TEXAS WATER COMMISSION

Joe D. Carter, Chairman
O. F. Dent, Commissioner
H. A. Beckwith, Commissioner

BULLETIN 6208

GROUND-WATER GEOLOGY OF EDWARDS COUNTY, TEXAS

Prepared in cooperation with the Geological Survey
United States Department of the Interior
and the City of San Antonio

April 1962

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By

A. T. Long, Geologist
United States Geological Survey

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GROUND-WATER GEOLOGY OF EDWARDS COUNTY, TEXAS

ABSTRACT

This report presents the results of a study of the ground-water resources of Edwards County (area 2,075 square miles) in southwest Texas. The purpose of the investigation, carried on simultaneously with an investigation in Real County, was to ascertain the quantity and quality of available ground water in the southern part of the Edwards Plateau. The report contains records of 613 wells and 46 springs, 139 analyses of water samples, and 64 well logs.

The Glen Rose limestone of Cretaceous age, the oldest formation that supplies water to wells in the county, yields small quantities of rather highly mineralized water. Springs in the Glen Rose discharge water that is generally less mineralized than that obtained from wells. Nearly all the wells and springs that produce water from the Glen Rose are in the southeastern part of the county, where the Edwards and associated limestones have been removed by erosion or are very thin.

The Comanche Peak, Edwards, and Georgetown limestones, collectively called the Edwards and associated limestones, underlie most of the county and form the principal aquifer. Generally, the water in the aquifer is under water-table conditions, but locally it may be artesian. The Edwards and associated limestones yield small to moderate quantities of water, which is hard but otherwise of good chemical quality.

The alluvium in the major stream valleys yields small to moderate quantities of hard water, similar in quality to that of the Edwards and associated limestones.

The main ground-water divides in the Edwards and associated limestones follow the topographic divides. Most of the ground water flows southward and either appears as springflow in the Nueces River drainage or flows underground into Kinney or Val Verde County. The remainder flows northward and ultimately appears as springflow in the South Llano River drainage.

Records of base flow of the major streams indicate that about 150,000 acre-feet of water is annually recharged to and discharged from the Edwards and associated limestones in Edwards County. Most of this water is available for additional development as only about 900 acre-feet per year is currently being used. However, additional development of ground water will result in a reduction in streamflow.

GROUND-WATER GEOLOGY OF EDWARDS COUNTY, TEXAS

INTRODUCTION

Location and Economic Development

Edwards County in southwest Texas occupies 2,075 square miles of the southern part of the Edwards Plateau. It is bounded on the north by Sutton and Kimble Counties, on the south by Kinney and Uvalde Counties, on the east by Kerr and Real Counties, and on the west by Val Verde County (Figure 1).

The thin limestone soil found in most of the county supports the characteristic grass, shrubs, and small trees of a semiarid region. Cedar, live oak, red oak, and mesquite grow on the rolling uplands and cypress and pecan along the streams. Edwards County is largely ranch country; the raising of cattle, sheep, and goats is the principal occupation. Agricultural products include wool and mohair, and small amounts of pecans, feed crops, and cedar fenceposts. Oil and gas, bat guano, road metal, and building stones are produced in small quantities. The landowners in the county derive a considerable income by leasing their property for deer and turkey hunting.

According to the U. S. Bureau of the Census, the population of Edwards County in 1960 was 2,317. Rocksprings, the county seat, population 1,182 in 1960, is a market for wool and mohair and a tourist center noted for rodeos. Other towns and communities in the county are Barksdale, Carta Valley, and the Texas A. & M. College Experimental Substation No. 14.

Purpose and Scope of Investigation

The investigation in Edwards County was made in 1954-55 by the U. S. Geological Survey in cooperation with the Texas Board of Water Engineers (now the Texas Water Commission) and the city of San Antonio. Its purpose was to ascertain the quantity and quality of available ground water in the southern part of the Edwards Plateau. The program included inventorying wells and springs, mapping the surface geology, and mapping the water table. The data studied, which are on file in the offices of the Geological Survey in Austin, Texas, included drillers' logs of 64 wells (Table 4), records of 613 wells and 46 springs (Table 3), and chemical analyses of samples of water from 114 wells and 25 springs (Table 6). Prior to 1940 chemical analyses of ground water were made by employees of the Works Progress Administration under the supervision of E. P. Schoch of the Bureau of Industrial Chemistry of The University of Texas and E. W. Lohr of the U. S. Geological Survey. Although these analyses may not meet the present standards of the Geological Survey, and should be used with caution, they probably are indicative of the general chemical quality of the water. Some data used in this report were

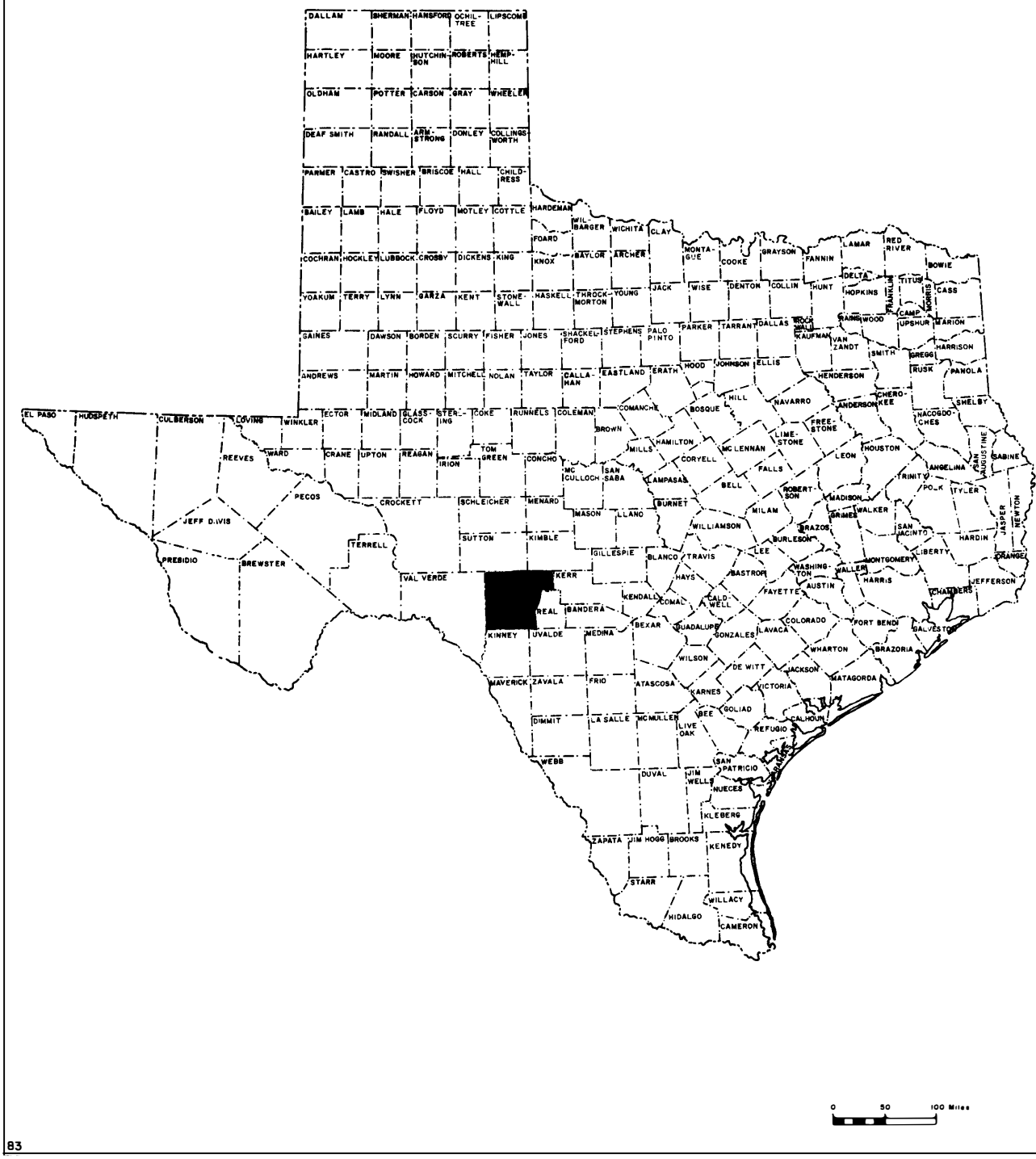


FIGURE 1.- Map of Texas showing location of Edwards County

obtained from an inventory of wells and springs in Edwards County made as a Works Progress Administration project in 1938-39 (Frazier, 1939).

Plate 1, which shows the locations of wells and springs in Edwards County, is divided into quadrangles or grids each measuring 10 minutes of longitude and of latitude. Each quadrangle is designated by a letter, beginning with "A" in the northwest corner of the map. Wells and springs are numbered serially according to their location within the quadrangles.

The report was prepared under the direct supervision of R. W. Sundstrom, district engineer of the U. S. Geological Survey in charge of ground-water investigations in Texas, and under the administrative supervision of S. W. Lohman, branch area chief, and A. N. Sayre, former chief of the Ground Water Branch.

Acknowledgments

Appreciation is expressed for the cooperation and assistance of oil-company personnel and well drillers who furnished geologic information and well logs. Thanks are also due to landowners who allowed access to the wells and provided information concerning them.

TOPOGRAPHY AND DRAINAGE

Edwards County is on the southern part of the Edwards Plateau, and the topography is closely related to the geologic structure of the plateau (Figure 2). The county is underlain by nearly flat-lying beds of limestone and a few beds of shale and marl; generally, the surface is gently rolling but, in places, erosion of resistant beds of limestone has formed steep slopes and narrow valleys. Along the southeastern border, the Nueces River has cut through the resistant limestone into the underlying less-resistant beds of marl and marly limestone and has formed a relatively broad valley. Sinkholes and other features associated with limestones that have undergone extensive solution are common throughout the county. The best known of these is the Devils Sinkhole, about 3 miles northeast of Rocksprings; its opening is 41 by 58 feet; the depth is 155 feet (Frazier, 1939, p. 10). Caves are commonly found throughout the county and many have been reported by drillers, particularly in the vicinity of Rocksprings.

Edwards County is drained by tributaries of three of the major drainage systems in Texas (Figure 2). The southern part of the county is drained by the Nueces and West Nueces Rivers, the Nueces ultimately flowing into the Gulf of Mexico. The South Llano River, which drains the northeastern part of the county, empties into the Colorado River. The Dry Devils River and the West Fork Sycamore Creek, both tributaries of the Rio Grande, drain the western part of the county. The Nueces and South Llano Rivers are perennial streams; the Dry Devils and the West Nueces are intermittent.

Rocksprings, the highest point on the divide between the Nueces and South Llano Rivers, is 2,410 feet above mean sea level. The lowest point in the county, 1,400 feet, is in the bed of the Nueces River just south of Barksdale.

Texas Water Commission in cooperation with the
U. S. Geological Survey and the city of San Antonio

Figure 2

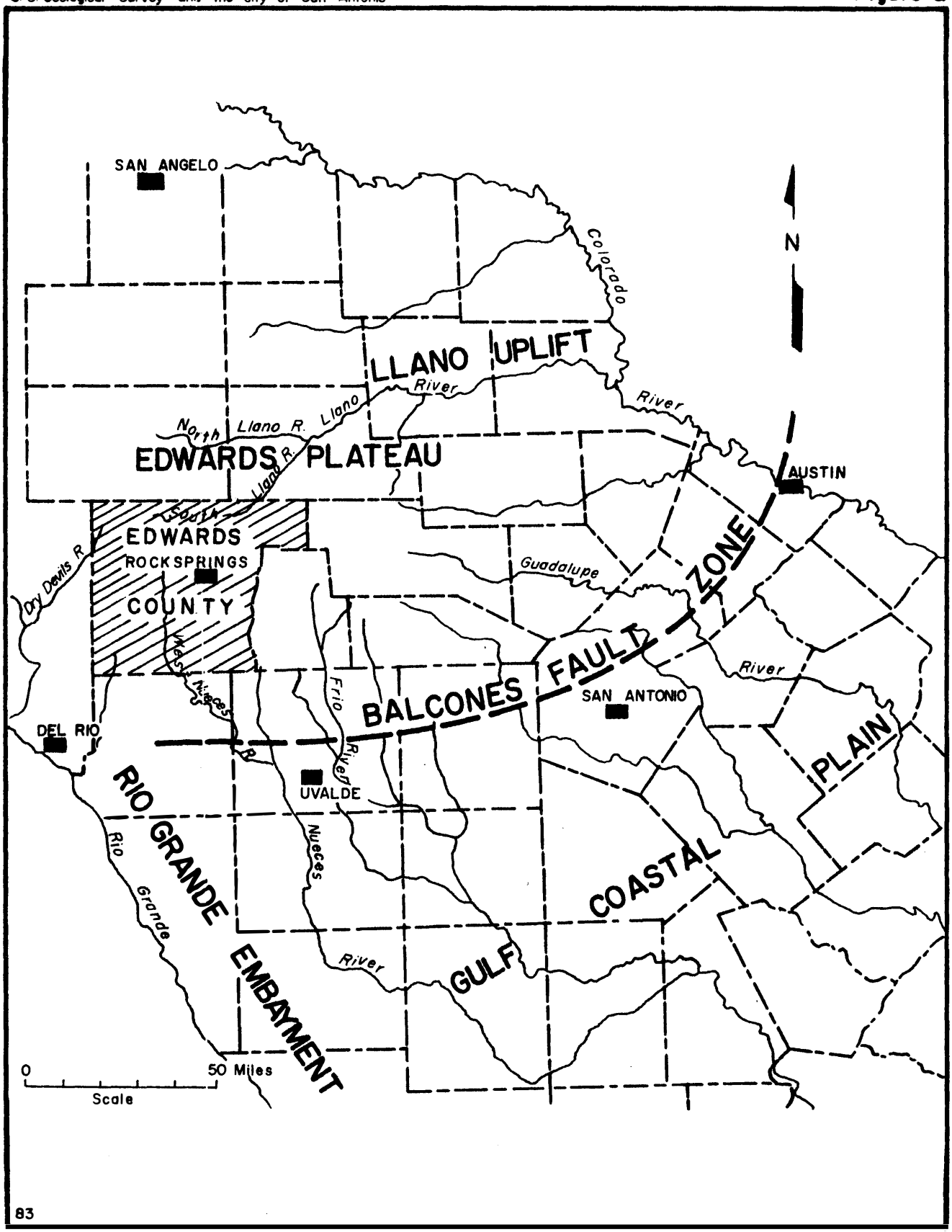


FIGURE 2.- Map of central Texas showing physiographic provinces

CLIMATE

The climate of Edwards County is typical of the semiarid regions of the Edwards Plateau. Average annual precipitation on the plateau ranges from more than 35 inches in the east to less than 20 inches in the west. The east-to-west decline may be illustrated by comparing the average annual precipitation for Real, Edwards, and Val Verde counties. The average annual precipitation in Edwards County (about 22 inches) is about 6 inches less than in Real County and 5 inches more than in Val Verde County.

