GROUND-WATER-LEVEL FLUCTUATIONS IN THE COCHITI DAM-PEÑA BLANCA AREA, SANDOVAL COUNTY, NEW MEXICO, 1976-89

By Paul J. Blanchard

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch	25.40	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre-foot	1,233	cubic meter
cubic foot per second	0.02832	cubic meter per second

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

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ABSTRACT

Ground-water seepage near Peña Blanca, a small community located along the Rio Grande flood plain and about 3 miles south-southwest of Cochiti Dam, has been suspected to be caused by the filling of the reservoir behind Cochiti Dam. Cochiti Dam was constructed on the Rio Grande beginning in 1967, and water was impounded beginning in 1973. Water levels in the reservoir reached the recreation pool level of 5,323 feet in 1975. Ground-water seepage was first observed near Peña Blanca in 1976, and was still present at the initiation of this study in September 1987.

Twelve well pairs were established to determine the vertical component of ground-water flow in the upper 150 feet of the saturated zone. No substantial upward component of vertical ground-water flow was observed at any of the 12 well pairs. At nine sites, the median downward vertical hydraulic gradient was 0.014 or less, and at three sites, located in the upland area along or south of the Santa Fe River, the median downward vertical hydraulic gradient was as large as 0.108.

Water levels in monitoring wells throughout the study area indicate that from 1980 through 1982, during nearly stable water levels in Cochiti Reservoir, the ground-water system was in approximate equilibrium with Cochiti Reservoir. Water levels in wells in the upland area were nearly stable throughout this period, and water levels in wells in and along the flood plain of the Rio Grande had seasonal fluctuations related to the irrigation season and flow in the Cochiti East Side Main Canal.

From spring of 1985 to spring of 1988, during generally high and rapidly fluctuating water levels in Cochiti Reservoir, water levels in wells in the upland area rose as much as about 40 feet, and water levels in wells in and along the Rio Grande flood plain and north of the Santa Fe River rose as much as about 7 feet. Water-level trends in these wells were similar to those in Cochiti Reservoir.

Water levels in wells in and along the flood plain of the Rio Grande and near Peña Blanca rose as much as about 2.8 feet, were near the annual maximum for a longer-than-normal time in 1987, and then generally declined through the winter of 1988-89. These trends correspond in time to water-level fluctuations in Cochiti Reservoir. Water levels in these wells were much more affected by flow in the Cochiti East Side Main Canal than by variations in flow in the Rio Grande.

INTRODUCTION

Cochiti Dam and Cochiti Reservoir are located on the Rio Grande in Sandoval County, New Mexico, about 40 miles northeast of Albuquerque and about 20 miles southwest of Santa Fe (fig. 1). Construction of the dam by the U.S. Army Corps of Engineers began in 1967 (CH2M Hill and Resource Technology, Inc., 1984) and impoundment of water began on November 12, 1973 (Dewey and others, 1979). In 1976, the Corps of Engineers reported that ground-water levels had risen and standing water had been observed in a field immediately downstream from Cochiti Dam. Ground-water levels also had risen near the town of Peña Blanca, about 3 miles south-southwest of the dam, causing damage to croplands and "negative effects" on sewage treatment in that community (U.S. Army Corps of Engineers, 1986).

Since 1976, investigations of ground-water conditions downstream from Cochiti Dam have been conducted by Geohydrology Associates, Inc. (1982) and by CH2M Hill and Resource Technology, Inc. (1984). Because standing water in fields near Peña Blanca was still a concern in September 1987, the U.S. Geological Survey, in cooperation with the U.S. Army Corps of Engineers, began a study to evaluate the ground-water system below Cochiti Dam.

Purpose and Scope

The purpose of this report is to describe elements of the ground-water flow system on the east side of the Rio Grande from Cochiti Dam to Peña Blanca, including the vertical component of ground-water flow at selected well pairs, the response of ground-water levels to changes in water levels in Cochiti Reservoir, and the influence of irrigation and irrigation canals on ground-water levels. The period of record used for this study is September 1976 through September 1989. The scope of work included constructing 14 water-level monitoring wells, collecting monthly water levels in those wells and in 20 previously constructed wells, conducting and interpreting streamflow gain-loss measurements in the Cochiti East Side Main Canal and in the Santa Fe River, and analyzing and interpreting hydrologic data collected prior to and during this study.

Description of the Study Area

The Cochiti Dam-Peña Blanca study area includes about 12 square miles on the east side of the Rio Grande from immediately downstream from Cochiti Dam, to about 1 1/2 miles south of the town of Peña Blanca (fig. 2). The study area is bordered on the north and northeast by Cochiti Dam, and on the west by the Rio Grande. The area includes the Rio Grande flood plain east of the river and the upland areas east of the flood plain. The border between the flood plain and the uplands approximately coincides with the Cochiti East Side Main Canal. The town of Peña Blanca is located in both the Rio Grande flood plain and the upland area.

In the upland area east of Highway 22 and north of Highway 16, there are no residences, and the primary land use is cattle grazing. The Santa Fe River flows through this area. Cochiti Grade School and part of Peña Blanca are located in the upland area south of Highway 16, and several wells in this area provide water to the school and to residences.

Agriculture is the primary land use in the Rio Grande flood plain, and irrigation water is supplied to this area from the Rio Grande, through the Cochiti East Side Main Canal. Only one residence is located in the flood plain north of the Santa Fe River. South of the Santa Fe River,

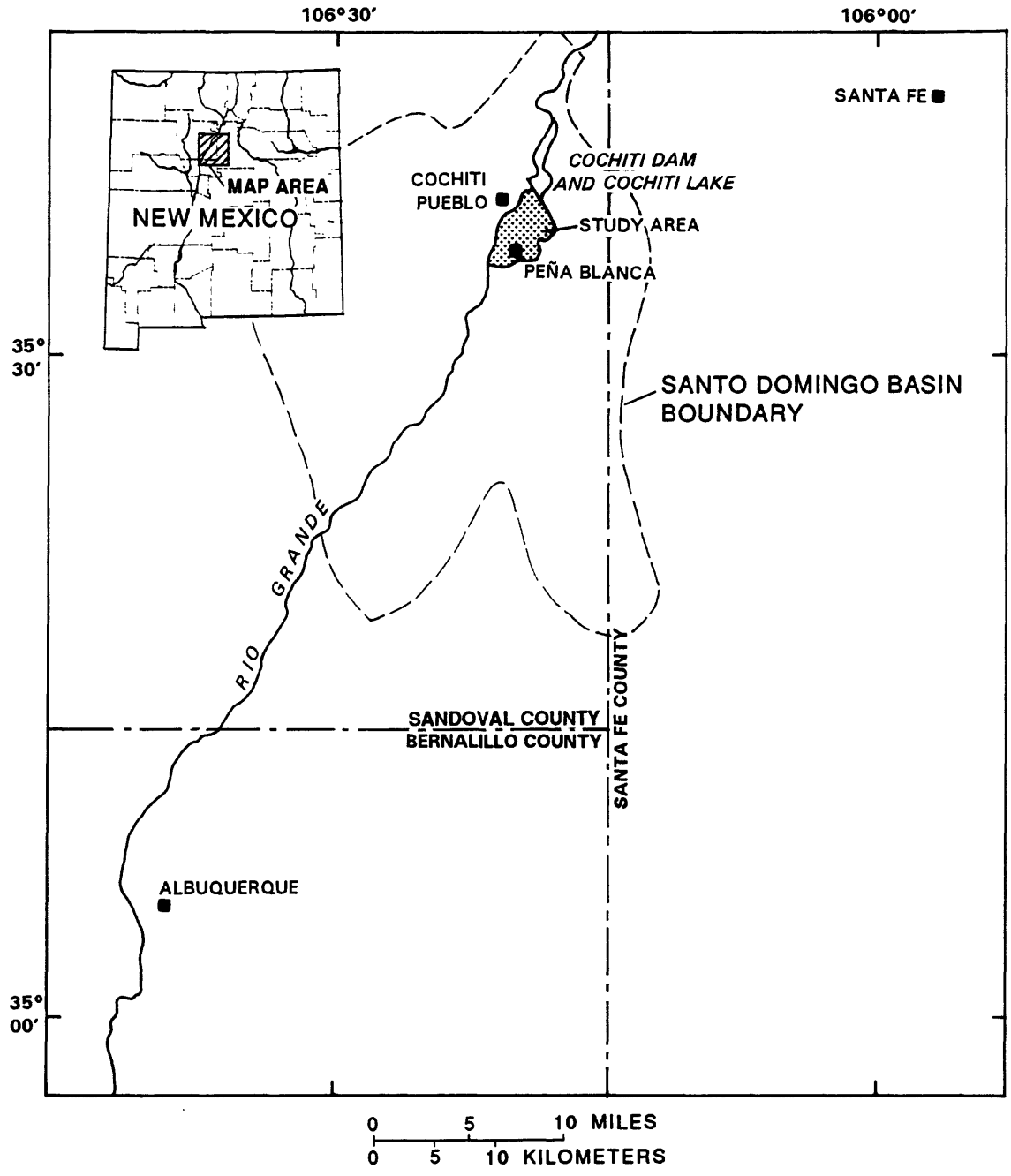
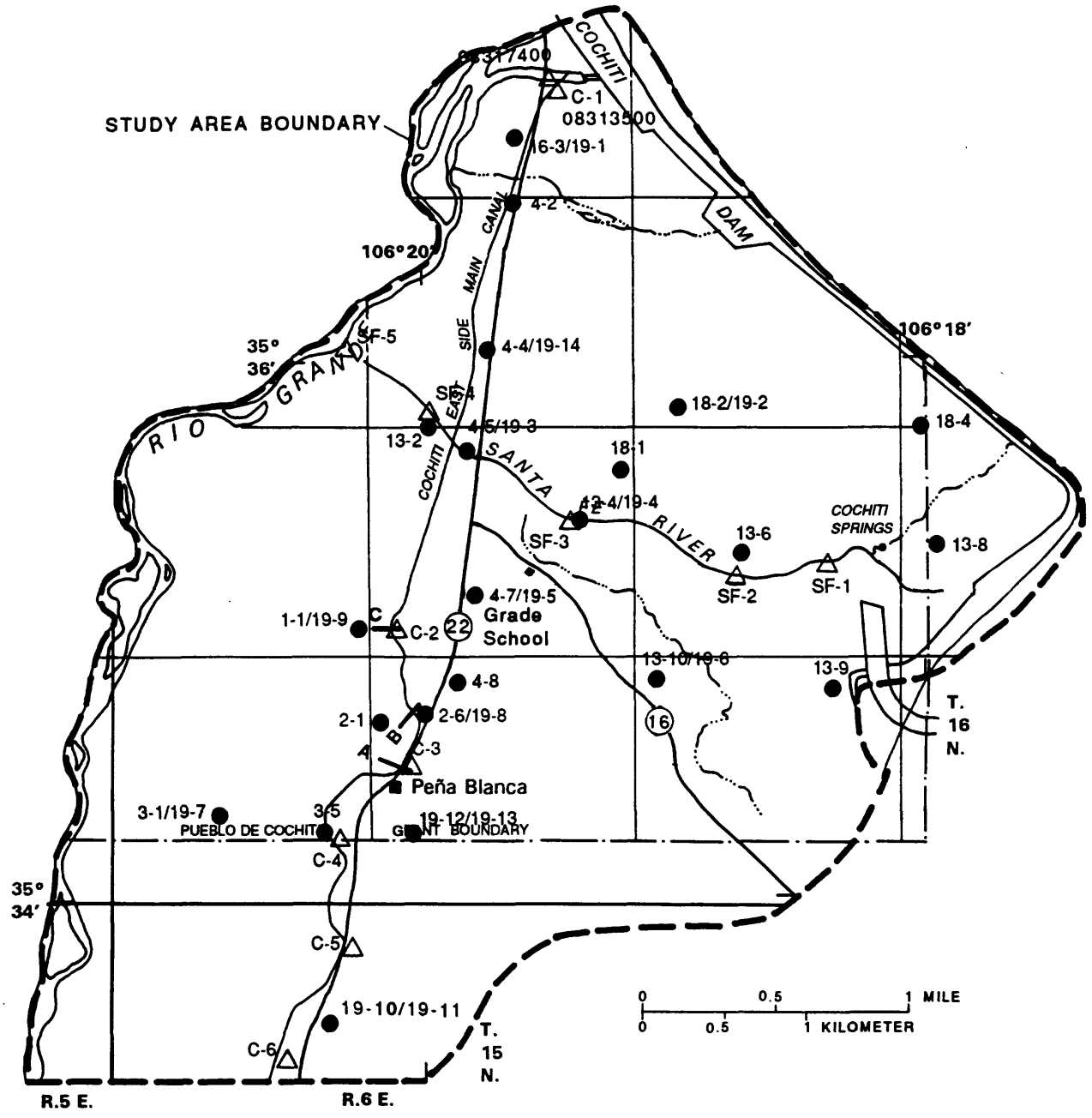


Figure 1.--Location of the Cochiti Dam-Peña Blanca study area.



EXPLANATION

19-10/19-11 — MONITORING WELL AND NUMBER

08317400 C-1 — SURFACE-WATER MEASUREMENT SITE AND ASSIGNED NUMBER (C-1) AND/OR NATIONAL NUMBER (08317400)

A — TERMINUS OF LINED REACH OF COCHITI EAST SIDE MAIN CANAL

Figure 2.--Location of hydrologic-data sites.

Acknowledgments

People of the Cochiti Tribe and land owners in Peña Blanca contributed to the success of this study. Governor John Bowanie and the members of the Cochiti Tribe allowed access to well and drilling sites on Cochiti land, and tribal members Richard Pecos and Joseph Quintana advised the members of the U.S. Geological Survey on entry to the sites throughout the drilling phase of this study. Patrick Montoya, Romeo Ortiz, and Joe Roybal, all land owners in the Peña Blanca area, also allowed access to well sites on their property.

GEOLOGY

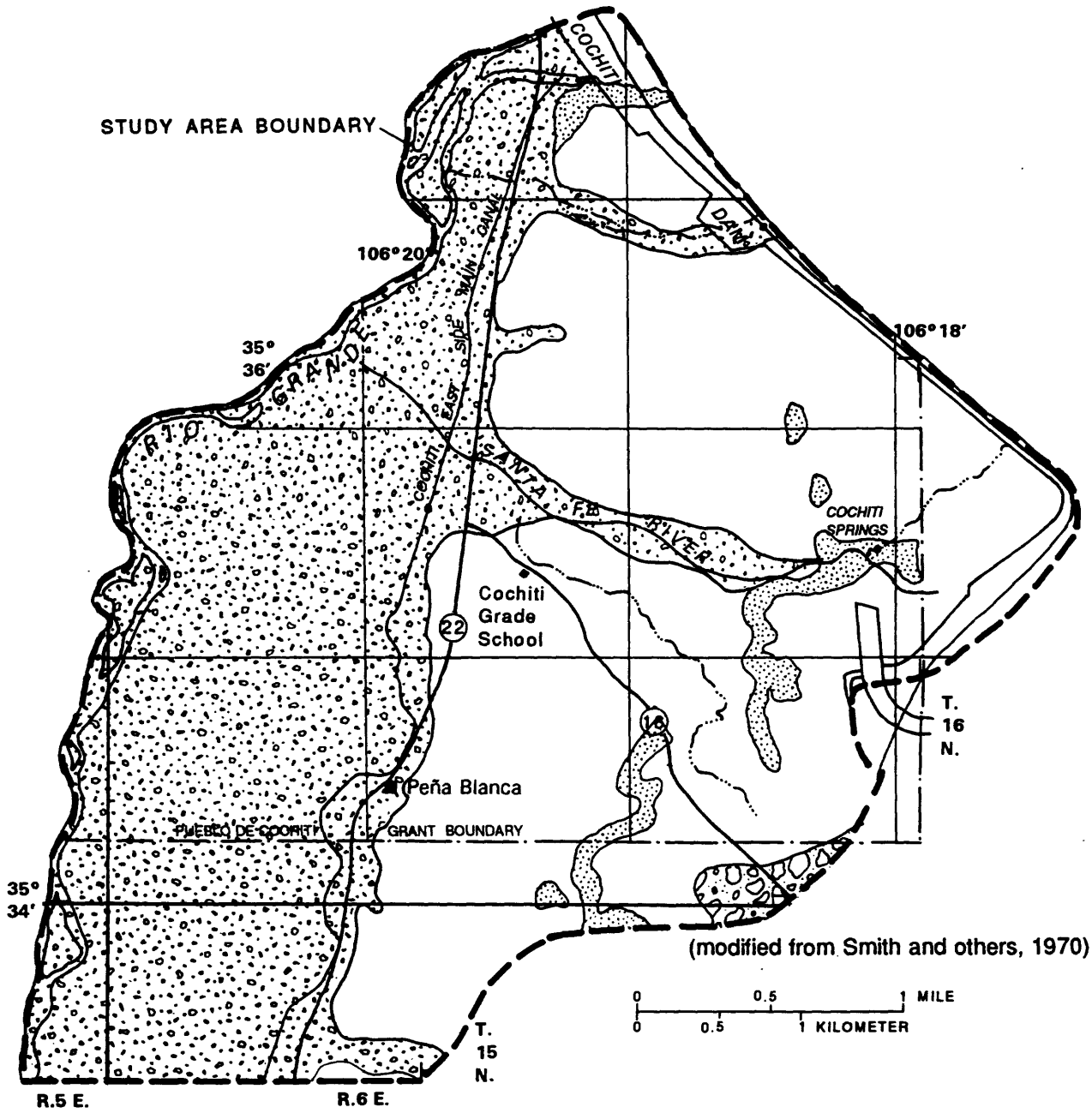
The Cochiti Dam-Peña Blanca area is in the Santo Domingo Basin at the northern margin of the Basin and Range physiographic province (Wilkins, 1986, pl. 1). The Santo Domingo Basin is one of several basins that make up the Rio Grande depression. The basins of the Rio Grande depression in northern New Mexico consist of large, north-trending, tilted, sagged, and faulted blocks (Baltz, 1978, p. 211).

