Ground-Water Conditions in the Anza-Terwilliger Area, with Emphasis on the Cahuilla Indian Reservation, Riverside County, California, 1973-86

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CONVERSION FACTORS

The inch-pound system of units is used in this report. For readers who prefer metric (International System) units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
acre	0.4047	hectare
acre-foot (acre-ft)	0.001233	cubic hectometer
acre-foot per year (acre-ft/yr)	0.001233	cubic hectometer per annum
foot (ft)	0.3048	meter
gallon per day (gal/d)	0.003785	cubic meter per day
gallon per minute (gal/min)	0.06309	liter per second
gallon per minute per foot [(gal/min)/ft]	0.2070	liter per second per meter
inch (in.)	25.4	millimeter
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer

Abbreviations used:

mg/L - milligram per liter
µg/L - microgram per liter
µS/cm - microsiemen per centimeter at 25 °Celsius.

ALTITUDE DATUM

In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

GROUND-WATER CONDITIONS IN THE ANZA-TERWILLIGER AREA,

WITH EMPHASIS ON THE CAHUILLA INDIAN RESERVATION,

RIVERSIDE COUNTY, CALIFORNIA, 1973-86

By Linda R. Woolfenden and Daniel J. Bright

ABSTRACT

Demand for ground water in the 96-square mile Anza-Terwilliger area has increased in recent years because of population growth and agricultural development. During 1950-73, the water table declined and chemical analyses showed elevated concentrations of nitrate in water from five wells. The U.S. Bureau of Indian Affairs is concerned that continued growth will cause greater water-table declines and further degrade ground-water quality at the Cahuilla Indian Reservation.

Water-level measurements indicate that, as in previous years, ground water normally moves toward streams in Anza and Terwilliger Valleys. However, during the summer, when pumping is at a maximum, ground water moves toward two areas of ground-water withdrawals in Anza Valley. One area where ground-water levels were lowered extends to the northern boundary of Cahuilla Indian Reservation.

Ground-water use during 1986 is estimated at 10,000 acre-feet, 6,000 acre-feet more than in 1973. The water table, however, generally has risen since 1973. The rise is due to the wet climatic conditions that generally have prevailed since 1976, resulting in above average recharge.

Dissolved-solids concentrations in water from the wells sampled ranged from 184 to 1,320 milligrams per liter. During 1986, water from 14 wells of the 38 locations sampled had dissolved-solids concentrations greater than 500 milligrams per liter, which is the U.S. Environmental Protection Agency recommended limit for public water supplies. Two of these 14 wells are on Cahuilla Indian Reservation.

Nitrate (as nitrogen) concentrations ranged from 0.0 to 170 milligrams per liter. Water from 8 wells of the 38 locations sampled had nitrate concentrations higher than the U.S. Environmental Protection Agency recommended limit of 10 milligrams per liter. None of these eight wells are on Cahuilla Indian Reservation.

The observation-well network was found to be generally adequate for detecting changes in water levels and water quality, but the addition of one water-level observation well and two water-quality observation wells would further enhance its effectiveness.

INTRODUCTION

Demand for ground water in the rural Anza-Terwilliger area has increased significantly because of population growth and establishment of irrigated crops on previously unirrigated land. A previous study based on 1973 information (Moyle, 1976) identified water-table depressions adjacent to the Cahuilla Indian Reservation that had increased the hydraulic gradient and caused the ground water beneath the reservation to flow toward the depressions. The study also indicated that water from five wells outside the reservation contained concentrations of nitrate that exceeded the limit recommended by the U.S. Environmental Protection Agency for public water supplies. The U.S. Bureau of Indian Affairs is concerned that continued population growth and increases in irrigation will cause greater water-table declines and further degradation of the quality of ground water at Cahuilla Indian Reservation.

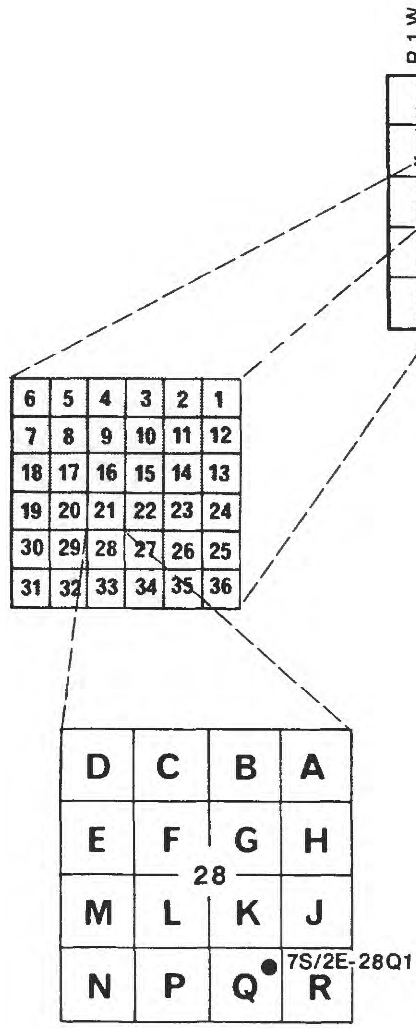
Purpose and Scope

This report, prepared in cooperation with the U.S. Bureau of Indian Affairs, evaluates the present (1986) occurrence, movement, and discharge of ground water, and documents changes in chemical quality that have occurred in the Anza-Terwilliger area during 1973-86. The present observation-well network, established in 1973, is evaluated to determine its effectiveness in detecting water-level and water-quality changes.

The study involved: (1) updating the well inventory and measuring water levels in 100 wells; (2) updating water-use data from current land-use and population data; and (3) sampling 30 wells, 5 springs, and 3 locations along Cahuilla Creek for chemical analyses.

Well- and Spring-Numbering System

Wells and springs are numbered according to their location in the rectangular system for the subdivision of public land. For example, in the number 7S/2E-28Q1 the part of the number preceding the slash indicates the township (T. 7 S.), the part between the slash and the hyphen indicates the range (R. 2 E.), the number between the hyphen and the letter indicates the section (sec. 28), and the letter indicates the 40-acre subdivision of the section. Within the 40-acre tract wells are numbered serially, as indicated by the final digit. Thus, well 7S/2E-28Q1 is the first well to be listed in the SW1/4SE1/4 sec. 28, T. 7 S., R. 2 E., San Bernardino base line and meridian as shown on the facing page. The numbering of springs is the same as for wells except that an S is placed between the 40-acre letter and the final digit (as in 7S/2E-26GS1).



Well- and Spring-Numbering Diagram

DESCRIPTION OF STUDY AREA

The Anza-Terwilliger study area (fig. 1) is in Riverside County about 90 miles southeast of Los Angeles. The 96-mi^2 study area is in the upper part of the Santa Margarita River and Coyote Creek hydrologic basins and includes the Cahuilla Indian Reservation. The Anza-Terwilliger area is drained by two ephemeral creeks, Cahuilla Creek and Coyote Creek. Anza, Burnt, Cahuilla, Durasna, and Durasno Valleys are drained by Cahuilla Creek (fig. 2). These valleys consist of 82 mi^2 and are designated the Anza area in this report. Terwilliger Valley, drained by Coyote Creek, consists of 14 mi^2 and is designated the Terwilliger area. The 29-mi^2 Cahuilla Indian Reservation extends into both the Anza and Terwilliger areas.

The main aquifer is composed of unconsolidated alluvial deposits that are bounded by consolidated rocks in the San Jacinto Mountains on the east and northeast, Cahuilla Mountain on the northwest, and low hills on the south. The alluvial deposits are dissected near the mountains, resulting in an undulating topography. Toward the center of the valleys, the deposits are less dissected and the relief is lower. The Anza-Terwilliger area slopes from east to west, and land-surface altitudes range from 6,890 feet above sea level on Thomas Mountain at the northern edge of the study area to 2,260 feet in the west where Cahuilla Creek exits the study area.

The study area has a semiarid climate, with warm, dry summers and cool winters. Most precipitation, partly snow, occurs during November-April; the rest of the precipitation, generally insignificant in comparison, occurs as scattered summer thundershowers. Precipitation data were collected at Anza by the California Department of Forestry from January 1943 to December 1986. Average annual precipitation for the period of record is 14.51 inches (table 1). Monthly precipitation throughout the period of record ranged from 0 inches for several months to a high of 11.61 inches in February 1980.

The current (1986) population of the study area is about 4,000. Of this total, about 50 people reside on Cahuilla Indian Reservation (Eugene Madrigal, business manager, Cahuilla Indians, oral commun., 1986) and about 1,300 reside near Anza, the principal town; the rest of the population is scattered throughout the study area.

The Anza-Terwilliger area is primarily an agricultural community. Figure 2 shows the distribution of land use throughout the study area. Land use was obtained from aerial photographs of 1984 and 1985 and was field checked in April 1986. Land-use categories include lake or reservoir, irrigated apple trees, irrigated potatoes, irrigated pasture, grain crops, ground water at land surface, and natural pasture (where ground water is within 10 feet of land surface). A large part of the study area is undefined and consists of residential areas, small businesses, unirrigated pasture, and brush. Residential and business areas are small compared to pasture and brush areas.

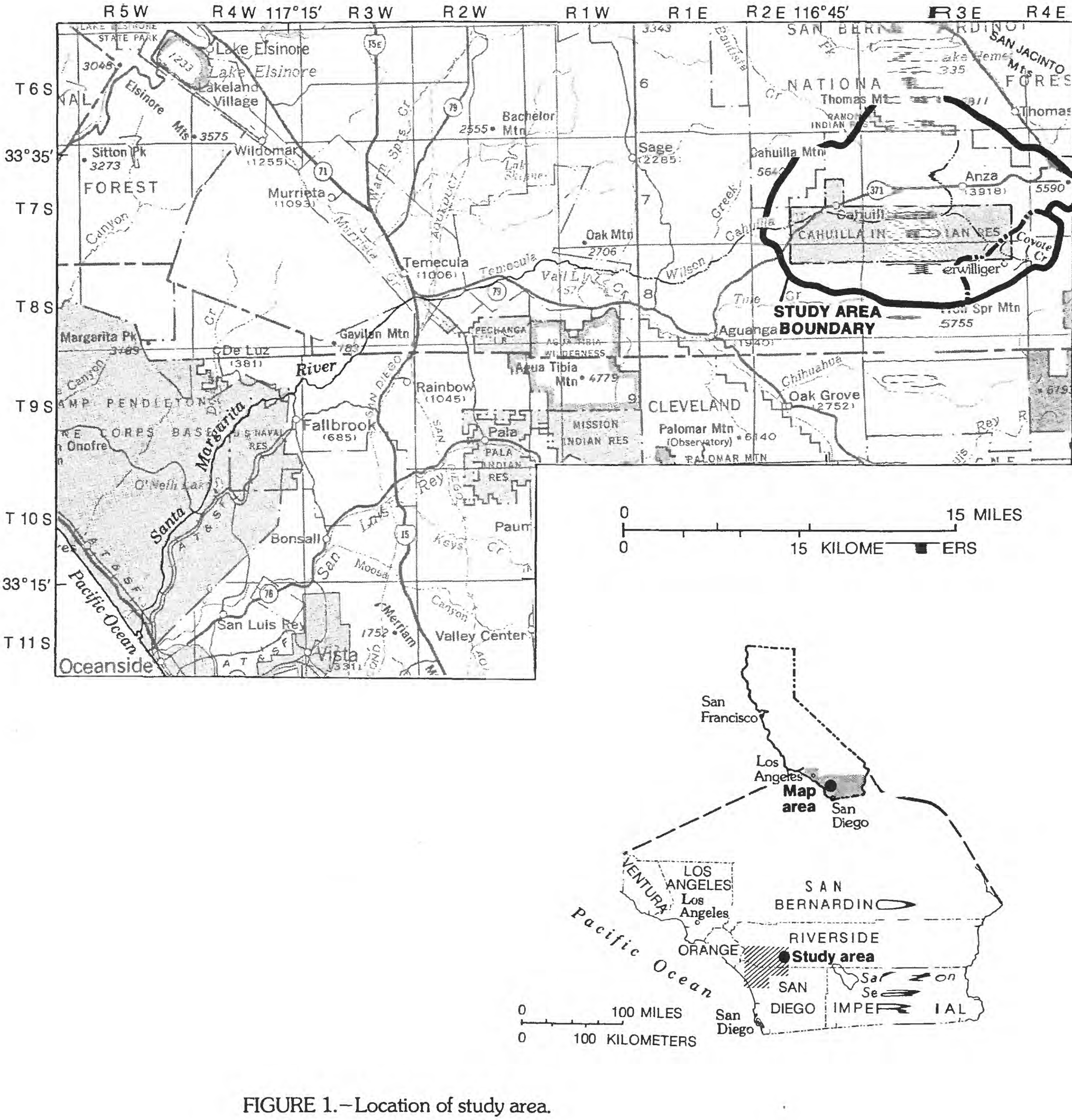


FIGURE 1.—Location of study area.

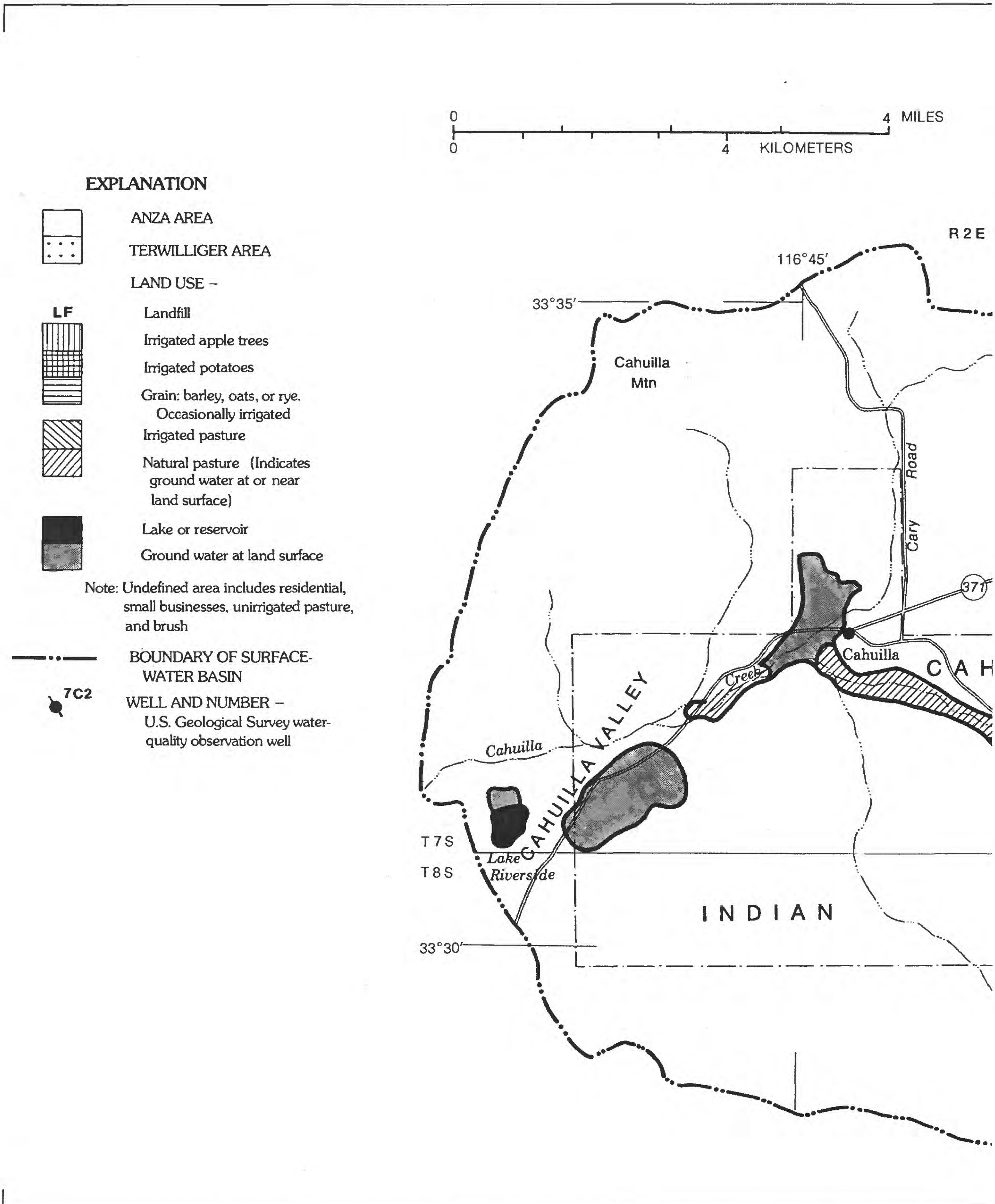


FIGURE 2.—Land use, 1986.

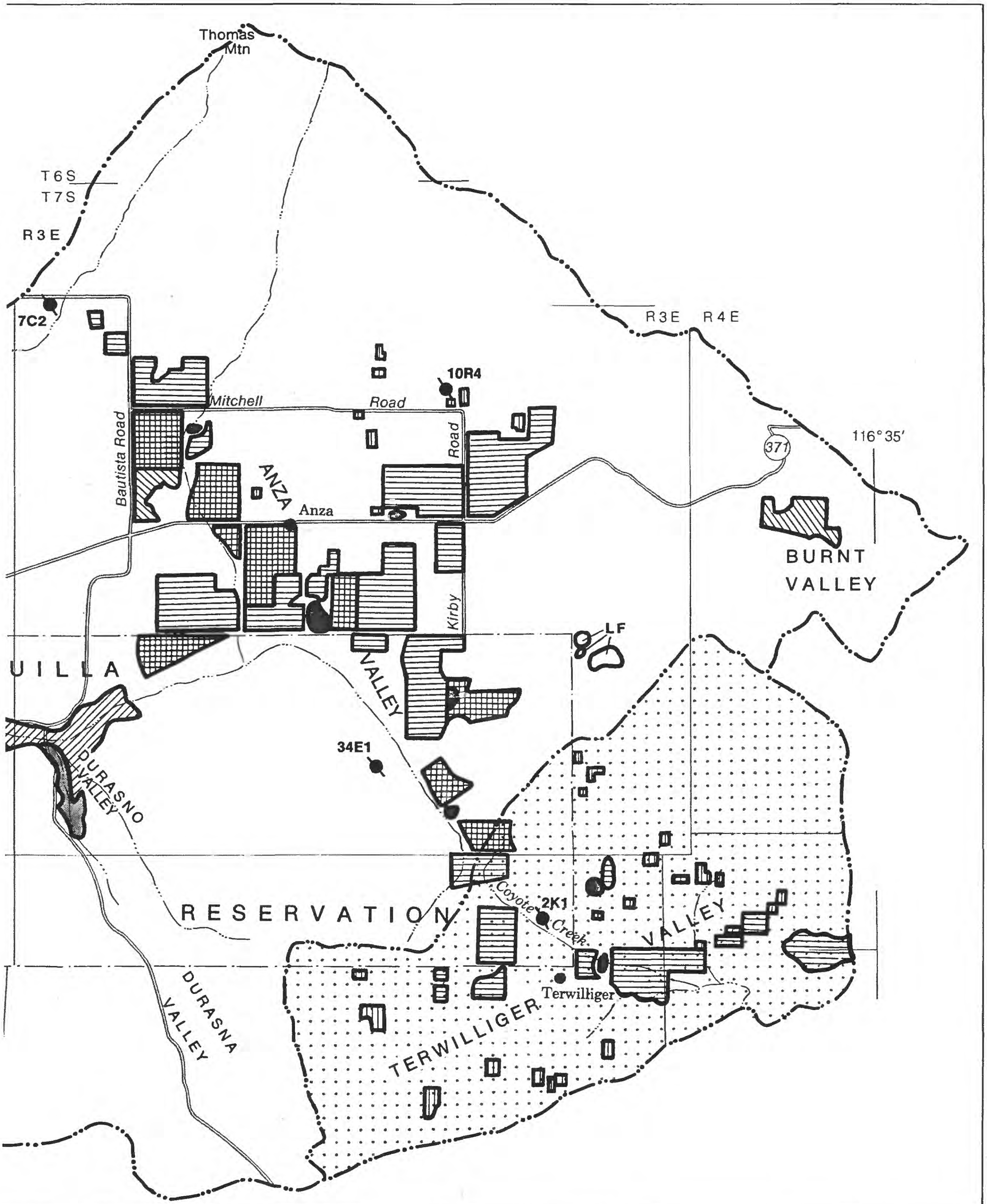

Thomas Mtn
T6S
T7S
R3E
7C2
R3E R4E
10R4
Mitchell Road
Bautista Road
Road
371
116°35′
ANZA
Anza
BURNT VALLEY
Kirby
LF
UILLA
VALLEY
34E1
DURASNO VALLEY
RESERVATION
Coyote Creek
2K1
VALLEY
Terwilliger
TERWILLIGER
DURASNA VALLEY

Table 1.--Annual precipitation at Anza, 1943-86

[Data are from California State Department of Forestry station at Anza and are for calendar years. Precipitation: +, above average; -, below average]

Year	Precipitation (inches)	Year	Precipitation (inches)	Year	Precipitation (inches)
1943	22.38+	1958	16.94+	1973	11.66-
1944	15.51+	1959	9.56-	1974	11.07-
1945	17.50+	1960	11.57-	1975	11.07-
1946	14.11-	1961	6.10-	1976	17.15+
1947	9.72-	1962	10.59-	1977	13.69-
1948	7.19-	1963	15.50+	1978	29.07+
1949	8.09-	1964	11.61-	1979	16.49+
1950	7.28-	1965	20.06+	1980	29.86+
1951	25.21+	1966	14.25-	1981	11.47-
1952	17.46+	1967	18.45+	1982	23.47+
1953	5.65-	1968	7.81-	1983	27.97+
1954	11.82-	1969	18.58+	1984	16.09+
1955	9.96-	1970	15.02+	1985	10.52-
1956	5.24-	1971	8.82-	1986	16.54+
1957	21.44+	1972	9.02-		
Average annual precipitation (1943-86).........................					14.51

Lake Riverside is a manmade, private recreational lake in Cahuilla Valley. Throughout the study area there are several other manmade reservoirs that are used for irrigating crops. A constant water level is maintained in the reservoirs throughout the year by pumping of ground water (Jesse Pinales, foreman, Agri-Empire, oral commun., 1986). Water is pumped from high-capacity wells into the irrigation reservoirs and is used for irrigation of potatoes and, when necessary, of grain crops.

Apples are becoming an increasingly important crop in the study area. Minimum residential parcel size off the reservation is 2.5 acres, and many residents have small apple orchards. There are an estimated 30,000 apple trees in the study area (Anza Growers Association, oral commun., 1986). Most water for irrigation of these orchards is pumped from domestic wells. Virtually all the orchards are irrigated by drip systems that use water more efficiently than other methods because there is less loss from runoff, ponding, and evaporation.

Potatoes, the principal irrigated crop in the study area, are planted on selected parcels every third year. In the interim, grain crops (barley, oats, or rye) are grown. Potatoes are planted in April and harvested in October. During this time, irrigation is nearly continuous. The grain crops are occasionally irrigated. Most of the water for irrigation is pumped from the reservoirs and applied by sprinklers. Some land in the eastern part of Cahuilla Indian Reservation is used for growing potatoes and grain crops.

A significant part of the study area is unirrigated pasture. Much of the unirrigated pasture on Cahuilla Indian Reservation is used to graze cattle. Some cattle also are grazed in Durasna Valley south of the reservation and in Cahuilla Valley west of the reservation. Water for cattle is provided by both springs and wells.