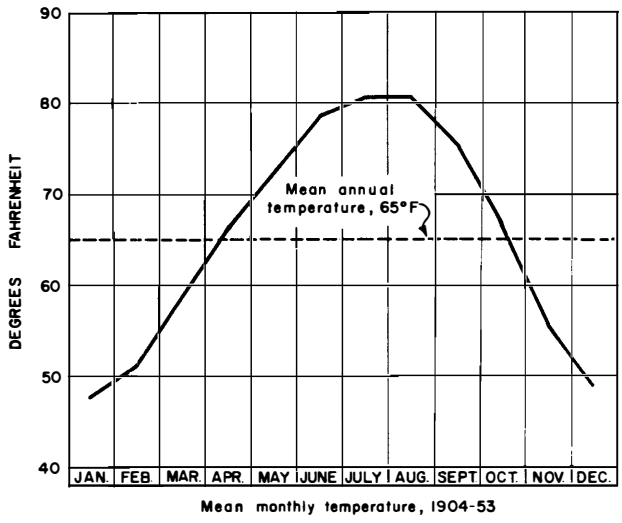
Figure 3 shows graphically the annual precipitation, the mean monthly temperature, and the average monthly precipitation recorded at the Texas A. & M. College Experimental Substation No. 14. The highest annual precipitation recorded at the station was 41.51 inches in 1935; the lowest was 6.31 in 1951. The average annual precipitation was 22.17 inches during the period 1919-55 (Bloodgood and others, 1954, p. 57, and Bloodgood, personal communication). May and September are the wettest months of the year, having averages of 3.07 and 3.01 inches, respectively.

The mean annual temperature at the Experimental Substation for the period 1904-53 was 65°F (Bloodgood and others, 1954, p. 23). The mean monthly temperature ranged from 47.5° in January to 80.5°F in July and August (Figure 3).

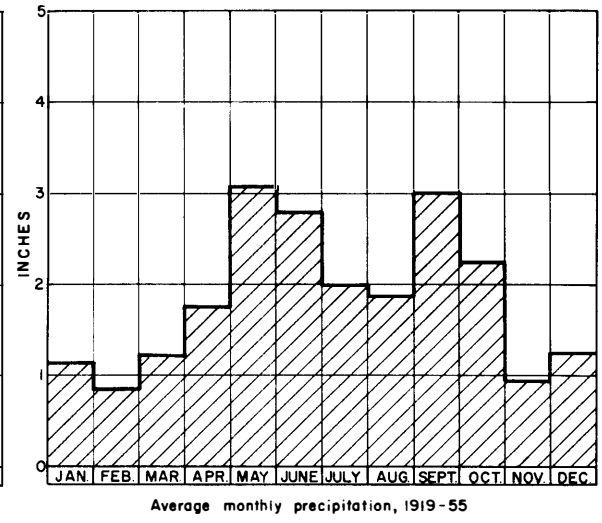
GENERAL GEOLOGY AND STRUCTURE

Edwards County is on the Edwards Plateau, a partially dissected remnant of an uplifted plain capped chiefly by resistant limestones. The county is underlain by Cretaceous rocks which overlie a basement of Paleozoic rocks. The Cretaceous rocks dip 10 to 12 feet per mile generally south and southwestward toward the Gulf Coastal Plain and the Rio Grande Embayment (Cartwright, 1932, p. 699, Pl. 4). Sellards and Baker (1934, p. 86) reported slight domes, anticlines, and synclines that interrupt the regional dip of the Cretaceous beds of the Edwards Plateau. In the northern part of the county the beds dip northwestward about 3 feet per mile. Minor faults and fractures trending northeastward roughly parallel the Balcones fault zone, a major structural feature in the counties to the south and southeast. However, a few faults northeast of Rocksprings trend north to northwest. Most of the faults are downthrown on the southeast and have displacements of 30 feet or less; however, one fault about 12 miles southeast of Rocksprings has a displacement of about 60 feet.

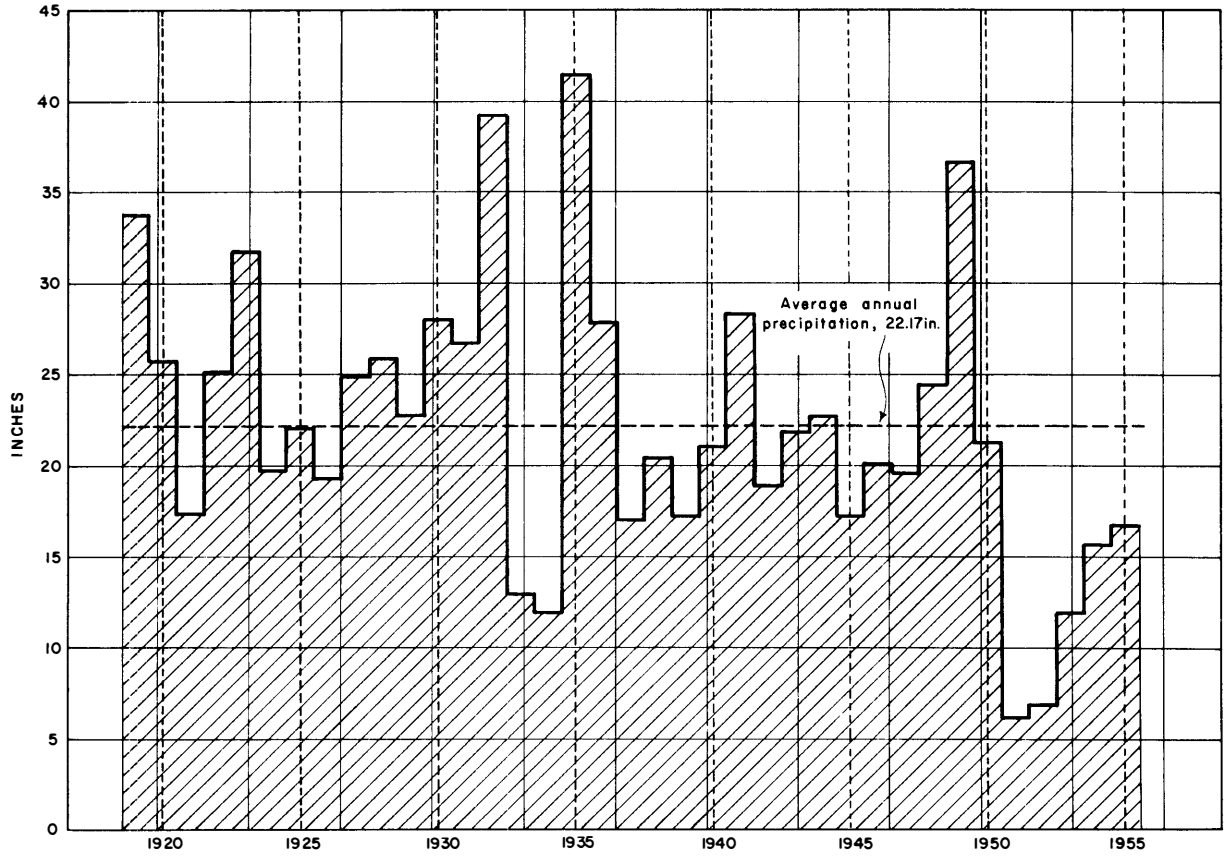
The Cretaceous rocks exposed in Edwards County, from oldest to youngest, consist of the Glen Rose limestone, Edwards and associated limestones (Comanche Peak, Edwards, and Georgetown limestones), Grayson shale, Buda limestone, and Eagle Ford shale (Plate 1). The oldest exposed formation, the Glen Rose, is found only in stream valleys where erosion has cut through the overlying formations. The Edwards and associated limestones crop out in most of the county, except on a few of the higher divides which are capped by younger formations and in the southeastern part of the county. Some valleys in Edwards County are underlain by alluvial deposits of Pleistocene and Recent age. These sediments are most extensive in the Nueces River valley, where they attain a maximum thickness of about 40 feet.



Mean monthly temperature, 1904-53



Average monthly precipitation, 1919-55



Annual precipitation

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FIGURE 3. – Temperature and precipitation at Texas A. & M. College Experimental Substation No. 14

(Records from Bloodgood, Patterson and Smith, 1954, and Bloodgood, personal communication)

The composite geologic section of the formations in Edwards County is shown in Figure 4. The lithologic and water-bearing characteristics are summarized in Table 1. The stratigraphic and structural relations of the Cretaceous units are shown in Figure 5.

ROCK FORMATIONS AND THEIR WATER-BEARING PROPERTIES

Pre-Cretaceous Rocks

Rocks of pre-Cretaceous age are not exposed in Edwards County. However, their lithologic characteristics and age have been revealed in a few places by exploration for oil and gas. The rocks consist chiefly of noncalcareous shale, sandstone, and limestone; their total thickness is not known. Different formations of probable Pennsylvanian age underlie the Cretaceous rocks in various parts of the county because of the unconformity between the Cretaceous and pre-Cretaceous rocks. The approximate altitude of the base of the Cretaceous rocks is shown in Figure 6.

No fresh water has been reported in the pre-Cretaceous rocks; the base of the overlying Cretaceous rocks is considered to be the base of the fresh-water-bearing beds in the county.

Cretaceous System

Pre-Comanche and Comanche Rocks, Undifferentiated

The oldest Cretaceous rocks reported by well drillers in Edwards County are identified in this report as "basement sands." Correlation of these beds is not certain, but it is believed that they may include the Pearsall formation of Comanche age and the Hosston and Sligo formations of Coahuila age (Imlay, 1945, p. 1426-41). None of these rocks crop out in Edwards County.

"Basement Sands"

In Edwards County the "basement sands" may be divided into three zones. The lowest consists of varicolored marl interbedded with poorly sorted quartz sand. The middle zone, a dolomitic limestone, which is very thin or absent in the northern part of the county, reaches a maximum thickness of 50 feet in the southern part. Well-sorted sand and gravel, generally interbedded with marl and limestone, is found in the uppermost zone. The "basement sands" unit becomes generally more calcareous from north to south. The thickness of the "basement sands" ranges from about 150 feet in the northern part of the county to more than 400 feet in the southern part (Figure 5). The "basement sands" unit is not tapped by water wells in Edwards County; however, it yields potable water to wells elsewhere on the Edwards Plateau and it is probable that small to moderate supplies could be obtained in Edwards County.

Glen Rose Limestone

The Glen Rose limestone overlying the "basement sands" is the oldest formation exposed in Edwards County. The Glen Rose crops out in the valleys of the tributaries of the Nueces River in the southeastern part of the county (grids S and T, Plate 1), in a small area in the valley of the West Nueces River (grid R), and in scattered small patches along Hackberry Creek (grid P). The Little Hackberry Creek section is described in detail in Table 2. The Glen Rose ranges in thickness from 450 feet in the northern part of the county to about 750 feet in the southern part.

George (1952, p. 17) divided the Glen Rose limestone in Comal County into a lower and upper member by designating the top of the Salenia texana zone as the line of separation. Only the upper member is exposed in Edwards County.

The lower member of the Glen Rose consists of massive fossiliferous limestone and limy shale, the shale predominating in the upper part. Many of the limestone beds are reefy and contain large rudistids in places.

The upper member of the Glen Rose consists chiefly of alternating beds of resistant limestone and soft marl which produce a typical stair-step or terraced topography. The relatively gentle terraced slopes contrast with the steep bluffs formed by the overlying Edwards and associated limestones. The beds of the upper part of the Glen Rose are brown where weathered, but in the subsurface they are blue and are referred to by drillers as the "blue" or "blue mud." Two beds of gypsum and anhydrite, each about 20 feet in thickness, are generally present about 200 and 400 feet below the top of the formation.

The large foraminifer Orbitolina texana (Roemer), which is common throughout the lower member of the Glen Rose, is less common in the upper member. Beds containing it and Porocystis globularis (Giebel) are exposed in stream valleys in the vicinity of Barksdale.

The Glen Rose limestone is one of the principal aquifers in Edwards County; however, in comparison with the major aquifers in Texas it is relatively unimportant. The formation is recharged by precipitation on its outcrop, by overland runoff, and by seepage from the overlying Edwards and associated limestones. The amount of recharge to the formation and the overall potential development in Edwards County have not been estimated but are, no doubt, small.

The water in the Glen Rose occurs in cracks, crevices, and solution channels in the limestone. The upper member of the Glen Rose consists of thin beds of limestone interbedded with marl and shale; consequently, the interconnection of the cracks and channels is small and the resultant permeability is low. The thick massive limestone beds in the lower member might be expected to contain a more highly interconnected system of openings. However, the beds are deeply buried in Edwards County, and there are no opportunities for extensive circulation of ground water.

The Glen Rose limestone yields small quantities of water to domestic and stock wells in Edwards County, chiefly in the southeastern part where the more productive Edwards and associated limestones are absent. The yields of individual wells are generally not more than 10 gpm (gallons per minute), although well T-26 had a yield

Figure 4

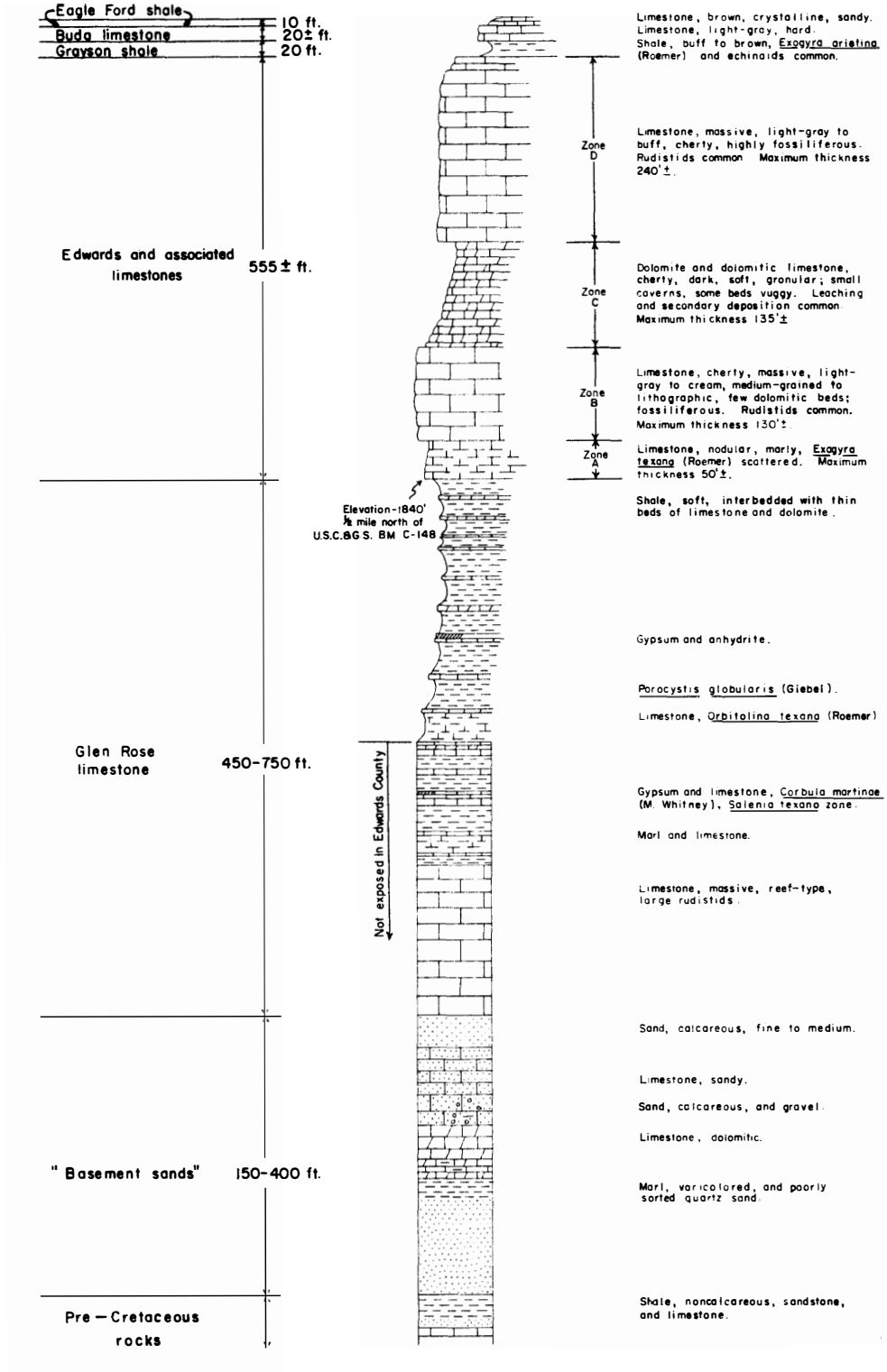

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FIGURE 4. - Composite geologic section in Edwards County

