09	Total hardness as CaCO <sub>3</sub>	276	
Bicarbonate (HCO <sub>3</sub> )	272	4.46			

## FOLLETT

Population in 1940: 431.

Source of information: Carl Fleming, water superintendent, June 24, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1928; depth, 369 feet; diameter, 6 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 170 feet below land surface; yield, 80 gallons a minute.

Well 2. Drilled in 1930; depth, 370 feet; diameter, 8 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 100 gallons a minute.

Pumpage (estimated): Summer, 150,000 gallons a day; winter, 40,000 gallons a day.

Storage: Ground storage reservoir, 70,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 150.

Treatment: None.

*Analysis*

[Composite sample, collected June 24, 1948. pH is 8.0. Analyzed by H. D. Smith]

	Parts per million	Equivalent per millior		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	50		Sulfate (SO <sub>4</sub> )	21	0.44
Iron (Fe)	.05		Chloride (Cl)	45	1.27
Calcium (Ca)	47	2.35	Fluoride (F)	1.0	.05
Magnesium (Mg)	25	2.06	Nitrate (NO <sub>3</sub> )	4.5	.07
Sodium (Na)	34	1.48	Dissolved solids	358	
Potassium (K)	13	.33	Total hardness as CaCO <sub>3</sub>	220	
Bicarbonate (HCO <sub>3</sub> )	270	4.43			

**HIGGINS**

Population in 1940: 741.

Source of information: Ted Lorenz, water superintendent, June 24, 1948.

Ownership: Municipal.

Source of supply: Two wells 100 feet apart near city light plant.

Well 1. Drilled in 1926; depth, 130 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; yield on test, 240 gallons a minute for 99 minutes; on continuous pumping, pumpage decreased to less than 200 gallons a minute.

Well 2. Drilled in 1938; depth, 133 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 200 gallons a minute.

Pumpage (estimated): Summer, 150,000 gallons a day; winter, 75,000 gallons a day.

Storage: Ground storage reservoir, 55,000 gallons; elevated tank, 250,000 gallons. (System tied into the Santa Fe Railroad reservoir, 185,000 gallons.)

Number of customers: 217.

Treatment: None.

*Analysis, well 2*

[Collected June 24, 1948. pH is 7.5. Analyzed by H. D. Smith]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	46		Sulfate (SO <sub>4</sub> )	9.5	0.20
Iron (Fe)	.00		Chloride (Cl)	14	.39
Calcium (Ca)	71	3.54	Fluoride (F)	.6	.03
Magnesium (Mg)	11	.90	Nitrate (NO <sub>3</sub> )	7.2	.12
Sodium (Na)	19	.33	Dissolved solids	292	
Potassium (K)	4.8	.12	Total hardness as CaCO <sub>3</sub>	222	
Bicarbonate (HCO <sub>3</sub> )	286	4.69			

**LUBBOCK COUNTY****IDALOU**

Population in 1940: 503.

Source of information: Mrs. J. T. Carlton, city secretary, Mar. 12, 1947.

Ownership: Municipal.

Source of supply: Well at elevated tank; drilled in 1925 by L. A. Peeples; depth, 125 feet; diameter, 15 inches; deep-well turbine pump and 10-horsepower electric motor.

Pumpage (estimated): 30,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 153.

Treatment: None.

## Analysis

[Collected Mar. 12, 1947. pH is 7.2. Analyzed by B. C. Dwyer]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	32		Sulfate (SO <sub>4</sub> )	67	1.39
Iron (Fe)	.09		Chloride (Cl)	78	2.20
Calcium (Ca)	54	2.70	Fluoride (F)	6.0	.32
Magnesium (Mg)	68	5.59	Nitrate (NO <sub>3</sub> )	5.5	.09
Sodium (Na)	36	1.58	Dissolved solids	565	
Potassium (K)	9.1	.28	Total hardness as CaCO <sub>3</sub>	414	
Bicarbonate (HCO <sub>3</sub> )	372	6.10			

## LUBBOCK

Population in 1940: 31,853.

Source of information: A. L. King, city engineer, Sept. 25, 1945.

Ownership: Municipal.

Source of supply: Nineteen wells.

Well 1. Three-quarters of a mile northeast of Lubbock post office; drilled in 1925 by Grant Baker; depth, 98 feet; diameter, 24 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 28.4 feet below land surface Sept. 25, 1944; drawdown reported, 50 feet while pumping 60 gallons a minute in 1925; yield, 600 gallons a minute.

Well 2. Drilled in 1917 by T. P. Wright; depth, 300 feet; diameter, 24 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 81.3 feet below land surface Sept. 26, 1944; drawdown reported, 57 feet while pumping 617 gallons a minute in 1932.

Well 3. Drilled in 1925 by D. L. McDonald; depth, 210 feet; diameter, 24 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 72.3 feet below land surface Sept. 25, 1944.

Well 4. Drilled in 1928 by B. B. Baron; depth, 156 feet; diameter, 24 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 67.42 feet below land surface Oct. 2, 1934.

Well 5. Drilled in 1929 by Coy Rodgers; depth, 150 feet; diameter, 24 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 72.2 feet below land surface Sept. 26, 1944; drawdown, 49 feet while pumping 440 gallons a minute in 1929.

Well 6. Drilled in 1931 by D. L. McDonald; depth, 142 feet; diameter, 18 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 80.0 feet below land surface Sept. 25, 1944; drawdown, 64 feet while pumping 430 gallons a minute in 1932.

Well 7. Drilled in 1931 by D. L. McDonald; depth, 158 feet; diameter, 18 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 68.1 feet below land surface Sept. 28, 1944; drawdown, 56 feet while pumping 780 gallons a minute.

Well 8. Drilled in 1931 by D. L. McDonald; depth, 157 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 76.4 feet below land surface Sept. 28, 1944.

- Well 9. Drilled in 1937 by B. B. Baron; depth, 151 feet; diameter, 22 to 18 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 66.5 feet below land surface Sept. 28, 1944; drawdown, 55 feet while pumping 650 gallons a minute in 1937.
- Well 10. Drilled in 1938 by Crawford and Anderson; depth, 151 feet; diameter, 24 to 18 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 67.4 feet below land surface Sept. 25, 1944; yield, 850 gallons a minute March 1938.
- Well 11. Drilled in 1938 by Crawford and Anderson; depth, 145 feet; diameter 24 to 18 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 61.7 feet below land surface Sept. 28, 1944; drawdown, 36 feet while pumping 500 gallons a minute in 1938.
- Well 12. Drilled in 1938 by Crawford and Anderson; depth, 145 feet; diameter 22 to 18 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 58.4 feet below land surface Sept. 28, 1944; drawdown 53 feet while pumping 430 gallons a minute in 1938.
- Well 13. Drilled in 1939 by Crawford and Anderson; depth, 150 feet; diameter, 22 to 18 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 53.7 feet below land surface Sept. 25, 1944; drawdown 35 feet while pumping 640 gallons a minute in 1939.
- Well 14. Drilled in 1940 by Crawford and Anderson; depth, 135 feet; diameter, 22 to 18 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 59.4 feet below land surface Sept. 26, 1944; drawdown 65 feet while pumping 535 gallons a minute in 1940.
- Well 15. Drilled in 1940 by Crawford and Anderson; depth, 135 feet; diameter 22 to 18 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 60.2 feet below land surface Sept. 25, 1944; drawdown, 41 feet while pumping 890 gallons a minute in 1940.
- Well 16. Drilled in 1941 by L. A. Peebles; depth, 135 feet; diameter, 22 to 18 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 54.6 feet below land surface Sept. 28, 1944; drawdown, 78 feet while pumping 640 gallons a minute in 1941.
- Well 17. Drilled in 1941 by L. A. Peebles; depth, 125 feet; diameter, 22 to 18 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 42.3 feet below land surface Sept. 30, 1944; drawdown, 45 feet while pumping 825 gallons a minute in 1943.
- Well 18. Drilled in 1943 by Geo. Anderson; depth, 110 feet; diameter, 22 to 18 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 25.6 feet below land surface Sept. 30, 1944; drawdown, 65 feet while pumping 700 gallons a minute in 1943.
- Well 19. Drilled in 1945 by L. A. Peebles; depth, 145 feet; diameter, 22 to 18 inches; deep-well turbine pump and electric motor; static water level, 26.5 feet below land surface Jan. 29, 1945; drawdown, 23 feet while pumping 1,050 gallons a minute.

*Average pumpage, in gallons a day*

	1942	1943	1944
January	2,440,000	2,850,000	2,630,000
February	2,620,000	3,170,000	2,750,000
March	3,040,000	4,500,000	4,500,000
April	3,150,000	4,670,000	4,070,000
May	5,100,000	4,430,000	4,400,000
June	6,150,000	5,280,000	6,170,000
July	5,730,000	6,160,000	5,000,000
August	4,840,000	8,220,000	5,960,000
September	2,780,000	4,700,000	4,100,000
October	2,480,000	3,480,000	3,420,000
November	2,830,000	3,080,000	3,090,000
December	2,690,000	2,720,000	2,750,000

Storage: Six concrete ground storage reservoirs, total capacity, 7,435,000 gallons.

Number of customers: 8,700.

Treatment: None.

*Analyses*

[Collected: Well 2, Feb. 15, 1944; well 5, Oct. 2, 1944. pH, well 2, is 8.1. Analyzed by J. H. Rowley]

	Well 2		Well 5	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	52			
Iron (Fe)	.02			
Calcium (Ca)	57	2.85	53	2.65
Magnesium (Mg)	65	5.35	60	4.93
Sodium (Na)	79	3.44	118	5.11
Potassium (K)	23	.59		
Bicarbonate (HCO <sub>3</sub> )	318	5.21	318	5.21
Sulfate (SO <sub>4</sub> )	169	3.52	153	3.19
Chloride (Cl)	110	3.10	150	4.23
Fluoride (F)	5.4	.28		
Nitrate (NO <sub>3</sub> )	7.5	.12	3.8	.06
Dissolved solids	746		654	
Total hardness as CaCO <sub>3</sub>	410		379	

[Collected: Wells 6 and 13, Sept. 22, 1944; well 16, Sept. 25, 1944; well 19, Feb. 15, 1945. pH, well 19, is 7.5. Analyzed by J. H. Rowley]

	Well 6		Well 13	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Calcium (Ca)	78	3.89	77	3.79
Magnesium (Mg)	86	7.07	94	7.73
Sodium and potassium (Na + K)	114	4.94	166	7.21
Bicarbonate (HCO <sub>3</sub> )	354	5.80	345	5.65
Sulfate (SO <sub>4</sub> )	319	6.64	421	8.77
Chloride (Cl)	114	3.22	147	4.12
Fluoride (F)	3.3	.17	3.2	.17
Nitrate (NO <sub>3</sub> )	4.1	.07	1.5	.02
Dissolved solids	893		1,087	
Total hardness as CaCO <sub>3</sub>	548		577	

	Well 16		Well 19	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )			64	
Iron (Fe)			06	
Calcium (Ca)	45	2.25	69	3.44
Magnesium (Mg)	58	4.77	80	6.58
Sodium and potassium (Na + K)	59	2.55	150	6.50
Bicarbonate (HCO <sub>3</sub> )	249	4.08	317	5.20
Sulfate (SO <sub>4</sub> )	120	2.50	272	5.66
Chloride (Cl)	98	2.76	190	5.36
Fluoride (F)	3.5	.18	4.1	.22
Nitrate (NO <sub>3</sub> )	2.8	.05	5.1	.08
Dissolved solids	619		990	
Total hardness as CaCO <sub>3</sub>	351		501	

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 15</b>					
Caliche	20	20	Red clay	21	106
Sandy red rock and red clay	32	52	Water sand	22	128
Hard sandrock	3	55	Red clay	2	130
Red water sand	8	63	Gray clay	20	150
Red sandrock	5	68	Caliche rock	10	160
Water sand	17	85			
<b>Well 16</b>					
Top soil	4	4	Rock	2	63
Caliche clay and sandy caliche	31	35	Red sand, water	12	75
Caliche rock (water at 39 feet)	15	50	Red clay	4	79
Red sand, water	11	61	Sand and gravel, water	82	111
			Red clay	24	135
			Clayey fine-grained sand	18	153
<b>Well 19</b>					
Top soil and caliche clay	20	20	Coarse sand and gravel, water	13	107
Caliche clay and small rock	10	30	Sandy red clay	38	140
Gray sand, water	13	43	Dry packed sand	11	151
Sandy red clay	40	83	White caliche rock	3	154
Red sand, honeycomb rock and some gravel, water	11	94			

**SLATON**

Population in 1940: 3,587.

Source of information: City secretary, Feb. 7, 1944.

Ownership: Municipal.

Source of supply: Three wells in well field about 1 mile north of town.

Well 1. Drilled in 1925 by W. M. Edwards; depth, 135 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 235 gallons a minute.

Well 2. Drilled by D. W. McDonald; depth, 125 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 140 gallons a minute.

Well 3. Drilled; depth, 206 feet; diameter, 18 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 99.6 feet below land surface Jan. 18, 1937; yield, 360 gallons a minute; temperature, 65° F.

Pumpage (estimated): 150,000 gallons a day.

Storage: Ground reservoir at well field, 50,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 950.

Treatment: None.

### Analysis, well 1

[Collected Feb. 17, 1944. pH is 8.3. Analyzed by J. H. Rowley.]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	51		Sulfate (SO <sub>4</sub> )	121	2.52
Iron (Fe)	.02		Chloride (Cl)	71	2.00
Calcium (Ca)	42	2.10	Fluoride (F)	5.9	.31
Magnesium (Mg)	51	4.19	Nitrate (NO <sub>3</sub> )	3.0	.05
Sodium (Na)	88	3.81	Dissolved solids	611	
Potassium (K)	15	.38	Total hardness as CaCO <sub>3</sub>	314	
Bicarbonate (HCO <sub>3</sub> )	342	5.60			

### Driller's log, well 1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
No record	84	84	Hard red clay	3	119
Fine soft sand, little water	5	89	Fine-grained sand, water	4	123
Stiff red clay	3	92	Sand, water	9	132
Sand and clay	14	106	Large gravel, rock and coarse sand, water	3	135
Sand, some water	10	116			

## LYNN COUNTY

### O'DONNELL

Population in 1940: 1,187.

Source of information: Rochelle Howard, water superintendent, Nov. 29, 1946.

Ownership: Municipal.

Source of supply: Nine wells.

Well 1. At elevated tank; depth, 82 feet; deep-well cylinder pump and  $\frac{3}{4}$ -horsepower electric motor; static water level reported, 70 feet below land surface; yield reported, about 3 gallons a minute in November 1946.

Well 2. At elevated tank; depth, 82 feet; deep-well cylinder pump and  $1\frac{1}{2}$ -horsepower electric motor; static water level reported, 70 feet below land surface; yield reported, about 2 gallons a minute in November 1946.

Well 3. At elevated tank; depth, 90 feet; deep-well cylinder pump and  $\frac{3}{4}$ -horsepower electric motor; static water level reported, 70 feet below land surface; yield reported, about 3 gallons a minute in November 1946.

Well 4. In northeast corner of city limits; depth, 82 feet; deep-well cylinder and  $\frac{3}{4}$ -horsepower electric motor; static water level reported, 70 feet below land surface; yield reported, about 4 gallons a minute in November 1946.

Well 5. In northeast corner of city limits; depth, 82 feet; deep-well cylinder pump and  $\frac{3}{4}$ -horsepower electric motor; static water level reported, 70 feet below land surface; yield reported, about 5 gallons a minute in November 1946.

Well 6. At intersection of U. S. Highway 87 bypass and business routes north of O'Donnell; drilled in 1938; depth, 62 feet; deep-well cylinder pump and 2-horsepower electric motor; static water level reported, 58 feet below land surface; yield reported, about 8 gallons a minute in November 1946.

Well 7. West of intersection of U. S. Highway 87 bypass and business routes north of O'Donnell; drilled in 1945; depth, 64 feet; deep-well turbine pump and 3-horsepower electric motor; static water level reported, 52 feet below land surface; yield reported, 25 gallons a minute in November 1946.

Well 8. West of intersection of U. S. Highway 87 bypass and business routes north of O'Donnell; drilled in April 1945; depth, 62 feet; deep-well turbine pump and 3-horsepower electric motor; static water level reported, 52 feet below land surface.

Well 9. West of elevated tank; drilled in 1934 by Charlie Nunally; depth, 67 feet; diameter, 5 $\frac{5}{8}$  inches; Hi-lift pump and 3-horsepower electric motor; static water level reported, 22 feet below land surface; yield reported, about 50 gallons a minute in November 1946.

Pumpage: Minimum, 50,000 gallons a day; maximum, 150,000 gallons a day.  
Storage: Elevated tank, 55,000 gallons; ground storage reservoir, 76,900 gallons.

Number of customers: 300.

Treatment: Chlorination.

### Analysis

[Composite sample of all wells. Collected Nov. 29, 1946. pH is 7.4. Analyzed by C. P. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Iron (Fe)-----	0.17	-----	Sulfate (SO <sub>4</sub> )-----	507	10.56
Calcium (Ca)-----	116	5.79	Chloride (Cl)-----	452	12.75
Magnesium (Mg)-----	127	10.44	Fluoride (F)-----	5.6	.29
Sodium (Na)-----	296	12.88	Nitrate (NO <sub>3</sub> )-----	6.2	.10
Potassium (K)-----	40	1.02	Dissolved solids-----	1,890	-----
Bicarbonate (HCO <sub>3</sub> )-----	392	6.43	Total hardness as CaCO <sub>3</sub> -----	812	-----

### TAHOKA

Population in 1940: 2,129.

Source of information: G. H. Hines, water superintendent, Nov. 20, 1946.

Ownership: Municipal.

Source of supply: Eight wells.

Well 1. About 3 miles north of elevated tank; drilled in 1937 by L. A. Peeples; depth, 80 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 52 feet below land surface; yield, 150 gallons a minute.

Well 2. About 3 miles north of elevated tank; drilled in 1937 by L. A. Peeples; depth, 80 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 150 gallons a minute.

Well 3. Northeast of well 1; drilled in 1939 by L. A. Peeples; depth, 80 feet; diameter, 10 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 100 gallons a minute.

Well 4. Three miles north of elevated tank; drilled in 1939 by L. A. Peeples; depth, 80 feet; diameter, 10 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 100 gallons a minute.

Well 5. Three miles north of elevated tank, northeast of well 3; drilled in 1941 by L. A. Peeples; depth, 80 feet; diameter, 10 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 100 gallons a minute.

Well 6. Four miles north of elevated tank; drilled in January 1946 by L. M. Bankson; depth, 80 feet; diameter, 10 inches; well not equipped for service on Nov. 29, 1946.

Well 7. Four miles north of elevated tank; drilled in January 1946 by L. M. Bankson; depth, 80 feet; diameter, 10 inches; well not equipped for service on Nov. 29, 1946.

Well 8. Four miles north of elevated tank; drilled in November 1946 by G. C. Paulk; depth, 92 feet; diameter, 10 inches; pumping equipment not installed Nov. 29, 1946.

Pumpage (estimated): Average, 300,000 gallons a day.

Storage: Ground storage reservoir, 255,000 gallons; elevated tank, 55,000 gallons.

Number of customers: 678.

Treatment: Chlorination.

### Analysis

[Composite sample of five wells. Collected Nov. 29, 1946. pH is 7.8. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	37		Sulfate (SO <sub>4</sub> )	5.4	0.11
Iron (Fe)	.04		Chloride (Cl)	28	.79
Calcium (Ca)	48	2.40	Fluoride (F)	5.6	.29
Magnesium (Mg)	45	3.70	Nitrate (NO <sub>3</sub> )	3.5	.06
Sodium (Na)	26	1.12	Dissolved solids	387	
Potassium (K)	5.2	.13	Total hardness as CaCO <sub>3</sub>	305	
Bicarbonate (HCO <sub>3</sub> )	372	6.10			

### Driller's log, well 1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil	6	6	Hard rock	10	59
Caliche	40	46	Sand and gravel	21	80
Sandrock	3	49	Yellow clay at 80 feet		

## MARTIN COUNTY

### STANTON

Population in 1940: 1,245.

Source of information: G. B. Shelburne, Dec. 18, 1946.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. Half a block north of elevated tank; drilled in 1927; depth, 142 feet; diameter, 6 inches; deep-well cylinder pump and 7½-horsepower electric motor; yield, 50 gallons a minute.

