TEXAS WATER COMMISSION

REPORT 88-01

GROUND-WATER RESOURCES OF THE ANDERSON COUNTY UNDERGROUND WATER CONSERVATION DISTRICT (ANDERSON COUNTY, TEXAS)

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GROUND-WATER RESOURCES OF THE ANDERSON COUNTY UNDERGROUND WATER CONSERVATION DISTRICT (ANDERSON COUNTY, TEXAS)

INTRODUCTION

Purpose and Scope

The purpose of this report is to present the results of a study that was made to: 1) determine the hydrogeologic characteristics of the Carrizo-Wilcox aquifer in the vicinity of the Keechi Salt Dome, Anderson County; 2) inventory all water wells within the Anderson County Underground Water Conservation District; and 3) to use a computer model of the Carrizo-Wilcox aquifer to evaluate the response to pumping in the vicinity of the Keechi Dome, and the probable future ground-water conditions. The study consisted of in-office compilations and analyses of available data, computer simulations, field work, and the writing of a technical report.

Location

The study area of this report is approximately centered on the Keechi salt dome. The Keechi dome is in central Anderson County, about seven miles northwest of Palestine, and is on State Highway 19. The nearest town is Montalba, which is about three miles to the northwest, and the nearest river is the Trinity, which is about eleven miles to the west of the dome. The dome is at 31°50'19" north latitude and 95°42'20" west longitude. The study area, location of the Keechi Salt Dome, and boundaries of the Anderson County Underground Water Conservation District are shown on Figure 1.

Method of Investigation

As stated above, one of the primary objectives of this study was to simulate the Carrizo-Wilcox aquifer with a computer model. The simulation process allows the prediction of water-level declines based on projected pumpage, and the predicted water-level declines provide a means for evaluating the ability of the aquifer to meet anticipated ground water withdrawal requirements. To obtain the necessary inputs for the modeling effort, data and published reports pertinent to the study area were retrieved to establish the hydrogeological framework.

Although wells were not sampled in this study, analyses of water from wells in and near this area that are shown in Report 150 of the Texas Water Development Board were reviewed. These data regarding water quality are assumed representative of the conditions in the report area and are briefly summarized in this report in terms of total concentration of soluble salts.

Electrical logs of wells in and near the report area (Figure 2 and Table 2), most of which were drilled for oil and gas, were analyzed to provide the data that were used to construct the maps that show the geological structure, net sand, and total thickness of the Carrizo Sand and the Wilcox Group. These maps are included in this report.

An inventory was made in the field to locate and obtain data on all wells in the District (Figure 3) which have been drilled for municipal, industrial, and irrigation purposes, and wells used for domestic and livestock supplies. Information on the vari-

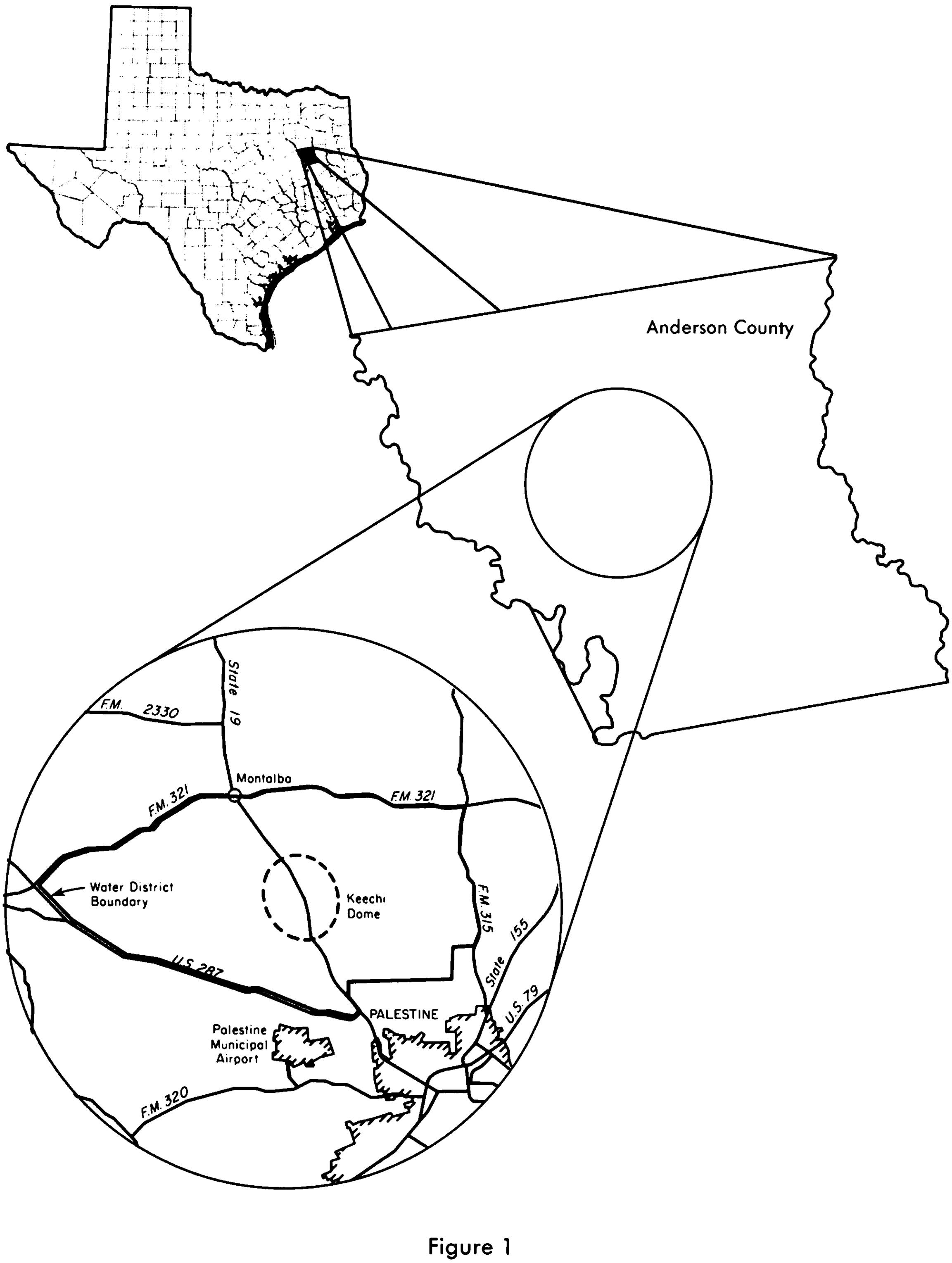
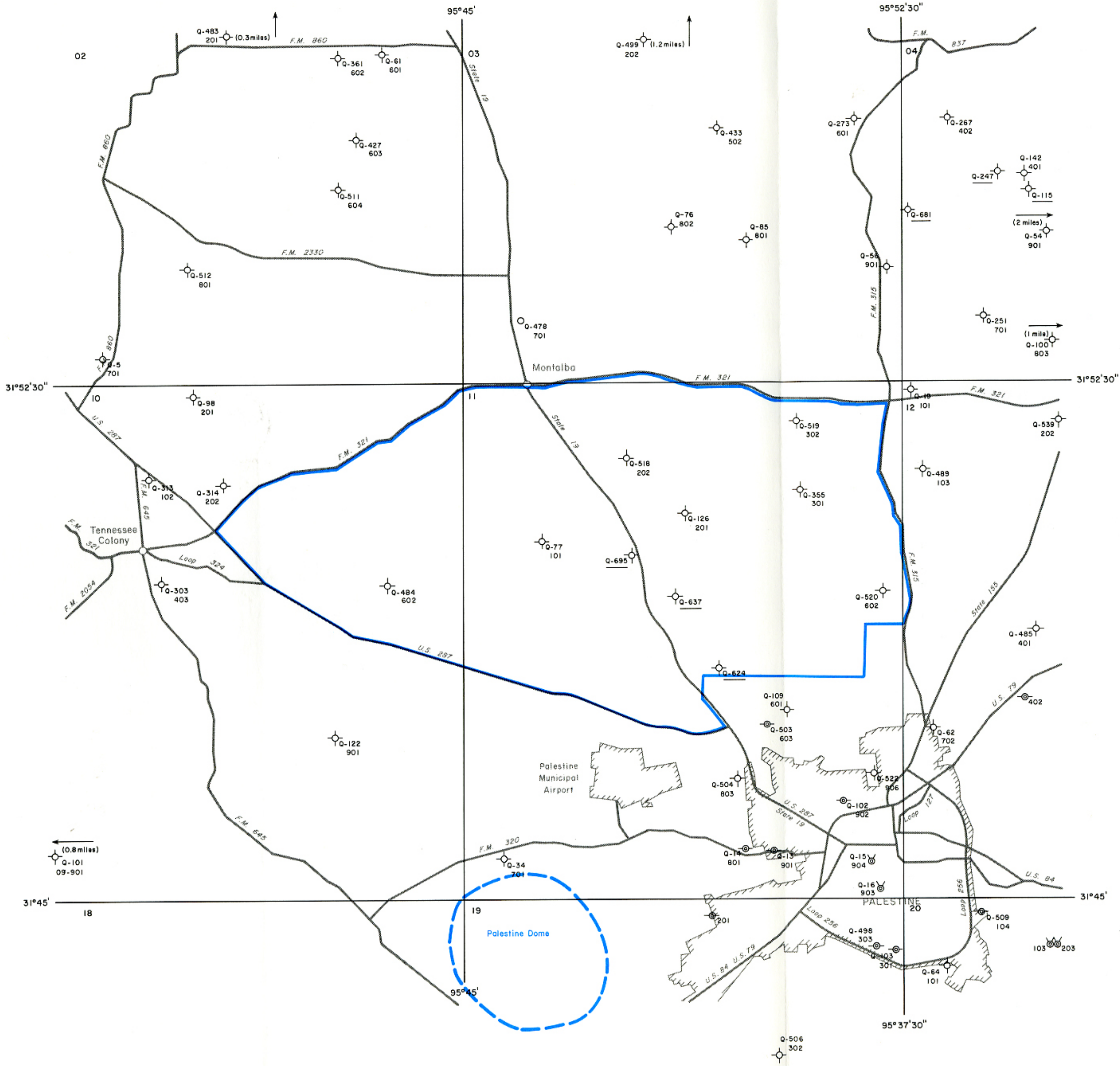


Figure 1
Location of the Anderson County
Underground Water Conservation District
and Study Area



EXPLANATION

Public supply well

Industrial well

Oil or gas well

Q-29
Electrical log file number

201
Last three digits of state well number

Water district boundary

0 1 2 3 4 Miles

Base map from general highway map of the Texas Department of Highways and Public Transportation

Figure 2
Location of Selected Wells Used for Control and Basic Data

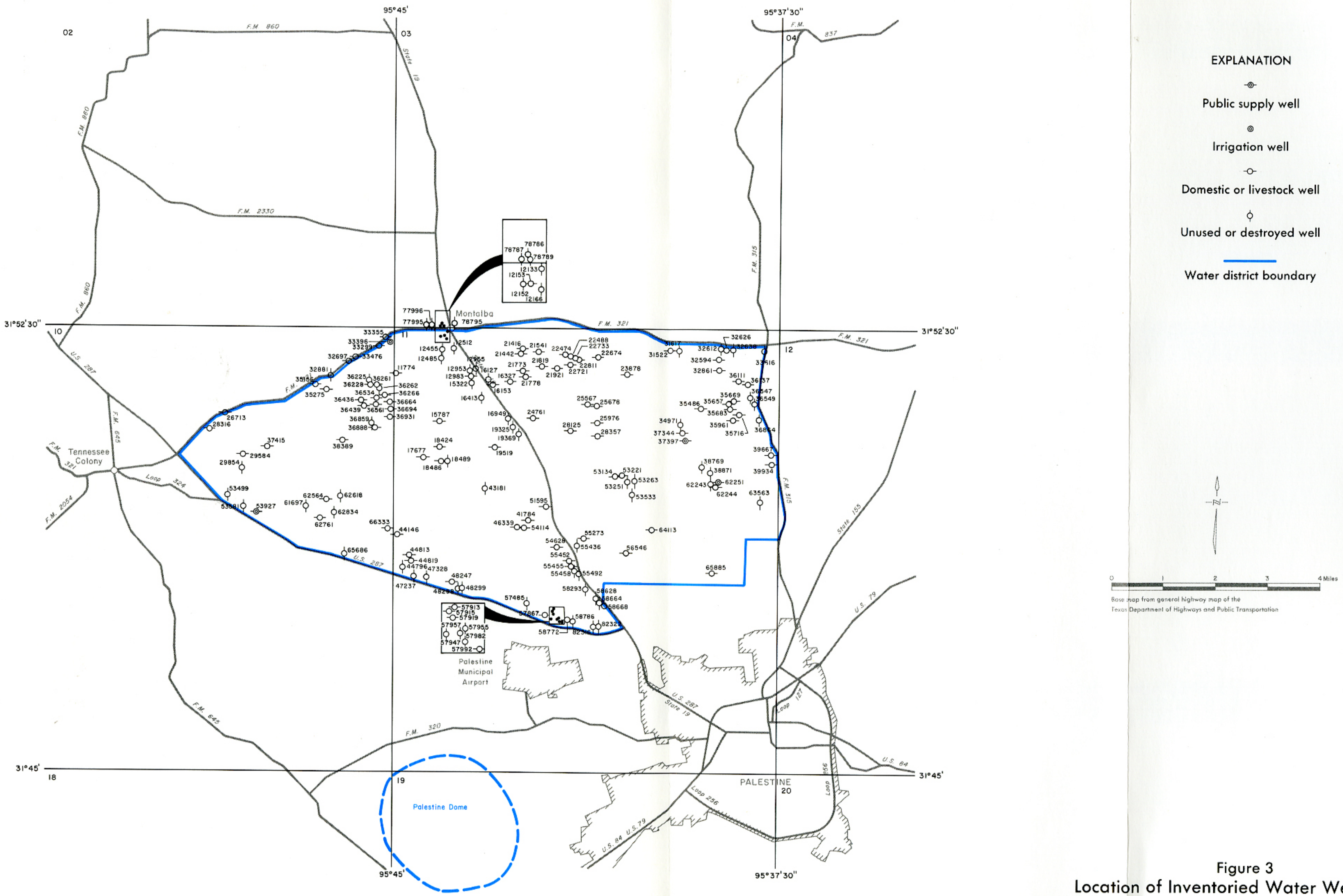


Figure 3
Location of Inventoried Water Wells in the
Anderson County Underground Water Conservation District