Lithologic descriptions from measured sections and logs

Table 1.--Geologic formations and their water-bearing characteristics in Edwards County

System	Series or group	Stratigraphic unit	Maximum thickness (feet)	Description of rocks	Surface expression	Water-bearing character
Quaternary	Pleistocene and Recent, undifferentiated	Alluvium	40	Sand, silt, and gravel.	Terraces in stream valleys.	Yields small to moderate supplies of hard water to shallow dug wells in stream valleys.
Cretaceous	Gulf series	Eagle Ford shale	10	Sandy crystalline, brown limestone.	Isolated patches capping hills.	Yields no water to wells in Edwards County.
	Comanche series, Washita group	Buda limestone	20	Hard, brittle, light-gray porcelaneous limestone.	Fragments or boulders capping divides.	Do.
		Grayson shale	20	Buff-brown clay or marl; contains thin lenses of limestone.	Caps interstream divides; forms rolling topography.	Do.
	Comanche series, Fredericksburg group	Edwards and associated limestones, Edwards and Georgetown limestones, Zone D	240	Massive, light-gray cherty limestone; rudistids, gastropods, and brachiopods abundant.	Cliffs or steep slopes. Rolling surface in the interstream areas.	Principal water-bearing formation in Edwards County. Yields small to moderate supplies of hard water to wells. Large discharge through the springs that feed the streams.
		Edwards and associated limestones, Edwards and Georgetown limestones, Zone C	135	Dolomite and dolomitic limestone; secondary deposits of calcite, quartz, and siliceous limestone; chert nodules; highly leached; cavernous in places.	Gentle slopes that retain more soil than zones B or D.	
		Edwards and associated limestones, Edwards and Georgetown limestones, Zone B	130	Massive cherty limestone; rudistids abundant.	Forms bluffs that do not retain soil.	
		Edwards and associated limestones, Comanche Peak ls., Zone A	60	Nodular marly limestone; scattered Exogyra texana; honeycombed in places.	Forms gentle slopes.	
	Comanche series, Trinity group	Glen Rose limestone	750	Alternating beds of hard limestone and soft marl; gray-blue in subsurface; weathers brown; gypsum.	Terraced topography; relatively gentle slopes.	Yields small quantities of fresh to moderately saline water.
		"Basement sands"	400	Well-sorted sand interbedded with marl and limestone; dolomitic limestone; interbedded varicolored marl and poorly sorted quartz sand.	Not exposed in Edwards County.	Yields no water to wells in Edwards County.
	Pre-Comanche rocks					
Pre-Cretaceous	?	?	?	Shale, sandstone, and limestone.	do	Do.

Figure 6

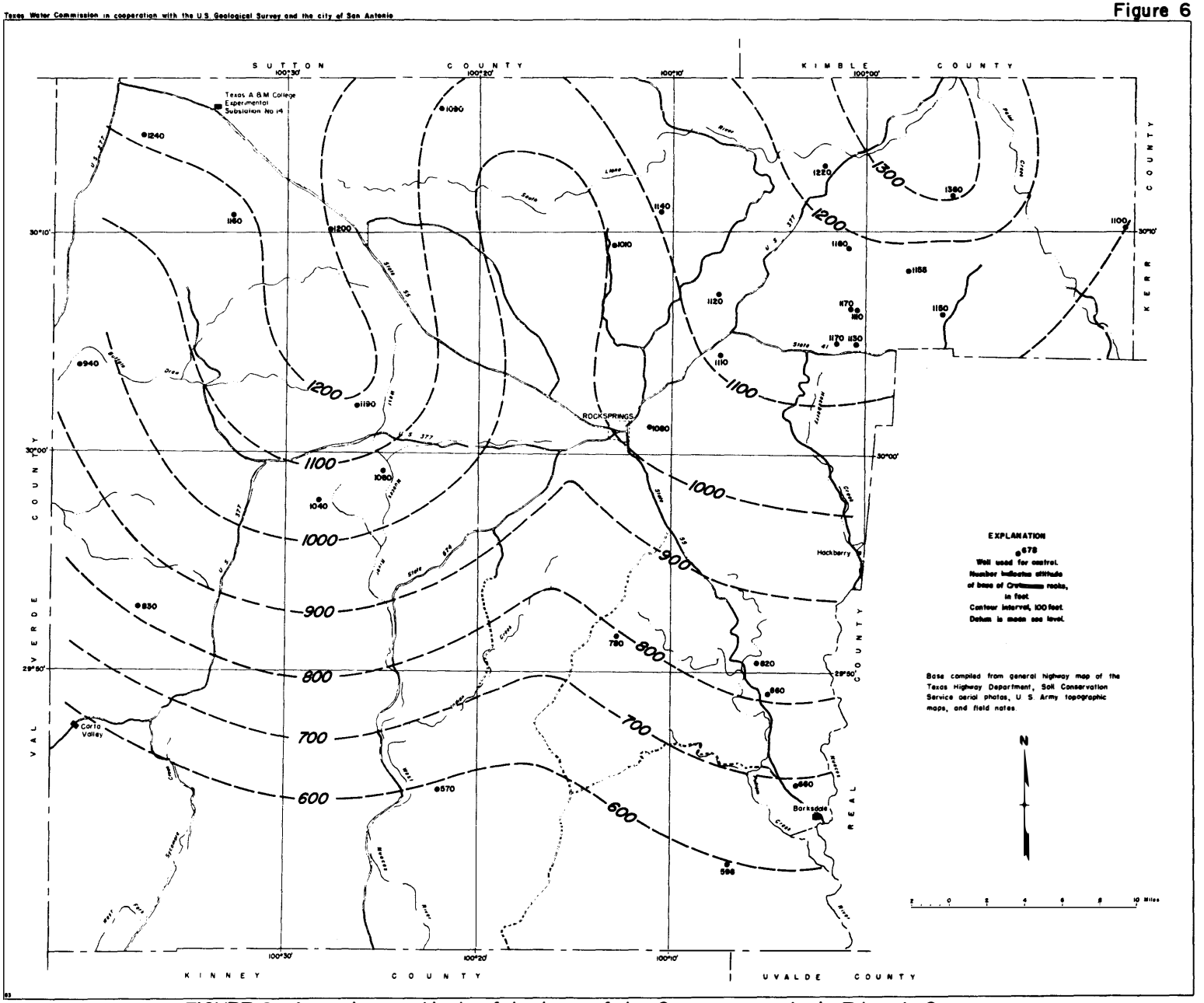

FIGURE 6 - Approximate altitude of the base of the Cretaceous rocks in Edwards County

of 40 gpm when drilled. Most of the wells are shallow, being about 100 feet deep. A few, however, are deep; well T-33, the deepest drawing from the Glen Rose, is 900 feet.

The Glen Rose yields small to moderate quantities of water to many springs in Edwards County, the largest being Taylor Springs (S-6) which had a measured flow of 430 gpm on October 15, 1953. Most of the springs are at or near the contact with the overlying Edwards and associated limestones. The similarity of the chemical analysis of the water to that of water from the Edwards indicates a direct hydraulic connection between the two formations in the area of the springs.

Fredericksburg and Washita Groups

The Fredericksburg group in Edwards County includes the Comanche Peak limestone and the Edwards limestone; the Walnut clay, the lowest unit, and the Kiamichi formation, the uppermost unit, have not been identified. The Washita group includes the Georgetown limestone, the Grayson shale, and the Buda limestone.

The Comanche Peak, Edwards, and Georgetown limestones form a single hydrologic unit which in the San Antonio area has been termed the "Edwards and associated limestones" (Petitt and George, 1956, p. 16). All formations between the Glen Rose limestone and the base of the Grayson shale are also referred to in this report as one stratigraphic and hydrologic unit--the Edwards and associated limestones--one of the most important aquifers in Texas.

Edwards and Associated Limestones

The Edwards and associated limestones crop out throughout Edwards County, except on the high divides where they are capped by younger formations and in the stream valleys where erosion has exposed the underlying Glen Rose limestone. The thickness of the unit at Rocksprings is about 550 feet; elsewhere in the county the thickness has not been precisely determined.

The oldest formation in the unit, the Comanche Peak limestone which conformably overlies the Glen Rose, crops out in deep valleys. It consists chiefly of buff-to-gray nodular marly limestone and is equivalent to zone A in Table 2 and Figure 4. The limestone is honeycombed in places and is rather soft, forming relatively gentle slopes. The nodular appearance is the most distinctive characteristic of the Comanche Peak. Specimens of Exogyra texana (Roemer) are found throughout zone A, especially in the lower part; unidentified high-spired gastropods are common in the upper part. The Comanche Peak ranges in thickness from about 45 to 60 feet but probably averages about 50 feet in Edwards County. The Comanche Peak and the lower part of the overlying Edwards formation are similar in lithology, but are very different in their fauna and mode of weathering.

The upper 500 feet of the Edwards and associated limestones consists of the Edwards limestone and the Georgetown limestone. In Edwards County, the two limestones have not been differentiated as such; however, they can be divided into three zones, zones B, C, and D in Table 2 and Figure 4.

Zone B, which overlies the Comanche Peak limestone, is a light-gray to cream massive limestone, medium-grained to lithographic in texture. Dark streaks of very fine texture, believed to be siliceous, probably represent a stage in the

development of chert. A few dolomitic beds are present. Pelecypods, chiefly Toucasia sp. and Caprina sp., are abundant. The zone, about 130 feet thick, forms bluffs which retain very little soil and consequently support sparse vegetation.

Zone C, about 135 feet thick, consists of gray to dark-brown dolomite and dolomitic limestone containing chert nodules and a few chert beds. Clayey and flaggy to thin-bedded limestone is interbedded with the dolomitic limestone. The dolomite is soft and granular in places and contains many cavities ranging from a few inches to several feet in diameter. Secondary deposits of calcite, silica in the form of quartz, siliceous limestone, and chert are abundant in many beds. The upper part of the zone shows an exceptionally high degree of leaching, which has destroyed or obscured much of the bedding. A few beds contain rudistids and gastropods. The beds altered by leaching are nonfossiliferous, but some of the chert nodules and chert beds contain fossils. The relatively gentle slopes of Zone C hold more soil and support more vegetation than the limestones of Zone B or Zone D.

Zone D, about 240 feet thick, consists chiefly of massive highly fossiliferous light-gray to buff limestone. Beds near the base consisting mainly of shells underlie beds containing Pecten sp., gastropods, and rudistids--chiefly Caprina sp., and Toucasia sp. A brachiopod, Kingena wacoensis (Roemer), is found near the top of the zone. In the northeastern part of the county, thin beds composed mainly of pelecypod fragments, probably Gryphaea sp., form a terrace in many places. Beds near the top of the zone are relatively fine-grained and thin-bedded. Chert as nodules and in beds is common throughout most of the zone. In the interstream areas, zone D forms the slightly rolling surface characteristic of the Edwards Plateau; however, in the stream valleys, the massive limestone forms prominent cliffs or steep slopes which retain little soil and support sparse vegetation.

The Edwards and associated limestones is the principal aquifer in Edwards County. It supplies small to moderate quantities of water of good chemical quality to wells and springs in all parts of the county, except in the southeastern part, where it has been removed by erosion. Of the 568 water wells for which records are available (Table 3), 524 obtain water from the Edwards and associated limestones. The yields of most of the wells are small, generally less than 10 gpm. However, generally only small quantities of water are needed and the wells are constructed accordingly. In many places much larger yields could be obtained from properly constructed wells drawing from the full thickness of the aquifer. For example, well H-44 used for municipal supply at Rocksprings, had a measured yield of 280 gpm on December 7, 1953. Additional information on ground water in the Edwards and associated limestones is given in the section of the report entitled "Ground Water."

Grayson Shale

The Grayson shale, formerly known as the Del Rio clay, which overlies the Edwards and associated limestones, crops out on the high divides in the vicinity of Rocksprings and eastward along State Highway 41. In the outcrop the Grayson forms a typically rolling topography which supports a considerable growth of mesquite. The Grayson and overlying Buda are not water-bearing in the county and are shown as a unit on Plate 1. The buff-to-brown clay and marl beds and thin limestone lenses that compose the Grayson reach a maximum thickness of 20 feet in Edwards County. A marly facies north of Rocksprings contains many echinoids, but only a few specimens of Exogyra arietina (Roemer) characteristically found

in abundance in the Grayson. The cephalopod Turrilites brazoensis (Roemer) is found in the lower part of the formation. The Grayson shale is relatively impermeable and is not a source of ground water in the county. Many surface reservoirs or tanks for stock use are dug in the outcrop area.

Buda Limestone

The Buda limestone lies conformably upon the Grayson shale in Edwards County, but the two formations have not been differentiated in Plate 1. The Buda consists of hard, brittle, fine-grained, dense, light-gray limestone. It has a porcelaneous texture and breaks with a conchoidal fracture. Erosion of the soft underlying Grayson shale generally reduces the brittle limestone to angular boulders. The presence of the Buda can generally be recognized by the heavy growth of live oak that it supports. The Buda limestone reaches a maximum thickness of 20 feet in Edwards County and is not a source of ground water in the county.

Gulf Series

Eagle Ford Shale

The Eagle Ford shale, the only formation of the Gulf series in Edwards County, overlies the Buda limestone, the uppermost formation of the Comanche series. Erosion has removed most of the formation; only the lower 10 feet, which consists chiefly of sandy brown crystalline limestone, is found in isolated patches capping a few hills. The Eagle Ford is not water bearing in Edwards County. Because of its limited areal extent, it is not shown on the geologic map (Plate 1), but is included in Table 1 and in the composite geologic section (Figure 4).

Quaternary System

Pleistocene and Recent Rocks, Undifferentiated

Alluvium

The alluvium in Edwards County consists of terrace deposits in stream valleys, ranging in texture from gravel to silt. The deposits reach a maximum thickness of 40 feet in the Nueces River valley where the river has cut deeply into the soft beds of the underlying Glen Rose limestone. Recent boulders and gravel in the streambeds are composed of slightly rounded chert and limestone.

The alluvium is in direct hydraulic connection with the river in many places and probably derives most of its recharge from that source. The rest of the recharge is from infiltration of precipitation, overland runoff from adjoining areas, and possibly from discharge from the underlying Glen Rose limestone.

The alluvium supplies small to moderate quantities of water to many wells in the county, particularly in the valley of the Nueces River. Most of the wells are dug wells less than 40 feet deep. The yields range from a few to as much as 400 gpm in well T-9.

Most of the wells that draw from the alluvium are used for domestic and stock supply; however, well T-9 is used in part to irrigate 2 acres of land and well T-27 is used for public supply at Barksdale.

The water in the alluvium is of good chemical quality except that it is hard. In samples from five wells the dissolved-solids content ranged from 195 to 276 ppm (parts per million).

GROUND WATER

Occurrence and Movement

The source of all ground water in Edwards County is precipitation. Part of the water that falls as precipitation is returned to the atmosphere by evaporation or transpiration by plants; part of the water runs off as streamflow. A small part moves downward through the fractures and solution channels in limestones and through sandy zones in the alluvium until it reaches the top of the zone of saturation. The top of this zone, the water table, is not a level surface but has irregularities which are similar to and related to the topography of the land surface.