Surficial geology in the Cochiti Dam-Peña Blanca area primarily consists of alluvium of Quaternary age beneath and near the Rio Grande, and river gravels of Quaternary and Tertiary age east of the alluvium (Smith and others, 1970). The alluvium and river gravels are deposited on the Cochiti Formation of Tertiary age, which is composed primarily of poorly consolidated gravel and sand. A small fan deposit of Quaternary age is located in the southeastern part of the study area. The surficial geology of the Cochiti Dam-Peña Blanca area is shown in figure 3.

The alluvium of Quaternary age is composed of stream deposits of silt, sand, and gravel; thickness typically is less than 100 feet. The river gravels of Quaternary and Tertiary age are composed of pebbles, cobbles, and boulders of primarily Precambrian quartzite and crystalline rocks and a small percentage of volcanic rocks; thickness typically is less than 200 feet. The Cochiti Formation is composed of poorly consolidated sand and gravel. The sand and gravel predominantly are composed of volcanic detritus; thickness ranges from about 500 feet in the eastern part of the study area to about 1,000 feet near the Rio Grande. The fan deposit of Quaternary age is composed of coarse sand and gravel and is less than 100 feet thick.

An intermittent, north-trending band of basalt of Quaternary and Tertiary age crops out about 2 miles east of the Rio Grande and is stratigraphically located within the river gravels of Quaternary and Tertiary age (fig. 3) (Smith and others, 1970). This band of basalt typically is about one-eighth mile wide, although a larger area crops out near the Santa Fe River. All of the monitoring wells are located where either the alluvium or the river gravels are at the surface, and all the wells except 13-8, 13-9, and 18-4 are west of the basalt outcrop.

Lithology at all of the drilling sites was similar (table 1; all tables are in the Supplemental Information section). During drilling, cuttings were collected at 10-foot intervals and visually analyzed for grain size. Different amounts of clay, silt, sand, and gravel were present at each well site. Typically, about 30 percent of a drill-cutting sample consisted of clay; this percentage was about the same for wells in the Rio Grande flood plain and for wells in the upland area. Some pumice was penetrated while drilling well 19-5, and strata of basalt were penetrated while drilling wells 13-8, 13-9, and 18-4.



EXPLANATION

- QUATERNARY ALLUVIUM
- QUATERNARY FAN DEPOSITS
- QUATERNARY AND TERTIARY RIVER GRAVELS
- QUATERNARY AND TERTIARY BASALT
- GEOLOGIC CONTACT

Figure 3.--Surficial geology in the Cochiti Dam-Peña Blanca area.

PRECIPITATION

Collection of precipitation data at Cochiti Dam began in February 1975 (National Oceanic and Atmospheric Administration, 1975-88). From 1976 through 1988, annual precipitation ranged from 6.82 inches in 1980 to 19.86 inches in 1986 (fig. 4). The mean annual precipitation for this period was 12.45 inches and the median annual precipitation was 12.00 inches. The 3 years of highest precipitation were 1986 (19.86 inches), 1985 (18.44 inches), and 1988 (15.00 inches). In 1987, the annual precipitation was 10.94 inches. These 4 years are the same period during which the water level in Cochiti Reservoir was consistently above the recreation pool level of 5,323 feet above sea level.

SURFACE-WATER SYSTEM

Principal components of the surface-water system in the Cochiti Dam-Peña Blanca area are the Rio Grande, the Cochiti Reservoir on the Rio Grande, the Santa Fe River, and the Cochiti East Side Main Canal (fig. 2). Water stored in Cochiti Reservoir has changed the flow of the Santa Fe River from intermittent to perennial because ground-water levels have risen (Geohydrology Associates, Inc., 1982, p. 17). The volume of water that is diverted annually from the Rio Grande to the Cochiti East Side Main Canal was increased twice during the period of record (1969-88) with the diversion of additional water into the Rio Grande basin upstream from Cochiti Reservoir.

Rio Grande

The Rio Grande basin upstream from the station, Rio Grande below Cochiti Dam, New Mexico (08317400), is about 14,900 square miles in area. This gaging station has been in operation since October 1970; streamflow at this station has been regulated by Cochiti Dam since November 12, 1973. During this period (water years 1974-88), the median value of daily mean streamflow has been about 860 ft^3/s (cubic feet per second); streamflow has been more than 1,000 ft^3/s 42 percent of the time and more than 2,000 ft^3/s 23 percent of the time. In 1985, 1986, and 1987, streamflow was substantially more than in other years. During these years, streamflow was more than 1,000 ft^3/s 56 percent, 95 percent, and 57 percent of the time, respectively, and was more than 2,000 ft^3/s 35 percent, 68 percent, and 48 percent of the time, respectively.

Monthly mean streamflow in the Rio Grande below Cochiti Dam typically is at or less than about 1,000 ft^3/s during 9 months each year (July-March) (fig. 5). Runoff from spring snowmelt typically is released from the Cochiti Reservoir during April, May, and June; average monthly mean streamflow during these months ranges from about 2,000 to 3,200 ft^3/s (U.S. Geological Survey, 1971-85; 1989). During 1985-87, monthly mean streamflow in the Rio Grande was more than 2,000 ft^3/s for about 5, 8, and 6 months, respectively, which is substantially longer than the typical 3-month period and average monthly mean streamflow in April, May, and June ranged from about 3,500 ft^3/s to 3,900 ft^3/s (U.S. Geological Survey, 1986-88).

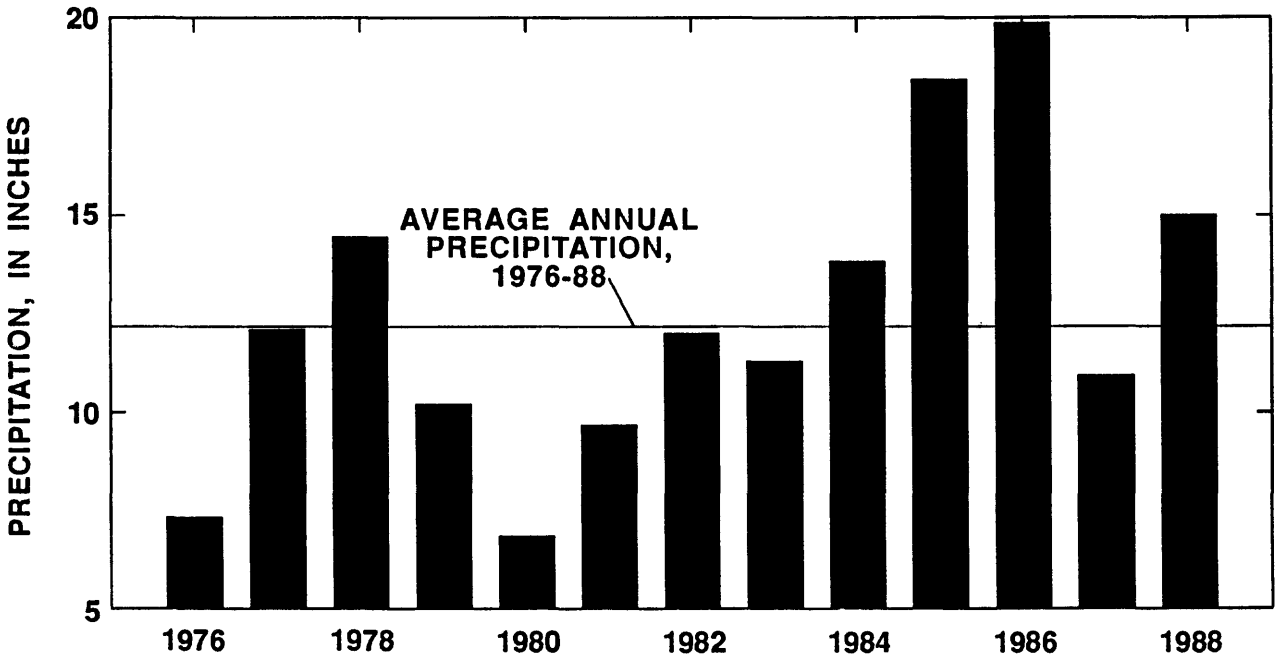


Figure 4.--Annual precipitation at Cochiti Dam, 1976-88.

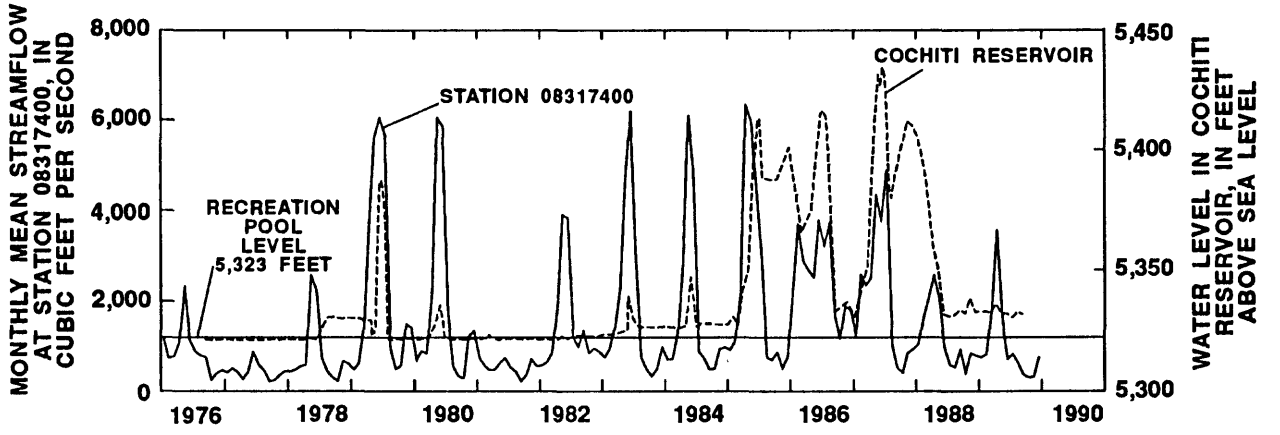


Figure 5.--Water levels in Cochiti Reservoir and monthly mean streamflow at station 08317400, Rio Grande below Cochiti Dam, 1976-89.

Cochiti Reservoir

Cochiti Reservoir consists of two arms, the Rio Grande arm and the Santa Fe River arm; these arms are connected by a conveyance channel (fig. 6). The altitude of the inlet to the Santa Fe River arm from the conveyance channel is 5,355 feet (James McAdoo, U.S. Army Corps of Engineers, oral commun., 1989), and the recreation pool level of the reservoir is 5,323 feet (U.S. Army Corps of Engineers, 1986). When the water level in the Rio Grande arm is above 5,355 feet, water flows from this arm of the reservoir into the Santa Fe River arm through the conveyance channel. When the water level in the Rio Grande arm subsequently recedes, water flows back into the Rio Grande arm.

Daily measurements of water levels in Cochiti Reservoir are made by the Corps of Engineers. Reservoir levels on the days when water levels in monitoring wells were measured were used for analysis. These data are shown in table 2 and a hydrograph of the water level in Cochiti Reservoir is shown in figure 5.

Prior to September 1975, the water level in Cochiti Reservoir was less than the recreation pool level. From September 1975 to March 1985, water levels in Cochiti Reservoir generally were within about 10 feet of the recreation pool level of 5,323 feet above sea level (fig. 5). In 1980, 1983, and 1984, the highest water levels were about 5,335 feet, 5,339 feet, and 5,347 feet, and water levels were above about 5,330 feet only in May of each of these years. In 1979, the water level was more than about 5,330 feet in May, June, and July, and the highest water level was about 5,387 feet.

From March 1985 through May 1988, the water level in Cochiti Reservoir was consistently higher than the recreation pool level (fig. 5). The maximum annual water level in each of these years was more than 5,400 feet, and the water level was less than 5,350 feet only from September 1986 to March 1987.

From June 1988 through September 1989, the water level was near the recreation pool level (fig. 5). The water level declined to less than 5,400 feet in February 1988, reached about 5,332 feet in June 1988, and ranged from about 5,330 to about 5,338 feet from June 1988 through September 1989.

The area inundated by water in Cochiti Reservoir increases substantially with rising water levels in the reservoir, which increases the area of recharge to the ground-water system (fig. 6). From White Rock Canyon (about 1 mile north of Cochiti Dam) to Cochiti Dam, the reservoir covers an area of about 1.2 square miles at the recreation pool level of 5,323 feet. At a water-level altitude of 5,400 feet, the reservoir covers 3.7 square miles, and at a water-level altitude of 5,450 feet, the reservoir covers 8.6 square miles. The area inundated in the Santa Fe River arm of Cochiti Reservoir increases from zero square miles at 5,323 feet to 1.4 square miles at 5,400 feet and to 3.8 square miles at 5,450 feet.

A water budget for Cochiti Reservoir was calculated by CH2M Hill and Resource Technology, Inc. (1984, p. 4-14) to estimate the volume of recharge to the ground-water system. Monthly records of flow in the Rio Grande upstream and downstream from Cochiti Reservoir, flow in irrigation canals, reservoir storage, and evaporation from the surface of Cochiti Reservoir were used in the calculation. In 1978 and 1979, when the water level in Cochiti Reservoir was above the approximate recreation pool level for 3 months and the maximum water level was 5,387 feet, the volume of seepage to the ground-water system was calculated to be about 84,000 acre-feet. In 1980 and 1981, when the water level in Cochiti Reservoir was near the recreation pool level, the volume of seepage to the ground-water system was calculated to be about 21,000 acre-feet.

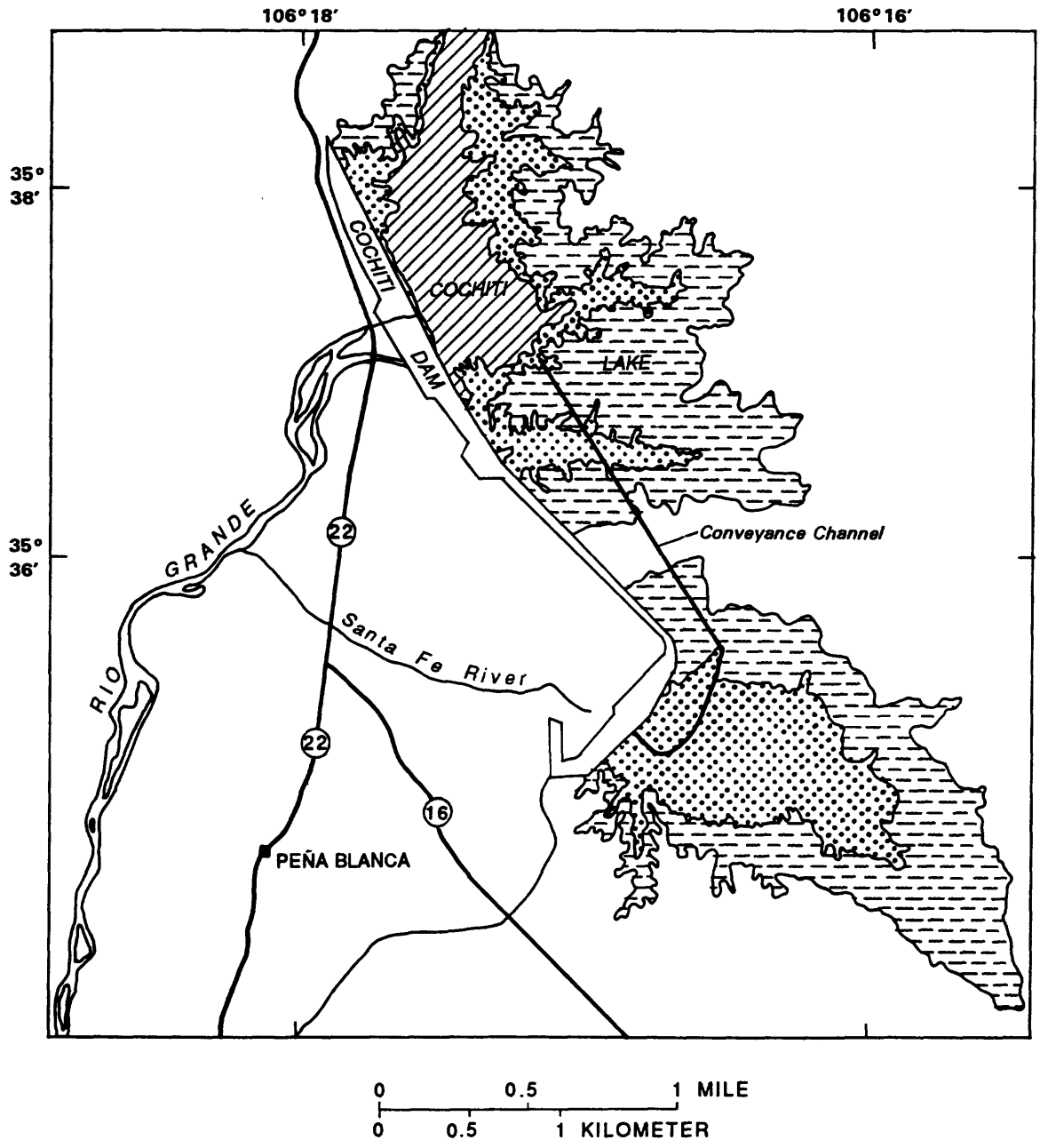


Figure 6.--Area inundated by Cochiti Reservoir at selected water levels.