ous wells was obtained from well owners and through field investigative methods. A number was assigned for each well according to the system described below (Figure 4), and a determination was made of the formation supplying its water, as indicated by available well records, the geologic map (Figure 5: Barnes, 1968, and Ebanks, 1965), and nearby well logs. Depth to water measurements were made in wells where this was practicable.

Personnel

This study was conducted by Texas Water Commission staff. In-office compilations and reviews were made by J. N. Russell, Brad Cross and David Prescott, and the latter two additionally conducted a field inventory of water wells within the proposed water district. Computer simulations were set up and run by Joseph L. Peters.

Well Numbering System

As indicated in Figure 4, the well numbering system for this report is based on longitude and latitude, with each well being assigned a nine-digit number.

Each 1-degree quadrangle in or overlapping into the State is given a two-digit number from 01 to 89. These are the first two digits of a well number. Each 1-degree quadrangle is further divided into sixty-four 7 1/2-minute quadrangles which are each assigned a two-digit number from 01 to 64. These two digits constitute the third and fourth digits of a well number. Each 7 1/2-minute quadrangle is subdivided into nine 2 1/2-minute quadrangles which are numbered 1 to 9. This is the fifth digit of a well number. This process of subdividing each progressively smaller quadrangle by nine is carried out four more times for a nine-digit well number. The ultimate quadrangle size is less than 2-seconds square, covering an area of approximately 175 square feet.

This area of Anderson County is covered by 1-degree quadrangle number 38. The 7 1/2-minute quadrangles are numbers 03, 10, 11 and 12.

Thus, Well Number 38-11-99376 would be located in 1-degree quadrangle 38, in 7 1/2-minute quadrangle 11, in 2 1/2-minute quadrangle 9, in 50-second quadrangle 9, in 16 2/3-second quadrangle 3, in 5 1/2-second quadrangle 7, and in 1 5/6-second quadrangle 6. (See Figure 4.)

Acknowledgements

The contributions and cooperation of the many Anderson County residents who assisted with the inventory of water wells are especially appreciated. Data and helpful comments were obtained from the Texas Water Development Board, particularly from David Thorkildsen. The constructive review of this report by Robert Price of the TWC contributed materially to the success of this project. The gracious permission granted by Mr. G. K. Ebanks to use the information from his University of Texas Master of Arts thesis on the geology of the Keechi dome materially aided in the preparation of this report.

GEOLOGY OF THE KEECHI SALT DOME

Keechi is a piercement salt dome that is highly elliptical with the 4.6 mile-long major axis oriented N 15°E, and the minor axis is 1.7 miles long. An anhydrite cap rock is present over most, but not all of the dome, and the cap has a maximum thickness of 300 feet. The minimum depth to cap rock and salt is 250 and 300 feet, respectively. The salt has not been mined, nor has it been used for petroleum storage. There has not been any production of sulfur or hydrocarbons at the Keechi dome.

The upward movement of the salt mass affected the overlying stratigraphic units. Erosion of uplifted units has resulted in exposure at the land surface over the crest of the dome of older-aged geologic formations that are approximately ringed by a succession of progressively younger formations. The geologic map of the study area (Figure 5) illustrates the geological features, as well as, the effects of the upward movement of the Keechi Dome.

Faults are present in the crestal area of the dome. The faults mostly trend northeast-southwest. Intersecting cross faults possibly limit ground-water recharge to separated fault blocks; this may be reflected in the water levels shown on Figure 6.

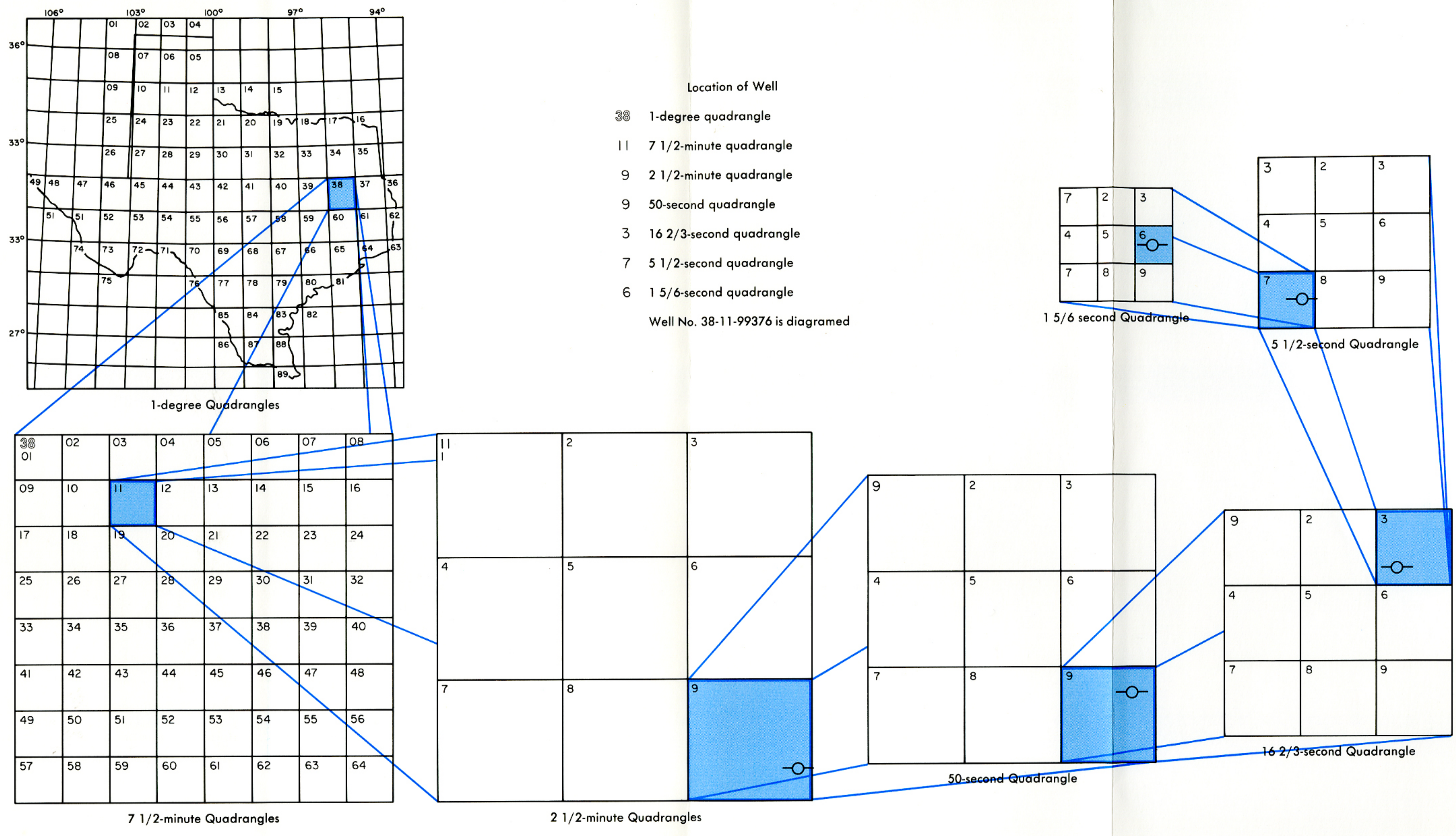
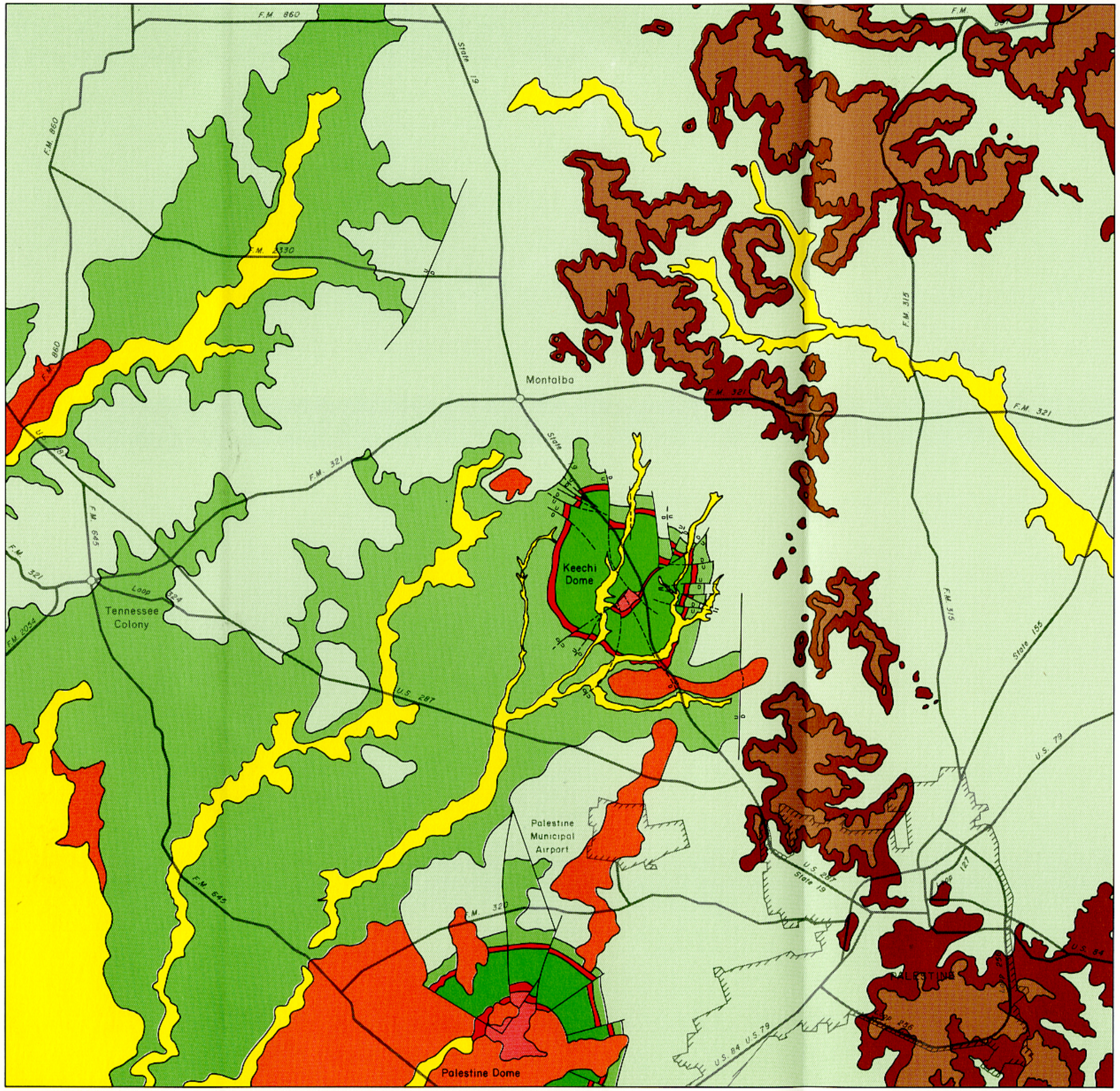