Some of the seepage from precipitation may be held by relatively impermeable materials at some level above the main ground-water body. Ground water thus separated from an underlying body of ground water by unsaturated rock is called perched water. In Edwards County such perched-water bodies are held by lenses of clay, shale, or impervious limestones. The perched-water bodies in Edwards County, though few and not extensive, may yield sufficient water for domestic and stock use as long as recharge conditions are favorable.

Figure 7 shows by contours the configuration of the water table in the Edwards and associated limestones in Edwards County. The water moves slowly along the hydraulic gradient (at right angles to the contours) until it is intercepted by wells or is discharged through springs or some other natural outlet or until it percolates into overlying or underlying beds. The contours of the water table in Edwards County indicate the presence of a ground-water divide that approximates in position the topographic divide.

The lithology, structure, thickness, and degree of weathering of a water-bearing formation determine its capacity to receive, store, and transmit water. The ground water moves from areas of recharge towards areas of discharge, the rate and direction of the movement of the water being controlled by the geologic structure and the permeability of the rock material. The permeability varies according to the size, shape, number, and degree of interconnection of the rock pores. Locally, rocks of low porosity may contain fractures, fissures, and solution channels through which water moves freely. This is particularly true in the massive limestones in the Edwards and associated limestones in Edwards County.

Structural geologic features such as faults and folds affect the movement of ground water. Faults may bring a water-bearing formation into contact with less permeable clay or shale, thus creating a barrier or impediment to the movement of ground water. Folding may up-warp beds, thus facilitating their exposure to recharge.

Ground water is discharged naturally from water-bearing formations by evapotranspiration in areas where the water table is near the land surface, through springs, by seepage into streams, and artificially through wells. The quantity of water discharged from wells in Edwards County is small compared to the natural discharge.

Most of the important areas of discharge through springs are shown on Plate 1. Seven Hundred Springs (E-4) in the upper South Llano valley is one of the largest in the interior of the Edwards Plateau. Most of the base flow of the South Llano River comes from it and other springs.

Ground water moving toward an area of discharge may pass between beds of impermeable material and thus become confined under artesian pressure. It will then rise above the bottom of the overlying confining layer in a well that draws from the water-bearing formation. In some places in Edwards County, water in the Edwards and associated limestones rises above the point where it is encountered by the drill bit, indicating local artesian conditions. It is believed, however, that in general the water in this aquifer is unconfined. The water in nearly all the wells in the Glen Rose limestone is under artesian pressure. Water in the alluvium generally is unconfined.

Relation Between Ground Water and Streamflow

Streamflow can be divided into two major parts: water that goes directly from precipitation to the streams, known as direct runoff, and water that discharges from the saturated zone through seeps and springs, known as base flow. In Edwards County the base flow sustains the flow of the streams during periods between storms. Being sustained by ground-water discharge, the base flow is dependent on ground-water recharge. Changes in base flow are related to changes in ground-water storage. Consequently, estimates of the ground-water recharge to the Edwards and associated limestones can be made from studies of the base flow of the streams in Edwards County. Estimates of the base flow were made purposely low to eliminate the effects of bank storage and temporary storage in the alluvium in the stream valleys. Over a long period of time the average base flow is approximately equal to the average recharge to the water-bearing formations, ignoring the other forms of discharge, which in Edwards County are negligible. For a particular year or other relatively short period of time, the two quantities will differ depending upon changes in storage during the period. The annual discharge, however, generally indicates whether recharge was greater or less than in the previous year because changes in storage are reflected in changes in base flow. The estimates of recharge, therefore, have been made on a long-term basis rather than on an annual basis.

Recharge and discharge estimates are based chiefly on records of the four stream-gaging stations shown in the table on page 24. (For locations of the stations see Figure 8.)

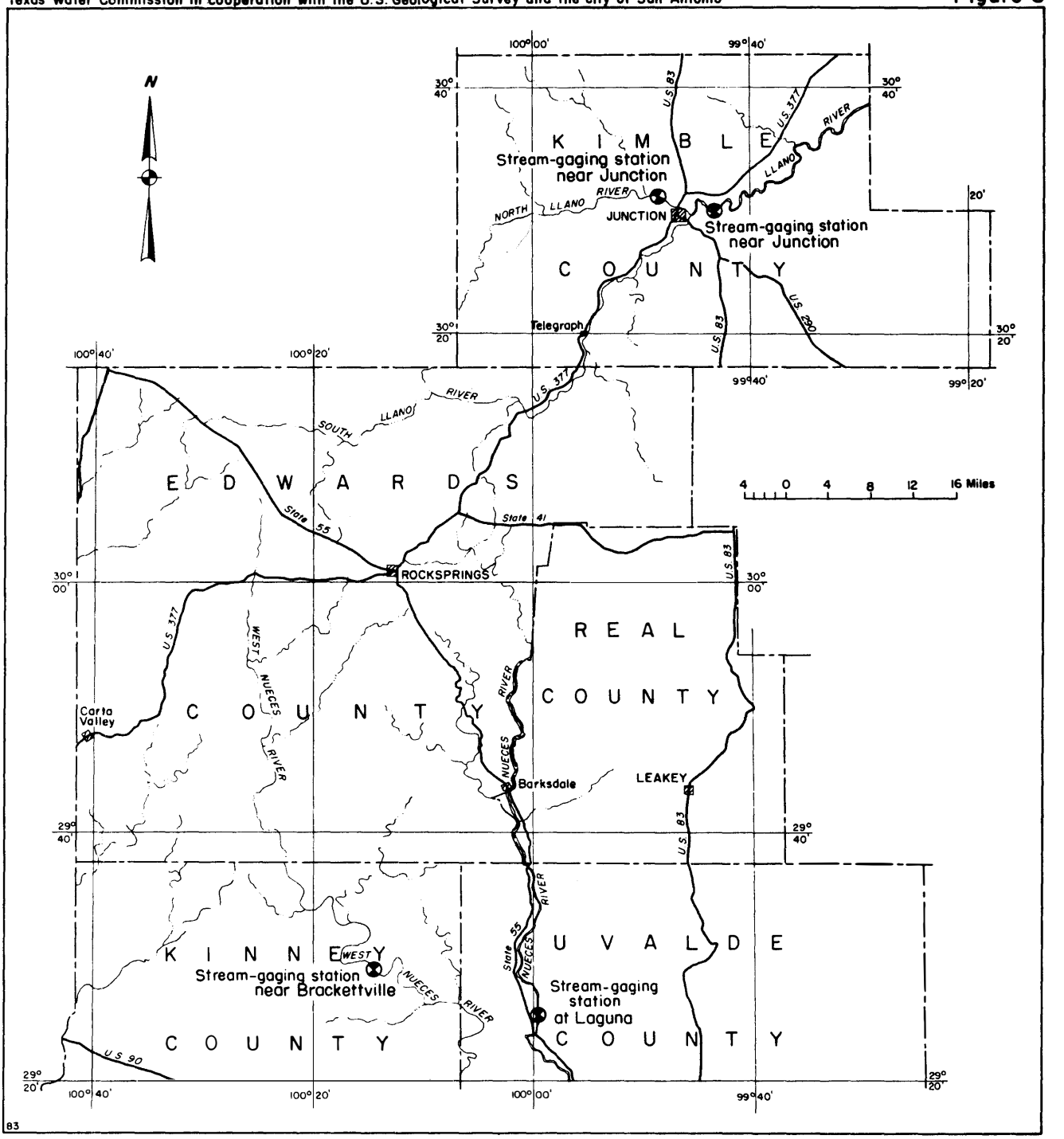

FIGURE 8.- Locations of stream-gaging stations in the vicinity of Edwards County

Station	Drainage area (sq. mi.)	Records available
Llano River near Junction, Kimble County	1,874	September 1915-57
North Llano River near Junction, Kimble County	914	September 1915-57
Nueces River at Laguna, Uvalde County	764	October 1923-57
West Nueces River near Brackettville, Kinney County	700	September 1939-50 and April 1956-57

The base flow in the South Llano and Nueces basins is believed to closely approximate the total ground-water discharge from these basins. The base flow at the station on the West Nueces, however, represents only a part of the ground-water discharge. A large part of the ground-water discharge out of that basin is by underflow into Kinney County. The ground-water discharge of the West Nueces basin in Edwards County, therefore, has been estimated from unit discharge figures obtained from the other two basins.

The South Llano River drains approximately 606 square miles in northeastern Edwards County. The river flows generally northeastward, joining the North Llano River at Junction in Kimble County to form the Llano River, which flows eastward into the Colorado River. The flow of the South Llano River can be computed by comparing the records of two stream-gaging stations near Junction in Kimble County--one on the North Llano River 3 miles northwest of Junction and the other on the Llano River 3 miles east of Junction (Figure 8). The difference in records of discharge of the two stations approximates the discharge of the South Llano River. Upstream from the crossing of U. S. Highway 377 in Edwards County the South Llano River generally is intermittent. From the crossing of the highway to the town of Telegraph in Kimble County most of the base flow of the river comes from springs which discharge from the Edwards and associated limestones. From Telegraph to Junction the base flow of the river does not increase appreciably. The inflow in the reach between the Kimble-Edwards County line and Junction, therefore, is approximately equal to the loss from evaporation and transpiration. Consequently, the base flow of the South Llano above its confluence with the North Llano at Junction is assumed to be equal to the base flow of the river at the Kimble-Edwards County line.

By comparing the flows at the Llano and North Llano stream-gaging stations, hydrographs were made for the computed daily flow of the South Llano River from January 1923 through December 1954; from these graphs the base flow and the storm-flow for the South Llano were estimated separately. The base flow as estimated in this manner probably is reasonably accurate, but estimates of floodflow are less accurate because of an undetermined time lag of flood peaks between gaging stations. The following table shows the computed annual runoff of the South Llano River and the estimated base flow.

Year	Total runoff		Base flow	Year	Total runoff		Base flow
	(Thousands of acre-ft.)	Inches	(Thousands of acre-ft.)		(Thousands of acre-ft.)	Inches	(Thousands of acre-ft.)
1923	343.0	6.72	64.5	1939	99.5	1.95	50.1
1924	85.5	1.69	64.8	1940	54.8	1.06	50.0
1925	111.0	2.18	55.0	1941	57.3	1.11	49.4
1926	60.9	1.19	54.6	1942	71.9	1.41	52.1
1927	52.0	1.01	45.6	1943	71.9	1.40	54.3
1928	44.6	.87	41.0	1944	43.7	.85	43.3
1929	37.0	.72	35.4	1945	35.1	.69	33.6
1930	42.4	.83	38.7	1946	33.4	.65	29.8
1931	56.2	1.10	41.0	1947	32.1	.63	31.6
1932	183.0	3.56	55.9	1948	225.6	4.41	41.8
1933	59.6	1.17	48.3	1949	84.6	1.65	57.5
1934	29.7	.58	29.2	1950	42.0	.82	41.5
1935	327.7	6.40	67.1	1951	29.1	.57	29.1
1936	154.6	3.04	69.8	1952	20.0	.39	20.0
1937	77.8	1.51	43.2	1953	17.9	.35	17.8
1938	147.4	2.87	62.6	1954	22.0	.43	17.9

The average annual precipitation in the South Llano River basin is about 24 inches. The total annual runoff ranged from 6.40 inches in 1935 to 0.35 inch in 1953, averaging 1.71 inches during the 32-year period 1923-54. Therefore, the average annual runoff is less than 10 percent of the average annual precipitation; more than 90 percent of the water falling on the basin is discharged by evapotranspiration. About 54 percent of the total runoff is estimated to be base flow.

The computed base flow of the South Llano River at Junction (presumed to be about the same as the base flow at the Kimble-Edwards County line) suggests that the average annual recharge to and discharge from the Edwards and associated limestones in the South Llano basin in Edwards County during the 32-year period was about 45 thousand acre-feet per year, or about 40 mgd (million gallons per day). This is about 74 acre-feet per square mile or 1.4 inches.

The Nueces River, which forms part of the boundary between Edwards and Real Counties, drains 353 square miles in Edwards County and about 213 square miles in Real County. Along the county line, the Nueces is perennial, deriving its base flow from the many springs which drain the Edwards and associated limestones.

The stream-gaging station at Laguna is about 14 miles downstream from the Edwards-Uvalde County line (Figure 8). Although springs discharge to the Nueces downstream from the county line, discharge measurements made during seepage investigations indicate that the base flow of the stream where it leaves Edwards County is about the same as that measured at Laguna and thus indicate that losses in this reach are about equal to the gains. It is probable, therefore, that the base flow at Laguna is about equal to the discharge from the Edwards and associated limestones in the upper Nueces basin in Edwards and Real Counties. About 62 percent of the base flow is presumed to come from Edwards County, based on the percentage of the drainage area in Edwards County.

The following table shows the annual runoff of the Nueces River at Laguna and the estimated base flow as estimated from hydrographs of the daily flow at the station.

Year	Total runoff		Base flow	Year	Total runoff		Base flow
	(Thousands of acre-ft.)	Inches	(Thousands of acre-ft.)		(Thousands of acre-ft.)	Inches	(Thousands of acre-ft.)
1924	49.7	1.22	41.1	1940	52.8	1.30	44.1
1925	102.0	2.50	36.7	1941	86.7	2.13	53.6
1926	77.0	1.89	40.9	1942	96.0	2.36	48.8
1927	64.1	1.57	42.8	1943	43.4	1.07	37.7
1928	38.9	.96	26.8	1944	63.7	1.56	48.9
1929	47.2	1.16	25.9	1945	45.5	1.12	36.2
1930	121.0	.97	43.1	1946	66.8	1.64	40.0
1931	118.0	2.90	70.6	1947	66.0	1.62	41.9
1932	255.0	6.26	68.9	1948	39.5	.97	25.6
1933	40.4	.99	40.0	1949	183.4	4.50	58.7
1934	17.9	.44	16.9	1950	47.2	1.16	41.3
1935	465.0	11.42	60.0	1951	19.4	.48	19.1
1936	233.4	5.74	60.2	1952	22.0	.54	14.2
1937	62.0	1.52	44.5	1953	22.4	.55	16.9
1938	72.5	1.78	52.0	1954	59.2	1.45	22.6
1939	158.4	3.89	39.4	1955	194.5	4.77	26.6

The average annual precipitation in the Nueces drainage area above the gaging station at Laguna is about 24 inches. The average runoff for the 32-year period, as measured at the gaging station at Laguna, was about 2.33 inches. About 42 percent of the total runoff for the 32-year period is estimated to be base flow.

The estimated average annual recharge to and discharge from the Edwards and associated limestones in the Nueces River basin in Edwards County for the 32-year period is 25 thousand acre-feet (about 22 mgd). This is nearly 71 acre-feet per square mile or 1.3 inches.

The average recharge to and discharge from the Edwards and associated limestones in the South Llano and Nueces River basins in Edwards County is estimated to be about 73 acre-feet per square mile per year. The geology and topography of the West Nueces basin and the remaining area in Edwards County are similar to those of the Llano and Nueces basins; therefore, the unit value probably is valid for the entire area. On this basis the average annual recharge to and discharge from the Edwards and associated limestones in the county is about 150,000 acre-feet.

Development

Present Development

The average use of water from wells in Edwards County is estimated to be about 800,000 gpd (gallons per day) or about 900 acre-feet per year. The principal use of ground water is for domestic and stock purposes; small quantities are used for public supplies at Rocksprings and Barksdale. The use of water from wells for industrial and irrigation purposes in Edwards County is negligible.