Santa Fe River

The Santa Fe River (1992) is a perennial stream from Cochiti Springs to the Rio Grande (fig. 2). From Cochiti Springs, the river flows about 3 miles west, where it discharges into the Rio Grande. The Santa Fe River was not perennial in most of this reach prior to the filling of Cochiti Reservoir (Geohydrology Associates, Inc., 1982, p. 17).

Three sets of streamflow measurements were made in the Santa Fe River during this study. During the measurements, streamflow was steady, and there were no diversions from the river and no return flows or tributary inflow to the river. The measurement sites are shown in figure 2, and the measured flows and losses are shown in table 3. From site SF-2 to its mouth, the Santa Fe River is a losing stream and the river recharges the ground-water system. On July 10, 1989, the Santa Fe River lost 60 percent of its flow in the reach between sites SF-2 and SF-4, and on September 11, 1989, the Santa Fe River lost 63 percent of its flow in the reach between site SF-2 and the mouth of the river. The percentage loss of streamflow in river reaches between individual sites is shown in table 4.

Cochiti East Side Main Canal

The Cochiti East Side Main Canal is just west of Highway 22 from near the Cochiti Dam to the southern boundary of the study area (fig. 2). The canal is the source of irrigation water for agriculture in the Rio Grande flood plain. In most of its reach the canal is unlined, and fluctuations in water levels in wells near the canal indicate that seepage from the canal recharges the ground-water system during the irrigation season.

Records of annual flow in the Cochiti East Side Main Canal are available for calendar years 1969-88 (U.S. Geological Survey, 1971-89). Typically, water is diverted from the Rio Grande into the canal from March through late October or early November. The volume of water diverted into the canal was increased beginning in 1971, and further increased beginning in 1974 (Geohydrology Associates, Inc., 1982, p. 19). Average annual flow in the Cochiti East Side Main Canal was about 32,000 acre-feet in 1969-70, about 42,000 acre-feet in 1971-73, and about 56,000 acre-feet in 1974-88.

An approximately 0.7-mile-long reach of the Cochiti East Side Main Canal near Peña Blanca is lined with shotcrete (Subhas Shah, Middle Rio Grande Conservancy District, oral commun., 1989). The southern part of this reach was lined prior to the 1978 irrigation season and is located between *A* and *B* in figure 2; the northern part of this reach was lined prior to the 1985 irrigation season and is located between *B* and *C* in figure 2.

Streamflow measurements were made in the Cochiti East Side Main Canal on September 15, 1987, to determine in which reaches the canal might gain flow from or lose flow to the ground-water system. The measurement sites are shown in figure 2 and the flow in the canal at these sites is shown in table 5. Streamflow at all measurement sites was about the same except at site C-2. Site C-2 is at the upstream end of the lined reach of the canal, and site C-3 is at the downstream end of the lined reach. It is not apparent why the flow at C-2 is less than that at C-3. From the downstream end of the lined reach at C-3 to the southern boundary of the study area at C-6, the total net loss in measured flow was 3.3 percent. The small variation in streamflow indicates that at the time of measurement the canal and the ground-water system were in approximate equilibrium and flow in the canal was not being lost to the ground-water system downstream from the lined reach.

GROUND-WATER SYSTEM

Fourteen water-level monitoring wells were drilled at 12 sites in the Cochiti Dam-Peña Blanca area from September 7, 1988, to October 17, 1988. The purpose of drilling these wells was to establish water-level monitoring wells to compare ground-water levels in wells completed near the water table (shallow wells) with water levels in wells completed deeper in the saturated zone (deep wells). These water-level measurements were then used to determine the direction and rate of the vertical component of ground-water flow in approximately the upper 150 feet of the saturated zone.

At 10 of the 12 sites, the difference in completed depth between the wells at each site ranged from about 100 to 125 feet. At the other two sites, well pair 4-5/19-3 and well pair 4-4/19-14, the difference in completed depth of wells was controlled by geologic conditions. The differences in depth were 30 feet at well pair 4-5/19-3 and 142.5 feet at well pair 4-4/19-14. Selected records of the monitoring wells are shown in table 6.

Water levels in the well pairs were measured monthly from November 1988 through September 1989. Hydrographs of water levels in these well pairs are shown in figures 7-18, and water-level records of the wells are shown in table 2.

For each month of water-level data collection, the difference in water levels between the shallow and deep well of each well pair was calculated; subsequently, the median of these differences for the 11-month period of record was calculated. For each well pair, this median difference in water levels was divided by the difference in completed depths of the wells to determine the median vertical hydraulic gradient at the site (eq. 1). The median vertical hydraulic gradient at each well pair is shown in table 7, and is determined by the equation:

$$\frac{\text{Median [head (S) - head (D)]}}{L}, \qquad (1)$$

where head (S) = altitude of the water level in the shallow well, in feet above sea level;

head (D) = altitude of the water level in the deep well, in feet above sea level; and

L = difference in completed depths between the shallow and deep wells, in feet.

The vertical component of ground-water flow is downward in the upper 150 feet of the saturated zone in nearly all of the study area that was monitored. Except for well pair 4-5/19-3 (fig. 11), the water level in the shallow well of each pair typically was higher than that of the deep well. At well pair 4-5/19-3 the water level in the deep well ranged from 0.03 foot lower to 0.27 foot higher than the shallow well and the median of the differences was a 0.03 foot higher water level in the deep well, indicating that there is no substantial vertical component of ground-water flow at this well pair.

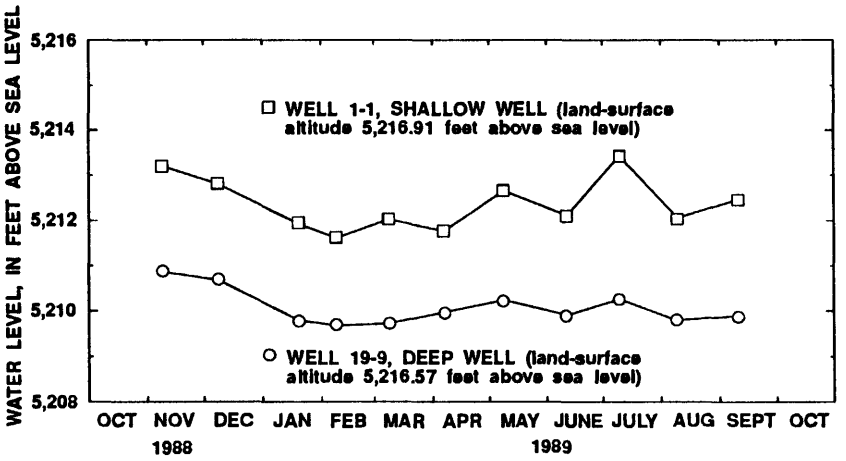


Figure 7.--Monthly water levels in well pair 1-1/19-9, November 1988-September 1989.

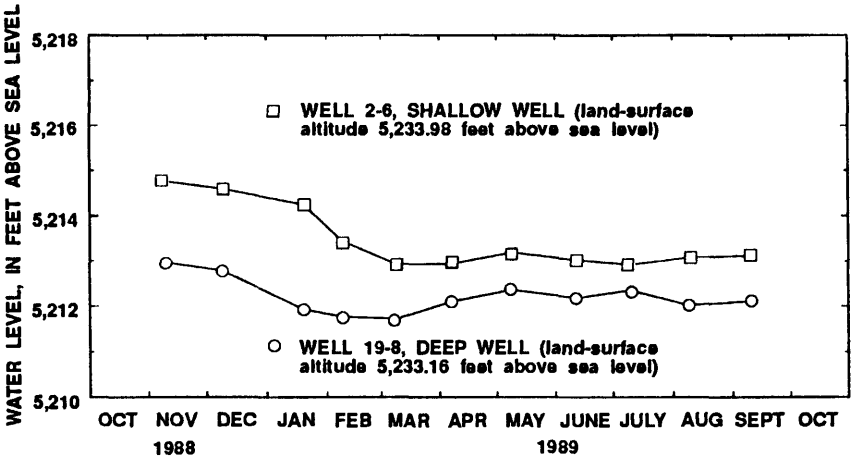


Figure 8.--Monthly water levels in well pair 2-6/19-8, November 1988-September 1989.

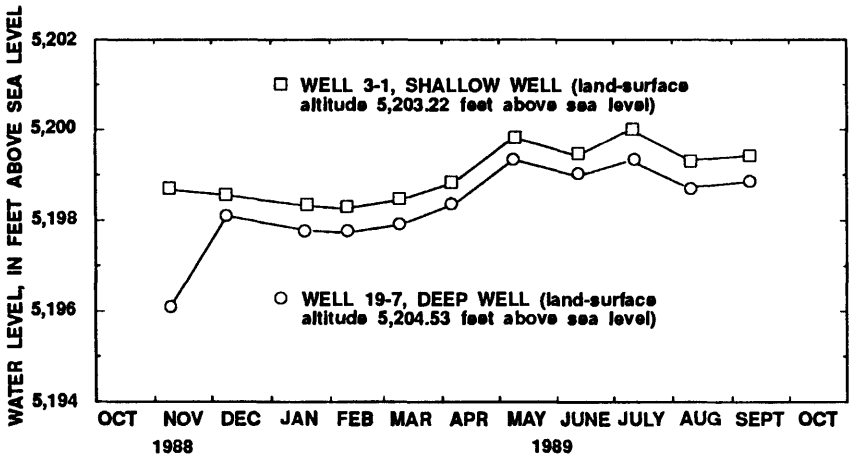


Figure 9.--Monthly water levels in well pair 3-1/19-7, November 1988-September 1989.

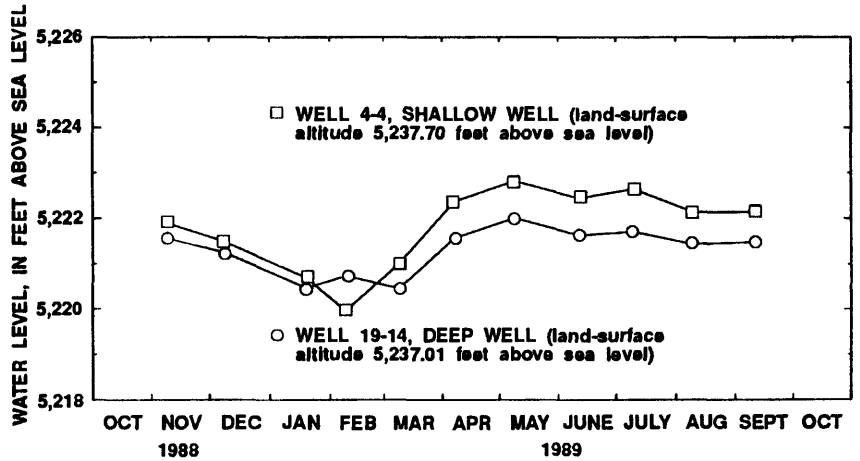


Figure 10.--Monthly water levels in well pair 4-4/19-14, November 1988-September 1989.

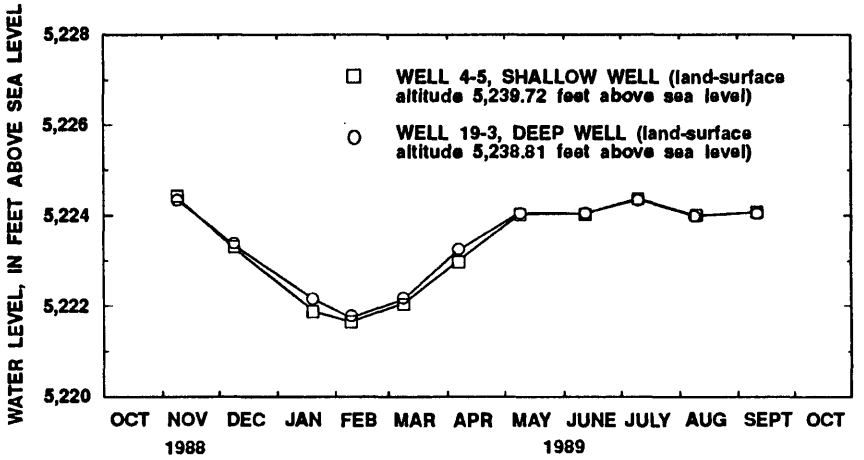


Figure 11.--Monthly water levels in well pair 4-5/19-3, November 1988-September 1989.

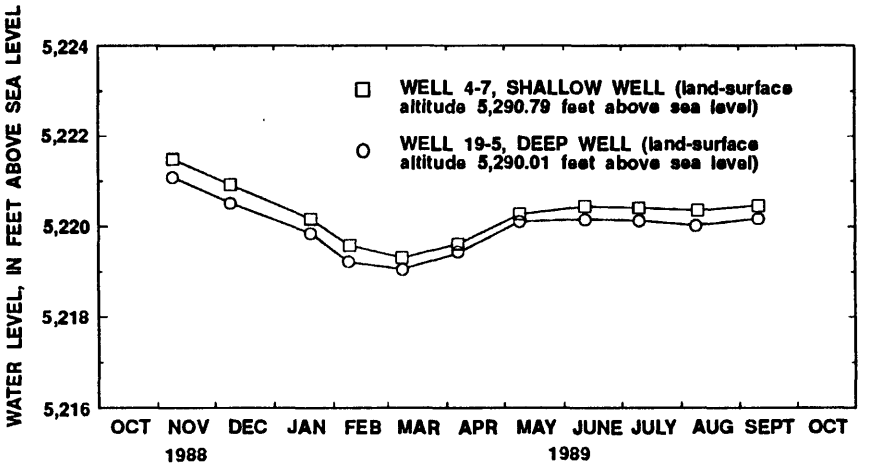


Figure 12.--Monthly water levels in well pair 4-7/19-5, November 1988-September 1989.

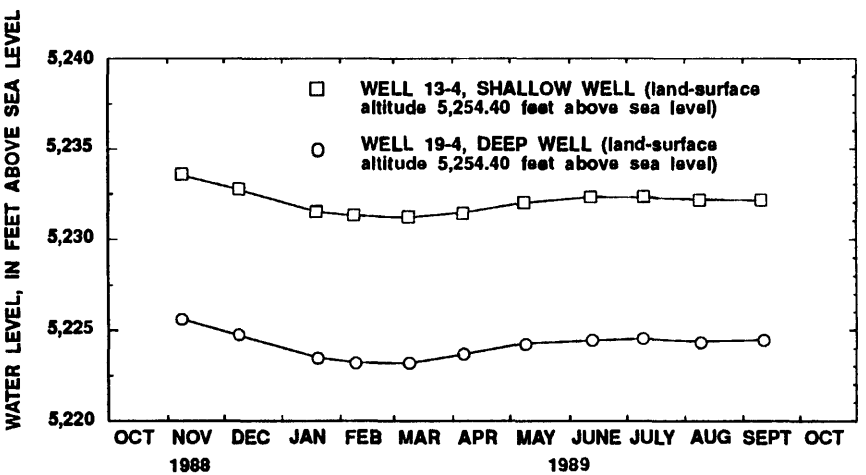


Figure 13.--Monthly water levels in well pair 13-4/19-4, November 1988-September 1989.