Figure 4

Well Numbering System



EXPLANATION

Terrace

Alluvium

Sparta Formation

Weches Formation

Queen City Formation

Recklaw Formation

Carrizo Sand Formation

Wilcox Group

Midway Group

Taylor & Navarro Groups

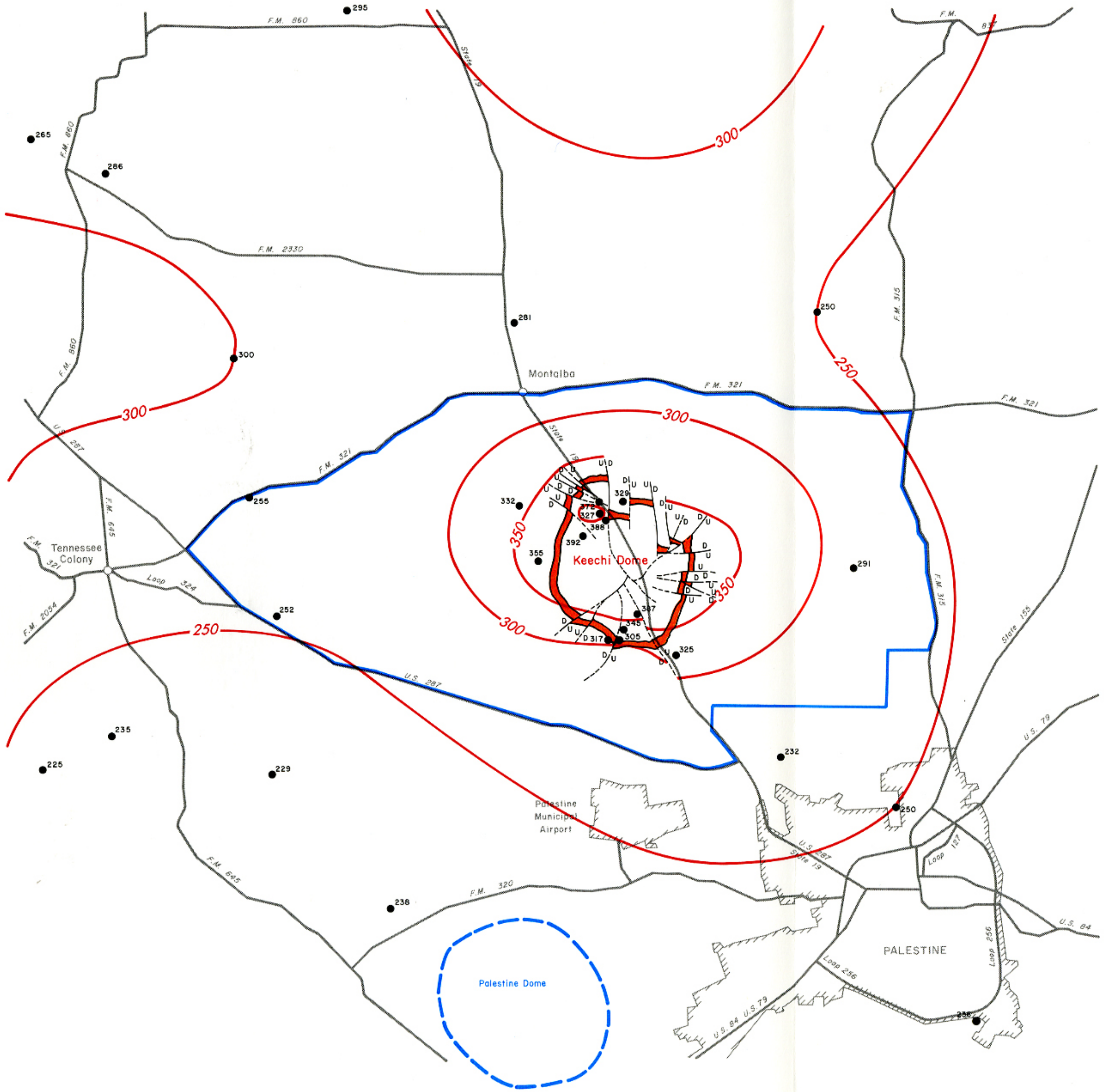
Contact

Fault
U, upthrown side; D, downthrown side

0 1 2 3 4 Miles

Base map from general highway map of the Texas Department of Highways and Public Transportation

Figure 5
Geologic Map
(Modified From Barnes, 1968, and Ebanks, 1965)



EXPLANATION

286 ●

Well used for control
Number indicates altitude of water level, in the Carrizo-Wilcox Aquifer, in feet above mean sea level

300

Line showing altitude of water level
Interval 50 feet
Datum is mean sea level

Outcrop of the Carrizo Sand

U D

Fault
U, upthrown side; D, downthrown side

Water district boundary

N

0 1 2 3 4 Miles

Base map from general highway map of the Texas Department of Highways and Public Transportation

Figure 6
Altitude of Water Levels in the Carrizo-Wilcox Aquifer

THE CARRIZO-WILCOX AQUIFER

The Carrizo-Wilcox aquifer, which is the major aquifer in this area, is defined for the purposes of this report to include the Carrizo Sand and the underlying Wilcox Group. The Carrizo-Wilcox is composed of interbedded sand, silt, clay, and minor amounts of lignite. The aquifer is underlain by the Midway Group, which consists primarily of clay and is not known to yield water to wells. The Carrizo-Wilcox is successively overlain by the Recklaw Formation and Queen City Sand, which are hydrologically connected to the aquifer in the study area. The aquifer's thickness (Figures 7 and 8) and structure (Figure 9) maps are provided for definitional purposes.

Recharge, Discharge, Movement

Annual recharge to the Carrizo-Wilcox aquifer in the study area averages about 200 acre-feet. This is based on one inch per year, or slightly less than three (3) percent of the annual rainfall (Thorkildsen and Price, in press), as applied to the outcrop of the Carrizo-Wilcox in the vicinity of the Keechi Dome (Figure 5). Additional recharge from the overlying Queen City and Recklaw to the Carrizo-Wilcox is possible where vertical leakage through confining beds takes place; this recharge is proportional to the head difference between the water-bearing units.

Ground water in an aquifer moves downward by gravity from the recharge zone to the zone of saturation. It then moves from areas of high hydraulic head, or potential, to low potential, and it moves generally in the direction of the slope of the piezometric surface. The piezometric surface is an imaginary surface that everywhere coincides with the static water level in the aquifer. The piezometric surface of the Carrizo-Wilcox aquifer in the study area is illustrated on Figure 6, and an indication of the probable direction of ground-water movement can be inferred from it.

From the foregoing discussion, it would be assumed that in the vicinity of the Keechi Dome, movement in the Carrizo-Wilcox would be radially away from the outcrop ringing the Keechi dome, which is shown on the geologic map in Figure 5, and this is also suggested on the map of the piezometric surface, which is shown in Figure 6.

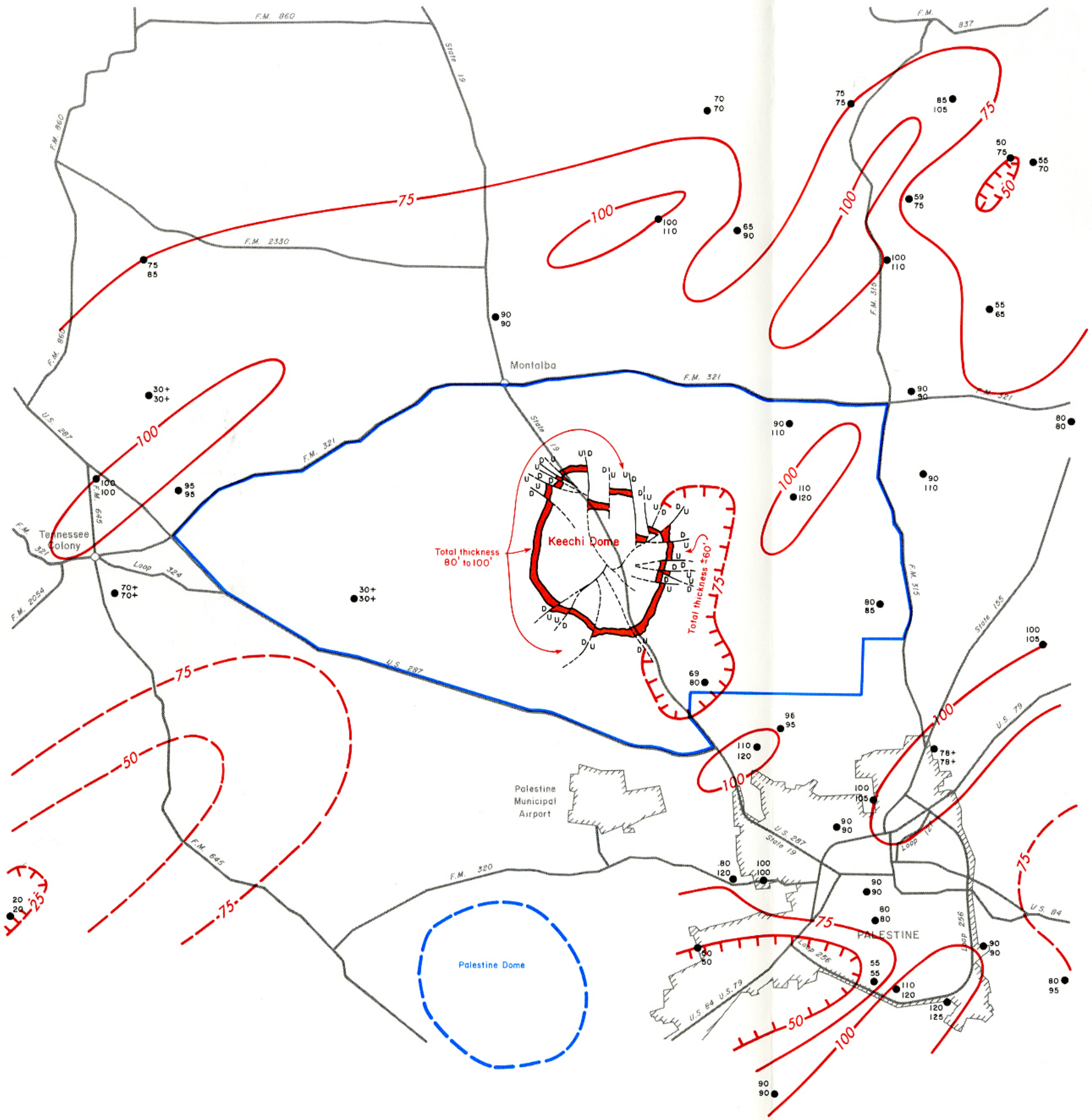
Eventually the water is discharged from the aquifer. This can occur at the land surface at seeps or by evapotranspiration. However, it can also be discharged at wells, either by flowing or pumping. Large scale production from wells can alter the piezometric surface and flow pattern.

The rate of movement of the ground water through the Carrizo-Wilcox aquifer has not been measured, but Fogg (1982, p. 38) states it generally ranges from less than one foot per year to one foot per day, although it has been estimated to be between 10 and 100 feet per year by Guyton (1972, p. 33). The rate of movement is dependent on many varying factors including permeability, which again is dependent on numerous factors, such as sand grain size and shape, and clay content, etc. The coefficient of permeability, which is probably more appropriately called hydraulic conductivity, is given below.

Hydraulic Characteristics

An aquifer's hydraulic characteristics are generally described in terms of its coefficients of transmissivity and storage. These are normally determined by conducting pumping tests in selected wells and from well performance tests that have been made by water well drilling and servicing companies. These tests consist of pumping a well for a period of time and taking periodic water-level measurements in the pumping well and in one or more nearby observation wells if available. Transmissivity is the product of the hydraulic conductivity (also called the coefficient of permeability) multiplied by the saturated thickness of the aquifer, and in common usage it is expressed in gallons per day per foot. The coefficient of storage is a dimensionless term which indicates the volume of water that an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface. For water-table conditions (outcrop), the coefficient of storage is the same as the specific yield (effective porosity) of the material dewatered during pumping, and for artesian conditions, it reflects the amount of aquifer compression and water expansion when the head or pressure is reduced during pumping.