Nearly all the water for domestic and stock use is obtained from privately owned small-diameter wells, most of which range from 200 to 500 feet deep and are equipped with windmills. Most of these wells yield only a few gallons per minute and are pumped only when water is needed.

Withdrawal rates from individual wells range from less than 1 gpm in some of the wells drawing from the Glen Rose limestone to as much as 400 gpm in well T-9 drawing from the alluvium. The largest yield from a well drawing from the Edwards and associated limestones was 280 gpm from well H-44, a municipal well at Rocksprings. Most of the wells are designed to produce only small quantities of water; larger yields could be obtained from properly constructed, deeper wells.

Potential Development

Based on the estimates of average annual recharge made from a study of the base flow records of the South Llano and Nueces Rivers, it is estimated that about 150,000 acre-feet of water per year (135 mgd) is available for perennial development. This is more than 150 times the present withdrawal of water from wells in Edwards County. The quantity of water available during any particular year may vary considerably from the average, depending upon changes in recharge rates and the amount of ground water in storage. The range is unpredictable because the quantity of ground water in storage is unknown. The base flow of the streams is sustained by the natural ground-water discharge which is reduced by the amount of withdrawals from wells. Thus, additional development from wells would result in reduced streamflow.

QUALITY OF WATER

The drinking-water standards of the U. S. Public Health Service (1946, p. 13) place definite limitations on water supplies used by interstate carriers subject to federal regulations. These standards are of general interest because they define an acceptable water that can be used as a basis for comparing water supplies. The standards pertaining to chemical characteristics appear in abridged form below.

> Iron (Fe) and Manganese (Mn) together should not exceed 0.3 ppm (parts per million).
>
> Magnesium (Mg) should not exceed 125 ppm.
>
> Sulfate (SO_4) should not exceed 250 ppm.
>
> Chloride (Cl) should not exceed 250 ppm.
>
> Fluoride (F) must not exceed 1.5 ppm.
>
> Dissolved solids should not exceed 500 ppm; however, if such water is not available, a dissolved-solids content of 1,000 ppm may be permitted.

The hardness of water, defined as the property of water attributable to the presence of alkaline earths, is expressed as equivalent calcium carbonate ($CaCO_3$). An arbitrary classification of water with reference to hardness is as follows: 60 ppm or less, soft; 61 to 120 ppm, moderately hard; 121 to 200 ppm, hard; and more than 200 ppm, very hard. Water having a hardness of more than 200 ppm should be softened for most uses.

Chemical analyses of water from 114 wells and 25 springs in Edwards County were made during the investigation and are given in Table 6. Representative analyses of water from the three principal aquifers are shown graphically in Figure 9. A bar over the well or spring number on Plate 1 indicates that an analysis is included in Table 6.

The analyses before 1941 were made by personnel of the Works Progress Administration and may not conform to the standards of accuracy of the Geological Survey; however, they do show the general type and approximate concentration of the mineral matter. It is likely that the values for dissolved solids in most of these analyses are low because silica and nitrate determinations were omitted and because there was probably some precipitation of $CaCO_3$ before the analyses were made.

Water from the Glen Rose limestone in Edwards County ranges widely in dissolved-solids content. Water from well T-10 had a dissolved-solids content of 259; water from well R-31 had 3,230 ppm. The high sulfate content of the Glen Rose water is probably the most objectionable feature. The sulfate content ranged from 13 ppm in well T-10 to 2,260 ppm in well R-31. The presence of sulfate is probably the result of the solution of gypsum in the Glen Rose. In general, the water from the springs in the Glen Rose is of better chemical quality than that from the wells. The spring water more nearly resembles water from the Edwards and associated limestones, indicating a possible hydraulic connection between the Edwards and Glen Rose in the vicinity of the springs.

Figure 9

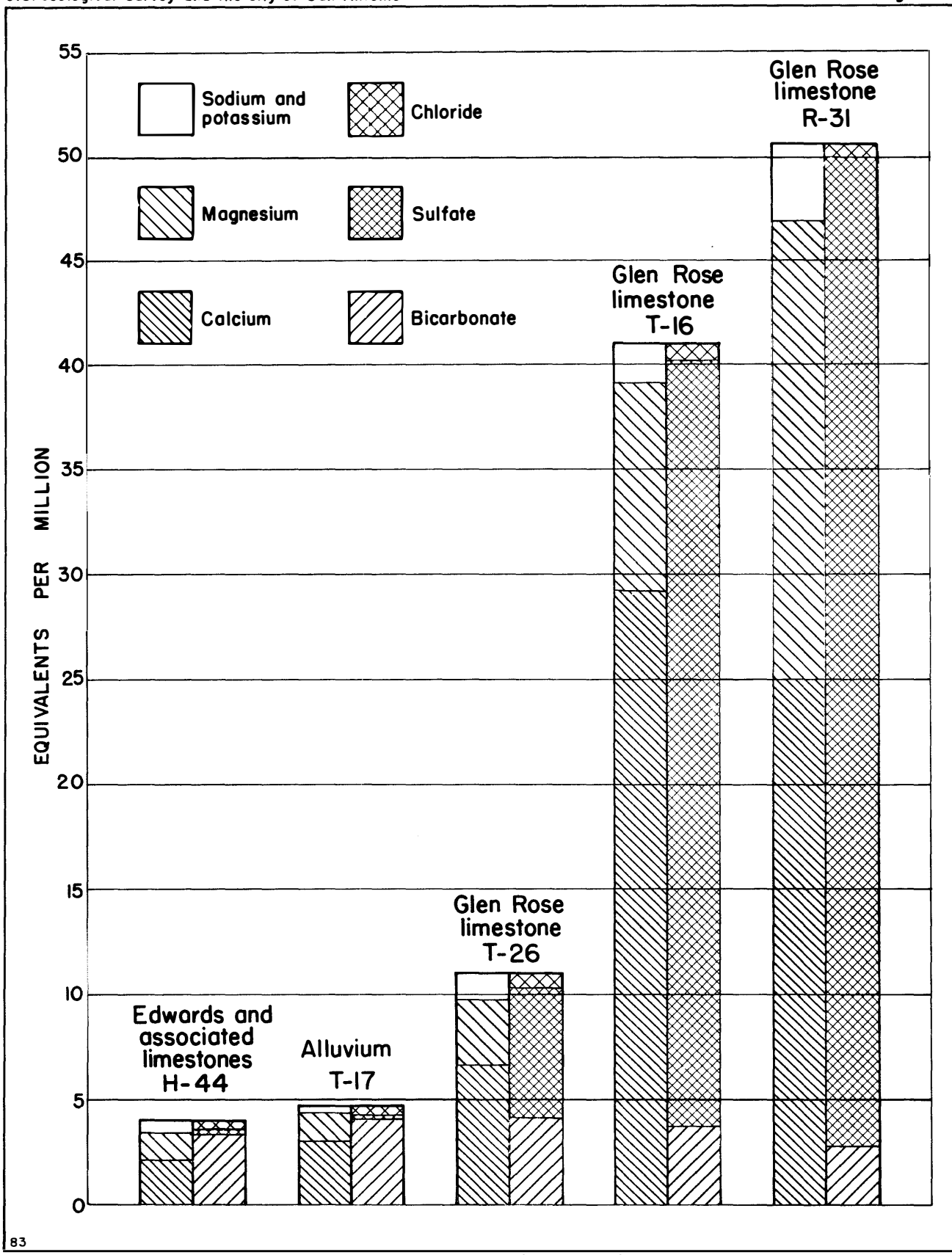

FIGURE 9.- Chemical quality of water from representative wells in Edwards County

The Edwards and associated limestones yield water of a rather uniform quality which is suitable for most purposes. The dissolved-solids content of this water is low, the concentrations ranging from 171 to 386 ppm. Most of the samples contained between 200 and 300 ppm of dissolved solids. The principal objectionable feature of water from the Edwards and associated limestones is hardness, which ranged from 152 to 305 ppm in the samples analyzed, the average being about 200 ppm.

Water from the alluvium is similar in chemical quality to water from the Edwards and associated limestones. It is hard, but otherwise of good quality. The dissolved-solids content ranged from 195 ppm in well E-17 to 276 in well T-43.

SUMMARY

The Edwards and associated limestones of Cretaceous age form the principal aquifer in Edwards County. It yields small to moderate quantities of water to wells throughout the county except in the southeastern part where the aquifer has been removed by erosion and in the major stream valleys. The Glen Rose limestone underlying the Edwards and associated limestones yields small quantities of water to wells and springs, particularly in the southeastern part of the county where the Edwards and associated limestones are absent. Small supplies, principally for domestic and stock purposes, are obtained from alluvial deposits in the major stream valleys. Little is known concerning the water-bearing properties of the older Cretaceous rocks in Edwards County, but they are at least partly sand and may be a potential source of ground water.

Ground water in Edwards County is derived from precipitation. The water-bearing formations are recharged by precipitation and overland runoff. The Glen Rose limestone is recharged, at least in part, by water from the overlying Edwards and associated limestones. The water table in the Edwards and associated limestones in Edwards County is a subdued replica of the land surface and ground water divides follow approximately the topographic divides. Most of the ground water flows southward and either appears as springflow in the Nueces River drainage in the southeastern part of the county or flows underground into Kinney or Val Verde County. Most of the remainder of the ground water in Edwards County flows northward and is ultimately discharged into the drainage of the South Llano River.

The base flow of the perennial streams of the county is dependent on springflow which in turn is dependent upon the rate of recharge to the Edwards and associated limestones. From a study of the base-flow records it can be shown that the average rate of recharge to the Edwards and associated limestones in the county is about 1.3 inches, or about 150,000 acre-feet annually.

The yields of wells in the county range widely from less than 1 gpm in some of the wells that draw from the Glen Rose limestone to as much as 400 gpm in a well that draws from the alluvium. Nearly all the wells in the county draw from the Edwards and associated limestones and are used to supply water to ranches for domestic and stock use. These wells are designed to produce only a few gallons per minute; much larger yields could be obtained from wells drawing from the complete thickness of the aquifer.

Estimates of average annual recharge in the county indicate that about 150,000 acre-feet of water per year (135 mgd) is available for perennial development.

This is more than 150 times the present development of water from wells in the county. However, an increase in the development of ground water would cause a decrease in streamflow.

The Edwards and associated limestones and the alluvium contain the water of best quality in the county. Most of the water is low in dissolved solids, ranging between 200 and 300 ppm. The only objectionable feature of the water is hardness, which averages about 200 ppm.

The water from the Glen Rose limestone ranges widely in quality. Some of the Glen Rose water closely resembles that of the Edwards and associated limestones and of the alluvium. Most of the water, however, is more highly mineralized, the high sulfate content being the most objectionable constituent.

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*Name of agency changed to Texas Water Commission January 30, 1962.

Table 2.--Measured geologic sections in Edwards County

The following composite geologic section was measured along Highway 55 beginning at the foot of a hill near Little Hackberry Creek and the Highway Department dynamite house, 14 miles south of Rocksprings. Tentative correlations are given. Refer to Figure 4 for corresponding lettered zones.

Edwards and associated limestones

Zone and bed		Description	Thickness (feet)
D	2	Limestone, buff, massive; Toucasia sp. abundant----------	1.0
	1	Limestone, buff, massive; Toucasia sp. and Caprina sp. abundant----------	18.1
C	37	Covered----------	10.1
	36	Limestone, coquinal, cream, coarse-grained, hard; large fossils----------	0.8
	35	Covered----------	10.6
	34	Limestone, coquinal, cream, medium-grained, hard; small fossils----------	3.4
	33	Limestone, pelletal, cream, medium-grained, hard----------	1.2
	32	Limestone, cream alternating with gray, medium-grained; lithographic at top; mostly thin-bedded; partially covered----------	5.2
	31	Limestone, cream, red-flecked, medium-grained, thin-bedded; powdery on weathered surface----------	1.9
	30	Covered----------	3.8
	29	Limestone, dolomitic, sugary, brown to yellow, slightly honeycombed; scattered large brown chert nodules; Toucasia sp. common----------	6.0
	28	Limestone, pelletal, cream, hard; coarse-grained at base, finer at top; dark flecks in lower part; inclusions of finer grained limestone; scattered gastropods----------	4.3
	27	Limestone, dolomitic, sugary, cream; small solution caverns----------	2.7
	26	Limestone, dolomitic, sugary, gray, massive; nodules and lenses of chert; few caverns----------	2.0
	25	Limestone, sugary, gray to yellow, coarse-grained; leached, vuggy; may be flaggy; contains calcite----------	3.7

(Continued on next page)

Table 2.--Measured geologic sections in Edwards County--Continued

Edwards and associated limestones--Continued

Zone and bed		Description	Thickness (feet)
C	24	Limestone, dolomitic, cream, hard, thin-bedded; lenses of gray silicified limestone----------	1.8
	23	Dolomite, sugary, gray, flaggy, medium hard; caverns common----------	2.6
	22	Chert, fossiliferous, purple----------	0.3
	21	Dolomite, sugary, gray to yellow, soft; large purple-pink chert nodules; relatively large caverns common; large gastropods in upper part; Toucasia sp. and Caprina sp. common----------	7.3
	20	Limestone, dolomitic, sugary, gray to buff; scattered brown chert; solution cavities in upper part; casts and molds----------	3.8
	19	Limestone, dolomitic, gray, coarse-grained to powdery, highly leached; blue-purple chert nodules; small caves common----------	3.5
	18	Limestone, dolomitic, gray, leached; caves in upper part; cavities partly filled with calcite----------	3.5
	17	Limestone, dolomitic, sugary, gray, highly leached, thin-bedded to flaggy; brown chert nodules; much calcite replacement----------	1.8
	16	Limestone, yellow-gray; large purple chert nodules; cavities lined with quartz and calcite; may be dolomitic; much calcite replacement----------	2.2
	15	Limestone, gray-purple, coarse-grained; upper surface uneven; partly bedded purple chert----------	1.3
	14	Dolomite, sugary to powdery, buff, soft; pink chert nodules; upper 2 ft. consists of layered calcite deposits; geodes; bedding obscured by solution----------	4.9
	13	Dolomite, nodular, yellow-buff, soft, highly leached; gray-purple chert nodules; bedding obscured----------	5.0
	12	Limestone, dolomitic, yellow-brown, hard, leached; purple-pink chert nodules; contains small rounded unidentifiable objects that may be fossils; may be partially silicified----------	3.5

(Continued on next page)

Table 2.--Measured geologic sections in Edwards County--Continued

Edwards and associated limestones--Continued

Zone and bed	Description	Thickness (feet)
C 11	Dolomite, sugary, gray, soft; coquina of *Nerinea* sp. and pelecypod shells; hard layer in middle part; probably silicified	2.8
10	Limestone, yellow-gray; consists mostly of calcite crystals; probably dolomitic; small solution caverns	3.0
9	Limestone, dolomitic, coquinal, buff; *Nerinea* sp. abundant; calcite deposits	0.6
8	Limestone, cream-buff, fine-grained; pink at top; upper part very fossiliferous; *Nerinea* sp. small pelecypod shells abundant; mottled with dark patches; believed to be siliceous	3.2
7	Limestone, sugary, white; mottled with dark patches; believed to be siliceous	1.5
6	Limestone, dolomitic, yellow, highly leached, vuggy; calcite crystals	1.5
5	Limestone, fossiliferous, cream, fine-grained, thin-bedded; lower half dolomitic; pink chert	2.4
4	Dolomite, sugary, gray, soft; pink-gray chert nodules common; cavernous	2.4
3	Dolomite, gray, soft; calcite deposits; small solution cavities common	3.3
2	Limestone, highly leached; calcite deposits; probably dolomitic; large gray chert nodules contain fossils	2.6
1	Limestone, cavernous, highly leached; secondary deposits of calcite; probably dolomitic; much of bedding destroyed or obscured by solution; large chert nodules contain fossils	14.5
	Subtotal	154.1

Section continued on a hill near Highway 55, about half a mile north of the Highway Department dynamite house.