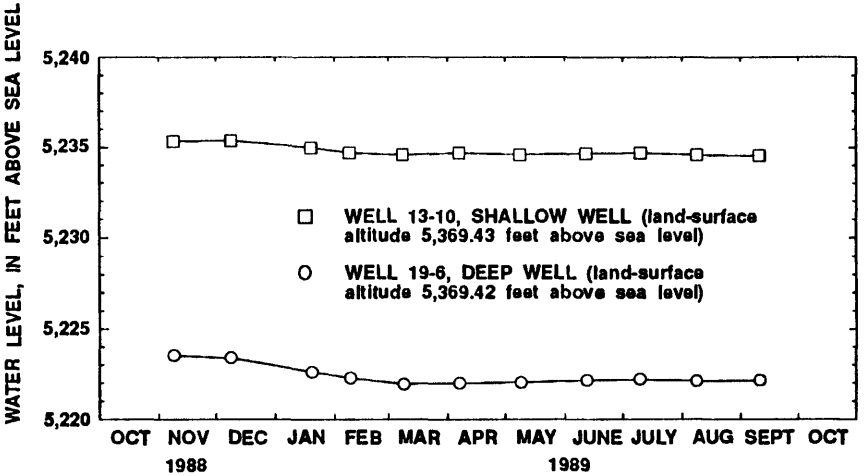


Figure 14.--Monthly water levels in well pair 13-10/19-6, November 1988-September 1989.

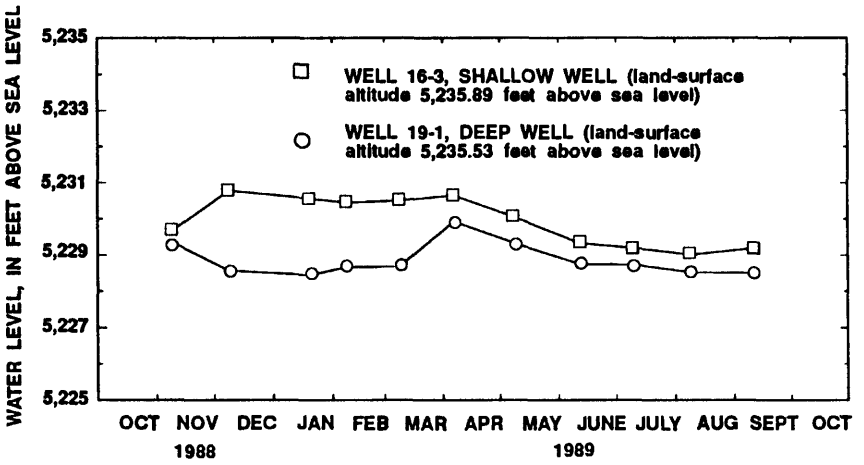


Figure 15.--Monthly water levels in well pair 16-3/19-1, November 1988-September 1989.

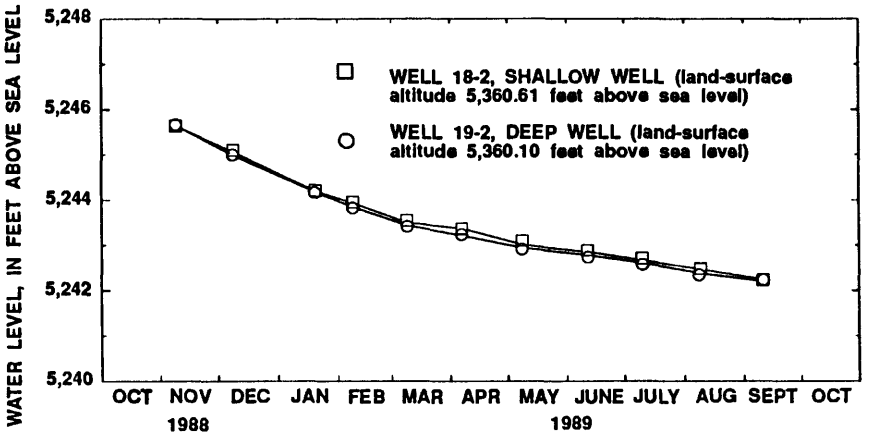


Figure 16.--Monthly water levels in well pair 18-2/19-2, November 1988-September 1989.

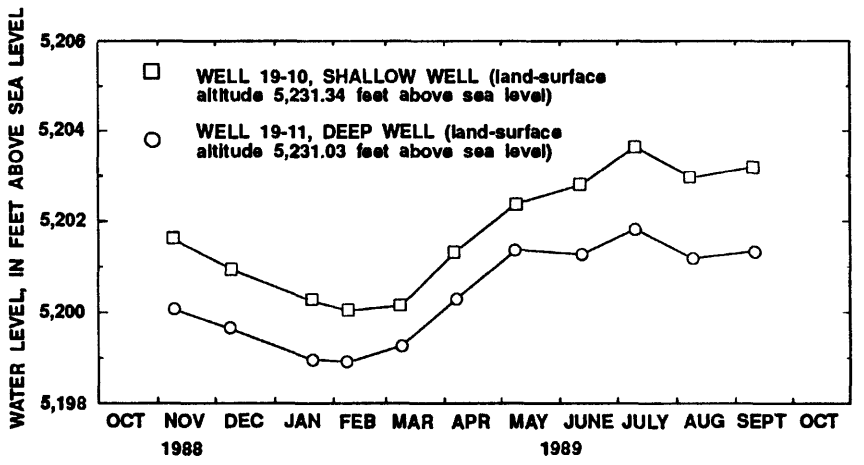


Figure 17.--Monthly water levels in well pair 19-10/19-11, November 1988-September 1989.

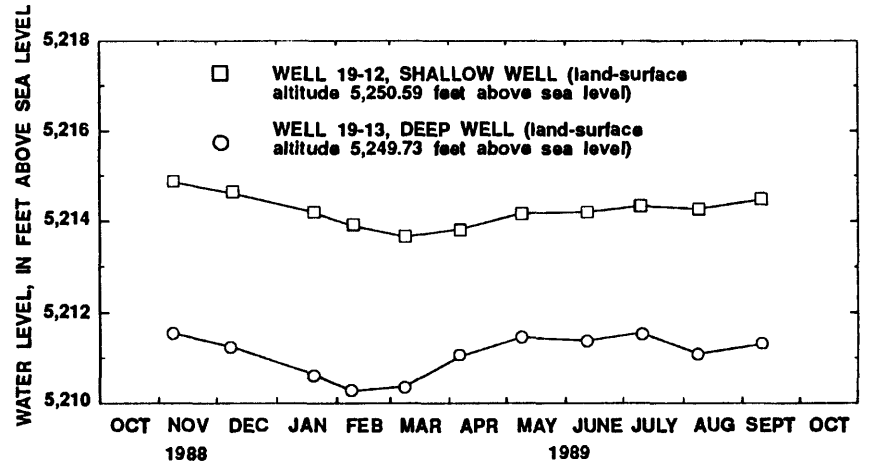


Figure 18.--Monthly water levels in well pair 19-12/19-13, November 1988-September 1989.

At most of the other well pairs, the difference in water levels between the shallow well and the deep well also was small, indicating a small downward component of vertical ground-water flow. The median difference in water levels was less than 1 foot in six well pairs and was from 1 to 2 feet in three other well pairs; the median vertical hydraulic gradient in these nine well pairs ranged from -0.001 to 0.014.

At three well pairs, the median difference in water levels was substantially larger: 3.17 feet at well pair 19-12/19-13 (fig. 18), 7.87 feet at well pair 13-4/19-4 (fig. 13), and 12.45 feet at well pair 13-10/19-6 (fig. 14). A downward hydraulic gradient was indicated at all three well pairs. The median vertical hydraulic gradient at these well pairs ranged from 0.029 to 0.108 downward. These well pairs are located in the upland area, adjacent to or south of the Santa Fe River.

These data reflect conditions at the time of collection, November 1988 through September 1989. During this period, water levels in Cochiti Reservoir were at or near the recreation pool level of 5,323 feet above sea level. The vertical hydraulic gradient may or may not have been upward during rising water levels and higher than recreation pool levels in March 1985 through May 1988.

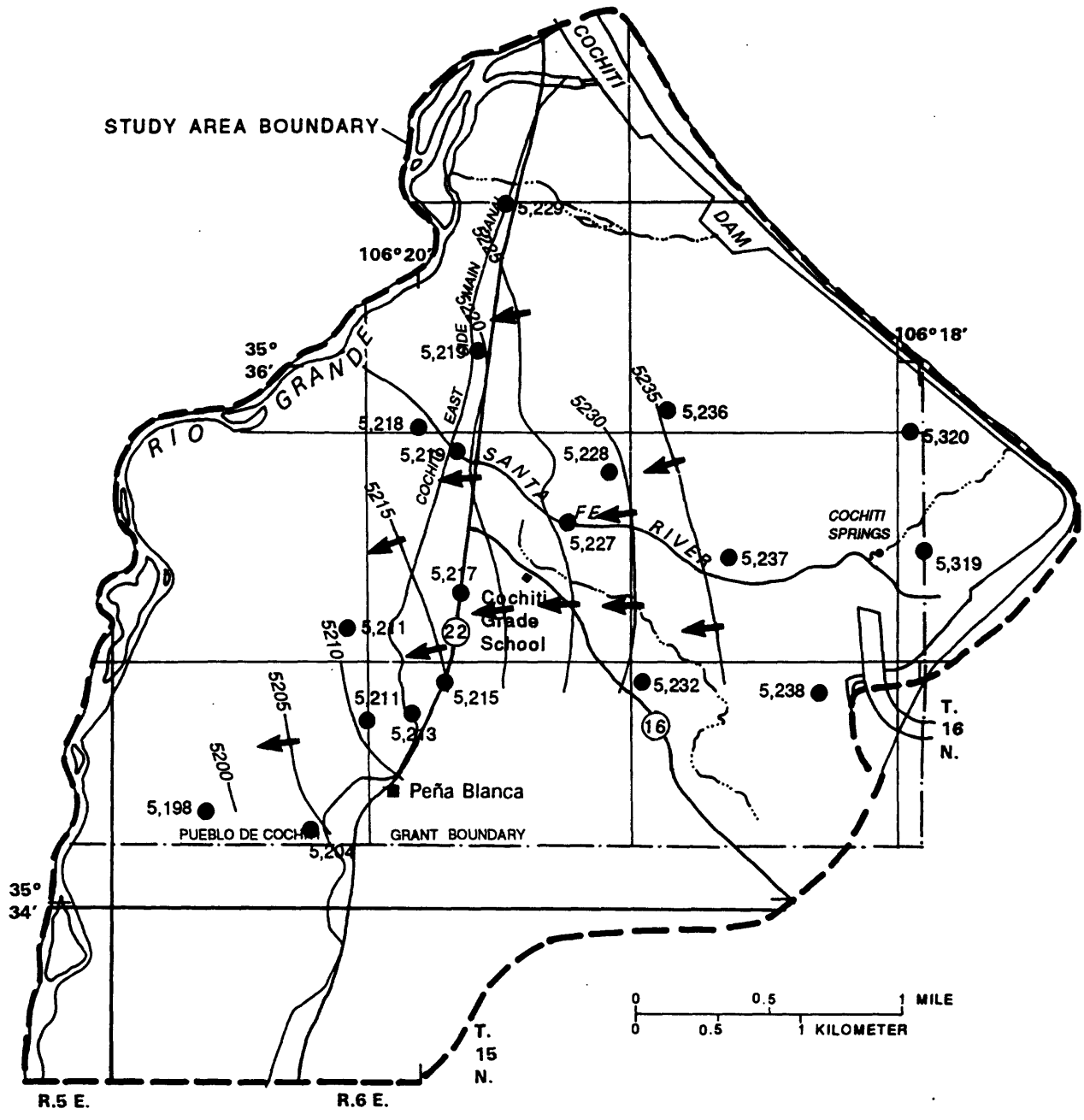
GROUND-WATER-LEVEL FLUCTUATIONS

The results of this study indicate that the ground-water system in the Cochiti Dam-Peña Blanca area is affected both directly and indirectly by the operation of Cochiti Reservoir, by the Santa Fe River, and by the Cochiti East Side Main Canal. Water levels in Cochiti Reservoir directly affect ground-water levels throughout the study area. Increased flow in the Santa Fe River has increased infiltration to the ground-water system near the river. Flow in the Cochiti East Side Main Canal causes seasonal variation of ground-water levels near the canal; however, the lining of parts of the canal has decreased this variation near the lined reaches. Installation of drains in fields in part of the Rio Grande flood plain near well 2-1 (fig. 2) in January 1989 has affected ground-water levels nearby.

Water levels in shallow wells and in Cochiti Reservoir were analyzed to determine what effect the operation of the reservoir might have had on ground-water levels. To achieve this determination, potentiometric-surface maps were constructed using water-level data from prior to, during, and following the period of high water levels in the reservoir. Water levels in individual wells were compared with water levels in the reservoir.

Water levels in wells drilled prior to this study (wells 1-1 through 18-4) and included in the monitoring-well network of this study typically were measured at least monthly by the Corps of Engineers and its contractors from when the wells were drilled through March 1983, and from May 1985 through December 1987. Water levels in these wells were measured monthly by the Geological Survey from October 1987 through September 1989. Water-level measurements are shown in table 2.

Three potentiometric-surface maps were constructed from water levels in shallow wells to compare the response of the water table to different water levels in Cochiti Reservoir. One map was constructed from water-level data collected in February 1982, prior to the 1982 irrigation season and prior to high water levels in the reservoir that began in 1985; a second map was constructed from data collected in January 1988, prior to the 1988 irrigation season but during high water levels in the reservoir; and a third map was constructed from data collected in March 1989, prior to the 1989 irrigation season but following the return of water levels in the reservoir to near the recreation pool altitude in June 1988 (figs. 19-21).

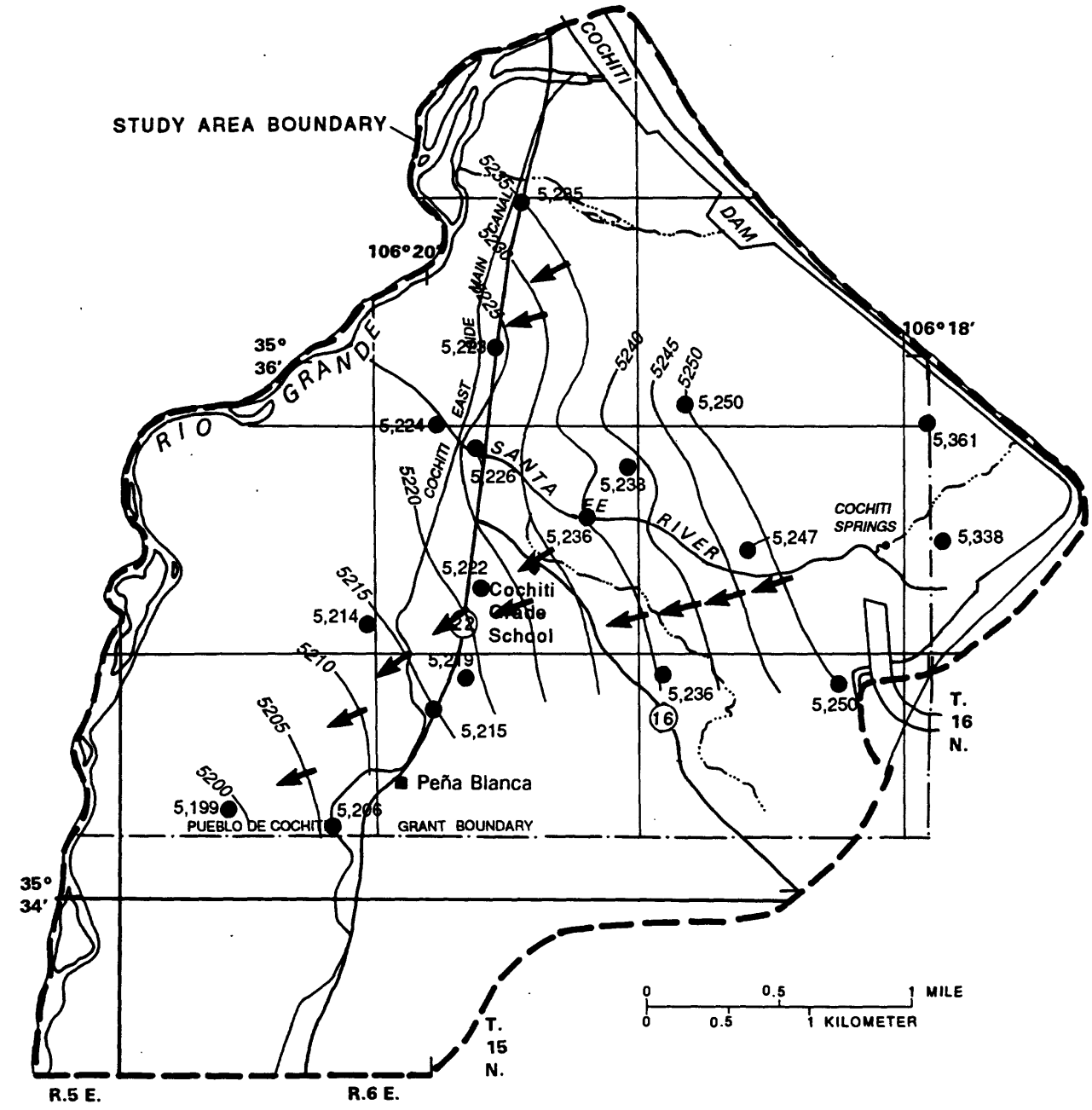


EXPLANATION

5,198 — WELL--Number is altitude of water level, in feet above sea level

5205 — POTENTIOMETRIC CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Contour interval 5 feet. Datum is sea level. Arrows show direction of ground-water movement

Figure 19.--Potentiometric surface of the ground-water system in the Cochiti Dam-Peña Blanca area on February 25, 1982.