Well 2. A quarter of a block northwest of elevated tank; drilled in 1930; depth, 135 feet; diameter, 8 inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 65 feet below land surface; yield, 150 gallons a minute.

Well 3. Three-quarters of a block northeast of elevated tank and half a block east of well 1; drilled in 1943 by Skeen Bros.; depth, 149 feet; diameter, 8 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 80 gallons a minute.

Well 4. Six hundred feet southwest of elevated tank; drilled in 1946 by L. Graves; depth, 160 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 150 gallons a minute.

*Average pumpage, in gallons a day*

1945

January.....	34,931	May.....	93,265	September.....	94,126
February.....	43,421	June.....	139,407	October.....	49,760
March.....	35,185	July.....	65,865	November.....	54,201
April.....	66,160	August.....	110,326	December.....	52,508

Storage: Ground storage reservoir, 50,000 gallons; elevated tank, 75,000 gallons.

Number of customers: 310.

Treatment: None.

*Analysis*

[Composite sample of wells 1, 2, and 3. Collected Dec. 18, 1946. pH is 7.4. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	36		Sulfate (SO <sub>4</sub> ).....	426	8.87
Iron (Fe).....	.17		Chloride (Cl).....	208	5.87
Calcium (Ca).....	128	6.39	Fluoride (F).....	3.2	.17
Magnesium (Mg).....	65	5.35	Nitrate (NO <sub>3</sub> ).....	6.4	.10
Sodium (Na).....	178	7.73	Dissolved solids.....	1,210	
Potassium (K).....	13	.33	Total hardness as CaCO <sub>3</sub> .....	587	
Bicarbonate (HCO <sub>3</sub> ).....	292	4.79			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil.....	4	4	Boulders.....	10	56
Caliche.....	20	24	Dry red sand.....	12	68
Boulders.....	5	29	Quicksand, water.....	18	86
Dry sand.....	7	36	Red clay.....	5	91
Boulders.....	5	41	Water sand and gravel.....	21	112
Dry sand.....	5	46	Lime rock.....	30	142

MIDLAND COUNTY

MIDLAND

Population in 1940: 9,352.

Source of information: A. B. Cole, water superintendent, Dec. 18, 1946.

Ownership: Municipal.

Source of supply: Fourteen wells in two well fields.

Rosedale well 1. Two and three-quarter miles east of city hall; drilled in 1940 by Chas. Skeen; depth, 137 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 35 feet below land surface; yield, 130 gallons a minute when drilled.

Rosedale well 2. About  $2\frac{1}{4}$  miles east of city hall; drilled in January 1940 by T. Hines; depth, 127 feet; diameter, 16 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 35 feet below land surface; yield, 160 gallons a minute when drilled.

Rosedale well 3. About  $2\frac{3}{4}$  miles east of city hall; drilled in June 1940 by T. Hines; depth, 109 feet; diameter, 16 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 190 gallons a minute when drilled.

Rosedale well 4. About  $2\frac{3}{4}$  miles east of city hall; drilled in June 1940 by Chas. Skeen; depth, 127 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 295 gallons a minute when drilled.

Rosedale well 7. Two and three-quarter miles east of city hall; drilled in 1942 by Chas. Skeen; depth, 130 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 225 gallons a minute.

Rosedale well 8. Two and three-quarter miles east of city hall; drilled in May 1941 by Chas. Skeen; depth, 147 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 225 gallons a minute.

Cloverdale well 1. Four miles east of city hall; drilled in 1927 by Layne-Texas Co.; depth, 110 feet; diameter, 20 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 35 feet below land surface; yield, 500 gallons a minute with drawdown of 15 feet.

Cloverdale well 3. Four miles east of city hall; drilled in 1934 by Watson and Hines; depth, 115 feet; diameter,  $15\frac{1}{2}$  inches; deep-well turbine pump and 10-horsepower electric motor; yield, 225 gallons a minute.

Cloverdale well 4. Four miles east of city hall; drilled in 1935 by Watson and Hines; depth, 125 feet; diameter,  $15\frac{1}{2}$  inches; deep-well turbine pump and 20-horsepower electric motor; yield, 400 gallons a minute with drawdown of 25 feet.

Cloverdale well 5. Four miles east of city hall; drilled in 1935 by Watson and Hines; depth, 128 feet; diameter, 16 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 200 gallons a minute.

Cloverdale well 6. Four miles east of city hall; drilled in 1936 by Watson and Hines; depth, 128 feet; diameter, 17 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 400 gallons a minute with drawdown of 37 feet.

Cloverdale well 7. Four miles east of city hall; drilled in 1937 by Watson and Hines; depth, 115 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 300 gallons a minute with drawdown of 56 feet.

Cloverdale well 8. Four miles east of city hall; drilled in 1940 by Watson and Hines; depth, 135 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 300 gallons a minute.

Cloverdale well 9. Four miles east of city hall; drilled in 1946 by T. Hines; depth, 130 feet; diameter, 16 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 300 gallons a minute.

Pumpage (estimated): Average, 2,500,000 gallons a day.

Storage: Ground storage reservoir, 1,000,000 gallons; ground storage reservoir, 500,000 gallons; ground storage reservoir, 300,000 gallons; elevated tank, 2,225,000 gallons; elevated tank, 300,000 gallons; elevated tank, 100,000 gallons.

Number of customers: 3,000.

Treatment: Chlorination.

### Analyses

[Collected Dec. 18, 1946. pH, each well, is 7.4. Analyzed by C. B. Cibulka]

	Rosedale well field (Composite sample from 6 wells)		Cloverdale well field (Composite sample from 8 wells)	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	53	-----	53	-----
Iron (Fe).....	.08	-----	.27	-----
Calcium (Ca).....	153	7.64	154	7.69
Magnesium (Mg).....	94	7.73	95	7.81
Sodium (Na).....	219	9.54	217	9.43
Potassium (K).....	14	.36	15	.38
Bicarbonate (HCO <sub>3</sub> ).....	244	4.00	244	4.00
Sulfate (SO <sub>4</sub> ).....	540	11.24	541	11.26
Chloride (Cl).....	344	9.70	342	9.65
Fluoride (F).....	1.8	.09	3.2	.17
Nitrate (NO <sub>3</sub> ).....	15	.24	14	.23
Dissolved solids.....	1,550	-----	1,550	-----
Total hardness as CaCO <sub>3</sub> .....	768	-----	775	-----

### Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Rosedale well 1</b>					
Top soil.....	10	10	Water sand.....	10	115
Caliche.....	15	25	Broken lime.....	5	120
Lime.....	15	40	Sand and gravel.....	10	130
Water sand.....	15	55	Brown sand.....	5	135
Lime.....	35	90	Red beds.....	2	137
Sand.....	15	105			
<b>Rosedale well 2</b>					
Top soil.....	10	10	Yellow sand.....	5	85
Caliche.....	15	25	Hard gravel.....	30	115
Sand and caliche.....	10	35	Sand.....	5	120
Sand and gravel.....	12	47	Brown lime.....	5	125
Water sand.....	18	65	Red beds.....	2	127
Sand and gravel.....	15	80			
<b>Rosedale well 3</b>					
Top soil.....	3	3	Sand.....	6	70
Caliche.....	42	45	Rock.....	4	30
Water sand.....	5	50	Sand and gravel.....	23	168
Lime.....	10	60	Red beds.....	6	109
Hard shells.....	10	70			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Rosedale well 4</b>					
Top soil.....	4	4	Sand and blue shale.....	25	100
Caliche.....	39	43	Gravel.....	25	125
Water sand.....	9	52	Red beds.....	2	127
Sand and gravel.....	23	75			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Rosedale well 8</b>					
Top soil.....	5	5	Gravel, water, some sand.....	5	65
Gray clay.....	5	10	Water sand (1 foot of clay)...	5	70
Caliche and clay.....	5	15	Water sand and gravel.....	5	75
Chalk rock and caliche, very white.....	10	25	Gray clay (some red clay).....	5	80
Caliche (hard rock at 27 feet)...	5	30	Clay (some red clay).....	5	85
Hard rock.....	5	35	Clay and gravel.....	20	105
Gray clay (1 foot of hard rock)...	5	40	Shelly sandrock.....	5	110
Sand and gravel (1 foot of hard rock; tested 40 gallons a minute)...	5	45	Sandrock and clay.....	5	115
Sand and gravel, little clay...	5	50	Hard gravel and clay.....	5	120
Gravel (1 foot of hard rock)...	5	55	Hard sandrock.....	5	125
Packed sand and clay.....	5	60	Water sand.....	10	135
			Gravel, sand, and some clay...	5	140
			Sand and clay.....	5	145
			Red beds.....	2	147

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Cloverdale well 3</b>					
Top soil.....	10	10	Gypsum.....	10	65
Caliche.....	10	20	Hard lime.....	6	71
Gypsum.....	10	30	Water sand and gravel.....	30	101
Sandy clay.....	15	45	Red rock.....	2	108
Clay.....	5	50	Water sand and gravel.....	12	115
Water sand.....	5	55	Gray clay.....	15	130

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Cloverdale well 4</b>					
Caliche.....	35	35	Blue shale.....	8	93
Lime.....	11	46	Lime.....	1	94
Water sand.....	2	48	Red rock.....	1	95
Hard lime.....	12	60	Hard gravel.....	12	107
Gravel.....	13	73	Gravel.....	5	112
Red rock.....	5	78	Clay.....	13	125
Gravel.....	7	85			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Cloverdale well 5</b>					
Caliche.....	35	35	Blue shale.....	8	93
Lime.....	11	46	Red rock.....	2	95
Sand.....	4	50	Hard gravel.....	10	105
Lime.....	10	60	Gravel and shale.....	2	107
Gravel.....	13	73	Gravel.....	5	112
Red rock.....	5	78	Clay.....	16	128
Gravel.....	7	85			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Cloverdale well 6</b>					
Caliche.....	25	25	Lime and sand.....	14	74
Sand and clay.....	25	50	Sand and gravel.....	50	124
Water sand.....	10	60	Blue clay.....	4	128

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Cloverdale well 8</b>					
Top soil.....	8	8	Water sand.....	20	80
Caliche.....	17	25	Shale.....	5	85
Hard sand.....	5	30	Hard shell.....	2	87
Hard lime.....	8	38	Sand and gravel.....	42	129
Lime.....	18	56	Red beds.....	6	135
Shale.....	4	60			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Cloverdale well 9</b>					
Sandy soil.....	10	10	Mixed sand and clay, water..	6	63
Mixed clay and gypsum.....	27	37	Mixed fine sand and clay.....	22	85
Rock.....	8	45	Yellow clay.....	17	102
Clay.....	3	48	Mixed clay and sand.....	13	115
Dry packed sand.....	2	50	Yellow clay.....	14	129
Mixed sand and clay.....	5	55	Red beds.....	1	130
Rock.....	2	57			

## MITCHELL COUNTY

## COLORADO CITY

Population in 1940: 5,213.

Source of information: H. F. McCorcle, pump supervisor, May 29, 1946.

Ownership: Municipal.

Source of supply: Sixteen wells.

Well 1. About 2,800 feet northeast of 17th and Chestnut Streets; drilled in 1927 by W. T. Vedder; depth, 223 feet; diameter, 15 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 124.8 feet below land surface Mar. 7, 1946; yield, 60 gallons a minute with a pumping level of 156 feet below land surface Mar. 19, 1946.

Well 2. About 1,150 feet west of well 1; drilled in 1921 by W. T. Vedder; depth, 220 feet; diameter, 15 inches; deep-well turbine pump and 20 horsepower electric motor; static water level, 133.5 feet below land surface Mar. 5, 1946; yield, 75 gallons a minute with a pumping level of 162 feet below land surface Mar. 6, 1946.

Well 3. About 2,050 feet south of well 2; drilled; depth, 220 feet; diameter, 8 inches; deep-well cylinder pump and 10-horsepower electric motor; static water level, 116.4 feet below land surface Mar. 5, 1946; yield, 23 gallons a minute.

Well 4. About 800 feet south of well 3; drilled in 1925 by Claude Bell; depth, 220 feet; deep-well turbine pump and 10-horsepower electric motor; static water level, 119.6 feet below land surface Mar. 5, 1946; yield, 21 gallons a minute with pumping level of 176 feet below land surface Mar. 9, 1946.

Well 5. About 500 feet south of well 4; drilled; depth, about 220 feet; deep-well turbine pump and 10-horsepower electric motor; static water level, 110.3 feet below land surface Mar. 7, 1946; yield, 75 gallons a minute with pumping level of 150 feet below land surface March 1946.

Well 6. About 425 feet northwest of well 5; drilled; depth, about 220 feet; deep-well cylinder pump and electric motor; static water level, 117.8 feet below land surface Mar. 5, 1946; yield, 22 gallons a minute with pumping level of 130.5 feet below land surface March 1946.

Well 7. About 400 feet northwest of well 6; drilled; depth, about 220 feet; deep-well cylinder pump and 10-horsepower electric motor; yield, 32 gallons a minute.

Well 8. About 400 feet north of well 7; drilled; depth, about 220 feet; deep-well cylinder pump and 10-horsepower electric motor; static water level, 110.9 feet below land surface Mar. 5, 1946; yield 18 gallons a minute with pumping level of 196.8 feet below land surface March 1946.

- Well 9. About 400 feet north of well 7; drilled; depth, about 220 feet; deep-well cylinder pump and 10-horsepower electric motor; static water level, 112.9 feet below land surface Mar. 5, 1946; yield, 30 gallons a minute with pumping level of 200 feet below land surface March 1946.
- Well 10. About 800 feet southeast of well 9; drilled in 1930; depth, 240 feet; diameter, 15 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 122 feet below land surface Mar. 6, 1946; yield, 75 gallons a minute with pumping level of 152 feet below land surface.
- Well 11. About 2,750 feet northwest of well 10; drilled in 1936; depth, 233 feet; deep-well turbine pump and electric motor; static water level, 137.4 feet below land surface Mar. 7, 1946; yield, 90 gallons a minute with pumping level of 162 feet below land surface.
- Well 12. About 1,550 feet northeast of well 11; drilled in 1944 by Olin House; depth, 255 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 143.3 feet below land surface Mar. 5, 1945; yield, 95 gallons a minute with pumping level of 192.5 feet below land surface March 1946.
- Well 13. About 1,150 feet west of well 12; drilled in 1944 by Olin House; depth, 249 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 128.2 feet below land surface Mar. 5, 1946; yield, 55 gallons a minute with pumping level of 183 feet below land surface March 1946.
- Well 14. About 1,250 feet south of well 13; drilled in 1944 by Olin House; depth, 238 feet; diameter, 10 inches; deep-well turbine pump and 10-horsepower electric motor; static water level, 127.9 feet below land surface Mar. 5, 1946; yield, 35 gallons a minute with pumping level of 171 feet below land surface March 1946.
- Well 16. In City Park about 950 feet southwest of State Highway 18 and Texas & Pacific Railroad; drilled in 1922; depth, 256 feet; deep-well cylinder pump and 5-horsepower electric motor; static water level, 77.2 feet below land surface Mar. 8, 1946; yield, 25 gallons a minute.
- Well 17. About 500 feet east of well 16; drilled in 1922; depth, 256 feet; diameter, 8 inches; deep-well cylinder pump and 5-horsepower electric motor; static water level, 84.2 feet below land surface Mar. 8, 1946; yield, 20 gallons a minute.

*Average pumpage, in gallons a day*

1940

January.....	171,700	May.....	262,300	September.....	278,800
February.....	188,800	June.....	276,200	October.....	244,200
March.....	170,300	July.....	281,900	November.....	230,000
April.....	205,800	August.....	433,600	December.....	156,700

Storage: Four ground storage reservoirs: 1,000,000 gallons, 169,000 gallons, 125,000 gallons, and 125,000 gallons, respectively; elevated tank, 100,000 gallons; standpipe, 70,000 gallons.

Number of customers: 1,500.

Treatment: Chlorination.

*Analysis*

[Composite sample of 14 wells. Collected May 29, 1946. pH is 7.9. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	16		Sulfate (SO <sub>4</sub> )	29 <sup>7</sup>	6.20
Iron (Fe)	55		Chloride (Cl)	54	1.52
Calcium (Ca)	94	4.69	Fluoride (F)	1.4	.07
Magnesium (Mg)	49	4.03	Nitrate (NO <sub>3</sub> )	.0	.00
Sodium (Na)	90	3.91	Dissolved solids	83 <sup>7</sup>	
Potassium (K)	26	.67	Total hardness as CaCO <sub>3</sub>	43 <sup>7</sup>	
Bicarbonate (HCO <sub>3</sub> )	336	5.51			

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 12</b>					
Surface sand	10	10	Water sand	20	165
Sandy clay	10	20	Blue clay	17	182
Sand and gravel	20	40	Soft rock	2	184
Red clay	30	70	Hard rock	3	187
Sandrock	10	80	Water-bearing sand	68.5	255.5
Blue clay	25	105	Red beds	.5	256
Sandrock	40	145			
<b>Well 13</b>					
Surface sand	5	5	Water sand	20	160
Red clay	10	15	Blue clay	10	170
Gravel	5	20	Rock	3	173
Sandrock	10	30	Water sand	76	249
Red clay	40	70	Red beds		249
Blue clay	70	140			
<b>Well 14</b>					
Top sand	10	10	Blue clay	28	138
Sandstone	20	30	Water sand	7	145
Red clay	40	70	Blue clay	23	168
Sandstone	15	85	Sandstone and conglomerate	70	238
Red clay	25	110			

**MOORE COUNTY****DUMAS**

Population in 1940: 2,117 (estimated 5,000 in 1947).

Source of information: J. W. Mills, city clerk, Nov. 21, 1947.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. Drilled in 1931 by Leo McDade; depth, 565 feet; diameter, 15½ inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 260 feet below land surface.

Well 2. Drilled in 1931; depth, 576 feet; diameter, 15½ inches; deep-well turbine pump and 50-horsepower electric motor.

Well 3. Drilled in 1944 by H. H. Heiskell; depth, 600 feet; diameter, 15½ inches; deep-well turbine pump and 50-horsepower electric motor; yield, 400 gallons a minute.

Well 4. Drilled in 1946; depth, 360 feet; diameter, 15½ inches; deep-well turbine pump and 50-horsepower electric motor; yield, 200 gallons a minute.

Pumpage: Maximum 894,000 gallons a day; minimum, 235,000 gallons a day. Storage: Ground storage reservoir, 200,000 gallons; elevated tank, 50,000 gallons.

Treatment: Chlorination.

### Analysis, well 2

[Collected Mar. 17, 1948. pH is 7.1. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	16		Sulfate (SO <sub>4</sub> )	98	2.04
Iron (Fe)	.55		Chloride (Cl)	11	.31
Calcium (Ca)	43	2.15	Fluoride (F)	1.8	.09
Magnesium (Mg)	19	1.56	Nitrate (NO <sub>3</sub> )	.0	.00
Sodium (Na)	95	4.13	Dissolved solids	466	
Potassium (K)	10	.26	Total hardness as CaCO <sub>3</sub>	186	
Bicarbonate (HCO <sub>3</sub> )	339	5.56			

## MOTLEY COUNTY

### MATADOR

Population in 1940: 1,376.

Source of information: H.O. Stanfield, water superintendent, Mar. 7, 1945.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1928 by Air Made Well Co.; depth, 277 feet; diameter, 28 to 6½ inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 72 feet below land surface August 1944; yield, 100 gallons a minute.

Well 3. About 1,250 feet north of well 1; drilled in 1939; depth, 293 feet; diameter, 12 inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 85 feet below land surface March 1945; yield, 135 gallons a minute with drawdown of 35 feet; temperature, 64½° F.

Well 5. Drilled in 1946 by G. G. Sawtelle; depth, 145 feet; diameter, 12½ to 6½ inches; deep-well turbine pump and 7½-horsepower electric motor; static water level, 77.7 feet below land surface Sept. 16, 1947; yield, 100 gallons a minute.

### Average pumpage, in gallons a day

	1944	1945	1946	1947
January	62,800	54,300	75,000	79,600
February	56,000	55,500	61,600	94,500
March	56,600		65,700	76,700
April	66,900		129,000	96,700
May			113,200	95,000
June	102,500		132,000	187,200
July	148,500		179,600	226,000
August	140,700		181,000	234,200
September	78,500		67,300	
October	68,700		73,000	
November	61,000		77,700	
December	52,700		76,200	

Storage: Ground reservoir, 100,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 340.