(Continued on next page)

Table 2.--Measured geologic sections in Edwards County--Continued

Edwards and associated limestones--Continued

Top of hill:

Zone and bed		Description	Thickness (feet)
C	1	Limestone, dolomitic; bed No. 1 in preceding section----------	
B	35	Limestone, thin-bedded; mostly covered----------	9.0
	34	Limestone, lithographic, buff; *Caprina* sp. scattered----------	3.7
	33	Limestone, buff, fine-grained----------	3.2
	32	Limestone, crystalline, light-gray; *Caprina* sp.----------	5.5
	31	Covered----------	4.7
	30	Limestone, buff, fine-grained; rosettes of milky quartz----------	2.0
	29	Limestone, light-gray, fine-grained----------	1.0
	28	Covered----------	4.7
	27	Limestone, light-gray, fine-grained----------	2.0
	26	Covered----------	4.0
	25	Limestone, fine-grained to lithographic, partly leached----------	1.2
	24	Covered----------	4.8
	23	Limestone, crystalline, cream; fossil fragments; blue chert nodules----------	7.6
	22	Covered----------	3.0
	21	Limestone, gray, fine-grained, hard----------	2.0
	20	Covered----------	4.0
	19	Limestone, bed No. 19 in following section----------	
		Subtotal	62.4

(Continued on next page)

Table 2.--Measured geologic sections in Edwards County--Continued

Section continued from the foot of a hill at the Highway Department dynamite house on Highway 55, 15 miles south of Rocksprings.

Edwards and associated limestones--Continued

Zone and bed		Description	Thickness (feet)
Fault:			
B	19	Limestone, buff, fine-grained, massive, hard; Toucasia sp. and Caprina sp. silicified and exposed on weathered surface; large chert nodules at top contain fossils filled with calcite	7.5
	18	Limestone, buff, fine-grained; lower part highly fossiliferous	3.7
	17	Limestone; mostly calcite and caliche	1.8
	16	Limestone, buff, fine-grained to lithographic, hard	1.0
	15	Limestone, coquinal, light-gray, hard; small gastropods abundant	1.3
	14	Limestone, dolomitic, sugary, pelletal, gray; medium to large chert nodules; brown-banded calcite; geodes lined with calcite	6.6
	13	Limestone, fine-grained to lithographic, light-gray, hard	1.4
	12	Limestone, dolomitic, fossiliferous, dark-gray, medium-grained; appears pelletal	2.7
	11	Limestone, buff, medium-grained; orange flecks; small fossils that may be fragments	1.6
	10	Limestone, pelletal, gray, medium-grained	3.9
	9	Limestone, fossiliferous, light-gray, coarse-grained; orange flecks	2.9
	8	Limestone, semilithographic, buff to brown; chert nodules common	3.1
	7	Limestone, gray, medium-grained, thin-bedded; scattered chert nodules	4.7

(Continued on next page)

Table 2.--Measured geologic sections in Edwards County--Continued

Edwards and associated limestones--Continued

Zone and bed		Description	Thickness (feet)
B	6	Limestone, light-gray, massive, hard; Toucasia sp. and Caprina sp. abundant----------	3.3
	5	Limestone, light-gray, coarse-grained; patches of dark lithographic limestone believed to be siliceous; Toucasia sp. scattered----------	1.8
	4	Limestone, gray to dark-gray, coarse-grained, mottled; contains areas of lithographic siliceous limestone; scattered chert nodules; weathers nodular----------	5.5
	3	Limestone, gray to dark-gray, fine-grained; upper part contains patches of siliceous limestone; lower part contains caliche----------	4.6
	2	Limestone, buff-gray, highly bored; partly honeycombed----------	6.0
	1	Limestone, buff-gray, fine-grained, massive; bedding planes contain irregular bands of brown calcite----------	6.5
Comanche Peak limestone			
A	1	Limestone, marly, nodular, buff to gray; matrix fine-grained to semilithographic; bedding obscured by solution and borings; Exogyra texana scattered----------	43.9
		Subtotal	113.8
		TOTAL (composite section)----------	330.3

The following section was measured on the south side of Little Hackberry Creek, 0.7 mile east of Highway 55. Altitude of the creekbed is 1,760 feet. Tentative correlations are given.

Comanche Peak limestone

Description	Thickness (feet)
Limestone, nodular; scattered Exogyra texana; forms vertical bluff----------	

(Continued on next page)

Table 2.--Measured geologic sections in Edwards County--Continued

Glen Rose limestone

Description	Thickness (feet)
Clay, yellow; few Exogyra texana; mostly covered by limestone boulders	21.1
Marlstone, yellow	6.1
Clay, yellow; few fossils; partly covered by boulders	19.4
Siltstone, calcareous; some fossils	0.5
Coquina of Exogyra texana	0.9
Limestone, fossiliferous, light-gray, fine-grained	1.4
Shale, buff; coquina of Exogyra texana in lower part	1.4
Limestone, oölitic, reddish-brown, hard	0.8
Limestone, light-gray; few fossil fragments	1.0
Siltstone, dolomitic, buff, porous	2.0
Shale, buff; Exogyra texana abundant	6.7
Siltstone, dolomitic; upper part calcareous	2.0
Shale, buff; pelecypod molds abundant; Exogyra texana	3.0
Marlstone, light-gray; contains calcite crystals	0.8
Shale, buff; Exogyra texana abundant	10.1
Limestone, calcarenitic, hard; cream matrix with brown detrital	0.5
Shale, light-brown; interbedded with limestone; fossil fragments; molds; Exogyra texana abundant; Engonoceras sp.	4.9
Shale, buff to brown; pelecypod molds abundant; fossil fragments in light-gray limestone layer in middle of bed	5.5
Limestone, light-gray, fine-grained; abundant fossils in creekbed	
TOTAL	88.1

Table 4.--Drillers' logs of wells in Edwards County

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well A-2--partial log					
Owner: W. T. O. and J. S. Holman. Driller: Phillips Petroleum Co.					
Cellar	18	18	Lime, hard	3	560
Lime	22	40	Shale, soft sandy	15	575
Lime, hard, white	30	70	Shale	17	592
Lime, hard, brown	20	90	Lime	18	610
Lime, medium gray	58	148	Shale, gray	40	650
Sand, soft, yellow	12	160	Lime	15	665
Sand, soft, gray	30	190	Shale and shells	20	685
Lime, medium-gray	10	200	Lime and shale	20	705
Lime, hard and soft, gray	30	230	Shale, blue	18	723
Lime, hard, gray	20	250	Lime, medium-gray	137	860
Lime, medium, gray	20	270	Lime, soft	40	900
Lime, soft, yellow	15	285	Lime, broken, hard	15	915
Lime	30	315	Sand, soft, gray	10	925
Lime, hard, water	20	335	Lime, hard	15	940
Lime, gray	85	420	Sand, soft, gray	15	955
Lime, medium, broken, brown	20	440	Lime and shale	25	980
Lime, broken, dark	4	444	Shale, soft, blue	5	985
Lime, medium, broken, dark	31	475	Sand, soft, gray	15	1,000
Lime, hard, dark	55	530	Shale, soft, blue	20	1,020
Lime, medium, dark	15	545	Shale, soft, dark	8	1,028
Shale, soft, sandy	12	557	Lime, soft, dark	4	1,032
			Shale, soft, dark	23	1,055

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

Well A-2--partial log--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Lime, hard, dark------	10	1,065	Shale, soft, dark----	60	1,500
Shale, soft, dark-----	5	1,070	Slate----------	7	1,507
Shale and shells, dark	50	1,120	Lime, hard, dark-----	13	1,520
Shale, soft, dark-----	20	1,140	Shale, soft----------	5	1,525
Lime, hard, dark------	15	1,155	Lime, hard----------	15	1,540
Shale and shells------	60	1,215	Shale and shells-----	50	1,590
Slate and shells------	40	1,255	Shale, soft, dark----	20	1,610
Lime, hard, gray------	15	1,270	Lime, hard----------	20	1,630
Shale and shells------	55	1,325	Shale and shells-----	55	1,685
Shale, soft, blue-----	5	1,330	Shale, soft, brown---	35	1,720
Lime, hard, gray------	15	1,345	Lime, hard, dark-----	15	1,735
Shale----------	5	1,350	Total depth----------		8,230
Shale and shells, dark	90	1,440			

Well A-8

Owner: Texas A. & M. College. Driller: W. S. Seward.

Caliche and shells----	17	17	Lime, blue----------	21	348
Lime, yellow----------	8	25	Lime, white----------	25	373
Lime, white----------	18	43	Cave, first water----	2	375
Lime, yellow----------	34	77	Lime, coarse, with crystals and flint, water----------	10	385
Lime, gray----------	68	145			
Lime, yellow----------	53	198	Lime, hard, gray-----	22	407
Lime, white----------	80	278	Lime, soft, gray-----	15	422
Lime, yellow----------	49	327	Lime, hard, brown----	3	425

Table 4.--Drillers' logs of wells in Edwards County--Continued

Well A-12

Owner: J. H. Taylor. Driller: O. L. Williams.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Lime----------	335	335	Lime, brown----------	5	530
Sand, water----------	5	340	Shale, blue----------	50	580
Lime----------	160	500	Sand, oil and lime---	10	590
Shale and lime--------	20	520	Shale, blue----------	10	600
Sand, water----------	5	525			

Well A-24

Owner: Paul Turney. Driller: H. H. Sides.

Lime, yellow and gray, with broken crevices	100	100	Shale----------	10	310
			Shale, blue----------	10	320
Lime, gray----------	30	130			
			Lime----------	5	325
Lime, yellow----------	10	140			
			Sand and shale-------	5	330
Lime, gray----------	10	150			
			Shale, blue and sand-	5	335
Lime, yellow----------	20	170			
			Lime, gray----------	25	360
Lime, gray----------	10	180			
			Lime----------	10	370
Lime, yellow----------	10	190			
			Lime, gray----------	10	380
Lime, gray----------	30	220			
			Shale, gray----------	10	390
Lime, and shale-------	10	230			
			Shale, blue----------	20	410
Lime----------	10	240			
			Sand, oil show-------	10	420
Lime, gray----------	10	250			
			Shale, blue----------	5	425
Shale----------	20	270			
			Shale----------	15	440
Lime, gray----------	10	280			
			Shale, blue----------	20	460
Lime----------	10	290			
			Lime, gray----------	10	470
Lime, gray----------	10	300			

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well A-24--Continued					
Shale, blue----------	50	520	Sand----------	50	780
Lime, blue----------	10	530	Sand and gravel-----	40	820
Lime, gray----------	10	540	Shale, blue---------	10	830
Sand and shale, blue--	10	550	Sand and shale------	10	840
Lime----------	20	570	Sand and gravel-----	10	850
Lime, gray----------	10	580	Sand and lime-------	5	855
Lime----------	20	600	Sand, gummy, oil----	5	860
Lime and sand---------	10	610	Sand and shale------	10	870
Lime, gray----------	10	620	Shale, sandy--------	20	890
Shale, gray----------	10	630	Shale----------	40	930
Lime, gray----------	20	650	Sand and shale------	10	940
Lime and sand---------	10	660	Shale, brown--------	10	950
Sand and lime---------	20	680	Shale, blue---------	10	960
Lime----------	10	690	Shale, gray---------	10	970
Lime and sand---------	10	700	Shale, brown--------	10	980
Lime, gray----------	10	710	Shale, gray---------	10	990
Sand----------	10	720	Shale----------	13	1,003
Sand, dry----------	10	730			

Well B-4

Owner: W. L. Miers. Driller: Sinclair Oil & Gas Co.

Caliche----------	30	30	Anhydrite----------	169	1,457
Lime, water----------	330	360	Lime and shale------	221	1,678
Shale, blue----------	115	475	Lime and shale, sandy	156	1,834
Lime, sandy----------	321	796	Lime and shale------	224	2,058
Lime and shale--------	492	1,288	Total depth---------		6,255

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well B-15

Owner: W. L. Holland. Driller: V. J. Meyer.

Lime, white---------	185	185	Lime, gray, water---	23	395
Lime, gray----------	53	238	Lime, dark-gray-----	70	465
Lime, hard, gray----	16	254	Lime, light-gray----	57	522
Lime, brown---------	11	265	Shale---------------	16	538
Lime, gray----------	13	278	Lime, soft----------	13	551
Lime, yellow--------	22	300	Shale, green--------	10	561
Lime, gray----------	72	372			

Well D-5--partial log

Owner: J. H. Gutherie. Driller: Humble Oil & Refining Co.

Clay, surface and gravel------------	50	50	Lime and sand-------	130	1,042
Lime, gray----------	151	201	Sand and shale------	63	1,105
Shale, green--------	183	384	Lime----------------	77	1,182
Shale and sand------	157	541	Lime and sand-------	71	1,253
Shale and lime------	125	666	Sand, lime, and shale-------------	73	1,326
Shale and sand------	207	873	Total depth---------		4,140
Lime----------------	39	912			

Well D-9

Owner: S. J. Epperson. Driller: W. S. Seward.

Surface------------	2	2	Lime, white---------	25	115
Lime, yellow--------	16	18	Lime, brown---------	23	138
Lime, broken, caves-	72	90	Lime, yellow--------	38	176

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well D-9--Continued					
Lime, gray----------	16	192	Lime, yellow--------	19	293
Flint----------	4	196	Lime, white---------	15	308
Lime, white----------	19	215	Lime, gray, water---	42	350
Lime, yellow----------	38	253	Lime, brown---------	14	364
Lime, white----------	21	274	Lime, gray----------	6	370
Well D-12					
Owner: S. J. Epperson. Driller: W. S. Seward.					
Surface----------	4	4	Lime, white---------	13	290
Lime, yellow----------	76	80	Lime, gray----------	30	320
Lime, white----------	97	177	Lime, brown, water 320-350----------	30	350
Lime, yellow----------	100	277			
Well D-13					
Owner: G. Lovelady. Driller: W. S. Seward.					
No record----------	247	247	Lime, brown, (water)	9	287
Lime, white----------	31	278	Lime, gray----------	13	300
Well E-1					
Owner: Mrs. V. Shurley. Driller: P. Urban.					
Lime, white, and caliche----------	95	95	Lime, yellow--------	20	205
Lime, white----------	90	185			
Well E-13--partial log					
Owner: Mrs. W. C. Rigsby. Driller: Auld, Dodson and Lyman.					
Lime----------	290	290	Lime, water---------	60	350

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well E-13--partial log--Continued					
Lime----------	95	445	Lime and shale-----	55	845
Shale----------	20	465	Lime----------	15	860
Lime----------	5	470	Shale----------	5	865
Shale, blue---------	55	525	Sand, water--------	25	890
Shale----------	20	545	Sand----------	10	900
Shale, blue---------	55	600	Shale----------	25	925
Shale----------	20	620	Sand and shale-----	15	940
Shale and lime------	20	640	Shale, brown-------	15	955
Lime, gray----------	20	660	Shale----------	25	980
Lime and shale------	30	690	Total depth--------		3,952
Lime----------	100	790			
Well E-18--partial log					
Owner: P. & L. Jackson. Driller: McMann Oil & Gas Co.					
Lime----------	325	325	Shale, light-------	45	810
Lime, sandy---------	40	365	Mud, blue----------	45	855
Lime----------	130	495	Shale, light-------	30	885
Mud, blue----------	80	575	Mud, blue----------	40	925
Lime, sandy---------	10	585	Lime----------	15	940
Mud, blue----------	75	660	Sand----------	15	955
Lime----------	10	670	Mud, red----------	7	962
Mud, blue----------	60	730	Lime, sandy--------	13	975
Shale, gray sandy---	20	750	Sand, heavy--------	20	995
Lime, broken--------	15	765	Gravel----------	10	1,005

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well E-18-partial log--Continued					
Sand	45	1,050	Mud, red	15	1,175
Shale, blue	5	1,055	Shale, blue	25	1,200
Rock, red	10	1,065	Mud, red	40	1,240
Sand	5	1,070	Shale, blue	40	1,280
Rock, red	15	1,085	Shale, dark	330	1,610
Lime, sandy	45	1,130	Shale, dark sandy	75	1,685
Sand	20	1,150	Sand	30	1,715
Lime	10	1,160	Total depth		3,897

Well F-4

Owner: Ed. C. Mayfield. Driller: Great Expectations Oil Corp.