An estimate of transmissivity for the Carrizo-Wilcox aquifer in the study area was determined from pumping test data taken from the City of



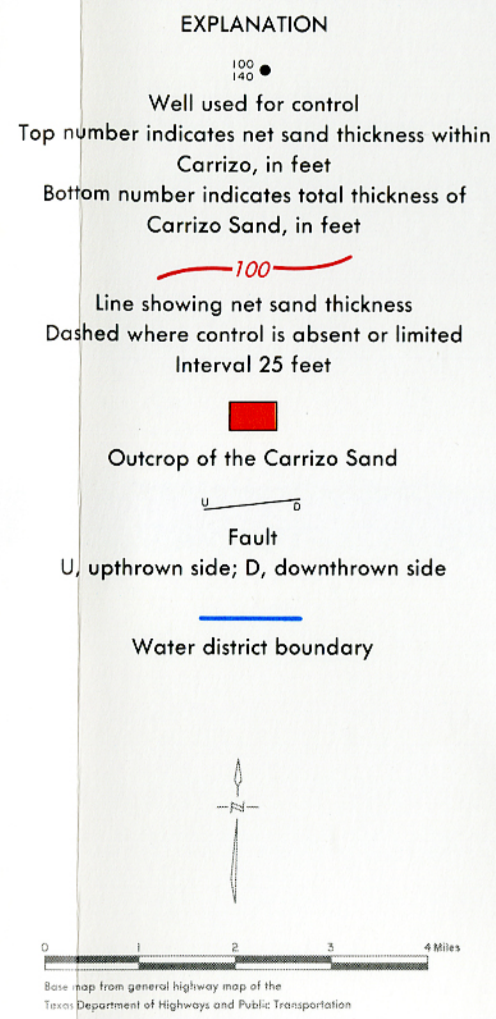
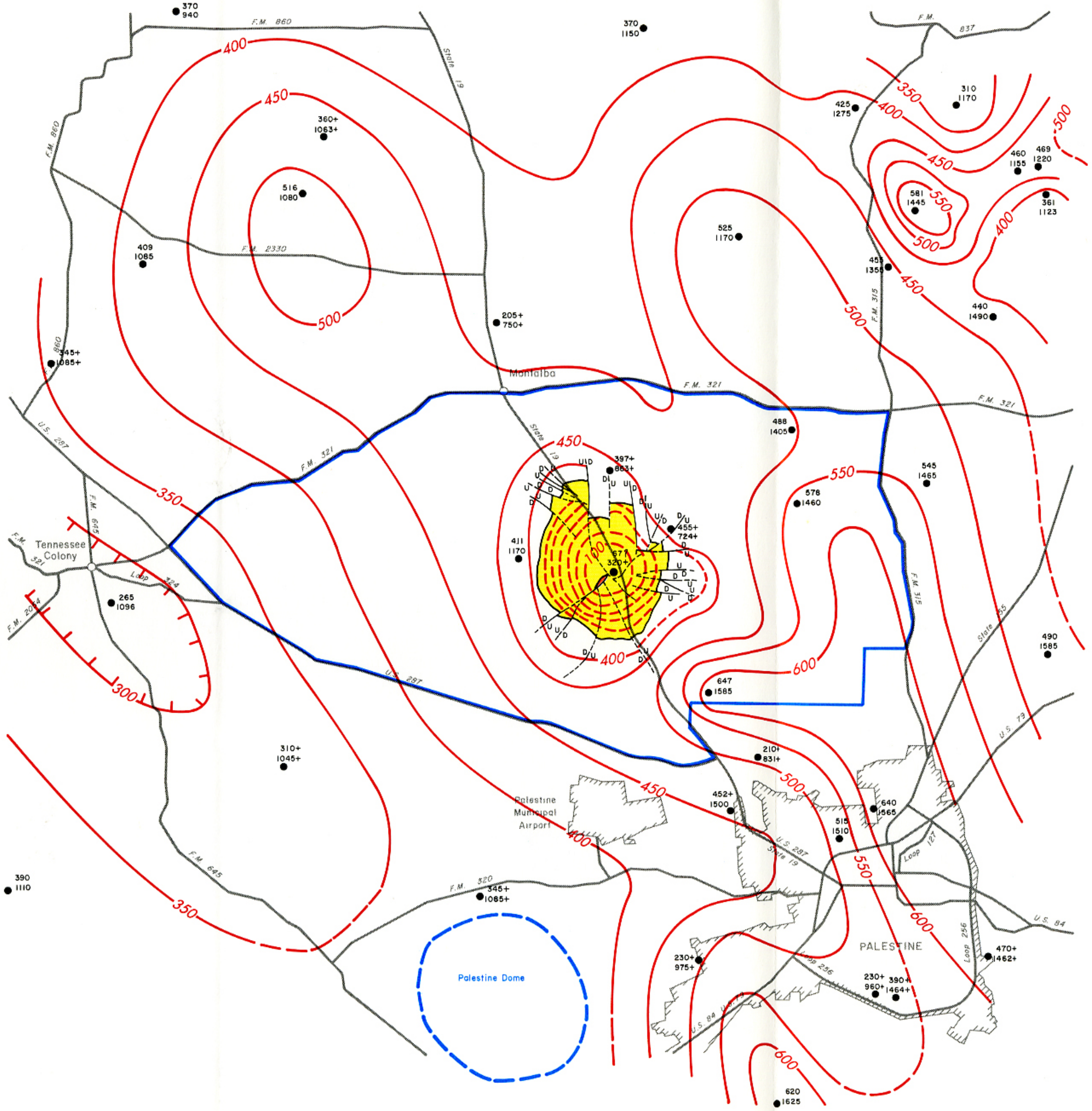


Figure 7
Approximate Thickness of the
Carrizo Sand Containing Ground Water



EXPLANATION

516
1080

Well used for control

Top number indicates net sand thickness within Wilcox Group, in feet

Bottom number indicates total thickness of Wilcox Group, in feet

300

Line showing net sand thickness

Dashed where control is absent or limited

Interval 50 feet

Outcrop of the Pre-Wilcox Formations

Wilcox Outcrop

U D

Fault

U, upthrown side; D, downthrown side

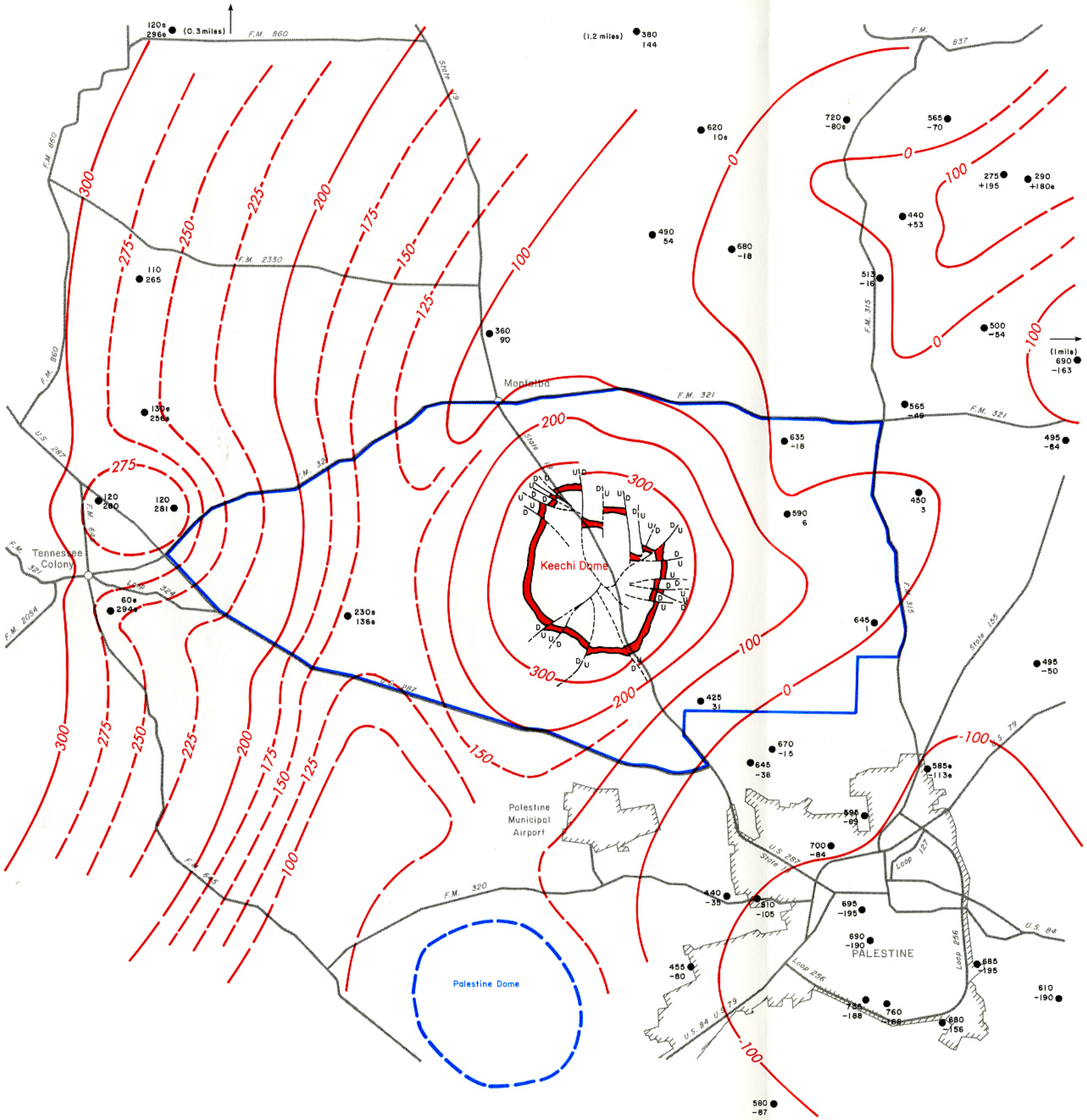
Water district boundary

0 1 2 3 4 Miles

Base map from general highway map of the Texas Department of Highways and Public Transportation

Figure 8

Approximate Thickness of the Wilcox Group Containing Ground Water



EXPLANATION

Well used for control
Top number indicates depth to top of Carrizo Sand, in feet
Bottom number indicates altitude of top of Carrizo Sand, in feet above or below (-) mean sea level
'e' indicates estimated

Line showing altitude of the top of the Carrizo Sand
Dashed where control is absent or limited
Interval is variable
Datum is mean sea level

Outcrop of the Carrizo Sand

Fault
U, upthrown side; D, downthrown side

Water district boundary

0 1 2 3 4 Miles

Base map from general highway map of the Texas Department of Highways and Public Transportation

Figure 9
Depth to and Altitude of the Top of the Carrizo Sand

Palestine's water well No. 4. The pumping test was conducted in 1957. The data were plotted (time vs. drawdown) according to a method described by Walton (1962, p. 32) that graphically solves the Jacobs-Hantush equations. The plot of the data when overlain on Walton's Plate 1 tracks the leaky artesian curve where r/B approximately equals 0.33. From this analysis, transmissivity was estimated to be approximately 15,000 gallons per day per foot. Additionally, the leakage (the change in leak flow per unit difference in head between the two aquifers) was determined from the 1957 pump test data.

Although the above-described plot of the pumping test of Well No. 4 showed that the aquifer is leaky, the transmissivity and leakage value calculated from this plot was found from preliminary computer simulations not to be represenatative of the aquifer's actual properties. These simulations did not predict drawdowns of the magnitude known to have occurred in the vicinity of the City of Palestine wells. This was probably due to the fact that the 1957 pump test used to determine the leakage was of too short a duration (24 hours) and its effects were too local to give a true picture of leakage over the whole region. For the final simulations, therefore, it was decided to model the most severe situation where there would be no leakage. Actual drawdowns should be somewhat less than those predicted under no leakage because of the moderating effect of the leakage which is expected to be present.

The recovery measurements that were made during the 1957 pumping test of Well No. 4 were also plotted to graphically solve the Theis recovery formula by a straight-line method described by Ferris (1962, p. 101, equation 17). By this method, which assumes no leakage, transmissivity was shown to be about 22,000 gallons per day per foot, which is the value that was shown by Guyton (1972, p. 54). Ultimately it was decided that this value of transmissivity (22,000 gpd/ft), together with an artesian storage coefficient of 0.00037 (Fogg 1982, p. 16), should be utilized in the modeling of the artesian areas of the aquifer, and values used in the modeling of the water table area, over the dome, should be 12,000 gpd/ft for transmissivity and 0.24 for storage coefficient. The results of the final computer simulations of the aquifer and its response to pumping are described below.

Chemical Quality

All ground water contains minerals carried in solution, the type and concentration of which depend upon the surface and subsurface environment, rate of ground-water movement, and source of the ground water. Precipitation is relatively free of minerals until it comes in contact with the various constituents which make up the soils and component rocks of the aquifer. As a result of the water's solvent power, minerals are dissolved and carried into solution as the water moves through the aquifer. The concentration depends upon the solubility of the minerals present, the length of time water is in contact with the rocks, and the amount of dissolved carbon dioxide the water contains. Concentrations of dissolved minerals in ground water generally increase with depth where circulation has been restricted due to various geologic conditions. The Carrizo-Wilcox aquifer in the study area contains water that is estimated to range from less than 200 to more than 3,000 milligrams per liter (mg/l) total dissolved solids. Water containing less than 1,000 mg/l of dissolved solids is regarded as fresh and is suitable for most municipal, industrial, and irrigation uses. Water having a dissolved-solids concentration of 1,000 to 3,000 mg/l is classified as slightly saline. Slightly saline water has been recognized as somewhat unsatisfactory but generally not harmful.

