

SUMMARY OF AVAILABLE HYDROGEOLOGIC DATA COLLECTED BETWEEN 1973 AND 1995 AND INFORMATION ON ALL PERMEABILITY DATA AND AQUIFER TESTS FOR THE CAPITAN AQUIFER, EDDY AND LEA COUNTIES, NEW MEXICO

By G.F. Huff

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CONTENTS

	Page
Abstract	1
Introduction	1
Purpose and scope	1
Previous investigations	4
New Mexico well-numbering system	4
Available data	4
Capitan aquifer observation-well network	5
Water levels stored in the U.S. Geological Survey data base	11
Water quality	11
Aquifer tests and permeability	16
Well locations stored in the New Mexico State Engineer Office data base	16
References cited	18

FIGURES

Figure	<ol style="list-style-type: none"> 1. Map showing location of the Capitan Reef complex, New Mexico and Texas..... 2. Map showing location of the study area and the Capitan aquifer in Eddy and Lea Counties, New Mexico 3. Diagram showing system of numbering wells in New Mexico..... 4. Map showing location of wells in the Capitan aquifer observation-well network as described by Hiss (1973)..... 5. Hydrographs showing water levels in selected wells in the Capitan observation-well network as stored in the OMNIANA data base and tabulated by Richey and others (1985, p. 57-58) 6. Map showing location of water levels in the Capitan aquifer and the Tansill Formation measured from 1973 to 1984 as stored in the Ground-Water Site-Inventory (GWSI) data base..... 7. Map showing location of water levels in the Capitan aquifer and the Tansill Formation measured from 1985 to 1995 as stored in the Ground-Water Site-Inventory (GWSI) data base..... 8. Hydrographs showing water levels in selected wells in the Capitan aquifer as stored in the Ground-Water Site-Inventory (GWSI) data base..... 9. Map showing location of water-quality analyses, stored in the U.S. Geological Survey quality-of-water data base, 1973 to 1995; aquifer tests; and core permeability data for the Capitan aquifer..... 10. Map showing location of wells that tap the Capitan aquifer as stored in the New Mexico State Engineer Office data base 	<ol style="list-style-type: none"> 2 3 5 6 8 12 13 14 15 17
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TABLES

	Page
Table 1. Results of efforts to locate and determine the condition of Capitan aquifer observation-network wells as described by Hiss (1973).....	7
2. Dates of water-level data collected by the U.S. Geological Survey using automated water-level recorders on the Capitan aquifer observation-network wells as stored in the OMNIANA data base	7
3. Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95, as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base	19
4. Measured water levels in the Tansill Formation, Eddy and Lea Counties, New Mexico, 1973-95, as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base	34
5. Water-quality data for the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95, as stored in the U.S. Geological Survey quality-of-water (QWDATA) data base	35
6. Locations and results of aquifer tests in the Capitan aquifer as reported by Hiss (1976, p. 160-162)	36
7. Permeability and porosity data for core samples from the Capitan aquifer as shown by Hiss (1976, fig. 21)	37
8. Depth and location of wells that tap the Capitan aquifer as stored in the New Mexico State Engineer Office data base.....	39

CONVERSION FACTORS AND VERTICAL DATUM

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
foot	0.3048	meter
mile	1.609	kilometer
acre	4,047	square meter
gallon per minute	0.06309	liter per second

Temperature in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) as follows:

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$$

SUMMARY OF AVAILABLE HYDROGEOLOGIC DATA COLLECTED BETWEEN 1973 AND 1995 AND INFORMATION ON ALL PERMEABILITY DATA AND AQUIFER TESTS FOR THE CAPITAN AQUIFER, EDDY AND LEA COUNTIES, NEW MEXICO

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ABSTRACT

This report summarizes the availability of water-level data for the Capitan aquifer and evaluates the condition of wells in the Capitan aquifer observation-well network. The report summarizes water-level and water-quality data for the Capitan aquifer, including water-level data specifically for the Tansill Formation, collected from 1973 through 1995. The report summarizes aquifer-test and permeability data for the Capitan aquifer and shows the location of wells stored in the New Mexico State Engineer Office data base that tap the Capitan aquifer.

INTRODUCTION

The Capitan Reef complex extends in an arcuate band through southeastern New Mexico and southwestern Texas following the rim of the Delaware Basin (fig. 1). The Capitan Reef complex is composed of the Capitan and Goat Seep Limestones and most or all of the Carlsbad facies of the Artesia Group (Meissner, 1972), including the Grayburg, Queen, Seven Rivers, Yates, and Tansill Formations (Richey and others, 1985). The Capitan Reef complex functions as a single geohydrologic unit and is collectively called the Capitan aquifer (Hiss, 1973; 1976). The Capitan aquifer is the primary source of freshwater for the City of Carlsbad and several other communities in Eddy County, New Mexico, and is a source of irrigation water for southeastern New Mexico. The study area, which includes Eddy and Lea Counties, New Mexico, and the areal extent of the Capitan aquifer in Eddy and Lea Counties, are shown in figure 2.

The New Mexico State Engineer Office (SEO) is responsible for management of water resources in the Capitan aquifer. Two problems that hinder water management in the Capitan aquifer are: (1) no comprehensive assessment of existing hydrogeologic data for the Capitan aquifer has been done since 1973 and (2) the hydrogeologic data that have been collected since 1973 have not been compiled. Therefore, the SEO recognized the need to compile, review, and update existing hydrogeologic data for the Capitan aquifer including hydrogeologic data that can be identified as representing conditions specifically in the Tansill Formation. The report was prepared in cooperation with the New Mexico State Engineer Office.

Purpose and Scope

This report shows the locations and summarizes the availability of water-level data for the Capitan aquifer and evaluates the condition of wells in the Capitan aquifer observation-well network. The report shows the locations of and tabulates or shows in graphical form water-level and water-quality data for the Capitan aquifer and Tansill Formation collected from 1973 through 1995. Graphs of water-level data for the Capitan aquifer observation-well network that were collected using automated data-collecting devices and stored in the OMNIANA data base include pre-1973 data for completeness. This report summarizes the results of aquifer tests and core sample permeability tests for the Capitan aquifer. This report shows the location and depth of wells in the SEO data base that tap the Capitan aquifer.

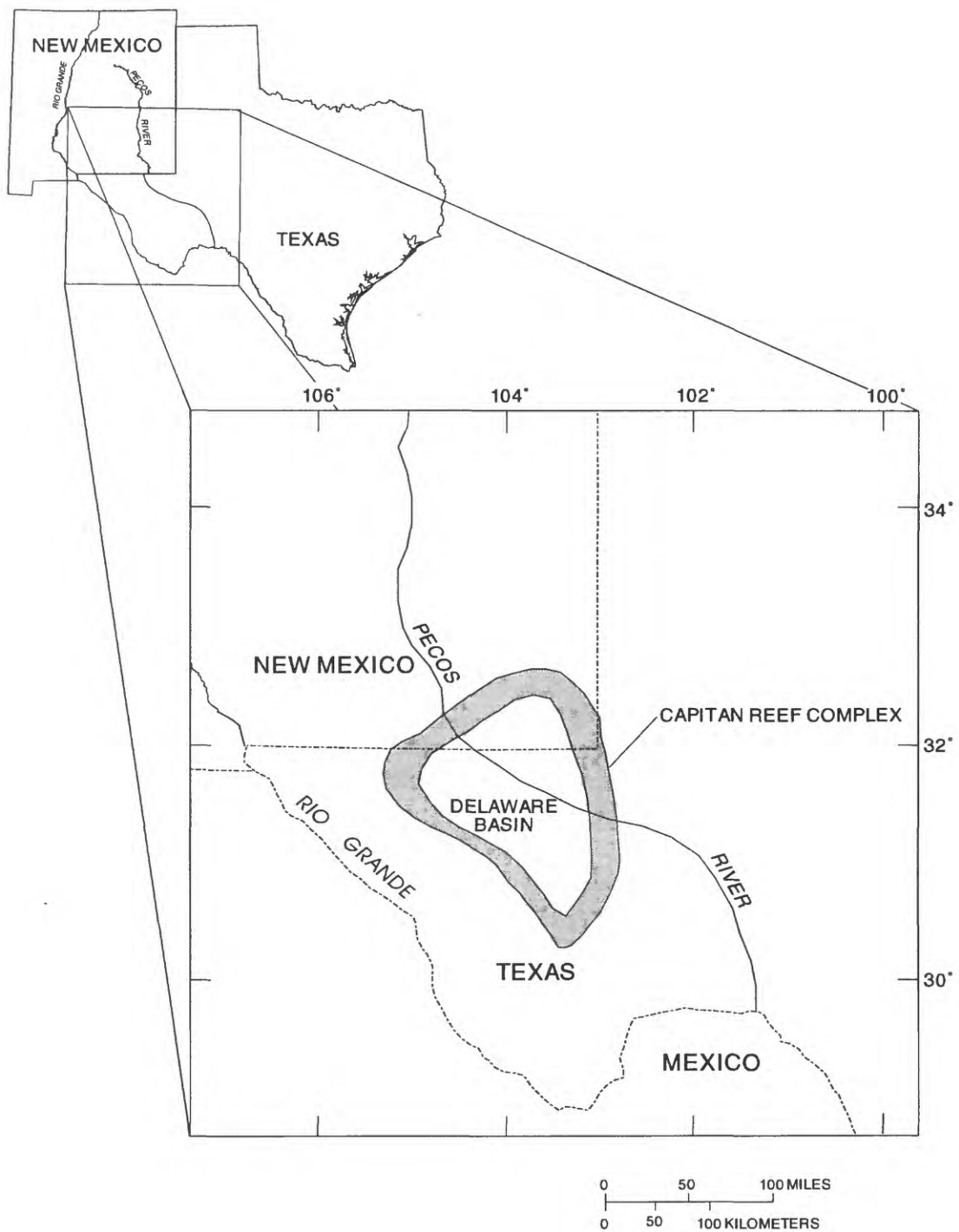


Figure 1.--Location of the Capitan Reef complex, New Mexico and Texas.