Treatment: None.

### Analyses

[Wells 1 and 3, collected Mar. 7, 1945. pH: well 1, 7.0; well 3, 7.2. Analyzed by J. H. Rowley. Well 5, collected Sept. 16, 1947. pH is 7.8. Analyzed by B. C. Dwyer]

	Well 1		Well 3		Well 5	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	25		23		20	
Iron (Fe)	.05		.05		.06	
Calcium (Ca)	127	6.34	69	3.44	97	4.84
Magnesium (Mg)	35	2.88	20	1.64	25	2.06
Sodium (Na)	142	6.18	145	6.32	126	5.46
Potassium (K)	7.8	.20	5.3	.14	10	.26
Bicarbonate (HCO <sub>3</sub> )	354	5.80	392	6.43	370	6.06
Sulfate (SO <sub>4</sub> )	139	2.89	92	1.92	110	2.29
Chloride (Cl)	204	5.75	102	2.88	138	3.89
Fluoride (F)		.03		.05		.04
Nitrate (NO <sub>3</sub> )	70	1.13	16	.26	21	.34
Dissolved solids	925		685		749	
Total hardness as CaCO <sub>3</sub>	461		254		345	

### Driller's log, well 1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sandy clay	4	4	Fine-grained yellow sand	13	102
Sand	4	8	Sand and gravel	3	105
Clay and gravel	12	20	Red clay and sand	10	115
Sand and clay	40	60	Sand and gravel	14	129
Yellow sand	25	85	Red shale	148	277
Fine-grained white sand	4	89			

### ROARING SPRINGS

Population in 1940: 514.

Source of information: J. D. Mitchell, city secretary, Sept. 16, 1947.

Owner: Roaring Springs Townsite Co.

Source of supply: Well on bank of Dutchman's Creek, 1 mile north of Roaring Springs; dug in 1913; depth, 24 feet; diameter 24 to 18 feet; deep-well turbine pump and 10-horsepower electric motor; yield, 250 gallons a minute.

Pumpage (estimated): 70,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 110.

Treatment: None.

### Analysis

[Collected December 1947. pH is 7.5. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	18		Sulfate (SO <sub>4</sub> )	67	1.39
Iron (Fe)	.04		Chloride (Cl)	60	1.69
Calcium (Ca)	80	3.99	Fluoride (F)	2.0	.11
Magnesium (Mg)	31	2.55	Nitrate (NO <sub>3</sub> )	.8	.01
Sodium (Na)	41	1.80	Dissolved solids	474	
Potassium (K)	5.3	.14	Total hardness as CaCO <sub>3</sub>	327	
Bicarbonate (HCO <sub>3</sub> )	322	5.28			

## NOLAN COUNTY

## ROSCOE

Population in 1940: 1,166.

Source of information: D. L. Kesler, pump operator, June 20, 1946.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1930; depth, 172 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; static water level reported, 125 feet below land surface when drilled; yield, 135 gallons a minute in June, 1946.

Well 2. About 100 feet east of well 1; drilled in 1944 by Jack Stewart; depth, 170 feet; diameter, 8 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 18 gallons a minute.

Well 3. Drilled in June 1946 by Olin House; depth, 180 feet; diameter, 8 inches; static water level, 88 feet below land surface June 25, 1946; no pumping equipment stalled June 25, 1946.

Pumpage: No record.

Storage: Ground storage reservoir, 100,000 gallons; elevated tank, 55,000 gallons.

Number of customers: 275.

Treatment: Chlorination.

## Analyses

[Collected June 20, 1946. pH: well 1, 7.6; well 2, 7.4. Analyzed by C. B. Cibulka]

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	19	-----	21	-----
Iron (Fe).....	.00	-----	.00	-----
Calcium (Ca).....	92	4.59	88	4.39
Magnesium (Mg).....	22	1.81	21	1.73
Sodium (Na).....	11	.48	17	1.76
Potassium (K).....	5.3	.13	4.9	.13
Bicarbonate (HCO <sub>3</sub> ).....	256	4.20	243	3.98
Sulfate (SO <sub>4</sub> ).....	55	1.15	55	1.15
Chloride (Cl).....	50	1.41	60	1.69
Fluoride (F).....	1.8	.09	1.8	.09
Nitrate (NO <sub>3</sub> ).....	10	.16	6.1	.10
Dissolved solids.....	420	-----	437	-----
Total hardness as CaCO <sub>3</sub> .....	320	-----	306	-----

## Driller's log, well 3

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil.....	2	2	Sand and gravel, water.....	6	101
Caliche.....	10	12	Sandstone.....	27	128
Sandstone.....	8	20	Sand and gravel.....	5	133
Red sandy clay.....	24	44	Sandstone.....	33	166
Sandstone.....	51	95	Red shale.....	14	180

## SWEETWATER

Population in 1940: 10,367.

Source of information: Roy Duckett, water superintendent, June 2, 1946.

Ownership: Municipal.

Source of supply: Two impounding reservoirs.

Lake Trammel. On Sweetwater Creek about 8 miles south of Sweetwater; earth filled; dam built in 1914; lake-surface area about 240 acres.

Lake Sweetwater. On Bitter Creek about 6 miles southeast of Sweetwater; earth filled; dam built in 1930; lake-surface area about 800 acres.

*Average pumpage, in gallons a day*

	1945		1946	
	Lake Trammel	Lake Sweetwater	Lake Trammel	Lake Sweetwater
January			859,200	622,800
February			951,200	717,700
March			770,600	779,300
April			884,700	1,547,900
May			814,200	1,359,500
June			1,144,700	2,089,900
July	926,200	1,137,400		
August	948,000	1,455,800		
September	980,000	1,453,100		
October	856,100	958,900		
November	934,900	720,600		
December	769,400	659,500		

Storage: Elevated tank, 750,000 gallons; stand pipe, 280,000 gallons.

Number of customers: 2,500.

Treatment: Prechlorination, aeration, coagulation, sedimentation, filtration, and postchlorination.

*Analysis of finished water*

[Composite sample, collected July 2, 1946. pH is 7.6. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	4.3		Sulfate (SO <sub>4</sub> )	38	.791
Iron (Fe)	.00		Chloride (Cl)	24	.677
Calcium (Ca)	49	2.446	Fluoride (F)	.2	.010
Magnesium (Mg)	12	.937	Nitrate (NO <sub>3</sub> )	.2	.003
Sodium (Na)	13	.057	Dissolved solids	232	
Potassium (K)	5.1	.130	Total hardness as CaCO <sub>3</sub>	172	
Bicarbonate (HCO <sub>3</sub> )	162	2.655			

**OCHILTREE COUNTY**

**PERRYTON**

Population in 1940: 2,325.

Source of information: Melvin Anderson, water superintendent, June 24, 1948.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled; depth, 295 feet; diameter, 12 inches; deep-well turbine pump and 50-horsepower electric motor; yield, 250 gallons a minute.

Well 2. Drilled in May 1946 by H. H. Heiskell; depth, 420 feet; diameter, 16 inches; deep-well turbine pump and electric motor; static water level, 248 feet below land surface May 1946; yield, 500 gallons a minute.

Well 3. Drilled in June 1948 by George Brothers; depth, 420 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 265 feet below land surface June 1948; yield, 550 gallons a minute.

Pumpage: Average, 600,000 gallons a day.

Storage: Ground storage reservoir, 215,000 gallons; elevated tank, 35,000 gallons.

Number of customers: 1,015.

Treatment: None.

### Analyses

[Collected June 24, 1948. pH: well 1, 7.5; well 2, 7.6. Analyzed by D. E. Weaver]

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	44		46	
Iron (Fe)	.00		.00	
Calcium (Ca)	40	2.00	42	2.10
Magnesium (Mg)	27	2.22	28	2.30
Sodium (Na)	25	1.09	27	1.17
Potassium (K)	5.2	.13	6.4	.16
Bicarbonate (HCO <sub>3</sub> )	242	3.97	246	4.03
Sulfate (SO <sub>4</sub> )	12	.25	33	.69
Chloride (Cl)	32	.90	25	.71
Fluoride (F)	2.4	.13	2.4	.13
Nitrate (NO <sub>3</sub> )	7.0	.11	6.8	.11
Dissolved solids	301		338	
Total hardness as CaCO <sub>3</sub>	211		220	

### Driller's logs

	Thickness	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 2</b>					
Surface soil	7	7	Sandy clay	15	250
Sand and clay	18	25	Sand	70	320
Caliche	75	100	Sand and gravel	20	340
Sand, clay, and caliche	95	195	Sand	80	420
Sand, clay, and gravel	40	235	Clay and red rock		420
<b>Well 3</b>					
Surface soil	11	11	Coarse sand and gravel	35	355
Clay and caliche	117	128	Clay	30	385
Sandy clay	18	141	Coarse sand and gravel	22	407
Fine sand, dry	28	169	Clay	13	420
Coarse sand and gravel	41	210	Red shale rock		420
Sandy clay, lime shells	110	320			

## OLDHAM COUNTY

### ADRIAN

Population in 1940: 187.

Source of information: John Horton, water manager, Nov. 20, 1947.

Ownership: Municipal.

Source of supply: Well, drilled in 1947 by John Hohenshelt; depth, 496 feet; diameter, 7 inches; deep-well cylinder pump and 5-horsepower electric motor; static water level, 455 feet below land surface; yield, 18 gallons a minute; temperature, 64° F.

Pumpage (estimated): 10,000 gallons a day.

Storage: Elevated tank, 20,000 gallons.

Treatment: None.

*Analysis*

[Collected Nov. 20, 1948. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	17	-----	Sulfate (SO <sub>4</sub> )	280	5.83
Calcium (Ca)	4	0.20	Chloride (Cl)	60	1.69
Magnesium (Mg)	4	.33	Nitrate (NO <sub>3</sub> )	3.2	.05
Sodium and Potassium (Na + K)	371	16.15	Dissolved solids	1,010	-----
Bicarbonate (HCO <sub>3</sub> )	556	9.11	Total hardness as CaCO <sub>3</sub>	26	-----

*Driller's log*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
No record	160	160	Blue shale	25	455
Hard sand	40	200	Water sand, first water	30	435
Pinkish red clay, no sand	160	360	Blue shale	9	494
Very fine dry sand, multi-colored layers.	70	430			

## VEGA

Population in 1940: 515.

Source of information: R. W. Armitage, city secretary, Nov. 20, 1947.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1930 by John Hohenshelt; depth, 300 feet; diameter, 7 inches; deep-well turbine pump and electric motor; static water level, 200 feet below land surface; yield 125 gallons a minute.

Well 2. About 75 feet from well 1; drilled in 1943 by H. H. Heiskel; depth, 330 feet; diameter, 10 inches; deep-well turbine pump and electric motor; yield, 125 gallons a minute.

Pumpage: No record.

Storage: Elevated tank, 50,000 gallons.

Treatment: None.

*Analysis*

[Composite sample, collected Nov. 20, 1947. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	29	-----	Sulfate (SO <sub>4</sub> )	200	4.16
Calcium (Ca)	31	1.55	Chloride (Cl)	28	.79
Magnesium (Mg)	52	4.23	Nitrate (NO <sub>3</sub> )	50	.81
Sodium and potassium (Na + K)	81	3.51	Dissolved solids	598	-----
Bicarbonate (HCO <sub>3</sub> )	218	3.58	Total hardness as CaCO <sub>3</sub>	298	-----

## WILDORADO

Population in 1940: 60.

Source of information: A. F. Moore, co-owner, Nov. 20, 1947.

Owners: W. E. O'Neil, C. C. Kellogg, and A. F. Moore.

Source of supply: Well; drilled about 1900; depth, 251 feet; diameter, 5 inches; deep-well cylinder pump and windmill and gasoline engine; temperature, 61° F.

Pumpage: No record.

Storage: Elevated tank, 5,000 gallons.

Treatment: None.

*Analysis*

[Collected Nov. 20, 1947. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	55	-----	Sulfate (SO <sub>4</sub> )	17	0.354
Calcium (Ca)	29	1.447	Chloride (Cl)	6.0	.169
Magnesium (Mg)	20	1.645	Nitrate (NO <sub>3</sub> )	7.5	.121
Sodium and potassium (Na + K)	28	1.232	Dissolved solids	227	-----
Bicarbonate (HCO <sub>3</sub> )	224	3.680	Total hardness as CaCO <sub>3</sub>	154	-----

**PARMER COUNTY****FARWELL**

Population in 1940: 1,250.

Source of information: B.N. Graham, City secretary, Mar. 2, 1945.

Owner: Texico-Farwell Water Works, Inc.

Source of supply: Two wells.

Well 1. North well; drilled; depth, 300 feet; diameter, 6 inches; deep-well turbine pump and electric motor; yield, 65 gallons a minute.

Well 2. South well; drilled; depth, 318 feet; diameter, 12 inches; deep-well turbine pump and electric motor; static water level, 70 feet below land surface in 1939; yield, 250 gallons a minute; temperature, 65° F.

Pumpage: Average, 200,000 gallons a day.

Storage: Elevated tank, 50,000 gallons.

Number of customers: 200.

Treatment: None.

*Analysis, well 2*

[Collected Mar. 2, 1945. pH is 7.8. Analyzed by M. L. Begley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	32	-----	Sulfate (SO <sub>4</sub> )	27	0.56
Iron (Fe)	.04	-----	Chloride (Cl)	16	.45
Calcium (Ca)	33	1.65	Fluoride (F)	2.8	.15
Magnesium (Mg)	25	2.06	Nitrate (NO <sub>3</sub> )	7.2	.12
Sodium (Na)	27	1.16	Dissolved solids	290	-----
Potassium (K)	7.0	.18	Total hardness as CaCO <sub>3</sub>	186	-----
Bicarbonate (HCO <sub>3</sub> )	230	3.77			

**FRIONA**

Population in 1940: 803.

Source of information: Mr. Wilson, City clerk, Oct. 6, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1929 by Leo McDade; depth, 216 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 150 gallons a minute.

Well 2. Drilled in 1935 by L. G. Simpson; depth, 192 feet; diameter, 10 inches; deep-well turbine pump and 15-horsepower electric motor; yield, 100 gallons a minute.

Pumpage: 57,000 gallons a day.

Storage: Elevated tank, capacity unknown.

Number of customers: 348.

Treatment: Chlorination.

*Analysis*

[Composite sample, collected Oct. 6, 1948. pH is 7.7. Analyzed by J. R. Avrett]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	37		Sulfate (SO <sub>4</sub> )	2 <sup>2</sup>	0.58
Iron (Fe)	.00		Chloride (Cl)	22	.62
Calcium (Ca)	32	1.60	Fluoride (F)	2.4	.13
Magnesium (Mg)	32	2.63	Nitrate (NO <sub>3</sub> )	9.5	.15
Sodium (Na)	28	1.22	Dissolved solids	317	
Potassium (K)	6.8	.17	Total hardness as CaCO <sub>3</sub>	212	
Bicarbonate (HCO <sub>3</sub> )	252	4.13			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Red clay	25	25	Brown packed sand (water at 155 feet).	125	215
White chalky sandstone	36	61	Porous water sand	11	226
Packed sand	29	90	Sandstone	4	230

## PECOS COUNTY

## FORT STOCKTON

Population in 1940: 3,294.

Source of information: Cleve Nunn, manager of utilities, Oct. 21, 1946.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled; depth, 160 feet; diameter, 6 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 52.5 feet below land surface Oct. 21, 1946; yield, 450 gallons a minute.

Well 2. South well; drilled in 1932 by Arthur Powell; depth, 193 feet; diameter, 13 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 51.4 feet below land surface Oct. 21, 1946; yield, 750 gallons a minute.

Well 3. Middle well; drilled in 1946 by R. A. Cleveland; depth, 203 feet; diameter, 12 inches; deep-well turbine pump and 25-horsepower electric motor; static water level, 51.8 feet below land surface Oct. 21, 1946; yield, 500 gallons a minute.

*Average pumpage in gallons a day, 1946*

January	315,000	April	589,000	July	673,000
February	299,000	May	435,000	August	728,000
March	350,000	June	688,000	September	490,000

Storage: Concrete ground reservoir, 100,000 gallons; two elevated tanks, total capacity, 175,000 gallons.

Number of customers: 794.

Treatment: Chlorination and ammoniation.

*Analyses*

[Collected Oct. 21, 1946. pH: well 2, 7.0; well 3, 7.2. Analyzed by C. B. Cibulka]

	Well 2		Well 3	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	16		16	
Iron (Fe)	.06		.19	
Calcium (Ca)	156	7.79	156	7.79
Magnesium (Mg)	52	4.23	53	4.36
Sodium (Na)	233	10.34	235	10.20
Potassium (K)	33	.97	39	1.00
Bicarbonate (HCO <sub>3</sub> )	276	4.52	274	4.49
Sulfate (SO <sub>4</sub> )	427	8.89	424	8.83
Chloride (Cl)	350	9.87	352	9.93
Fluoride (F)	1.8	.09	1.8	.09
Nitrate (NO <sub>3</sub> )	.4	.01	.8	.01
Dissolved solids	1,420		1,410	
Total hardness as CaCO <sub>3</sub>	604		608	

**IMPERIAL**

Population in 1940: 75.

Source of information: Mrs. E. E. Scarbrough, wife of former owner, Sept. 29, 1948.

Owner: Imperial Water Co.

Source of supply: Wells of the Byrd-Frost Water Co. about 15 miles north of Imperial in Crane County.

Pumpage: 10,000 gallons a day.

Storage: Elevated tank, 8,000 gallons.

Number of customers: 75.

Treatment: None.

*Analysis*

[Tap sample, collected Oct. 26, 1946. pH is 7.4. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	39		Sulfate (SO <sub>4</sub> )	32	0.666
Iron (Fe)	.05		Chloride (Cl)	32	.903
Calcium (Ca)	64	3.194	Fluoride (F)	1.0	.053
Magnesium (Mg)	5.7	.469	Nitrate (NO <sub>3</sub> )	16	.258
Sodium (Na)	24	1.043	Dissolved solids	293	
Potassium (K)	3.6	.092	Total hardness as CaCO <sub>3</sub>	183	
Bicarbonate (HCO <sub>3</sub> )	178	2.918			

**IRAAN**

Population in 1940: 1,000.

Source of information: Geo. L. Munnich, Dec. 13, 1946.

Owner: Iraan Ice, Water and Gas Co.

Source of supply: Two wells about 0.4 mile south of ice plant.

Well 1. Drilled in 1936 by Fred Slaughter; depth, 210 feet; diameter, 8 inches; deep-well cylinder pump and 3-horsepower electric motor; static water level, 115.6 feet below land surface Dec. 13, 1946; yield, 25 gallons a minute.

Well 2. Drilled by Sam Parker; depth, 210 feet; diameter, 7 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 75 gallons a minute.

*Average pumpage, in gallons a day*

January.....	21,300	May.....	30,300	September.....	28,200
February.....	29,600	June.....	35,000	October.....	20,900
March.....	29,300	July.....	36,000	November.....	22,700
April.....	30,300	August.....	41,500	December.....	-----

Storage: Concrete ground reservoir on top of hill, 19,000 gallons.

Number of customers: 174.

Treatment: None.

*Analysis, well 1*

[Collected Feb. 11, 1947. pH is 7.3. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	12	-----	Sulfate (SO <sub>4</sub> ).....	238	4.85
Iron (Fe).....	.12	-----	Chloride (Cl).....	500	14.10
Calcium (Ca).....	152	7.59	Fluoride (F).....	1.2	.06
Magnesium (Mg).....	74	6.09	Nitrate (NO <sub>3</sub> ).....	ε .2	.10
Sodium (Na).....	221	9.61	Dissolved solids.....	1,370	-----
Potassium (K).....	24	.61	Total hardness as CaCO <sub>3</sub> .....	684	-----
Bicarbonate (HCO <sub>3</sub> ).....	292	4.79			

*Driller's log, well 2*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Gray lime.....	38	38	Yellow lime.....	68	176
Yellow lime.....	52	90	Yellow sand and lime.....	4	180
Yellow sandy lime.....	18	108	Sand, water.....	30	210

**POTTER COUNTY****AMARILLO**

Population in 1940: 51,686.