Table 2 shows the acreages of selected land uses for 1973 and 1986. It is evident that there has been a significant increase in the amount of land devoted to growing both irrigated and grain crops. Of particular importance in terms of water use, is the tenfold increase in acreage of grain crops. The amounts of natural pasture and ground water at land surface also have increased significantly; these land uses are mainly in the western and central parts of the study area.

Most households and businesses in the study area obtain their water from individual domestic wells. There are two very small water districts in the study area--one in central Anza Valley and the other in the Table Mountain area of Terwilliger Valley.

Table 2.--Changes in acreage for selected land uses, 1973-86

Land use	Total number of acres		Change in acreage (1973-86)	Percent difference (rounded)
	1973	1986		
Irrigated crops	460	1,330	870	190
Natural pasture	120	570	450	380
Lakes and reservoirs	140	110	-30	-20
Ground water at land surface	320	730	410	130
Grain crops	210	2,270	2,060	980

GEOHYDROLOGY

Geology of the study area has been described in previous reports by Moyle (1976) and Giessner and Mermod (1974). Igneous and metamorphic rocks crop out in the mountains and low hills of the study area. Hydraulic characteristics of the consolidated rocks are markedly different from those of the unconsolidated alluvial deposits that occur mainly along streams and other low-lying areas.

Geology and location of wells, springs, and surface-water sampling sites inventoried in 1985 and 1986 are shown in figure 3. Well-construction data for sites visited during 1985-86 are given in Supplemental Data A.

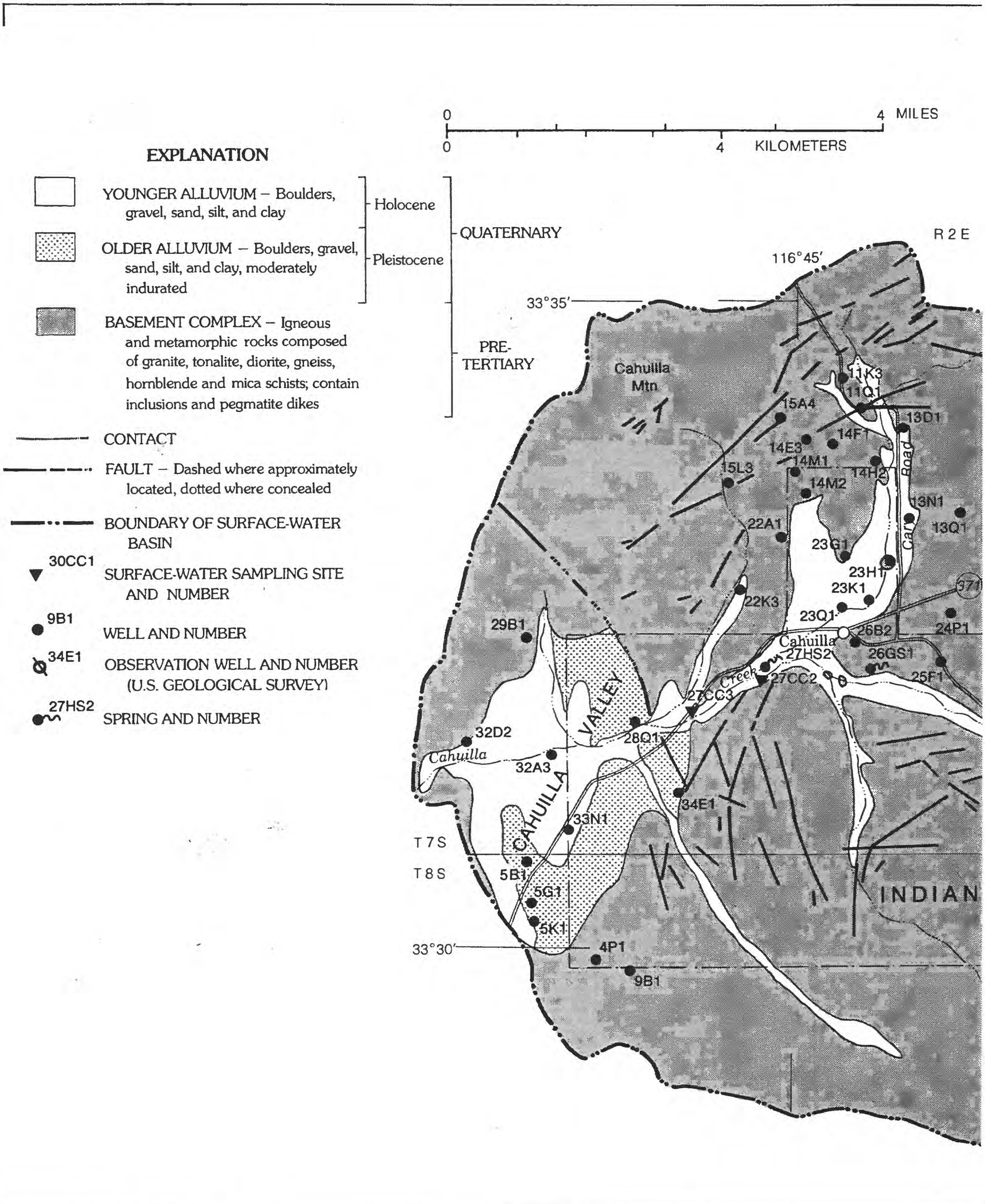
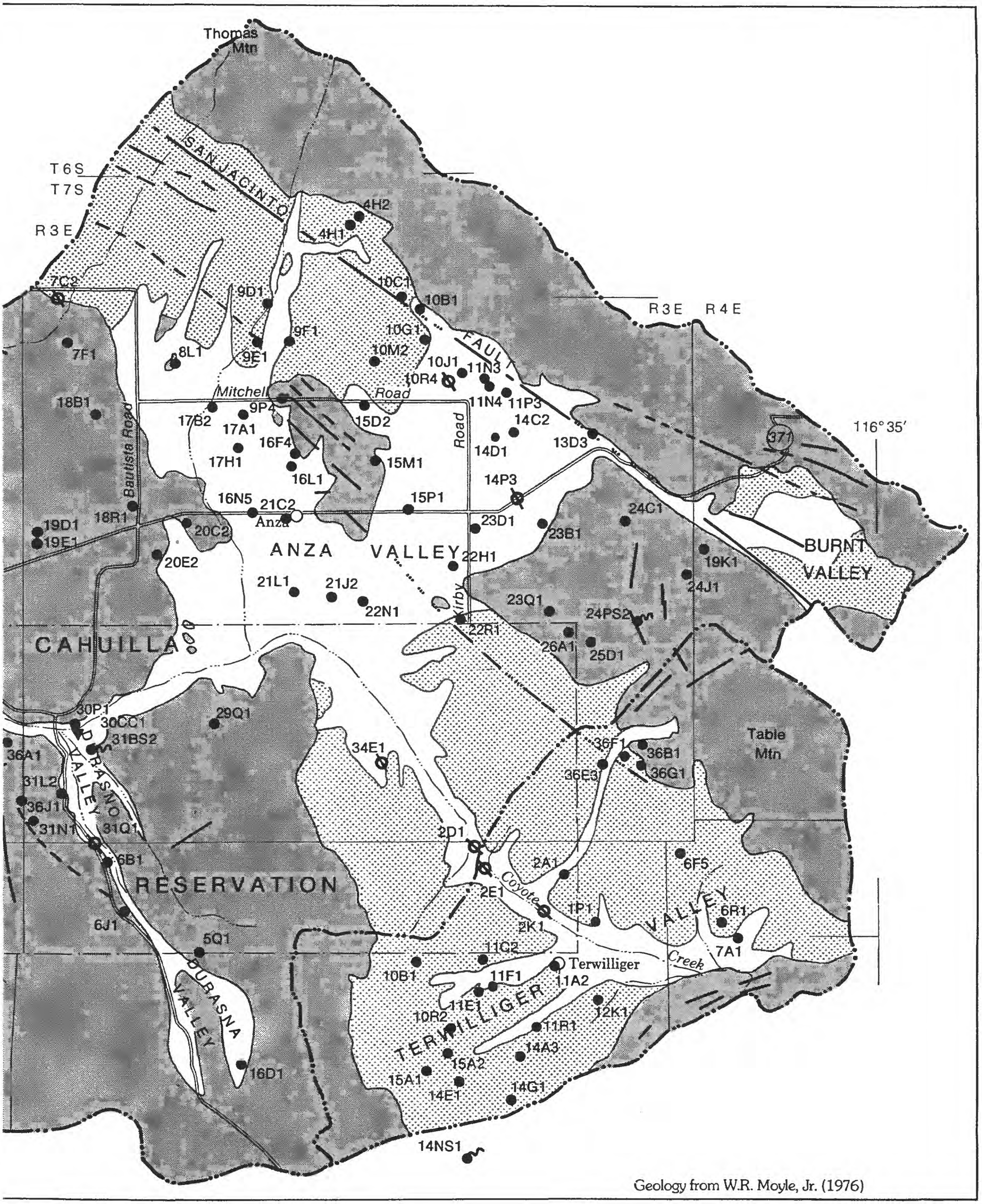


FIGURE 3.—Geology and location of wells, springs, and surface-water sampling sites.


Thomas Mtn
T 6 S
T 7 S
R 3 E
SAN JACINTO
FAULT
R 3 E
R 4 E
116° 35′
Mitchell
Road
Bautista Road
Road
Anza
ANZA VALLEY
Kirby
BURNT VALLEY
CAHUILLA
RESERVATION
DURASNO VALLEY
DURASNA VALLEY
Table Mtn
Coyote
Creek
VALLEY
Terwilliger
TERWILLIGER
7C2
7F1
18B1
8L1
9D1
9E1
9F1
4H2
4H1
10C1
10B1
10G1
10M2
10J1
10R4
11N3
11N4
11P3
14C2
14D1
13D3
371
17B2
9P4
17A1
15D2
16F4
17H1
16L1
15M1
14P3
16N5
21C2
15P1
18R1
19D1
19E1
20C2
23D1
23B1
24C1
20E2
22H1
19K1
24J1
21L1
21J2
22N1
23Q1
24PS2
22R1
26A1
25D1
30P1
30CC1
31BS2
29Q1
36A1
34E1
36F1
36B1
36E3
36G1
31L2
36J1
31N1
31Q1
2D1
6B1
2A1
6F5
2E1
2K1
1P1
6R1
6J1
7A1
5Q1
11C2
10B1
11F1
1.1A2
11E1
12K1
10R2
11R1
14A3
15A2
15A1
14E1
14G1
16D1
14NS1
Geology from W.R. Moyle, Jr. (1976)

Description of Aquifers

Consolidated rocks of the mountains and hills are pre-Tertiary in age (fig. 3). The rocks consist of granite, diorite, tonalite, granite gneiss, diorite gneiss, hornblende schist, and mica schist and contain some xenoliths and pegmatite dikes (Moyle, 1976). Many domestic wells are drilled into the consolidated rocks throughout the study area. Small to moderate quantities (5 to 70 gal/min) of water are obtained from wells that penetrate deeply weathered or fractured zones (Moyle, 1976). Specific capacities of wells perforated in the weathered or fractured rocks range from 0.1 to 2.4 (gal/min)/ft of drawdown.

The older alluvium is of Pleistocene age and consists of moderately indurated boulders, gravel, sand, silt, and clay. Analysis of drillers' logs indicates that gravel (with occasional boulders) makes up 0 to 50 percent of this unit, sand 10 to 55 percent, and silt and clay 10 to 75 percent. The older alluvium contains many discontinuous clay lenses. The older alluvium is found mainly along mountain fronts and underlies the younger alluvium in most areas (fig. 3). The older alluvium is considered the principal aquifer of the study area, and most wells with large yields (200 to 1,100 gal/min) obtain water from this unit. Specific capacities of wells perforated in the older alluvium range from 1.5 to 11.4 (gal/min)/ft of drawdown.

The younger alluvium consists of unconsolidated boulders, gravel, sand, silt, and clay of Holocene age. The younger alluvium is found mainly along stream channels and in the central part of Anza Valley (fig. 3). This unit is generally above the regional water table, but where it is saturated it yields water freely to wells (Moyle, 1976).

The main fault in the study area is the San Jacinto fault (fig. 3). It is a northwest-trending fault in the northeastern part of the study area. The fault acts as a barrier to ground-water flow, and water levels on either side of the fault differ as much as 400 feet.

An unnamed fault parallels the San Jacinto fault and extends from Anza Valley across the surface-water divide into Terwilliger Valley near the base of Table Mountain (fig. 3). Water-level measurements indicate that this fault probably is not a barrier to ground-water flow. Hydraulic characteristics of other faults in the area are unknown.

Recharge

Ground water in the study area is derived entirely from precipitation. Precipitation in the Anza-Terwilliger area either moves downward into the fractures and weathered zones of the consolidated rocks, is held as soil moisture and consumed by evapotranspiration, infiltrates past the root zone and recharges unconsolidated deposits, runs off into stream channels, or recharges the ground-water system by seepage through the permeable streambeds. The quantity of ground water in storage and the water levels in wells are related to a cycle of extended periods of relatively wet and dry weather. A curve of cumulative departure from 1943-86 mean annual precipitation at Anza (see fig. 4a) shows wet and dry periods as follows:

Type	Period	Average precipitation (inches)	Percentage above (+) or below (-) 1943-86 average precipitation
Dry	1943-75	12.92	-11.0
Wet	1976-86	19.30	+33.0

Although the overall trend of the cumulative-departure curve during the dry period was decreasing, there were some minor reversals during this period. However, a major reversal of the trend, marking the beginning of the wet period, occurred in 1976, when precipitation was 2.64 inches above the 1943-86 mean of 14.51 inches.

As shown in figure 4, a close correlation exists between precipitation and measured water levels in the U.S. Geological Survey monitor well 7S/3E-34E1. This unused well is in alluvium in the eastern part of the reservation. Although there is no continuous water-level record for most of the 1943-75 dry period, it can be seen that water-table altitudes in 1946 and 1951-54 were considerably higher than those in 1975. Water-table altitudes for 1960 and 1969 show a progressive lowering from 1951-54 to 1975 levels. The water table declined generally during 1946-75 because ground-water discharge exceeded recharge. During the 1976-86 wet period, water-table altitudes rose sharply as a result of increased recharge and a subsequent decrease in pumping.

Moyle (1976) estimated ground-water recharge in 1973 as 3,800 acre-ft. Average precipitation for 1973 was 11.66 inches (2.85 inches below the 1943-86 mean), so the long-term average rate of recharge may be higher than 3,800 acre-ft. No additional data were collected during this investigation to enable an accurate estimate of long-term recharge.

Discharge

Principal uses of ground water in 1986 were irrigation of crops, evapotranspiration from natural pasture, domestic supplies, livestock supplies, pumpage for maintenance of lakes and reservoirs, and evaporation in areas where ground water was at land surface. Table 3 shows estimated consumptive use for the above categories for 1973 and 1986. For the 1986 consumptive-use estimate, the total number of acres for each water-use category was estimated from figure 2. The population of the study area was estimated from Riverside County population data. The number of cattle and horses is assumed to be the same as in 1973. Consumptive-use rates and individual requirements were taken from Moyle (1976). Estimates of the consumptive use of ground water for 1973 and 1986 are rounded to one significant figure.

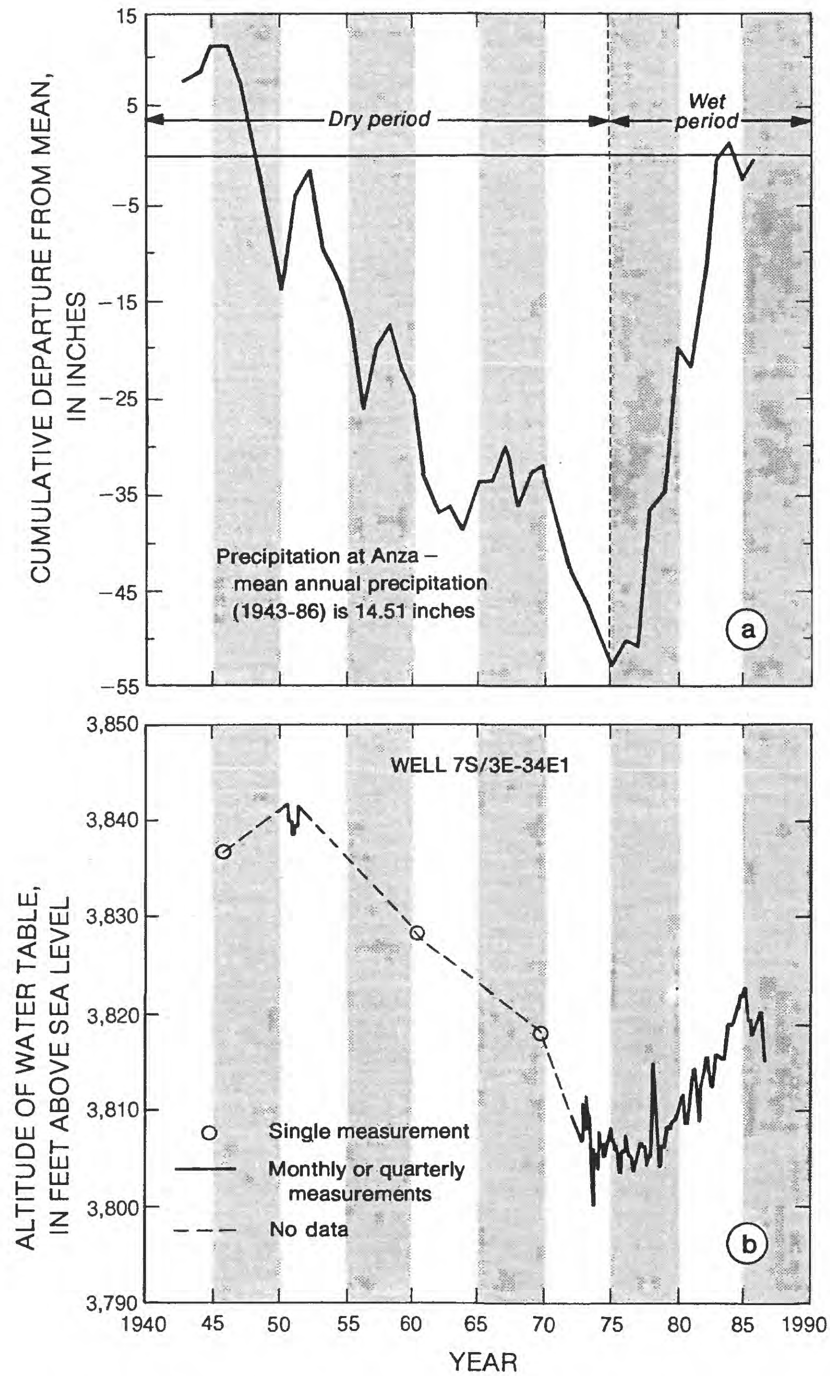


FIGURE 4.—(a) Cumulative departure from 1943-86 mean annual precipitation at Anza and (b) water-table altitudes in well 7S/3E-34E1.

Table 3.--Estimated consumptive use of ground water, 1973 and 1986

Water use	Total number of acres (1986)	Individual requirement, in gallons per day	Number of individuals (1986)	Rate of use, in feet per year	Consumptive use, in acre-feet per year	
					1973	1986
Irrigated crops	1,330	--	--	2.1	970	2,790
Evaporation from natural pasture	570	--	--	3.5	420	2,000
Domestic use	--	125	4,000	--	140	560
Cattle and horses	--	15	500	--	10	10
Evaporation from lakes and reservoirs	110	--	--	5.3	740	580
Evaporation from ground water at land surface	730	--	--	5.3	1,670	3,870
Supplemental water on grain crops	2,270	--	--	1.0	210	2,270
Estimated consumptive use of ground water					[1]4,000	[1]10,000

[1]Rounded to one significant figure.

The irrigated-crops category in table 3 includes both potatoes and apples. The total number of acres has increased by 190 percent since 1973 (table 2). Consumptive use for crops in 1986 was 1,820 acre-ft/yr more than in 1973.

Natural pastures are areas where ground water is within about 10 feet of land surface. Water is consumed from natural pasture by evapotranspiration, which includes transpiration of water by growing vegetation and water evaporated from soil. Natural pasture increased by 380 percent (table 2) during 1973-86, probably due to a rising water table. This resulted in an increase in consumptive use of 1,580 acre-ft/yr.

Domestic water supplies include those for household and business uses. Consumptive use for this category is based on total population, which increased by 400 percent during 1973-86. This accounts for an increase of 420 acre-ft/yr in consumptive use.

Consumptive use for cattle and horses is based on the number of animals. The number of cattle and horses is assumed to have remained the same during 1973-86, and the total consumptive use (10 acre-ft) for this category is relatively small in comparison with other use categories.

Pumpage for maintenance of lakes and reservoirs is estimated from pan evaporation rates (5.3 ft/yr). These lakes and reservoirs are filled with ground water to maintain a constant level. Both Lake Riverside and the irrigation reservoirs are full year-round. Water is pumped into the irrigation reservoirs from February through October, and the water levels are maintained by precipitation from November through January (Jesse Pinales, foreman, Agri-Empire, oral commun., 1986). The area of lakes and reservoirs in 1986 was 20 percent less than in 1973 (table 2), resulting in a decrease of 160 acre-ft/yr in consumptive use.

In areas of ground water at land surface, there is standing water and the water table is at or above land surface. Estimation of consumptive use for this category also is based on pan evaporation rates. Total area for this category increased by 130 percent during 1973-86 (table 2). This resulted in an increase in consumptive use of 2,200 acre-ft/yr.

Grain crops are irrigated only when there is insufficient precipitation for their needs. This land-use category had the largest increase in acreage during 1973-86, 980 percent (table 2). Consumptive use for grain crops increased by 2,060 acre-ft/yr.

Estimated total consumptive use in 1986 was 10,000 acre-ft/yr, an increase of 6,000 acre-ft/yr since 1973. The increase in agricultural activities accounts for 49 percent of the additional consumptive use of ground water during 1973-86. Forty-six percent of the additional consumptive use during 1973-86 is due to the increase in the quantity of ground water evaporated in areas where the water table is near or above land surface. Pumpage for domestic supplies accounts for 5 percent of the increase.

Ground-Water Levels and Movement

Prior to 1950 when the water table in the study area was unaffected by pumping, movement of ground water was toward major streams in Anza and Terwilliger Valleys (Moyle, 1976). The water-table surface sloped from its highest altitudes in the consolidated rocks in the mountains toward Cahuilla and Coyote Creeks. Over the long term, ground-water discharge equaled recharge, and the system was in a steady-state condition.

Figures 5 and 6 show altitude of the water table for summer 1973 and summer 1986, respectively. The water-table maps are based on water-level measurements in wells that are completed at varying depths in the ground-water system. However, the limited data indicate that hydraulic head does not vary significantly with depth, and that the measured water levels closely approximate the altitude of the water table in both the consolidated rocks and alluvium. Historical water levels for wells measured in 1986 are given in Supplemental Data B.

Figure 5 shows the altitude of the water table during summer 1973. Water-table altitudes were determined from land-surface altitudes estimated from topographic maps and original water-level measurements made in July and August 1973. Two areas in the alluvium are shown where ground water moved toward water-table depressions. One of the depressions was in Cahuilla Indian Reservation, and another was just north of the reservation. Grain crops were planted in both areas. Supplemental irrigation for crops probably was more intense than normal during 1973 because of the below-average precipitation.