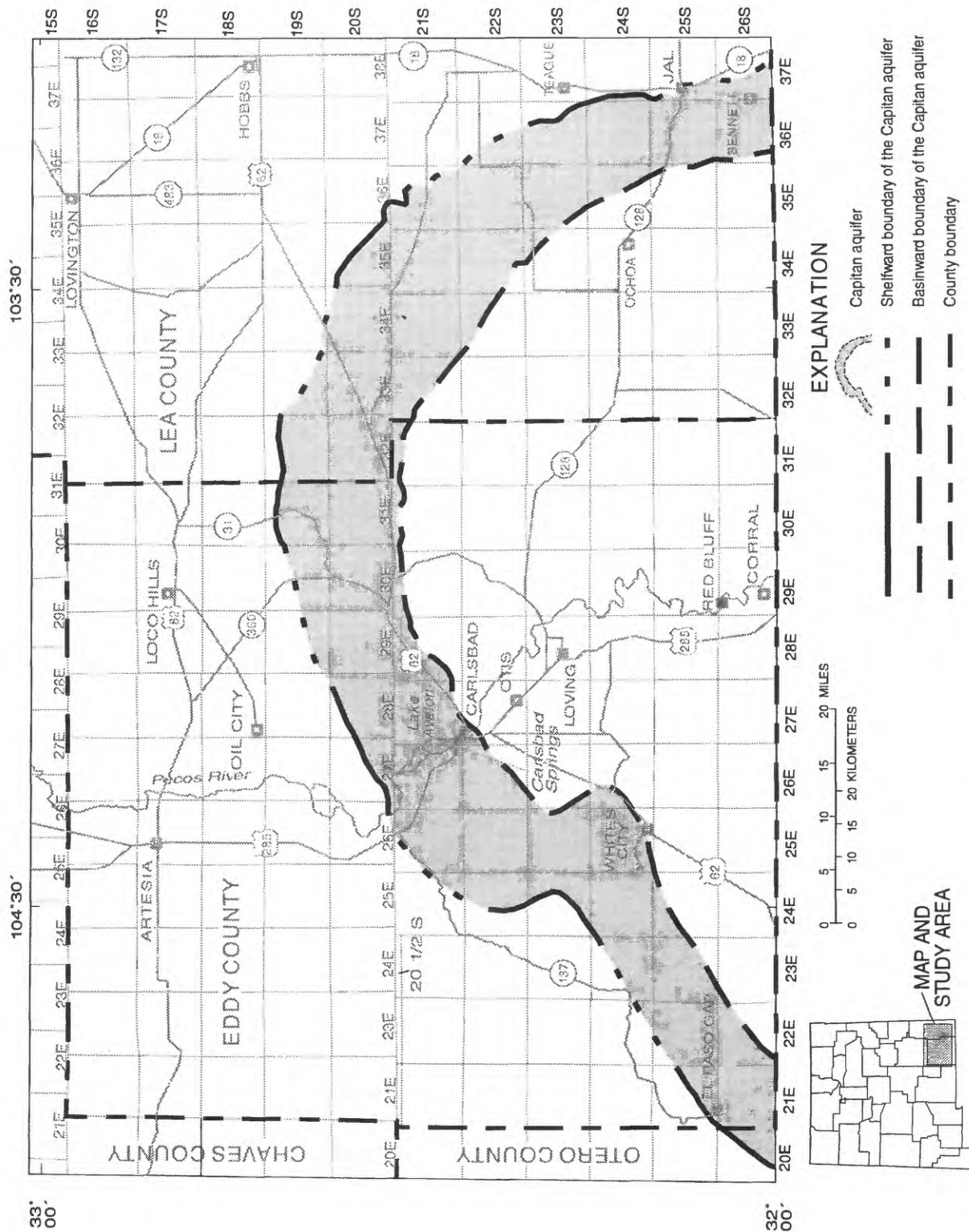


Figure 2.--Location of the study area and the Capitan aquifer in Eddy and Lea Counties, New Mexico.

Previous Investigations

Ground-water quantity and ground-water quality in the Carlsbad area were investigated by Bjorklund and Motts (1959) and Cox (1967) and in Eddy County by Hendrickson and Jones (1952). Ground-water quantity and quality in the Delaware Basin were studied by Hiss and others (1969), Hiss (1971; 1973; 1976), and Richey and others (1985). Hiss (1975) made an extensive tabulation of ground-water-quality data in the Delaware Basin. All of the above investigations include information on ground-water quantity or quality in the Capitan aquifer.

New Mexico Well-Numbering System

The system of numbering wells in New Mexico is based on the common subdivision of public lands into sections (fig. 3). The well number, in addition to designating the well, locates its position in the land network. The number is divided into four segments. The first segment denotes the Township (T.) north or south of the New Mexico base line; the second denotes the Range (R.) east or west of the New Mexico principal meridian, and the third denotes the section. The fourth segment of the number, which consists of three or more digits, denotes the 160-, 40-, and 10-acre tracts, respectively, in which the well is situated. For this purpose, the section is divided into four quarters, numbered 1, 2, 3, and 4, in the normal reading order, for the northwest, northeast, southwest, and southeast quarters, respectively. The first digit of the fourth segment gives the quarter section, which is a tract of 160 acres. Similarly, the quarter section is divided into four 40-acre tracts numbered in the same manner, and the second digit denotes the 40-acre tract. Finally, the 40-acre tract is divided into four 10-acre tracts, and the third digit denotes the 10-acre tract. Thus, well 21S.27E.19.334 is in the SE1/4 SW1/4 SW1/4 of section 19, T. 21 S., R. 27 E. If a well can be located accurately within tracts smaller than 10 acres, the same process of dividing the remaining area in quarters is continued as needed. Letters A, B, C, and so on are added to the last segment to designate the second, third, fourth, and succeeding wells in the same 10-acre tract.

AVAILABLE DATA

A thorough attempt was made to find all published and unpublished data on the Capitan aquifer in Eddy and Lea Counties including: (1) wells that tap the Capitan aquifer or the Tansill Formation, (2) water levels, (3) water quality, (4) aquifer tests, and (5) permeability. Information searches were conducted in the libraries of New Mexico State University and New Mexico Institute of Mining and Technology. Data were sought through personal and telephone contacts with State and Federal agencies, including the New Mexico Bureau of Mines and Mineral Resources, the Roswell and Santa Fe offices of the SEO, the Hobbs and Artesia offices of the New Mexico Oil Conservation Division, the Texas Bureau of Economic Geology, the Texas Water Development Board, and the Bureau of Reclamation. The Roswell Geological Society and a number of individual consultants were contacted. In addition, the Petroleum Data Corporation data base was searched for data on the Capitan Reef complex. Gamma logs used to locate wells in the SEO data base that tap the Capitan aquifer were obtained from the Artesia office of the New Mexico Oil Conservation Division.

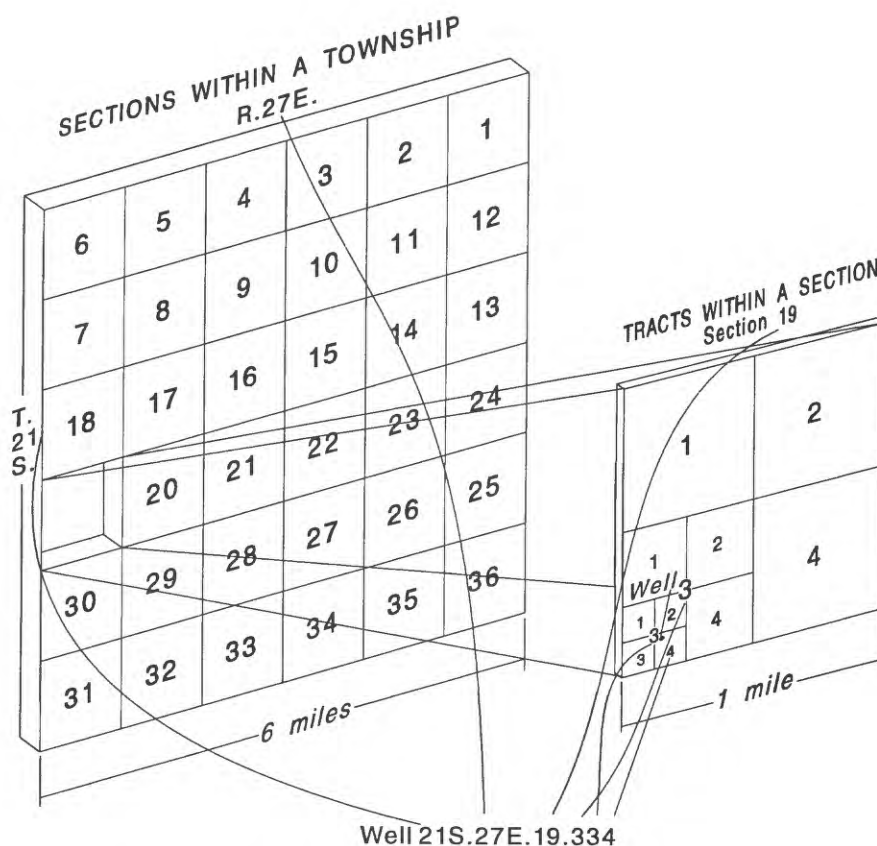


Figure 3.--System of numbering wells in New Mexico.

Capitan Aquifer Observation-Well Network

The location of wells in the Capitan aquifer observation-well network as described by Hiss (1973) is shown in figure 4. Efforts were made to locate and determine the condition of all observation-network wells. Once a well was located, a slug test was performed on each accessible observation-network well. Table 1 provides the results of efforts to locate and determine the condition of the observation-network wells as described by Hiss (1973). Water-level data from the Capitan aquifer observation-well network collected using automated water-level recorders are stored in the U.S. Geological Survey (USGS) OMNIANA data base. Table 2 lists the dates of water-level data for the Capitan aquifer observation-well network stored in the OMNIANA data base. Hydrographs of water levels for the Capitan aquifer observation-well network stored in the OMNIANA data base, excluding wells Yates State 1 and Hackberry Deep 1 in which water levels require correction for the presence of oil in the well bore (Hiss, 1973), are shown in figure 5. Water-level data for selected wells in the Capitan aquifer observation-well network for 1977-79 are tabulated in Richey and others (1985, p. 57-58) and also are shown in figure 5. Additional water-level data for City of Carlsbad well 13 and well Yates State 1 are stored in the USGS Ground-Water Site-Inventory (GWSI) data base.