Source of information: M. V. Moss, city manager, June 23, 1948.

Ownership: Municipal.

Source of supply: Thirty-two wells southwest of Amarillo.

Palo Duro well 1. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Palo Duro well 2. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor.

Palo Duro well 3. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; pumping level, 95 feet below land surface January 1943, 117 feet below land surface August 1945; static water level, 61.0 feet below land surface January 1943; yield, 720 gallons a minute Jan. 30, 1942.

Palo Duro well 4. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; pumping level, 95 feet below land surface January 1943, 130 feet below land surface August 1945; static water level, 61.0 feet below land surface January 1943; yield, 594 gallons a minute Jan. 30, 1942.

- Palo Duro well 5. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; pumping level, 70 feet below land surface January 1945, 121.0 feet below land surface August 1945; static water level, 35.0 feet below land surface January 1943; yield, 454 gallons a minute Jan. 30, 1942.
- Palo Duro well 6. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; pumping level, 100.0 feet below land surface January 1943, 128 feet below land surface August 1945; static water level, 88.0 feet below land surface January 1943; yield, 751 gallons a minute Jan. 30, 1942.
- Palo Duro well 7. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; pumping level, 52 feet below land surface January 1943, 114.0 feet below land surface August 1945; static water level, 38.0 feet below land surface January 1943; yield, 860 gallons a minute Jan. 30, 1942.
- Palo Duro well 8. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; pumping level, 86.0 feet below land surface January 1943, 130 feet below land surface August 1945; static water level, 61.0 feet below land surface January 1943; yield, 820 gallons a minute Jan. 30, 1942.
- Palo Duro well 9. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; yield, 598 gallons a minute Jan. 30, 1942.
- Palo Duro well 10. Drilled in 1927; depth, 200 feet; diameter, 10 inches; deep-well turbine pump and electric motor; yield, 450 gallons a minute Jan. 30, 1942.
- Greely well 1. Drilled in 1944 by H. H. Heiskell; depth, 313 feet; diameter, 16 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 120.0 feet July 1944; pumping level, 18<sup>7</sup> feet July 1944 and 212 feet May 1946.
- Greely well 2. Drilled in 1944 by H. H. Heiskell; depth, 264 feet; diameter, 16 inches; deep-well turbine pump and electric motor; static water level, 106.0 feet below land surface May 12, 1946; pumping level, 158 feet below land surface May 1946; yield, 1,115 gallons a minute with drawdown of 15 feet May 13, 1944.
- Greely well 3. Drilled in 1944; depth, 283 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 135.0 feet below land surface April 1945; pumping level, 156 feet below land surface April 1945 and 187 feet below land surface May 1946.
- Greely well 4. Drilled in 1946 by H. H. Heiskell; depth, 305 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; yield, 800 gallons a minute.
- Greely well 5. Drilled in 1946 by H. H. Heiskell; depth, 262 feet; diameter, 16 inches; deep-well turbine pump and electric motor; static water level, 126.0 feet below land surface Apr. 1, 1946; yield, 1,340 gallons a minute with drawdown of 44 feet Apr. 2, 1946.
- Greely well 7. Drilled in May 1946 by H. H. Heiskell; depth, 303 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; yield, 900 gallons a minute.

- Greely well 8. Drilled in 1946 by H. H. Heiskell; depth, 280 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; yield, 600 gallons a minute.
- Bush well. Drilled in 1944 by H. H. Heiskell; depth, 260 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 135.0 feet below land surface May 1944; pumping level, 182 feet below land surface May 1946; yield, 1,060 gallons a minute with drawdown of 24 feet May 5, 1944.
- Bush well 1. Drilled in 1943 by H. H. Heiskell; depth, 296 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 150 feet below land surface May 25, 1943; pumping level, 198 feet below land surface May 1946; yield, 880 gallons a minute with drawdown of 36 feet May 26, 1943.
- Bush well 2. Drilled in 1944 by H. H. Heiskell; depth, 250 feet; diameter, 16 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 153 feet below land surface June 1945; pumping level, 180 feet below land surface June 1945, 190 feet below land surface May 1946; yield, 1,100 gallons a minute with drawdown of 33 feet April 1944.
- Bush well 3. Drilled in 1944 by H. H. Heiskell; depth, 239 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 132 feet below land surface Apr. 22, 1944; pumping level, 200 feet below land surface May 1946; yield, 720 gallons a minute with drawdown of 49 feet Apr. 23, 1944.
- Bush well 4. Drilled in 1943 by H. H. Heiskell; depth, 305 feet; diameter, 16 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 141 feet below land surface May 9, 1943; pumping level, 205 feet below land surface May 1946; yield, 880 gallons a minute with drawdown of 49 feet May 10, 1943.
- Bush well 5. Drilled in 1943 by H. H. Heiskell; depth, 263 feet; diameter, 16 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 137 feet below land surface Apr. 23, 1943; pumping level, 192 feet below land surface May 1946; yield, 1,090 gallons a minute with drawdown of 18.5 feet Apr. 24, 1943.
- McDonald well 1. Drilled in 1929 by D. L. McDonald; depth, 270 feet; diameter, 18 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 162.0 feet below land surface July 30, 1931; pumping level, 240 feet below land surface May 1946; yield, 750 gallons a minute with drawdown of 42 feet Sept. 1, 1941.
- McDonald well 2. Drilled in 1929 by D. L. McDonald; depth, 270 feet; diameter, 18 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 160.0 feet below land surface Aug. 24, 1929; pumping level, 240.0 feet below land surface May 1946; yield, 750 gallons a minute.
- McDonald well 3. Drilled in 1929 by D. L. McDonald; depth, 270 feet; diameter, 18 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 156 feet below land surface Aug. 13, 1929; pumping level, 230 feet below land surface May 1946; yield, 750 gallons a minute with drawdown of 37 feet.
- McDonald well 4. Drilled in 1929 by D. L. McDonald; depth, 322 feet; diameter, 18 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 162.0 feet below land surface Aug. 1,

1931; pumping level, 229 feet below land surface May 1936; yield, 750 gallons a minute with drawdown of 46 feet Sept. 2, 1931.

McDonald well 5. Drilled in 1929 by D. L. McDonald; depth, 336 feet; diameter, 18 inches; deep-well turbine pump and 75-horsepower electric motor; static water level, 163.0 feet below land surface Aug. 1, 1931; pumping level, 239 feet below land surface May 1946; yield, 750 gallons a minute with drawdown of 44 feet.

McDonald well 6. Drilled in 1947 by H. H. Heiskell; depth, 280 feet; diameter, 16 inches; deep-well turbine pump and 50-horsepower electric motor; yield, 750 gallons a minute.

Bassett well 1. Drilled in 1947 by H. H. Heiskell; depth, 265 feet; diameter, 16 inches; deep-well turbine pump and 50-horsepower electric motor; yield, 750 gallons a minute.

Bassett well 2. Drilled in 1947 by H. H. Heiskell; depth, 280 feet; diameter, 16 inches; deep-well turbine pump and 50-horsepower electric motor; yield, 750 gallons a minute.

Brinkman well 1. Drilled in 1944 by H. H. Heiskell; depth, 277 feet; diameter, 16 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 170 feet below land surface January 1945; pumping level, 210 feet below land surface May 1946; yield, 700 gallons a minute with drawdown of 50 feet.

*Average pumpage, in gallons a day*

	1942	1943	1944	1945	1946	1947	1948
January	3,400,000	4,600,000	5,470,000	5,980,000	5,810,000	6,290,000	5,040,000
February	3,360,000	5,220,000	5,500,000	6,570,000	6,210,000	6,460,000	5,140,000
March	3,360,000	5,980,000	5,780,000	7,970,000	7,210,000	6,700,000	6,220,000
April	3,730,000	7,480,000	6,500,000	7,780,000	10,200,000	7,500,000	11,300,000
May	6,500,000	6,630,000	7,660,000	11,430,000	11,640,000	7,690,000	10,950,000
June	7,410,000	10,930,000	8,140,000	11,900,000	13,180,000	11,900,000	-----
July	10,300,000	7,820,000	9,000,000	12,250,000	15,160,000	16,180,000	-----
August	6,150,000	11,500,000	10,950,000	11,800,000	15,400,000	15,260,000	-----
September	5,190,000	8,960,000	8,150,000	11,500,000	8,540,000	13,820,000	-----
October	4,400,000	6,640,000	6,680,000	7,020,000	6,780,000	10,020,000	-----
November	4,550,000	6,190,000	6,310,000	6,910,000	6,230,000	6,390,000	-----
December	4,430,000	5,300,000	5,840,000	6,000,000	6,240,000	5,210,000	-----

Storage: Three ground storage reservoirs; 5,000,000 gallons each; three elevated tanks, 1,000,000 gallons each; one elevated tank, 500,000 gallons.

Number of customers: 16,812.

Treatment: None.

*Analyses*

[All samples collected June 23, 1948. pH: Palo Duro well, 7.5; Greeley well, 7.6; Bush well and Brinkman well, each 7.4. Palo Duro well and Greeley well analyzed by H. D. Smith; Bush well and Brinkman well analyzed by D. E. Weaver and H. D. Smith]

	Palo Duro well 2		Greeley well 1	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	52	-----	80	-----
Iron (Fe)	.00	-----	.00	-----
Calcium (Ca)	44	2.20	32	1.60
Magnesium (Mg)	43	3.54	43	3.54
Sodium (Na)	23	1.00	25	1.09
Potassium (K)	6.4	.16	8.0	.20
Bicarbonate (HCO <sub>3</sub> )	354	5.80	328	5.38
Sulfate (SO <sub>4</sub> )	32	.67	34	.71
Chloride (Cl)	6.7	.19	7.0	.20
Fluoride (F)	4.4	.23	3.2	.17
Nitrate (NO <sub>3</sub> )	5.1	.08	2.8	.05
Dissolved solids	376	-----	372	-----
Total hardness as CaCO <sub>3</sub>	287	-----	257	-----

	Bush well 1		Brinkman well 1	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	67		62	
Iron (Fe)	.00		.00	
Calcium (Ca)	58	2.89	48	2.40
Magnesium (Mg)	26	2.14	27	2.22
Sodium (Na)	24	1.04	16	.70
Potassium (K)	6.0	.15	9.2	.24
Bicarbonate (HCO <sub>3</sub> )	288	4.72	294	4.82
Sulfate (SO <sub>4</sub> )	50	1.04	25	.52
Chloride (Cl)	9.0	.25	4.1	.12
Fluoride (F)	2.4	.13	2.8	.15
Nitrate (NO <sub>3</sub> )	3.5	.06	2.8	.05
Dissolved solids	382		341	
Total hardness as CaCO <sub>3</sub>	252		231	

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Greeley well 1</b>					
Soil	3	3	Red water sand	40	140
Caliche	17	20	Water sand	60	200
Red sand	20	40	Water sand and shells	20	220
Caliche	40	80	Water sand	20	240
Sand and caliche	20	100	Fine water sand	40	280
<b>Greeley well 2</b>					
Soil	3	3	Water sand, shells	30	120
Red and yellow caliche	17	20	Red water sand and shells	120	240
Yellow sand, caliche	40	60	Hard shell, sand	20	260
Sand and shells	20	80	Brown and yellow clay	4	264
Red sand and shells	10	90			
<b>Greeley well 3</b>					
Soil	3	3	Sand and shells	180	260
Caliche	17	20	Water sand	19	279
Sand and caliche	60	80	Red shale	4	283
<b>Greeley well 4</b>					
Soil	3	3	Muddy sand and shells	70	150
White caliche	7	10	Red sand, coarse shells	130	280
Brown caliche	12	22	Red sand, clay and shells	15	295
White caliche	58	80	Red beds	10	305
<b>Greeley well 5</b>					
Soil	7	7	Sand	20	150
Sand and clay	43	50	Sand and shells	20	170
Caliche	30	80	Sand	30	200
Sand and caliche	40	120	Sand and shells	62	262
Sand and shells	10	130	Red rock	1	263

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Bush well 1</b>					
Soil.....	3	3	Brown sandy clay.....	47	128
Brown clay.....	5	8	Fine-grained sand.....	32	160
Brown caliche.....	32	40	Sand and shell.....	90	250
Brown caliche.....	35	75	Clay and shell.....	10	260
Hard shell and gravel.....	6	81	Red and blue shale.....	36	296
<b>Bush well 2</b>					
Soil.....	3	3	Brown sand and shells.....	54	154
Gray caliche.....	17	20	Clean water sand.....	76	230
Gray fine-grained sand.....	20	40	Red and blue sand and shells	11	241
Hard gray sand.....	60	100	Gray sand.....	9	250
<b>Bush well 3</b>					
Soil.....	5	5	Dry sand, clay, and shells...	54	130
Gray caliche, sand.....	15	20	Clean water sand.....	100	230
Red caliche, sand.....	40	60	Red shales and shells.....	9	239
Dry sand, clay, and shells.....	16	76			
<b>Bush well 4</b>					
Soil.....	4	4	Sand and hard shells.....	19	229
Brown caliche clay.....	23	27	Loose red sand.....	24	253
Sandy clay.....	13	40	Hard shell, red and blue clay	22	275
Brown clay and caliche.....	44	84	Red, blue and white clay.....	11	286
Brown clay and sandy clay.....	31	115	Fine gray sand.....	3	289
Brown sand.....	18	133	Hard shell.....	2	291
Fine water sand.....	60	193	Loose gray sand.....	6	297
Sand and shells.....	17	210	Red beds.....	8	305
<b>McDonald well 1</b>					
Top soil (clay and sand).....	4	4	Sandrock.....	4	186
Caliche.....	8	12	Sand and sand boulders.....	8	194
Yellowish clay.....	58	70	Sandy clay.....	19	213
Red sandy clay.....	12	82	Red cavey sand.....	10	223
Light sandy clay.....	13	95	Very fine-grained sand.....	15	238
Gray clayey sand.....	45	140	White clay.....	2	240
Soft red sandy clay.....	5	145	Red sand.....	11	251
Honeycombed sandrock.....	18	163	White clay.....	3	254
Red cavey sand.....	6	169	Clean red sand.....	5	259
Sandrock.....	1	170	Red clay.....	11	270
Soft honeycombed sandrock.....	12	182			
<b>McDonald well 2</b>					
Soil.....	4	4	Gray clayey sand.....	7	170
Red clay.....	13	17	Loose sand boulders.....	6	176
Caliche.....	4	21	Clean red sand.....	4	180
Yellow clay.....	47	68	Gray clayey sand.....	3	183
Yellow sandy clay.....	19	87	Gray sand and sandrock.....	3	186
Gray sandy clay.....	5	92	Gray clayey sand.....	14	200
Light-gray sandy clay.....	8	100	Soft sandrock.....	4	204
Soft red sandy clay.....	48	148	Coarse sand and honey-	6	210
Honeycombed sandrock.....	3	151	combed sandrock.....		
Dirty gray sand.....	9	160	No record.....	60	270
Clean red sand.....	3	163			
<b>McDonald well 3</b>					
Soil.....	4	4	Honeycombed sand.....	6	176
Yellow clay.....	46	50	Red sandstone.....	14	190
Gray sandy clay.....	12	62	Red sand with thin clay	8	198
Red sandy clay.....	45	107	strata.....		
Red sandy clay, soft.....	43	150	Red cavey sand.....	10	208
Sandrock.....	4	154	Clayey gray sand.....	4	212
Gray sand and rock.....	2	156	Red caving sand.....	3	215
Coarse sand and sandrock.....	14	170	No record.....	55	270

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>McDonald well 5</b>					
Soil.....	2	2	White sandy clay.....	3	215
Yellow clay.....	63	65	Red sand.....	31	246
Yellow sandy clay.....	33	98	Red sand with loose white rock.....	9	255
Gray sandy clay.....	34	132	White sandy clay.....	3	258
Yellow clayey sand.....	26	158	Red sand.....	26	284
Soft loose water-bearing sand and pebbles.....	6	164	Reddish-brown clay.....	28	312
Yellow sand with thin clay streaks.....	30	194	Red clay.....	5	317
White sandy clay.....	6	200	Gray sand.....	9	326
Red sand.....	12	212	Red beds.....	10	336
<b>Brinkman well 1</b>					
Soil.....	4	4	Fine water sand, and shells..	42	250
Caliche.....	6	10	Red and blue shale and shells.....	6	256
Brown caliche.....	110	120	Red, gray, and blue shells....	21	277
Sand and shells.....	53	173			
Fine-grained sand and shells..	35	208			

## PRESIDIO COUNTY

## MARFA

Population in 1940: 3,805.

Source of information: H. F. Dyer, water superintendent, July 1948.

Ownership: Municipal.

Source of supply: Three wells on city lot at standpipe.

Well 2. Drilled in 1928 by Layne-Texas Co.; depth, 881 feet; diameter, 15½ inches to 281 feet and 10 inches from 281 to 881 feet; deep-well turbine pump and 125-horsepower electric motor; yield, 1,000 gallons a minute.

Well 3. Drilled in 1936 by J. H. Cass; depth, 889 feet; diameter, 10 inches to 306 feet and 8 inches from 306 to 889 feet; deep-well turbine pump and 100-horsepower electric motor; yield, 800 gallons a minute.

Well 4. Drilled in 1945 by Emmitt Harrell; depth, 1,100 feet; diameter, 16 inches to 314 feet and 11 inches from 314 to 1,100 feet; deep-well turbine pump and 65-horsepower electric motor; yield, 307 gallons a minute.

Pumpage (estimated): 1,000,000 gallons a day, which includes water sold to Fort D. A. Russell.

Storage: Ground reservoir, 83,000 gallons; elevated tank; 325,000 gallons.

Number of customers: 1,200.

Treatment: None.

*Analysis, well 2*

[Collected July 19, 1948. pH is 7.6. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	72		Sulfate (SO <sub>4</sub> ).....	26	0.541
Iron (Fe).....	.05		Chloride (Cl).....	17	.479
Calcium (Ca).....	26	1.298	Fluoride (F).....	2.8	.147
Magnesium (Mg).....	2.2	.181	Nitrate (NO <sub>3</sub> ).....	4.2	.068
Sodium (Na).....	59	2.570	Dissolved solids.....	328	
Potassium (K).....	13	.333	Total hardness as CaCO <sub>3</sub> .....	74	
Bicarbonate (HCO <sub>3</sub> ).....	192	3.147			

## Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 3</b>					
Silt, sand, and gravel	18	18	Brown clay	53	580
Clay	20	38	Sandy shale	6	586
Sand	168	206	Broken lime	14	600
Water sand	34	240	Sand and shale	50	650
Hard sand	10	250	Lava wash	47	697
Sand and gravel	49	299	Water sand	21	718
Black rock	60	359	Brown clay	29	747
Pink clay	3	362	Water sand	23	770
Sandy clay	49	411	Brown clay	2	772
Water sand	15	426	Coarse sand	8	780
Sand	24	450	Sandrock	32	812
White clay	46	496	Sandy clay	11	823
Hard rock	31	527	Water sand and gravel	66	889

<b>Well 4</b>					
Soil and clay	30	30	Sand and gravel	5	875
Sand and gravel	268	298	Clay	9	884
Brown rock	60	358	Gravel	5	889
Brown sand	212	570	Clay	1	890
Red rock	8	578	Brown lava rock	75	965
Sand and gravel	222	800	Clay and lava rock	25	990
Sticky clay	30	830	Brown lava rock	14	1004
Clay and some gravel	20	850	Clay and lava rock	29	1033
Clay	10	860	Broken clay and rock	67	1100
Clay and gravel	10	870			

## PRESIDIO

Population in 1940: 1,500.

Source of information: A. H. Spangle, owner, July 1948.

Source of supply: Two wells; depth, 48 feet; diameter, 12 inches; piston-type pumps and 15-horsepower electric motors.

Pumpage (estimated): 130,000 gallons a day.

Storage: None; pumped directly into pipeline.

Number of customers: 115.

Treatment: None.

## Analysis

[Composite sample, collected July 19, 1948. pH is 7.4. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	60		Sulfate (SO <sub>4</sub> )	114	2.37
Iron (Fe)	.05		Chloride (Cl)	2°	.79
Calcium (Ca)	78	3.89	Fluoride (F)	1.2	.06
Magnesium (Mg)	9.8	.81	Nitrate (NO <sub>3</sub> )	9.6	.15
Sodium (Na)	63	2.72	Dissolved solids	524	
Potassium (K)	8.4	.21	Total hardness as CaCO <sub>3</sub>	235	
Bicarbonate (HCO <sub>3</sub> )	260	4.26			

## RANDALL COUNTY

## CANYON

Population in 1940: 2,600.