The lowermost Wilcox sands, at some locations, contain water with a dissolved-solids content that is estimated to be greater than 3,000 mg/l; where it is present, this interval ranges in thickness from 40 to 210 feet, and the thickest interval is seen to occur on logs of wells at locations about five miles east-southeast of Montalba. Although data is not available to the Commission regarding water quality immediately overlying the dome, electrical logs of wells on the flanks of the dome that have a thinned Wilcox section are interpreted to show that water in almost all of these sands probably contains less than 2,000 mg/l total dissolved solids; similar conditions probably exist over the dome.

Aquifer Development and Decline of Water Levels

Development of ground water from the Carrizo-Wilcox aquifer in the study area has been mainly for domestic and livestock use. Records of 167 water wells were collected during the investigation. Of these wells, one (1) was used for irrigation, four (4) were used for public supply, and the rest were used for domestic and livestock purposes or unused (abandoned). Locations of these inventoried water wells are shown on Figure 3, and their related data are given in Table 1.

The public supply and irrigation wells are completed in the Carrizo-Wilcox aquifer. However, the remainder of the wells (domestic, stock, and abandoned) utilize the Queen City, Recklaw, and Carrizo-Wilcox.

Historical water-level data for the Carrizo-Wilcox are very limited in the study area with repect to pumpage and water-level declines. However, data is available for the City of Palestine's wells for the 1940-1969 time frame which shows water levels declined on the order of 100 feet during the above period of record in response to municipal pumpage. Municipal pumpage increased steadily from less than 0.5 million gallons per day during the 1940s to above 2 million gallons per day during 1968. After 1969, Palestine began using surface water and water levels recovered to pre-development levels.

Availability of Ground Water for Future Development

A first estimate of the amount of ground water available from the Carrizo-Wilcox aquifer in the study area can be based on the estimated average annual recharge (200 acre-feet) to the aquifer's outcrop in the vicinity of the Keechi Dome. For the purposes of this analysis, it is assumed that 200 acre-feet of water can theoretically be transmitted from the outcrop (Figure 5) to uniformly distributed pumping wells by the aquifer annually. This amount of water can be pumped without causing large water-level declines, removal of water from aquifer storage, and inducing leakage from the overlying Queen City and Recklaw Formations. Also, it must be recognized that the above availability estimate is very conservative and is based on an ideal development scheme which in practice can never be realized.

A more realistic means for evaluating the ability of the aquifer to meet anticipated ground-water requirements involves the use of a computer mathematical model. This computer simulation process allows the prediction of water-level declines in the aquifer based on projected pumpage and provides for utilization of recharge, leakage from other water-bearing strata, and aquifer storage.

One of the primary objectives of this study was to simulate the Carrizo-Wilcox aquifer in the study area with a computer model. The model used was the GWSIM-IV ground-water simulation program which is essentially a modification of the well known Prickett and Lonquist models (1971). Both are two-dimensional finite difference models.

Two uses were made of the aquifer simulations. First, for the purpose of determining well interference and well spacing guidelines, drawdown vs. distance information was obtained for both artesian and water-table conditions. Second, it was desired to know whether the aquifer could provide a firm water supply of approximately 2,420 acre-feet (1,500 gpm) annually for a 20-year time period. For both requirements, the model was made to simulate two alternative lines of pumping wells—one under artesian conditions and the second under water-table conditions. The magnitudes and methods of obtaining aquifer parameter inputs (transmissivity, storage, etc.) to the model were derived from pump test data as described above.

Drawdown versus distance graphs obtained from the results of the artesian and water-table simulations for flow rates of 500, 1,000, and 1,500 gpm for the one (1) and 20-year time periods are given in Figures 10 and 11. Drawdown contour maps (Figures 12 and 13) show the effects of pumping 1,500 gpm continuously for 20 years from the two well fields under the above-stated aquifer conditions.

The results of the simulations of both the artesian and water-table well fields indicate that the Carrizo and Wilcox aquifers as a whole will not be adversely affected by the required pumpage. For the artesian well field, drawdown in the general area of the well field will be on the order of 112 feet after a continuous pumpage of 1,500 gpm for a period of 20 years. Drawdown in the immediate vicinity of any one well could be considerably higher depending on the total number of wells, their spacing, and the well efficiency. Drawdown at the Trinity River would be about 3.5 feet at the closest point.

For the water-table well field, drawdown in the general area would be on the order of 76 feet, again

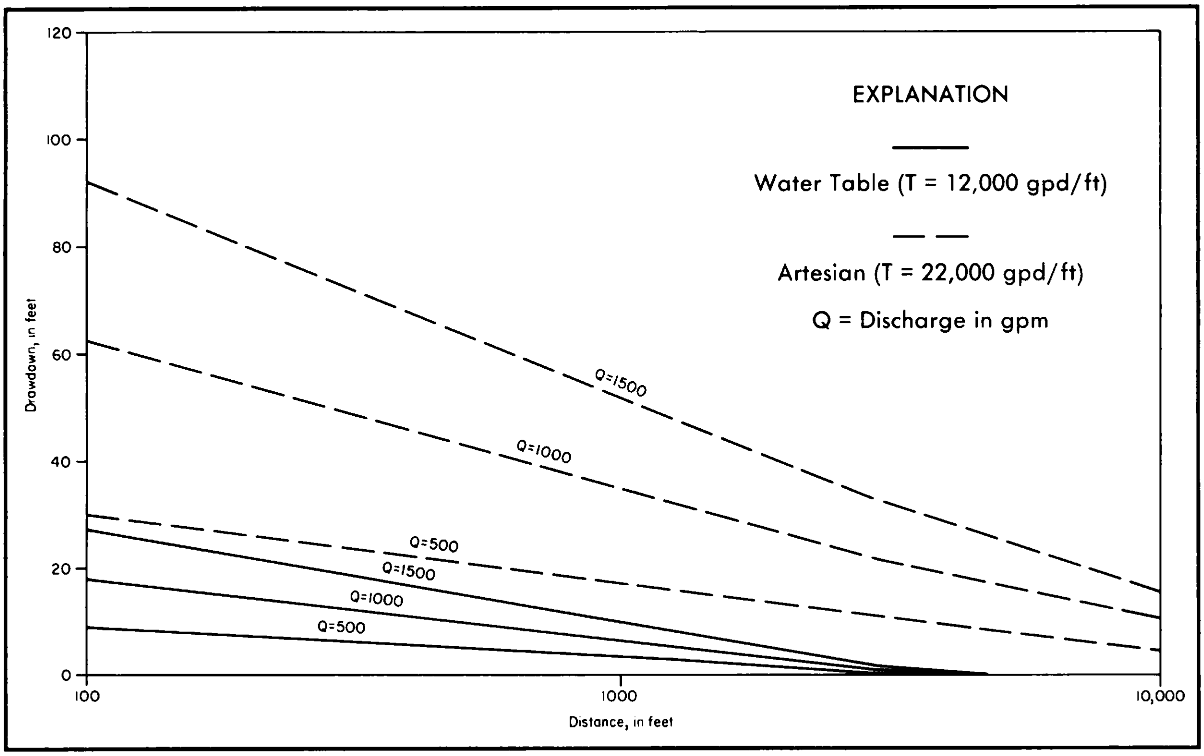


Figure 10.-Time Versus Drawdown
Time = 1 Year

with the likelihood that it could be much greater in the immediate vicinity of a well for the reasons cited above. This is especially critical in this case because of the general rule that a water-table well's drawdown should be no more than 1/3 of the thickness of the producing formation. The maximum drawdown at the Trinity River for this case could be about 3.2 feet.

The simulations of lines of pumping wells in areas of water table and artesian conditions indicate that a firm water supply of 2,420 acre-feet (1,500 gpm) annually can be developed from the Carrizo-Wilcox aquifer (Line A) where the aquifer is under artesian conditions. Water shown to be available would come from recharge, aquifer storage, and leakage from the overlying Queen City and Recklaw. Assuming the well field (Line A) is completed in the Wilcox, water levels would not drawdown below the top of the water-bearing strata and drawdowns in the vicinity of the Trinity River would be minor. Additionally, the line of pumping wells under water-table conditions (Line B) is expected to yield between 1,613 acre-feet (1,000 gpm) and 2,420 acre-feet (1,500 gpm) annually for the 20-year period of interest which is less than the withdrawals used in the computer simulation. This reduction in availability is because the authors feel drawdowns will be in excess of 1/3 of the thickness of the producing formation at any one well. It should be kept in mind that all the simulations were based on limited data and, therefore, the results should not be taken to be exact predictions but as general indicators of what might be expected.

CONCLUSIONS AND RECOMMENDATIONS

Throughout the study area, the Carrizo-Wilcox aquifer yields fresh to slightly saline water which is acceptable for most public supply, irrigation and industrial purposes. The estimated average annual recharge to the aquifer from the outcrop in the vicinity of the Keechi Dome is approximately 200 acre-feet.

The computer simulation of the Carrizo-Wilcox aquifer for a 20-year time frame indicates the following:

(a) a firm water supply of up to 2,420 acre-feet (1,500 gpm) of ground water from wells can be developed in central Anderson County from the aquifer and

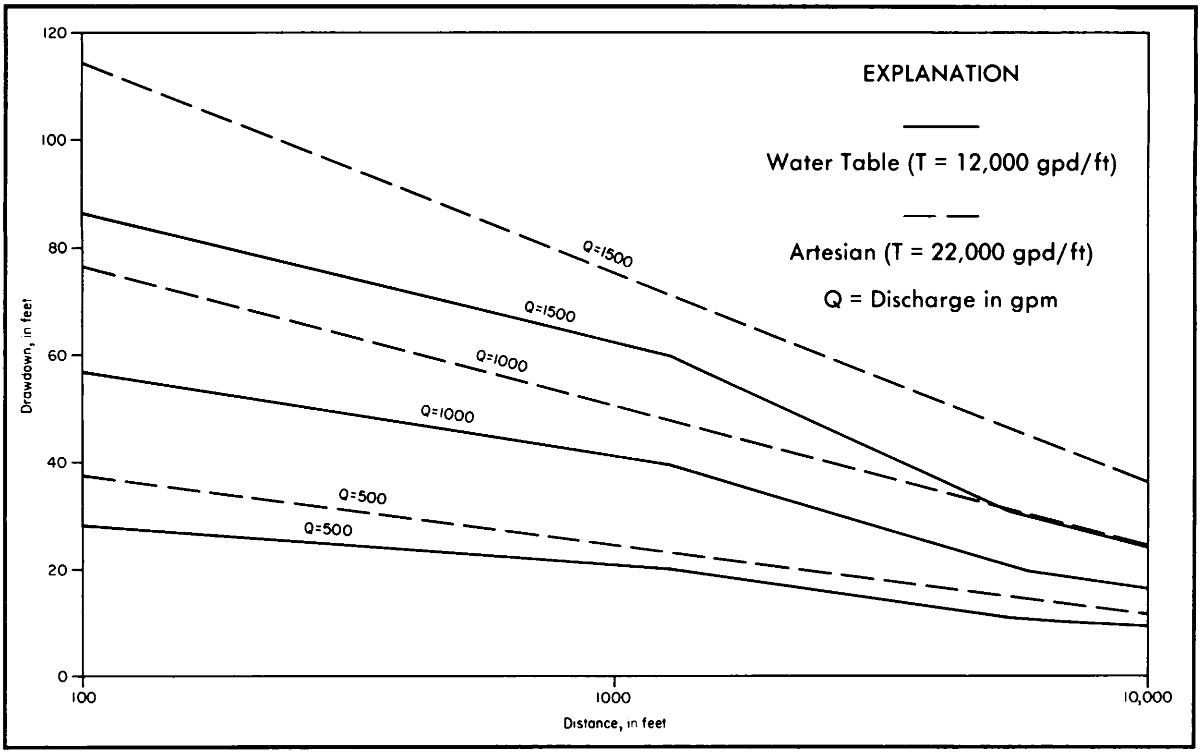


Figure 11.-Time Versus Drawdown
Time = 20 Years

(b) based on limited data, wells completed in the Wilcox Formation which overlies the Keechi Dome can be expected to yield between 1,613 acre-feet (1,000 gpm) and 2,420 acre-feet (1,500 gpm) annually for the 20-year period of interest.

The Carrizo-Wilcox aquifer is susceptible to leakage through confining beds of poor-quality water from the Queen City and Recklaw. Both the Queen City and Recklaw are high in iron content and locally can yield highly mineralized water. Therefore, should the Carrizo-Wilcox aquifer be developed to the extent that the hydrostatic head is lowered significantly, contamination could result due to interformational leakage.