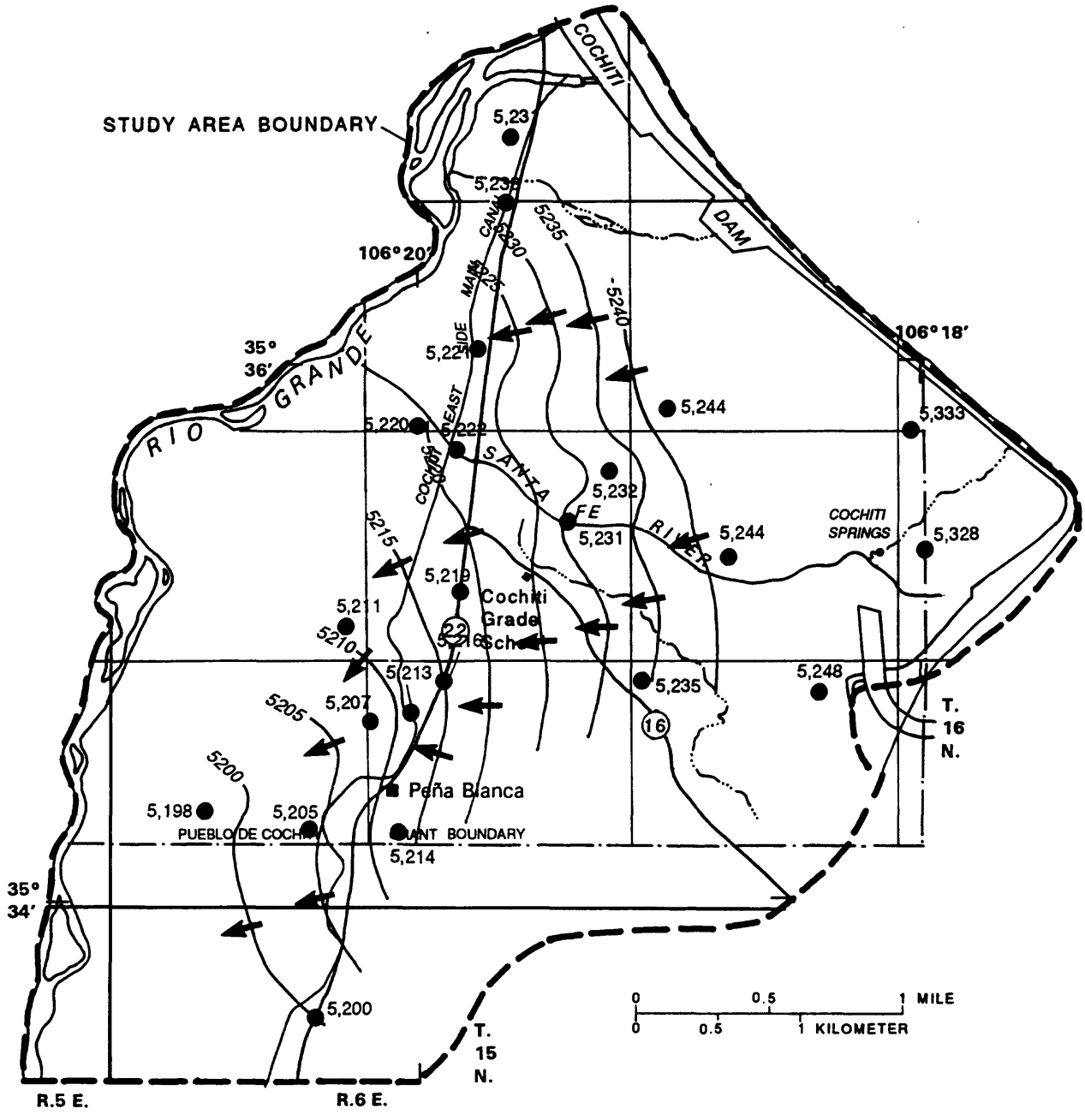


EXPLANATION

5,206 WELL--Number is altitude of water level, in feet above sea level

5205 POTENTIOMETRIC CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Contour interval 5 feet. Datum is sea level. Arrows show direction of ground-water movement

Figure 20.--Potentiometric surface of the ground-water system in the Cochiti Dam-Peña Blanca area on January 8, 1988.



EXPLANATION

5,200 WELL--Number is altitude of water level, in feet above sea level

5200 POTENTIOMETRIC CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Contour interval 5 feet. Datum is sea level. Arrows show direction of ground-water movement

Figure 21.--Potentiometric surface of the ground-water system in the Cochiti Dam-Peña Blanca area on March 9, 1989.

Comparison of these potentiometric-surface maps (figs. 19 and 20) indicates that between February 1982 and January 1988, water levels rose substantially in the upland area, as much as 40 feet near Cochiti Dam; water levels rose about 4 to 7 feet in the northern part of the Rio Grande flood plain north of the Santa Fe River; and water levels rose about 1 to 3 feet in the Rio Grande flood plain south of the Santa Fe River. From January 1988 to March 1989, water levels declined throughout the study area (figs. 20 and 21); however, water levels in March 1989 remained about 4 to 13 feet higher than in February 1982 in the upland area, and remained about 2 to 4 feet higher than in February 1982 in the Rio Grande flood plain north of the Santa Fe River. Water levels declined to within 1 foot above the February 1982 water levels in the Rio Grande flood plain south of the Santa Fe River.

To aid in further detailed analysis of ground-water/surface-water interactions, two sets of hydrographs were plotted using the water-level data collected at monitoring wells. The hydrograph of water levels in the Cochiti Reservoir is included on hydrographs of water levels in each well. The first set of hydrographs includes data for the entire period of water-level measurement for each well (figs. 22-40). The second set contains the annual maximum and minimum water levels for the entire period of water-level measurement for selected wells (figs. 41-49).

In both sets of hydrographs, the vertical scales for the hydrographs of water levels in wells are larger than those for Cochiti Reservoir. The larger scales were used to enhance the trend of the water levels in wells to aid in examination of the relation between water levels in the reservoir and ground-water levels at the well sites. The hydrographs of water levels in wells do not compare directly with those of Cochiti Reservoir; rather these hydrographs, enhanced by the larger vertical scale, are used to compare the trends in ground-water-level changes with time to that of the reservoir.

For the purpose of analyzing changes in water levels with time, the monitoring wells were divided into two groups: (1) wells in the upland area, away from the flood plain of the Rio Grande; and (2) wells in or near the flood plain of the Rio Grande, near the Cochiti East Side Main Canal and near land irrigated by water from this canal (fig. 2). Wells 13-4 through 13-10 and 18-1 through 18-4 are in the upland area; wells 1-1 through 4-7 and well 13-2 are in or near the flood plain of the Rio Grande. Wells 13-2, 13-4, and 13-6 also are in the flood plain of the Santa Fe River. Wells in or near the flood plain of the Rio Grande were further divided--wells 4-2, 4-4, 4-5, and 13-2 are north of the Santa Fe River and wells 1-1, 2-1, 2-6, 3-1, 3-5, 4-7, and 4-8 are south of the Santa Fe River. Wells 2-6, 4-7, and 4-8 are in the upland area, but also are near the Rio Grande flood plain and the Cochiti East Side Main Canal.

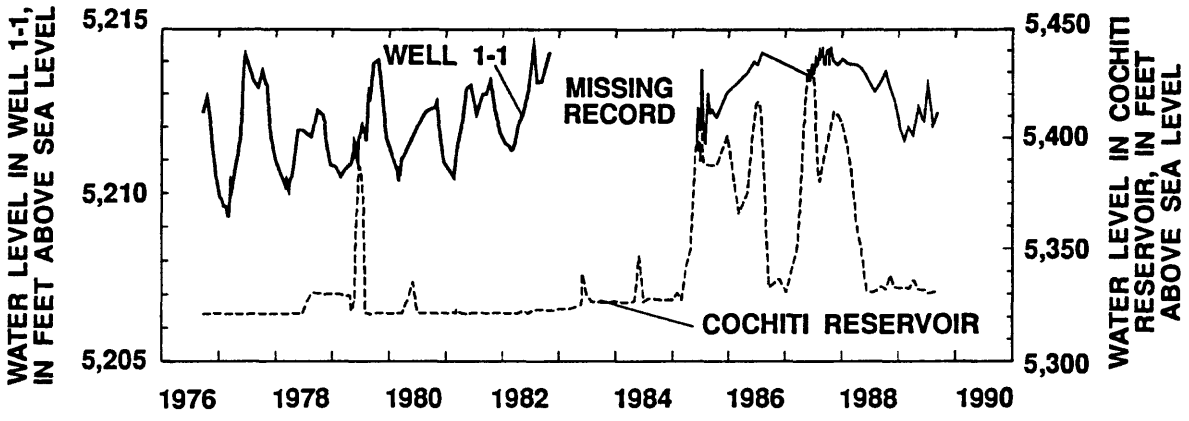


Figure 22.--Selected water levels in Cochiti Reservoir and well 1-1, September 1976-September 1989.

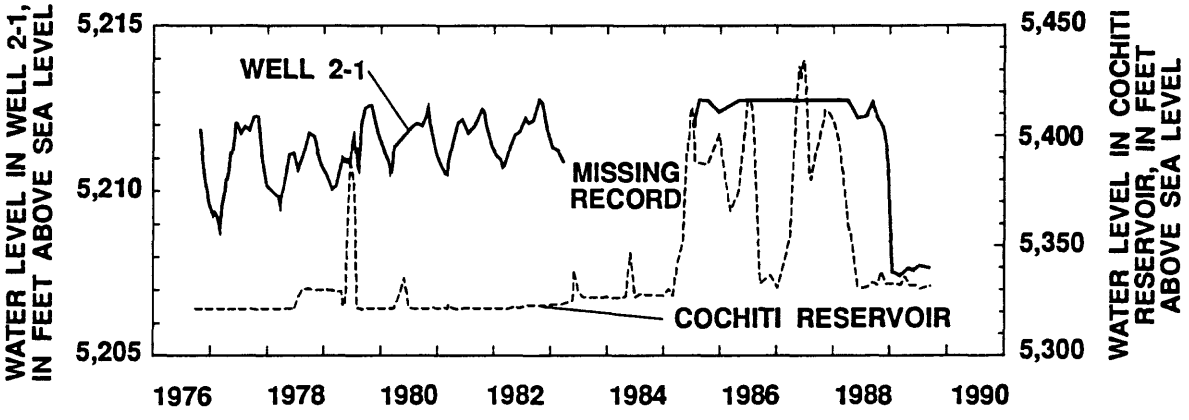


Figure 23.--Selected water levels in Cochiti Reservoir and well 2-1, September 1976-September 1989.

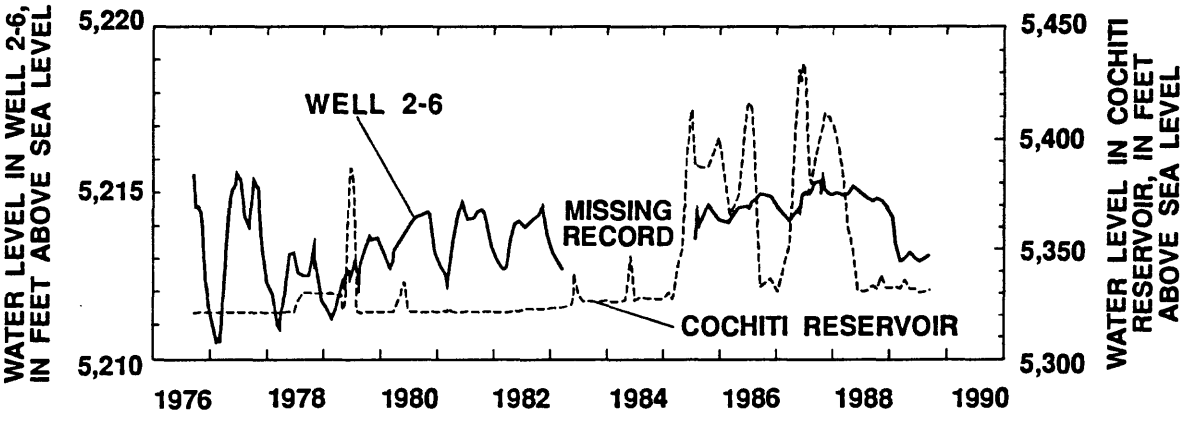


Figure 24.--Selected water levels in Cochiti Reservoir and well 2-6, September 1976-September 1989.

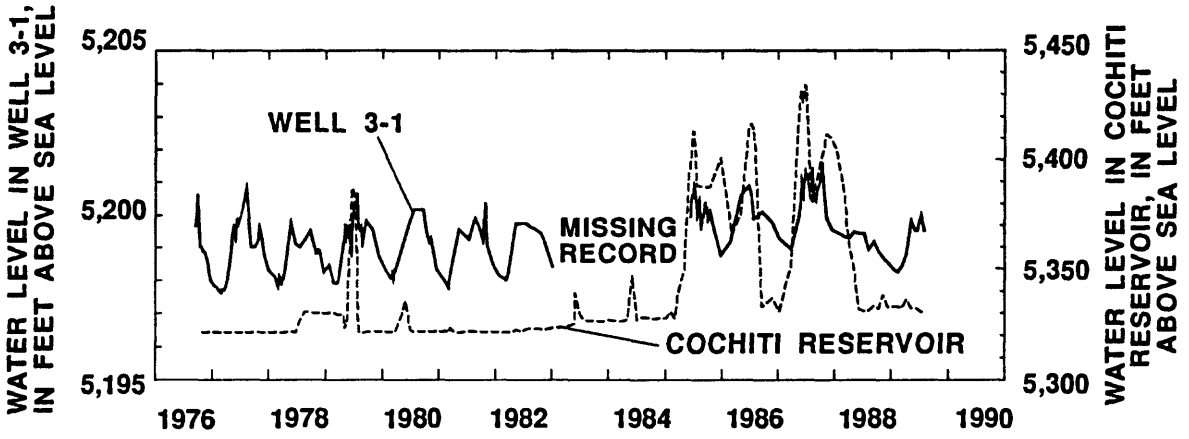


Figure 25.--Selected water levels in Cochiti Reservoir and well 3-1, September 1976-September 1989.

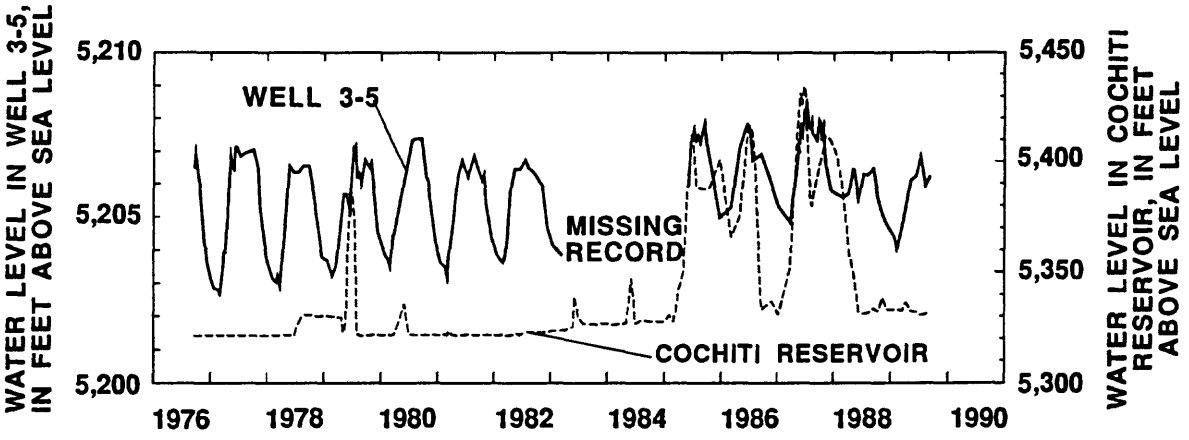


Figure 26.--Selected water levels in Cochiti Reservoir and well 3-5, September 1976-September 1989.