Source of information: C. L. Key, water superintendent, Dec. 4, 1947.

Ownership: Municipal.

Source of supply: Four wells.

Pomona well 1. Drilled in 1930 by Omer Kersey; depth, 490 feet; diameter, 15½ to 12½ inches; deep-well turbine pump and electric motor; static water level, 250 feet below land surface; pumping level, 425 feet below land surface; yield, 200 gallons a minute; temperature, 66° F.

Pomona well 2. Drilled in 1930 by Omer Kersey; depth, 520 feet; diameter, 15½ to 12½ inches; deep-well turbine pump and electric motor; yield, 250 gallons a minute.

Utility well. Drilled; depth, 490 feet; diameter, 15½ to 12½ inches; deep-well turbine pump and electric motor; pumping level, 335 feet below land surface while pumping 130 gallons a minute and 351 feet below land surface while pumping 185 gallons a minute; yield, 150 gallons a minute.

Muncey well. Drilled in 1943 by Muncey Bros.; depth, 504 feet; diameter, 14 to 10 inches; deep-well turbine pump and electric motor; yield, 450 gallons a minute.

*Average pumpage, in gallons a day*

1934.....	161,000	1939.....	213,000	1944.....	296,000
1935.....	185,000	1940.....	251,000	1945.....	246,000
1936.....	171,000	1941.....	249,000	1946.....	384,000
1937.....	181,000	1942.....	189,000	1947.....	430,000
1938.....	187,000	1943.....	235,000		

Storage: Ground storage reservoir, 750,000 gallons; elevated tank, 250,000 gallons.

Treatment: None.

*Analysis*

[Composite sample of four wells, collected Dec. 4, 1947. pH is 8.0. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per millior	Equivalents per million
Silica (SiO <sub>2</sub> ).....	11	-----	Sulfate (SO <sub>4</sub> ).....	29	0.60
Iron (Fe).....	.05	-----	Chloride (Cl).....	17	.48
Calcium (Ca).....	7.7	.38	Fluoride (F).....	2.2	.12
Magnesium (Mg).....	5.8	.48	Nitrate (NO <sub>3</sub> ).....	.5	.01
Sodium (Na).....	135	5.86	Dissolved solids.....	390	-----
Potassium (K).....	3.2	.08	Total hardness as CaCO <sub>3</sub> .....	43	-----
Bicarbonate (HCO <sub>3</sub> ).....	341	5.59			

*Driller's logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Pomona well 1</b>					
Soil.....	3	3	Light-brown shale.....	72	337
Gypsum.....	62	65	White water sand.....	20	357
Pink shale.....	19	84	Red shale.....	6	363
Gypsum.....	3	87	Hard sandy shale.....	30	393
Red sandy shale.....	38	125	Brown shale.....	17	410
Brown shale.....	20	145	White water sand.....	33	443
Blue sandy shale.....	53	198	Blue shale.....	3	446
Red shale.....	34	232	Water sand.....	39	485
Blue shale.....	13	245	Blue sandy shale.....	3	488
Pink sandy shale.....	20	265			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Pomona well 2</b>					
No record.....	265	265	H S S (Hard sandstone ?)....	30	393
Light-brown shale.....	60	325	Brown shale.....	27	420
Sand, no water.....	10	335	Sand, no water.....	5	425
White water sand.....	15	350	White water sand.....	15	440
Red shale.....	13	363	Blue sandy shale.....	50	490
<b>Utility well</b>					
Soil.....	5	5	Brown shale.....	33	328
Pink clay.....	10	15	White sandstone.....	22	350
Caliche and little lime rock.....	30	45	Red shale.....	34	384
Caliche and little lime and sand.....	10	55	Gray sandstone.....	30	414
Sand and caliche, red and gray.....	10	65	Blue shale.....	3	417
White shale, first water.....	25	90	Gray sandstone.....	23	440
Red shale.....	25	115	Red shale and a little gray sandstone.....	16	456
Brown shale.....	45	160	White sandstone (extra good).....	29	485
Blue shale.....	30	190	Red shale.....	5	490
Red shale.....	105	295			

## REAGAN COUNTY

## BIG LAKE

Population in 1940: 763.

Source of information: Ross Clark, city secretary, Aug. 21, 1947.

Ownership: Municipal.

Source of supply: Two wells.

Well 2. Half a block south of the county courthouse near elevated tank; depth, 535 feet; diameter, 6 inches; deep-well turbine pump and 25-horsepower electric motor; pump set at 390 feet; pumping level, 329.3 feet below land surface while pumping 140 gallons a minute Sept. 11, 1947; temperature, 69° F.

Well 3. Two blocks south of county courthouse; drilled in 1944 by W. A. Schooler; depth, 535 feet; diameter, 7 inches; cased to bottom; deep-well turbine pump and 25-horsepower electric motor, pump set at 410 feet; pumping level, 242.6 feet below land surface while pumping 150 gallons a minute Sept. 11, 1947; temperature, 69° F.

## Average pumpage, in gallons a day

	1946	1947		1946	1947		1946	1947
January.....		46,800	May.....	69,900	79,600	September...	111,200	
February.....	41,840	54,600	June.....	72,200	108,000	October.....	58,200	
March.....	41,700	50,000	July.....	86,800	123,200	November.....	56,700	
April.....	57,000	55,400	August.....	85,000		December.....	44,800	

Storage: Elevated tank, 65,000 gallons; concrete ground tank, 100,000 gallons.

Number of customers: 315.

Treatment: Occasional chlorination.

*Analyses*

[Collected Sept. 11, 1947. pH: well 2, 7.3; well 3, 7.4. Analyzed by B. C. Dwyer]

	Well 2		Well 3	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	6.0		6.0	
Iron (Fe)	.09		.05	
Calcium (Ca)	182	9.08	167	8.34
Magnesium (Mg)	109	8.96	108	8.88
Sodium (Na)	289	12.56	306	13.30
Potassium (K)	24	.61	28	.72
Bicarbonate (HCO <sub>3</sub> )	274	4.49	274	4.49
Sulfate (SO <sub>4</sub> )	933	19.42	947	19.72
Chloride (Cl)	254	7.16	244	6.88
Fluoride (F)	2.4	.13	2.6	.14
Nitrate (NO <sub>3</sub> )	.8	.01	.8	.01
Dissolved solids	1,940		1,940	
Total hardness as CaCO <sub>3</sub>	902		861	

**SANTA RITA**

Population in 1940: 75.

Source of information: M. B. Rogers, clerk, Sept. 11, 1947.

Owner: Group No. 1 Oil Co.

Source of supply: Two wells about 2 miles northeast of camp.

Well 1. Drilled by Signal Gasoline Co.; depth, 325 feet; diameter, 12 inches; cylinder pump and 5-horsepower electric motor; static water level, 192.9 feet below land surface Sept. 11, 1947; yield reported, 15 gallons a minute; water level measured while well 2 was pumping.

Well 2. Drilled by Signal Gasoline Co.; depth, 460 feet; diameter, 12 inches; deep-well turbine pump and 7½-horsepower electric motor; pump set at 230 feet; water level reported, 190 feet below land surface; yield reported, 44 gallons a minute; temperature, 69½° F.

Pumpage: Maximum, 63,000 gallons a day; minimum, 30,000 gallons a day; average, 42,000 gallons a day.

Storage: Two wooden ground tanks, 67,000 gallons each; one steel ground tank, 462,000 gallons.

Number of customers: 35.

Treatment: None.

*Analysis, well 2*

[Collected Sept. 11, 1947. pH is 7.7. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	10		Sulfate (SO <sub>4</sub> )	704	14.66
Iron (Fe)	.11		Chloride (Cl)	760	21.43
Calcium (Ca)	149	7.44	Fluoride (F)	2.6	.14
Magnesium (Mg)	93	7.65	Nitrate (NO <sub>3</sub> )	15	.24
Sodium (Na)	574	24.97	Dissolved solids	2,450	
Potassium (K)	21	.54	Total hardness as CaCO <sub>3</sub>	754	
Bicarbonate (HCO <sub>3</sub> )	252	4.13			

**TEXON**

Population in 1940: 1,123.

Source of information: W. J. Grissett, assistant superintendent, Aug. 20, 1947.

Owner: Big Lake Oil Co.

Source of supply: Six wells.

Well 1. Three miles north of Texon; drilled in 1932; depth, 359 feet; diameter, 7 inches; deep-well cylinder pump and electric motor; yield, 53 gallons a minute.

Well 2. Three miles north of Texon; drilled in 1932; depth, 360 feet; diameter, 7 inches; deep-well cylinder pump and electric motor; yield, 53 gallons a minute.

Well 3. Three miles north of Texon; drilled in 1938; depth, 359 feet; diameter, 7 inches; deep-well cylinder pump and electric motor; yield, 53 gallons a minute.

Well 4. At gasoline plant one-fourth mile northwest of Texon; drilled in 1925; depth, 400 feet; diameter, 7 inches; deep-well cylinder pump; yield, 18 gallons a minute.

Well 5. At gasoline plant one-fourth mile northwest of Texon; drilled in 1925; depth, 400 feet; diameter, 7 inches; deep-well cylinder pump; yield, 7 gallons a minute.

Well 6. One and a half miles southwest of Texon; drilled about 1927; depth, 450 feet; diameter 7 inches; deep-well cylinder pump and electric motor; yield, 11 gallons a minute.

Pumpage (estimated): 140,000 gallons a day.

Storage: Seven steel tanks, total capacity 111,000 gallons.

Number of customers: 1,123.

Treatment: None.

### Analyses

[Collected: well 1, Aug. 20, 1947; wells 3 and 5, Sept. 11, 1947. pH: well 1, 7.8; wells 3 and 5, each 7.7. Analyzed by B. C. Dwyer]

	Well 1		Well 3		Well 5	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	17		11		8.0	
Iron (Fe)	.72		.28		3.9	
Calcium (Ca)	155	7.74	136	6.79	156	7.79
Magnesium (Mg)	90	7.40	84	6.91	103	8.47
Sodium (Na)	387	16.81	238	10.33	235	12.40
Potassium (K)	6.3	.16	16	.41	19	.49
Bicarbonate (HCO <sub>3</sub> )	260	4.26	246	4.03	262	4.29
Sulfate (SO <sub>4</sub> )	903	18.80	813	16.93	985	20.51
Chloride (Cl)	310	8.74	112	3.16	144	4.06
Fluoride (F)	2.4	.13	2.6	.14	2.6	.14
Nitrate (NO <sub>3</sub> )	11	.18	11	.18	9.0	.15
Dissolved solids	2,010		1,540		1,840	
Total hardness as CaCO <sub>3</sub>	757		685		813	

### Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Surface soil	10	10	Sand, water	46	266
Yellow lime	40	50	Red beds	14	280
White lime	105	155	White sand	58	338
Yellow lime	20	175	Red beds	4	342
Sandy lime	25	200	White sand	14	356
Brown sandy rock	20	220	Red beds	3	359

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 2</b>					
Surface soil.....	17	17	Sand, water.....	12	312
Lime.....	200	217	Sandy lime.....	8	320
Sand.....	18	235	Lime and red rock.....	10	330
Lime.....	3	238	Hard sandrock.....	15	345
Sand.....	7	245	Sand, water.....	5	350
Lime.....	13	258	Hard sandrock.....	8	358
Red beds.....	14	272	Red rock.....	2	360
Broken lime and red rock.....	28	300			

<b>Well 3</b>					
Surface soil.....	12	12	Sandrock.....	6	280
White lime.....	38	50	Sand, water.....	58	338
Yellow lime.....	125	175	Red rock.....	4	342
White lime and sand.....	45	220	Sand.....	14	356
Sand, water.....	46	266	Red rock.....	8	359
Red beds.....	8	274			

## REEVES COUNTY

## BALMORHEA

Population in 1940: 1,000.

Source of information: W. E. Gould, owner, Dec. 11, 1946.

Owner: W. E. Gould.

Source of supply: Two wells.

Well 1. Four and a half miles west of city; drilled in 1928; depth, 79 feet; diameter, 6 inches; deep-well cylinder and 2-horsepower electric motor.

Well 2. One and a half miles west of city; drilled in 1928; depth, 67 feet; diameter, 6 inches; deep-well cylinder and 2-horsepower electric motor; yield, 15 gallons a minute.

Pumpage (estimated): Average, 21,000 gallons a day.

Storage: Two concrete storage reservoirs, 7,000 gallons each.

Number of customers: 60.

Treatment: Chlorination.

*Analysis*

[Composite sample of wells 1 and 2. Collected Dec. 11, 1946. pH is 7.0. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	32		Sulfate (SO <sub>4</sub> ).....	517	10.76
Iron (Fe).....	.78		Chloride (Cl).....	220	6.20
Calcium (Ca).....	178	8.88	Fluoride (F).....	8	.04
Magnesium (Mg).....	29	2.38	Nitrate (NO <sub>3</sub> ).....	12	.19
Sodium (Na).....	274	11.92	Dissolved solids.....	1,450	
Potassium (K).....	6.8	.17	Total hardness as CaCO <sub>3</sub> .....	563	
Bicarbonate (HCO <sub>3</sub> ).....	376	6.16			

## PECOS

Population in 1940: 4,855.

Source of information: J. H. Oglesby, water superintendent, Dec. 17, 1946.

Ownership: Municipal.

Source of supply: Five wells, 9½ miles southeast of city.

Well 1. Drilled in 1933 by Tom Simmonds; depth, 187 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; static water level, 87.8 feet below land surface Oct. 10, 1940; yield, 250 gallons a minute.

Well 2. Drilled in 1935 by Tom Simmonds; depth, 211 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 300 gallons a minute.

Well 3. Drilled in 1935 by Tom Simmonds; depth, 300 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 200 gallons a minute.

Well 4. Drilled in 1942 by D. M. Bassett; depth, 191 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 300 gallons a minute.

Well 5. Drilled in 1942 by D. M. Bassett; depth, 170 feet; diameter, 10 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 300 gallons a minute.

*Average pumpage, in gallons a day*

	1945	1946		1945	1946		1945	1946
January.....		452,600	May.....		719,300	September.....		696,300
February.....		451,100	June.....		890,100	October.....		546,100
March.....		571,500	July.....		968,600	November.....		481,000
April.....		687,100	August.....		972,900	December.....	429,100	425,700, first 15 days of month

Storage: Concrete storage reservoir, 1,500,000 gallons; ground storage reservoir, 200,000 gallons; elevated tank, 110,000 gallons.

Number of customers: 1,336.

Treatment: None.

*Analysis*

[Composite sample of five wells. Collected Sept. 4, 1946. pH is 7.0. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	27		Sulfate (SO <sub>4</sub> ).....	163	3.39
Iron (Fe).....	.11		Chloride (Cl).....	72	2.03
Calcium (Ca).....	91	4.54	Fluoride (F).....	2.0	.11
Magnesium (Mg).....	24	1.97	Nitrate (NO <sub>3</sub> ).....	10	.16
Sodium and Potassium (Na + K).....	62	2.69	Dissolved solids.....	578	
Bicarbonate (HCO <sub>3</sub> ).....	214	3.51	Total hardness as CaCO <sub>3</sub> .....	320	

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Top soil.....	10	10	Yellow clay.....	16	119
Red sandrock.....	20	30	Red sand, shale.....	17	136
Conglomerate.....	10	40	Red sand, water.....	6	142
Red sandrock.....	5	45	Light sand.....	5	147
Conglomerate.....	20	65	Dry sand.....	13	160
Yellow clay.....	5	70	Red sandrock and clay.....	17	177
Conglomerate.....	14	84	Sand and honeycomb, water.....	6	183
Sand and honeycomb, water.....	19	103	Red sandrock.....	4	187

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 2</b>					
Top soil, sand, and caliche.....	24	24	Yellow sand, loose rock.....	14	107
Brown sandstone and clay.....	6	30	Yellow clay and rock.....	3	110
Hard white sandstone.....	23	53	Red sandstone, water.....	44	154
Yellow clay with little sand and very small amount of water.....	27	80	Red shale.....	11	165
Red sand, water.....	13	93	Red sandstone, water.....	26	191
			Red sand and clay.....	20	211

<b>Well 3</b>					
Top soil and caliche.....	30	30	Red sandstone, water.....	7	176
Red sandstone, yellow clay.....	6	36	Red clay.....	28	204
Brown rock, clay in seams, little water at 80 feet.	44	80	Sand and black gravel, water Red clay.....	6	210
Red sandstone.....	10	90	Red sandstone, gravel, water Red sandstone.....	4	214
Red sandstone and gravel.....	20	110	Red clay.....	5	219
Red sandstone.....	8	118	Red sandstone.....	11	230
Red clay.....	1	119	Red clay.....	2	232
Red sandstone, water.....	29	148	Red sandstone.....	13	245
Red clay.....	8	156	Red clay.....	2	247
Very hard red sandstone.....	10	166	Red sandstone.....	28	275
Red clay.....	3	169	Red clay.....	25	300

<b>Well 4</b>					
Top soil.....	3	3	Gray sand, water.....	10	95
Caliche.....	25	28	Sandy shale.....	35	130
Red shale.....	44	72	Red shale.....	30	160
Sandy red shale.....	13	85	Sticky red beds.....	31	191

<b>Well 5</b>					
Caliche and gravel.....	30	30	Red shale.....	2	127
Yellow sand.....	10	40	Water sand.....	23	150
Red shale.....	50	90	Sticky red shale.....	5	155
Red sand, water.....	5	95	Broken sand.....	8	163
Red shale.....	2	97	Sandy shale.....	7	170
Red sand, water.....	28	125			

## TOYAH

Population in 1940: 464.

Source of information: O. G. McPherson, Dec. 11, 1946.

Owner: Texas and Pacific Railroad.

Source of supply: Impounding reservoir on Big Aguja Canyon, 47 miles southwest of Toyah.

*Average pumpage, in gallons a day, 1946*

March.....	17,635	June.....	25,080	September.....	11,217
April.....	22,393	July.....	24,542	October.....	11,800
May.....	20,226	August.....	19,000		

Storage: Ground storage reservoir, 200,000 gallons; ground storage reservoir, 180,000 gallons; elevated tank, 150,000 gallons; elevated tank, 100,000 gallons.

*Analyses*

[Collected Dec. 11, 1946. pH: raw water, 7.5; finished water, 7.2. Analyzed by C. B. Cibulka]

	Raw water		Finished water	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	32		32	
Iron (Fe)	.68		.69	
Calcium (Ca)	37	1.847	35	1.747
Magnesium (Mg)	4.6	.378	5.5	.452
Sodium (Na)	17	.760	17	.748
Potassium (K)	3.6	.092	3.4	.087
Bicarbonate (HCO <sub>3</sub> )	158	2.590	152	2.491
Sulfate (SO <sub>4</sub> )	6.7	.139	6.9	.144
Chloride (Cl)	10	.282	12	.338
Fluoride (F)	1.0	.053	1.0	.053
Nitrate (NO <sub>3</sub> )	.8	.013	.5	.008
Dissolved solids	191		189	
Total hardness as CaCO <sub>3</sub>	111		110	

## ROBERTS COUNTY

## MIAMI

Population in 1940: 713.

Source of information: C. Hubbard, plant operator, June 24, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Well; drilled in 1947; depth, 113 feet; diameter, 18 inches; deep-well turbine pump and electric motor; static water level, 45 feet below land surface January 1947; yield, 320 gallons a minute with drawdown of 45 feet.

Pumpage (estimated): 65,000 gallons a day.

Storage: Ground reservoir on hill, 186,000 gallons.

Number of customers: 183.

Treatment: None.

*Analysis*

[Collected June 24, 1948. pH is 7.9. Analyzed by H. D. Smith]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		Sulfate (SO <sub>4</sub> )	5.7	0.119
Iron (Fe)	.00		Chloride (Cl)	5.2	.147
Calcium (Ca)	59	2.945	Fluoride (F)	.6	.032
Magnesium (Mg)	8.6	.707	Nitrate (NO <sub>3</sub> )	8.3	.134
Sodium (Na)	2.9	.126	Dissolved solids	246	
Potassium (K)	6.0	.153	Total hardness as CaCO <sub>3</sub>	183	
Bicarbonate (HCO <sub>3</sub> )	214	3.508			

## SCHLEICHER COUNTY

## ELDORADO

Population in 1940: 1,530.