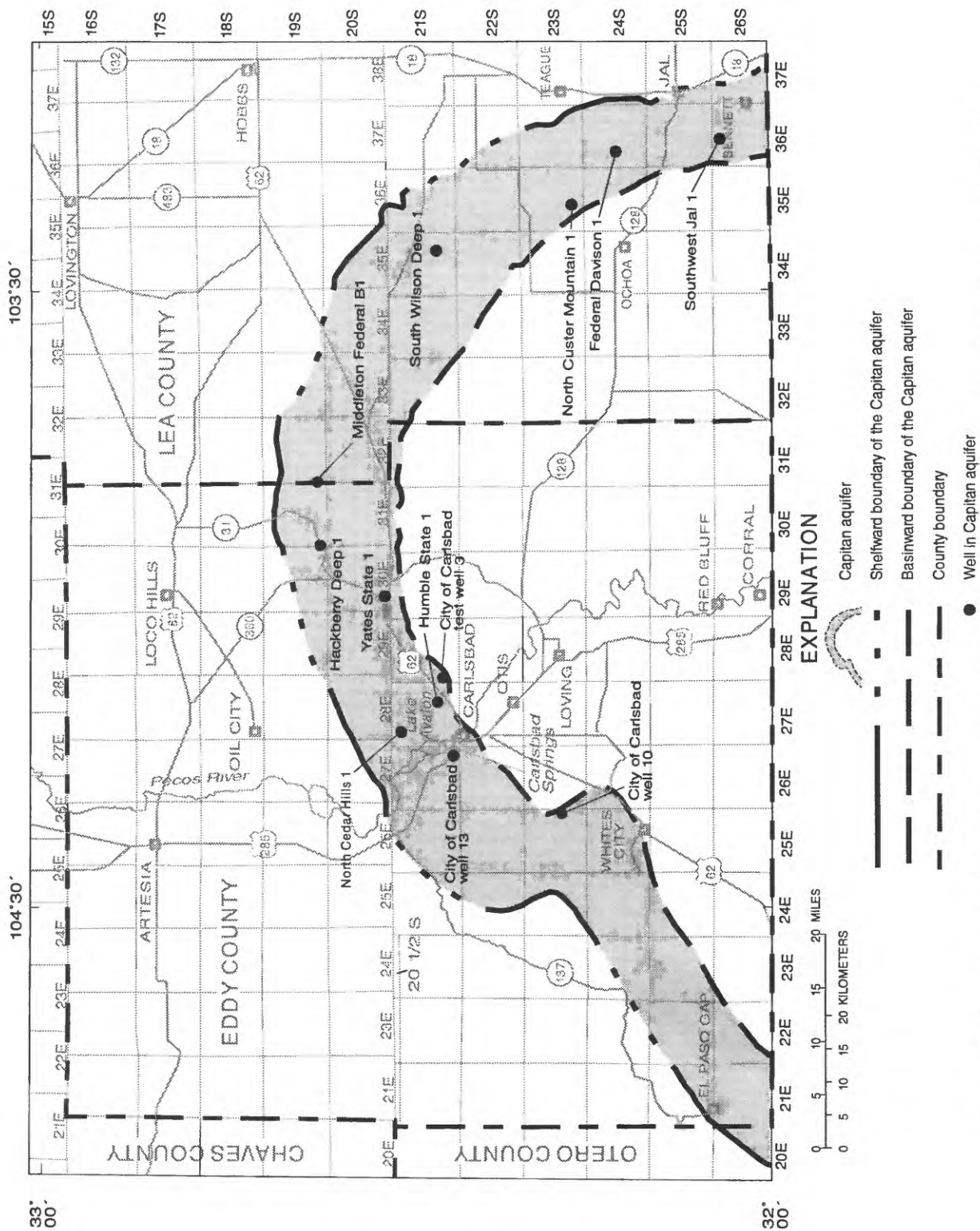


Figure 4.--Location of wells in the Capitan aquifer observation-well network as described by Hiss (1973).

Table 1.--Results of efforts to locate and determine the condition of Capitan aquifer observation-network wells as described by Hiss (1973)

[Well locations shown in figure 4]

Well name	Local well number	Well status	Perforation status	Remarks
City of Carlsbad well 10	23S.25E.24.21333	Located	Open	
City of Carlsbad well 13	21S.26E.36.22110	Located	Open	
City of Carlsbad test well 3	21S.28E.30.14123	Located	Open	
Humble State 1	21S.27E.23.330	Unable to locate	Unknown	
North Cedar Hills 1	21S.27E.05.414	Located	Plugged	
Yates State 1	20S.30E.32.341344	Located	Plugged	
Hackberry Deep 1	19S.31E.31.132	Located	Unknown	Natural gas leak
Middleton Federal B1	19S.32E.31.110	Unable to locate	Unknown	
South Wilson Deep 1	21S.34E.23.310	Located	Plugged	
North Custer Mountain 1	23S.35E.28.120	Located	Unknown	Behind locked gate
Federal Davison 1	24S.36E.20.210	Located	Plugged	
Southwest Jal 1	26S.36E.04.230	Located	Unknown	Behind locked gate

Table 2.--Dates of water-level data collected by the U.S. Geological Survey using automated water-level recorders on the Capitan aquifer observation-network wells as stored in the OMNIANA data base

[Well locations shown in figure 4]

Well name	Start date	End date
City of Carlsbad well 10	August 1963	December 1979
City of Carlsbad well 13	April 1962	April 1980
City of Carlsbad test well 3	January 1963	July 1980
Humble State 1	February 1968	April 1974
North Cedar Hills 1	May 1966	November 1978
Yates State 1	September 1967	January 1977
Hackberry Deep 1	September 1966	October 1979
Middleton Federal B1	September 1966	January 1976
South Wilson Deep 1	February 1967	December 1979
North Custer Mountain 1	November 1966	December 1979
Federal Davison 1	January 1967	December 1979
Southwest Jal 1	September 1966	December 1979

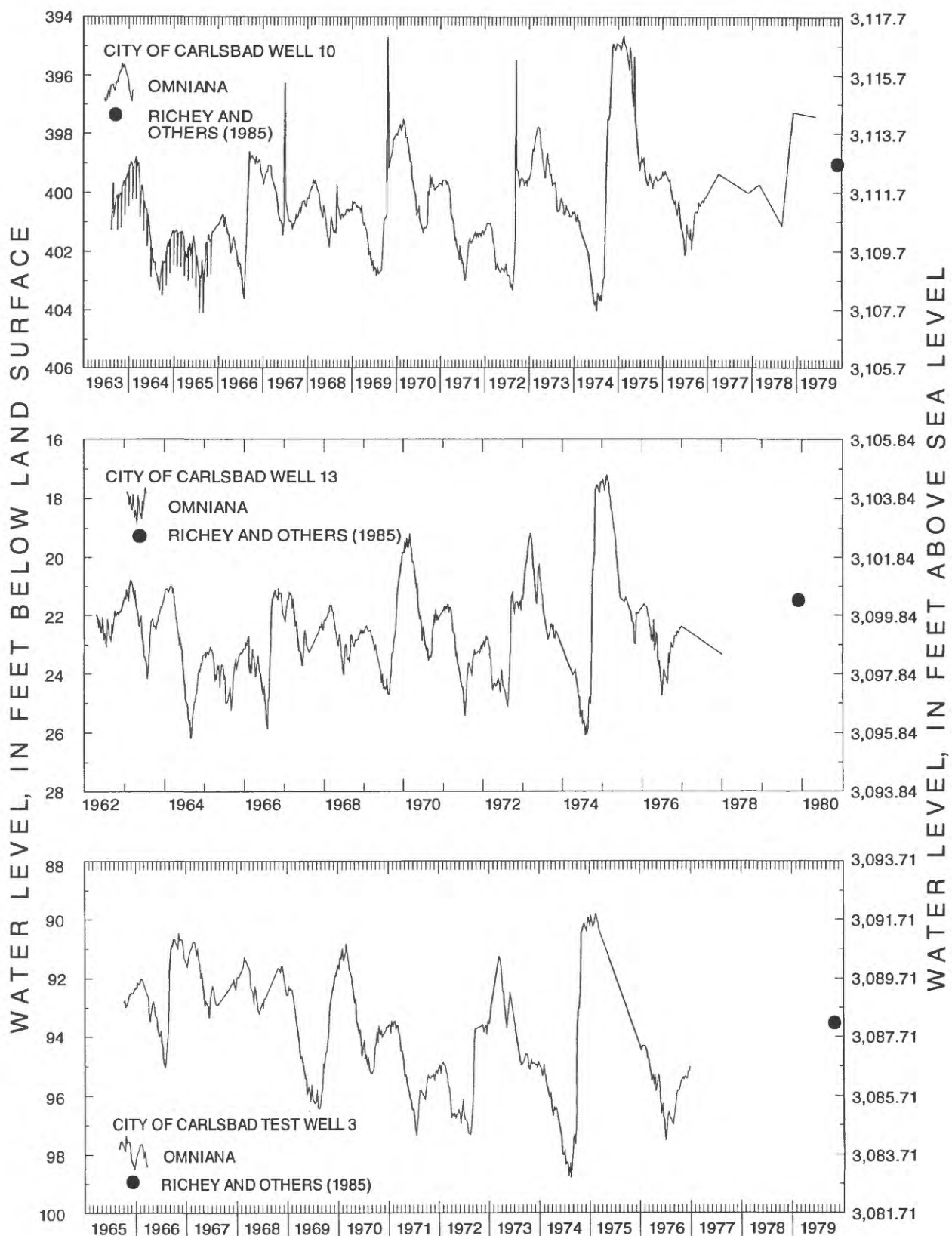


Figure 5.--Water levels in selected wells in the Capitan observation-well network as stored in the OMNIANA data base and tabulated by Richey and others (1985, p. 57-58). Well locations shown in figure 4.

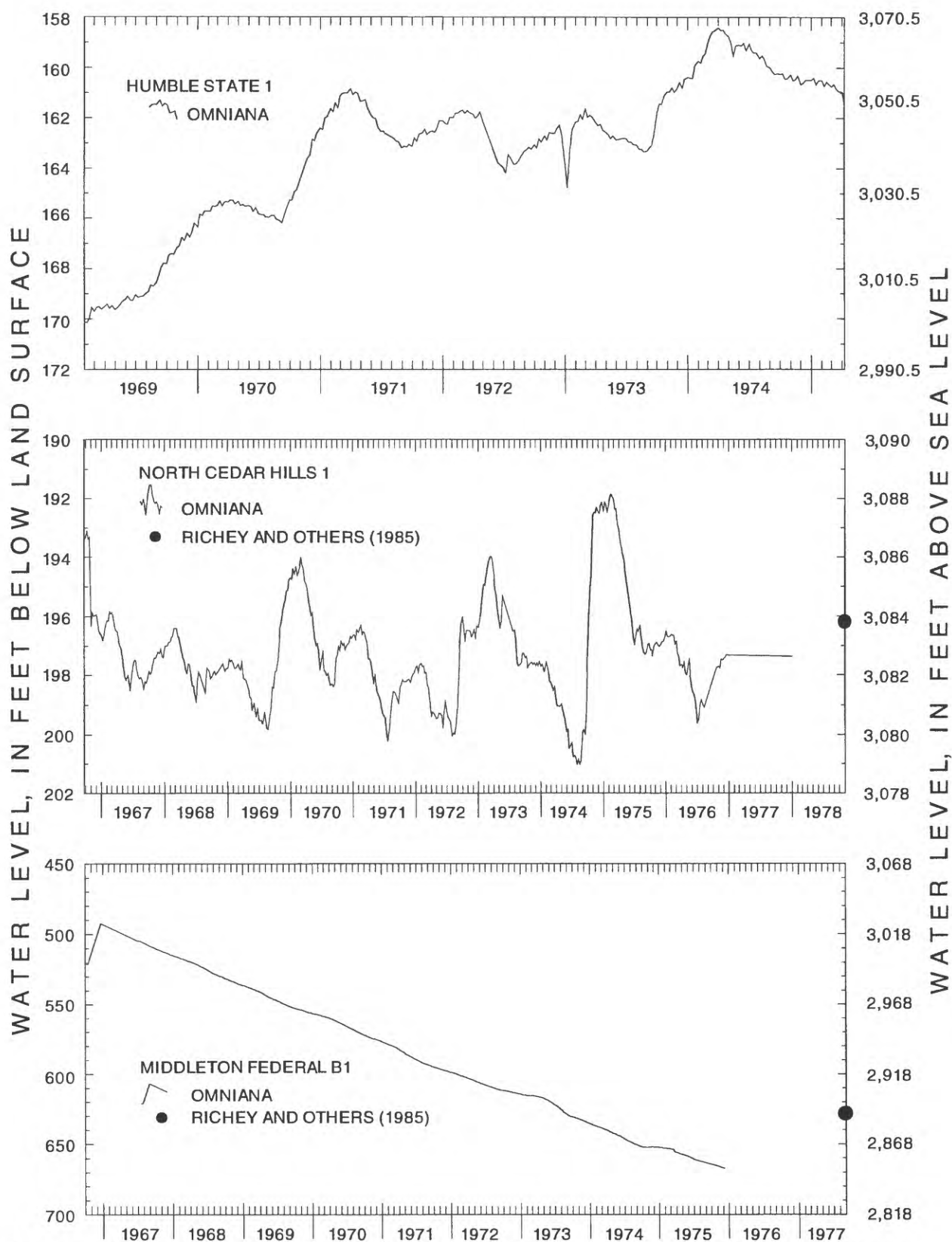


Figure 5.--Water levels in selected wells in the Capitan observation-well network as stored in the OMNIANA data base and tabulated by Richey and others (1985, p. 57-58). Well locations shown in figure 4--Continued.