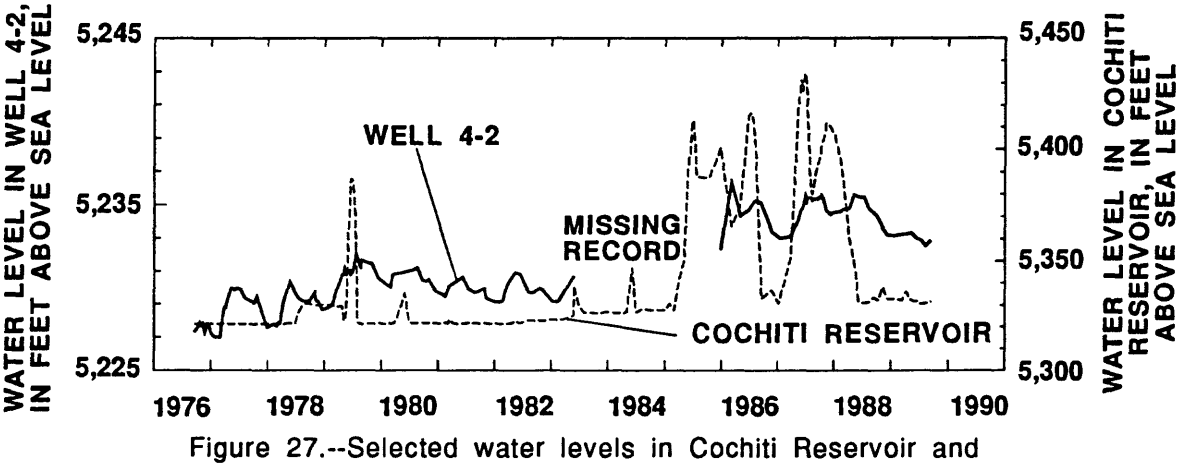


Figure 27.--Selected water levels in Cochiti Reservoir and well 4-2, September 1976-September 1989.

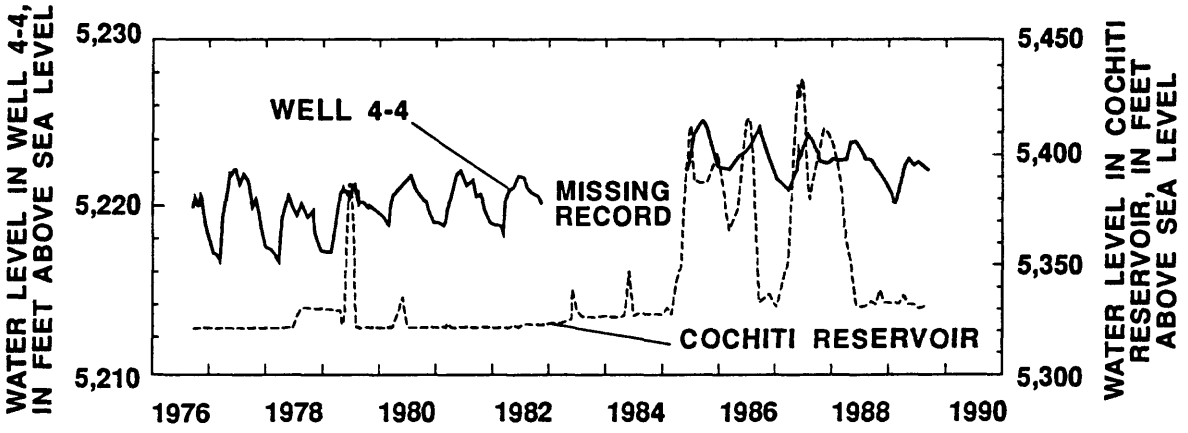


Figure 28.--Selected water levels in Cochiti Reservoir and well 4-4, September 1976-September 1989.

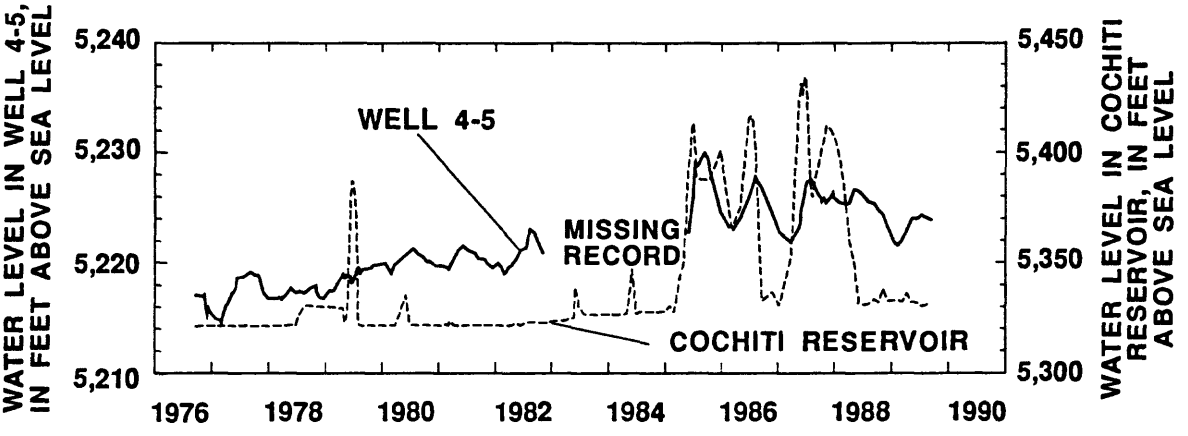


Figure 29.--Selected water levels in Cochiti Reservoir and well 4-5, September 1976-September 1989.

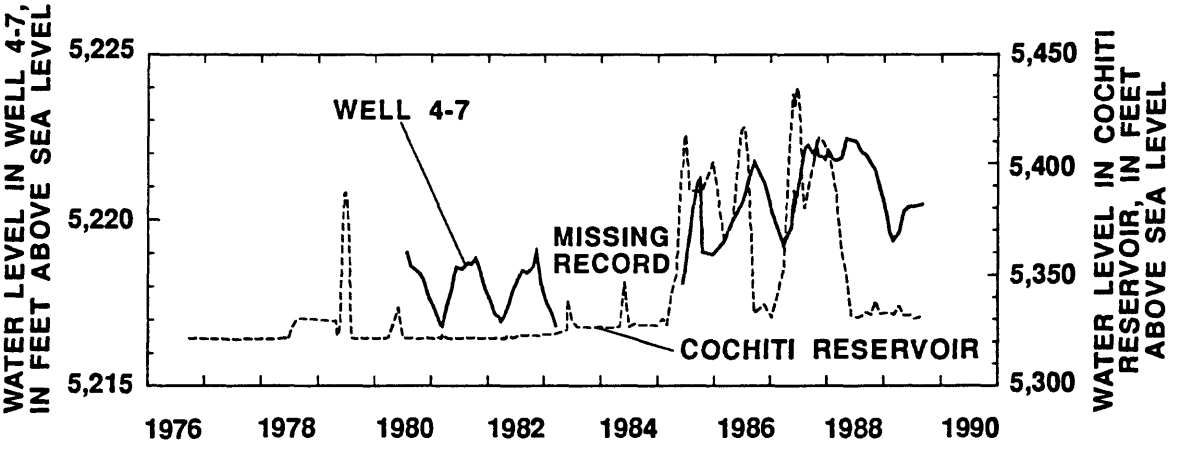


Figure 30.--Selected water levels in Cochiti Reservoir and well 4-7, September 1976-September 1989.

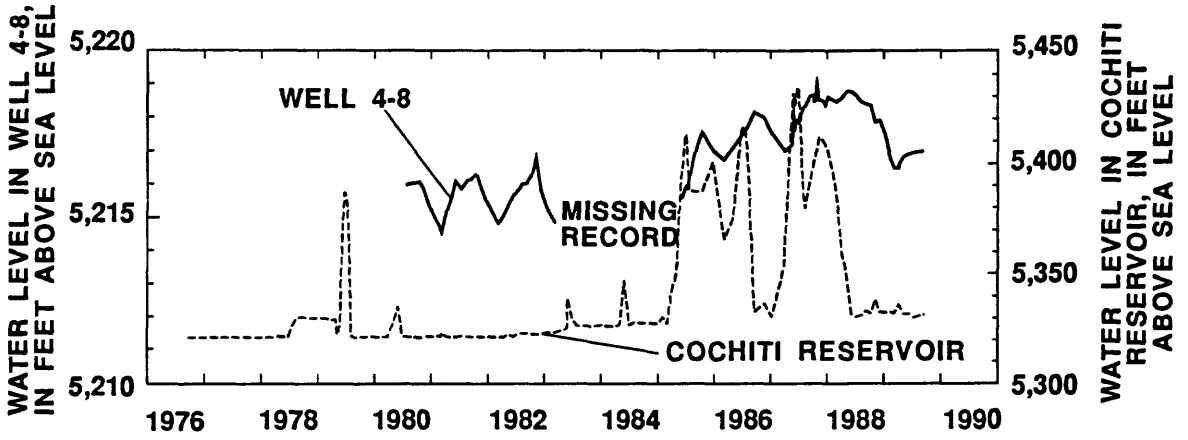


Figure 31.--Selected water levels in Cochiti Reservoir and well 4-8, September 1976-September 1989.

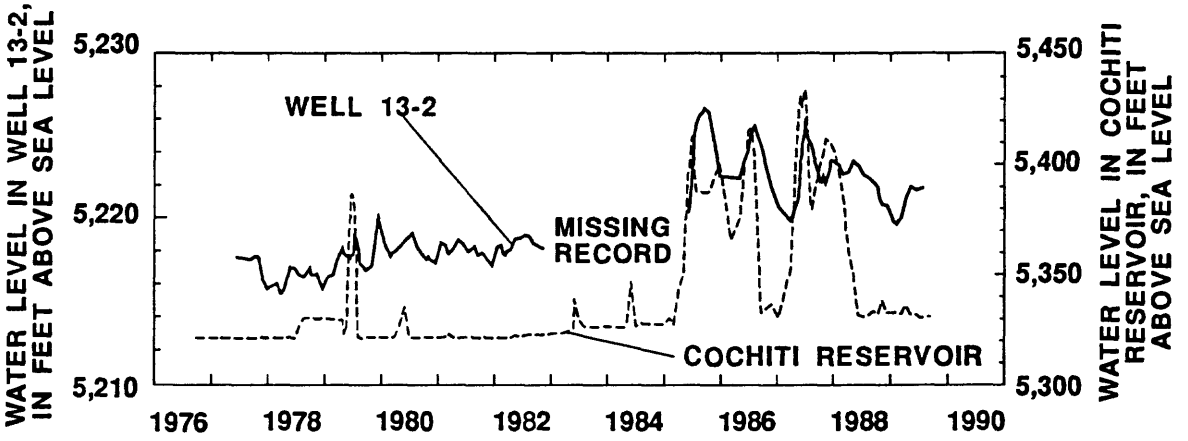


Figure 32.--Selected water levels in Cochiti Reservoir and well 13-2, September 1976-September 1989.

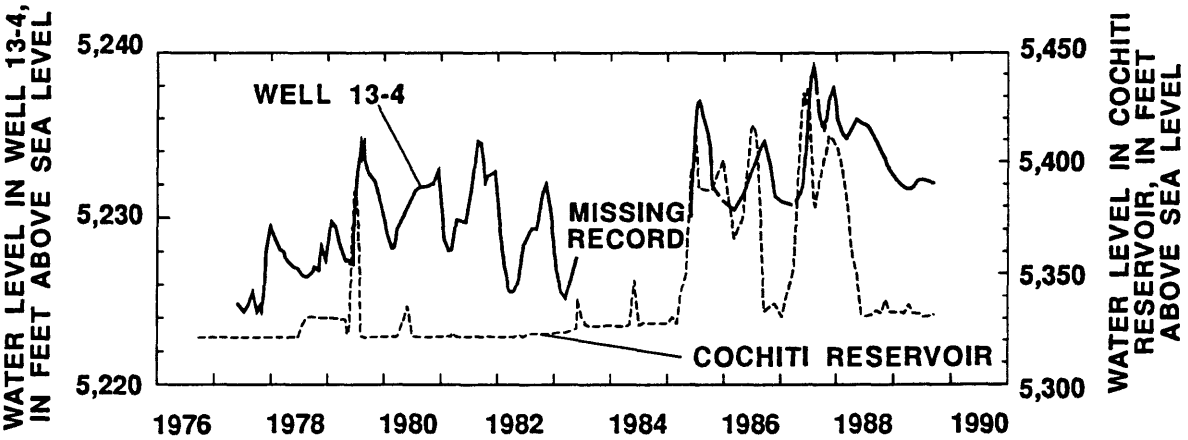


Figure 33.--Selected water levels in Cochiti Reservoir and well 13-4, September 1976-September 1989.

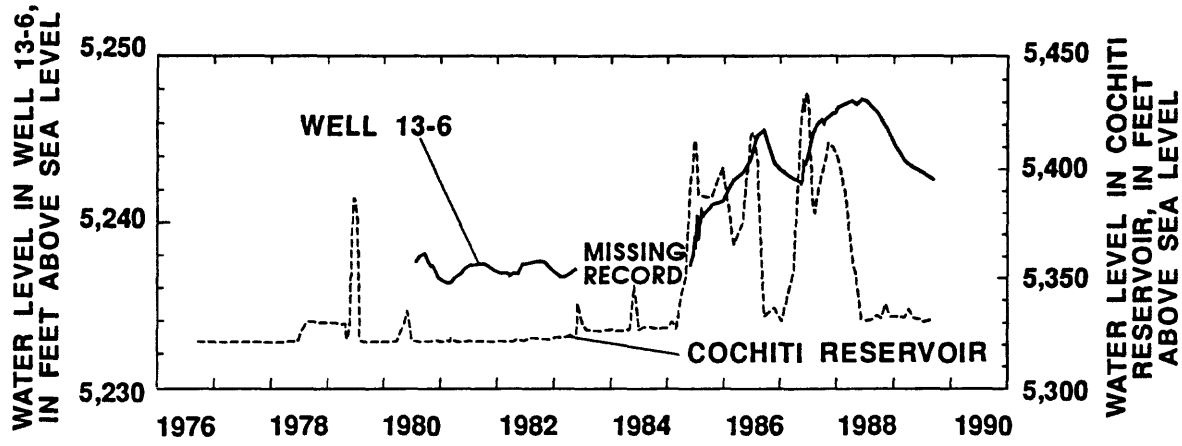


Figure 34.--Selected water levels in Cochiti Reservoir and well 13-6, September 1976-September 1989.

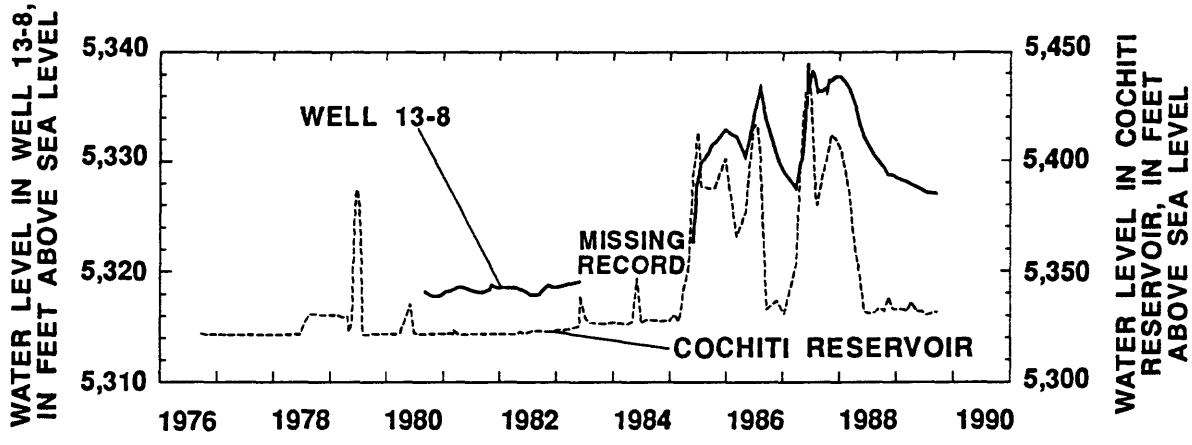


Figure 35.--Selected water levels in Cochiti Reservoir and well 13-8, September 1976-September 1989.