Source of information: L. B. Burk, water superintendent, Sept. 21, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Near city hall; drilled in December 1938 by V. P. O'Harrow; depth, 361 feet; diameter, 8 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 280 feet below land surface when drilled; yield, 400 gallons a minute.

Well 2. Three blocks north and half a block east of city hall; drilled in 1939 by V. P. O'Harrow; depth, 361 feet; diameter, 8 inches; deep-well turbine pump and 40-horsepower electric motor; yield 225 gallons a minute when drilled.

Pumpage (estimated): 125,000 gallons a day.

Storage: Concrete ground reservoir, 100,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 450.

Treatment: Chlorination.

### Analyses

[Collected Sept. 21, 1948. pH: well 1, 7.5; well 2, 7.2. Analyzed by D. E. Weaver]

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	14		12	
Iron (Fe)	.65		.45	
Calcium (Ca)	47	2.35	47	2.35
Magnesium (Mg)	24	1.97	24	1.97
Sodium (Na)	15	.65	15	.65
Potassium (K)	2.8	.07	3.2	.08
Bicarbonate (HCO <sub>3</sub> )	212	3.47	212	3.47
Sulfate (SO <sub>4</sub> )	27	.56	26	.54
Chloride (Cl)	26	.73	27	.76
Fluoride (F)	2.2	.12	2.0	.11
Nitrate (NO <sub>3</sub> )	8.5	.14	6.7	.11
Dissolved solids	282		278	
Total hardness as CaCO <sub>3</sub>	216		216	

### Driller's log, well 1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	2	2	Hard lime layers and caliche	32	268
Caliche and boulders	6	8	Hard lime	12	280
Hard lime layers	42	50	Hard gray lime	29	309
Caliche	2	52	Soft gray lime	5	314
Hard lime	15	67	Soft lime	8	322
Hard lime layers in caliche	19	86	Lime	8	330
Soft lime	16	102	Soft lime and flint	5	335
Hard lime layers	5	107	Lime	3	338
Caliche	3	110	Soft mixed rock	6	344
Hard layers and caliche	9	119	Hard rock	1	345
Hard lime	25	144	Soft porous lime, water	4	349
Lime layers and caliche	87	231	Hard light-gray lime	12	361
Lime and flint layers	5	236			

## SCURRY COUNTY

### HERMLEIGH

Population in 1940: 404.

Source of information: Geo. O. Hale, pump operator, June 20, 1946.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1928; depth, 220 feet; diameter, 6 inches; deep-well cylinder pump and 5-horsepower electric motor; yield, 3 gallons a minute.

Well 2. Drilled in 1928; depth, 240 feet; diameter, 6 inches; deep-well cylinder pump and  $\frac{3}{4}$ -horsepower electric motor; yield, 3 gallons a minute.

Well 3. Drilled; depth, 260 feet; diameter, 6 inches; deep-well cylinder pump and 1-horsepower electric motor; yield, 3 gallons a minute.

Pumpage: No record.

Storage: Ground storage reservoir, 150,000 gallons (not used); elevated tank, 150,000 gallons.

Number of customers: 54.

Treatment: None.

### Analysis

[Composite sample of three wells. Collected June 20, 1946. pH is 8.1. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	17		Sulfate (SO <sub>4</sub> )	222	4.62
Iron (Fe)	.12		Chloride (Cl)	32	.90
Calcium (Ca)	84	4.19	Fluoride (F)	1.8	.09
Magnesium (Mg)	21	1.73	Nitrate (NO <sub>3</sub> )	.5	.01
Sodium (Na)	94	4.07	Dissolved solids	636	
Potassium (K)	4.2	.11	Total hardness as CaCO <sub>3</sub>	236	
Bicarbonate (HCO <sub>3</sub> )	274	4.49			

### SNYDER

Population in 1940: 3,815.

Source of information: Carl Keller, May 20, 1946.

Ownership: Municipal.

Source of supply: Four wells.

Well 1. At city hall; drilled in 1925 by D. D. Doty; depth, 160 feet; diameter, 17 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 250 gallons a minute in May 1946; temperature, 70° F.

Well 2. About 100 feet east of well 1; drilled in 1926 by D. D. Doty; depth, 165 feet; diameter, 17 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 66 feet below land surface May 23, 1946; yield, 250 gallons a minute with drawdown of 40 feet after 4 hours of pumping May 23, 1946.

Well 3. About 0.8 mile north of courthouse; drilled in 1928 by D. D. Doty; depth, 187 feet; diameter, 17 inches; no pumping equipment as of May 26, 1946; static water level, 45 feet below land surface May 22, 1946.

Well 4. About 0.3 mile east of courthouse; drilled in 1945 by D. D. Doty; depth, 205 feet; diameter, 17 to 12 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 30 feet below land surface May 24, 1946; yield, 125 gallons a minute; temperature, 69° F.

Pumpage (estimated): Average, 375,000 gallons a day.

Storage: Concrete ground reservoir, 150,000 gallons; elevated tank, 100,000 gallons.

Number of customers: 925.

Treatment: None.

## Analyses

[Collected May 29, 1946. pH: wells 1 and 2, 7.5; well 4, 7.6. Analyzed by C. B. Cibulka]

	Well 1		Well 2		Well 4	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	27		27		27	
Iron (Fe)	.04		.05		.02	
Calcium (Ca)	60	2.99	79	3.94	56	2.80
Magnesium (Mg)	23	1.89	28	2.30	19	1.56
Sodium (Na)	45	1.94	49	2.14	40	1.75
Potassium (K)	5.0	.13	4.8	.12	3.8	.10
Bicarbonate (HCO <sub>3</sub> )	308	5.05	316	5.18	292	4.79
Sulfate (SO <sub>4</sub> )	32	.67	51	1.06	24	.50
Chloride (Cl)	34	.96	66	1.86	24	.68
Fluoride (F)	1.6	.08	1.6	.08	1.8	.09
Nitrate (NO <sub>3</sub> )	12	.19	20	.32	9.4	.15
Dissolved solids	391		496		349	
Total hardness as CaCO <sub>3</sub>	244		312		218	

## Driller's logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Chalk rock	15	15	Red clay	31	90
Hard rock	2	17	Sand	30	120
Sandy clay	8	25	Chalk and sand	8	128
Rock	3	28	Clay	2	130
Sandy clay	3	31	Rock, water	7	137
Sandrock	10	41	Red clay	27	164
Hard rock	4	45	Rock	11	175
Soft rock	10	55	Red clay	8	183
Sandrock	4	59			
<b>Well 2</b>					
Soft clay and sand	35	35	Hard rock	7	134
Sand rock, water	12	47	Sand	6	140
Blue clay	13	60	Sandrock	10	150
Hard rock	1	61	Rock, shale	4	154
Red and blue clay	31	92	Soft sand	2	156
Hard rock	1	93	Hard rock	3	159
Sand, water	4	97	Cave	1	160
Hard rock	1	98	Hard rock	1	161
Soft sand, water	5	103	Cave	1	162
Red clay	18	121	Hard rock	3	165
Sandrock	4	125	Yellow clay	14	179
Soft sand	2	127			
<b>Well 3</b>					
Soil and clay	6	6	Hard rock	2	111
Chalk and gravel	14	20	Clay	2	113
Clay and gravel	21	41	Rock, soft	1	114
Sand	7	48	Sand, water	7	121
Sand and gravel	12	60	Hard rock	4	125
Yellow sandrock	7	67	Soft sand	9	134
Clay	5	72	Hard rock	2	136
Hard rock	2	74	Sandrock	4	140
Soft cave	1	75	Water sand	10	150
Hard rock	3	78	Rock, hard	7	157
Soft sand	4	82	Soft rock	5	162
Hard rock	2	84	Hard rock	4	166
Hard rock	7	91	Soft rock	2	168
Sandy clay	1	92	Hard rock	4	172
Hard rock	6	98	Red clay	15	187
Sandy clay	11	109			

## SHERMAN COUNTY

## STRATFORD

Population in 1940: 877.

Source of information: Chester Guthrie, manager, Southwestern Public Service Co., June 24, 1948.

Owner: Southwestern Public Service Co.

Source of supply: Two wells.

Well 2. Drilled; depth, 300 feet; diameter, 8 inches; deep-well turbine pump and electric motor; static water level, 220 feet below land surface; yield, 170 gallons a minute with drawdown of 30 feet.

Well 3. Drilled in 1930 by L. E. McDade; depth, 300 feet; diameter, 10 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 216 feet below land surface; yield, 225 gallons a minute.

Pumpage: Average, 125,000 gallons a day.

Storage: Ground reservoir, 20,000 gallons; elevated tank, 85,000 gallons.

Number of customers: 470.

Treatment: Chlorination.

*Analysis, well 3*

[Collected June 24, 1948. pH is 7.6. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	31		Sulfate (SO <sub>4</sub> )	48	1.00
Iron (Fe)	.00		Chloride (Cl)	10	.28
Calcium (Ca)	36	1.80	Fluoride (F)	1.2	.06
Magnesium (Mg)	36	2.96	Nitrate (NO <sub>3</sub> )	9.5	.15
Sodium (Na)	14	.61	Dissolved solids	314	
Potassium (K)	5.2	.18	Total hardness as CaCO <sub>3</sub>	237	
Bicarbonate (HCO <sub>3</sub> )	244	4.00			

*Driller's log, well 3*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Top soil	4	4	Packed sand	40	189
Soft sandstone	25	29	Loose, sliding sand	30	219
Yellow clay	60	89	Water, quicksand	81	300
Caliche	60	149			

## STONEWALL COUNTY

## ASPERMONT

Population in 1940: 1,041.

Source of information: Marvin B. Austin, water superintendent, Sept. 15, 1947.

Ownership: Municipal.

Source of supply: Lake Sellers; built in 1913 and enlarged in 1934; capacity, 500 acre-feet.

Pumpage: Average, 140,000 gallons a day.

Storage: Settling basin at treating plant, 100,000 gallons; elevated tank, 65,000 gallons.

Number of customers: 250.

Treatment: Coagulation, sedimentation, prechlorination and postchlorination.

*Analyses*

[Collected Sept. 15, 1947. pH: raw water, 7.7; finished water, 6.8. Analyzed by B. C. Dwyer]

	Raw water		Finished water	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		4.0	
Iron (Fe)	91	.08	.04	
Calcium (Ca)	19	4.54	120	5.99
Magnesium (Mg)	19	1.56	9.8	.81
Sodium (Na)	19	.84	3.9	.17
Potassium (K)	2.2	.06	3.0	.08
Bicarbonate (HCO <sub>3</sub> )	250	4.10	50	.82
Sulfate (SO <sub>4</sub> )	46	.96	236	4.96
Chloride (Cl)	50	1.41	44	1.24
Fluoride (F)	1.0	.05	.2	.01
Nitrate (NO <sub>3</sub> )	30	.02	1.2	.02
Dissolved solids	460		502	
Total hardness as CaCO <sub>3</sub>	305		340	

## SUTTON COUNTY

## SONORA

Population in 1940: 2,528.

Source of information: R. M. McCarver, water superintendent, July 22, 1947.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. About 1,500 feet northwest of city hall; drilled in 1938; depth, 303 feet; diameter, 10 inches; deep-well turbine pump and 40-horsepower electric motor; yield, 400 gallons a minute.

Well 2. East of well 1; drilled in 1938 by Layne-Texas Co.; depth, 303 feet; diameter, 10 3/4 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 276 feet below land surface in 1938; yield, 420 gallons a minute in 1938.

Well 3. Drilled in 1947 by Layne-Texas Co.; depth, 302 feet; diameter, 10 3/4 inches; deep-well turbine pump and 60-horsepower electric motor; static water level, 276 feet below land surface in June 1947; yield, 600 gallons a minute.

Pumpage (estimated): Average, 375,000 gallons a day.

Storage: Three concrete ground storage reservoirs, 50,000 gallons, 150,000 gallons, and 200,000 gallons, respectively. All reservoirs located on hill.

Number of customers: 800.

Treatment: Chlorination.

*Analysis of finished water*

[Composite sample from 3 wells. Collected July 22, 1947. pH is 7.5. Analyzed by F. C. Dwyer]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	11		Sulfate (SO <sub>4</sub> )	8.8	0.18
Iron (Fe)	.00		Chloride (Cl)	16	.45
Calcium (Ca)	75	3.74	Fluoride (F)	.2	.01
Magnesium (Mg)	20	1.64	Nitrate (NO <sub>3</sub> )	5.0	.08
Sodium (Na)	4.8	.21	Dissolved solids	297	
Potassium (K)	4.4	.11	Total hardness as CaCO <sub>3</sub>	269	
Bicarbonate (HCO <sub>3</sub> )	304	4.98			

## Driller's log, well 2

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
White limestone.....	10	10	Hard limestone.....	1.5	171.5
Caliche and boulders.....	2.5	12.5	Hard layers and soft limestone.	22.5	194
Hard limestone.....	1.5	14	Very hard limestone.....	6	200
Limestone and caliche.....	5	19	Hard limestone.....	12	212
Conglomerate.....	10	29	Limestone.....	6	218
Caliche.....	3	32	Light gray limestone.....	10	228
Soft limestone.....	9	41	Soft gray limestone.....	8	236
Hard limestone.....	5	46	Hard gray limestone.....	17	253
Limestone and caliche.....	8	54	Soft gray limestone.....	1	254
Very hard rock.....	4	58	Red clay and boulders.....	20.5	274.5
Soft gray limestone.....	1.5	59.5	Hard rock.....	1	275.5
Hard limestone.....	26.5	86	Soft rock.....	4.5	280
Hard limestone and caliche.....	2	88	Gravel and boulders, water.....	2	282
Hard limestone.....	13	101	Light gray limestone.....	3	285
Caliche and boulders.....	1	102	Soft limestone.....	3	288
Hard limestone.....	14	116	Porous limestone, water.....	2.5	290.5
Soft limestone.....	5	121	Very hard rock.....	2.5	293
Hard layers in soft limestone.....	10	131	Soft white limestone.....	3.5	296.5
Flint.....	1.5	132.5	Cavity, water.....	1.5	298
Flint layers and caliche.....	10.5	143	No sample.....	2	300
Hard layers and soft limestone.	6	149	Tight sand.....	2	302
Very hard limestone.....	2	151	Brown flint.....	1	303
Hard layers and soft limestone.	19	170			

## SWISHER COUNTY

## HAPPY

Population in 1940: 576.

Source of information: Wm. F. Miller, water superintendent, Mar. 6, 1945.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. About 20 feet north of elevated tank; drilled in 1928 by Leo McDade; depth, 179 feet; diameter, 6 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 25 gallons a minute; temperature, 62½° F.

Well 2. About 40 feet south of well 1; drilled in 1928 by Travis Gillum; depth, 179 feet; diameter, 6 inches; deep-well turbine pump and 3-horsepower electric motor; yield, 25 gallons a minute; temperature, 62½° F.

Pumpage: No record.

Storage: Concrete ground reservoir, 150,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 100.

Treatment: None.

## Analysis, well 2

[Collected Mar. 6, 1945. pH is 7.9. Analyzed by M. L. Begley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> ).....	38	-----	Sulfate (SO <sub>4</sub> ).....	26	0.54
Iron (Fe).....	.04	-----	Chloride (Cl).....	10	.28
Calcium (Ca).....	47	2.35	Fluoride (F).....	2.0	.11
Magnesium (Mg).....	27	2.22	Nitrate (NO <sub>3</sub> ).....	13	.21
Sodium (Na).....	24	1.06	Dissolved solids.....	332	-----
Potassium (K).....	5.9	.15	Total hardness as CaCO <sub>3</sub> .....	228	-----
Bicarbonate (HCO <sub>3</sub> ).....	283	4.64			

## TULIA

Population in 1940: 2,055.

Source of information: L. L. Schenault, water superintendent, Mar. 3, 1945.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Drilled in 1922 by R. J. Stalling; depth, 198 feet; diameter, 18 inches; deep-well turbine pump and 40-horsepower electric motor; yield, 400 gallons a minute.

Well 2. Drilled in 1926 by G. E. Higgins; depth, 167 feet; diameter, 26 inches; deep-well turbine pump and 50-horsepower electric motor; static water level, 78.5 feet below land surface Mar. 3, 1945; yield, 515 gallons a minute.

Well 3. Drilled in 1914 by R. J. Stalling; depth, 140 feet; diameter, 18 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 200 gallons a minute.

Pumpage: No record.

Storage: Ground storage reservoir, 265,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 700.

Treatment: None.

*Analysis, well 2*

[Collected Mar. 3, 1945. pH is 7.8. Analyzed by M. L. Begley]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	58		Sulfate (SO <sub>4</sub> )	3F	0.69
Iron (Fe)	.06		Chloride (Cl)	2F	.62
Calcium (Ca)	36	1.80	Fluoride (F)	5.2	.27
Magnesium (Mg)	31	2.55	Nitrate (NO <sub>3</sub> )	2.8	.05
Sodium (Na)	53	2.29	Dissolved solids	377	
Potassium (K)	8.7	.22	Total hardness as CaCO <sub>3</sub>	21F	
Bicarbonate (HCO <sub>3</sub> )	319	5.23			

## TERRELL COUNTY

## SANDERSON

Population in 1940: 2,150.

Source of information: James Caroline, water superintendent, Sept. 23, 1948.

Owner: Community Public Service Co.

Source of supply: Twelve wells.

Well 1. At ice plant near Texas and New Orleans Railroad on Wilson Street; drilled; depth reported, 470 feet; deep-well cylinder and pump jack and 3-horsepower electric motor; yield, 9 gallons a minute.

Well 2. Near well 1; drilled; depth, 415 feet; deep-well cylinder and pump jack and 3-horsepower electric motor; yield, 8 gallons a minute.

Well 3. Near elevated tank; drilled; depth, 470 feet; deep-well turbine pump and 7½-horsepower electric motor; yield, 22 gallons a minute.

Well 5. About 50 feet west of Wilson Street near the corner of Pine and Wilson Streets; drilled in 1940 by Layne-Texas Co.; depth, 525 feet; diameter, 12¾ to 6¾ inches; deep-well cylinder and electric motor; yield, 3 gallons a minute.

Well 7. Three blocks north and one block east of the courthouse; drilled by C. V. Cox; depth, 491 feet; diameter, 12 to 8 inches; deep-well cylinder and pump jack and electric motor; yield, 13 gallons a minute.

Well 8. Northeast of well 7; drilled in June 1943 by Brownie Locke; depth, 485 feet; diameter, 12 inches; deep-well cylinder and pump jack and 5-horsepower electric motor; yield, 10 gallons a minute.

Well 10. Northeast of well 8; drilled in July 1945 by Huffman and Brazell; depth, 525 feet; diameter, 10 to 8¼ inches; deep-well cylinder and pump jack and 3-horsepower electric motor; yield, 9 gallons a minute.

Well 11. About 850 yards northeast of well 10; drilled; depth, 545 feet; diameter, 8 inches; deep-well cylinder and pump jack and 7½-horsepower electric motor; yield, 13 gallons a minute.

Well 14. West of well 11; drilled in April 1946 by Huffmar and Brazell; depth, 525 feet; diameter, 8¼ inches; deep-well cylinder and pump jack; yield, 7 gallons a minute.

Well 15. Northeast of well 11; drilled in April 1946 by Huffman and Brazell; depth, 580 feet; diameter, 8½ inches; deep-well cylinder and pump jack and electric motor; yield, 8 gallons a minute.

Well 16. About 4,200 feet northwest of power plant; drilled; depth, 840 feet; diameter, 7 inches; deep-well cylinder and pump jack and electric motor; yield on test, 49 gallons a minute.

Well 17. South of well 16; drilled; depth, unknown; diameter, unknown; deep-well cylinder and pump jack and 5-horsepower electric motor; yield, 17 gallons a minute.

Pumpage (estimated): 150,000 gallons a day.

Storage: Concrete reservoir, rock reservoir, and steel tank; all elevated on hill; capacity, unknown.

Number of customers (estimated): 350.

Treatment: Hypochlorination.