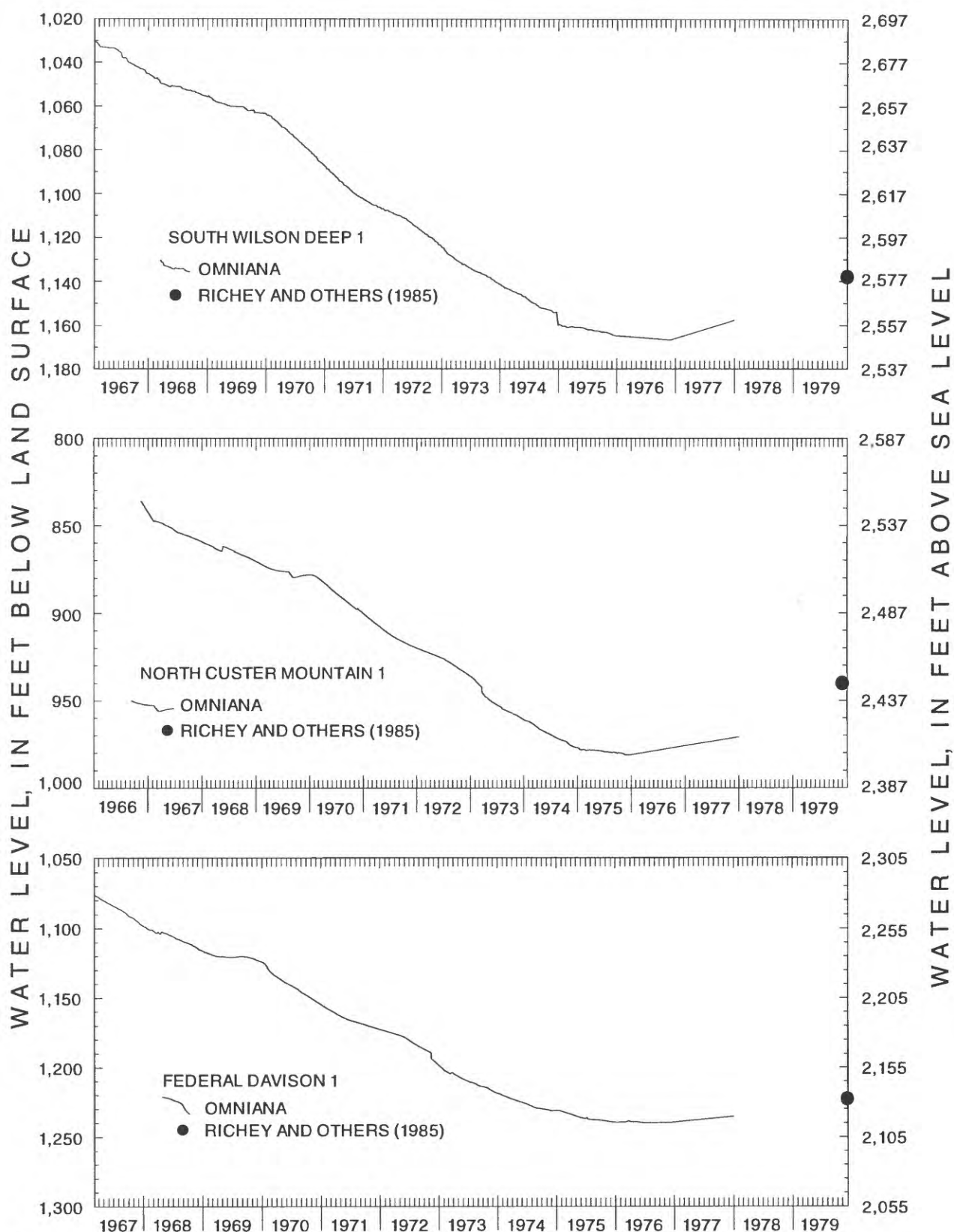


Figure 5.--Water levels in selected wells in the Capitan observation-well network as stored in the OMNIANA data base and tabulated by Richey and others (1985, p. 57-58). Well locations shown in figure 4--Continued.

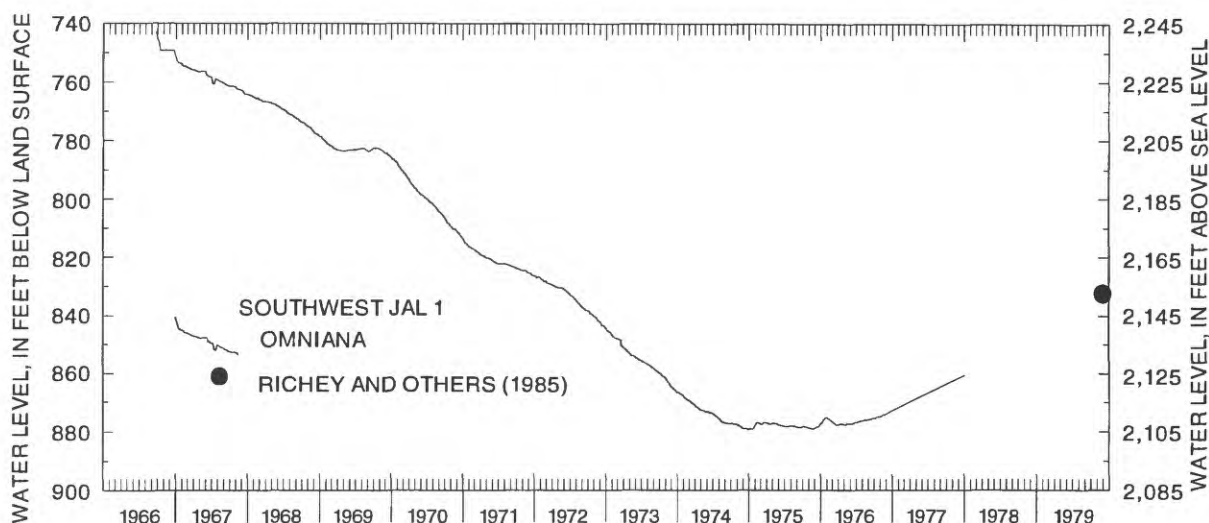


Figure 5.--Water levels in selected wells in the Capitan observation-well network as stored in the OMNIANA data base and tabulated by Richey and others (1985, p. 57-58). Well locations shown in figure 4--Concluded.

Water Levels Stored in the U.S. Geological Survey Data Base

Measured water levels in the Capitan aquifer and the Tansill Formation in Eddy and Lea Counties for 1973-95 that are stored in the GWSI data base are listed in tables 3 and 4, respectively (tables 3-8 are in the back of the report). Locations of water levels measured in the Capitan aquifer and the Tansill Formation during 1973-84 and 1985-95, as recorded in GWSI, are shown in figures 6 and 7, respectively. Available water levels in selected wells in the Capitan aquifer, including City of Carlsbad well 13, for 1973-95 are shown in figure 8.

Water Quality

One water-quality analysis for the Capitan aquifer in Eddy and Lea Counties was available for 1973-95 and is stored in the USGS quality-of-water (QWDATA) data base (table 5). The location of this water-quality analyses is shown in figure 9. The extensive ground-water-quality data tabulation of Hiss (1975) contains only pre-1973 data.

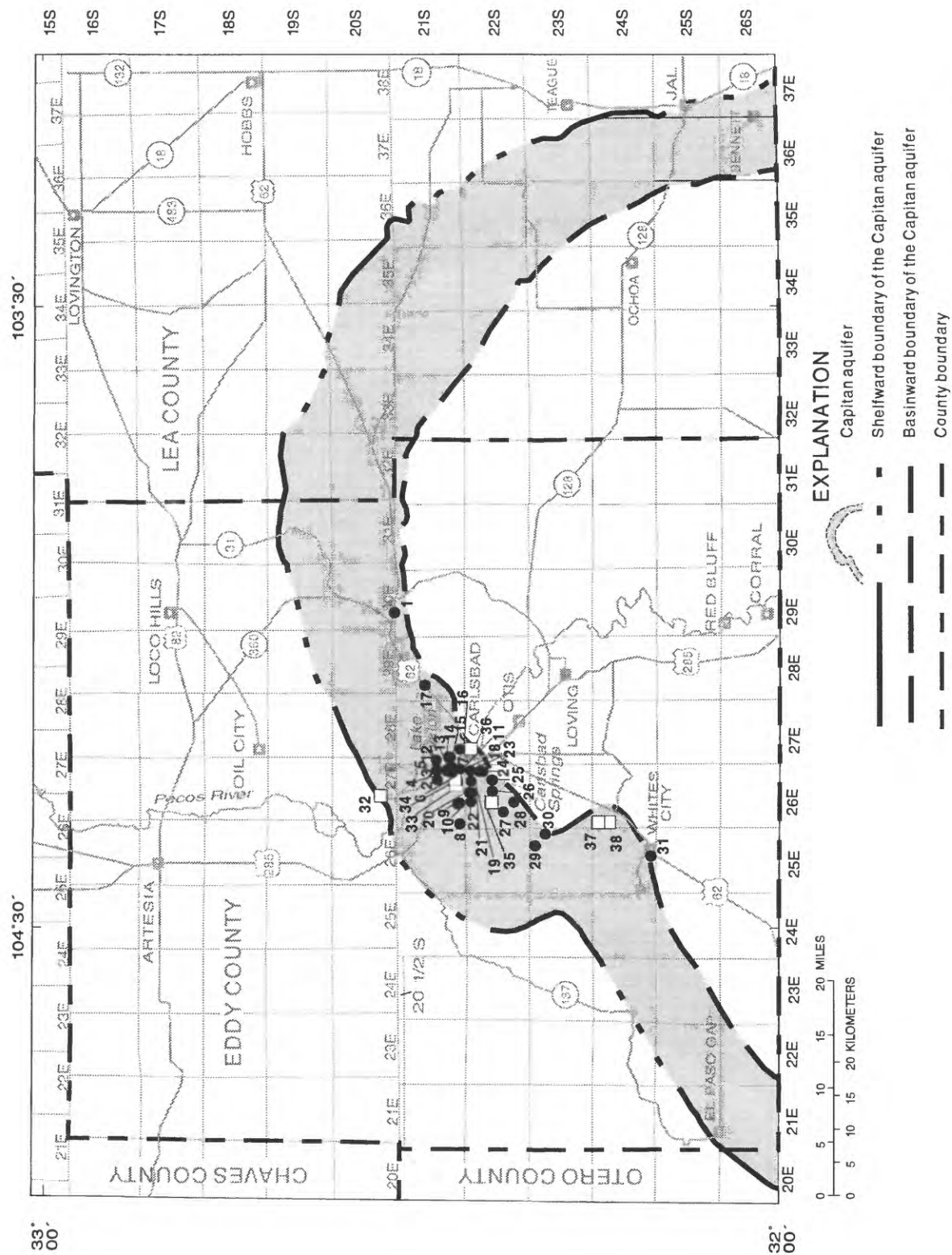


Figure 6.--Location of water levels in the Capitan aquifer and the Tansill Formation measured from 1973 to 1984 as stored in the Ground-Water Site-Inventory (GWSI) data base.