Figure 6 shows the altitude of the water table during the summer 1986 pumping season. Water-table altitudes are based on water-level measurements made in July and August 1986, and the altitudes range from 3,413 feet in well 7S/3E-32D2 to 4,757 feet in well 7S/3E-4H2. There are two areas in the alluvium where ground water flowed toward water-table depressions. One depression, in central Anza Valley, extended to the northern boundary of Cahuilla Indian Reservation. This depression was centered around the largest irrigation reservoir in the study area. The other water-table depression was at the northeast edge of Anza Valley where potatoes and grains were grown.

Hydrographs for four wells monitored by the U.S. Geological Survey are shown in figure 7. Two wells, 8S/3E-2D1 and 8S/3E-2K1, are in the southeastern part of Cahuilla Indian Reservation in the alluvium (fig. 3). The hydrograph for well 8S/3E-2D1, an irrigation well, shows water-table altitudes for 1960, 1969, and 1973-86. The water table in 1969 was much lower than in 1960 because of the dry conditions and increased ground-water use that prevailed during that period. Declines were less sharp between 1973 and 1977 because a wet period began in 1976. The water table then rose slightly during 1977-86. This corresponded to periods of higher-than-average precipitation, particularly in 1978 (19.07 inches) and 1980 (19.86 inches). The hydrograph for well 8S/3E-2K1, an unused well, shows the same trend during 1973-86, except that the declines in this well were steeper between 1973 and 1977.

Water-table altitudes for wells 7S/3E-7C2 and 7S/3E-31Q1 also show the effects of wet and dry periods. The hydrograph for well 7S/3E-7C2 shows a fairly stable water table during 1969-76, but the water table rose markedly during 1977-86. Well 7S/3E-7C2 is a domestic well in the north end of the study area in alluvium and consolidated rocks (fig. 3). Well 7S/3E-31Q1 is a domestic well in the central part of Cahuilla Indian Reservation in a narrow strip of alluvium. The hydrograph for this well shows that the water table was relatively constant until 1977 when it rose sharply because of the higher-than-average precipitation.

Figure 8 shows changes in water-table altitudes between the summer of 1973 and the summer of 1986 at 39 wells. All water-level measurements were made in nonpumping wells in the middle of the summer pumping season when most irrigation pumps were running and maximum stress was imposed on the ground-water system.

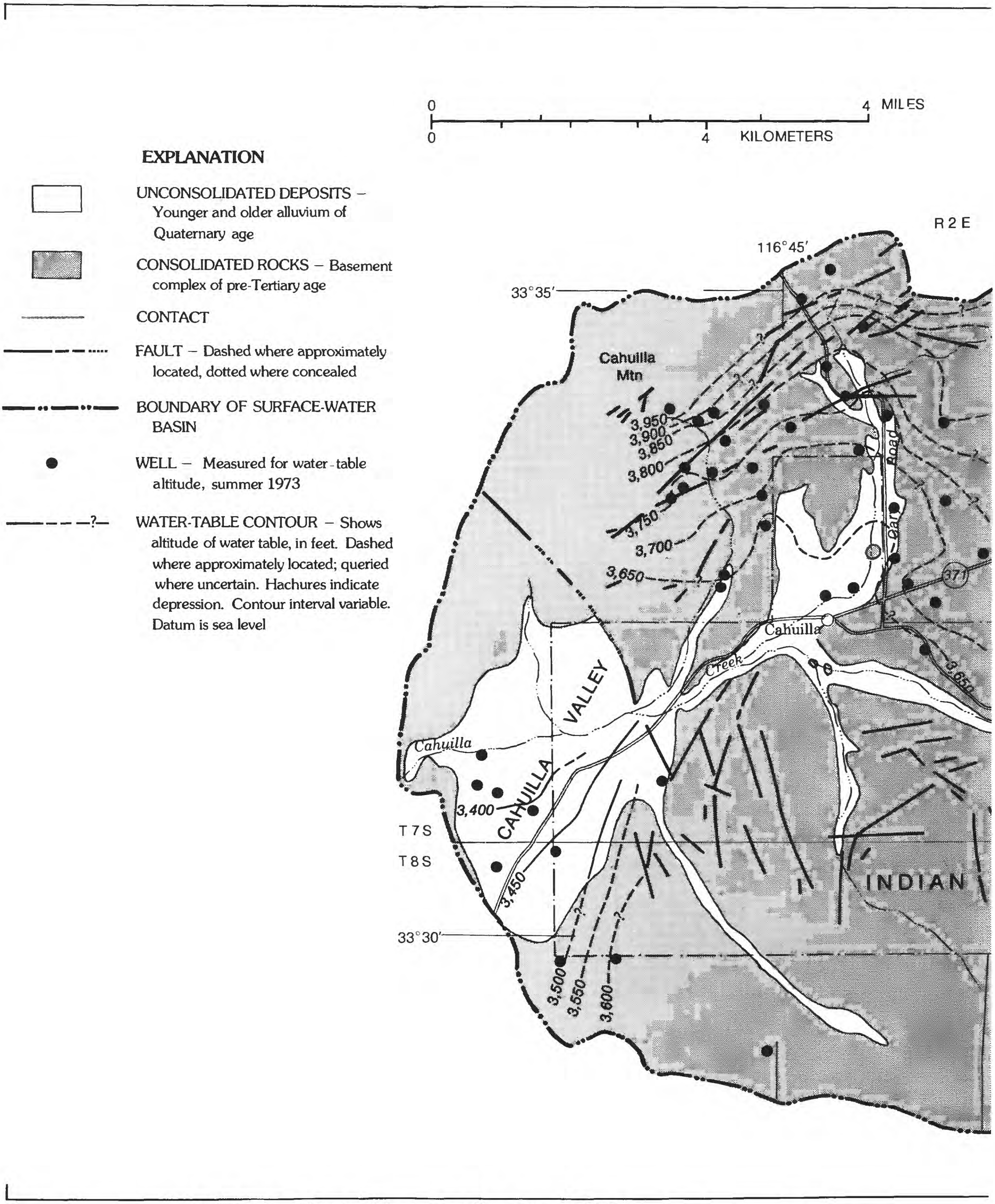
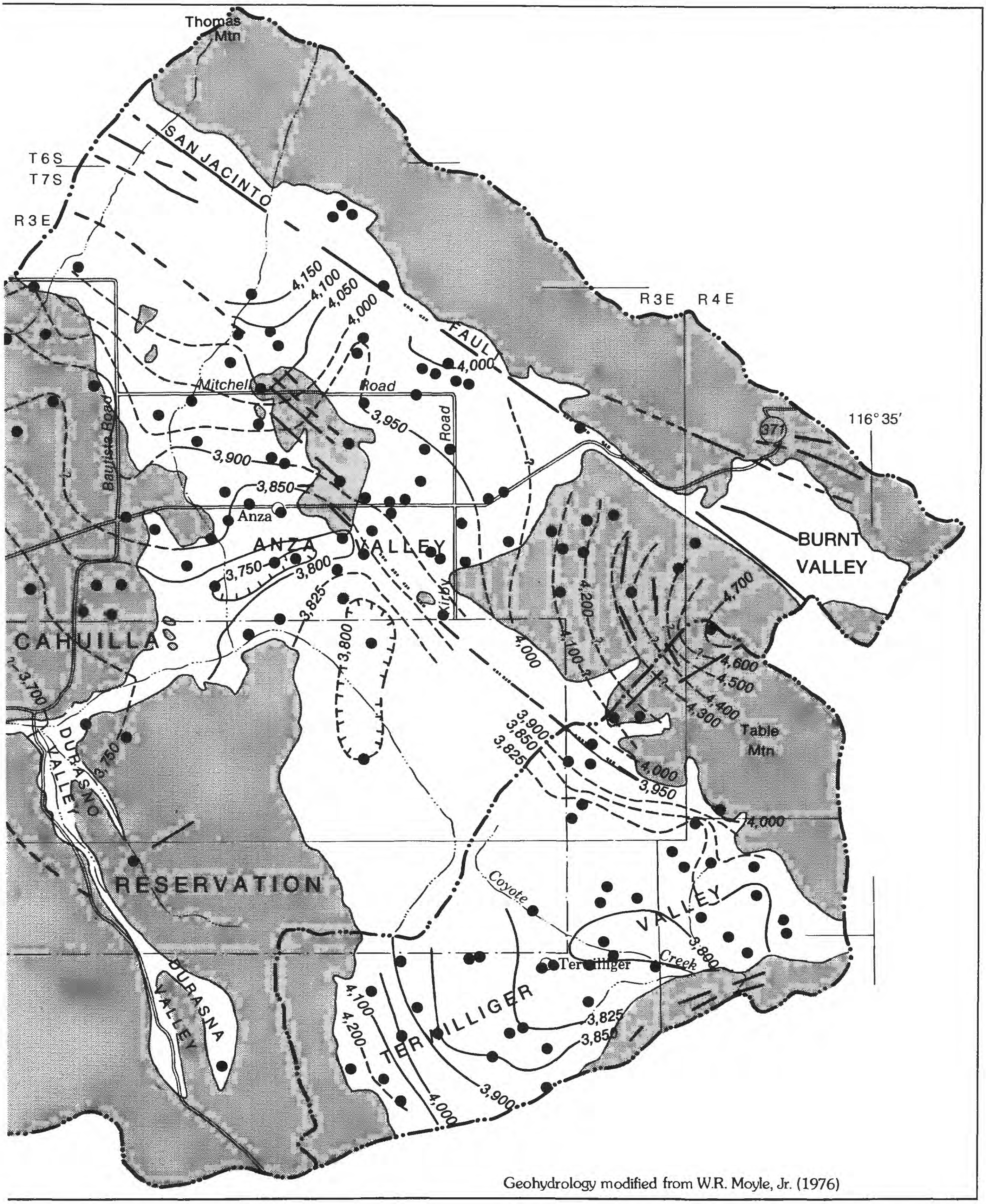


FIGURE 5.—Altitude of the water table, summer 1973.


Thomas Mtn
T6S
T7S
R3E
SAN JACINTO
FAULT
R3E R4E
116° 35′
371
Mitchell
Road
Bautista Road
Road
Anza
ANZA VALLEY
Kirby
BURNT VALLEY
CAHUILLA
DURASNO VALLEY
RESERVATION
Table Mtn
Coyote
Creek
VALLEY
Terwilliger
TERWILLIGER
4,150
4,100
4,050
4,000
3,950
3,900
3,850
3,800
3,750
3,825
3,700
4,200
4,700
4,600
4,500
4,400
4,300
Geohydrology modified from W.R. Moyle, Jr. (1976)

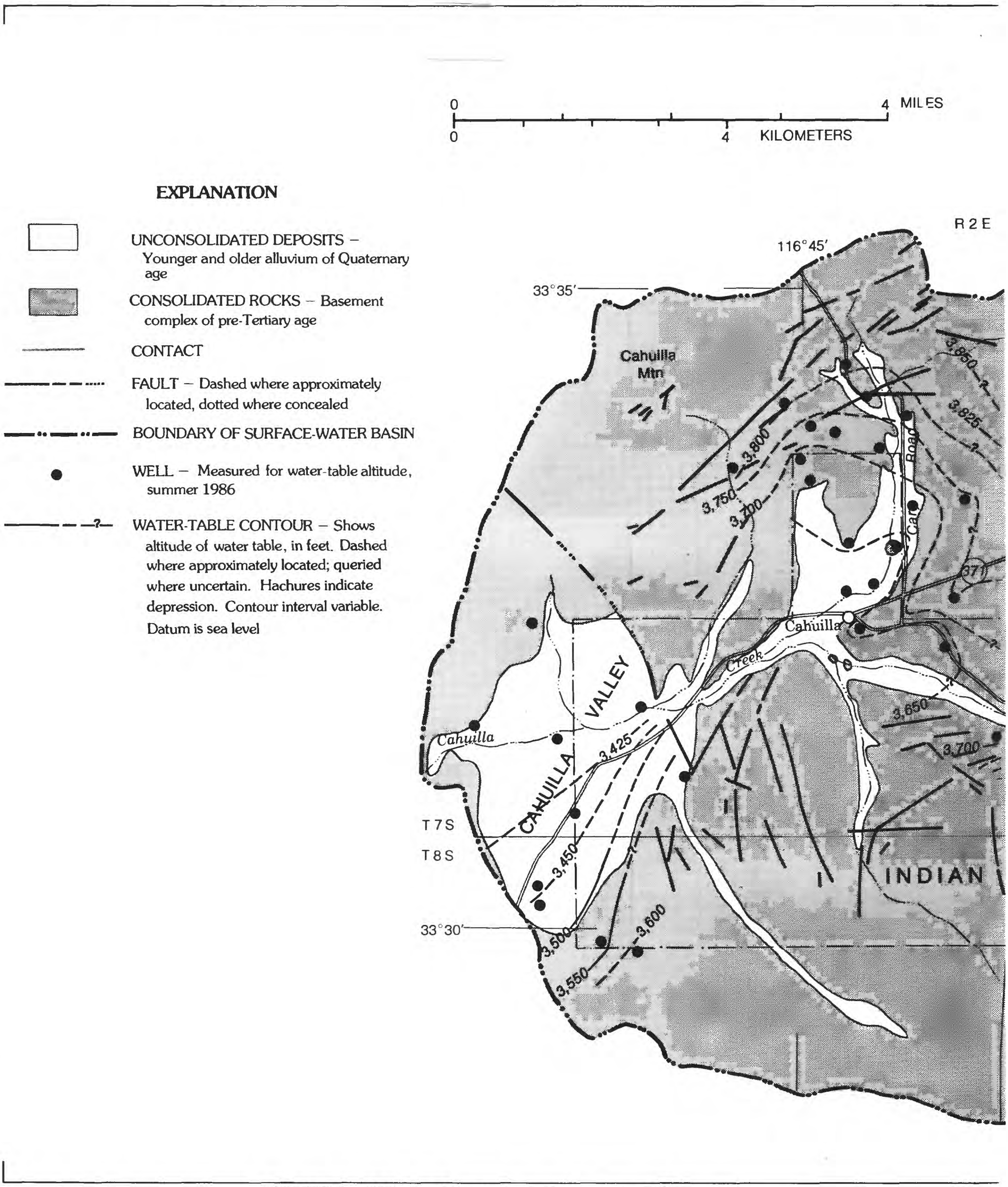
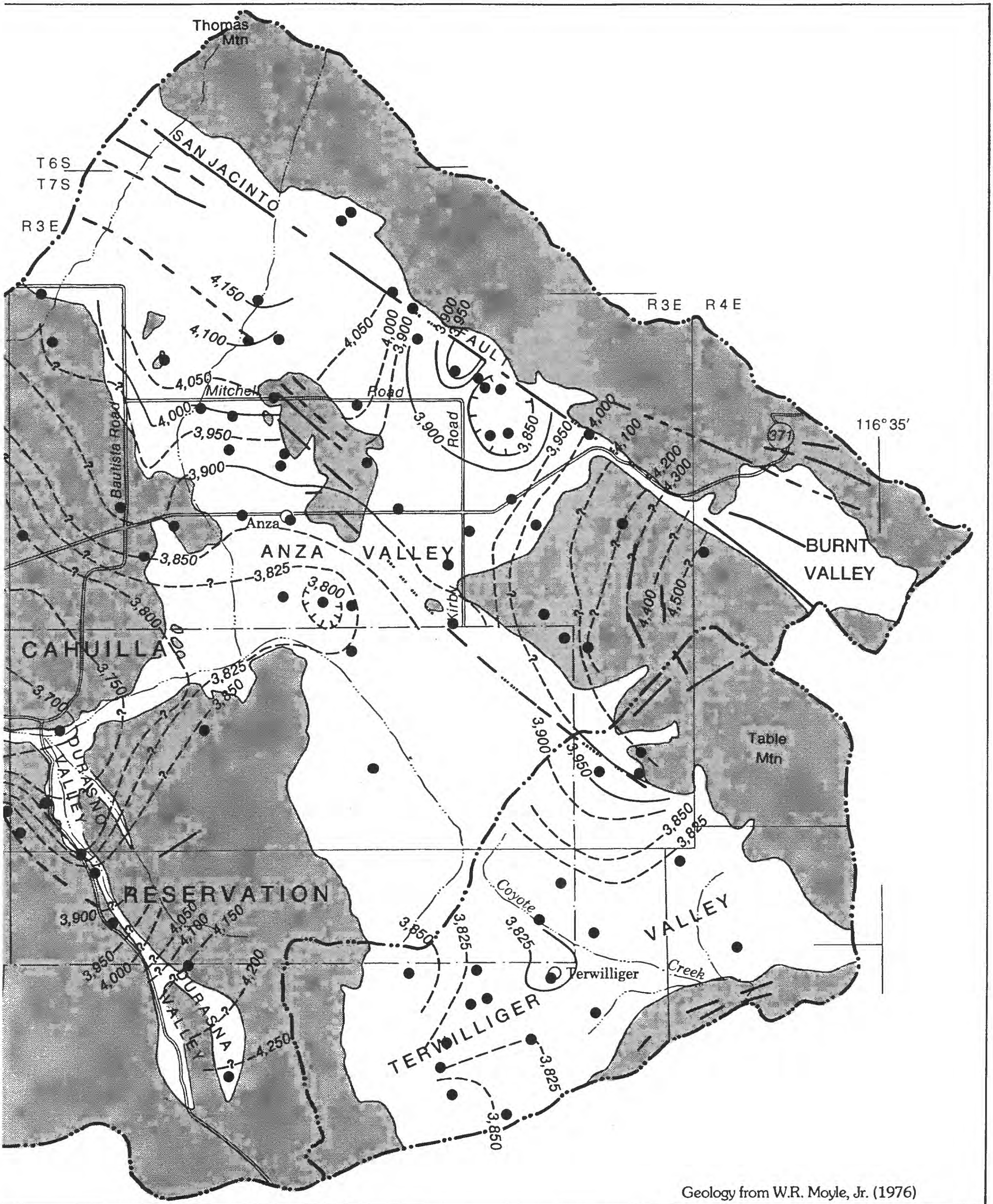


FIGURE 6.—Altitude of the water table, summer 1986.



Geology from W.R. Moyle, Jr. (1976)

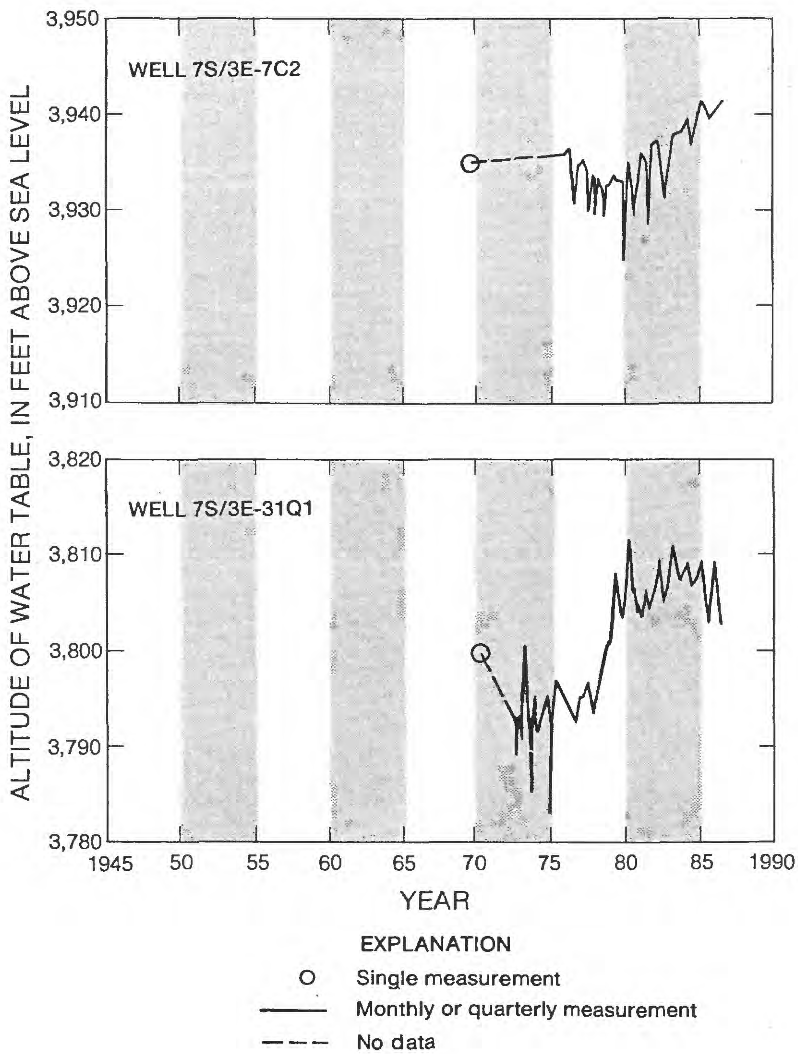


FIGURE 7.—Hydrographs showing altitude of the water table in selected wells.

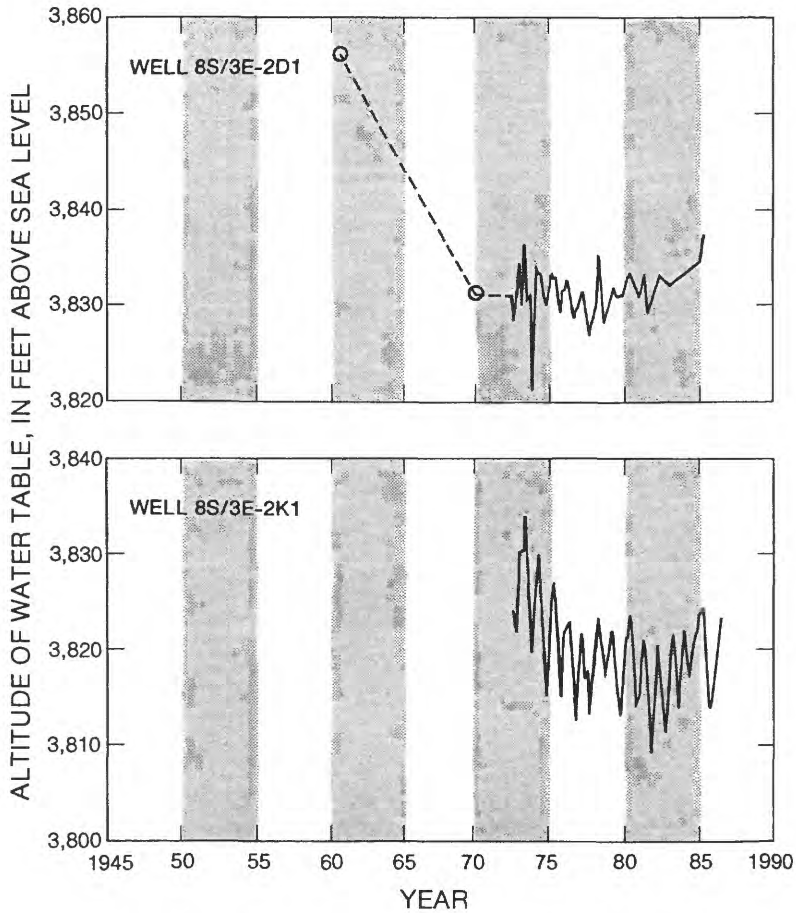


FIGURE 7. – Continued.