Boulders and gravel	50	50	Lime	55	165
Rock	25	75	Lime, blue	107	272
Rock and clay	25	100	Shale	25	297
Lime	5	105	Mud, green	3	300
Rock, yellow	5	110	Shale and lime shells	55	355

Well F-9

Owner: A. M. & B. A. Newby. Driller: Eldon, Ltd.

Lime	288.5	288.5	Shale, green	8	306.5
Shale, blue	10	298.5	Lime	4.5	311

Well F-11

Owner: Ed. C. Mayfield. Driller: Great Expectations Oil Corp.

Limestone, hard, with crevices carrying fresh water	348	348	Clay, greenish, with thin lime streaks and sand streaks	45	400
Clay, greenish, oil odor	7	355			

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well F-18

Owner: W. E. Whitehead. Driller: Magnolia Petroleum Co.

Lime, hard----------	280	280	Slate, blue----------	6	788
Slate, blue----------	73	353	Sand, gray----------	140	928
Lime shells----------	302	655	Shale, blue----------	7	935
Lime----------	68	723	Shale, red----------	25	960
Slate, white----------	10	733	Lime, shells----------	870	1,830
Lime, white----------	17	750	Sand, gray----------	205	2,035
Sand, gray----------	32	782	Lime shells----------	155	2,190

Well G-7

Owner: R. T. Hazzard. Driller: W. S. Seward.

Caliche, yellow-------	24	24	Lime, gray----------	41	297
Lime, yellow----------	2	26	Lime, hard, yellow----	11	308
Caliche----------	8	34	Lime, blue----------	42	350
Lime, soft, cavern at 70----------	36	70	Lime, yellow----------	20	370
			Lime, white, flint----	26	396
Lime, yellow, ½gpm water at 135--------	65	135	Lime, soft, brown, increased water-----	9	405
Lime, white----------	115	250	Lime, yellow----------	47	452
Flint----------	6	256	Lime, blue----------	8	460

Well G-18

Owner: S. W. Higgins. Driller: Wesley Young.

Lime, broken----------	2	2	Lime, firm, white-----	10	28
Lime, hard, gray------	16	18	Lime, hard, white-----	7	35

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)
Well G-18--Continued		
Lime, hard, yellow----	7	42
Lime, white----------	43	85
Blind, no samples-----	25	110
Lime, hard, pink------	20	130
Lime, sandy, sharp----	15	145
Lime, pink-----------	50	195
Lime, hard, yellow----	40	235
Lime, hard, leaky, pink----------	15	250
Cavity, blind, no samples----------	10	260
Sand, coarse (water)--	5	265
Sand, hard, brown-----	17	282

Well H-4--partial log

Owner: Mrs. H. H. Hough. Driller: The Texas Co.

Boulders and surface dirt----------	3	3
Stone, yellow and lime-	29	32
Blind----------	18	50
Lime, hard----------	30	80
Lime, yellow----------	45	125
Anhydrite----------	25	150
Lime, honeycombed, and anhydrite----------	35	185
Blind----------	70	255
Hard and blind---------	55	310
Lime, yellow----------	5	315
Sand, water----------	15	330
Sand----------	10	340
Lime, sandy brown------	60	400
Lime brown----------	45	445
Lime, brown streaks---	50	495
Lime, gray----------	23	518
Shale, gray----------	27	545
Shale, green----------	45	590
Shale----------	20	610
Shale, green----------	15	625
Lime, sandy----------	122	747
Shale and lime--------	326	1,073
Shale and lime, with shells----------	171	1,244
Shale and lime--------	32	1,276
Shale, black----------	10	1,286
Shale and lime--------	54	1,340
Shale, black----------	202	1,542
Total depth----------		5,307

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well H-30

Owner: Homer Rudasill. Driller: W. S. Seward.

Lime, white----------	60	60	Lime, white---------	16	316
Lime, yellow----------	110	170	Lime, yellow--------	16	332
Lime, white----------	90	260	Lime, white---------	43	375
Lime, gray-----------	13	273	Lime, gray, water---	15	390
Lime, yellow----------	27	300			

Well H-44

Owner: City of Rocksprings. Driller: Letsinger Sonora Drilling Co.

No record-----------	434	434	Lime, gray----------	115	560
Water formation-------	11	445	Mud, blue----------	3	563

Well H-46

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

Lime, sandy, yellow and white, lime shells, cave at 150-160 feet--------	175	175	Lime, white---------	45	365
			Lime, pink----------	20	385
			Lime, white---------	50	435
Lime, and flint lime--	120	295	Sand, fine, water---	50	485
Lime, yellow, flint---	25	320	Slate, blue---------	115	600

Well J-6--partial log

Owner: Hal Bradford. Driller: Dan Auld, et al.

Lime-----------------	440	440	Shale, gray and lime shells-----------	270	930
Lime, broken----------	45	485			
			Shale, gray---------	15	945
Slate, blue----------	175	660			

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well J-6--partial log--Continued					
Sand, water----------	45	990	Lime, broken and slate	63	1,095
Rock, red----------	10	1,000	Shale, blue----------	85	1,180
Conglomerate----------	15	1,015	Total depth----------		4,224
Rock, red----------	17	1,032			
Well J-18--partial log					
Owner: J. S. Peterson. Driller: James Dalglish, et al.					
Lime, water----------	525	525	Sand----------	33	1,180
Slate, broken, gray---	19	544	Slate, yellow---------	75	1,255
Shale, green----------	119	663	Slate, dark----------	45	1,300
Shale, gray----------	110	773	Sand----------	25	1,325
Lime, broken----------	41	814	Lime, gray, sandy-----	36	1,361
Slate, white----------	36	850	Slate, black----------	319	1,680
Lime, broken----------	50	900	Lime, gray----------	46	1,726
Slate and lime shells-	112	1,012	Sand, gray----------	39	1,765
Sand, water----------	28	1,040	Lime, black----------	40	1,805
Red beds, sandy-------	55	1,095	Total depth----------		5,206
Slate, red----------	52	1,147			
Well J-20--partial log					
Owner: J. S. Peterson. Driller: --Weymeyar.					
Limestone----------	310	310	Shale, light green----	180	680
Lime, (water unbailable)----------	10	320	Shale----------	290	970
Limestone----------	180	500	Sand, water (top Hensell)----------	52	1,022

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well J-20--partial log--Continued					
Sand shells----------	53	1,075	Shell----------	4	1,214
Shale----------	33	1,108	Shale, black---------	56	1,270
Shale-reddish color----	32	1,140	Total depth----------		3,962
Shale, black----------	70	1,210			
Well J-21--partial log					
Owner: J. S. Peterson. Driller: X. K. Stout.					
Lime, surface----------	235	235	Clay, yellow---------	25	1,160
Sand, water----------	12	247	Shale, gray----------	20	1,180
Lime, water----------	153	400	Shale, mixed, red and green----------	50	1,230
Lime, broken----------	130	530	Shale, mixed, rotten-	68	1,298
Shale, green----------	60	590	Shale, sandy, black--	122	1,420
Shale, gray----------	105	695	Shale, sandy, gray---	240	1,660
Shale, gray and lime shells----------	30	725	Sand, broken---------	40	1,700
Lime, broken----------	325	1,050	Shale, sandy and shells	45	1,745
Sand, water----------	60	1,110	Shale, brown and black	45	1,790
Sand, broken----------	25	1,135	Total depth----------		2,440
Well J-23--partial log					
Owner: J. S. Peterson. Driller: X. K. Stout.					
Lime----------	550	550	Limestone----------	5	760
Shale, light green and gray----------	165	715	Shale, sandy----------	85	845
Shale, gray----------	35	750	Slate, white and shells	25	870
Shale, white----------	5	755	Limestone, broken-----	130	1,000

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Table 4.--Drillers' logs of wells in Edwards County--Continued

Well J-23--partial log--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale----------	55	1,055	Shale, black--------	600	1,875
Sand, water----------	20	1,075	Sand, gray and shell	75	1,950
Limestone----------	25	1,100	Shale, black--------	78	2,028
Sand----------	8	1,108	Sand, black and sand, water----------	222	2,250
Shale, black---------	42	1,150	Slate, black soft---	185	2,435
Shale, yellow--------	13	1,163	Sand----------	78	2,513
Shale, brown---------	22	1,185	Total depth---------		4,410
Shale, red----------	5	1,190			
Shale, brown and yellow----------	85	1,275			

Well J-24--partial log

Owner: J. S. Peterson. Driller: James Dalglish.

Lime, water----------	550	550	Sand----------	8	1,108
Shale, green and gray	165	715	Shale, blue---------	42	1,150
Shale, gray----------	35	750	Shale, yellow-------	13	1,163
Shale, white---------	5	755	Shale, brown--------	22	1,185
Shale, sandy---------	90	845	Shale, red----------	5	1,190
Slate, white and shells	25	870	Shale, brown and yellow----------	30	1,220
Lime, broken---------	130	1,000	Shale, mixed, brown-	15	1,235
Lime----------	20	1,020	Shale, mixed--------	35	1,270
Shale----------	35	1,055	Shale, black--------	605	1,875
Sand, water----------	20	1,075	Total depth---------		4,600
Lime----------	25	1,100			

Table 4.--Drillers' logs of wells in Edwards County--Continued

Well J-35--partial log

Owner: C. & H. Peterson. Driller: Dan Auld, et al.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Lime and caliche------	100	100	Lime----------	67	785
Lime----------	30	130	Shale and lime------	15	800
Lime, sandy----------	10	140	Lime----------	85	885
Lime----------	70	210	Lime, broken--------	45	930
Lime and caliche------	60	270	Lime----------	30	960
Lime----------	10	280	Anhydrite and lime--	45	1,005
Lime and caliche------	10	290	Lime, broken--------	20	1,025
Anhydrite and lime----	65	355	Sand----------	65	1,090
Lime and sands--------	25	380	Shale----------	20	1,110
Shale, blue and caliche	10	390	Lime----------	7	1,117
Lime and shale--------	40	430	Shale, green--------	5	1,122
Shale----------	30	460	Lime and shale------	18	1,140
Lime and caliche------	20	480	Shale, blue---------	13	1,153
Lime----------	45	525	Red beds----------	9	1,162
Shale, blue----------	20	545	Rock, red----------	13	1,175
Shale----------	64	609	Clay, yellow--------	10	1,185
Lime----------	6	615	Shale and lime shells	45	1,230
Shale, blue----------	25	640	Shale, black--------	17	1,247
Shale, blue, and caliche----------	30	670	Lime, black---------	10	1,257
Shale----------	30	700	Shale, black, and lime----------	18	1,275
Anhydrite and lime----	18	718	Total depth		5,078

Table 4.--Drillers' logs of wells in Edwards County--Continued

Well K-4

Owner: W. G. Welch. Driller: K. E. Edmonds.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil----------	3	3	Rock, broken--------	18	208
Lime, soft----------	17	20	Lime, yellow--------	55	263
Lime, hard----------	5	25	Lime, white---------	17	280
Rock, honeycombed---	25	50	Lime, soft, and gravel, water-----	12	292
Lime, hard, white---	45	95	Lime, white---------	8	300
Rock, broken crevices	59	154			
Lime, white---------	36	190			

Well K-15--partial log

Owner: Mrs. S. A. Hatch. Driller: Plateau Oil and Gas Co.

Lime----------	290	290	Sand, water---------	25	1,005
Gravel----------	20	310	Sand, hard----------	25	1,030
Lime, brown---------	8	318	Rock, red-----------	10	1,040
Lime----------	177	495	Sand----------	20	1,060
Shale, blue---------	133	628	Sand conglomerate---	25	1,085
Lime----------	112	740	Rock, red and sand--	15	1,100
Lime, brown---------	20	760	Rock, red-----------	10	1,110
Lime----------	20	780	Lime, broken--------	30	1,140
Shale, gray---------	25	805	Mud, blue-----------	22	1,162
Shale and lime------	80	885	Lime----------	3	1,165
Lime shells and shale	70	955	Sand----------	5	1,170
Lime----------	15	970	Rock, red-----------	54	1,224
Shale, gray---------	10	980	Sand----------	18	1,242

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well K-15--partial log--Continued					
Rock, red----------	18	1,260	Shale, blue and brown----------	20	1,375
Red beds, hard-------	40	1,300	Shale, blue--------	55	1,430
Shale, brown---------	20	1,320	Shale, gray--------	10	1,440
Shale, red, white, and blue----------	10	1,330	Total depth--------		5,176
Slate, blue----------	25	1,355			

Well L-1

Owner: C. H. Whitehead and C. B. Wardlaw. Driller: E. B. Fuller.

Lime----------	100	100	Lime, yellow-------	25	260
Flint----------	15	115	Lime, white--------	40	300
Lime, white----------	65	180	Lime, gray---------	50	350
Lime, yellow---------	15	195	Lime, white--------	25	375
Clay, red----------	10	205	Lime, gray, water--	20	395
Lime, yellow---------	20	225	Edwards lime-------	60	455
Lime, white----------	10	235	Shale, blue--------	47	502

Well L-14

Owner: Ned Dunbar. Driller: W. S. Seward.

Surface (soil)-------	4	4	Lime, white--------	129	257
Lime, yellow---------	26	30	Lime, yellow-------	13	270
Lime, white----------	80	110	Lime, gray, water--	10	280
Lime, yellow---------	18	128	Lime, brown--------	11	291

Well L-15

Owner: Ned Dunbar. Driller: W. S. Seward.

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Boulders----------	2	2	Lime, yellow, water seep, 225-230-------	75	280
Lime, white----------	8	10	Lime, white----------	30	310
Lime, yellow---------	35	45	Lime, gray----------	9	319
Lime and flint-------	77	122	Lime, white, water, 365----------	72	391
Lime, yellow---------	41	163			
Lime, white----------	42	205			

Well L-17

Owner: Barron and McClain Ranch. Driller: W. S. Seward.

Soil and boulders----	5	5	Lime, yellow----------	17	290
Lime, yellow---------	20	25	Lime, white, water----	25	315
Lime, white----------	131	156	Lime, gray----------	40	355
Lime, brown----------	44	200	Lime, blue----------	29	384
Lime, white----------	73	273			

Well L-20

Owner: Ned Dunbar. Driller: W. S. Seward.

Soil and boulders----	2	2	Lime, white----------	70	310
Lime, white----------	6	8	Lime, yellow----------	12	322
Lime, yellow---------	24	32	Lime, white----------	30	352
Lime, broken---------	38	70	Lime, yellow, water---	16	368
Lime and flint-------	114	184	Lime, gray----------	2	370
Lime, yellow---------	56	240			

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well L-34

Owner: I. B. Newman. Driller: J. T. Crawford.