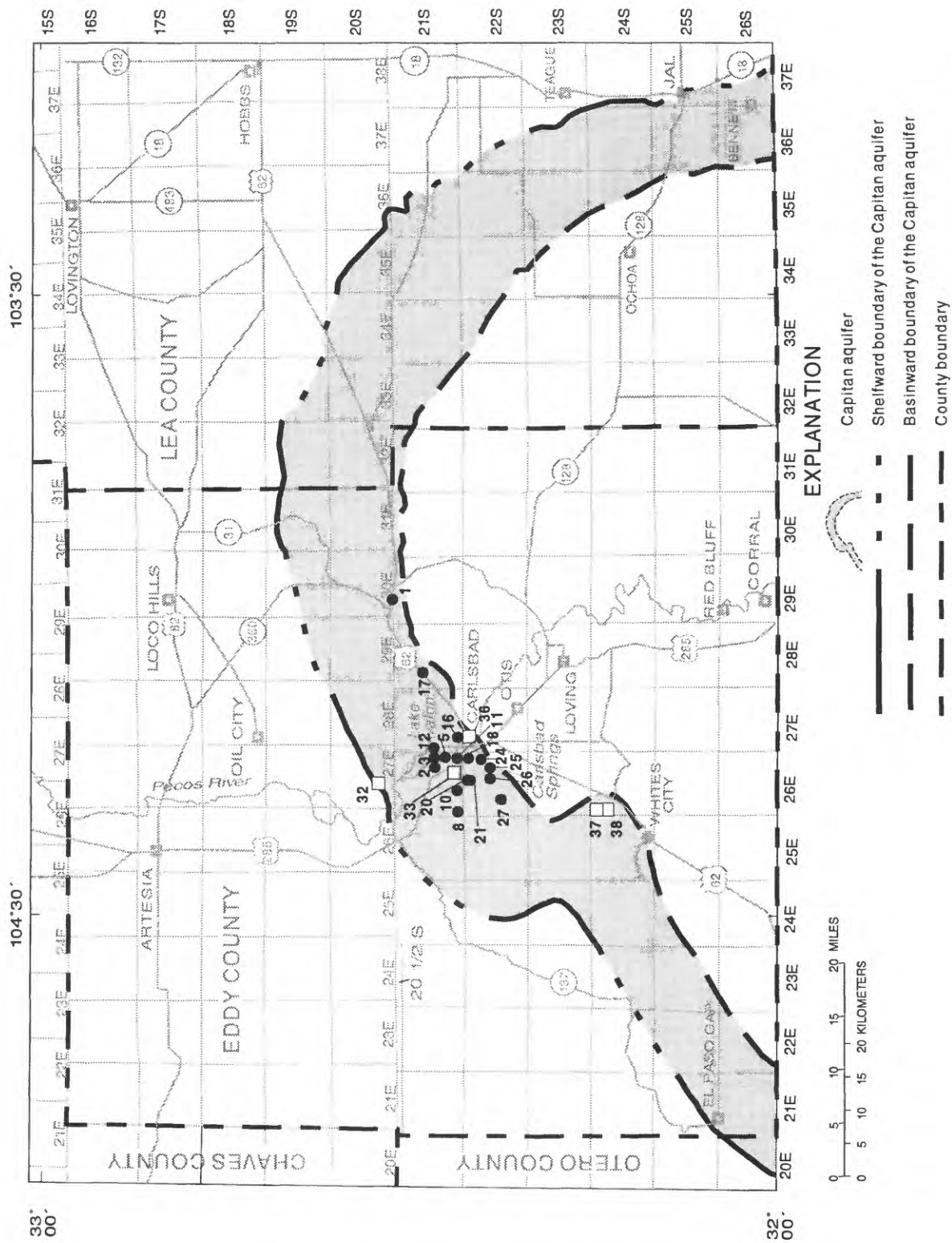


Figure 7.--Location of water levels in the Capitan aquifer and the Tansill Formation measured from 1985 to 1995 as stored in the Ground-Water Site-Inventory (GWSI) data base.

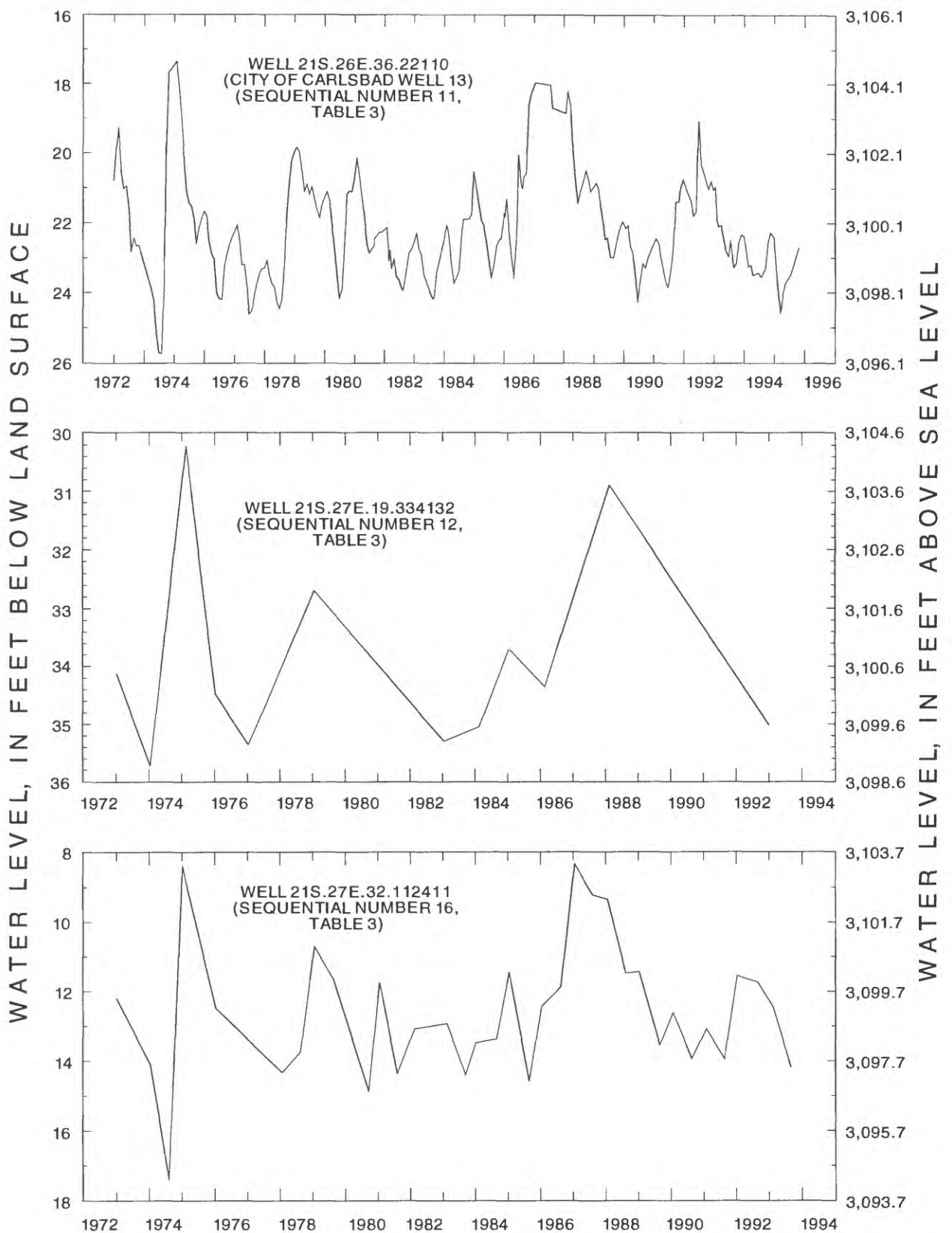


Figure 8.--Water levels in selected wells in the Capitan aquifer as stored in the Ground-Water Site-Inventory (GWSI) data base.

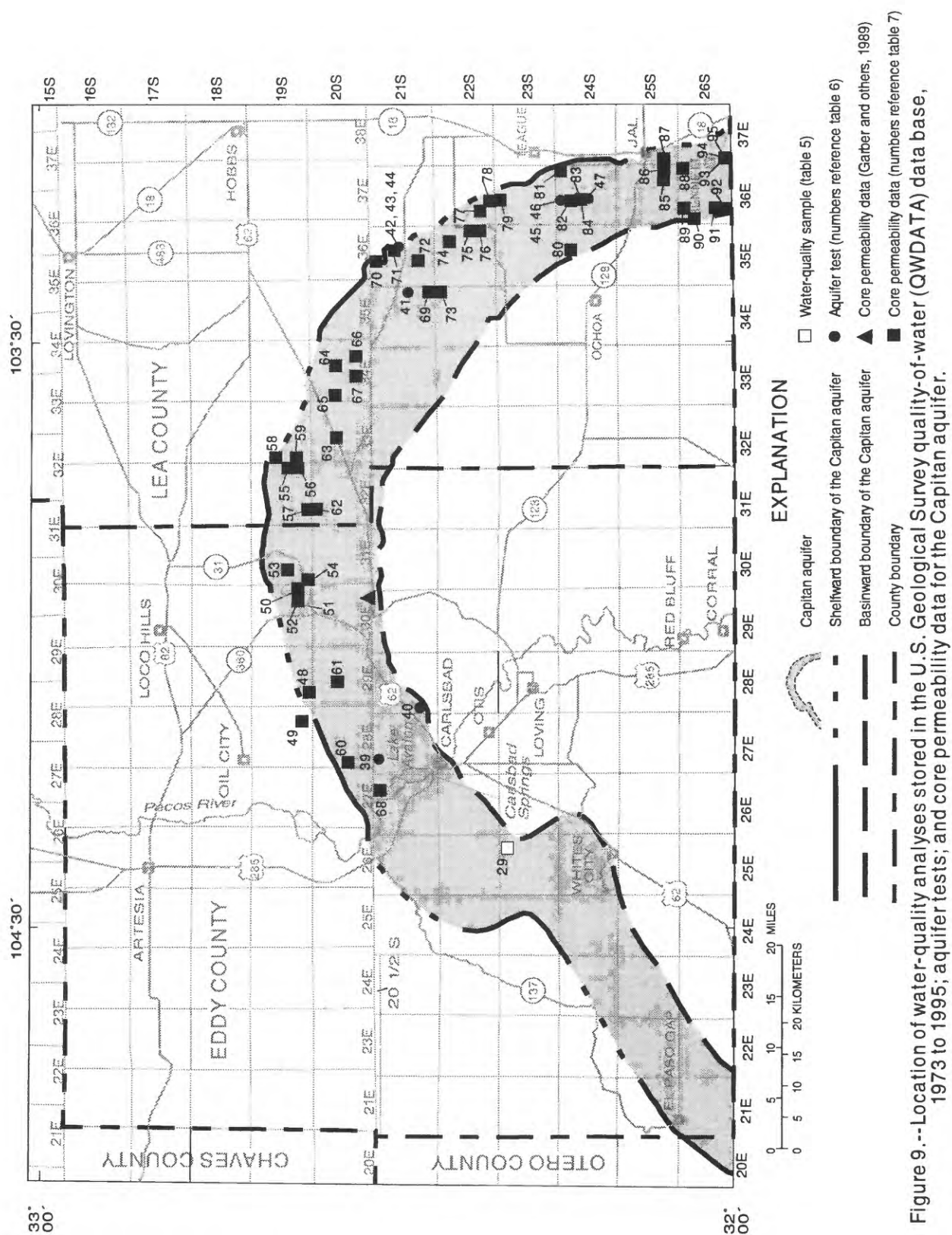


Figure 9.--Location of water-quality analyses stored in the U.S. Geological Survey quality-of-water (QWDATA) data base, 1973 to 1995; aquifer tests; and core permeability data for the Capitan aquifer.