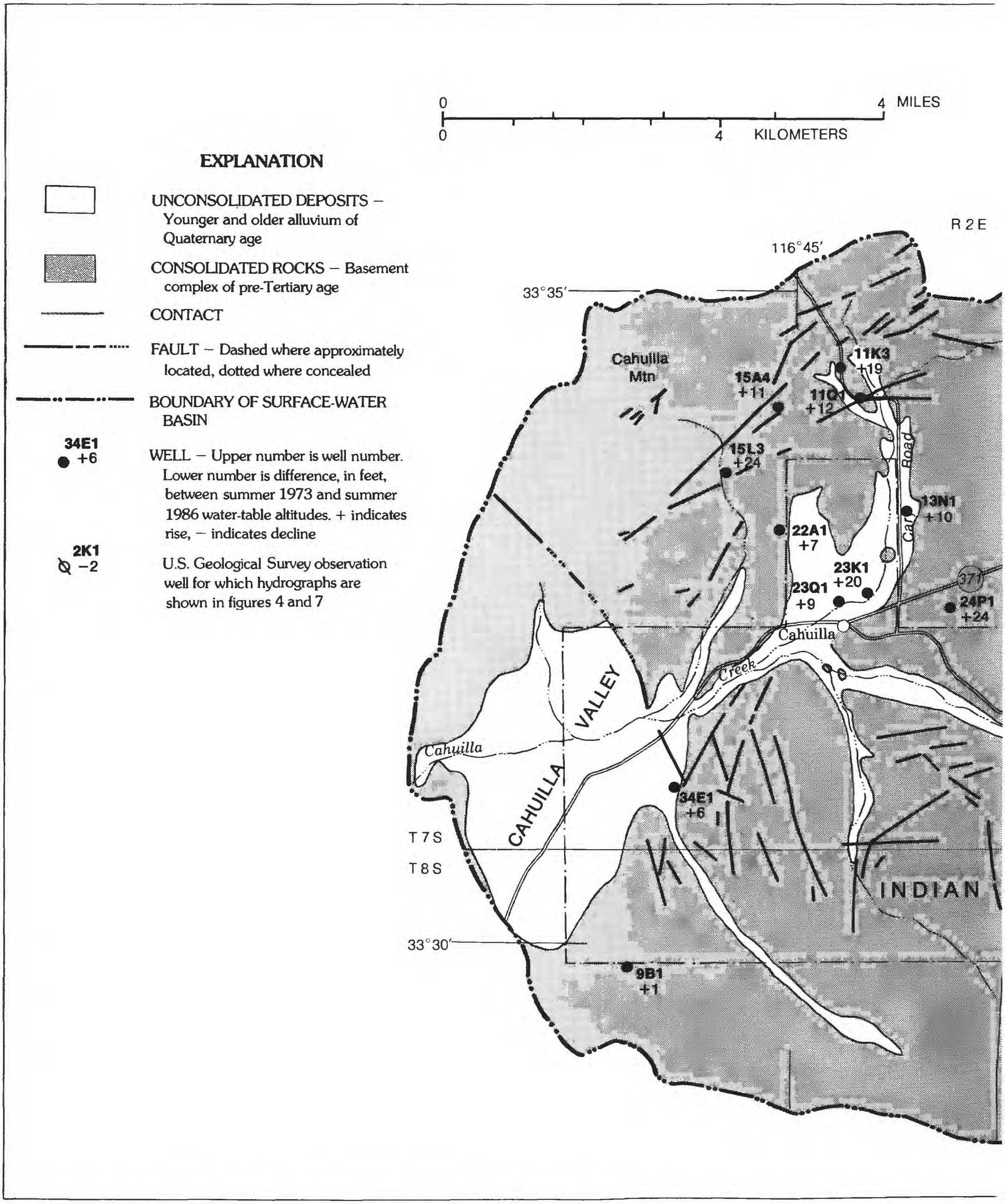
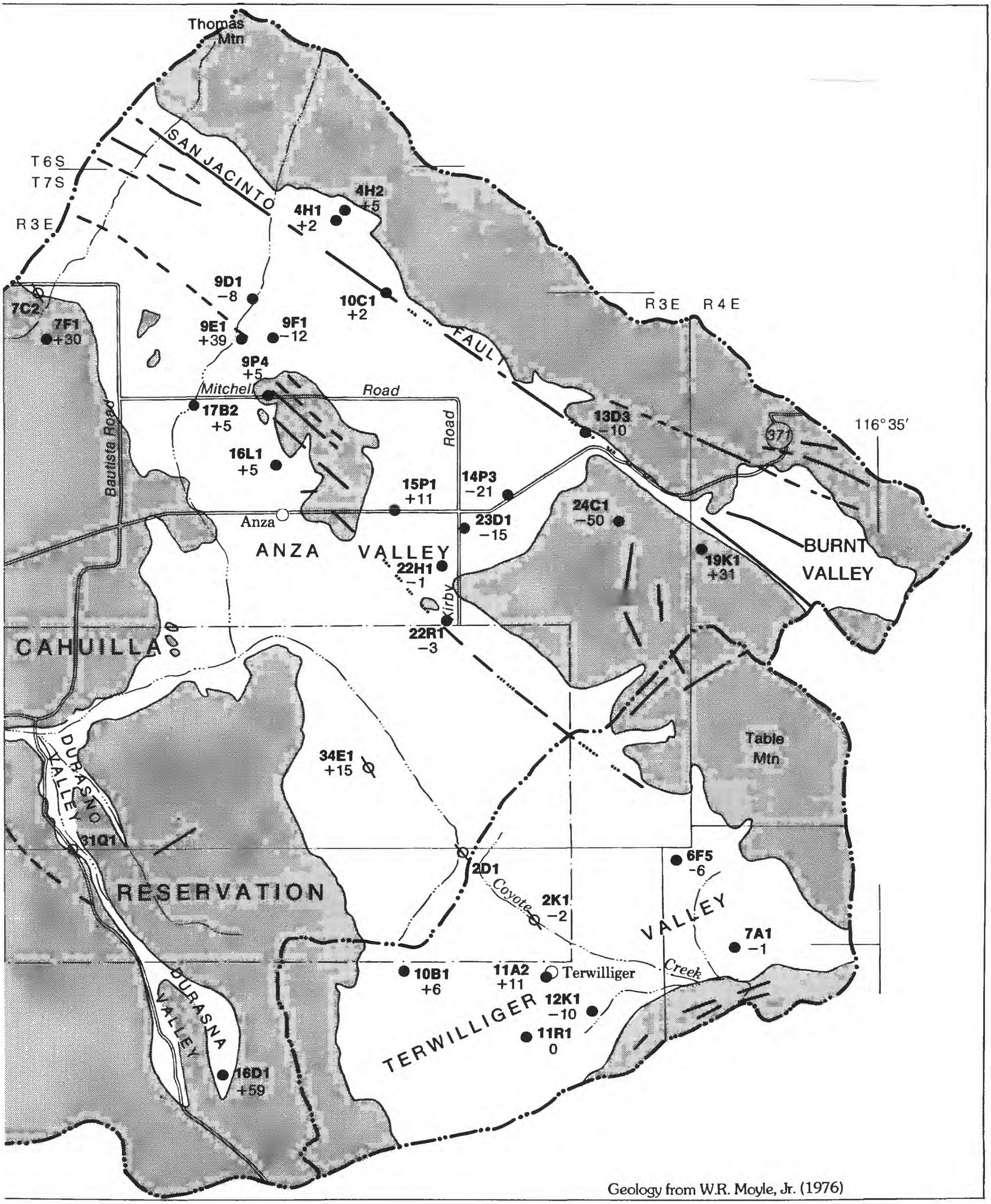


FIGURE 8.—Change in water-table altitudes between summer 1973 and summer 1986.



Geology from W.R. Moyle, Jr. (1976)

Water-level measurements in 28 wells in the alluvium showed that changes in water-table altitude between the summers of 1973 and 1986 ranged from a decline of 21 feet (well 7S/3E-14P3) to a rise of 59 feet (well 8S/3E-16D1). The water table, on the average, rose 5 feet. Of the 28 wells in the alluvium, 23 were in Anza and Terwilliger Valleys where most of the pumping for irrigation occurs. Changes in water-table altitude between the summers of 1973 and 1986 in the 23 wells ranged from a decline of 21 feet (well 7S/3E-14P3) to a rise of 39 feet (well 7S/3E-9E1). On the basis of water-level measurements in the 23 wells, the water-table rose an average of 1 foot.

Water-level measurements in 10 of 11 wells in the consolidated rocks showed higher water-table altitudes in the summer of 1986 than in the summer of 1973. Rises ranged from 1 foot (well 8S/2E-9B1) to 30 feet (well 7S/3E-7F1) in the consolidated rocks west of Anza and Terwilliger Valleys. The water table rose 31 feet in one well (7S/4E-19K1) in the consolidated rocks east of Anza and Terwilliger Valleys. The water table in another well in the same area (7S/3E-24C1) declined 50 feet. On the basis of water-level measurements in the 11 wells, the water table rose an average of 10 feet.

There are insufficient data to accurately estimate the change in ground-water storage between the summer of 1973 and the summer of 1986. However, the average change in water-level altitude for wells measured in both years indicates that the change in storage was small.

WATER QUALITY

In November 1985 and January-March 1986, water from 30 wells, 5 springs, and Cahuilla Creek at three locations was sampled for chemical analyses of major anions and cations, and of nitrate. Selection of sampling sites was based on areal distribution, availability of previous water-quality records, and accessibility to sites. Chemical analyses are given in Supplemental Data C, along with water-quality records from four U.S. Geological Survey water-quality observation wells (sampled in 1984 and 1985) and wells recently drilled on Cahuilla Indian Reservation by Indian Health Services (sampled in 1984). The 1984 and 1985 chemical analyses were included to provide additional water-quality information for the study area. It is assumed that the water quality in 1986 is not significantly different from that in 1984 and 1985.

Dissolved Solids

Ground Water

Wells

Dissolved-solids and nitrate (as nitrogen) concentrations were determined for water from wells sampled for this study, from U.S. Geological Survey observation wells, and from wells drilled by the Indian Health Service.

Dissolved-solids concentrations were estimated from specific-conductance measurements of water in wells without chemical analyses. The linear relation between dissolved-solids concentration and specific conductance serves as the basis for this technique. In general, dissolved-solids values are 0.55 to 0.75 times the value of specific conductance (Hem, 1985). Chemical analyses from this study indicate that the dissolved-solids concentration, in milligrams per liter, is approximately 0.61 times the value of specific conductance. Dissolved-solids and nitrate (as nitrogen) concentrations for 1984-86 are shown in figure 9.

Dissolved-solids concentrations in ground water ranged from 184 to 1,320 milligrams per liter (mg/L). Ground water in the eastern and central parts of Cahuilla Indian Reservation, in Lake Riverside Estates south of Highway 371, and in eastern Terwilliger Valley contained less than 500 mg/L dissolved solids. Population in these areas is sparse, and land use is limited to natural pasture, irrigated apple trees, and grain crops (fig. 2). Some wells are completed in consolidated rocks and some in unconsolidated deposits, indicating that water-quality differences (with respect to dissolved-solids concentration) between the two types of material are small.

Fourteen ground-water samples had dissolved-solids concentrations that exceeded the U.S. Environmental Protection Agency (EPA) recommended limit of 500 mg/L for drinking water (U.S. Environmental Protection Agency, 1986). In Cahuilla Valley and eastern Cahuilla Mountain, areal variation in dissolved-solids concentration was large. Within these areas, five water samples with dissolved-solids concentrations ranging from 708 to 1,320 mg/L were collected from wells located short distances from other wells with much lower concentrations. Two of these five wells containing water with high dissolved-solids concentrations, 8S/2E-4P1 and 7S/2E-14M1, are on Cahuilla Indian Reservation. Areal variation in dissolved-solids concentration within the eastern half of the study area, however, is more gradational. Water from four wells in southwestern Terwilliger Valley contained dissolved-solids concentrations ranging from 520 to 590 mg/L. The remaining five samples with concentrations greater than 500 mg/L were collected from wells in Anza Valley, north of Cahuilla Indian Reservation. Dissolved-solids concentrations in these samples ranged from 570 to 810 mg/L.

Most of the 14 wells that yielded water with dissolved-solids concentrations that exceed EPA limits are in areas where residential or agricultural land use predominate. High dissolved-solids concentrations are detected in ground-water samples in unsewered residential areas and usually indicate contamination from septic systems, which act as point sources of ground-water pollution (Todd and others, 1976). In addition, agricultural areas may serve as diffuse sources of high concentrations of dissolved solids through evapotranspiration; dissolution and leaching of mineral matter in the soil; and additives that are applied at land surface, such as fertilizers (Todd and others, 1976). Wells in the discharge area of a basin, such as the lower reaches of Cahuilla Creek, also may contain water with a high concentration of dissolved solids because of the increased time the water has been in contact with aquifer materials. In this case, however, evaporation from the shallow water table, often at land surface, increases the dissolved-solids concentrations in the ground water. All the above mechanisms probably contributed to the observed water-quality conditions in areas where dissolved-solids concentrations were highest.

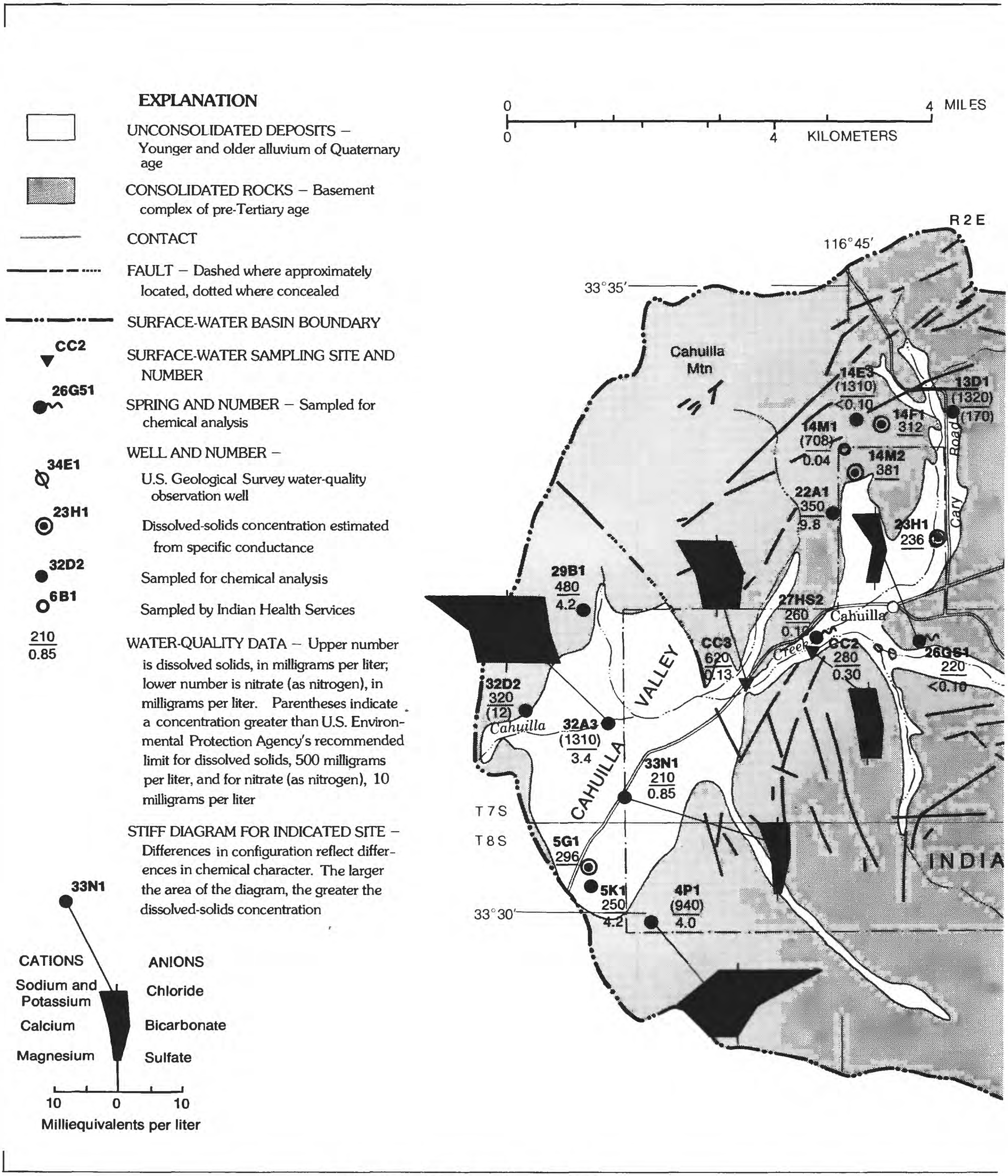


FIGURE 9.—Water quality, 1984-86.

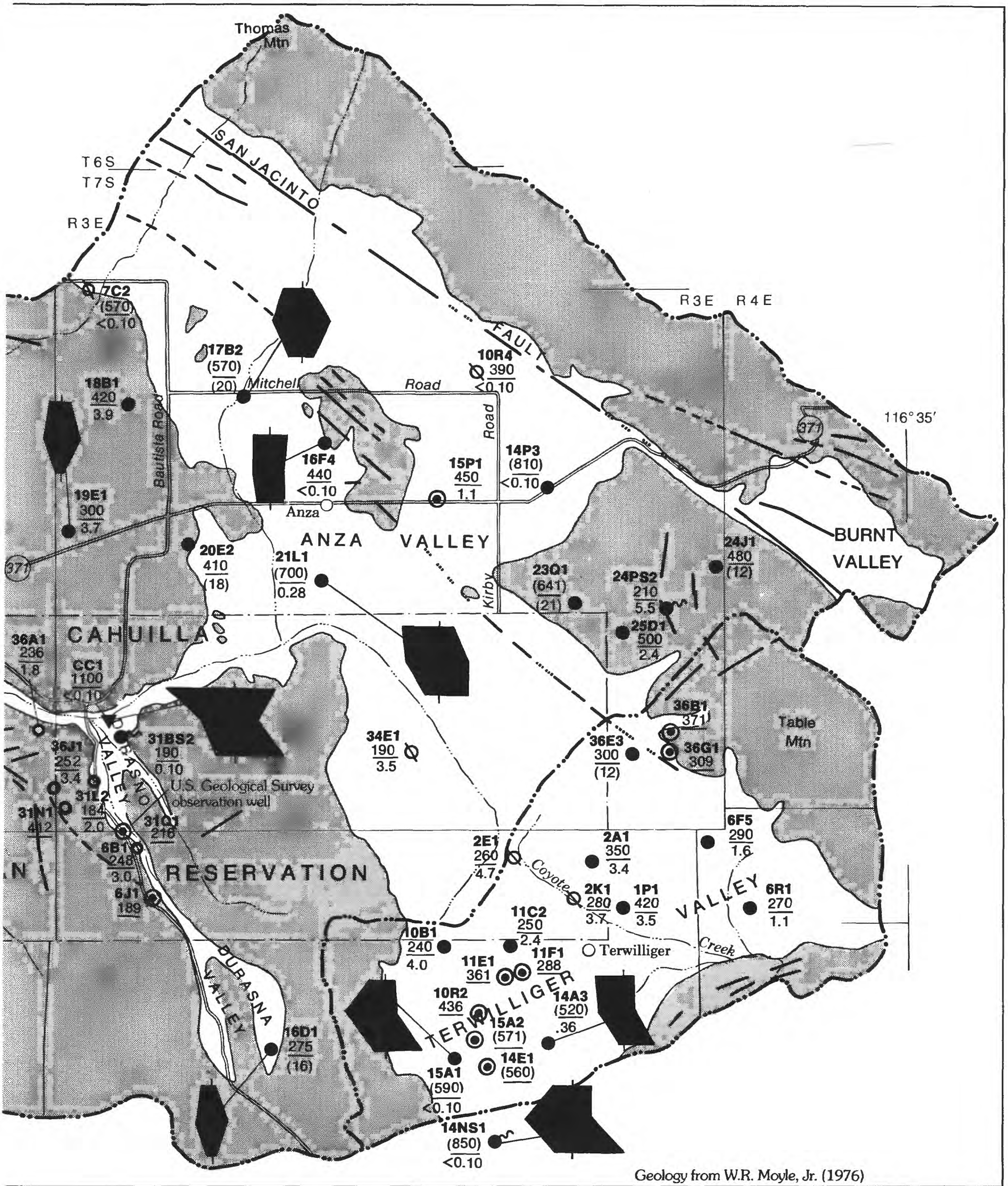

Thomas Mtn
SAN JACINTO FAULT
T6S
T7S
R3E
R3E R4E
116° 35′
7C2 (570) <0.10
17B2 (570) (20)
18B1 420 3.9
19E1 300 3.7
16F4 440 <0.10
10R4 390 <0.10
15P1 450 1.1
14P3 (810) <0.10
Mitchell Road
Bautista Road
Kirby Road
Anza
ANZA VALLEY
BURNT VALLEY
20E2 410 (18)
21L1 (700) 0.28
23Q1 (641) (21)
24PS2 210 5.5
24J1 480 (12)
25D1 500 2.4
CAHUILLA
36A1 236 1.8
CC1 1100 <0.10
31BS2 190 0.10
36J1 252 3.4
31L2 184 2.0
31N1 412
31Q1 216
6B1 248 3.0
6J1 189
U.S. Geological Survey observation well
RESERVATION
34E1 190 3.5
36E3 300 (12)
36B1 371
36G1 309
Table Mtn
6F5 290 1.6
2A1 350 3.4
2E1 260 4.7
2K1 280 3.7
1P1 420 3.5
6R1 270 1.1
Coyote Creek
VALLEY
11C2 250 2.4
10B1 240 4.0
11E1 361
11F1 288
Terwilliger
TERWILLIGER
10R2 436
15A2 (571)
14A3 (520) .36
14E1 (560)
15A1 (590) <0.10
14NS1 (850) <0.10
16D1 275 (16)
DURASNA VALLEY
Geology from W.R. Moyle, Jr. (1976)

Figure 10 shows dissolved-solids concentration over a period of time for three U.S. Geological Survey water-quality observation wells in Anza Valley. Water in wells 7S/3E-7C2 and 8S/3E-2E1 had large fluctuations in dissolved-solids concentration during 1978-81, a period of alternating high and low precipitation.

Samples from 12 wells were compared with previous water-quality records (Giessner and Mermod, 1974) to define changes in dissolved-solids concentration over time (table 4). Water from 4 of the 12 wells had increases greater than 100 mg/L. Water from all wells sampled in 1984-86 that had increases are located in areas of increased agricultural development.

Most of the ground water in the study area is classified as a calcium sodium bicarbonate type, as shown by the water-quality diagrams in figure 9. Typical examples of this water type are found in wells 7S/3E-19E1 and 8S/3E-16D1. Sodium, however, occurs as the major cation in central Cahuilla Valley (wells 7S/2E-33N1 and 7S/2E-32A3). The distribution and concentration of both calcium and sodium may simply reflect the chemistry of the consolidated rocks within the study area. Tonalite, which typically contains large quantities of calcium minerals, is the predominant rock type; adamellite, which typically contains large quantities of sodium minerals, is common (Sharp, 1965). However, some occurrences of high sodium concentrations are more likely associated with the concentration of salts by evapotranspiration from irrigated fields.