Developing and utilizing ground water for maximum efficiency requires adequate planning. Future development of the ground-water resources by large capacity wells within the study area should be based on a program of test drilling, test pumping, and chemical analyses of water from the various producing sands. Such preliminary data can be used to determine the most efficient well completion method, efficient pump setting, proper well spacing, and feasibility of drilling additional wells. Large concentrated withdrawals of ground water in small areas should be avoided.

The problem of spacing pumped wells within the study area properly is generally one of economics which directly affects the cost of pumping water and is also related to possible water-quality changes within the aquifer. The following table was slightly modified from the "Rules of the High Plains Underground Water Conservation District No. 1" and is intended as a guide for those interested in the proper spacing between pumping wells.

Column Pipe (inside dia.)	Pumping Rate (gallons per minute)	Minimum Distance from Nearest Well or Authorized Well Site
4 inches	50 to 250 gpm	200 yards
5 inches	250 to 400 gpm	250 yards
6 inches	400 to 550 gpm	300 yards
8 inches	550 to 1,000 gpm	400 yards
10 inches	More than 1,000 gpm	450 yards

The drilling location, completion, and closure of water wells within the study area should at a minimum conform to the Commission's rules (31 TAC-Chapter 287) which implement the legislative authorities accorded to the Texas Water Well Drillers

Board. Additional consideration should be given to the following:

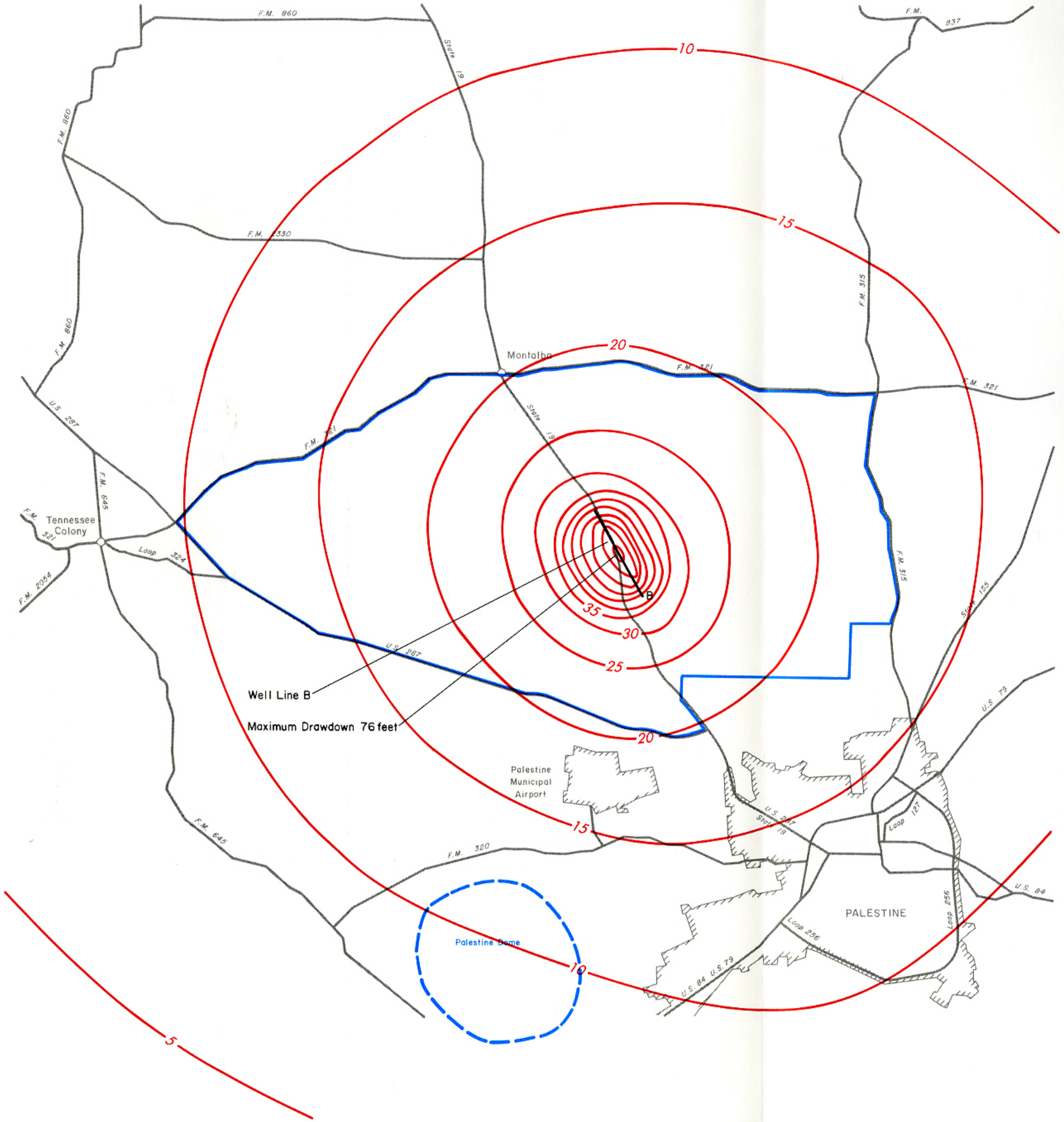
(a) casing new wells from land surface to the top of the water- bearing sands;

(b) the entire length of the casing should be cemented; and

(c) for wells completed in loose, unconsolidated aquifer materials, the casing should be perforated or slotted, extend the entire depth of the hole, and then gravel packed at the water-producing zone.

Well screens are often used instead of perforated or slotted casing. Proper well completion improves the yield, protects from contamination, and extends the life of the well.

All abandoned water wells within the study area should be properly capped and abandoned. These wells represent a serious safety hazard for animals, children, and even adults. They also provide a direct conduit to the aquifer for pollutants from the surface or through interformational transfer of ground water.



EXPLANATION

30 — Line showing decline of water level
Interval 5 feet

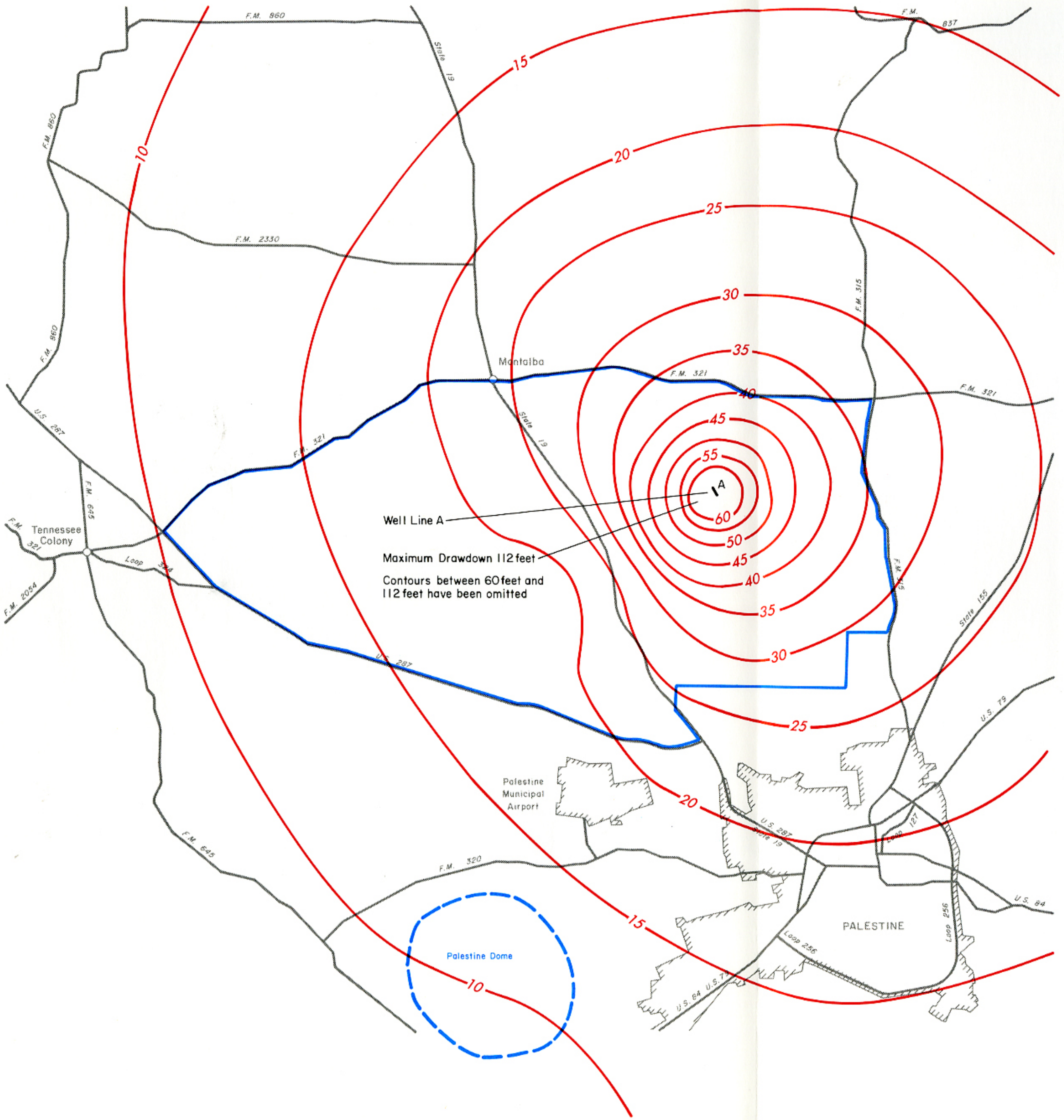
Water district boundary

N

0 1 2 3 4 Miles

Base map from general highway map of the Texas Department of Highways and Public Transportation

Figure 13
Predicted Decline of Water Levels in a Proposed Well Field Under Water-Table Conditions Over the Keechi Salt Dome
(1500 gpm for 20 years)



EXPLANATION

30

Line showing decline of water level
Interval 5 feet

Water district boundary

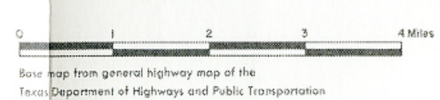


Figure 12
Predicted Decline of Water Levels in a
Proposed Well Field Under Artesian Conditions
Northeast of the Keechi Salt Dome
(1500 gpm for 20 years)

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Table 1.-Records of Selected Wells in Anderson County

Water level: Reported water levels given to the nearest foot; measured water levels given in tenths of a foot, (+), flows; E, estimated.
Method of lift and type of power: J, jet; S, submersible; E, electric; H, hand; N, none.
Use of water: D, domestic; Ind, industrial, Irr, irrigation; N, none; P, public; S, livestock.
Altitude of land surface: Altitudes are estimated from U.S. Geological Survey topographic quadrangle maps having 10-foot contour intervals.
Water-bearing unit: CZ, Carrizo; CZ-W, Carrizo-Wilcox; QC, Queen City; R, Recklaw; S, Sparta; W, Wilcox.

Well	Owner	Driller	Date Completed	Depth of well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
					Diameter (in.)	Depth (ft)			Below land-surface (ft)	Date of measurement			
38-03-77995	Mae Atta Henderson Estate	--	--	28	30	28	QC	422	24	Aug. 25, 1987	N	N	Abandoned.
77996	Marie Richardson	--	Pre-1960	28	32	32	QC	425	13.0	do	N	N	--
78786	Gunspot Gun Shop	--	--	--	30	--	QC	422	23.0	do	N	N	Abandoned.
78787	Ben Fitzgeral	--	Pre-1960	--	30	--	QC	418	17.0	do	N	N	--
78789	T. H. Cowan	--	1887	--	--	--	QC	418	--	Aug. 24, 1987	N	N	Well sealed.
78795	Sadie Rae Lambert	--	Pre-1972	--	30	--	QC	420	17.5	Aug. 25, 1987	N	N	Abandoned.
10-26713	Mac Johnson	--	Early 1970's	700	4	400	CZ-W	355	100.0	do	S, E	D	25 gpm capacity.
28316	W. D. Edwards	--	--	--	4	--	QC/R	473	111.7	Sept. 3, 1987	S, E	D	--
29584	Herold Brown	--	1986	41	4	41	QC	427	20.0	do	E	S	8 gpm capacity.
29854	Campbell	--	--	--	30	--	QC	412	19.0	do	N	N	Abandoned.
32697	Francis Dunivan	--	--	--	36	--	QC	444	23.5	Aug. 24, 1987	E	D	5 gpm capacity.
32881	--	--	--	--	36	--	QC/R	392	15.0	do	N	N	Abandoned.
33299	W. H. Galloway	--	--	--	30	--	QC	465	60.0	Aug. 25, 1987	E	D	--
33355	Cathy Pruett	--	--	--	36	--	QC	443	43.0	do	E	D	--
33396	Charles Grasty	Hampton Well Drlg.	1986	81	30	81	QC/R	420	48.0	do	E	Irr	45 gpm capacity; 32,400 to 37,800 gpd used.
33476	Joe E. Tubbs	J. M. Allen	1980	68	28	68	QC	450	55.3	Aug. 24, 1987	E	D	3.5 gpm capacity.
35156	Frank Williams	--	Pre-1957	32	36	32	QC/R	413	24.0	do	E	D	7.5 gpm capacity.
35275	Carrie Jones	--	--	--	36	--	R	395	--	do	E	D	--
36225	Vura May Galloway	--	--	--	36	--	QC	419	31.3	Aug. 13, 1987	N	N	--
36228	do	--	--	--	36	--	QC	420	27.4	do	E	D	8 gpm capacity.
36261	Jesse Hendrix	Joy Drilling	--	45	36	45	QC	412	25.8	do	E	D	8 gpm capacity.
36262	do	--	--	35	36	35	QC	411	26.0	do	N	N	--