Aquifer Tests and Permeability

The most complete source of aquifer-test data for the Capitan aquifer is Hiss (1976, p. 160-162). Richey and others (1985, p. 86) retabulated selected aquifer tests from Hiss (1976). Permeability data for a continuous core through the Capitan Reef northeast of Carlsbad were reported by Garber and others (1989). Additional values of permeability and porosity for the Capitan aquifer are shown in figure 21 of Hiss (1976). The locations of available aquifer tests and core permeability data for the Capitan aquifer are shown in figure 9. Table 6 is a list of locations and results of aquifer tests in the Capitan aquifer. Table 7 contains information on permeability and porosity determined in core samples from specified depths within the Capitan aquifer as shown in Hiss (1976, fig. 21).

Well Locations Stored in the New Mexico State Engineer Office Data Base

To determine which wells in the SEO data base tap the Capitan aquifer, the following criteria were used: (1) the well location plotted within the areal extent of the Capitan aquifer as described by Hiss (1973; 1976), (2) the well depth was within 300 feet above the top or 300 feet below the base of the Capitan aquifer according to thickness and structure maps of the Capitan aquifer (Hiss, 1976), and (3) the exact top and base of the Capitan aquifer were determined by examining gamma logs near wells passing the first two criteria; if the total well depth was between the top and base of the Capitan aquifer, the well was designated to tap the Capitan aquifer. Wells in the SEO data base that tap the Capitan aquifer are shown in figure 10. Table 8 provides the location and depth of wells in the SEO data base that tap the Capitan aquifer.

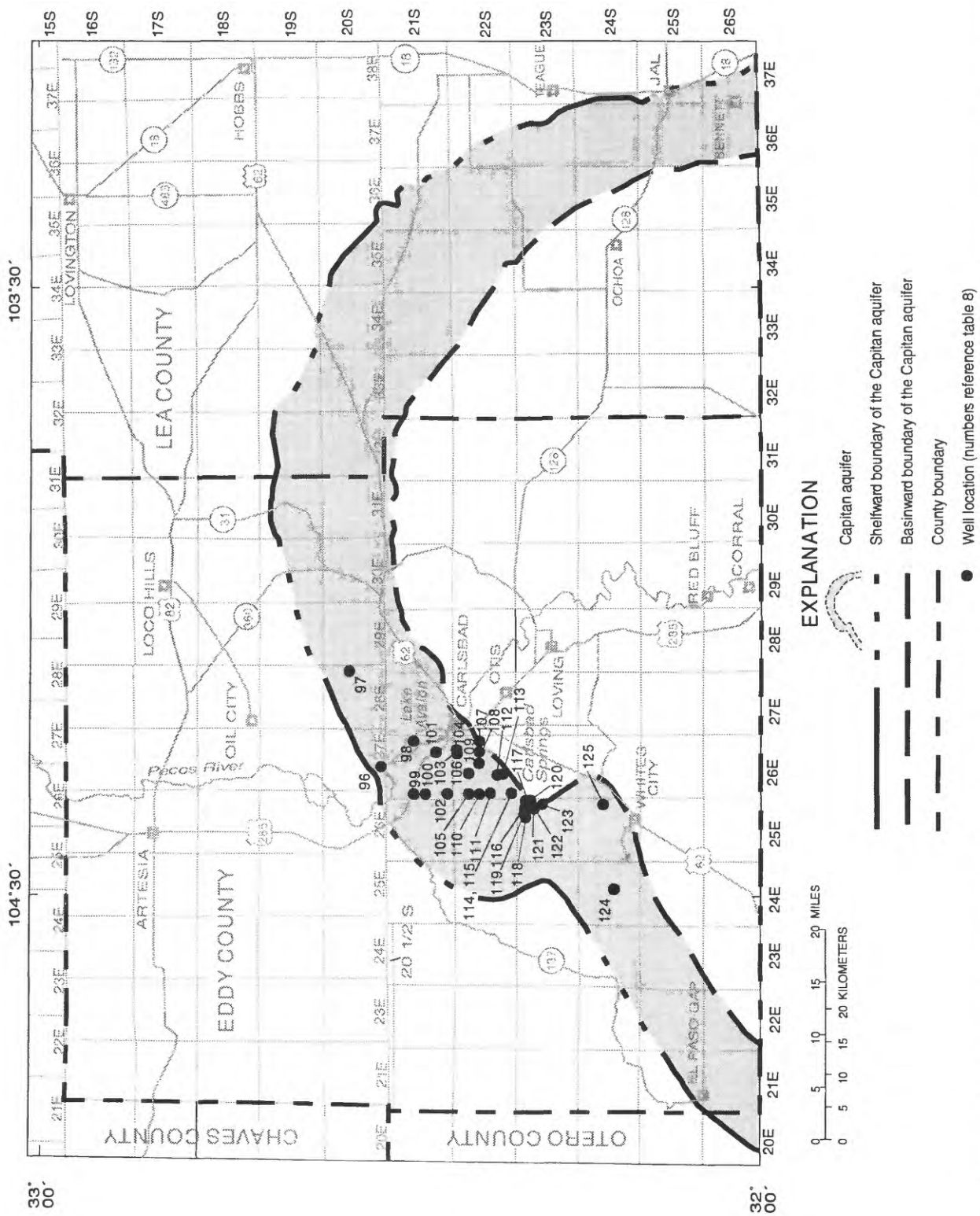


Figure 10.--Location of wells that tap the Capitan aquifer as stored in the New Mexico State Engineer Office data base.

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- Richey, S.F., Wells, J.G., and Stephens, K.T., 1985, Geohydrology of the Delaware Basin and vicinity, Texas and New Mexico: U.S. Geological Survey Water-Resources Investigations Report 84-4077, 99 p.

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base

[Primary use of water: U, unused; I, irrigation; H, domestic; P, public supply; S, stock. --, no data]

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
1	205.30E.32.341344 (Yates State 1)	323123	1035948	U.S. Geological Survey	U	2,515	3,364.20	04-09-74	325.47
2	21S.26E.23.13333	322759	1041612	--	I	418	3,143.20	01-15-76 12-14-76 01-01-78 02-15-83 03-02-94	325.70 326.57 316.22 320.30 320.41
3	21S.26E.24.423343	322745	1041424	Rayroux, L.F.	I	320	3,154.44	01-04-73 01-16-74 01-10-75 01-13-76 01-13-77 01-25-78 01-22-79 02-17-83 02-16-88 01-13-93	54.08 55.71 50.26 54.69 55.28 56.26 52.50 54.77 51.02 54.53
4	21S.26E.25.114241	322723	1041458	Donnelly, Jim	I	300	3,171.60	01-05-78	71.15
5	21S.26E.25.14241	322715	1041445	N. Mex. Game And Fish Department	I	464	3,151.20	10-19-82	51.40
6	21S.26E.25.34434	322640	1041446	Carter, Albert	I	304	3,124.65	02-16-88 01-13-93 01-04-73 01-16-74	46.24 49.90 24.27 17.60

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95, as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
7	21S.26E.25.43430	322640	1041431	Beason, A.L.	I	200	3,122.70	01-04-73 01-16-74 01-10-75	24.48 24.76 23.56
8	21S.26E.31.24344	322614	1041923	Watts, Marvin	H	250	3,311.30	02-17-83 10-13-87 01-13-93	240.93 193.56 194.37
9	21S.26E.33.11224	322637	1041800	Robbins, Marshall M.	H	308	3,265.80	01-12-78	166.02
10	21S.26E.33.44242	322557	1041714	Irwin, L.C.	H	210	3,248.70	10-13-87	144.45
11	21S.26E.36.22110 (City of Carlsbad well 13)	322637	1041423	Beason, A.L.	P	327	3,122.10	01-00-73 02-00-73 03-00-73 04-00-73 05-00-73 06-00-73 07-00-73 08-00-73 09-00-73 10-00-73 11-00-73 04-00-74 05-00-74 06-00-74 07-00-74 08-00-74 09-00-74 10-00-74 11-00-74 12-00-74 01-00-75	20.78 19.90 19.33 20.52 21.02 20.93 21.51 22.79 22.44 22.66 22.65 23.90 24.26 25.16 25.72 25.73 23.87 19.65 17.66 17.58 17.48

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
11	21S.26E.36.22110 (City of Carlsbad well 13)							02-00-75	17.35
								03-00-75	18.01
								04-00-75	18.97
								05-00-75	20.07
								06-00-75	21.09
								07-00-75	21.42
								08-00-75	21.52
								09-00-75	21.91
								10-00-75	22.56
								11-00-75	22.10
								12-00-75	21.84
								01-00-76	21.66
								02-00-76	21.81
								03-00-76	22.51
								04-00-76	22.88
								05-00-76	23.02
								06-00-76	24.02
								07-00-76	24.17
								08-00-76	24.20
								09-00-76	23.24
								10-00-76	22.91
								11-00-76	22.63
								12-00-76	22.43
								01-00-77	22.27
								02-00-77	22.07
								03-00-77	22.40
								04-00-77	23.20
								05-00-77	23.18
								06-00-77	23.78
								07-00-77	24.62
								08-00-77	24.53
								09-00-77	24.05
								10-00-77	23.73

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in		Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
						feet below land surface	feet below land surface			
11	21S.26E.36.22110 (City of Carlsbad well 13)								11-00-77	23.44
									12-00-77	23.31
									01-00-78	23.29
									02-00-78	23.07
									03-00-78	23.50
									04-00-78	23.75
									05-00-78	23.84
									06-00-78	24.29
									07-00-78	24.46
									08-00-78	24.18
									09-00-78	23.19
									10-00-78	21.69
									11-00-78	20.85
									12-00-78	20.18
									01-00-79	19.96
									02-00-79	19.83
									03-00-79	19.95
									04-00-79	20.48
									05-00-79	21.09
									06-00-79	20.89
									07-00-79	21.17
									08-00-79	20.96
									09-00-79	21.31
									10-00-79	21.63
									11-00-79	21.84
									12-00-79	21.46
									01-00-80	21.27
									02-00-80	21.10
									03-00-80	21.34
									04-00-80	22.02
									05-00-80	22.63
									06-00-80	23.43
									07-00-80	24.15