Bicarbonate occurs as the major anion in most parts of the study area, especially where dissolved-solids concentrations are lower than 500 mg/L. In areas where higher dissolved-solids concentrations occur, sulfate commonly is the predominant anion (for example, well 8S/3E-15A1). Water from four of the wells sampled had sulfate concentrations that exceed the recommended limit of 250 mg/L for drinking water (U.S. Environmental Protection Agency, 1986; Supplemental Data C).

Springs

All spring samples collected throughout the study area had dissolved-solids concentrations less than 300 mg/L, except for spring 8S/3E-14NS1, which contained water with a dissolved-solids concentration of 850 mg/L. Water from spring 8S/3E-14NS1 had a sulfate concentration of 390 mg/L, which exceeds the EPA recommended limit for drinking water. Spring 8S/3E-14NS1 also is the only sampled spring in which the concentration of dissolved solids in the water exceeded the concentrations in water from nearby wells. The closest sampled well (8S/3E-15A1) to this spring contained water with a similar calcium sulfate type (fig. 9), indicating that the sulfate may be naturally occurring rather than from a point source of contamination such as a septic system. Sodium also occurs naturally in high concentrations, as shown by water from spring 7S/2E-26GS1, which was a sodium bicarbonate type. Water from the remaining sampled springs is classified as a calcium sodium bicarbonate type.

Table 4.--Comparison of historical and 1984-86 dissolved-solids concentrations in water from selected wells

[Concentrations are given in milligrams per liter. Month and year well was sampled is in parentheses]

Well No.	Historical dissolved-solids concentration	1984-86 dissolved-solids concentration
7S/2E-13D1	415 (Dec. 1964)	1,320 (Jan. 1986)
7S/2E-14E3	1,040 (June 1970)	1,310 (Jan. 1986)
7S/3E-7C2	570 (May 1976)	570 (July 1985)
7S/3E-15P1	405 (Nov. 1962)	450 (Jan. 1986)
7S/3E-17B2	490 (Oct. 1962)	570 (Jan. 1986)
7S/3E-20E2	310 (Oct. 1962)	410 (Jan. 1986)
7S/3E-21L1	445 (May 1953)	700 (Jan. 1986)
7S/3E-23Q1	600 (Nov. 1962)	641 (Jan. 1986)
7S/3E-31L2	179 (June 1970)	184 (Feb. 1984)
7S/3E-34E1	186 (July 1976)	190 (Aug. 1985)
8S/3E-2E1	286 (May 1976)	260 (Aug. 1984)
8S/3E-2K1	339 (Sept. 1977)	280 (Aug. 1985)

Surface Water

Water samples collected from Cahuilla Creek in March 1986 had dissolved-solids concentrations of 1,100 mg/L upstream at site CC1, 280 mg/L at site CC2, and 620 mg/L at site CC3 farthest downstream (fig. 9). All three sites along Cahuilla Creek were sampled, at the same time, during a period of above-average discharge.

Distribution of dissolved-solids concentrations in water at the three sampling sites along Cahuilla Creek suggests that the high dissolved-solids concentrations in water at the upstream reaches of Cahuilla Creek most likely were a result of irrigation runoff and soil-zone leaching. Site CC1 is approximately 2 miles downstream from the main agricultural areas in the study area. Improved surface-water quality at the central sampling site CC2 probably was the result of natural ground-water discharge from Durasno Valley. Ground water in Durasno Valley generally contained less than 300 mg/L dissolved solids. A change from sulfate as the predominant anion upstream at site CC1 to bicarbonate as the predominant anion at site CC2 also indicates a downstream dilution by ground water. Increased dissolved-solids concentration in water at site CC3 probably was due to the introduction of water with a high dissolved-solids concentration from a tributary that drains the eastern Cahuilla Mountain area. Ground water from wells located along this tributary contained dissolved-solids concentrations generally ranging from 200 to 1,300 mg/L.

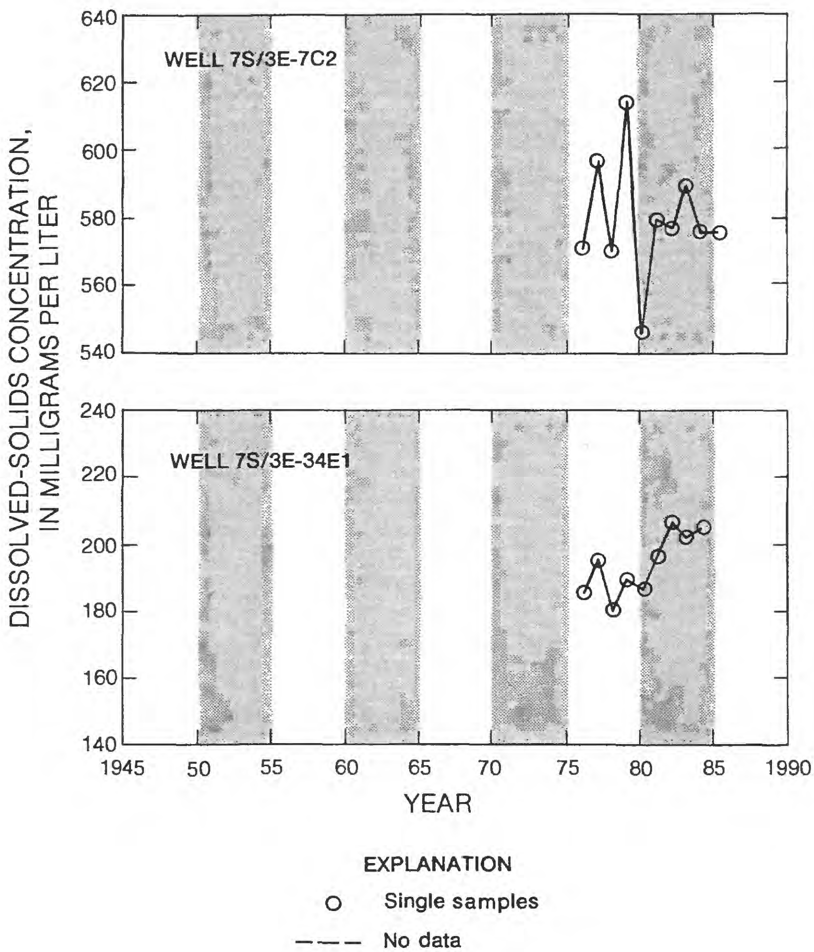


FIGURE 10.—Dissolved-solids concentration in water from selected wells.

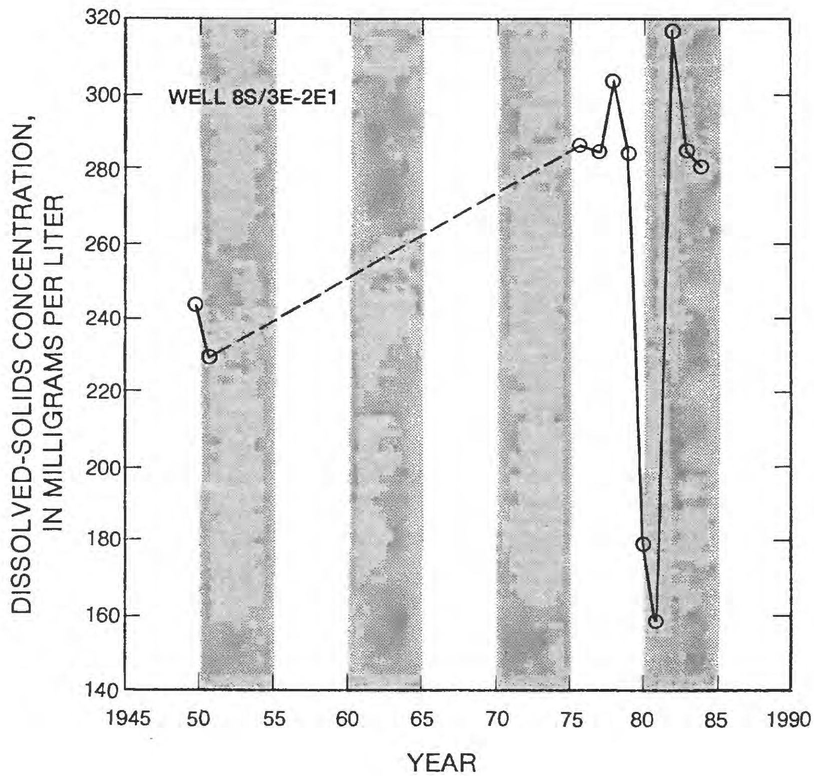


FIGURE 10.– Continued.

Nitrate

Nitrate (as nitrogen) concentration in ground water exceeded the EPA drinking-water limit of 10 mg/L (U.S. Environmental Protection Agency, 1986) in eight of the wells sampled in 1986 (fig. 9). Nitrate concentrations in the eight samples ranged from 12 to 170 mg/L (Supplemental Data C). Most sampled wells containing water with high nitrate concentrations were perforated in weathered consolidated rocks. Water levels in these wells ranged from 13.4 to 78.5 feet below land surface.

Animal wastes and septic systems appear to be the main sources of nitrate in these areas. Most of the eight wells that yielded water with nitrate concentrations exceeding the EPA recommended limit are in residential areas where agricultural land use is low. Three wells, however, are on sites of previously active commercial animal farms (7S/2E-13D1 and 7S/3E-20E2) or within unirrigated pasture used for grazing cattle (8S/3E-16D1). Diffuse sources of nitrate include the application of nitrogen fertilizers, animal waste, and leachate from waste-disposal areas (U.S. Environmental Protection Agency, 1986). However, concentrations of nitrate (as nitrogen) were less than 10 mg/L in all water samples collected from wells in the main agricultural areas in Anza and Terwilliger Valleys, except for one sample. High nitrate concentrations as a result of nitrogen fertilizers are therefore thought to be minimal. Nitrate (as nitrogen) concentrations in all water samples collected on Cahuilla Indian Reservation were less than the EPA drinking-water limit.

EVALUATION OF THE OBSERVATION-WELL NETWORK

The existing observation-well network (fig. 3) has been operational since 1973. Currently (1986), water levels are measured quarterly in six wells (7S/3E-7C2, 7S/3E-14P3, 7S/3E-31Q1, 7S/3E-34E1, 8S/3E-2D1, and 8S/3E-2K1), and water is sampled annually from five wells (7S/3E-7C2, 7S/3E-10R4, 7S/3E-34E1, 8S/3E-2E1, and 8S/3E-2K1) for chemical analyses. All the wells are in the eastern part of the study area where agricultural development is most intense, except 7S/3E-31Q1, which is in Durasno Valley.

Hydrographs in figures 4 and 7 indicate that water levels in wells included in the existing network adequately reflect long-term water-level changes in agricultural areas. Current distribution of observation wells and the frequency of measurement are adequate most of the year, when ground-water flow is toward the streams. However, locally there is a depletion of ground-water storage during the summer heavy pumping season. Additional observation wells in Anza Valley near the reservation, where several irrigation wells are located, would allow monitoring of the effects of increased pumping during summer. Existing wells north of the reservation boundary in township 7S, range 3E, sections 21 or 22, could be used to supplement the present observation-well network. Monthly measurements of water levels in all observation wells during the summer would improve definition of the extent of water-level declines.

Distribution of wells in the existing water-quality observation-well network adequately reflects current water-quality conditions in the eastern part of the study area. Because recharge to the ground-water system was above normal during 1976-86, increases in concentrations of dissolved solids and nitrate have been minimized as a result of greater dilution.

Expansion of the water-quality observation-well network to include two other parts of the study area, however, would be desirable. The first area is in Durasno Valley. Water from well 8S/3E-16D1, upgradient from Durasno Valley, had a nitrate (as nitrogen) concentration of 16 mg/L when sampled in 1986. This is greater than the EPA recommended limit for drinking water. The second area is in the northernmost part of the reservation, north of the town of Cahuilla. Two wells north of this part of the reservation, and one on the reservation, yielded water with dissolved-solids concentrations greater than 500 mg/L when sampled in 1986. In addition, water from one of the wells north of the reservation had a high (170 mg/L) nitrate concentration.

SUMMARY AND CONCLUSIONS

Principal ground-water uses in the Anza-Terwilliger area during 1986 were irrigation of crops, evapotranspiration from natural pasture, domestic supplies, livestock supplies, pumpage for maintenance of lakes and reservoirs, and evaporation in areas where the water table was at land surface. Consumptive use of ground water is estimated at 10,000 acre-ft during 1986, an increase of 6,000 acre-ft from 1973. The increase in agricultural activities accounts for almost half of the additional consumptive use since 1973. The remaining increase is due mainly to the increased amounts of ground water evaporated in high-water-table areas.

Ground water in the study area is derived entirely from precipitation. Precipitation data for 1943-86 indicate that 1943-75 was a relatively dry period. Water-level measurements for 1943-75 indicate that ground-water discharge exceeded recharge and the water table generally declined. During 1976-86, wet conditions prevailed, and the water table rose in most areas, including the Cahuilla Indian Reservation.

Prior to 1950, movement of ground water was toward Cahuilla and Coyote Creeks. During 1986, ground water generally moved in the same direction, but ground water also moved toward two areas of ground-water withdrawal created by heavy summer pumping for irrigation. One area, in central Anza Valley, extended to the northern boundary of the reservation; the other was in northeastern Anza Valley northeast of the reservation.

Dissolved-solids concentrations in ground water during 1984-86 ranged from 184 to 1,320 mg/L within the study area. Water from 14 of the wells had dissolved-solids concentrations greater than the EPA recommended limit for drinking water of 500 mg/L. The high dissolved-solids concentrations in ground water were in residential and agricultural areas.

Calcium was the predominant dissolved cation in ground water in most parts of the study area. Bicarbonate was the predominant dissolved anion in areas where dissolved-solids concentrations were less that 500 mg/L. Where dissolved-solids concentrations were greater than 500 mg/L, sulfate commonly was the predominant anion. Sulfate concentration exceeded the EPA recommended drinking-water limit of 250 mg/L in water from four wells.

All water samples collected from springs had dissolved-solids concentrations less than 300 mg/L, except for a concentration of 850 mg/L in water from one spring. Water from most springs that were sampled can be classified as calcium sodium bicarbonate type.

Water samples collected from Cahuilla Creek in 1986 had dissolved-solids concentrations that ranged from 280 to 1,100 mg/L. Sodium and sulfate were the predominant dissolved ions in water from upstream reaches of the creek, but bicarbonate significantly increased in concentration farther downstream.

Nitrate (as nitrogen) concentration in ground water ranged from 0.0 to 170 mg/L. Water from eight of the sampling locations had concentrations higher than the EPA recommended limit for drinking water of 10 mg/L. High nitrate concentrations were detected in samples throughout the study area, but most high concentrations were in water from wells completed in weathered consolidated rocks. Concentrations generally were less than 10 mg/L in the agricultural areas of Anza and Terwilliger Valleys, indicating that effects from nitrogen fertilizers were minimal. Nitrate (as nitrogen) concentrations in water from all sampling locations on Cahuilla Indian Reservation were less than the EPA drinking-water limit.

The observation-well network was found to be generally adequate for detecting changes in water level and water quality. However, the addition of observation wells in Anza Valley near the reservation would allow monitoring of water levels during the summer heavy pumping season. Also, additional observation wells downgradient from an area of high nitrate concentrations in Durasna Valley and in an area of high dissolved-solids concentrations north of the town of Cahuilla would be desirable.

REFERENCES CITED

Giessner, F.W. and Mermod, M.J., 1974, Water wells and springs in the eastern part of the Upper Santa Margarita River watershed, Riverside and San Diego Counties, California: California Department of Water Resources Bulletin 91-22, 213 p.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water: U.S. Geological Survey Water-Supply Paper 2254, 263 p.

Krieger and Stewart Engineering Consultants, 1986, Preliminary evaluation of groundwater pumping of AWD [Anza Water District] wells within the Anza-Terwilliger groundwater basin: Krieger and Stewart Engineering Consultants, Riverside, California, 16 p.

Moyle, W.R., Jr., 1976, Geohydrology of the Anza-Terwilliger area, Riverside County, California: U.S. Geological Survey Water-Resources Investigations 76-10, 25 p.

Sharp, R.V., 1965, Geology of the San Jacinto fault zone in the Peninsular Ranges of southern California: Pasadena, California, California Institute of Technology, Ph.D. dissertation, 184 p.

Todd, D.K., Tinlin, R.M., Schmidt, K.D., and Everett, L.D., 1976, Monitoring groundwater quality: Monitoring methodology: U.S. Environmental Protection Agency-600/4-76-026, 154 p.

U.S. Environmental Protection Agency, 1986, Quality criteria for water: Washington, D.C., U.S. Government Printing Office, EPA 440/5-86-001.

page 39 follows

SUPPLEMENTAL DATA

A: Well Construction

B: Water Levels

C: Water Quality

SUPPLEMENTAL DATA A: Well construction

[Depth of well and perforated interval are in feet below land-surface datum. --, no data]

Well number	Date inventoried	Depth of well	Diameter of casing (inches)	Perforated interval	Material at perforations
7S/2E-11K3	11-20-69	190	6.6	--	Weathered zone/ basement complex
7S/2E-11Q1	11-25-69	100	6.0	Open hole	Basement complex
7S/2E-13D1	07-26-60	144	--	--	Weathered zone/ basement complex
7S/2E-13N1	07-26-60	110	8.0	--	--
7S/2E-13Q1	10-30-69	140	8.0	40-140	Weathered zone
7S/2E-14E3	12-01-69	220	8.0	40-220	Weathered zone/ basement complex
7S/2E-14F1	01-15-86	--	6.5	--	--
7S/2E-14H2	08-03-60	70	8.0	--	--
7S/2E-14M1	01-08-86	350	6.6	70-100 210-250	Weathered zone
7S/2E-14M2	01-08-86	240	7.0	60-080 100-120 140-160	Weathered zone/ basement complex
7S/2E-15A4	11-05-69	200	6.0	--	Weathered zone/ basement complex
7S/2E-15L3	06-11-70	131	6.0	--	Weathered zone/ basement complex
7S/2E-22A1	04-07-60	60	8.0	--	Weathered zone/ basement complex
7S/2E-22K3	04-08-86	--	5.0	--	--
7S/2E-23G1	07-29-86	--	6.0	--	Weathered zone/ basement complex
7S/2E-23H1	01-08-86	--	6.8	--	--
7S/2E-23K1	07-26-60	50	8.0	--	--
7S/2E-23Q1	12-01-69	195	12.0	50-195	Weathered zone/ basement complex
7S/2E-24P1	10-28-69	150	8.0	53-150	Weathered zone/ basement complex
7S/2E-25F1	01-10-86	--	6.5	--	--
7S/2E-26B2	07-29-86	--	6.6	--	Weathered zone/ basement complex
7S/2E-28Q1	06-10-70	95	6.6	55-095	Weathered zone
7S/2E-29B1	02-03-86	--	6.0	--	Weathered zone/ basement complex

SUPPLEMENTAL DATA A: Well construction--Continued

Well number	Date inventoried	Depth of well	Diameter of casing (inches)	Perforated interval	Material at perforations
7S/2E-32A3	01-21-86	115	5.5	--	Alluvium
7S/2E-32D2	01-21-86	250	5.5	--	Weathered zone/ basement complex
7S/2E-33N1	11-16-73	90	6.0	--	Alluvium
7S/2E-34E1	08-28-73	100	5.5	20-040 60-100	Weathered zone/ basement complex
7S/2E-36A1	01-07-86	200	6.5	40-080 100-120 140-160	Weathered zone/ basement complex
7S/2E-36J1	01-07-86	150	6.5	60-140	Weathered zone/ basement complex
7S/3E-4H1	08-06-60	125	10.0	--	--
7S/3E-4H2	07-06-60	124	12.0	Open hole	Basement complex
7S/3E-7C2	08-05-69	201	6.0	160-200	Weathered zone/ basement complex
7S/3E-7F1	08-05-69	220	6.0	Open hole	Basement complex
7S/3E-8L1	08-01-69	--	6.0	--	--
7S/3E-9D1	08-24-60	156	6.0	--	--
7S/3E-9E1	08-24-60	235	8.0	--	Older alluvium
7S/3E-9F1	07-30-69	300	6.0	200-300	Older alluvium
7S/3E-9P4	07-29-69	210	8.0	20-120 150-210	Weathered zone
7S/3E-10B1	07-24-69	125	8.0	60-125	Older alluvium
7S/3E-10C1	10-05-60	20.3	5.0	--	Older alluvium
7S/3E-10G1	07-24-69	545	6.6	347-387 426-487 507-546	Older alluvium
7S/3E-10J1	07-24-69	--	--	--	--
7S/3E-10M2	09-09-60	315	8.0	275-315	Older alluvium
7S/3E-10R4	12-16-76	410	6.6	180-200 240-320 360-410	Older alluvium
7S/3E-11N3	07-16-86	600	10.0	100-600	Older alluvium
7S/3E-11N4	07-16-86	620	12.0	100-620	Older alluvium
7S/3E-11P3	07-17-86	900	12.0	300-600	Older alluvium

SUPPLEMENTAL DATA A: Well construction--Continued

Well number	Date inventoried	Depth of well	Diameter of casing (inches)	Perforated interval	Material at perforations
7S/3E-13D3	08-04-60	--	8.0	--	--
7S/3E-14C2	07-17-86	427	12.0	247-427	Older alluvium
7S/3E-14D1	07-17-86	422	12.0	202-422	Older alluvium
7S/3E-14P3	11-18-71	255	6.0	Open	Basement complex
7S/3E-15D2	09-08-60	385	12.0	--	--
7S/3E-15M1	07-29-69	155	6.0	50-98, Open 98-155	Weathered zone/ basement complex
7S/3E-15P1	08-03-60	70	7.0	--	--
7S/3E-16F4	01-24-86	120	6.5	Open 20-120	Basement complex Weathered zone/ basement complex
7S/3E-16L1	07-28-60	60	6.0	25-60	--
7S/3E-16N5	08-04-69	150	8.0	--	--
7S/3E-17A1	08-05-69	--	6.0	--	--
7S/3E-17B2	08-11-60	300	6.6	80-300	Weathered zone/ basement complex
7S/3E-17H1	08-05-69	136	6.0	--	--
7S/3E-18B1	02-04-86	--	6.0	--	Weathered zone/ basement complex
7S/3E-18R1	08-07-69	300	6.6	Open	Basement complex
7S/3E-19D1	04-08-86	--	5.5	--	Weathered zone/ basement complex
7S/3E-19E1	01-24-86	--	6.0	--	Weathered zone/ basement complex
7S/3E-20C2	--	551	14.0	100-551	Weathered zone/ basement complex
7S/3E-20E2	10-22-69	315	8.0	130-315	Weathered zone
7S/3E-21C2	10-05-60	--	8.0	--	--
7S/3E-21J2	08-10-60	232	12.0	68-228	Older alluvium
7S/3E-21L1	08-11-60	88	8.0	50-70	Older alluvium
7S/3E-22H1	10-29-69	65	6.6	25-65	Older alluvium
7S/3E-22N1	08-10-60	136	8.0	30-136	Older alluvium
7S/3E-22R1	10-30-69	300	6.6	Open hole	Basement complex
7S/3E-23B1	07-23-69	191	8.0	0-191	Younger alluvium/ basement complex
7S/3E-23D1	08-04-60	--	12.0	--	--
7S/3E-23Q1	08-12-69	170	8.0	70-170	Basement complex
7S/3E-24C1	08-11-69	155	6.0	--	Weathered zone/ basement complex