### Analysis

[Composite sample, collected Sept. 28, 1948. pH is 8.3. Analyzed by D. E. Weaver]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	12		Sulfate (SO <sub>4</sub> )	27	0.541
Iron (Fe)	.65		Chloride (Cl)	13	.367
Calcium (Ca)	56	2.795	Fluoride (F)	.6	.032
Magnesium (Mg)	22	1.809	Nitrate (NO <sub>3</sub> )	3.2	.052
Sodium (Na)	3.1	.135	Dissolved solids	267	
Potassium (K)	2.4	.061	Total hardness as CaCO <sub>3</sub>	237	
Bicarbonate (HCO <sub>3</sub> )	230	3.775			

### Drillers' logs

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 5</b>					
Hard rock	24	24	Yellow sandrock	10	350
White lime	61	85	White sandrock	10	360
White and gray lime	35	120	Sandrock	30	390
Yellow lime	40	160	Dark lime rock	5	395
Gray-blue lime	15	175	Blue lime rock	15	410
Yellow lime	40	215	Sandy blue rock	30	440
Gray lime	50	265	Fine white sandrock	10	450
Blue lime	35	300	Blue sandrock	50	500
Yellow sandrock	20	320	Gray sandrock	25	525
White sandrock	20	340			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well 7					
Gravel .....	6	6	Gray sand .....	15	360
Yellow lime .....	54	60	First water .....	5	365
Gray lime .....	75	135	Yellow sand .....	10	375
Yellow lime .....	95	230	Blue sand .....	15	390
Blue lime .....	30	260	Gray sand .....	45	435
Yellow lime .....	30	290	Yellow sand .....	15	450
Gray sandrock .....	15	305	Soapstone .....	15	465
Yellow sand .....	20	325	Soapstone .....	13	478
Blue sand .....	5	330	Rock .....	9	487
Yellow sand .....	15	345	Soapstone and sand .....	4	491

Well 8					
Rock and caliche .....	10	10	Gray lime .....	60	280
Gray lime .....	100	110	Blue lime .....	30	310
Brown lime .....	20	130	Gray sandrock .....	40	350
Blue lime .....	20	150	Yellow sandrock strips of soapstone.	135	485
Gray lime .....	30	180			
Yellow lime .....	40	220			

Well 10					
Caliche .....	25	25	Yellow lime, sandy .....	20	390
Broken lime .....	65	90	Blue shale .....	15	405
Lime shells and caliche .....	35	125	Sand .....	10	415
Gray lime .....	40	165	Blue shale .....	45	460
White lime .....	20	185	Sand .....	10	470
Yellow lime, sandy .....	20	205	Blue sand .....	10	480
Gray lime .....	50	255	Blue lime .....	5	485
Blue lime .....	45	300	Blue lime, sandy .....	11	496
White sand .....	15	315	Blue lime .....	14	510
Yellow sand .....	45	360	Blue shale .....	15	525
White sand .....	10	370			

Well 11					
Soil and caliche .....	11	11	Lime, sandy (water) .....	45	400
Broken lime .....	89	100	Gray lime .....	25	425
Yellow lime .....	65	165	Gray lime .....	40	465
White lime .....	45	210	Sand (water) .....	5	470
Yellow lime .....	50	260	Sandy lime .....	40	510
Blue lime .....	40	300	Sand .....	10	520
White lime .....	10	310	Blue shale .....	25	545
Yellow sand .....	45	355			

Well 14					
Broken lime .....	15	15	Blue shale .....	10	360
Gray lime .....	25	40	Yellow sandy shale .....	25	385
Yellow lime .....	10	50	Broken sand .....	10	395
Lime .....	85	135	Blue shale .....	10	405
Gray lime .....	25	160	Broken sand .....	7	412
Yellow caliche .....	15	175	Blue shale .....	8	420
Caliche .....	5	180	Broken lime .....	10	430
Yellow lime .....	65	245	Blue sandy shale .....	10	440
Gray lime .....	49	294	Broken lime .....	20	460
Yellow broken lime .....	9	303	Blue shale .....	30	490
Gray lime .....	7	310	Brown sand, some green shale.	35	525
Yellow broken lime .....	20	330			
Sandy lime .....	20	350			

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 15</b>					
Caliche .....	25	25	Blue shale .....	5	380
Yellow lime .....	5	30	Yellow lime .....	10	390
Gray lime .....	10	40	Blue shale .....	5	395
Broken lime .....	60	100	Broken lime .....	15	410
Lime .....	5	105	Sandy blue shale .....	55	465
Gray lime .....	20	125	Blue shale and lime shells .....	30	495
Broken lime .....	55	180	Blue sandy shale .....	5	500
Lime .....	4	184	Sandy lime .....	10	510
Red shale, sandy .....	16	200	Sandy lime .....	15	525
Yellow lime .....	50	250	Sandy blue shale .....	20	545
Gray lime .....	65	315	Blue shale .....	5	550
Yellow broken lime .....	5	320	Red beds .....	5	555
Broken sand .....	10	330	Blue shale .....	5	560
Yellow sand, hard .....	20	350	Lime .....	10	570
Gray lime .....	25	375	Unknown .....	10	580

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 16</b>					
Caliche .....	50	50	Lime, shells, and shale .....	65	515
Gravel .....	10	60	Broken sand .....	10	525
Caliche .....	5	65	Blue shale .....	15	540
Lime .....	20	85	Lime, shells, and shale .....	10	550
Brown lime and shale .....	20	105	Lime .....	5	555
Gray lime .....	10	115	Sandy lime .....	15	570
Lime and shells .....	75	190	Lime, shells, and shale .....	160	730
Lime and caliche .....	70	260	Lime .....	30	760
Blue lime .....	50	310	Gray lime .....	20	780
Yellow caliche .....	45	355	Brown lime .....	20	800
Sand and gravel .....	5	360	Brown lime .....	3	808
Yellow caliche .....	25	385	Sandy (?) .....	10	813
Sand, water .....	15	400	Blue lime .....	12	825
Water sand and gravel .....	15	415	Brown lime .....	10	835
Blue shale .....	10	425	Blue sand .....	5	840
Sandy lime .....	25	450			

## TERRY COUNTY

### BROWNFIELD

Population in 1940: 4,009.

Source of information: E. E. Jones, water superintendent, May 24, 1944.

Ownership: Municipal.

Source of supply: Three wells.

Well 1. Dug and drilled; depth, 107 feet; deep-well turbine pump and electric motor; yield, 300 gallons a minute.

Well 2. Drilled in 1932; depth, 117 feet; deep-well turbine pump and electric motor; yield, 400 gallons a minute.

Well 3. Drilled in 1941 by Paul Pierson; depth, 132 feet; diameter, 13 inches; deep-well turbine pump and 20-horsepower electric motor; yield, 400 gallons a minute.

Pumpage: No record.

Storage: Two concrete storage reservoirs, total capacity, 140,000 gallons; two elevated tanks, total capacity, 250,000 gallons.

Number of customers: 1,000.

Treatment: None.

*Analysis, well 1*

[Collected May 24, 1944. pH is 7.9. Analyzed by W. W. Hastings]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	46		Sulfate (SO <sub>4</sub> )	169	3.52
Iron (Fe)	.05		Chloride (Cl)	98	2.76
Calcium (Ca)	64	3.19	Fluoride (F)	3.0	.16
Magnesium (Mg)	61	5.02	Nitrate (NO <sub>3</sub> )	10	.16
Sodium (Na)	64	2.78	Dissolved solids	740	
Potassium (K)	15	.38	Total hardness as CaCO <sub>3</sub>	410	
Bicarbonate (HCO <sub>3</sub> )	291	4.77			

*Driller's log, well 3*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil, clay, and sand	33	33	Chert, crystalline sandstone	7	105
Soft red sand	36	69	Water sand, probably some water	1	106
Hard sand	5	74	Chert	4	110
Soft white sand (dry)	12	86	Gravel, water	20	130
Caliche	8	94	Red rock (red bed), clay	2	132
Water sand	4	98			

**TOM GREEN COUNTY****CHRISTOVAL**

Population in 1940: 544.

Source of information: H. H. Shaw, owner, Aug. 19, 1947.

Owner: H. A. Shaw.

Source of supply: Dug well; depth, 40 feet; dimensions, 4 by 7 feet at top and 8 by 16 feet at bottom; lined with concrete to a depth of 30 feet below the surface; centrifugal pump and 3-horsepower electric motor; static water level, 23 feet below land surface; pumping level, 24.52 feet below land surface Aug. 19, 1947; yield, 100 gallons a minute.

Pumpage: Average, 80,000 gallons a day.

Storage: Two concrete storage reservoirs, 14,000 gallons each.

Number of customers: 40.

Treatment: None.

*Analysis*

[Collected Aug. 19, 1947. pH is 7.0. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	15		Sulfate (SO <sub>4</sub> )	16	0.33
Iron (Fe)	.04		Chloride (Cl)	22	.62
Calcium (Ca)	104	5.19	Fluoride (F)	.2	.01
Magnesium (Mg)	16	1.32	Nitrate (NO <sub>3</sub> )	3.5	.06
Sodium (Na)	5.1	.22	Dissolved solids	355	
Potassium (K)	1.2	.03	Total hardness as CaCO <sub>3</sub>	326	
Bicarbonate (HCO <sub>3</sub> )	350	5.74			

**SAN ANGELO**

Population in 1940: 25,802.

Source of information: Walter Beaty, water superintendent, Aug. 19, 1947.

Owner: West Texas Utilities Co.

Source of supply: Four reservoirs.

Lake Concho. At south end of city near filtration plant; constructed in 1902; capacity, 459 acre-feet.

Lake Ben Ficklin. Above Lake Concho; constructed in 1918; capacity, 398 acre-feet.

Lake Metcalfe. Constructed in 1902; capacity, 425 acre-feet.

Lake Nosworthy. Constructed in 1930; capacity, 10,500 acre-feet.

*Average pumpage, in gallons a day*

	1946	1947		1946	1947		1946	1947
January	3,172,000	2,896,000	May	6,742,000	5,124,000	September	6,750,000	-----
February	3,818,000	3,488,000	June	9,315,000	9,353,000	October	3,476,000	-----
March	4,180,000	2,835,000	July	10,634,000	11,770,000	November	3,617,000	-----
April	6,470,000	5,437,000	August	11,065,000	-----	December	3,038,000	-----

Storage: Ground storage reservoir, 630,000 gallons; two elevated tanks, 250,000 gallons each.

Number of customers: 9,702.

Treatment: Coagulation, sedimentation, filtration, and chlorination.

*Analyses*

[Collected Aug. 18, 1947. pH: raw and finished water, each 7.5. Analyzed by B. C. Dwyer]

Lake Nosworthy	Raw water		Finished water	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	11	-----	14	-----
Iron (Fe)	37	-----	.06	-----
Calcium (Ca)	55	2.75	54	2.70
Magnesium (Mg)	20	1.64	21	1.73
Sodium (Na)	43	1.89	47	2.06
Potassium (K)	7.0	.18	7.0	.18
Bicarbonate (HCO <sub>3</sub> )	228	3.74	228	3.74
Sulfate (SO <sub>4</sub> )	29	.60	37	.77
Chloride (Cl)	74	2.09	76	2.14
Fluoride (F)	.6	.03	.4	.02
Nitrate (NO <sub>3</sub> )	0	.00	.0	.00
Dissolved solids	352	-----	369	-----
Total hardness as CaCO <sub>3</sub>	220	-----	222	-----

**SANATORIUM**

Population in 1940: 450.

Source of information: T. E. Heskey, chief engineer, Aug. 19, 1947.

Owner: State of Texas.

Source of supply: Two wells northeast of Sanatorium power plant, half a mile apart; auxiliary supply from North Concho River.

Well 1. Dug in 1930; depth, 80 feet; diameter, 12 feet; deep-well turbine pump and 40-horsepower electric motor; static water level, 18.5 feet below land surface Aug. 19, 1947; yield, 250 gallons a minute; reported decline considerable after several hours of pumping.

Well 2. Dug in 1938; depth, 80 feet; diameter, 12 feet; deep-well turbine pump and 40-horsepower electric motor; pumping level, 53.8 feet below land surface Aug. 19, 1947; yield, 500 gallons a minute.

Pumpage: Maximum, 375,000 gallons a day; minimum, 225,000 gallons a day. Storage: Elevated tank, 100,000 gallons.

Number of customers: 1,350 patients and staff members.

Treatment: None.

*Analysis, well 2*

[Collected Aug. 19, 1947. pH is 7.2. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	20		Sulfate (SO <sub>4</sub> )	100	2.08
Iron (Fe)	.04		Chloride (Cl)	68	1.92
Calcium (Ca)	90	4.49	Fluoride (F)	.6	.03
Magnesium (Mg)	52	4.28	Nitrate (NO <sub>3</sub> )	3.8	.06
Sodium (Na)	35	1.53	Dissolved solids	568	
Potassium (K)	7.0	.18	Total hardness as CaCO <sub>3</sub>	438	
Bicarbonate (HCO <sub>3</sub> )	390	6.39			

*Driller's log, well 1*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	4	4	Coarse tight sand	4	64
Loose gravel	20	24	Hard rock	5	69
Gravel and clay	4	28	Yellow shale	10	79
Hard conglomerate, water at 32 feet.	32	60	Blue shale	1	80

## UPTON COUNTY

## McCAMEY

Population in 1940: 2,595.

Source of information: E. B. Heinze, city secretary, Feb. 10, 1947.

Ownership: Municipal.

Source of supply: Two wells 15 miles southeast of McCamey in Pecos County.

Well 1. Drilled in 1929 by Layne-Texas Co.; depth, 272 feet; diameter 15½ to 8 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 167.6 feet below land surface Feb. 11, 1947; yield, 280 gallons a minute.

Well 2. Drilled in 1929 by Layne-Texas Co.; depth, 354 feet; diameter, 16 to 8 inches; deep-well turbine pump and 30-horsepower electric motor; static water level, 148.1 feet below land surface Feb. 10, 1947; yield, 280 gallons a minute.

*Average pumpage, in gallons a day*

	1946	1947		1946	1947		1946	1947
January	112,300	123,000	May	198,000		September	199,000	
February	124,000		June	252,000		October	162,000	
March	140,000		July	290,000		November	115,000	
April	160,900		August	293,600		December	98,100	

Storage: Two ground storage reservoirs, 100,000 gallons each; elevated tank, 100,000 gallons.

Number of customers: 693.

Treatment: None.

*Analysis, well 2*

[Collected Feb. 10, 1947. pH is 7.2. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	14		Sulfate (SO <sub>4</sub> )	76	1.58
Iron (Fe)	.09		Chloride (Cl)	44	1.24
Calcium (Ca)	71	3.54	Fluoride (F)	1.2	.06
Magnesium (Mg)	25	2.06	Nitrate (NO <sub>3</sub> )	3.3	.06
Sodium (Na)	30	1.30	Dissolved solids	397	
Potassium (K)	5.4	.14	Total hardness as CaCO <sub>3</sub>	280	
Bicarbonate (HCO <sub>3</sub> )	250	4.10			

*Driller's logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 1</b>					
Caliche	155	155	Red sand with little clay	57	265
Pink clay	9	164	Red clay	1	266
White and yellow clay	11	175	Clay	2	268
Red sand with some clay	28	203	Rock	1	269
Pink sand	5	208	Sand	3	272
<b>Well 2</b>					
Soil	16	16	Gravel and boulders	18	288
Caliche and gravel	129	145	Gravel and clay	7	295
Gravel	15	160	Fine sand	5	300
Caliche and gravel	10	170	Clay	6	306
Gravel, water	10	180	Fine sand	23	329
Caliche	40	220	Gravel and clay	3	332
Caliche and gravel	50	270	Clay	22	354

**RANKIN**

Population in 1940: 672.

Source of information: W. J. Pollard, operator, Sept. 22, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. About 100 yards northeast of Yates Hotel; drilled in 1939; depth, 170 feet; diameter, 8 inches; deep-well turbine pump and 7½-horsepower electric motor; yield, 50 gallons a minute.

Well 2. About 300 yards south of well 1; drilled in 1948 by N. C. House; depth, 166 feet; diameter, 7 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 60 gallons a minute.

Pumpage (estimated): 100,000 gallons a day.

Storage: Concrete ground storage reservoir, 50,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 270.

Treatment: None.

*Analyses*

[Collected Sept. 22, 1948. pH, each well, is 7.2. Analyzed by J. R. Avrett and L. E. Weaver]

	Well 1		Well 2	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	8.2		18	
Iron (Fe)	.10		.15	
Calcium (Ca)	150	7.49	150	7.49
Magnesium (Mg)	117	9.62	78	6.41
Sodium (Na)	276	11.99	142	6.18
Potassium (K)	7.6	.19	5.2	.13
Bicarbonate (HCO <sub>3</sub> )	312	5.11	336	5.51
Sulfate (SO <sub>4</sub> )	919	19.13	545	11.35
Chloride (Cl)	165	4.65	108	3.05
Fluoride (F)	3.0	.16	2.0	.11
Nitrate (NO <sub>3</sub> )	15	.24	12	.19
Dissolved solids	1,820		1,230	
Total hardness as CaCO <sub>3</sub>	856		695	

*Driller's log, well 2*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	8	8	White sandrock	16	118
Gravel and caliche	17	25	Red rock	11	129
No record	33	58	White lime	2	131
Yellow lime	10	68	Yellow sand (water)	35	166
Sand and gravel (water)	34	102			

VAL VERDE COUNTY

DEL RIO

Population in 1940: 13,343.

Source of information: C. C. Brown, water superintendent, Nov. 1, 1945.

Ownership: Municipal.

Source of supply: San Felipe Springs in northeastern Del Rio, about half a mile north of U. S. Highway 90.

*Average pumpage, in gallons a day*

	1943	1944		1943	1944		1943	1944
January	1,000,000	1,196,000	May	2,050,000	1,865,000	September	2,666,000	1,543,000
February	1,330,000	1,305,000	June	1,743,000	1,800,000	October	1,240,000	1,295,000
March	1,526,000	1,340,000	July	2,416,000	2,267,000	November	1,564,000	1,331,000
April	1,758,000	1,675,000	August	3,030,000	3,010,000	December	1,167,000	915,000

Storage: Two concrete elevated reservoirs, 2,250,000 gallons each.

Number of customers: 3,100.

Treatment: Chlorination and ammoniation.

*Analysis*

[Collected Nov. 1, 1945. pH is 6.8. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	14		Sulfate (SO <sub>4</sub> )	6.2	0.129
Iron (Fe)	.05		Chloride (Cl)	13	.367
Calcium (Ca)	58	2.894	Fluoride (F)	1.0	.053
Magnesium (Mg)	7.6	.625	Nitrate (NO <sub>3</sub> )	5.8	.094
Sodium (Na)	27	1.174	Dissolved solids	264	
Potassium (K)	4.0	.102	Total hardness as CaCO <sub>3</sub>	172	
Bicarbonate (HCO <sub>3</sub> )	254	4.163			

## WARD COUNTY

## BARSTOW

Population in 1940: 558.

Source of information: M. W. Nichols, water superintendent, Oct. 9, 1948.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. About  $4\frac{1}{2}$  miles east of Barstow; drilled in 1930 by James Miles; depth, 117 feet; diameter, 8 inches; deep-well turbine pump and  $7\frac{1}{2}$ -horsepower electric motor; static water level, 95.72 feet below land surface Aug. 9, 1940; yield, 55 gallons a minute.

Well 2. About 30 feet south of well 1; drilled in July 1948 by C. C. and H. Drilling Co.; depth, 120 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 72 gallons a minute.

Pumpage (estimated): 75,000 gallons a day.

Storage: Concrete ground reservoir, 50,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 175.

Treatment: None.

*Analysis, well 1*

[Collected May 24, 1940. Analyzed by N. Talvite]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	28		Sulfate (SO <sub>4</sub> )	428	8.91
Iron (Fe)	12		Chloride (Cl)	83	2.34
Calcium (Ca)	149	7.44	Fluoride (F)	1.2	.06
Magnesium (Mg)	51	4.19	Nitrate (NO <sub>3</sub> )	6.4	.10
Sodium (Na)	76	3.30	Dissolved solids	985	
Potassium (K)	6.2	.16	Total hardness as CaCO <sub>3</sub>	582	
Bicarbonate (HCO <sub>3</sub> )	216	3.54			

## GRANDFALLS

Population in 1940: 653.

Source of information: L. J. Adams, manager, Oct. 9, 1948.