Table 1.-Records of Selected Wells in Anderson County-Continued

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing: Diameter (in.)	Casing: Depth (ft)	Water-bearing unit	Altitude of land surface (ft)	Water level: Below land-surface (ft)	Water level: Date of measurement	Method of lift	Use of water	Remarks
38-10-36266	J. T. Conley	--	Pre-1960	30	30	30	QC/R	403	17.0	Sept. 2, 1987	E	D	3.5 gpm capacity.
36436	A. L. & Betty Dutton	Duncan Water Well	Pre-1984	75	4	70	QC/R	410	36.0	do	E	D	2 gpm capacity.
36439	do	--	Pre-1984	--	30	--	R	410	36.0	do	E	D	4 gpm capacity.
36534	Johnny Martinez	--	--	--	4.5	--	R	385	--	do	S, E	D	5 gpm capacity.
36561	Steve McCrary	Duncan W. W.	1985	50	4.5	50	R	385	35.0	do	E	D	--
36664	Billy Henry	--	1987	60	4.5	55	R	375	15.0	do	E	D	--
36694	Ralph Mack	--	1986	60	4.5	55	R	370	15.0	do	E	D	6.5 gpm capacity; 65 gpd used.
36859	M. C. Mims	J. M. Allen	1982	47	36	47	R	383	30.0	Aug. 13, 1987	N	N	--
36888	Dolan Mims	do	1987	43	28	43	R	383	28.0	July 20, 1987	E	D	--
36931	Junior Miller	--	1986	60	4.5	55	R	368	17.0	Sept. 2, 1987	E	D	6.5 gpm capacity; 65 gpd used.
37415	Charles Turner	--	--	56	36	56	QC	413	50.0	July 27, 1987	E	S	--
38389	Charles Seagler	--	1970	63	30	63	QC	403	52.0	Sept. 2, 1987	E	D	10-15 gpm capacity; 1,800 to 2,700 gpd used.
53499	Mrs. O. R. Sherman	--	--	--	36	--	QC	--	--	Aug. 24, 1987	N	N	Abandoned.
53581	George Simms	--	--	--	--	--	QC	--	--	do	N	N	Do.
53927	W. T. Yancey	James E. Grimes	--	357	4	330	CZ-W	399	147	do	S, E	P	50 gpm capacity; serves 4 rent houses.
61697	Kenneth Albright	--	--	--	30	--	QC/R	358	12.4	Sept. 3, 1987	N	N	Abandoned.
62564	A. L. Buchanan	--	1978	36	36	36	R	331	24.0	1984	E	D	Pump not working.
62618	E. T. Seagler	--	--	--	36	--	R	332	23.7	Sept. 2, 1987	N	N	--
62761	Loyd Pettiette	--	Pre-1950	27	30	27	QC/R	354	20.0	Sept. 3, 1987	E	D	2 gpm capacity.
62834	Roland Higginbotham	--	--	--	30	--	R	352	18.2	do	N	N	Abandoned.
65686	Ed Copeland	--	--	28	36	28	R	297	20.0	Aug. 24, 1987	N	N	Do.
66333	L. J. Stubbs	J. M. Allen	1974	62	36	62	R	370	47.8	July 27, 1987	E	D	--
11-11774	Herman Williams	--	--	--	36	--	QC	405	24.8	Aug. 13, 1987	E	D	5 gpm capacity.
12133	D. Rater	--	--	--	30	--	QC	432	17.5	Aug. 25, 1987	N	N	--
12152	R. F. Malone	--	--	--	30	--	QC	420	14.5	do	N	N	--
12153	Leon Herbrough	--	1953	30+	32	30+	QC	427	25.0	do	E	D	10 gpm capacity; 600 gal/week used.
12166	Josie Seib	--	--	--	30	--	QC	422	19.5	do	N	N	--
12455	Kenneth Hutcherson	--	--	--	30	--	QC	434	31.3	do	N	N	Abandoned.

Table 1.-Records of Selected Wells in Anderson County-Continued

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
					Diameter (in.)	Depth (ft)			Below land-surface (ft)	Date of measurement			
38-11-12485	Paul Williams	--	1930	--	30	--	QC	405	--	Aug. 27, 1987	N	N	Well not accessible.
12512	M. L. Johnson	--	1980	--	30	--	QC	421	16.5	do	N	N	Abandoned.
12953	Amy Miller	--	Pre-1962	--	30	--	QC	419	7.3	Aug. 26, 1987	N	N	Do.
12955	Fanny Arnold	--	1960	20	30	20	QC	433	17.5	do	N	N	Do.
12983	Jane Patton	--	1967	--	30	--	QC	410	15.0	do	E	P	Beauty Shop.
15322	Laura Stewart	--	--	--	30	--	QC	440	40.0	do	N	N	Abandoned.
15787	Victor Poff	--	1983	617	3.87	617	CZ-W	400	68.0	July 24, 1983	E	D	--
16127	Mary Via	--	Pre-1950	--	30	--	QC	445	30.0	Aug. 26, 1987	N	N	--
16153	Arthor L. Pike	--	Pre-1975	45	48	45	QC	445	47.0	do	H	D	--
16327	Roy M. Pope	--	1970	40	30	40	QC	485	20.5	Sept. 2, 1987	E	D	5 gpm capacity.
16413	L. V. Giles	--	--	--	30	--	QC/R	423	25.2	Aug. 27, 1987	N	N	Abandoned.
16949	T. A. Wilhite	--	--	--	30	--	CZ-W	400	27.7	do	N	N	Do.
17677	Dickie Douglass	--	--	--	36	--	R	401	22.5	Sept. 2, 1987	E	D	--
18424	Roy Chapman	--	--	62	4	62	R	382	50.0	Aug. 25, 1987	E	D	--
18486	Bert Ricards	--	--	800	5	800	CZ-W	385	30.0	do	E	D	9 gpm capacity.
18489	do	--	1946	--	36	5	R	385	30.0	do	N	N	Abandoned.
19325	David A. Budge	--	1962	190	4.5	140	CZ-W	402	75.0	Aug. 27, 1987	J	N	Pump broken for 10 yrs.
19369	Grady Light	--	1953	--	30	--	W	402	13.7	do	N	N	Abandoned.
19519	Joe Grumbles	--	1889	80	36	80	W	422	30.1	Aug. 25, 1987	E	D	18 gpm capacity.
21416	Lelola Brown	--	--	--	28	--	QC	482	11.0	Sept. 2, 1987	S, E	D	5 gpm capacity.
21442	Willie F. Brown	--	Pre-1900	57	32	57	QC	505	43.7	do	E	D	Do.
21541	Walter Brown	Bob Hampton	1974	61	30	61	QC	441	16.2	Aug. 14, 1987	E	D	Do.
21773	F. T. Fulgham	--	--	--	4	--	--	500	84.0	Sept. 2, 1987	E	D, S	Do.
21778	Clara Williams	--	--	--	30	--	QC	450	35.0	do	E	D	Do.
21819	Frank Fulgham	--	1970	60	36	60	QC	441	27.5	Aug. 13, 1987	E	D	7.5 gpm capacity.
21921	Bethel Church	--	--	--	28	--	QC	450	9.0	Sept. 2, 1987	E	D	5 gpm capacity.
22474	Jerusalem Missionary Baptist Church	--	--	--	30	--	QC	473	19.8	Sept. 1, 1987	E	D	--

Table 1.-Records of Selected Wells in Anderson County-Continued

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing: Diam-eter (in.)	Casing: Depth (ft)	Water-bearing unit	Altitude of land surface (ft)	Water level: Below land-surface (ft)	Water level: Date of measurement	Method of lift	Use of water	Remarks
38-11-22488	Frank Moore	--	Pre-1971	29	32	29	QC	470	11.8	Sept. 1, 1987	E	D	5 gpm capacity.
22674	Charlie Dearing	--	--	70	32	70	QC	475	63.0	do	E	D	60 gpm capacity.
22721	Charles Moore	--	1970	50	32	50	QC	470	10.0	do	E	D, S	7 gpm capacity.
22733	Floyd Gabbard	--	--	40	32	40	QC	492	25.0	do	E	D	Do.
22811	Bell Fane Estate	--	1965	35	32	35	QC	492	24.7	do	H	D	--
23878	R. R. Thornton	--	1969	66.5	32	66.5	QC	482	38.0	do	E	D	5 gpm capacity.
24761	A. M. Johnson	--	1977	132	4	--	CZ-W	394	65.0	Sept. 2, 1987	E	D	Do.
25567	Paul Kilgore	Robert Simons	1986	48	4	48	QC	410	10.0	July 24, 1987	E	D	10 gpm capacity.
25678	J. S. Hill	--	--	--	32	--	QC	423	24.0	Sept. 1, 1987	E	D	4.5 gpm capacity.
25976	Jeff Larkin	--	1949	32	32	32	QC	421	29.0	do	E	D	4 gpm capacity.
28125	Lela May Kimbrough	--	--	54.5	32	54.5	CZ-W	410	40.0	Sept. 2, 1987	E	D	--
28357	J. W. Denison	--	--	--	28	--	QC	448	39.8	Sept. 1, 1987	E	D	Pump not hooked up.
31522	Lula Wilson	--	--	30	30	30	S	685	25.0	Aug. 25, 1987	E	D	4 gpm capacity.
31617	C. L. McCall	--	1977	--	--	--	S	627	19.5	Aug. 24, 1987	N	N	--
32594	John Campbell	--	1957	32	30	32	QC	490	20.0	July 25, 1987	E	D	--
32612	Arlena Brown	--	Pre-1935	--	--	--	QC	483	--	Aug. 26, 1987	H	N	Dry.
32626	Alex Harden	--	1907	37	30	37	QC	510	22.0	do	H	D	--
32638	Ed Brown	--	--	--	30	--	QC	490	22.0	do	N	N	Abandoned.
32861	Fred Woodard	--	1940	20	30	20	QC	490	19.0	Aug. 25, 1987	E	D	5 gpm capacity.
33616	Ira May Jackson	--	--	--	30	--	QC	495	38.0	do	N	N	Abandoned.
34971	James Roper	--	--	--	5.5	--	QC	598	140.0	Aug. 28, 1987	N	N	Do.
35486	Bobby Rogers	--	--	--	18	--	QC	--	--	do	E	D	7 gpm capacity.
35657	Dora Dial	--	1940	86	30	86	QC	540	79.0	Aug. 26, 1987	S, E	D	3 gpm capacity; 90 gpd used.
35669	Balmarez Dominga	--	1985	--	4.5	--	QC	--	--	do	E	D	6 gpm capacity.
35683	Preston Cook, Jr.	--	1980	--	2.5	--	QC	--	--	--	E	D	12 gpm capacity.
35961	George E. Hamilton	Wiggins	1965	85	36	85	QC	--	--	Aug. 26, 1987	E	D	4.5 gpm capacity.
36111	Otis Coleman	Dave Box	1956	30	30	36	QC	470	25.0	do	E	D	4 gpm capacity; 48 gpd used.
36137	Ruby J. Taylor	--	--	52	30	55	QC	493	50.3	do	H	D	--
36547	Robert Gray, Jr.	--	--	--	30	--	QC	510	61.0	do	N	N	Abandoned.