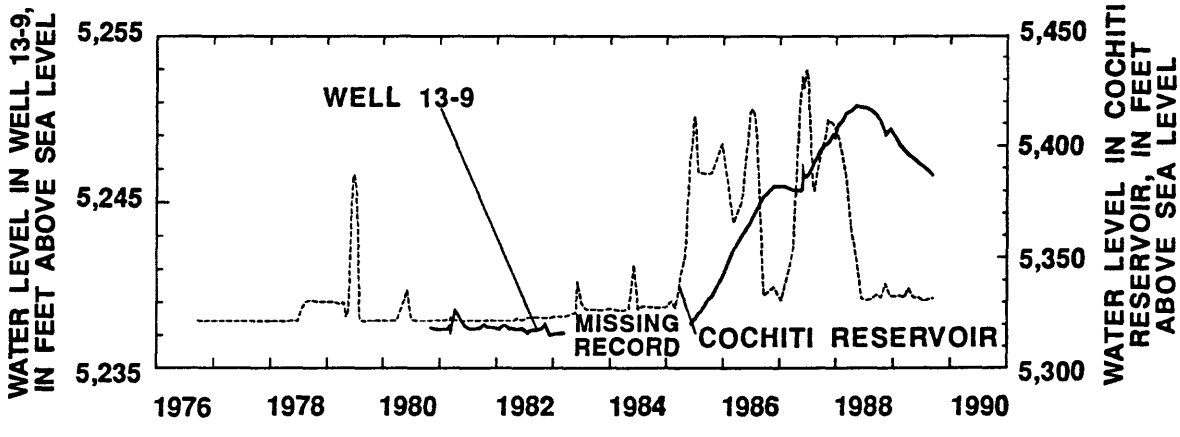


Figure 36.--Selected water levels in Cochiti Reservoir and well 13-9, September 1976-September 1989.

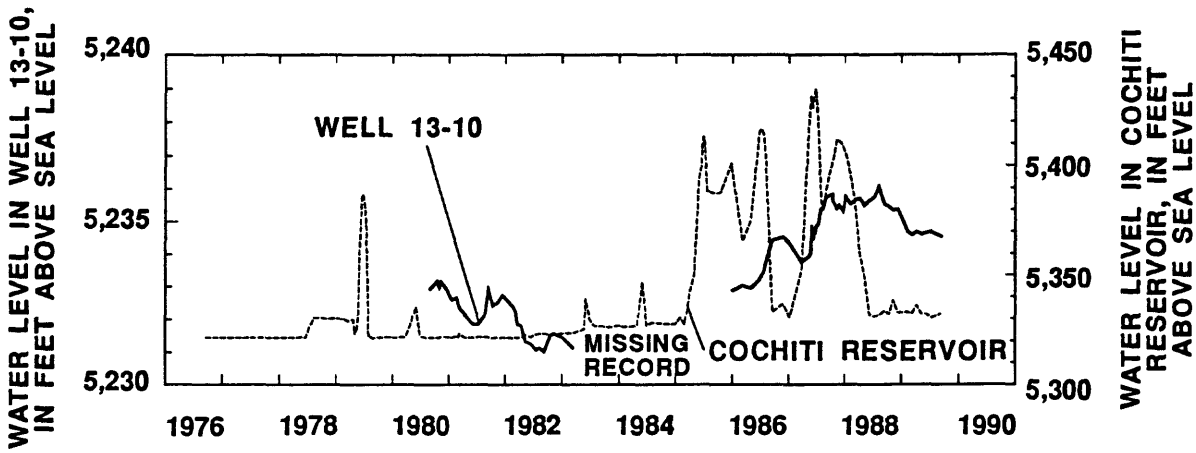


Figure 37.--Selected water levels in Cochiti Reservoir and well 13-10, September 1976-September 1989.

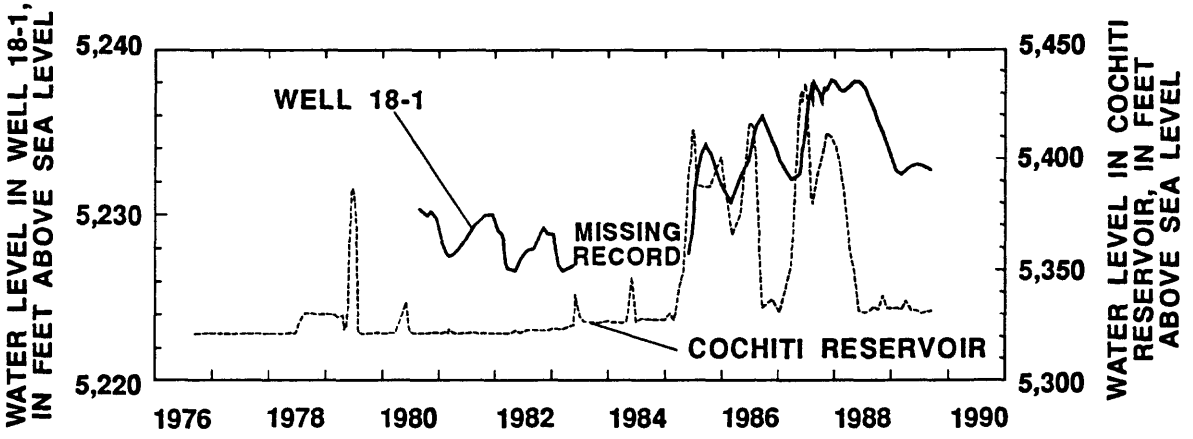


Figure 38.--Selected water levels in Cochiti Reservoir and well 18-1, September 1976-September 1989.

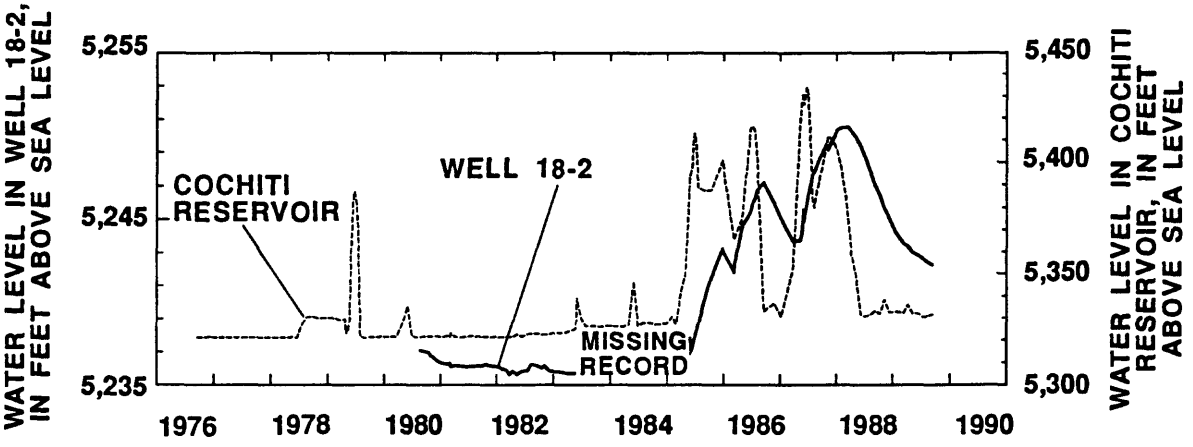


Figure 39.--Selected water levels in Cochiti Reservoir and well 18-2, September 1976-September 1989.

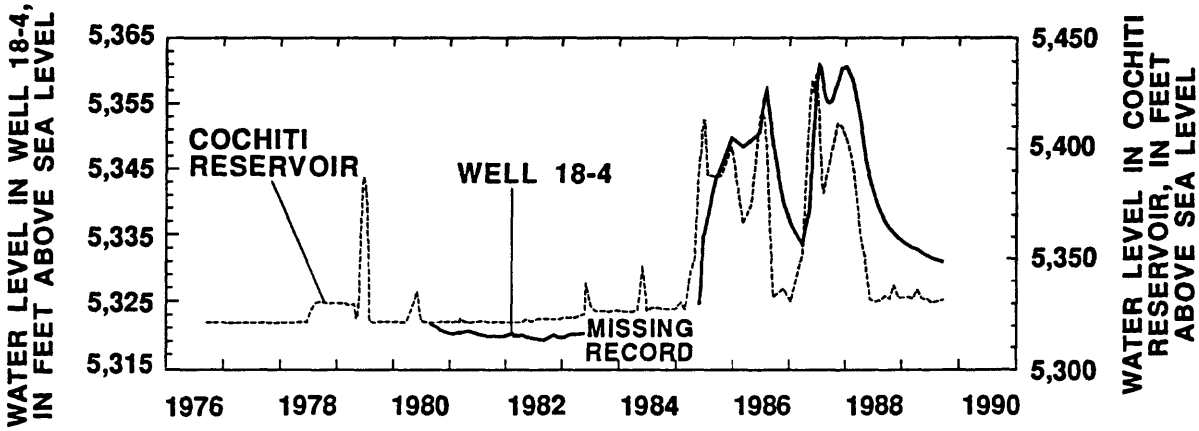


Figure 40.--Selected water levels in Cochiti Reservoir and well 18-4, September 1976-September 1989.

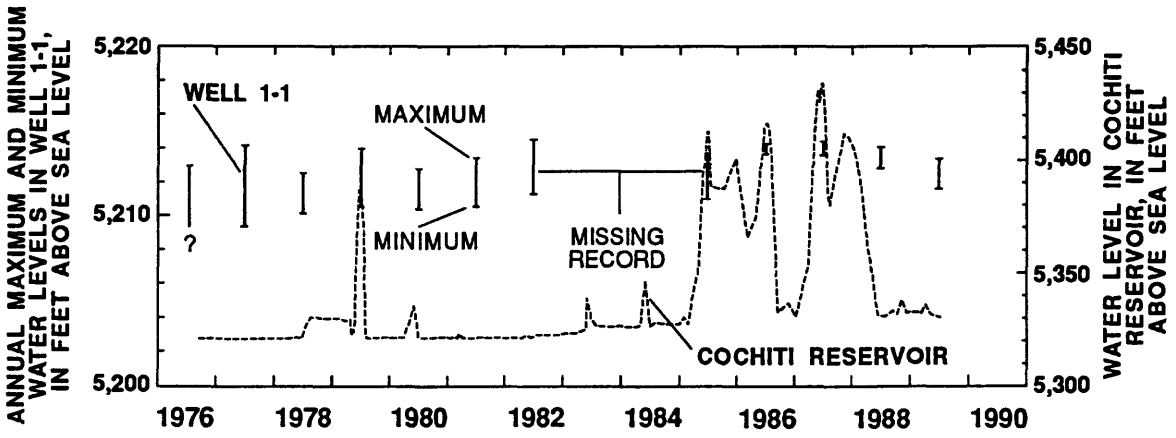


Figure 41.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 1-1, 1976-89.

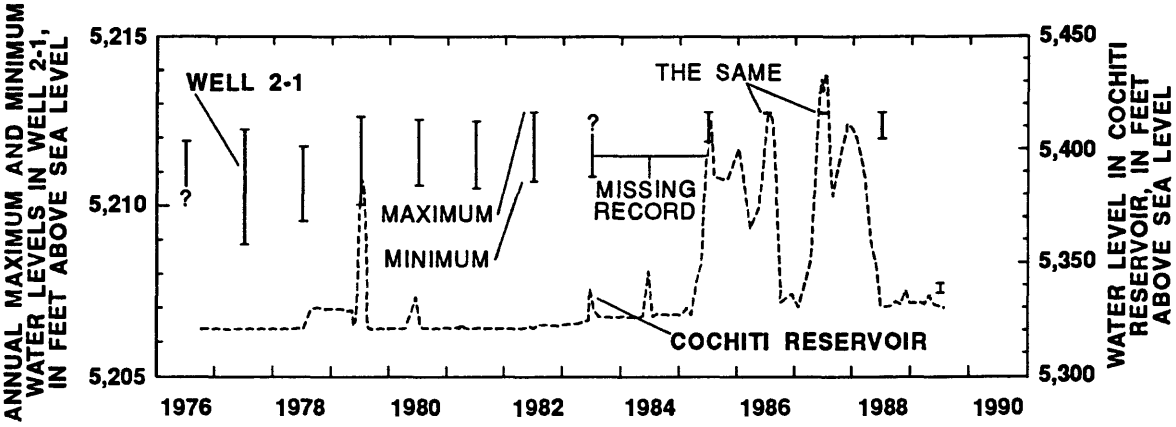


Figure 42.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 2-1, 1976-89.

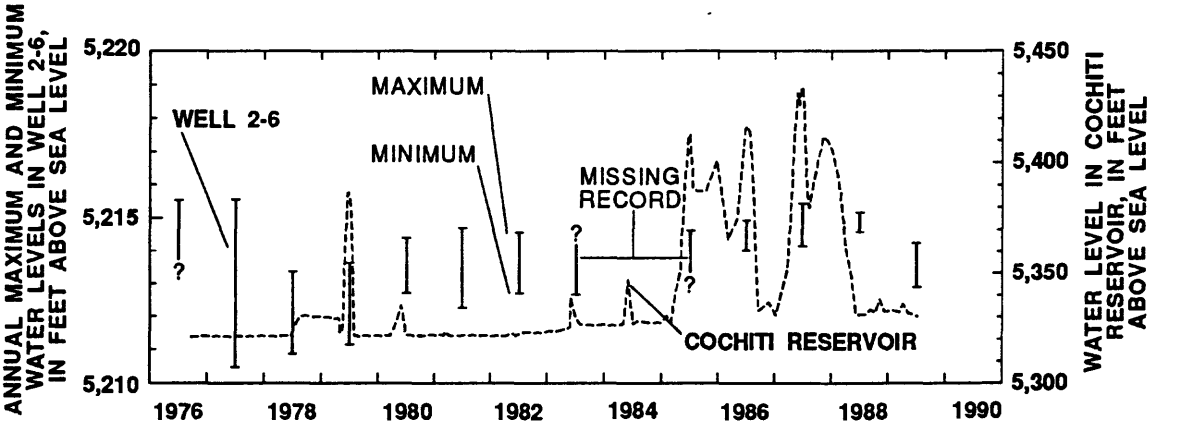


Figure 43.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 2-6, 1976-89.

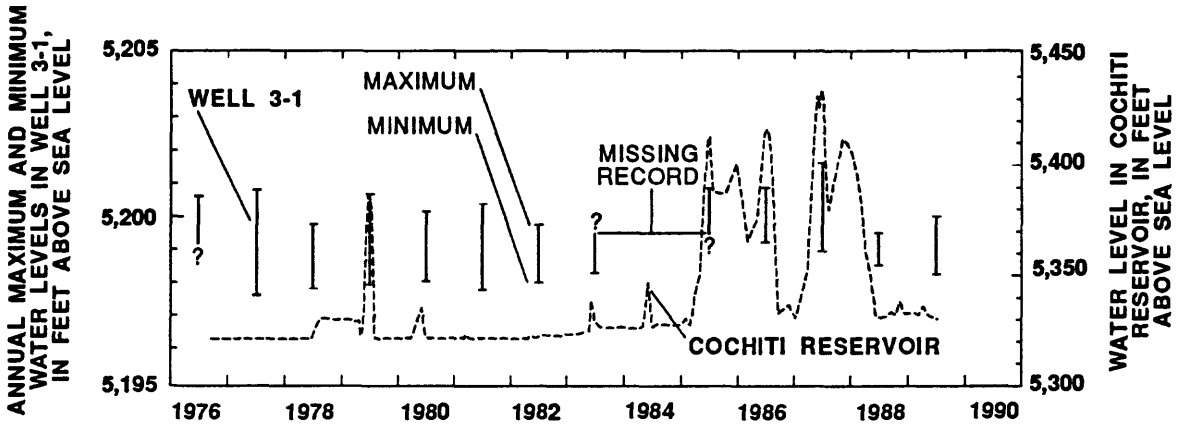


Figure 44.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 3-1, 1976-89.

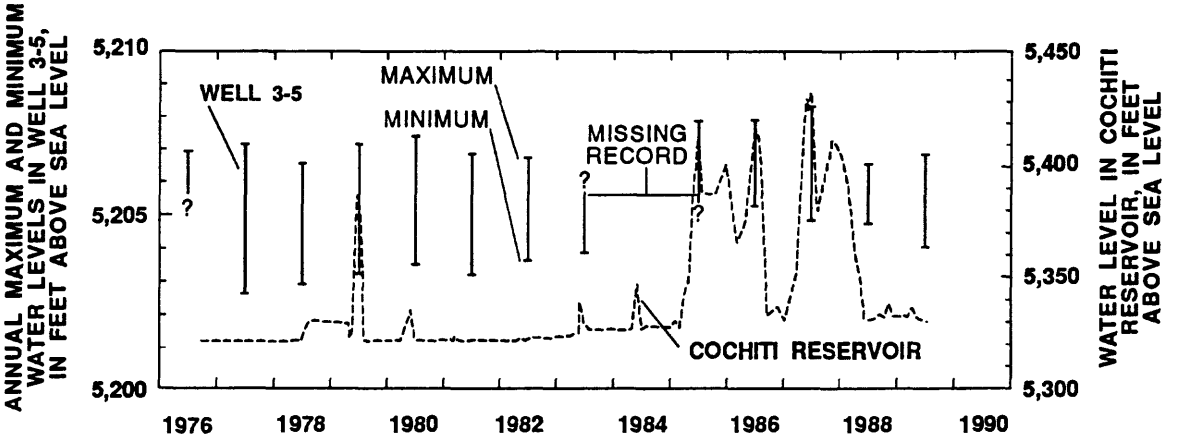


Figure 45.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 3-5, 1976-89.