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in		Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
						feet below land	surface			
11	21S.26E.36.22110 (City of Carlsbad well 13)								08-00-80	23.91
									09-00-80	22.73
									10-00-80	21.18
									11-00-80	21.08
									12-00-80	21.11
									01-00-81	20.72
									02-00-81	20.16
									03-00-81	20.63
									04-00-81	21.30
									05-00-81	21.78
									06-00-81	22.58
									07-00-81	22.86
									08-00-81	22.74
									08-31-81	22.65
									09-00-81	22.45
									10-00-81	22.37
									11-00-81	22.27
									12-00-81	22.27
									02-00-82	22.13
									03-00-82	23.09
									03-09-82	22.77
									04-00-82	23.31
									05-00-82	23.04
									06-00-82	23.54
									07-00-82	23.63
									08-00-82	23.88
									08-18-82	23.94
									09-00-82	23.77
									10-00-82	23.32
									11-00-82	22.85
									12-00-82	22.77
									01-00-83	22.56
									02-00-83	22.31

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
11	21S.26E.36.22110 (City of Carlsbad well 13)							03-00-83	22.75
								03-23-83	22.84
								04-00-83	22.92
								05-00-83	23.50
								08-00-83	24.11
								08-22-83	24.18
								09-00-83	24.15
								10-00-83	23.43
								01-00-84	22.51
								02-00-84	22.08
								02-20-84	22.20
								03-00-84	22.37
								04-00-84	23.22
								05-00-84	23.73
								06-00-84	23.56
								07-00-84	23.37
								08-00-84	22.47
								08-21-84	21.89
								09-00-84	21.89
								10-00-84	21.89
								11-00-84	21.87
								12-00-84	21.74
								01-00-85	20.55
								01-18-85	20.79
								04-00-85	21.92
								05-00-85	22.07
								06-00-85	22.50
								07-00-85	23.01
								08-00-85	23.56
								09-00-85	23.20
								10-00-85	22.69
								11-00-85	22.51
								12-00-85	22.44

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
11	21S.26E.36.22110 (City of Carlsbad well 13)							01-00-86	21.73
								01-14-86	21.80
								02-00-86	21.30
								03-00-86	22.17
								04-00-86	22.88
								05-00-86	23.53
								06-00-86	22.57
								07-00-86	20.03
								08-00-86	20.90
								08-18-86	20.99
								09-00-86	20.65
								10-00-86	20.57
								11-00-86	18.62
								12-00-86	18.28
								01-21-87	17.96
								07-21-87	18.03
								08-17-87	18.69
								01-25-88	18.84
								02-18-88	18.22
								03-21-88	18.62
								04-15-88	19.76
								04-18-88	19.74
								05-25-88	20.84
								06-20-88	21.40
								07-21-88	21.07
								08-16-88	20.88
								09-27-88	20.49
								10-31-88	20.77
								11-21-88	21.09
								01-27-89	20.85
								02-21-89	20.97
								03-17-89	21.41
								04-27-89	22.04

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
11	21S.26E.36.22110 (City of Carlsbad well 13)							05-22-89	22.47
								06-16-89	22.43
								07-24-89	22.98
								08-28-89	22.99
								09-25-89	22.66
								10-30-89	22.31
								11-27-89	22.06
								12-18-89	21.96
								01-24-90	22.15
								02-21-90	22.07
								03-22-90	22.66
								04-19-90	22.84
								05-15-90	23.29
								06-20-90	24.23
								07-18-90	23.69
								08-21-90	23.16
								09-20-90	23.29
								10-25-90	22.99
								01-28-91	22.45
								02-22-91	22.54
								03-12-91	22.65
								03-20-91	22.88
								06-21-91	23.85
								07-23-91	23.40
								08-20-91	22.85
								09-26-91	21.38
								10-30-91	21.39
								11-21-91	21.00
								12-23-91	20.74
								01-31-92	21.04
								03-26-92	21.37
								04-24-92	21.79
								05-26-92	21.67

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in		Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
						feet below land	surface			
11	21S.26E.36.22110 (City of Carlsbad well 13)								06-29-92	19.06
									07-27-92	20.30
									10-23-92	21.02
									11-23-92	20.80
									12-22-92	21.04
									01-13-93	20.96
									02-01-93	21.87
									02-22-93	22.10
									03-24-93	22.06
									04-22-93	22.37
									05-25-93	22.81
									06-28-93	22.96
									07-21-93	22.53
									08-30-93	23.27
									09-27-93	23.17
									10-30-93	22.54
									11-30-93	22.34
									12-30-93	22.39
									01-21-94	22.70
									02-22-94	23.25
									03-23-94	23.20
									04-18-94	23.50
									06-20-94	23.43
									07-28-94	23.55
									09-15-94	23.30
									10-19-94	22.54
									11-15-94	22.28
									12-28-94	22.41
									01-23-95	23.28
									02-24-95	24.15
									03-20-95	24.56
									04-20-95	23.98
									05-16-95	23.73

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
11	21S.26E.36.22110 (City of Carlsbad well 13)							07-20-95	23.47
12	21S.27E.19.334132	322736	1041402	Forrest, Bob and Dick	I	320	3,134.60	01-04-73 01-14-74 02-18-75 01-13-76 01-13-77 01-22-79 01-20-83 02-16-84 01-18-85 02-21-86 02-16-88 01-03-93	34.11 35.72 30.25 34.48 35.36 32.70 35.30 35.05 33.70 34.36 30.90 35.02
13	21S.27E.30.42434	322653	1041315	Ives, T.O.	H	256	3,112.60	01-04-73 01-16-74 01-10-75 01-14-76 01-13-77 01-25-78 01-22-79	14.28 14.55 12.78 14.41 14.52 14.81 13.36
14	21S.27E.30.43312	322646	1041337	Nicholas, T.	I	220	3,116.80	01-12-73 01-14-74	15.38 13.91
15	21S.27E.30.441412	322649	1041320	Ives, T.O.	I	268	3,116.00	10-19-82	16.12
16	21S.27E.32.112411	322636	1041258	Loman, George	I	305	3,111.70	01-04-73 01-16-74 08-09-74 01-10-75 01-14-76	12.20 14.10 17.35 8.42 12.48

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
16	21S.27E.32.112411							01-13-77	13.40
								01-25-78	14.33
								08-17-78	13.74
								01-22-79	10.71
								08-29-79	11.69
								09-18-80	14.85
								01-20-81	11.74
								08-10-81	14.35
								02-19-82	13.08
								02-15-83	12.93
								09-14-83	14.39
								01-09-84	13.48
								08-24-84	13.37
								01-18-85	11.46
								08-28-85	14.56
								01-14-86	12.44
								08-18-86	11.87
								01-21-87	8.34
								08-12-87	9.22
								01-25-88	9.34
								08-16-88	11.47
								01-12-89	11.43
								08-28-89	13.54
								01-24-90	12.62
								08-21-90	13.93
								01-28-91	13.09
								08-20-91	13.94
								01-09-92	11.55
								08-25-92	11.73
								02-10-93	12.45
								08-30-93	14.18
17	21S.28E.17.34444	322824	1040623	Tapp, Harold	H	500	3,198.90	12-14-76	49.54

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
17	21S.28E.17.34444							01-19-83 10-15-87 03-18-88 01-13-93	47.15 49.27 47.56 47.13
18	22S.26E.01.233323	322523	1041442	City Of Carlsbad, N. Mex.	P	245	3,135.00	01-11-78	37.09
19	22S.26E.02.24241	322530	1041519	Carlsbad City Schools	P	--	3,159.80	01-11-83 02-18-88 01-07-93 01-04-73 01-14-74 01-10-75 01-14-76 01-13-77 01-25-78 01-26-79	36.64 31.78 35.04 58.18 57.73 59.85 58.64 59.22 60.20 56.52
20	22S.26E.03.111224	322546	1041711	--	H	102	3,229.10	01-10-83 03-16-88	42.22 69.04
21	22S.26E.03.344441	322456	1041649	Klein, Mark	I	167	3,185.60	01-04-73 01-14-74 01-14-76 01-13-77 01-25-78 01-18-79 01-10-83 02-18-88 01-08-93	84.87 84.10 83.87 84.98 83.61 79.09 89.07 80.35 82.12
22	22S.26E.04.344224	322500	1041750	Gerrells, Walter	I	361	3,226.20	01-11-78	125.80

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
23	22S.26E.12.11210	322452	1041504	Voight, Lee	I	206	3,133.30	01-10-78 10-21-82 01-11-83	38.10 34.87 34.29
24	22S.26E.12.341421	322411	1041454	Albright, Leroy	I	180	3,132.60	01-12-78 01-11-83 02-18-88 01-07-93	34.24 33.67 32.43 33.09
25	22S.26E.14.322331	322330	1041553	Plowman, J.R.	I	125	3,202.10	01-17-78 01-11-83 02-18-88 01-08-93	101.44 102.75 97.96 101.14
26	22S.26E.15.42200	322329	1041618	City Of Carlsbad, N. Mex.	U	443	3,254.10	01-04-73	153.30
								01-14-74 01-29-75 01-14-76 01-13-77 01-24-78 01-17-79 01-11-83 02-18-88 01-15-93	154.80 149.40 153.90 155.34 155.28 152.39 154.95 150.14 153.69
27	22S.26E.20.31412	322235	1041910	--	S	257	3,346.60	01-06-78 01-19-83 10-16-87 01-12-93	221.03 220.00 220.39 221.56
28	22S.26E.28.41310	322140	1041746	Echols, W.R.	U	580	3,299.72	01-04-73 01-14-74 01-29-75	198.65 200.20 194.75

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Continued

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
29	23S.25E.02.44322	321940	1042133	City Of Carlsbad, N. Mex.	U	927	3,504.20	01-04-73	403.04
								01-25-73	403.45
								02-01-73	403.55
								03-29-73	404.90
								04-19-73	403.80
								01-14-74	404.62
								10-03-74	404.70
								11-29-74	402.70
								12-31-74	402.53
								01-29-75	400.48
								01-30-75	404.58
								02-27-75	405.80
								03-00-75	404.55
								04-02-75	404.55
								05-30-75	405.90
								06-00-75	407.38
								07-01-75	407.38
								08-27-75	407.90
								09-30-75	407.85
								01-23-76	403.52
								04-00-76	406.55
								05-00-76	406.55
								06-00-76	406.55
								07-30-76	400.50
								09-02-76	405.25
								10-01-76	405.21
								11-30-76	405.15
								01-03-77	405.20
								01-28-77	403.52
								02-28-77	405.47
								04-01-77	405.50
								05-31-77	405.49
								06-30-77	405.49

Table 3.--Measured water levels in the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey Ground-Water Site-Inventory (GWSI) data base--Concluded

Se- quen- tial num- ber	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
29	23S.25E.02.44322							07-28-77	405.50
								08-31-77	405.50
								10-03-77	405.50
								12-01-77	405.50
								02-22-78	405.03
								09-29-78	405.55
								10-31-78	405.50
								12-01-78	405.55
								02-02-79	405.55
								03-02-79	405.50
								04-30-79	405.55
								06-01-79	405.55
								07-31-79	405.50
								08-31-79	405.55
								09-28-79	405.55
								10-30-79	405.55
								12-31-79	405.55
								02-01-80	405.55
								03-31-80	405.55
								05-01-80	405.55
								06-30-80	405.55
								07-31-80	405.55
								09-01-80	405.55
								10-01-80	405.55
								12-01-80	405.55
								01-12-83	382.69
30	23S.25E.12.33224	321855	1042106	City Of Carlsbad, N. Mex.	U	790	3,504.50	01-04-73	401.85
								01-14-74	403.25
								02-11-75	397.47
								02-22-78	403.71
								01-12-83	405.95
31	24S.25E.34.22111A	321055	1042236	--	P	1,200	3,927.40	01-17-78	823.20