Table 1.-Records of Selected Wells in Anderson County-Continued

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing: Diameter (in.)	Casing: Depth (ft)	Water-bearing unit	Altitude of land surface (ft)	Water level: Below land-surface (ft)	Water level: Date of measurement	Method of lift	Use of water	Remarks
38-11-36549	Roosavelt Gray	--	--	--	30	--	QC	511	61.8	Aug. 26, 1987	N	N	Abandoned.
36716	Leo Williams	--	1965	--	30	--	QC	512	53.0	do	E	D	4 gpm capacity.
36864	Gordon Broughton	--	--	--	30	--	QC	499	58.0	do	E	N	--
37344	Kenneth H. Dempsey	--	1980	800	4	780	CZ-W	--	--	--	E	D	Not accessible.
37397	Len Grabill	--	1980	--	4.5	--	QC	525	51.0	Aug. 28, 1987	E	P	7 gpm capacity.
38769	Tom Anderson	--	--	--	30	--	QC	684	11.5	do	N	N	--
38871	Jerry Spencer	--	--	--	30	--	S	670	23.0	do	N	N	Abandoned.
39667	David Handorf, Jr.	--	1982	50	36	50	QC	470	30.1	Aug. 26, 1987	E	D	9 gpm capacity; 500 gpd used.
39934	do	--	Pre-1930	50	30	50	QC	498	26.0	do	E	D	Pump not running.
41784	N. C. Stanaland	--	1880	60	36	60	W	360	15.0	Aug. 27, 1987	J	D	--
43181	Bert Ricards	--	--	--	30	--	W	400	30.0	Aug. 25, 1987	N	N	Abandoned.
44146	Mrs. A. F. Via	--	1935	--	30	--	R	365	45.5	Sept. 2, 1987	E	D	5 gpm capacity.
44796	Lee Roy Grubbs	--	--	80	5	--	QC/R	355	44.7	Aug. 13, 1987	N	N	--
44813	V. L. Thurston	--	--	--	4	--	QC/R	--	--	Sept. 2, 1987	E	S	--
44819	Stephen Waymire	Bob Hampton	1981	61.5	30	61.5	R	340	38.0	July 27, 1987	E	D	--
46339	N. C. Stanaland	--	1880	40	36	40	CZ	340	22.5	Aug. 27, 1987	--	S	--
47237	Joe O. Banks	--	1950	--	36	--	R	320	23.0	Aug. 24, 1987	H	N	--
47328	--	--	--	--	36	--	R	--	--	do	N	N	Abandoned, dry.
48247	Ed Smart	--	--	64	36	64	R	355	34.0	do	E	N	--
48298	Cindy Stewart	--	--	--	36	--	R	349	17.0	do	N	N	Abandoned.
48299	do	--	--	--	36	--	R	350	17.5	do	N	N	Do.
51595	Joe Saxton	--	1952	40	30	40	W	412	25.0	Aug. 27, 1987	E	D	--
53134	Don Parish	Hampton	1970	44	36	44	QC	458	32.0	Sept. 1, 1987	E	D	7 gpm capacity.
53221	Ana Boyd	--	1974	50+	32	50+	QC	492	44.0	do	E	D	4 gpm capacity.
53251	Mamie Coleman	--	1969	40+	32	40+	QC	485	42.0	do	N	N	Abandoned.
53263	Will Smith	--	1965	42	32	42	QC	482	42.3	do	N	N	Do.
53533	Randle Kelley	--	1940	37	32	37	QC	482	29.7	do	N	N	Do.
54114	N. C. Stanaland	--	1880	40	36	40	CZ	345	40.0	Aug. 27, 1987	H	S	--
54628	Margaret Johnson	--	1987	410	4	--	CZ-W	--	--	do	E	S	21 gpm capacity; well not used much.

Table 1.-Records of Selected Wells in Anderson County-Continued

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing		Water-bearing unit	Altitude of land surface (ft)	Water level		Method of lift	Use of water	Remarks
					Diameter (in.)	Depth (ft)			Below land-surface (ft)	Date of measurement			
38-11-55273	Roy & Dixie Terry	--	1981	90	4	90	R	410	30.0	Aug. 27, 1987	E	D	7 gpm capacity.
55436	Roy White	--	--	325	4	325	CZ-W	390	80.0	do	N	N	Abandoned.
55452	A. B. Calcote	--	1956	50	30	50	R	395	34.7	do	E	D	5 gpm capacity.
55455	J. W. Hardison	--	1962	40+	30	40+	R	395	34.7	do	E	S	Do.
55458	Gary Calcote	--	--	50+	30	50+	R	390	33.0	do	N	N	Abandoned. 2 wells.
55492	Roger B. Douglas	Wiggins	1959	40	30	40	R	385	31.5	do	N	N	Not used since 1966.
56546	Pete Thornton	--	--	88	4.5	88	QC	--	--	Sept. 1, 1987	S, E	D	4 gpm capacity.
57485	W. G. Elrod	--	--	--	36	--	QC	400	11.0	Aug. 24, 1987	N	N	Abandoned.
57867	Inez Lee Veeners	--	--	60	36	60	QC	--	--	do	E	D	--
57913	Jimmy Martin	--	1954	28	36	28	QC	445	17.0	do	J, E	D	20 gpm capacity.
57915	Mrs. J. L. Gregory	--	--	--	36	--	QC	443	18.0	do	J, E	D	21 gpm capacity.
57919	Raymond Martin	--	--	--	8	--	QC	452	31.0	do	E	D	20 gpm capacity.
57947	E. G. Martin	--	--	40	8	--	QC	452	35.0	Aug. 14, 1987	N	N	Abandoned.
57955	Lora Watson	--	--	--	36	--	QC	450	20.0	do	N	N	Do.
57957	Arley Wilson	--	--	--	36	--	QC	445	18.8	do	N	N	Do.
57982	Lora Watson	--	--	--	36	--	QC	440	13.0	do	N	N	Do.
57992	Harold Vickery	--	--	35	36	35	QC	435	15.8	do	E	S	10 gpm capacity.
58293	Pearl Carpenter	--	1940	60	36	60	R	400	18.5	Aug. 27, 1987	N	N	Abandoned.
58628	Dan Hollingworth	--	1972	--	30	--	R	396	9.0	do	N	N	Do.
58664	Hudleston Wall	--	--	--	30	--	QC/R	410	12.2	do	N	N	Do.
58668	Joseph F. Andrews	--	Pre-1970	35	30	35	QC/R	420	21.0	do	J, E	D	--
58772	D. S. Calcote	--	--	--	--	--	QC	--	--	Aug. 14, 1987	--	D	--
58786	Mr. Pickle	--	--	20	40	20	QC	--	--	do	N	N	Dry; abandoned.
62243	Jack Smith	--	Pre-1983	45	30	45	S	695	--	--	N	N	Abandoned. Well not accessible.
62244	do	--	--	486	4	--	R	695	157.0	Aug. 28, 1987	E	D	--
62251	Norwood Water System	Russell Drilling	1986	1,280	10.75	1,280	W	695	404	do	E	P	340 gpm capacity; 500,000 gpd maximum used.
63563	John B. Jones	--	Pre-1950	12	24	12	QC	--	--	Aug. 26, 1987	N	N	Dry; abandoned.
64113	Alvin Williams	--	1935	9	32	9	QC	463	8.3	Sept. 1, 1987	E	D	Water level below pump.

Table 1.-Records of Selected Wells in Anderson County-Continued

Well	Owner	Driller	Date completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water-bearing unit	Altitude of land surface (ft)	Water level Below land-surface (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
38-11-65885	G. Kenner	--	1986	120	4	120	QC	485	30.0	Sept. 1, 1987	E	D	--
82316	Ozie Bragg	--	--	18	36	18	QC	406	5.0	Aug. 14, 1987	N	N	Abandoned.
82322	Troy Lovelady	--	--	--	36	--	QC	411	7.5	do	N	N	Do.

Table 2.-Selected Wells Used for Control and Basic Data

Well Number*	Electrical Log File Number**	Well Name
AA-38-02-201	Q-483	W.C. Perryman & G. C. Greer: H. L. Forrester No. 1
AA-38-02-601	Q-61	The Texas Co.: Dock Hanks No. 1
AA-38-02-602	Q-361	The Texas Co.: Barnard No. 2
AA-38-02-603	Q-427	Phillips Petroleum Co.: Broadway No. 1
AA-38-02-604	Q-511	Texas Minerals Inc.: Irma A. Nixon No. 1
AA-38-02-701	Q-5	Butter & Douglas: E. M. Cross No. 1
AA-38-02-801	Q-512	Sunray-Midcontinent Oil Co.: C. Smith No. 1
AA-38-03-202	Q-499	W. C. Perryman & I. P. LaRue: W. J. Inmon No. 1
AA-38-03-502	Q-433	Carter-Gragg Oil Co.: N. Jaramillo No. 1
AA-38-03-601	Q-273	McKellar & Tynes: Ruby Hall No. 1
AA-38-03-701	Q-478	Montalba Water Supply Corp.
AA-38-03-801	Q-85	Humble Oil & Refining Co.: J. W. Horwitz No. 1
AA-38-03-802	Q-76	C. Andrade & W. M. Knight: Fitzgerald No. 1
AA-38-03-901	Q-56	L. A. Douglas & F. K. Johnson: J. W. Braly No. 1
AA-38-04-401	Q-142	Humble Oil & Refining Co.: Royal National Bank No. 2
AA-38-04-402	Q-267	Humle Oil & Refining Co.: G. O. Firod No. 1
AA-38-04-701	Q-251	M. H. Shaw: Reed No. 1
AA-38-04-901	Q-54	Fred Birdsong, et al: Royal National Bank No. 1
None	Q-115	John G. Voight: Royal National Bank No. 2
None	Q-247	Humble Oil & Refining Co.: Royal National Bank"B" No. 4
None	Q-681	Humble Oil & Refining Co.: M. C. Calhoun No. 1
AA-38-09-901	Q-101	Continental Oil Co.: W. R. Cady No. 1
AA-38-10-102	Q-313	Magnolia Petroleum Co.: Woolverton No. 1
AA-38-10-201	Q-98	Gragg Drilling Co.: Hudson Oil Unit No. 1
AA-38-10-202	Q-314	Humble Oil & Refining Co.: R. B. Douglas No. 1
AA-38-10-403	Q-303	Continental Oil Co.: Royal National Bank No. 4
AA-38-10-602	Q-484	J. A. Messenger et al: M. A. Davey, Jr. Unit A No. 1
AA-38-10-901	Q-122	Deven-Leduc: J. H. Barrett No. 1
AA-38-11-101	Q-77	The Texas Co.: S. W. O'Flynn No. 1
AA-38-11-201	Q-126	E. B. LaRue, Jr. & F. R. Jackson: Nathan Scott No. 1
AA-38-11-202	Q-518	E. B. LaRue, Jr. & Jackson Oil Co.: R. V. Jernigan No. 1
AA-38-11-301	Q-355	Jack Frost et al: Connie Lee Walker No. 1
AA-38-11-302	Q-519	L. W. Storms, Jr.: G. W. Broyles No. 1
AA-38-11-601	Q-109	Bill R. Tipton: Joe Chotiner No. 1
AA-38-11-602	Q-520	M. T. Halbouty: B. H. Gardiner No. 1
AA-38-11-603	Q-503	Lone Pine Water Supply Corp.
AA-38-11-701	Q-34	T. J. Johnson & P. B. Berry: W. A. Armstrong No. 1
AA-38-11-801	Q-14	City of Palestine No. 2
AA-38-11-803	Q-504	H. B. Pyle: Henderson No. 1
AA-38-11-901	Q-13	City of Palestine No. 1
AA-38-11-902	Q-102	City of Palestine No. 4
AA-38-11-903	Q-16	Missouri Pacific Railroad

See Footnotes at end of table.

Table 2.-Selected Wells Used for Control and Basic Data-Contnued

Well Number*	Electrical Log File Number**	Well Name
AA-38-11-904	Q-15	Missouri Pacific Railroad
AA-38-11-906	Q-522	Coates Drilling Co. & Colorado Oil & Gas Co.: Jeff Kale No. 1
None	Q-624	B. G. Byars: Elizabeth Pessoney No. 1
None	Q-637	McCormick & Short: Clyde Jones No. 1
None	Q-695	Bob M. Lloyd: N. R. Link No. 1
AA-38-12-101	Q-19	L. A. Douglas & L. A. Grelling: Royal National Bank No. 1
AA-38-12-103	Q-489	W. C. Perryman: Royall National Bank No. 1
AA-38-12-202	Q-539	T. J. Johnson: Ophelia Barnett No. 1
AA-38-12-401	Q-485	F. R. Jackson & J. C. Robbins: C. A. Dial No. 1
AA-38-12-402	No Log	Norwood Water Supply Corp.
AA-38-12-702	Q-62	Wheelock & Weinschel: M. Howard No. 1
AA-38-19-201	No Log	Four Pine Water Supply Corp.
AA-38-19-301	Q-103	City of Palestine No. 3
AA-38-19-302	Q-506	Jack Frost & E. L. Howard-Persons: Lemac No. 1
AA-38-19-303	Q-498	Pleasant Springs Water Supply Corp.
AA-38-20-101	Q-64	Thomas Jordan Inc.: M. McFarlane No. 1
AA-38-20-103	No Log	Vernon Calhoun Packing Co.
AA-38-20-104	Q-509	Walston Springs Water Supply Corp.
AA-38-20-203	No Log	Vernon Calhoun Packing Co. No. 2

*Well Number that appears in Report 150, Texas Water Development Board
**Number assigned to log for filing by Texas Water Commission in Electrical Log File