SUPPLEMENTAL DATA A: Well construction--Continued

Well number	Date inventoried	Depth of well	Diameter of casing (inches)	Perforated interval	Material at perforations
7S/3E-24J1	02-04-86	160	6.6	120-160	Basement complex
7S/3E-25D1	01-14-86	--	6.5	--	Weathered zone/ basement complex
7S/3E-26A1	08-30-76	235	6.6	195-235	Weathered zone/ basement complex
7S/3E-29Q1	01-15-86	--	6.0	--	Weathered zone
7S/3E-30P1	04-07-86	--	5.5	--	Weathered zone/ basement complex
7S/3E-31L2	11-22-85	140	6.6	80-140	Weathered zone/ basement complex
7S/3E-31N1	01-06-86	175	6.6	115-175	Weathered zone/ basement complex
7S/3E-31Q1	06-11-70	150	8.0	--	Weathered zone/ basement complex
7S/3E-34E1	08-25-60	249	8.6	40-182	Older alluvium
7S/3E-36B1	01-14-86	--	6.8	--	Weathered zone/ basement complex
7S/3E-36E3	01-14-86	330	6.5	185-205 225-305	Weathered zone/ basement complex
7S/3E-36F1	01-14-86	--	--	--	Weathered zone/ basement complex
7S/3E-36G1	01-14-86	295	6.6	215-295	Weathered zone/ basement complex
7S/4E-19K1	08-07-69	--	6.0	--	--
8S/2E-4P1	11-22-85	340	6.0	100-120 200-220 270-290 300-320	Weathered zone/ basement complex
8S/2E-5B1	11-22-85	--	6.0	--	Weathered zone/ basement complex
8S/2E-5G1	01-09-86	--	7.0	--	--
8S/2E-5K1	01-10-86	--	6.0	--	--
8S/2E-9B1	11-19-85	195	8.0	--	Weathered zone/ basement complex
8S/3E-1P1	01-23-86	250	6.0	90-110 130-190 230-250	Older alluvium

SUPPLEMENTAL DATA A: Well construction--Continued

Well number	Date inventoried	Depth of well	Diameter of casing (inches)	Perforated interval	Material at perforations
8S/3E-2A1	02-05-86	255	6.6	80-100 120-160 180-100 220-240	Older alluvium
8S/3E-2D1	10-20-69	440	--	--	Older alluvium
8S/3E-2E1	08-25-60	140	8.0	--	Older alluvium
8S/3E-2K1	06-13-72	296	7.8	--	Older alluvium
8S/3E-5Q1	10-30-86	--	6.0	--	Weathered zone/ basement complex
8S/3E-6B1	01-07-86	230	5.5	90-110 130-150 170-230	Weathered zone/ basement complex
8S/3E-6J1	01-06-86	--	--	--	Weathered zone/ basement complex
8S/3E-10B1	07-19-73	--	6.0	--	Older alluvium
8S/3E-10R2	01-14-86	--	7.0	--	Older alluvium
8S/3E-11A2	07-18-73	63	7.3	19-63	Younger/older alluvium
8S/3E-11C2	01-13-86	248	6.0	80-100 168-248	Older alluvium
8S/3E-11E1	01-14-86	--	6.5	--	Older alluvium
8S/3E-11F1	01-14-86	208	8.0	--	Older alluvium
8S/3E-11R1	07-17-73	--	6.0	--	--
8S/3E-12K1	07-18-73	156	8.0	63-156	Older alluvium
8S/3E-14A3	01-24-86	260	6.6	160-260	Older alluvium
8S/3E-14E1	01-10-86	--	6.0	--	--
8S/3E-14G1	08-01-86	--	6.0	--	--
8S/3E-15A1	01-22-86	470	7.0	250-350	Older alluvium
8S/3E-15A2	01-13-86	325	8.0	225-325	Older alluvium/ weathered zone
8S/3E-16D1	07-24-69	204	8.0	40-204	Younger/older alluvium
8S/4E-6F5	07-30-73	280	6.6	150-280	Older alluvium/ weathered zone
8S/4E-6R1	01-24-86	265	8.0	225-265	Older alluvium
8S/4E-7A1	07-31-73	--	7.3	--	--

SUPPLEMENTAL DATA B: Water levels

[Altitude, in feet, refers to distance above sea level.
Site status: p, pumping; r, recently pumped; s, static]

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/2E-11K3	11-20-69	3,860	62.40	3,798	s
	08-22-73		62.93	3,797	s
	08-01-86		43.59	3,816	s
7S/2E-11Q1	11-25-69	3,800	27.42	3,773	s
	08-22-73		30.93	3,769	s
	08-01-86		18.58	3,781	s
7S/2E-13D1	11-29-51	3,772	40.20	3,732	s
	11-21-52		21.10	3,751	s
	05-07-53		22.00	3,750	s
	11-09-53		24.90	3,747	s
	05-10-54		31.80	3,740	s
	07-26-60		32.42	3,740	s
	10-31-69		35.40	3,737	s
	04-08-86		20.32	3,752	s
	07-29-86		19.65	3,752	s
7S/2E-13N1	11-29-51	3,700	50.10	3,650	s
	11-21-52		40.10	3,660	s
	05-07-53		39.10	3,661	s
	11-10-53		42.30	3,658	s
	05-10-54		42.80	3,657	s
	07-26-60		53.93	3,646	s
	10-30-69		40.55	3,659	s
	08-22-73		38.94	3,661	s
	07-31-86		29.04	3,671	s
7S/2E-13Q1	07-31-86	3,770	29.02	3,741	s
7S/2E-14E3	12-01-69	3,760	38.10	3,722	s
	06-11-70		47.22	3,713	s
	07-29-86		24.24	3,736	s
7S/2E-14F1	01-15-86	3,762	51.59	3,710	s
	07-16-86		49.67	3,712	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/2E-14H2	11-10-53	3,730	33.70	3,696	s
	05-10-54		30.80	3,699	s
	08-03-60		36.21	3,694	s
	11-25-69		28.20	3,702	s
	07-31-86		27.39	3,703	s
7S/2E-14M1	01-08-86	3,700	10.79	3,689	s
	04-07-86		6.40	3,694	s
	07-17-86		10.60	3,689	s
7S/2E-14M2	01-08-86	3,690	23.55	3,666	r
	04-07-86		19.50	3,670	s
	07-17-86		20.44	3,670	s
7S/2E-15A4	11-05-69	3,830	35.07	3,795	s
	08-22-73		38.98	3,791	s
	08-01-86		28.38	3,802	s
7S/2E-15L3	08-23-73	3,820	32.72	3,787	s
	08-01-86		9.38	3,811	s
7S/2E-22A1	04-07-53	3,670	23.50	3,646	s
	11-09-53		32.00	3,638	s
	05-10-54		27.90	3,642	s
	09-08-60		28.55	3,641	s
	10-23-69		23.78	3,646	s
	08-23-73		29.12	3,641	s
	04-08-86		17.34	3,653	s
	07-30-86		22.00	3,648	s
7S/2E-22K3	10-23-69	3,560	7.83	3,552	s
	08-23-73		8.89	3,661	s
	04-08-86		5.31	3,555	s
7S/2E-23G1	07-29-86	3,690	27.80	3,662	s
7S/2E-23H1	01-07-86	3,670	35.45	3,635	r
	04-07-86		34.47	3,636	s
	07-17-86		36.29	3,634	s
7S/2E-23K1	11-29-51	3,636.6	27.00	3,610	s
	11-21-52		21.50	3,615	s
	05-07-53		19.20	3,617	s
	11-09-53		19.90	3,617	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/2E-23K1	05-10-54	3,636.6	19.80	3,617	s
	07-26-60		22.81	3,614	s
	12-01-69		10.51	3,616	s
	08-31-73		29.90	3,607	p
	07-30-86		9.92	3,627	s
7S/2E-23Q1	04-24-60	3,620	15.00	3,605	s
	12-01-69		11.43	3,609	s
	08-31-73		12.05	3,608	s
	07-16-86		2.78	3,617	s
7S/2E-24P1	08-22-73	3,780	55.35	3,725	s
	08-01-86		30.90	3,749	s
7S/2E-25F1	01-10-86	3,675	39.01	3,636	s
	04-07-86		37.99	3,637	s
	07-14-86		41.46	3,634	s
7S/2E-26B2	07-29-86	3,675	17.04	3,658	s
7S/2E-28Q1	06-10-70	3,450	48.97	3,401	s
	09-14-73		66.00	3,384	p
	02-05-86		28.34	3,422	s
	04-07-86		19.73	3,430	s
	07-14-86		28.40	3,422	s
7S/2E-29B1	02-03-86	3,560	31.80	3,528	s
	04-08-86		29.29	3,531	s
	07-17-86		37.71	3,522	s
7S/2E-32A3	01-21-86	3,430	12.53	3,417	s
	04-08-86		9.80	3,420	p
	07-17-86		14.16	3,416	p
7S/2E-32D2	01-21-86	3,430	14.31	3,416	s
	04-08-86		13.44	3,417	s
	07-17-86		16.73	3,413	s
7S/2E-33N1	11-16-73	3,430	16.17	3,414	s
	11-20-85		0.43	3,430	s
	04-07-86		0.30	3,430	s
	07-14-86		0.41	3,430	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/2E-34E1	08-28-73	3,580	5.21	3,575	s
	04-09-86		-1.78	3,582	s
	07-14-86		-1.49	3,581	s
7S/2E-36A1	01-07-86	3,720	36.87	3,683	s
	07-14-86		36.90	3,683	s
7S/2E-36J1	01-07-86	3,910	44.81	3,865	s
	07-14-86		43.95	3,866	s
7S/3E-4H1	07-28-69	4,720	8.92	4,711	s
	08-08-73		10.05	4,710	s
	07-15-86		7.52	4,712	s
7S/3E-4H2	07-28-69	4,780	21.09	4,759	s
	08-08-73		18.36	4,752	s
	07-14-86		23.46	4,757	s
7S/3E-7C2	08-05-69	4,055	120.33	3,935	s
	12-10-75		119.48	3,936	s
	01-22-76		119.10	3,936	s
	03-29-76		118.74	3,936	s
	05-27-76		120.39	3,935	s
	07-07-76		124.75	3,930	s
	08-04-76		123.97	3,931	s
	09-02-76		122.46	3,933	s
	10-12-76		120.87	3,934	s
	11-18-76		120.26	3,935	s
	12-16-76		120.05	3,935	s
	02-04-77		119.80	3,935	s
	03-24-77		119.75	3,935	s
	04-21-77		120.24	3,935	s
	06-08-77		120.63	3,934	s
	07-21-77		125.55	3,929	s
	08-24-77		124.40	3,931	s
	09-22-77		121.50	3,934	s
	11-21-77		121.31	3,934	s
	12-19-77		121.32	3,934	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-7C2	01-25-78	4,055	125.88	3,929	s
	02-16-78		123.89	3,931	s
	03-08-78		121.11	3,934	s
	07-19-78		123.44	3,932	s
	09-07-78		126.13	3,929	s
	10-10-78		122.83	3,932	s
	01-11-79		122.39	3,933	s
	02-10-79		121.90	3,933	s
	03-30-79		121.42	3,934	s
	04-25-79		124.00	3,931	r
	05-14-79		122.01	3,933	r
	08-13-79		129.75	3,925	r
	09-14-79		123.67	3,931	r
	10-16-79		124.27	3,931	s
	11-15-79		122.35	3,933	s
	12-20-79		131.29	3,924	r
	01-23-80		130.72	3,924	s
	02-28-80		120.45	3,935	s
	03-31-80		120.32	3,935	s
	05-14-80		120.02	3,935	s
	07-02-80		123.87	3,931	s
	07-30-80		124.04	3,931	s
	09-03-80		125.97	3,929	s
	10-10-80		124.51	3,930	s
	11-07-80		122.37	3,933	s
	12-11-80		121.18	3,934	s
	01-27-81		119.99	3,935	s
	02-17-81		119.59	3,935	s
	03-10-81		119.28	3,936	s
	04-07-81		120.38	3,935	s
	06-04-81		119.93	3,935	s
	07-09-81		123.24	3,932	s
	08-06-81		127.04	3,928	s
	09-15-81		121.70	3,933	s
	10-15-81		118.27	3,937	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-7C2	12-28-81	4,055	118.93	3,936	r
	03-03-82		117.93	3,937	s
	04-16-12		118.04	3,937	s
	06-30-82		120.84	3,934	r
	08-24-82		124.40	3,931	s
	12-02-82		119.62	3,935	r
	03-24-83		117.40	3,938	s
	06-28-83		121.39	3,934	r
	10-05-83		120.11	3,935	r
	12-09-83		116.72	3,938	s
	03-15-84		115.51	3,939	s
	06-26-84		118.41	3,937	s
	10-02-84		115.99	3,939	s
	12-03-84		115.07	3,940	s
	03-15-85		113.76	3,941	s
	09-12-85		115.76	3,939	s
	07-30-86		113.65	3,941	s
7S/3E-7F1	08-05-69	4,090	134.88	3,955	s
	08-21-73		142.70	3,947	s
	07-16-86		112.80	3,977	s
7S/3E-8L1	08-01-69	4,160	92.66	4,067	s
	04-19-73		96.24	4,064	s
	08-17-73		120.20	4,040	p
	07-30-86		82.65	4,077	s
7S/3E-9D1	08-24-60	4,290	140.00	4,150	s
	07-31-69		122.37	4,168	s
	08-16-73		122.94	4,167	s
	07-29-86		130.78	4,159	s
7S/3E-9E1	08-24-60	4,220	117.10	4,103	s
	06-10-70		149.73	4,070	s
	08-16-73		148.59	4,071	s
	07-29-86		110.16	4,110	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-9F1	07-30-69	4,280	170.25	4,110	s
	12-08-71		152.74	4,127	s
	04-19-73		152.84	4,127	s
	08-21-73		179.89	4,100	s
	07-31-86		192.13	4,088	s
7S/3E-9P4	07-29-69	4,120	56.70	4,063	s
	08-16-73		69.38	4,051	s
	07-16-86		63.70	4,056	s
7S/3E-10B1	07-24-69	4,360	28.57	4,331	s
	07-15-86		26.15	4,334	s
7S/3E-10C1	10-05-60	4,390	14.84	4,375	s
	07-24-69		6.00	4,384	s
	08-08-73		17.63	4,372	s
	07-17-86		15.75	4,374	s
7S/3E-10G1	07-16-86	4,280	413.19	3,867	s
7S/3E-10J1	07-24-69	4,180	186.35	3,994	s
	08-06-73		164.70	4,015	s
	07-15-86		183.33	3,997	s
7S/3E-10M2	09-09-60	4,250	179.50	4,070	s
	08-08-73		265.92	3,984	p
	07-16-86		49.82	4,200	s
7S/3E-11N3	07-16-86	4,150	275.91	3,874	s
7S/3E-11N4	07-16-86	4,143	295.12	3,848	r
7S/3E-11P3	07-17-86	4,145	301.35	3,843	p
7S/3E-13D3	11-03-53	4,230	6.70	4,223	s
	08-04-60		13.71	4,216	r
	07-23-69		6.75	4,223	s
	08-07-73		2.06	4,228	s
	07-15-86		11.68	4,218	r

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-14C2	07-17-86	4,070	255.82	3,814	p
7S/3E-14D1	07-17-86	4,060	255.38	3,805	p
7S/3E-14P3	08-06-73	4,030	74.98	3,955	s
	08-20-79		88.79	3,941	s
	09-14-79		88.85	3,941	s
	10-16-79		89.13	3,941	s
	11-15-79		91.98	3,938	s
	12-20-79		89.73	3,940	s
	01-23-80		89.35	3,941	s
	02-28-80		95.58	3,934	s
	03-31-80		89.80	3,940	s
	05-14-80		88.77	3,941	s
	07-02-80		87.52	3,942	s
	07-30-80		86.90	3,943	s
	07-03-80		86.14	3,944	s
	10-10-80		86.37	3,944	s
	11-07-80		85.90	3,944	r
	12-11-80		85.51	3,944	s
	01-27-81		86.59	3,943	s
	02-17-81		84.87	3,945	s
	03-10-81		85.00	3,945	s
	04-07-81		89.80	3,940	r
	06-04-81		86.73	3,943	s
	07-08-81		90.00	3,940	s
	07-09-81		86.09	3,944	s
	08-06-81		92.20	3,938	r
	09-15-81		87.59	3,942	s
	10-15-81		88.10	3,942	s
	12-28-81		88.51	3,941	r
	03-03-82		88.52	3,941	r
	04-12-82		88.30	3,942	s
	06-30-82		92.44	3,938	r

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-14P3	08-24-82	4,030	91.60	3,938	r
	12-02-82		95.69	3,934	r
	03-24-83		95.68	3,934	r
	06-28-83		92.97	3,937	r
	10-05-83		90.27	3,940	r
	12-09-83		90.70	3,939	r
	04-07-86		95.52	3,934	r
	07-16-86		95.71	3,934	s
7S/3E-15D2	09-08-60	4,100	94.39	4,006	s
	07-30-86		94.29	4,006	s
7S/3E-15M1	07-29-69	3,995	52.65	3,942	s
	07-30-86		52.22	3,943	s
7S/3E-15P1	05-22-53	3,935.68	30.00	3,906	s
	11-24-53		-2.80	3,938	s
	04-24-54		25.20	3,910	p
	08-03-60		29.22	3,906	s
	07-29-69		19.12	3,917	s
	08-09-73		22.18	3,913	s
	04-08-86		11.60	3,924	r
	07-17-86		12.10	3,924	s
7S/3E-16F4	01-24-86	3,940	27.50	3,912	s
	04-07-86		26.07	3,914	s
	07-16-86		27.32	3,913	s
7S/3E-16L1	07-28-60	3,975	61.40	3,914	s
	07-30-69		48.47	3,927	s
	08-16-73		50.73	3,924	s
	07-30-86		46.10	3,929	s
7S/3E-16N5	08-04-69	3,930	90.59	3,839	s
	11-18-71		90.58	3,839	s
	05-30-72		91.20	3,839	s
	09-27-72		93.09	3,837	s
	04-19-73		90.83	3,839	s
	07-29-86		74.75	3,855	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-17A1	08-05-69	4,065	87.85	3,977	s
	07-31-86		70.30	3,995	s
7S/3E-17B2	08-11-60	4,075	81.00	3,994	s
	08-31-62		67.00	4,008	s
	08-05-69		77.05	3,998	s
	08-15-73		80.46	3,995	s
	04-07-86		70.90	4,004	s
	07-16-86		75.00	4,000	s
7S/3E-17H1	07-31-86	4,020	87.72	3,932	s
7S/3E-18B1	02-04-86	3,900	211.03	3,689	s
	04-07-86		216.99	3,683	s
	07-15-86		278.80	3,621	p
7S/3E-18R1	08-07-69	4,030	145.30	3,885	s
	07-31-86		92.23	3,938	s
7S/3E-19D1	04-08-86	3,840	35.10	3,805	s
	07-30-86		44.24	3,796	p
	07-31-86		37.27	3,803	s
7S/3E-20C2	07-16-86	3,958	66.85	3,891	s
7S/3E-20E2	10-22-69	3,900	79.00	3,821	s
	04-08-86		42.70	3,857	s
	07-18-86		44.56	3,855	s
7S/3E-21C2	10-05-60	3,920	81.00	3,839	s
	10-23-69		96.05	3,824	s
	07-29-86		64.32	3,856	s
7S/3E-21J2	11-30-50	3,849.25	8.50	3,841	s
	11-29-51		31.20	3,818	s
	11-18-52		13.00	3,836	s
	05-26-53		26.00	3,823	s
	04-22-54		31.90	3,817	s
	10-19-54		25.30	3,824	s
	10-28-69		44.80	3,804	s
	08-10-73		98.00	3,751	p
	08-20-86		72.79	3,776	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-21L1	11-13-52	3,842.51	17.50	3,825	s
	05-27-53		34.50	3,808	p
	11-18-53		17.50	3,825	s
	11-24-53		44.70	3,798	p
	04-22-54		49.00	3,794	p
	08-22-60		55.62	3,787	p
	08-15-73		64.80	3,778	p
	07-16-86		18.20	3,824	s
7S/3E-22H1	10-29-69	3,940	8.25	3,932	s
	08-09-73		8.66	3,931	s
	08-01-86		9.50	3,930	s
7S/3E-22N1	01-20-50	3,861.29	16.20	3,845	s
	11-20-51		18.00	3,843	s
	11-18-52		18.60	3,843	s
	03-26-53		22.20	3,839	s
	11-24-53		26.20	3,835	s
	04-22-54		25.00	3,836	s
	10-19-54		25.80	3,835	s
	08-10-60		42.06	3,819	p
	10-28-69		45.42	3,816	s
	08-08-73		55.91	3,805	s
	08-01-86		39.70	3,822	s
7S/3E-22R1	10-30-69	3,920	43.17	3,877	s
	08-10-73		44.45	3,876	s
	07-17-86		49.55	3,870	r
	08-01-86		46.94	3,873	s
7S/3E-23B1	07-13-69	4,060	62.72	3,997	s
	08-01-86		52.00	4,008	s
7S/3E-23D1	05-26-53	3,974.58	23.10	3,951	s
	11-23-53		22.40	3,952	s
	04-20-54		22.30	3,952	s
	08-04-60		29.84	3,945	s
	08-12-69		35.38	3,939	s
	08-06-73		29.13	3,945	s
	07-17-86		45.07	3,930	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-23Q1	04-08-86	4,080	45.70	4,034	r
	07-18-86		46.71	4,033	s
7S/3E-24C1	08-11-69	4,320	45.78	4,274	s
	08-03-73		75.80	4,244	s
	08-01-86		126.45	4,194	s
7S/3E-25D1	01-14-86	4,240	30.85	4,209	s
	04-09-86		29.50	4,210	s
	07-15-86		28.03	4,212	s
7S/3E-26A1	08-30-73	4,170	191.30	3,979	r
	04-09-86		79.95	4,090	s
	07-30-86	4,170	84.43	4,086	s
7S/3E-29Q1	01-15-86	3,890	33.52	3,856	p
	07-14-86		32.85	3,857	s
7S/3E-30P1	04-07-86	3,680	1.50	3,678	s
	07-14-86		4.15	3,676	s
7S/3E-31L2	11-23-85	3,790	15.54	3,774	r
	04-07-86		13.43	3,777	r
	07-15-86		15.35	3,775	r
7S/3E-31N1	01-06-86	3,900	44.30	3,856	r
	04-07-86		40.56	3,859	s
	07-14-86		40.16	3,860	s
7S/3E-31Q1	06-11-70	3,840	41.00	3,799	s
	06-13-72		58.18	3,782	r
	07-19-72		58.40	3,782	r
	08-24-72		63.25	3,777	r
	09-28-72		47.94	3,792	s
	10-16-72		51.71	3,788	s
	11-30-72		49.06	3,791	s
	01-03-73		45.22	3,795	s
	02-06-73		49.56	3,790	s
	03-09-73		43.45	3,797	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-31Q1	04-18-73	3,840	40.14	3,800	s
	05-31-73		57.24	3,783	r
	07-24-73		61.68	3,778	p
	08-29-73		61.54	3,778	p
	09-14-73		49.09	3,791	s
	10-12-73		47.48	3,793	s
	11-16-73		55.80	3,784	s
	12-24-73		45.00	3,795	s
	01-25-74		45.86	3,794	s
	02-22-74		49.28	3,791	s
	03-26-74		56.90	3,783	p
	04-18-74		66.70	3,773	p
	05-09-74		56.80	3,783	p
	06-05-74		48.30	3,792	r
	07-05-74		68.60	3,771	r
	08-06-74		48.00	3,792	p
	09-05-74		46.40	3,794	p
	10-03-74		57.50	3,782	p
	11-11-74		45.14	3,795	s
	12-27-74		47.63	3,792	s
	01-28-75		57.85	3,782	s
	02-26-75		47.97	3,792	s
	04-10-75		44.67	3,795	s
	05-07-75		43.55	3,796	s
	06-02-75		61.78	3,778	r
	06-26-75		60.75	3,779	r
	07-24-75		58.52	3,781	r
	08-28-75		67.17	3,773	r
	09-29-75		54.26	3,786	r
	01-22-76		47.96	3,792	r
	05-28-76		65.44	3,775	r
	09-02-76		70.62	3,769	r
	11-18-76		48.50	3,792	s
	12-16-76		45.52	3,794	s
	02-04-77		64.52	3,775	r