Table 4.--Measured water levels in the Tansill Formation, Eddy and Lea Counties,
New Mexico, 1973-95, as stored in the U.S. Geological Survey Ground-Water
Site-Inventory (GWSI) data base

[Primary use of water: I, irrigation; S, stock; H, domestic; U, unused. --, no data]

Sequential number	Local well number	Latitude	Longitude	Owner	Primary use of water	Depth of well, in feet below land surface	Altitude of land surface, in feet above sea level	Water- level date	Water level, in feet below land surface
32	20S.27E.21.31112	323336	1041735	Clayton, Leon	I	190	3,217.00	02-28-84 02-14-89 02-10-93 02-11-94	111.91 110.03 111.89 115.03
33	21S.26E.35.122214	322639	1041545	Hoose, E.M.	S	87	3,184.12	01-13-78 01-05-83 02-09-88 05-04-92	83.46 82.26 78.09 82.42
34	21S.26E.35.213414	322629	1041537	McLaughlin, Harold	H	120	3,154.73	01-04-78 02-07-83	56.51 55.51
35	22S.26E.09.12213	322452	1041756	Leck	S	--	3,230.20	01-11-78 01-11-83	135.77 130.73
36	22S.27E.05.142314	322530	1041242	Joyce, John	I	400	3,161.00	01-18-78 01-27-83 01-05-93	90.46 88.46 85.40
37	24S.26E.06.32130	321446	1042008	White, John H.	U	125	3,629.70	01-19-78 01-10-83 10-08-87 04-08-88 05-13-93	60.09 61.88 64.61 65.32 67.33
38	24S.26E.07.34122	321345	1041948	Judkins, Gratton E.	U	330	3,565.00	02-01-78 01-10-83 10-08-87 10-21-92	124.27 122.33 117.02 123.63

Table 5.--Water-quality data for the Capitan aquifer, Eddy and Lea Counties, New Mexico, 1973-95,
as stored in the U.S. Geological Survey quality-of-water (QWDATA) data base

[Well location shown in figure 6 (well 29). deg C, degrees Celsius; gal/min, gallons per minute; μ S/cm, microsiemens
per centimeter at 25 deg C; mg/L, milligrams per liter; wat wh tot fet, water whole total fixed end-point titration;
noncarb wh wat tot, fld, noncarbonate whole water total, field; < less than]

Local well number	Date	Time	Temperature water (deg C)	Flow rate, instantaneous (gal/min)	Specific conductance (μ S/cm)	pH water whole field (stand- ard units)	Carbon dioxide, dis- solved (mg/L as CO ₂)	Alkalinity water total field (mg/L as CaCO ₃)	Bicarbonate water total field (mg/L as HCO ₃)
23S.25E.02.44322	06-16-77	1508	22.0	2,080	690	7.2	27	220	270

Nitrogen, NO ₂ +NO ₃ , dis- solved (mg/L as N)	Phosphate, ortho, dis- solved (mg/L as PO ₄)	Phosphorus ortho, dis- solved (mg/L as P)	Hardness, total (mg/L as CaCO ₃)	Hardness noncarbo- hydrate total, fld (mg/L as CaCO ₃)	Calcium, dis- solved (mg/L as Ca)	Magnesium, dis- solved (mg/L as Mg)	Sodium, dis- solved (mg/L as Na)	Sodium adsorp- tion ratio
1.00	0.06	0.020	330	110	78	34	32	0.8

Sodium percent	Potassium, dis- solved (mg/L as K)	Chloride, dis- solved (mg/L as Cl)	Sulfate, dis- solved (mg/L as SO ₄)	Fluoride, dis- solved (mg/L as F)	Silica, dis- solved (mg/L as SiO ₂)	Iron, dis- solved (μ g/L as Fe)	Manganese, dis- solved (μ g/L as Mn)	Solids, sum of constituents, dis- solved (mg/L)
17	1.6	45	100	0.40	14	<10	4	442

Table 6.--Locations and results of aquifer tests in the Capitan aquifer as reported by Hiss (1976, p. 160-162)

Sequential number (fig. 9)	Location of aquifer test	Date of aquifer test	Top of interval tested (feet below land surface)	Bottom of interval tested (feet below sea level)	Hydraulic conductivity (feet/day)
39	21S.27E.05	08-12-69	1,007	1,014	2.4
40	21S.28E.30	08-09-61	640	1,060	16
41	21S.34E.24	01-14-65	3,547	5,020	3.0
42	21S.35E.14	07-08-62	4,178	4,663	1.7
43	21S.35E.14	12-14-66	4,178	4,663	1.9
44	21S.35E.14	12-15-66	4,178	4,663	1.4
45	24S.36E.04	02-28-68	3,875	4,500	24
46	24S.36E.04	02-28-68	3,875	4,500	25
47	24S.36E.16	10-04-67	3,995	4,500	4.4

Table 7.--Permeability and porosity data for core samples from the
Capitan aquifer as shown by Hiss (1976, fig. 21)

[<, less than]

Sequen- tial num- ber (fig. 9)	Land network location of core samples	Formation name	Depth to top of the cored interval, in feet below land surface	Length of cored interval, in feet	Average perme- ability, in millidarcies	Average effective porosity, in percent
48	19S.29E.32.1	Yates	1,382	22	<1	4
49	19S.28E.35.1	Yates	1,576	2	<1	14
50	19S.30E.25.2	Yates	1,744	101	18	13
51	19S.30E.26.1	Yates	1,869	80	12	8
52	19S.30E.26.1	Seven Rivers	1,759	59	2	11
53	19S.31E.20.3	Queen	2,143	42	<1	6
54	19S.31E.31.4	Yates	2,184	17	2	8
55	19S.32E.24.4	Yates	2,961	58	2	16
56	19S.32E.25.2	Yates	2,988	22	1	16
57	19S.32E.32.2	Yates	2,493	152	<1	7
58	19S.33E.18.3	Seven Rivers	3,254	7	15	11
59	19S.33E.30.2	Yates	3,003	43	70	13
60	20S.28E.19.3	Yates	915	31	<1	9
61	20S.29E.16.1	Yates	1,132	94	4	9
62	20S.32E.05.2	Yates	2,635	33	1	12
63	20S.33E.16.2	Yates	3,040	186	5	8
64	20S.34E.15.3	Yates	3,608	16	3	16
65	20S.34E.18.1	Yates	3,395	67	5	15
66	20S.34E.26.3	Seven Rivers	3,500	63	2	14
67	20S.34E.28.4	Grayburg	4,428	15	58	13
68	21S.26E.02	Yates	313	28	51	15
69	21S.34E.36.2	Yates	3,776	18	<1	14
70	21S.35E.36.2	Seven Rivers	3,791	17	8	20
71	21S.35E.14	Yates	3,832	54	<1	12
72	21S.35E.28	Seven Rivers	4,077	13	4	13

Table 7.--Permeability and porosity data for core samples from the Capitan aquifer as shown by Hiss (1976, fig. 21)--Concluded

Sequen- tial num- ber (fig. 9)	Land network location of core samples	Formation name	Depth to top of the cored interval, in feet below land surface	Length of cored interval, in feet	Average perme- ability, in millidarcies	Average effective porosity, in percent
73	22S.34E.01.3	Yates	3,773	55	12	14
74	22S.35E.11.4	Yates	3,832	96	5	19
75	22S.35E.24.1	Yates	3,682	96	4	14
76	22S.35E.25.3	Yates	3,718	38	1	15
77	22S.36E.29.2	Queen	3,651	157	1	7
78	22S.36E.33.4	Seven Rivers	3,381	393	2	6
79	23S.36E.04.4	Yates	3,135	558	5	7
80	24S.35E.10.1	Tansill	3,777	16	1	8
81	24S.36E.01.2	Queen	3,428	34	<1	30
82	24S.36E.09.3	Yates	3,501	84	<1	12
83	24S.36E.16.1	Yates	3,486	72	<1	9
84	24S.36E.16.3	Queen	3,722	89	16	10
85	25S.36E.25.1	Yates	3,054	79	1	8
86	25S.36E.26	Yates	3,130	35	2	11
87	25S.37E.30.2	Seven Rivers	3,105	141	310	5
88	26S.36E.01	Yates	2,833	60	<1	3
89	26S.36E.05	Seven Rivers	3,353	97	<1	4
90	26S.36E.07	Tansill	3,286	58	12	5
91	26S.36E.20	Tansill	3,405	25	<1	7
92	26S.36E.29	Tansill	3,189	121	<1	6
93	26S.36E.30	Tansill	2,790	171	<1	2
94	26S.37E.30	Yates	2,923	408	33	8
95	26S.37E.30	Yates	2,926	220	3	8

Table 8.--Depth and location of wells in the New Mexico State Engineer Office data base that tap the Capitan aquifer

Sequential number (fig. 10)	Land network location	Latitude	Longitude	Depth of well (feet below land surface)	Altitude of bottom of well (feet above sea level)
96	20S.27E.33.42	323139	1041638	805	2,434
97	20S.28E.13.14434	323429	1040752	1,183	2,062
98	21S.26E.13.234	322851	1041427	775	2,482
99	21S.26E.18.33233	322831	1042008	360	2,989
100	21S.26E.19.44122	322744	1041924	465	2,935
101	21S.26E.26.132144	322716	1041602	995	2,149
102	21S.26E.31.242124	322626	1041920	618	2,697
103	22S.26E.02.122	322547	1041547	409	2,796
104	22S.26E.02.242231	322532	1041519	560	2,621
105	22S.26E.07.21123	322452	1041948	630	2,969
106	22S.26E.09.2232	322447	1041727	602	2,623
107	22S.26E.13.112	322401	1041501	287	2,864
108	22S.26E.14.22214	322359	1041520	220	2,943
109	22S.26E.15.322	322315	1041648	443	2,861
110	22S.26E.18.11	322349	1042008	719	2,879
111	22S.26E.19.244	322243	1041922	633	2,719
112	22S.26E.28.322	322149	1041750	580	2,699
113	22S.26E.28.13123	322200	1041816	206	3,089
114	22S.26E.31.31244	322050	1042008	365	3,038
115	22S.26E.31.31244	322050	1042008	389	3,014
116	23S.25E.01.3311	321949	1042119	590	3,001
117	23S.25E.01.4311	321949	1042049	930	2,571
118	23E.25S.02.3422	321949	1042151	428	3,142
119	23E.25S.02.4413	321944	1042134	678	2,874
120	23S.25E.12.2142	321930	1042035	878	2,558
121	23S.25E.12.3122	321910	1042105	758	2,746
122	23S.25E.12.3322	321857	1042105	790	2,709
123	23S.25E.13.1144421	321833	1042105	1,000	2,499
124	24S.24E.22.24411	321221	1042837	1,816	2,784
125	24S.25E.13.24121	321320	1042030	350	3,252