Lime and flint--------	30	30	Sandrock, gray------	100	308
Lime, hard, white-----	160	190	Sand, common, soft--	30	338
Rock, yellow----------	6	196	Sand, rock, hard, blue----------	2	340
Rock, pink------------	12	208			

Well L-37

Owner: Paul F. Rosenow. Driller: W. S. Seward.

Lime, yellow----------	47	47	Lime, gray----------	115	435
Lime, white-----------	203	250	Lime, brown, water--	109	544
Lime, yellow----------	70	320			

Well M-5

Owner: Leona Shaw. Driller: Wesley Young.

Lime, broken----------	18	18	Cavity----------	9	209
Lime, yellow, flint---	54	72	Lime, light yellow--	46	255
Lime, hard, white-----	18	90	Lime, yellow, and clay----------	13	268
Lime, hard, yellow----	15	105	Lime, hard, blue----	10	278
Lime, hard, pink------	60	165	Shale----------	2	280
Lime, light yellow----	35	200			

Well M-11

Owner: W. P. Rudasill. Driller: W. S. Seward.

Caliche----------	4	4	Lime, yellow, caves-	8	26
Lime, yellow----------	14	18	Lime, white---------	16	42

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well M-11--Continued					
Lime, yellow---------	25	67	Lime, soft, yellow, water, 98-104------	6	104
Lime, white----------	16	83	Lime, hard, yellow---	6	110
Lime, yellow---------	15	98			
Well M-14					
Owner: W. E. Wittenburg. Driller: W. S. Seward.					
Lime, yellow---------	68	68	Lime, blue, water, 268-270 feet-------	25	295
Lime, gray-----------	177	245	Shale, blue----------	9	304
Lime, yellow---------	25	270			
Well M-26					
Owner: Mrs. M. I. Dragoo. Driller: W. S. Seward.					
Lime, white---------	143	143	Lime, yellow---------	30	350
Lime, yellow--------	57	200	Lime, brown, water at 350 ----------	8	358
Lime, white---------	120	320	Lime, gray-----------	65	423
Well M-30					
Owner: L. L. Ellis. Driller: W. S. Seward.					
Surface-------------	4	4	Lime, gray-----------	27	167
Lime, yellow---------	14	18	Lime, yellow---------	56	223
Flint, cave----------	5	23	Lime, white----------	17	240
Lime, yellow---------	67	90	Lime, yellow---------	28	268
Lime, white----------	8	98	Lime, yellow, water--	12	280
Lime, yellow---------	42	140	Lime, blue-----------	24	304

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well M-55

Owner: J. S. Balentine. Driller: W. S. Seward.

Flint----------	2	2	Lime, yellow---------	15	160
Lime, hard, yellow---	113	115	Lime, yellow, water at 160-165----------	20	180
Lime, hard, white----	30	145			

Well N-1

Owner: H. S. Martindale. Driller: W. S. Seward.

Surface----------	2	2	Lime, broken, yellow-	15	205
Lime, broken, white--	143	145	Lime, solid, yellow--	30	235
Lime, yellow---------	7	152	Lime, yellow--------- (water from 300-315)	103	338
Lime, white----------	38	190			

Well N-12

Owner: W. P. Rudasill. Driller: Seward & Placker.

No record----------	213	213	Lime, brown, water (well deepended from 212 to 304 feet)---	21	304
Lime, white----------	35	248			
Lime, yellow---------	35	283			

Well N-22

Owner: S. S. Henry. Driller: W. S. Seward.

Soil----------	2	2	Lime, yellow---------	6	70
Lime, yellow---------	16	18	Lime, white, caves---	56	126
Lime, broken---------	12	30	Lime, yellow, caves--	92	218
Lime, yellow---------	27	57	Lime, solid, yellow, water, first water at 218 feet--------	25	243
Flint, red----------	7	64			

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well N-22--Continued					
Lime, white----------	44	287	Lime, solid, yellow--	12	332
Lime, yellow----------	13	300	Lime, broken and shale, gray--------	68	400
Flint----------	4	304	Lime, solid, dark gray----------	8	408
Lime, gray----------	5	309	Shale, gray, and lime	47	455
Lime, gray, flint-----	6	315			
Lime, yellow----------	5	320			
Well N-23					
Owner: S. S. Henry. Driller: W. S. Seward.					
Surface----------	1	1	Lime, white----------	62	232
Lime, white----------	99	100	Lime, gray----------	53	285
Lime, yellow----------	70	170			
Well N-37					
Owner: F. L. Speck. Driller: W. S. Seward.					
Lime, white----------	90	90	Lime, white----------	23	428
Lime, yellow----------	20	110	Lime, gray----------	20	448
Lime, white----------	80	190	Lime, brown, water at 450-460 feet-------	42	490
Lime, yellow----------	65	255	Shale, blue----------	30	520
Lime, white----------	8	263			
Lime, gray----------	142	405			
Well N-38					
Owner: F. L. Speck. Driller: L. J. Crawford.					
Soil and surface boulders----------	2	2	Lime, brown----------	78	80

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well N-38--Continued					
Lime, yellow and flint----------	190	270	Sand, water--------	18	448
			Lime, gray---------	14	462
Lime, white, and kaolin----------	160	430	Shale, blue--------	5	467

Well N-42--partial log

Owner: O. D. Collins. Driller: Humble Oil & Refining Company.

Lime, surface--------	460	460	Shale, with lime streaks----------	89	1,065
Sand, water----------	20	480	Lime----------	433	1,498
Lime, gray and shale streaks----------	50	530	Lime, with shale streaks, hard----	21	1,519
Lime, green----------	32	562	Shale, hard, with lime streaks-----	37	1,556
Lime, gray, with shale streaks------	35	597	Lime, with sand streaks----------	201	1,757
Lime, with shale streaks----------	254	851	Lime, with shale---	78	1,835
Lime----------	125	976	Total depth--------		7,319

Well P-20

Owner: C. A. Duncan. Driller: C. A. Burrows.

Soil and loose rock--	5	5	Lime, broken and flint----------	14	88
Ledge, hard----------	3	8	Lime, yellow-------	105	193
Caliche, soft and flint----------	2	10	Lime, and flint----	27	220
Hard ledges and flint	3	13	Pure flint and caves----------	60	280
Loose rock----------	55	68	Lime, soft, yellow-	18	298
Rock, honeycombed----	2	70	Lime----------	6	304
Fling, ledges, hard--	4	74			

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well P-20--Continued					
Pure flint----------	11	315	Lime, white---------	5	345
Lime----------	10	325	Lime, sandy, gray, water----------	15	360
Flint----------	10	335	Lime----------	54	414
Lime, gray, water----	5	340			
Well P-25					
Owner: Bill Wall. Driller: C. A. Burrows.					
Soil----------	3	3	Flint ledge---------	14	77
Caliche----------	13	16	Clay, yellow--------	4	81
Boulders----------	1	17	Lime, water at 85 feet----------	14	95
Caliche and rock-----	15	32	Lime, hard----------	9	104
Flint ledge----------	1	33	Lime----------	23	127
Caliche, rock--------	9	42	Lime, soft, gray----	8	135
Flint ledge----------	1	43	Lime, water---------	2	137
Clay, red----------	5	48	Lime, soft, gray----	2	139
Caliche, hard--------	15	63	Lime----------	1	140
Well P-38					
Owner: F. W. Pope. Driller: C. A. Burrows.					
Lime----------	17	17	Lime and flint------	87	141
Flint----------	4	21	Flint----------	5	146
Lime----------	14	35	Lime, hard----------	62	208
Flint----------	1	36	Lime, soft, gray----	2	210
Lime----------	18	54	Lime, hard----------	15	225

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Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well P-38--Continued					
Lime----------	51	276	Lime, sandy, water---	15	395
Lime, sandy, water--	14	290	Lime, hard----------	5	400
Lime, gray----------	90	380			
Well P-44--partial log					
Owner: Wahlenmaier et al. Driller: Paul Teas.					
Limestone----------	348	348	Shale and lime shells	143	1,375
Shale, gray and limestone---------	47	395	Shale----------	100	1,475
Lime----------	435	830	Lime, broken---------	63	1,538
Shale, sandy--------	145	975	Lime, hard, sandy----	75	1,613
Lime and shale------	47	1,022	Lime, gray----------	92	1,705
Lime----------	33	1,055	Lime, sandy, and pyrite----------	46	1,751
Shale and sand------	15	1,070	Shale and lime-------	54	1,805
Lime, hard, brown---	72	1,142	Lime, broken---------	38	1,843
Lime and shale------	18	1,160	Shale, dark----------	4	1,847
Lime----------	40	1,200	Shale, black---------	53	1,900
Shale and shells----	32	1,232	Total depth		5,270
Well Q-11					
Owner: S. Carruthers. Driller: W. S. Seward.					
Lime, white---------	40	40	Lime, yellow, water at 450-455 feet----	30	480
Flint----------	30	70	Lime, white, water at 500-510 feet----	20	500
Lime, white---------	93	163	Lime, yellow---------	25	525
Lime, yellow--------	157	320			
Lime, gray----------	130	450			

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well Q-18

Owner: Mrs. J. W. Carruthers. Driller: W. S. Seward.

Lime, white----------	340	340	Lime, gray----------	20	440
Lime, yellow----------	25	365	Lime, hard, yellow--	53	493
Lime, white----------	40	405	Lime, yellow, water-	12	505
Lime, yellow----------	15	420			

Well R-23--partial log

Owner: O. L. McNealy, Jr. Driller: Empire Gas and Fuel Company.

Lime----------	54	54	Shale, soft---------	5	300
Shale----------	10	64	Lime----------	20	320
Lime----------	23	87	Shale----------	8	328
Clay, red----------	53	140	Lime----------	15	343
Shale----------	20	160	Shale----------	17	360
Limestone, white------	26	186	Lime----------	5	365
Shale----------	4	190	Shale----------	8	373
Shale, blue----------	10	200	Missing, oil and gas show----------	12	385
Shale and lime--------	15	215	Shale----------	13	398
Lime, hard----------	10	225	Sand----------	5	403
Lime, shaly----------	20	245	Shale----------	2	405
Lime, hard----------	3	248	Lime----------	26	431
Shale----------	2	250	Shale----------	5	436
Lime, hard----------	5	255	Lime----------	44	480
Lime and shale--------	20	275	Shale----------	14	494
Lime, hard----------	13	288	Lime----------	46	540
Lime----------	7	295			

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

Well R-23--partial log--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Shale	40	580	Shale	11	1,050
Lime	61	641	Shale, reddish color	10	1,060
Shale	15	656	Shale, blue	15	1,075
Lime	34	690	Lime, hard, gray	5	1,080
Shale	10	700	Sand, coarse, white and shale, hard, gray	10	1,090
Lime	110	810	Shale	2	1,092
Coal	3	813	Shale and sand, hard	4	1,096
Lime, soft	12	825	Shale, red	12	1,108
Lime	45	870	Shale, black	13	1,121
Sand, water	25	895	Clay, soft, red	21	1,142
Gumbo	5	900	Shale, blue	4	1,146
Shale	20	920	Shale, hard	1	1,147
Sand, gray	7	927	Sand, sulphur water	13	1,160
Shale	31	958	Limestone, hard	10	1,170
Sandrock	7	965	Sandrock, hard	20	1,190
Sand and shale	10	975	Sand, soft	15	1,205
Shale, sticky	8	983	Sand, water	85	1,290
Shale	22	1,005	Clay, yellow	10	1,300
Slate	13	1,018	Shale, broken, cavey	26	1,326
Shale, gray	3	1,021	Shale, black	124	1,450
Shale	4	1,025	Total depth		3,635
Sand	5	1,030			
Gumbo	9	1,039			

Table 4.--Drillers' logs of wells in Edwards County--Continued

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

Well R-28

Owner: J. G. Blackman Estate. Driller: W. S. Seward.

Lime, broken, caves--	50	50	Lime, broken, hard---	22	330
Lime, soft, yellow---	68	118	Lime, hard, yellow---	33	363
Flint----------	29	147	Lime, blue, water seep	4	367
Lime, hard, yellow---	43	190	Lime----------	23	390
Lime, broken, soft, yellow----------	28	218	Shale, gray----------	30	420
Lime, yellow---------	90	308	Shale, blue----------	18	438

Well S-8

Owner: F. J. Weldon. Driller: W. S. Seward.

Lime, white----------	18	18	Lime, yellow---------	36	250
Lime, yellow---------	6	24	Lime, gray----------	42	292
Lime, white----------	71	95	Lime, yellow---------	13	305
Lime, soft, yellow---	7	102	Conglomerate, coarse-	10	315
Lime, hard, yellow---	48	150	Lime, porous, gray---	53	368
Flint rock----------	7	157	Lime, brown----------	12	380
Lime, yellow, flint--	33	190	Lime, gray----------	23	403
Lime, hard, yellow---	15	205	Lime, gray, flint----	15	418
Lime, yellow----------	9	214	Lime, brown, water at 418----------	14	432

Well T-14--partial log

Owner: Neal Jernigan. Driller: Gale Oil Co.

Lime----------	14	14	Shale, blue and lime shells----------	56	169
Shale, gray, bluish, and lime shells----	99	113	Lime, sandy----------	3	172

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well T-14--partial log--Continued					
Lime, gray----------	19	191	Shale, blue----------	15	850
Shale, light blue----	33	224	Sand, water----------	20	870
Lime, sandy----------	19	243	Sand, water and lime shells----------	65	935
Lime, gray----------	33	276	Lime, sandy----------	20	955
Shale, blue----------	26	302	Sand and lime, sandy-	25	980
Lime, gray----------	30	332	Lime, gray----------	10	990
Shale, blue----------	43	375	Sand, water----------	10	1,000
Lime and shale, blue-	60	435	Lime, caving, gray---	20	1,020
Lime, gray----------	25	460	Lime and sand--------	5	1,025
Shale, broken, blue--	33	493	Rock, red, or shale red, caving--------	20	1,045
Lime, brown----------	82	575	Shale, sandy---------	30	1,075
Lime, gray----------	75	650	Mud, blue------------	5	1,080
Shale, blue----------	20	670	Shale, sandy---------	5	1,085
Lime, gray----------	5	675	Lime-----------------	10	1,095
Shale, blue and shells	20	695	Shale, brown---------	10	1,105
Lime-----------------	35	730	Total depth----------		4,010
Sand, water----------	45	775			
Lime-----------------	60	835			

Well T-26

Owner: S. A. Williams. Driller: C. A. Burrows.

Soil-----------------	2	2	Caliche--------------	8	28
Caliche and rocks----	3	5	Gravel---------------	4	32
Caliche--------------	10	15	Caliche and rock-----	6	38
Loose rock-----------	5	20	Caliche, solid-------	18	56

(Continued on next page)

Table 4.--Drillers' logs of wells in Edwards County--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Well T-26--Continued					
Shale, gray----------	5	61	Mud, blue----------	4	99
Mud, blue----------	4	65	Lime, gray----------	16	115
Shale, gray----------	11	76	Lime, porous, black (water)----------	2	117
Lime, gray----------	10	86	Shale, blue---------	1	118
Mud----------	1	87	Lime, gray----------	5	123
Shale----------	3	90			
Mud, shale----------	5	95			
Well T-46					
Owner: J. J. McFatter. Driller: L. A. Placker.					
Surface soil----------	3	3	Lime, yellow--------	2	30
Caliche----------	7	10	Shale, blue---------	60	90
Clay, red, and boulders	16	26	Mud, blue----------	10	100
Sand, water, yellow---	2	28			