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-31Q1	03-24-77	3,840	74.50	3,766	r
	04-21-77		45.39	3,795	s
	06-08-77		51.18	3,789	r
	07-21-77		43.95	3,796	s
	08-24-77		76.85	3,763	r
	09-22-77		66.95	3,773	r
	11-21-77		45.58	3,794	s
	12-19-77		47.57	3,792	s
	01-25-78		45.37	3,795	s
	02-16-78		50.90	3,789	r
	03-08-78		45.65	3,794	s
	07-19-78		45.55	3,794	r
	10-10-78		40.47	3,800	s
	01-11-79		46.68	3,793	r
	02-07-79		38.66	3,801	s
	03-30-79		34.47	3,806	s
	04-25-79		32.63	3,807	s
	05-14-79		32.32	3,808	s
	06-28-79		33.17	3,807	s
	08-13-79		35.03	3,805	s
	09-14-79		36.04	3,804	s
	10-16-79		37.07	3,803	s
	11-15-79		37.29	3,803	s
	12-20-79		39.78	3,800	p
	01-23-80		36.03	3,804	s
	02-28-80		56.95	3,783	r
	03-31-80		28.77	3,811	s
	05-14-80		42.72	3,797	r
	07-02-80		40.35	3,800	r
	07-30-80		34.36	3,806	s
	09-03-80		34.38	3,806	s
	10-10-80		40.10	3,800	r
	11-07-80		36.80	3,803	s
	12-11-80		35.28	3,805	s
	01-27-81		37.52	3,802	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-31Q1	02-17-81	3,840	56.23	3,784	r
	03-10-81		37.80	3,802	r
	04-07-81		50.69	3,789	r
	06-04-81		33.92	3,806	s
	07-08-81		38.62	3,801	r
	08-06-81		36.47	3,804	s
	09-15-81		44.68	3,795	r
	10-15-81		55.86	3,784	r
	12-28-81		41.73	3,798	r
	03-03-82		33.55	3,806	s
	04-12-82		30.98	3,809	s
	06-29-82		33.20	3,807	s
	08-24-82		35.91	3,804	s
	12-02-82		34.70	3,806	s
	03-24-83		29.03	3,811	s
	06-28-83		44.71	3,795	p
	10-05-83		33.36	3,807	s
	12-09-83		32.18	3,808	r
	03-15-84		31.14	3,809	s
	06-26-84		34.00	3,806	s
	10-02-84		36.38	3,804	r
	01-07-86		31.35	3,809	s
	07-14-86		37.86	3,802	s
7S/3E-34E1	04-19-46	3,876.51	39.40	3,837	s
	01-31-51		34.50	3,842	s
	03-08-51		34.70	3,842	s
	04-05-51		36.90	3,840	s
	05-08-51		36.20	3,840	s
	06-13-51		37.90	3,839	s
	07-09-51		37.90	3,839	s
	07-31-51		37.00	3,840	s
	09-06-51		36.70	3,840	s
	10-03-51		36.30	3,840	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-34E1	11-07-51	3,876.51	35.90	3,841	s
	11-15-51		37.30	3,839	s
	01-03-52		34.70	3,842	s
	11-24-53		37.60	3,839	s
	05-07-54		38.20	3,838	s
	08-25-60		48.17	3,828	s
	10-30-69		58.32	3,818	s
	06-13-72		68.50	3,808	r
	07-19-72		70.41	3,806	r
	08-24-72		70.46	3,806	r
	09-27-72		70.53	3,806	r
	10-16-72		69.75	3,807	s
	11-30-72		66.22	3,810	s
	01-03-73		65.51	3,811	s
	02-06-73		68.52	3,808	s
	03-09-73		64.85	3,812	s
	04-19-73		67.75	3,809	s
	05-31-73		66.84	3,810	s
	07-24-73		76.75	3,800	s
	08-29-73		70.55	3,806	s
	09-14-73		70.98	3,806	s
	10-12-73		71.99	3,805	s
	11-16-73		72.61	3,804	s
	12-24-73		69.64	3,807	s
	01-25-74		68.30	3,808	s
	02-22-74		69.38	3,807	s
	03-26-74		69.93	3,807	s
	04-18-74		68.75	3,808	p
	05-09-74		69.66	3,807	s
	06-05-74		71.32	3,805	s
	07-05-74		72.00	3,805	r
	08-06-74		72.90	3,804	p
	09-05-74		71.55	3,805	r
	10-03-74		70.94	3,806	p
	11-11-74		71.49	3,805	p

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-34E1	12-27-74	3,876.51	68.75	3,808	s
	01-28-75		68.26	3,808	s
	02-26-75		70.47	3,806	s
	04-10-75		69.72	3,807	s
	05-07-75		69.95	3,807	s
	06-02-75		71.95	3,805	r
	06-26-75		72.58	3,804	r
	07-24-75		72.63	3,804	r
	08-28-75		73.00	3,804	s
	09-29-75		70.52	3,806	s
	11-05-75		70.71	3,806	r
	12-10-75		70.60	3,806	s
	01-22-76		68.90	3,808	s
	03-29-76		71.30	3,805	s
	05-27-76		71.24	3,805	s
	07-07-76		72.41	3,804	r
	08-04-76		72.88	3,804	s
	09-02-76		73.04	3,803	s
	10-12-76		72.27	3,804	r
	11-18-76		72.44	3,804	r
	12-16-76		71.68	3,805	r
	02-04-77		70.69	3,806	s
	03-24-77		69.69	3,807	s
	04-21-77		70.45	3,806	s
	06-08-77		70.30	3,806	s
	07-21-77		72.28	3,804	s
	08-24-77		71.61	3,805	s
	09-22-77		71.83	3,805	s
	11-21-77		71.28	3,805	s
	12-19-77		70.29	3,806	s
	01-25-78		69.66	3,807	s
	02-16-78		64.57	3,812	s
	03-08-78		61.44	3,815	s
	07-19-78		71.30	3,805	s
	09-07-78		72.40	3,804	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S-3E-34E1	10-10-78	3,876.51	70.20	3,806	s
	01-11-79		68.59	3,808	s
	02-10-79		68.35	3,808	s
	03-30-79		67.93	3,809	s
	04-25-79		68.37	3,808	s
	05-14-79		68.55	3,808	s
	06-28-79		67.64	3,809	s
	08-13-79		67.29	3,809	s
	09-14-79		67.08	3,809	s
	10-16-79		66.89	3,810	s
	11-15-79		66.60	3,810	s
	12-20-79		66.22	3,810	s
	01-23-80		65.99	3,811	s
	02-28-80		65.51	3,811	s
	03-31-80		64.99	3,812	s
	05-14-80		64.55	3,812	s
	07-02-80		67.35	3,809	s
	07-30-80		67.65	3,809	s
	09-03-80		66.97	3,810	s
	10-10-80		65.59	3,811	s
	11-07-80		64.52	3,812	s
	12-11-80		63.76	3,813	s
	01-27-81		62.94	3,814	s
	02-17-81		62.58	3,814	s
	03-10-81		62.61	3,814	s
	04-07-81		61.99	3,815	s
	06-04-81		64.23	3,812	s
	07-08-81		66.68	3,810	s
	08-06-81		67.68	3,809	s
	09-15-81		67.74	3,812	s
	10-15-81		63.51	3,813	s
	12-28-81		61.92	3,815	s
	03-03-82		61.15	3,815	s
	04-12-82		60.83	3,816	s
	06-29-82		63.88	3,813	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
7S/3E-34E1	08-24-82	3,876.51	62.98	3,814	s
	12-02-82		60.66	3,816	s
	06-28-83		61.35	3,815	s
	10-05-83		58.88	3,818	s
	12-09-83		57.50	3,819	s
	03-15-84		57.64	3,819	s
	06-26-84		56.60	3,820	s
	10-02-84		55.83	3,821	s
	12-03-84		54.70	3,822	s
	03-15-85		53.73	3,823	s
	06-05-85		56.74	3,820	s
	09-12-85		58.86	3,818	s
	06-13-86		56.02	3,820	s
	06-18-86		57.14	3,819	s
	06-29-86		58.04	3,818	s
	07-31-86		61.50	3,815	s
7S/3E-36B1	01-14-86	4,240	98.50	4,142	s
	07-31-86		106.66	4,133	s
7S/3E-36E3	01-14-86	4,060	79.30	3,981	s
	04-09-86		78.51	3,981	s
	07-15-86		91.98	3,968	s
7S/3E-36F1	01-14-86	4,165	67.95	4,097	s
7S/3E-36G1	01-14-86	4,170	80.88	4,089	s
	04-09-86		81.84	4,088	s
	07-15-86		91.18	4,079	r
	07-30-86		84.94	4,085	s
7S/4E-19K1	08-07-69	4,550	44.94	4,505	s
	08-02-73		61.70	4,488	s
	08-01-86		30.57	4,519	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/2E-4P1	11-22-85	3,634	88.14	3,546	r
	01-08-86		88.38	3,546	s
	04-07-86		89.21	3,545	s
	07-14-86		89.81	3,544	s
8S/2E-5B1	11-22-85	3,460	53.40	3,407	s
8S/2E-5G1	01-09-86	3,475	26.20	3,449	s
	04-07-86		26.42	3,449	s
	07-31-86		26.35	3,449	s
8S/2E-5K1	01-10-86	3,540	85.39	3,454	s
	04-07-86		85.58	3,454	s
	07-17-86		87.25	3,453	s
8S/2E-9B1	08-29-73	3,680	68.50	3,612	s
	11-21-85		62.28	3,618	s
	07-31-86		66.68	3,613	s
8S/3E-1P1	01-23-86	3,870	60.09	3,810	s
	04-07-86		58.44	3,812	s
	07-15-86		69.63	3,800	p
	07-30-86		60.05	3,810	s
8S/3E-2A1	02-05-86	3,905	90.11	3,815	s
	06-15-86		87.75	3,817	s
	06-18-86		89.99	3,815	s
	06-29-86		90.60	3,814	s
8S/3E-2D1	07-25-60	3,900	44.08	3,856	s
	10-30-69		69.09	3,831	s
	06-13-72		69.15	3,831	s
	07-19-72		71.86	3,828	s
	08-24-72		69.39	3,831	s
	09-27-72		69.18	3,831	s
	10-16-72		68.79	3,831	s
	11-30-72		65.88	3,834	s
	01-03-73		70.39	3,830	s
	02-06-73		65.82	3,834	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2D1	03-09-73	3,900	66.89	3,836	s
	04-19-73		64.96	3,835	s
	05-31-73		69.91	3,830	s
	07-29-73		69.20	3,831	s
	08-29-73		72.80	3,827	s
	09-14-73		70.82	3,829	s
	10-12-73		77.00	3,823	s
	11-16-73		78.99	3,821	s
	12-29-73		67.18	3,833	s
	01-25-74		66.09	3,834	s
	02-22-74		66.52	3,833	s
	03-26-74		66.85	3,833	s
	04-18-74		66.78	3,833	s
	05-09-74		67.61	3,832	s
	06-05-74		69.00	3,831	s
	07-05-74		69.79	3,830	s
	08-06-74		69.61	3,830	s
	09-05-74		70.28	3,830	s
	10-03-74		69.76	3,830	s
	11-11-74		68.96	3,831	s
	12-27-74		67.27	3,833	s
	01-28-75		66.92	3,833	s
	02-26-75		67.44	3,833	s
	04-10-75		67.21	3,833	s
	05-07-75		67.70	3,832	s
	06-02-75		69.42	3,831	s
	06-26-75		70.48	3,830	s
	07-24-75		70.63	3,829	s
	08-28-75		70.84	3,829	s
	09-29-75		69.83	3,830	s
	11-05-75		68.75	3,831	s
	12-10-75		68.58	3,831	s
	01-22-76		67.58	3,832	s
	03-29-76		68.64	3,831	s
	05-27-76		69.78	3,830	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2D1	07-07-76	3,900	70.81	3,830	s
	08-04-76		71.51	3,828	s
	09-02-76		71.72	3,828	s
	10-12-76		70.40	3,830	s
	11-18-76		70.18	3,830	s
	12-16-76		69.53	3,830	s
	02-04-77		69.02	3,831	s
	03-24-77		68.64	3,831	s
	04-21-77		69.93	3,830	s
	06-08-77		71.40	3,829	s
	07-21-77		72.90	3,827	s
	08-24-77		72.47	3,828	s
	09-22-77		73.20	3,827	s
	11-21-77		71.70	3,828	s
	12-19-77		71.04	3,829	s
	01-25-78		70.26	3,830	s
	02-16-78		67.41	3,833	s
	03-08-78		64.93	3,835	s
	07-19-78		72.00	3,828	s
	09-07-78		71.99	3,828	s
	10-10-78		70.79	3,829	s
	01-11-79		68.99	3,831	s
	02-10-79		68.73	3,831	s
	03-30-79		68.36	3,832	s
	04-25-79		68.82	3,831	s
	05-14-79		69.13	3,831	s
	06-28-79		69.29	3,831	s
	08-13-79		69.03	3,831	s
	09-14-79		69.13	3,831	s
	10-16-79		69.08	3,831	s
	11-15-79		68.41	3,832	s
	12-20-79		67.99	3,832	s
	01-23-80		67.67	3,832	s
	02-28-80		67.18	3,833	s
	03-31-80		66.80	3,833	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2D1	05-14-80	3,900	73.78	3,826	r
	07-02-80		74.65	3,825	r
	11-07-80		73.90	3,826	r
	12-11-80		69.34	3,831	s
	01-27-81		68.14	3,832	s
	02-17-81		68.09	3,832	s
	03-10-81		67.44	3,833	s
	04-07-81		66.94	3,833	s
	06-04-81		70.92	3,829	s
	09-15-81		73.70	3,826	r
	10-15-81		73.72	3,826	r
	12-28-81		68.27	3,832	s
	03-03-82		67.26	3,833	s
	04-12-82		66.84	3,833	s
	06-29-82		73.90	3,826	r
	08-24-82		74.68	3,825	r
	12-02-82		68.08	3,832	s
	03-24-83		74.29	3,826	r
	10-05-83		75.17	3,825	r
	12-09-83		66.75	3,833	s
	06-26-84		74.15	3,826	r
8S/3E-2E1	12-06-50	3,892	32.10	3,860	s
	01-31-51		32.50	3,860	s
	03-08-51		35.80	3,856	s
	04-05-41		33.90	3,858	s
	05-08-51		34.40	3,858	s
	06-13-51		36.30	3,856	s
	07-09-51		34.20	3,858	s
	07-31-51		34.20	3,858	s
	09-06-51		34.20	3,858	s
	10-03-51		34.10	3,858	s
	11-07-51		34.00	3,858	s
	11-15-51		33.90	3,858	s
	01-03-52		32.20	3,860	s
	02-04-52		33.00	3,859	s
	03-04-52		34.80	3,857	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2E1	04-14-52	3,892	32.70	3,859	s
	05-13-52		35.50	3,856	s
	06-10-52		34.00	3,858	s
	07-08-52		34.40	3,858	s
	07-30-52		36.00	3,856	s
	08-25-52		35.50	3,856	s
	10-21-52		35.40	3,857	s
	01-16-53		33.40	3,859	s
	02-27-53		33.50	3,858	s
	03-27-53		33.10	3,859	s
	05-27-53		33.90	3,858	s
	07-03-53		34.30	3,858	s
	08-10-53		34.80	3,857	s
	09-01-53		35.50	3,856	s
	10-08-53		35.50	3,856	s
	11-23-53		34.40	3,858	s
	01-06-54		34.50	3,858	s
	02-04-54		34.50	3,858	s
	04-01-54		34.00	3,858	s
	08-25-60		43.09	3,849	p
	10-30-69		42.31	3,850	s
8S/3E-2K1	06-13-72	3,870	45.89	3,824	s
	07-19-72		47.70	3,822	s
	08-24-72		48.60	3,821	s
	09-27-72		47.75	3,822	s
	10-16-72		45.45	3,825	s
	11-30-72		39.65	3,830	s
	01-03-73		39.97	3,830	s
	02-06-73		39.70	3,830	s
	03-16-73		36.20	3,834	s
	04-19-73		36.65	3,833	s
	05-31-73		42.10	3,828	s
	07-24-73		45.63	3,824	s
	08-29-73		49.50	3,820	s
	09-14-73		50.67	3,819	s
	10-12-73		50.09	3,820	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2K1	11-16-73	3,870	46.56	3,823	s
	12-24-73		43.16	3,827	s
	01-25-74		40.84	3,829	s
	02-22-74		40.74	3,829	s
	03-26-74		40.16	3,830	s
	04-18-74		41.41	3,829	s
	05-09-74		42.86	3,827	s
	06-05-74		46.14	3,824	s
	07-05-74		50.06	3,820	s
	08-06-74		52.51	3,817	s
	09-05-74		54.66	3,815	s
	10-03-74		54.76	3,815	s
	11-11-74		49.18	3,821	s
	12-27-74		45.30	3,825	s
	01-28-75		44.17	3,826	s
	02-26-75		43.35	3,827	s
	04-10-75		43.30	3,827	s
	05-07-75		44.31	3,826	s
	06-02-75		46.98	3,823	s
	06-26-75		51.22	3,819	s
	07-24-75		53.56	3,816	s
	08-28-75		54.91	3,815	s
	09-29-75		51.28	3,819	s
	11-05-75		48.67	3,821	s
	12-10-75		48.08	3,822	s
	01-22-76		47.26	3,823	s
	03-29-76		47.05	3,823	s
	05-28-76		52.03	3,818	s
	07-07-76		54.40	3,816	s
	08-04-76		55.98	3,814	s
	09-02-76		57.32	3,813	s
	10-12-76		52.07	3,818	s
	11-18-76		50.51	3,819	s
	12-16-76		49.40	3,821	s
	02-04-77		48.30	3,822	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2K1	03-24-77	3,870	48.44	3,822	s
	04-21-77		53.14	3,817	s
	06-08-77		52.12	3,818	s
	07-21-77		56.61	3,813	s
	08-24-77		56.53	3,813	s
	09-22-77		54.78	3,815	s
	11-21-77		52.13	3,818	s
	12-19-77		50.84	3,819	s
	01-25-78		49.38	3,821	s
	02-16-78		49.07	3,821	s
	03-08-78		46.14	3,824	s
	07-19-78		53.20	3,817	s
	09-07-78		52.50	3,818	s
	10-10-78		50.74	3,819	s
	01-11-79		48.34	3,822	s
	02-07-79		47.98	3,822	s
	03-30-79		49.54	3,820	s
	04-25-79		51.70	3,818	s
	05-14-79		52.31	3,818	s
	06-28-79		54.65	3,815	s
	08-13-79		58.86	3,813	s
	09-14-79		55.76	3,814	s
	10-16-79		53.41	3,817	s
	11-15-79		50.73	3,819	s
	12-20-79		48.95	3,821	s
	01-23-80		48.76	3,821	s
	02-28-80		47.40	3,823	s
	03-31-80		46.66	3,823	s
	05-14-80		47.80	3,822	s
	07-02-80		53.96	3,816	s
	07-30-80		55.94	3,814	s
	11-07-80		54.34	3,816	s
	12-11-80		51.22	3,819	s
	01-27-81		50.46	3,820	s
	02-17-81		49.59	3,820	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-2K1	03-10-81	3,870	48.84	3,821	s
	04-07-81		49.81	3,820	s
	06-04-81		53.31	3,817	s
	07-08-81		55.79	3,814	s
	08-06-81		58.18	3,812	s
	09-15-81		60.45	3,810	s
	10-15-81		57.36	3,813	s
	12-28-81		50.82	3,819	s
	03-03-82		49.41	3,821	s
	04-12-82		54.24	3,816	s
	06-29-82		57.76	3,812	s
	08-24-82		59.18	3,811	s
	12-02-82		50.76	3,819	s
	03-24-83		48.31	3,822	s
	06-28-83		56.18	3,814	s
	10-05-83		51.35	3,819	s
	12-09-83		48.03	3,822	s
	03-15-84		53.09	3,817	s
	06-26-84		49.67	3,820	s
	10-02-84		48.48	3,822	s
	12-03-84		46.00	3,824	s
	03-15-85		45.68	3,824	s
	06-05-85		51.86	3,818	s
	09-12-85		56.32	3,814	s
	06-13-86		46.58	3,823	s
	06-18-86		46.70	3,823	s
	06-29-86		47.33	3,823	s
	07-17-86		48.23	3,822	s
8S/3E-5Q1	07-30-86	4,250	106.52	4,143	s
8S/3E-6B1	01-07-86	3,910	50.28	3,860	s
	07-14-86		52.00	3,858	s
8S/3E-6J1	01-06-86	3,990	61.72	3,928	s
	07-14-86		63.56	3,926	s

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-10B1	07-19-73	4,070	197.75	3,872	s
	04-09-86		191.32	3,879	s
	07-15-86		191.75	3,878	s
8S/3E-10R2	01-14-86	4,020	195.98	3,824	s
	04-09-86		195.56	3,824	s
	07-16-86		195.60	3,824	s
8S/3E-11A2	07-18-73	3,870	52.16	3,818	s
	07-31-86		40.77	3,829	s
8S/3E-11C2	01-13-86	3,925	109.35	3,816	s
	07-15-86		109.81	3,816	s
8S/3E-11E1	01-14-86	3,950	127.00	3,823	p
	07-17-86		128.49	3,822	s
8S/3E-11F1	01-14-86	3,930	110.86	3,819	s
	04-09-86		100.19	3,830	s
	07-30-86		111.29	3,819	s
8S/3E-11R1	07-17-73	3,920	101.03	3,819	s
	04-09-86		101.94	3,818	s
	07-30-86		101.15	3,819	s
8S/3E-12K1	07-18-73	3,880	67.45	3,813	s
	07-31-86		77.08	3,803	s
8S/3E-14A3	01-22-86	4,100	118.86	3,981	p
	07-16-86		124.24	3,976	p
8S/3E-14E1	01-10-86	4,060	154.70	3,905	s
	07-16-86		174.53	3,885	s
8S/3E-14G1	08-01-86	4,005	171.53	3,833	s
8S/3E-15A2	01-13-86	4,040	228.20	3,812	s
	07-16-86		227.23	3,813	s