Owner: L. C. Harrison Water Co.

Source of Supply: Two wells.

Well 1. About  $4\frac{1}{2}$  miles northwest of town; drilled in 1940 by Boyd Hopkins; depth, 95 feet; diameter  $8\frac{1}{4}$  inches; deep-well turbine pump and 100-horsepower natural gas engine; yield, 500 gallons a minute.

Well 2. South of well 1; drilled; depth, 95 feet; diameter, 8 inches; deep-well turbine pump and 75-horsepower electric motor; yield, 500 gallons a minute.

Pumpage (estimated): 200,000 gallons a day.

Storage: Two steel surface reservoirs, 24,000 and 32,00 gallons, respectively.

Number of customers: 247.

Treatment: None.

*Analysis, well 1*

[Collected May 15, 1940. Analyzed by N. Talvite]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	18		Sulfate (SO <sub>4</sub> )	324	6.75
Iron (Fe)	.11		Chloride (Cl)	463	13.06
Calcium (Ca)	94	4.69	Fluoride (F)	1.7	.09
Magnesium (Mg)	40	3.29	Nitrate (NO <sub>3</sub> )	1.0	.02
Sodium (Na)	367	15.96	Dissolved solids	1,437	
Potassium (K)	9.6	.25	Total hardness as CaCO <sub>3</sub>	399	
Bicarbonate (HCO <sub>3</sub> )	240	3.98			

**MONAHANS**

Population in 1940: 3,944.

Source of information: E. R. Blackmond, water superintendent, Sept. 29, 1948.

Ownership: Municipal.

Source of supply: Twenty wells.

Unit 1. Five wells seven blocks north of city hall; all wells about 130 feet deep and each equipped with deep-well turbine pump and 5-horsepower electric motor; combined yield of five wells, 300 gallons a minute.

Unit 2. Twelve wells northwest of city limits; drilled between 1942 and 1947; depths, about 130 feet; deep-well turbine pumps and electric motors; combined yield, 957 gallons a minute.

Unit 3. Well 40 feet south of Victory Avenue and 140 feet west of city limits; drilled January 1948; depth, 160 feet; diameter, 16 to 14 inches; deep-well turbine pump and 40-horsepower electric motor; static water level, 49 feet below land surface in March 1948; yield, 400 gallons a minute with drawdown of 52 feet after pumping 3 hours in March 1948.

Unit 4. Well about 1,100 feet south of Unit 3; drilled in January 1948; depth, 160 feet; diameter, 16 to 14 inches; deep-well turbine pump and 40-horsepower electric motor; yield, 350 gallons a minute with drawdown of 50 feet after pumping 6 hours in May 1948.

Unit 5. Well about 1,100 feet south of Unit 4; drilled in January 1948; depth, 160 feet; diameter, 16 to 14 inches; deep-well turbine pump and 25-horsepower electric motor; yield, 300 gallons a minute with drawdown of 50 feet after pumping 6 hours in August 1948.

Pumpage (estimated): 1,000,000 gallons a day.

Storage: Two elevated tanks, 56,000 gallons and 500,000 gallons, respectively; two concrete ground storage reservoirs, 200,000 gallons each.

Number of customers: 1,825.

Treatment: None.

*Analysis, well 1, unit 1*

[Collected Apr. 29, 1941. Analyzed by B. Irelan and N. L. Lewis]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	17		Sulfate (SO <sub>4</sub> )	149	3.10
Calcium (Ca)	32	1.60	Chloride (Cl)	76	2.14
Magnesium (Mg)	6.7	.55	Fluoride (F)	3.7	.19
Sodium and potassium (Na + K)	178	7.76	Nitrate (NO <sub>3</sub> )	8.8	.14
Bicarbonate (HCO <sub>3</sub> )	265	4.34	Dissolved solids	602	
			Total hardness as CaCO <sub>3</sub>	108	

## WHEELER COUNTY

## SHAMROCK

Population in 1940: 3,123.

Source of information: T. M. Dickey, water superintendent, Dec. 13, 1946.

Ownership: Municipal.

Source of supply: Bronco Springs and five wells 12 miles north of Shamrock.

Bronco Springs. In SE $\frac{1}{4}$  sec. 41, blk. A8; water collected in galleries through tile drains; yield, about 150 gallons a minute.

Well 1. In NE $\frac{1}{4}$  sec. 2, Poitevent subdivision; drilled by Kelly Well Co. in 1928; depth, 50 feet; diameter, 18 inches; deep-well turbine pump and 7 $\frac{1}{2}$ -horsepower electric motor; static water level, 15 feet below land surface in 1928 and 26.52 feet below land surface Dec. 13, 1946; original yield, 175 gallons a minute; pump broke suction after pumping several hours in 1946.

Well 2. About 534 feet west of well 1; drilled by Kelly Well Co. in 1928; depth, 36 feet; diameter, 18 inches; deep-well turbine pump and 7 $\frac{1}{2}$ -horsepower electric motor; static water level, 8 feet below land surface in 1928 and 21.3 feet below land surface Dec. 14, 1946; original yield, 175 gallons a minute; pump broke suction after pumping 4 or 5 hours in 1946.

Well 3. About 638 feet north of well 2; drilled by Kelly Well Co. in 1928; depth, 48 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 12 feet below land surface in 1928 and 31.0 feet below land surface Dec. 14, 1946; original yield, 250 gallons a minute; pump broke suction after pumping 4 or 5 hours in 1946.

Well 4. About 600 feet north of well 3; drilled by Kelly Well Co. in 1928; depth, 66 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 13.8 feet below land surface in 1928 and 34.9 feet below land surface Dec. 14, 1946; original yield, 250 gallons a minute; yield in 1946, 200 gallons a minute; temperature, 62° F.

Well 5. About 628 feet north of well 1; drilled by Kelly Well Co. in 1928; depth, 65 feet; diameter, 18 inches; deep-well turbine pump and 15-horsepower electric motor; static water level, 25 feet below land surface in 1928 and 42.8 feet below land surface Dec. 14, 1946; original yield, 250 gallons a minute; yield somewhat less in 1946.

Pumpage: Average, 690,000 gallons a day in 1945.

Storage: Ground storage reservoir in well field, 50,000 gallons; ground storage reservoir 1 $\frac{1}{2}$  miles north of city, 1,000,000 gallons; ground storage reservoir in city, 1,000,000 gallons; elevated tank, 75,000 gallons.

Number of customers: 1,129.

Treatment: None.

*Analyses*

[Collected Dec. 13, 1946. pH, Bronco Springs and well 4, each 7.4. Analyzed by C. B. Cibulka]

	Bronco Springs		Well 4	
	Parts per million	Equivalents per million	Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	19		18	
Iron (Fe)	.05		.04	
Calcium (Ca)	67	3.344	68	3.394
Magnesium (Mg)	5.1	.419	4.5	.370
Sodium (Na)	5.8	.254	7.2	.315
Potassium (K)	2.3	.059	1.7	.043
Bicarbonate (HCO <sub>3</sub> )	224	3.672	202	3.311
Sulfate (SO <sub>4</sub> )	5.1	.106	7.6	.158
Chloride (Cl)	8.0	.226	6.0	.169
Fluoride (F)	.6	.032	.0	.000
Nitrate (NO <sub>3</sub> )	2.5	.040	30	.484
Dissolved solids	218		261	
Total hardness as CaCO <sub>3</sub>	188		188	

**WHEELER**

Population in 1940: 848.

Source of information: J. E. Risner, water superintendent, Dec. 16, 1946.

Ownership: Municipal.

Source of supply: Well 1½ miles west of town in SE¼SW¼ sec. 13, blk. A4; drilled in 1926 by L. D. Lancaster and others; depth, about 100 feet; diameter, 15 to 8 inches, 40 feet of 8-inch screen, gravel-walled; deep-well turbine pump and 15-horsepower electric motor; static water level reported, 27 feet below land surface; yield reported, 200 gallons a minute with draw-down of 17 feet.

Pumpage (estimated): Maximum 288,000; minimum 60,000; average, 150,000 gallons a day.

Storage: Steel ground tank at well, 50,000 gallons; elevated tank, 50,000 gallons.

Number of customers: 200.

Treatment: Occasional chlorination.

*Analysis*

[Collected Dec. 16, 1946. pH is 7.4. Analyzed by C. B. Cibulka]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	23		Sulfate (SO <sub>4</sub> )	14	0.29
Iron (Fe)	.08		Chloride (Cl)	14	.39
Calcium (Ca)	83	4.14	Fluoride (F)	.6	.03
Magnesium (Mg)	6.3	.52	Nitrate (NO <sub>3</sub> )	15	.24
Sodium (Na)	24	1.06	Dissolved solids	349	
Potassium (K)	1.8	.05	Total hardness as CaCO <sub>3</sub>	233	
Bicarbonate (HCO <sub>3</sub> )	294	4.82			

**WINKLER COUNTY****KERMIT**

Population in 1940: 2,584.

Source of information: Fred W. Pearson, mayor, May 15, 1947.

Ownership: Municipal.

Source of supply: Four wells.

Well 1 (Underwood). Drilled; depth, 700 feet; diameter, 12½ inches; deep-well turbine pump and 25-horsepower electric motor; yield, 350 gallons a minute.

Well 2 (Walton). Drilled in 1935 by Crandell and Osmond; depth, 545 feet; diameter, 12½ inches; deep-well turbine pump and 25-horsepower electric motor.

Well 3 (Underwood). Drilled in 1946 by Permian Well Service; depth, 510 feet; diameter, 13¾ inches; deep-well turbine pump and 25-horsepower electric motor; pump set at 180 feet; static water level reported, 90 feet below land surface when drilled; yield, 360 gallons a minute.

Well 4 (Walton). Drilled in 1946 by Permian Well Service; depth, 471 feet; diameter, 20 to 13¾ inches; gravel-walled and gun-perforated; deep-well turbine pump and 25-horsepower electric motor; static water level reported, 95 feet below land surface when drilled; yield, 360 gallons a minute.

*Average pumpage, in gallons a day*

1943	1944	1945	1946
195,000	262,000	335,000	590,000

Storage: Two ground storage reservoirs, 300,000 gallons each; elevated tank, 150,000 gallons.

Number of customers: 1,172.

Treatment: None.

*Analysis, well 4 (Walton)*

[Collected May 15, 1947. pH is 7.5. Analyzed by B. C. Dwyer]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	26		Sulfate (SO <sub>4</sub> )	34	0.536
Iron (Fe)	.02		Chloride (Cl)	19	.095
Calcium (Ca)	40	1.997	Fluoride (F)	1.8	.048
Magnesium (Mg)	7.2	.592	Nitrate (NO <sub>3</sub> )	3.0	
Sodium (Na)	25	1.073	Dissolved solids	232	
Potassium (K)	4.6	.118	Total hardness as CaCO <sub>3</sub>	129	
Bicarbonate (HCO <sub>3</sub> )	146	2.393			

*Drillers' logs*

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 3 (Underwood)</b>					
Caliche	44	44	Red rock	8	308
Sand	156	200	Gravel and sand (water)	7	315
Red beds	10	210	Sand	2	317
Sand and gravel (water)	13	223	Red bed	13	330
Red shale	3	226	Sand	5	335
Red bed	16	242	Red bed	81	416
Gravel (water)	6	248	Sand (water)	19	435
Red bed	32	280	Red bed	21	456
Sand	5	285	Sand	5	461
Red bed	15	300	Red bed	40	501

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
<b>Well 4 (Walton)</b>					
Sand and caliche	24	24	Red bed	8	358
Sand	158	182	Sand	5	363
Red bed	13	195	Red bed	5	368
Sand and gravel (water)	18	213	Sand	9	377
Red bed	38	251	Red bed	3	380
Sand and gravel (water)	5	256	Sand	10	390
Red bed	24	280	Red bed	13	403
Sand and gravel (water)	3	283	Sand	19	422
Red bed	37	320	Red bed	3	425
Sand	14	334	Sand (water)	23	448
Red bed	4	338	Red bed	8	456
Sand and gravel	1	339	Sand	13	469
Red bed	9	348	Red bed	2	471
Sand	2	350			

## YOAKUM COUNTY

## PLAINS

Population in 1940: 480.

Source of information: D. B. McGinty, owner, May 1945.

Owner: D. B. McGinty.

Source of supply: Well drilled in 1940 by W. A. Willis; depth, 128 feet; diameter, 12 inches; deep-well turbine pump and gasoline engine; static water level reported, 72 feet below land surface in 1940.

Pumpage: No record.

Storage: Elevated tank, about 50,000 gallons.

Number of customers: 65.

Treatment: None.

*Analysis*

[Collected May 1945. pH is 7.7. Analyzed by J. H. Rowley]

	Parts per million	Equivalent per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	42		Sulfate (SO <sub>4</sub> )	779	16.22
Iron (Fe)	.08		Chloride (Cl)	102	2.88
Calcium (Ca)	114	5.69	Fluoride (F)	5.5	.29
Magnesium (Mg)	111	9.13	Nitrate (NO <sub>3</sub> )	8.6	.18
Sodium (Na)	179	7.78	Dissolved solids	1,490	
Potassium (K)	34	.87	Total hardness as CaCO <sub>3</sub>	741	
Bicarbonate (HCO <sub>3</sub> )	241	3.95			

## DENVER CITY

Population in 1940: 1,750.

Source of information: Water superintendent, December 1944.

Ownership: Municipal.

Source of supply: Two wells.

Well 1. Drilled in 1939 by W. A. Willis; depth, 178 feet; diameter, 8 inches; deep-well turbine pump and 5-horsepower electric motor; yield, 95 gallons a minute.

Well 2. Drilled in 1940 by W. A. Willis; depth, 180 feet; diameter, 8 inches; deep-well turbine pump and 10-horsepower electric motor; yield, 150 gallons a minute.

Pumpage: Average, 48,300 gallons a day.

Storage: Two ground storage reservoirs and elevated tank, total capacity, 125,000 gallons.

Number of customers: 234.

Treatment: None.

### Analysis, well 2

[Collected December 1944. pH is 7.8. Analyzed by W. W. Hastings]

	Parts per million	Equivalents per million		Parts per million	Equivalents per million
Silica (SiO <sub>2</sub> )	61		Sulfate (SO <sub>4</sub> )	110	2.29
Iron (Fe)	.02		Chloride (Cl)	51	1.44
Calcium (Ca)	62	3.09	Fluoride (F)	2.7	.14
Magnesium (Mg)	33	2.71	Nitrate (NO <sub>3</sub> )	5.5	.09
Sodium and potassium (Na + K)	44	1.91	Dissolved solids	559	
Bicarbonate (HCO <sub>3</sub> )	229	3.75	Total hardness as CaCO <sub>3</sub>	290	

### LITERATURE CITED

- American Public Health Association, 1946, Standard methods for the examination of water and sewage, 9th ed.
- Broadhurst, W. L., Sundstrom, R. W., and Rowley, J. H., 1950, Public water supplies in southern Texas: U. S. Geol. Survey Water-Supply Paper 1070.
- Collins, W. D., 1928, Notes on practical water analysis: U. S. Geol. Survey Water-Supply Paper 596-H.
- Dean, H. T., 1938, Endemic fluorosis and its relation to dental caries: U. S. Public Health Repts., vol. 53.
- Faucett, R. L., and Miller, H. C., 1946, Methemoglobinemia occurring in infants fed milk diluted with well water of high nitrate content: Jour. Pediatrics, vol. 29.
- Smith, H. V., Smith, M. C., and Foster, E. O., 1936, Mottled enamel in the Salt River Valley and the fluorine content of the water supplies: Univ. Arizona Agr. Exper. Sta. Tech. Bull. 61.
- Sundstrom, R. W., Broadhurst, W. L., and Dwyer, B. C., 1949, Public water supplies in central and north-central Texas: U. S. Geol. Survey Water-Supply Paper 1069.
- Sundstrom, R. W., Hastings, W. W., and Broadhurst, W. L., 1948, Public water supplies in eastern Texas: U. S. Geol. Survey Water-Supply Paper 1047.
- Wilcox, L. V., 1948, Explanation and interpretation of analyses of irrigation waters: U. S. Dept. Agr. Circ. 784.

# INDEX

	Page		Page
<b>A</b>		<b>F</b>	
Abernathy .....	80	Fabens .....	65
Acknowledgments .....	3	Floydada .....	69-70
Adrian .....	124-125	Follett .....	104-105
Alpine .....	18-19	Forsan .....	95-96
Amarillo .....	129-135	Fort Stockton .....	127-128
Amherst .....	101	Friona .....	126-127
Andrews .....	15-16	<b>G</b>	
Anton .....	89-90	Grandfalls .....	160-161
Aspermont .....	148-149	Groom .....	21
<b>B</b>		Ground water in the area .....	3-5
Balmorhea .....	141	Gruver .....	85
Barnhart .....	99	<b>H</b>	
Barstow .....	160	Hale Center .....	81
Big Lake .....	138-139	Happy .....	150
Big Spring .....	91-95	Hardness of water .....	12-13
Booker .....	104	Hartley .....	88
Borger .....	97-98	Hedley .....	48-49
Bronte .....	28-29	Hereford .....	44
Brownfield .....	154-155	Hermleigh .....	145-146
<b>C</b>		Higgins .....	105
Canadian .....	88-89	Hitchland .....	85-86
Canyon .....	136-138	<b>I</b>	
Channing .....	87-88	Idalou .....	105-106
Chemical character of the water .....	9-12	Imperial .....	128
Childress .....	24-27	Iraan .....	128-129
Christoval .....	155	<b>J</b>	
Clarendon .....	47-48	Jurassic rocks, Broad Pass area .....	188
Claude .....	17	Jayton .....	101
Coahoma .....	95	<b>K</b>	
Colorado City .....	117-119	Kermit .....	163-165
Crane .....	32-34	<b>L</b>	
Crosbyton .....	35	Lamesa .....	40-43
<b>D</b>		Lefors .....	77-78
Dalhart .....	37-39	Levelland .....	90-91
Del Rio .....	159	Literature cited .....	166
Denver City .....	165-166	Littlefield .....	102
Dickens .....	44-46	Lockney .....	70
Dimmit .....	24	Lorenzo .....	36
Dodsonville .....	30	Lubbock .....	106-109
Dougherty .....	69	<b>M</b>	
Dumas .....	119-120	McCamey .....	157-158
<b>E</b>		McLean .....	78-79
Eldorado .....	144-145	Marfa .....	135-136
El Paso .....	61-65	Matador .....	120-121
Estelline .....	82-83	Memphis .....	83-84
Extent of area .....	2	Mertzton .....	99-100

	Page		Page
Miami -----	144	Sanderson -----	151-154
Midland -----	113-117	Santa Rita -----	139
Monahans -----	161	Seagraves -----	71-73
Morse -----	86	Seminole -----	73-74
Morton -----	28	Shamrock -----	162-163
Muleshoe -----	17-18	Sierra Blanca -----	96-97
		Silverton -----	20
O		Skeleystown -----	22-23
Odessa -----	49-60	Slaton -----	109-110
O'Donnell -----	110-111	Snyder -----	146-147
Olton -----	102-103	Sonora -----	149-150
Ozona -----	34-35	South Plains -----	71
		Spearman -----	86-87
P		Spur -----	46-47
Paducah -----	31-32	Stanton -----	112-113
Pampa -----	79-80	Stinnett -----	99
Panhandle -----	21-22	Stratford -----	148
Pecos -----	141-143	Sudan -----	103
Perryton -----	123-124	Surface water in the area -----	8
Petersburg -----	81	Sweetwater -----	122-123
Plains -----	165		
Plainview -----	82	T	
Post -----	74-77	Tahoka -----	111-112
Presidio -----	136	Texline -----	39-40
Pringle -----	98-99	Texon -----	139-141
		Tormillo -----	66
Q		Toyah -----	143-144
Quitauque -----	19-20	Tulia -----	151
		Turkey -----	84
R			
Ralls -----	36	V	
Rankin -----	158-159	Valentine -----	100
Roaring Springs -----	121	Van Horn -----	37
Robert Lee -----	29	Vega -----	125
Roby -----	67		
Rocksprings -----	61	W	
Roscoe -----	122	Wellington -----	30-31
Rotan -----	67-68	Wheeler -----	163
		White Deer -----	23
S		Wilderado -----	125-126
San Angelo -----	155-156		
Sanatorium -----	156-157	Y	
		Ysleta -----	66-67