SUPPLEMENTAL DATA B: Water levels--Continued

Well number	Measurement date	Land-surface altitude (feet)	Depth to water (feet below land surface)	Water-table altitude (feet)	Site status
8S/3E-16D1	07-24-69	4,330	159.77	4,170	s
	07-31-73		130.15	4,200	s
	04-09-86		74.19	4,256	r
	07-30-86		71.30	4,259	s
8S/4E-6F5	07-30-73	4,000	185.46	3,815	s
	04-07-86		190.52	3,809	s
	07-31-86		190.58	3,809	s
8S/4E-7A1	07-03-73	3,870	50.41	3,820	s
	04-09-86		49.65	3,820	s
	07-15-86		50.59	3,819	s

SUPPLEMENTAL DATA C: Water quality

[µS, microsiemens per centimeter at 25°C; °C, degrees Celsius; mg/L, milligrams per liter; µg/L, micrograms per liter; <, less than; --, no data. The analysis of each sample is displayed as one line on two consecutive pages]

Well or spring No.	Date	Time	pH (standard units)	pH, lab. (standard units)	Specific conductance (µS/cm)	Specific conductance, lab. (µS/cm)	Temperature (°C)	Hardness (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Alkalinity, total, field (mg/L as $CaCO_3$)
7S/2E-13D1	09-13-55	--	7.4	--	289	--	--	100	30	6.6	16	3.1	71
	06-04-57	--	7.8	--	350	--	--	95	24	8.6	28	3.9	106
	11-22-57	--	8.0	--	210	--	--	60	19	3.0	19	4.1	72
	05-20-58	--	7.3	--	400	--	19.0	140	42	9.0	25	3.9	100
	11-20-58	--	7.2	--	563	--	--	190	50	16	32	5.3	107
	05-07-59	--	7.7	--	490	--	--	150	43	11	35	4.0	115
	06-08-60	--	7.7	--	492	--	18.0	170	--	--	--	--	95
	12-21-60	--	7.3	--	455	--	--	150	--	--	--	--	108
	09-13-61	--	7.6	--	657	--	--	250	72	16	26	5.1	83
	05-01-62	--	7.6	--	535	--	--	190	55	13	33	4.7	97
	05-01-63	--	7.3	--	538	--	--	180	59	9.0	34	5.0	105
	12-03-64	--	7.3	--	553	--	--	180	53	11	34	5.0	106
	01-17-86	--	6.8	6.8	--	1,910	16.0	710	220	39	70	8.0	--
7S/2E-14E3	06-11-70	--	7.5	--	1,460	--	19.0	650	180	52	72	16	56
	01-17-86	--	6.8	6.8	2,120	1,890	18.5	1,000	270	86	120	17	141
7S/2E-14M1[1]	01-25-84	--	--	6.9	--	1,110	16.6	450	132	40	45	11	98
7S/2E-22A1	02-03-86	1600	7.2	7.4	499	489	16.5	150	39	12	40	3.8	82
7S/2E-26GS1	03-11-86	1245	--	9.7	377	326	13.5	24	1.1	5.1	68	0.6	--
7S/2E-27HS2	03-11-86	1000	--	7.7	457	395	15.5	100	32	6.0	38	2.2	--
7S/2E-29B1	02-03-86	1000	7.8	7.6	736	768	20.0	250	75	15	54	6.9	171
7S/2E-32A3	01-21-86	1415	7.7	7.6	--	2,120	15.6	480	110	51	280	10	354
7S/2E-32D2	01-21-86	1555	7.6	7.8	--	496	21.5	--	44	8.9	40	3.2	112
7S/2E-33N1	11-21-85	1200	8.3	8.4	355	368	20.5	--	16	20	52	3.9	79
7S/2E-36A1[1]	02-03-84	--	--	--	--	--	--	--	39	6.7	31	4.9	--
7S/2E-36J1[1]	02-03-84	--	--	--	--	--	--	130	43	4.4	36	4.8	--
7S/3E-7C2	05-27-76	1500	--	--	880	--	18.5	370	110	22	39	8.9	248
	09-22-77	1800	6.8	--	930	--	19.5	370	110	23	44	7.5	246
	07-19-78	1640	6.6	--	865	--	24.0	370	110	24	40	9.2	240
	06-28-79	1045	6.9	--	830	--	20.5	370	110	22	39	8.8	--
	07-02-80	1320	7.0	--	830	--	20.0	370	110	23	36	9.5	240
	07-09-81	1330	7.1	7.3	830	868	22.0	360	110	21	41	9.2	--
	06-30-82	1130	7.0	7.5	870	861	17.5	370	110	23	42	9.1	250
	07-26-83	1300	7.1	7.4	860	814	18.5	370	110	23	39	8.4	250
	08-21-84	1100	7.1	7.5	840	829	19.5	370	110	22	39	8.0	251
	07-24-85	1630	7.2	7.6	845	855	18.5	360	110	21	37	8.7	247

Well or spring No.	Sulfate dis-solved (mg/L as SO_4)	Chlo-ride, dis-solved (mg/L as Cl)	Fluo-ride, dis-solved (mg/L as F)	Silica, dis-solved (mg/L as SiO_2)	Solids, residue at 180°C dis-solved (mg/L)	Solids, sum of consti-tuents, dis-solved (mg/L)	Nitro-gen NO_2+NO_3 dis-solved (mg/L as N)	Phos-phate, ortho, dis-solved (mg/L as PO_4)	Boron, dis-solved (µg/L as B)	Iron, dis-solved (µg/L as Fe)	Manga-nese, dis-solved (µg/L as Mn)
7S/2E-13D1	19	12	0.0	--	208	--	--	--	0	--	--
	13	22	.4	25	--	190	--	--	80	--	--
	2.0	16	.4	76	--	180	--	--	0	--	--
	14	36	.2	35	--	230	--	--	0	--	--
	19	48	.2	26	--	260	--	--	0	--	--
	24	35	.1	40	--	260	--	--	130	--	--
	--	38	--	--	--	--	--	--	--	--	--
	--	32	--	--	--	--	--	--	--	--	--
	6.0	43	.2	37	--	250	--	--	0	--	--
	27	34	.1	37	--	260	--	--	100	--	--
	25	34	.2	35	--	260	--	--	20	--	--
	38	34	.3	35	--	270	--	--	40	--	--
	39	100	<.1	42	--	1,320	170	--	50	29	9
7S/2E-14E3	560	110	.4	18	--	1,000	--	--	0	940	--
	780	190	.2	47	--	1,310	<0.10	--	50	7,400	620
7S/2E-14M1	393	53	.7	19	--	708	.04	0.01	--	4	1.3
7S/2E-22A1	86	25	1.0	54	--	350	9.80	.21	60	81	7
7S/2E-26GS1	28	17	--	50	--	220	<.10	.03	210	6	1
7S/2E-27HS2	56	26	.4	34	--	260	<.10	1.1	70	230	370
7S/2E-29B1	110	63	.2	31	--	480	4.20	--	80	17	2
7S/2E-32A3	390	220	.7	19	--	1,310	3.4	.15	260	30	10
7S/2E-32D2	27	40	.3	31	--	320	12	.03	30	70	2
7S/2E-33N1	18	49	.3	20	210	--	.85	.01	40	8	4.0
7S/2E-36A1	2.9	36	.21	15	236	--	1.8	.06	--	0.05	6.7
7S/2E-36J1	5.4	32	.57	14	252	--	3.40	.0	--	0	0
7S/3E-7C2	180	22	.2	39	--	570	.00	--	40	0	--
	180	21	.2	39	--	570	--	--	<20	0	--
	180	23	.2	39	--	570	.06	--	40	380	--
	190	21	.2	41	613	--	--	--	<20	620	--
	160	21	.3	41	--	540	.00	.0	50	20	--
	190	24	.2	44	--	580	.05	.0	30	410	170
	180	23	.2	42	--	580	<.10	.03	40	850	160
	190	24	.2	42	--	590	<.10	.03	30	460	160
	180	22	.2	41	--	570	<.10	.06	40	740	170
	180	23	.2	41	--	570	<.10	--	20	860	150

SUPPLEMENTAL DATA C: Water quality--Continued

Well or spring No.	Date	Time	pH (standard units)	pH, lab. (standard units)	Specific conductance (µS/cm)	Specific conductance, lab. (µS/cm)	Temperature (°C)	Hardness (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Alkalinity, total, field (mg/L as $CaCO_3$)
7S/3E-10R4	06-28-79	1210	7.7	--	610	--	24.0	160	49	8.0	74	3.8	194
	07-02-80	1245	7.7	--	550	--	22.0	150	47	7.6	64	4.1	190
	07-08-81	1315	7.6	7.7	580	676	25.0	160	51	8.9	75	3.9	--
	08-24-82	1200	7.9	8.3	575	572	20.5	140	44	7.6	67	3.8	180
	07-26-83	1530	8.1	8.1	640	618	21.0	160	48	8.8	75	3.7	190
	09-06-84	1030	7.7	8.0	680	658	21.5	160	50	9.2	79	4.3	187
	07-24-85	1300	7.8	7.9	670	674	21.5	160	49	8.9	75	3.9	186
7S/3E-14P3	02-05-86	1500	7.7	7.5	1,140	1,150	18.0	450	110	42	74	9.4	142
7S/3E-15P1	05-22-53	--	8.0	--	620	--	--	160	46	12	68	--	176
	11-01-62	--	8.1	--	672	--	--	190	58	12	68	3.0	192
	01-17-86	--	7.5	7.8	693	706	17.0	200	61	12	67	2.9	190
7S/3E-16F4	01-24-86	1445	6.7	6.7	638	660	--	210	49	22	47	7.6	118
7S/3E-17B2	10-31-62	--	8.1	--	797	--	19.0	280	82	19	60	3.0	228
	01-24-86	0900	7.6	7.6	831	862	--	300	86	20	63	4.0	213
7S/3E-18B1	02-04-86	1600	7.6	7.7	703	727	17.0	290	77	24	26	6.5	243
7S/3E-19E1	01-24-86	1615	7.5	7.1	432	462	--	150	46	8.0	33	6.1	144
7S/3E-20E2	10-31-62	--	7.6	--	508	--	17.0	170	51	11	32	7.0	154
	01-17-86	--	6.8	7.3	654	653	18.5	210	65	11	45	5.9	156
7S/3E-21L1	05-27-53	--	7.6	7.4	750	1,090	--	250	66	20	70	--	175
	01-23-86	1530	7.5	--	1,130	--	22.5	--	93	20	120	3.8	237
7S/3E-23Q1	11-01-62	--	8.3	--	994	--	--	310	82	26	90	5.6	238
	01-17-86	--	7.2	7.6	1,060	1,040	17.5	300	79	24	98	3.7	248
7S/3E-24J1	02-04-86	1100	7.9	7.7	808	818	--	300	81	24	49	7.7	233
7S/3E-24PS2	03-11-86	1630	--	7.7	495	395	11.0	120	27	12	35	4.3	--
7S/3E-25D1	01-17-86	--	7.0	7.3	857	858	16.0	230	50	26	93	1.8	281
7S/3E-31BS2	03-14-86	1230	--	8.3	448	317	8.7	90	26	5.5	28	4.8	--
7S/3E-31L2[1]	02-03-84	--	8.2	--	269	--	15.8	80	23	4.8	24	2.9	--
7S/3E-31N1[1]	07-27-84	--	7.2	6.8	465	684	14.9	242	69	12	37	--	201
7S/3E-34E1	07-07-76	1400	--	--	305	--	22.0	81	25	4.6	21	4.2	81
	09-22-77	1300	7.6	--	320	--	17.0	83	25	4.9	23	4.4	81
	07-19-78	1040	7.1	--	295	--	20.0	86	26	5.1	22	4.5	76
	06-28-79	0640	7.6	--	280	--	17.0	86	26	5.0	22	4.3	--
	07-02-80	1010	7.6	--	300	--	17.0	85	26	4.9	23	4.7	74
	07-08-81	1130	7.5	7.2	300	309	20.5	88	27	5.0	23	4.7	--
	06-29-82	1300	7.6	8.0	305	311	17.5	89	27	5.3	27	4.9	85

Well or spring No.	Sulfate dis-solved (mg/L as SO_4)	Chlo-ride, dis-solved (mg/L as Cl)	Fluo-ride, dis-solved (mg/L as F)	Silica, dis-solved (mg/L as SiO_2)	Solids, residue at 180°C dis-solved (mg/L)	Solids, sum of consti-tuents, dis-solved (mg/L)	Nitro-gen NO_2+NO_3 dis-solved (mg/L as N)	Phos-phate, ortho, dis-solved (mg/L as PO_4)	Boron, dis-solved (µg/L as B)	Iron, dis-solved (µg/L as Fe)	Manga-nese, dis-solved (µg/L as Mn)
7S/3E-10R4	57	51	0.4	39	380	400	--	--	<20	<10	--
	31	37	.3	21	--	330	0.64	0.12	40	<10	--
	60	57	.2	23	--	390	.11	.09	30	10	6
	37	46	.2	20	--	330	.47	.18	140	4	21
	57	57	.2	19	--	380	<.10	.12	20	7	130
	69	59	.3	20	--	400	<.10	.31	40	<3	190
	63	61	.2	19	--	390	<.10	.12	10	130	240
7S/3E-14P3	410	48	.5	26	--	810	<.10	--	80	4,000	1,300
7S/3E-15P1	56	50	--	--	--	340	--	--	50	--	--
	61	60	.8	25	405	400	--	--	20	--	--
	73	63	.3	22	--	450	1.10	.12	30	5	15
7S/3E-16F4	110	73	.3	57	--	440	<.10	.02	20	5,300	350
7S/3E-17B2	91	54	.5	29	490	480	--	--	20	--	--
	75	68	.4	34	--	570	20.0	.06	80	6	6
7S/3E-18B1	14	68	.3	42	--	420	3.90	--	70	15	3
7S/3E-19E1	5.8	44	.2	53	--	300	3.70	.12	60	15	2
7S/3E-20E2	7.0	50	.2	24	310	270	--	--	40	--	--
	12	60	.2	41	--	410	18.0	.06	70	24	4
7S/3E-21L1	96	67	--	--	--	450	--	--	80	--	--
	200	98	.3	27	--	700	.28	.10	90	25	16
7S/3E-23Q1	39	120	.6	30	600	530	--	--	40	--	--
	56	110	.7	26	--	641	21.0	.03	90	9	4
7S/3E-24J1	18	77	.4	21	--	480	12.0	--	110	6	1
7S/3E-24PS2	8.5	23	.6	22	--	210	5.50	--	50	5	<1
7S/3E-25D1	17	88	1.2	34	--	500	2.40	--	100	14	1
7S/3E-31BS2	14	23	.4	21	--	190	.10	.10	50	30	1
7S/3E-31L2	0	24	.27	13	184	--	2.00	--	--	0	0
7S/3E-31N1	12	75	--	--	412	--	--	--	--	0	0
7S/3E-34E1	7.3	26	.1	31	--	170	4.00	--	<20	40	--
	6.9	25	.1	32	--	170	--	--	<20	--	--
	6.5	24	.1	30	--	160	3.70	--	250	20	--
	6.0	24	.1	33	190	--	--	--	<20	<10	--
	6.9	28	.2	32	--	170	3.70	.0	20	30	--
	7.7	26	.1	36	--	180	4.10	1.5	10	10	3
	10	27	.2	35	--	190	4.00	.03	20	18	5

Well or spring No.	Date	Time	pH (standard units)	pH, lab. (standard units)	Specific conductance (µS/cm)	Specific conductance, lab. (µS/cm)	Temperature (°C)	Hardness (mg/L as $CaCO_3$)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Alkalinity, total, field (mg/L as $CaCO_3$)
7S/3E-34E1	08-10-83	0900	7.8	7.7	310	306	18.0	88	27	5.0	23	4.8	90
	08-21-84	1800	7.7	7.8	315	319	18.0	97	30	5.3	24	4.3	91
	08-01-85	0900	7.8	7.8	315	321	17.5	91	28	5.2	24	4.6	92
7S/3E-36E3	01-23-86	1130	7.7	7.7	405	476	17.5	130	38	8.4	42	3.8	116
8S/2E-4P1	01-21-86	1134	7.3	7.3	--	1,870	18.5	700	190	54	64	7.9	136
8S/2E-5K1	01-17-86	--	7.3	7.7	417	419	17.5	110	35	6.1	36	4.3	125
8S/3E-1P1	01-23-86	1010	7.5	7.3	--	690	--	230	64	16	47	4.5	131
8S/3E-2A1	02-05-86	1000	7.1	7.2	590	591	17.5	180	54	11	43	3.2	102
8S/3E-2E1	12-07-50	--	8.2	--	430	--	--	120	30	10	53	--	125
	11-15-51	--	8.2	--	390	--	--	130	38	8.0	43	--	120
8S/3E-2E1	05-27-76	1630	--	--	460	--	18.5	140	39	9.4	32	2.2	117
	09-22-77	1500	6.9	--	460	--	17.0	140	39	9.6	33	2.6	123
	07-19-78	1200	7.1	--	500	--	19.0	150	42	10	36	2.4	110
	06-28-79	0755	7.3	--	420	--	18.5	140	40	9.0	32	2.8	--
	07-02-80	1100	8.1	--	330	--	21.0	110	34	6.5	22	2.4	110
	07-08-81	1230	7.3	7.4	360	296	19.0	100	33	4.8	19	1.9	--
	06-29-82	1445	7.1	7.5	500	494	17.5	150	43	9.7	41	3.0	130
	07-26-83	1700	7.3	7.5	435	427	17.0	140	40	9.6	32	3.0	130
	08-21-84	1600	7.2	7.6	425	428	17.0	140	42	9.3	32	2.9	127
8S/3E-2K1	09-22-77	1700	7.1	--	560	--	16.5	150	43	10	48	3.2	123
	07-19-78	1330	6.9	--	535	--	25.0	150	42	9.8	48	3.4	120
	06-28-79	0900	7.1	--	520	--	20.0	160	46	10	46	3.1	--
	07-02-80	1145	7.2	--	810	--	19.0	210	64	12	92	2.7	140
	06-29-82	1430	7.2	7.7	455	454	18.5	140	41	10	38	3.7	130
	08-10-83	1200	7.4	7.6	440	435	18.5	140	39	9.5	32	3.6	130
	08-21-84	1400	7.2	7.6	565	561	18.5	170	50	11	48	3.1	137
	08-01-85	1200	7.4	7.7	470	472	18.0	140	41	9.7	34	3.4	130
8S/3E-6B1[1]	02-03-84	--	--	--	--	--	--	120	36	8.7	45	4.2	--
8S/3E-10B1	01-22-86	1420	7.2	7.5	380	378	17.5	110	33	7.8	27	3.6	101
8S/3E-11C2	01-22-86	1615	7.5	7.5	395	403	18.0	120	34	7.4	33	1.9	100
8S/3E-14A3	01-24-86	1245	7.6	7.6	777	808	--	200	69	7.4	88	2.8	90
8S/3E-14NS1	03-12-86	1200	--	7.4	--	1,170	12.0	490	140	33	66	6.5	--
8S/3E-15A1	01-22-86	1200	7.9	7.9	902	882	18.0	360	110	20	48	4.9	94
8S/3E-16D1	01-22-86	1000	7.8	7.8	427	426	16.0	150	42	10	24	3.5	112
8S/4E-6F5	01-23-86	1255	7.5	7.6	--	475	--	120	35	7.0	52	2.6	148
8S/4E-6R1	01-24-86	1010	7.4	7.6	411	451	--	100	32	5.9	50	2.3	107
Surface-water site													
Cahuilla Creek 1	03-10-86	1133	8.4	8.2	1,850	1,690	11.5	380	95	34	220	16	195
Cahuilla Creek 2	03-11-86	1045	--	7.6	655	469	8.5	99	27	7.6	56	8.4	--
Cahuilla Creek 3	03-14-86	1730	--	8.0	1,460	1,030	8.5	240	58	23	120	12	--

SUPPLEMENTARY DATA C: Water quality--Continued

Well or spring No.	Sulfate dis- solved (mg/L as SO_4)	Chlo- ride, dis- solved (mg/L as Cl)	Fluo- ride, dis- solved (mg/L as F)	Silica, dis- solved (mg/L as SiO_2)	Solids, residue at 180°C dis- solved (mg/L)	Solids, sum of consti- tuents, dis- solved (mg/L)	Nitro- gen NO_2+NO_3 dis- solved (mg/L as N)	Phos- phate, ortho, dis- solved (mg/L as PO_4)	Boron, dis- solved (µg/L as B)	Iron, dis- solved (µg/L as Fe)	Manga- nese, dis- solved (µg/L as Mn)
7S/3E-34E1	7.7	29	0.1	34	--	180	3.80	0.03	20	63	12
	7.2	29	.1	33	--	190	3.70	.03	20	25	6
	7.0	29	.1	34	--	190	3.50	.03	<10	15	5
7S/3E-36E3	15	35	.3	30	--	300	12.0	.12	70	4	5
8S/2E-4P1	13	480	.3	27	--	940	4.00	.03	40	41	120
8S/2E-5K1	12	49	.3	31	--	250	4.20	.03	40	12	32
8S/3E-1P1	46	100	.2	30	--	420	3.50	.15	50	31	2
8S/3E-2A1	21	93	.2	52	--	350	3.40	.25	40	29	3
8S/3E-2E1	14	50	--	--	--	240	--	--	100	--	--
	6.0	50	--	--	--	230	--	--	40	--	--
8S/3E-2E1	12	49	.3	50	--	260	4.90	--	20	30	--
	8.4	42	.3	48	280	260	--	--	<20	--	--
	13	57	.2	49	--	280	5.70	--	<20	60	--
	9.0	42	.2	48	284	--	--	--	<20	<10	--
	7.4	27	.3	15	--	180	0.00	.03	30	20	--
	4.0	36	.1	15	--	150	2.00	.0	10	200	140
	14	54	.3	50	--	290	5.70	.18	10	110	9
	9.7	42	.2	47	--	260	4.80	.21	10	71	4
	9.6	39	.3	46	--	260	4.70	.21	20	96	3
8S/3E-2K1	18	65	.3	48	--	310	--	--	<20	--	--
	17	68	.2	50	--	310	3.70	--	30	20	--
	19	69	.3	49	342	--	--	--	<20	<10	--
	48	140	.5	47	--	490	4.10	.18	100	20	--
	13	46	.2	48	--	280	3.60	.12	20	21	5
	13	43	.2	46	--	260	3.60	.09	20	28	14
	27	68	.3	45	--	330	4.00	.12	40	8	4
	15	48	.2	46	--	280	3.70	.09	20	24	18
8S/3E-6B1	11	20	.46	14	248	--	3.00	--	--	1	0
8S/3E-10B1	10	41	.2	44	--	240	4.00	.09	20	30	6
8S/3E-11C2	16	41	.2	44	--	250	2.40	.12	30	41	17
8S/3E-14A3	220	58	.2	24	--	520	0.36	.12	30	28	4
8S/3E-14NS1	390	90	.3	39	--	850	<0.10	.06	40	15	75
8S/3E-15A1	270	51	.2	29	--	590	<0.10	--	30	120	200
8S/3E-16D1	13	14	.4	27	--	275	16.0	.12	50	29	5
8S/4E-6F5	13	48	.4	34	--	290	1.60	.06	60	13	7
8S/4E-6R1	17	59	.3	37	--	270	1.10	.18	30	15	4
Surface-water site											
Cahuilla Creek 1	380	220	1.1	12	--	1,100	<0.10	1.1	290	26	31
Cahuilla Creek 2	73	40	.4	8.8	--	280	0.30	2.2	100	61	<1
Cahuilla Creek 3	180	83	.6	15	--	620	0.13	1.7	190	61	21

[1]Well sampled by Indian Health Services.