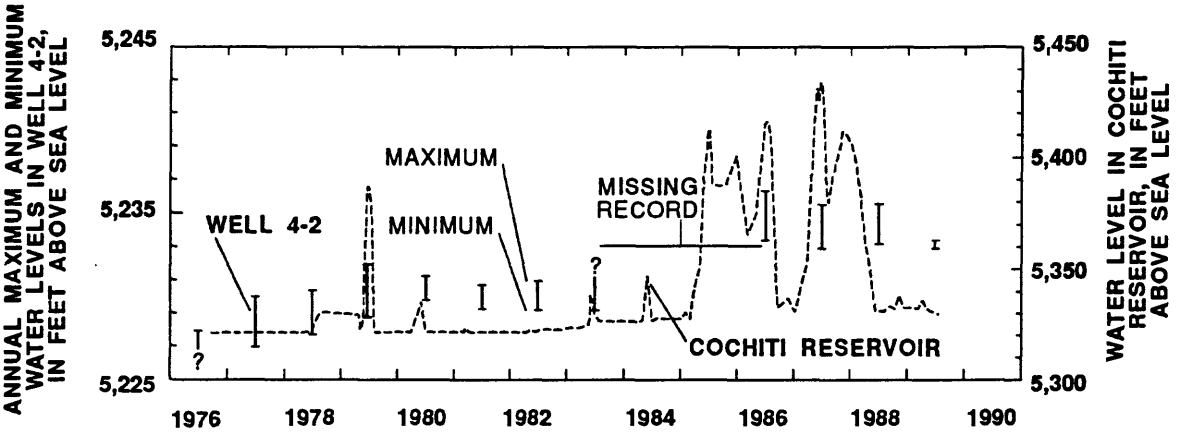


Figure 46.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 4-2, 1976-89.

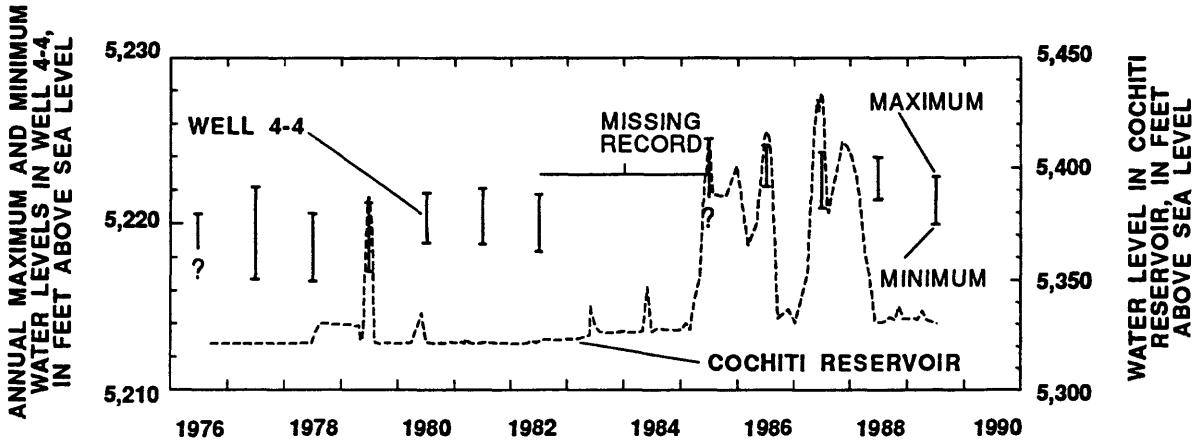


Figure 47.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 4-4, 1976-89.

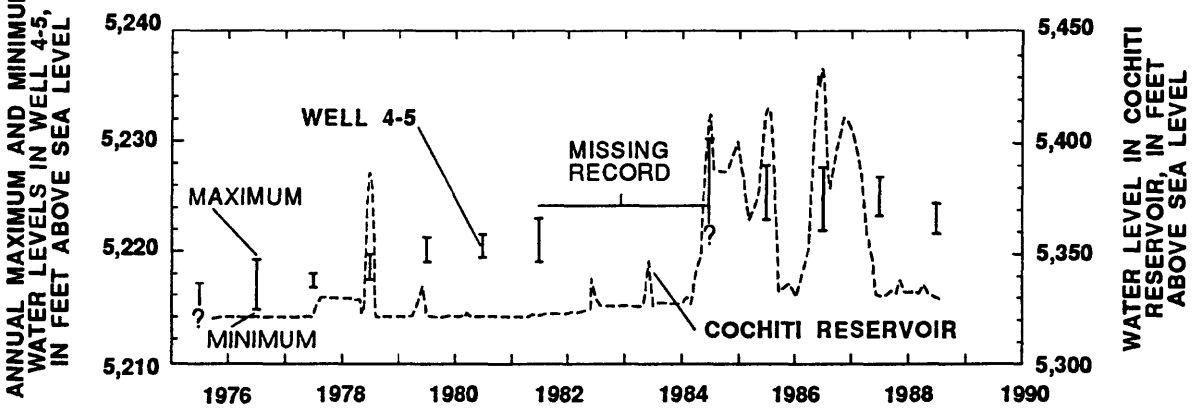


Figure 48.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 4-5, 1976-89.

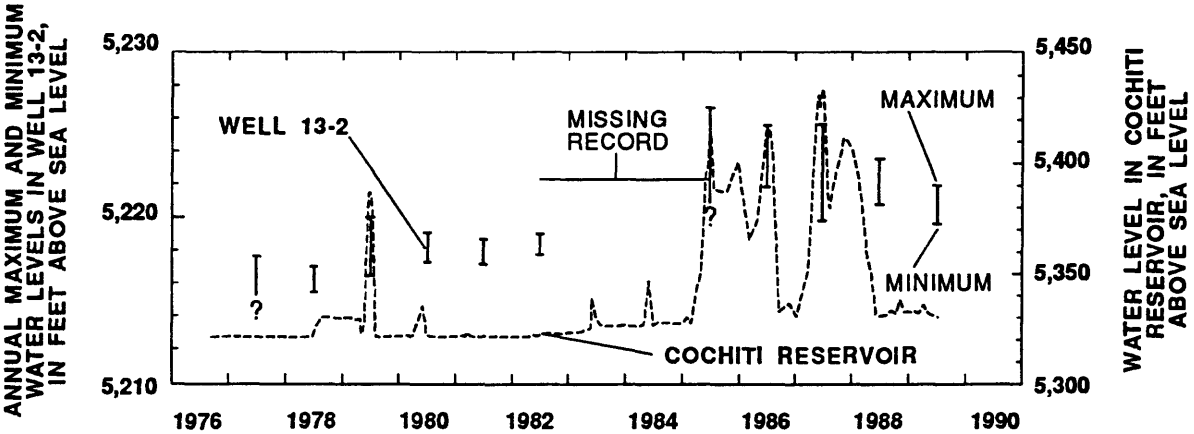


Figure 49.--Selected water levels in Cochiti Reservoir and annual range of water levels in well 13-2, 1976-89.

Upland Area

From summer 1980 to spring 1983 during part of the period of nearly stable water levels in Cochiti Reservoir, the total fluctuation in water levels in wells 13-8, 13-9, and 18-2 was less than 1.5 feet (figs. 35, 36, and 39); the fluctuation in well 13-6 was 1.8 feet (fig. 34); and the fluctuation in wells 13-10 and 18-4 was between 2 and 3 feet (figs. 37 and 40). The nearly stable water levels in the reservoir and the wells during this period indicate that the ground-water system was in approximate equilibrium with Cochiti Reservoir.

From May 1985 to September 1988 during the period of generally high and rapidly changing water levels in Cochiti Reservoir, the fluctuation in water levels in wells 13-6, 13-8, 13-9, 18-1, 18-2, and 18-4 (figs. 34, 35, 36, 38, 39, and 40) ranged from about 10 feet (well 13-6; fig. 34) to about 36 feet (well 18-4; fig. 40). The fluctuation in well 13-10 was 4.62 feet (fig. 37). These large fluctuations in water levels correspond in time to the large fluctuation in water levels in Cochiti Reservoir, and except for wells 13-9 and 13-10 the hydrographs indicate a trend of water-level changes in the wells similar to that in Cochiti Reservoir (figs. 34-40). Generally, the similarity between the well and the reservoir water level rise, the magnitude of the water-level fluctuation increases, and the response time of water levels in wells to changes in water levels in the reservoir is more rapid with proximity to the Rio Grande arm of Cochiti Reservoir (figs. 34, 35, 37-40; table 8).

Wells in upland areas all show a rapid rise in water level in 1985 in response to the rise in the water level in the reservoir, and a decline in 1988 in response to the decline in the reservoir water level. The water levels in all these wells, however, ranged from about 2 to 9 feet higher in September 1989 than in May 1985, and the hydrographs of the water levels in wells indicate that the rate of water-level decline in these wells was slowing. It is not clear whether water levels in these wells will return to about the same as those in May 1985 or will establish equilibrium with Cochiti Reservoir at a higher water level.

At water levels in Cochiti Reservoir of less than 5,355 feet above sea level, the Santa Fe River arm of the reservoir is dry, and ground-water levels are affected only by water levels in the Rio Grande arm. At water levels higher than 5,355 feet, ground-water levels are affected by both arms of the reservoir. Wells 13-9 and 13-10 are closer to the Santa Fe River arm than to the Rio Grande arm. Therefore, the influence of the reservoir water levels on ground-water levels at these wells is greater when the water levels are higher than 5,355 feet. Similarly, the response time of water levels at these wells to changes in water levels in the reservoir is less when the water levels in the reservoir are higher than 5,355 feet. The hydrographs of water levels in wells 13-9 and 13-10 illustrate these effects (figs. 36 and 37).

Well 13-4 is in the Santa Fe River flood plain and well 18-1 is near the flood plain, about two-thirds mile northeast of well 13-4. Seepage loss in the Santa Fe River (tables 3 and 4) and the downward vertical hydraulic gradient in well pair 13-4/19-4 (table 7) indicate that well 13-4 is in an area where the Santa Fe River is recharging the ground-water system. The hydrograph of water levels in well 13-4 shows a range in seasonal fluctuations of about 4.5 to about 7 feet in 1979 through 1982, and the hydrograph of well 18-1 shows seasonal fluctuations of about 2.5 feet in 1981 and 1982 (figs. 33 and 38). These fluctuations in ground-water level might indicate seasonal variations in flow in the Santa Fe River, although this cannot be substantiated. From 1985 through 1988, however, the hydrograph of water levels in well 13-4 shows a trend similar to that of Cochiti Reservoir and generally higher water levels than from 1977 to 1982 (fig. 33); this indicates that the high and rapidly changing water levels in Cochiti Reservoir affected the ground-water system near this well.

Rio Grande Flood Plain North of the Santa Fe River

Four monitoring wells are in the Rio Grande flood plain or near its eastern margin and also along or to the north of the Santa Fe River. Wells 4-2, 4-4, and 4-5 are directly east of the Cochiti East Side Main Canal along the eastern margin of the Rio Grande flood plain, and well 13-2 is about 0.15 mile west of the canal and in the flood plains of both the Rio Grande and the Santa Fe River (fig. 2).

The hydrographs of water levels in wells have a similar seasonal trend for each year from 1980 through 1982 (figs. 27-29 and 32) and the annual maximum and minimum water levels in these wells characteristically were nearly stable from 1980 through 1982 (figs. 46-49). These data indicate that the ground-water system near these wells was in approximate equilibrium with Cochiti Reservoir when the water level was at or near its recreation pool level. Annual minimum water levels occurred most often in December at well 4-2, in March at wells 4-4 and 4-5, and in December and March at well 13-2 (table 2), prior to or at the beginning of the irrigation season and the beginning of seasonal flow in the Cochiti East Side Main Canal. Annual maximum water levels in these wells occurred most often in May and June at wells 4-2 and 4-4, in August and September at well 4-5, and in May, June, and July at well 13-2, during the irrigation season and flow in the canal.

From 1985 through 1988, the years of generally high and rapidly changing water levels in Cochiti Reservoir, the shape of the hydrographs of water levels in wells 4-2, 4-5, and 13-2 is similar to that of the reservoir, indicating that the effect of the reservoir was greater than that of Cochiti East Side Main Canal (figs. 27, 29, and 32). Except for the annual maximum water level in well 4-5 in 1988, the annual maximum and minimum water levels in these wells and well 4-4 were higher in 1986 through 1988 than in 1980 through 1982 (figs. 46-49). The annual maximum and minimum water levels in all of these wells declined between 1988 and 1989, following the return to lower and more stable water levels in Cochiti Reservoir.

Rio Grande Flood Plain South of the Santa Fe River

Seven monitoring wells are in the Rio Grande flood plain or near its eastern margin and also within about 1 mile of Peña Blanca (fig. 2). Wells 1-1, 2-1, 3-1, and 3-5 are in the Rio Grande flood plain--wells 1-1 and 2-1 are about 0.15 mile west of Cochiti East Side Main Canal, well 3-1 is about 0.4 mile west of the canal, and well 3-5 is about 150 feet west of the canal. Well 2-6 is about 250 feet east of the eastern margin of the flood plain and about 120 feet east of the Cochiti East Side Main Canal. Wells 4-7 and 4-8 are in the upland area about 0.2 mile east of the Rio Grande flood plain.

Water levels in all these wells correspond in part to seasonal flow in the Cochiti East Side Main Canal and in part to water levels in Cochiti Reservoir. Water levels in the four wells in the flood plain also are affected by the Rio Grande and by applied irrigation water.

Water levels in wells 3-1 and 3-5 were used to determine the relative effects of the Cochiti East Side Main Canal and the Rio Grande on ground-water levels in the Rio Grande flood plain. These wells were used because they are about 0.4 mile apart along a line nearly perpendicular to the canal and the Rio Grande (fig. 2). Data collected during calendar years 1980-82 were used because during these years the water level in Cochiti Reservoir fluctuated very little and the Cochiti East Side Main Canal had flow consistently more than 110 ft^3/s during the irrigation season and had no flow during the nonirrigation season.

The distance between the Rio Grande and the Cochiti East Side Main Canal along the line between wells 3-1 and 3-5 is about 0.9 mile (fig. 2). Well 3-1 is about equal distance from the river and canal: about 0.48 mile east of the river and about 0.42 mile west of the canal. Well 3-5 is about 150 feet west of the canal.

The total fluctuation in water levels in Cochiti Reservoir during calendar years 1980-82 was about 2 feet, except for spring 1980, when the total fluctuation was about 14 feet (fig. 5). The effect of this small fluctuation is minimal on ground-water levels 3.5 miles downstream from the reservoir where wells 3-1 and 3-5 are located; water-level fluctuations in these wells are caused by influences other than water levels in Cochiti Reservoir.

With few exceptions, the flow for 1980-82 in Cochiti East Side Main Canal at head, gaging station 08313500, was either zero during the nonirrigation season (from about November 1 to March 1) or between about 110 and 140 ft^3/s during the irrigation season (from about March 1 to November 1). The canal has no flow during the nonirrigation season, and the gage height is at one nearly constant level during the irrigation season.

The expected effect of the Cochiti East Side Main Canal on ground-water levels is a rise in water levels after flow begins in the canal about March 1, and a decline in water levels after flow ceases in the canal about November 1. These effects should vary only slightly from year to year because the volume of flow and the timing of the flow in the canal are similar from year to year. Water-level fluctuations should be similar at wells 3-1 and 3-5, but larger at well 3-5 because of its proximity to the canal--well 3-5 is about 150 feet from the canal; well 3-1 is about 0.42 mile from the canal.

The hydrographs of wells 3-1 and 3-5 for 1980-82 show these characteristics (fig. 50). The fluctuations in ground-water levels correspond very closely in time with the beginning and ending of canal flow in each of the 3 years; water-level fluctuations are similar in both wells, but typically are larger at well 3-5 than at well 3-1.

Streamflow in the Rio Grande below Cochiti Dam, station 08317400, varied substantially during calendar years 1980-82 (fig. 50). In 1981, the maximum daily mean streamflow at this gaging station was about 1,700 ft^3/s; in 1980 and 1982, the maximum daily mean streamflows were about 6,800 and 5,100 ft^3/s, respectively.

During May and June of 1980 and 1982, the monthly mean streamflow averaged about 5,900 and 3,900 ft^3/s, respectively; during May and June of 1981, it was about 700 ft^3/s. The maximum monthly mean flow in any other month was about 2,200 ft^3/s in 1980, about 700 ft^3/s in 1981, and about 1,900 ft^3/s in 1982. A discernible period of peak flow resulting from releases of spring runoff from Cochiti Dam occurred in 1980 and 1982; conversely, no discernible peak flow occurred during 1981.

The expected effects of the flow in the Rio Grande on ground-water levels would be a corresponding peak in May and June 1980 and 1982 and no such peak in 1981. The peak should be larger in 1980 than in 1982. The variation in ground-water levels should be larger at well 3-1, about 0.48 mile east of the Rio Grande, than at well 3-5, about 0.93 mile from the river.

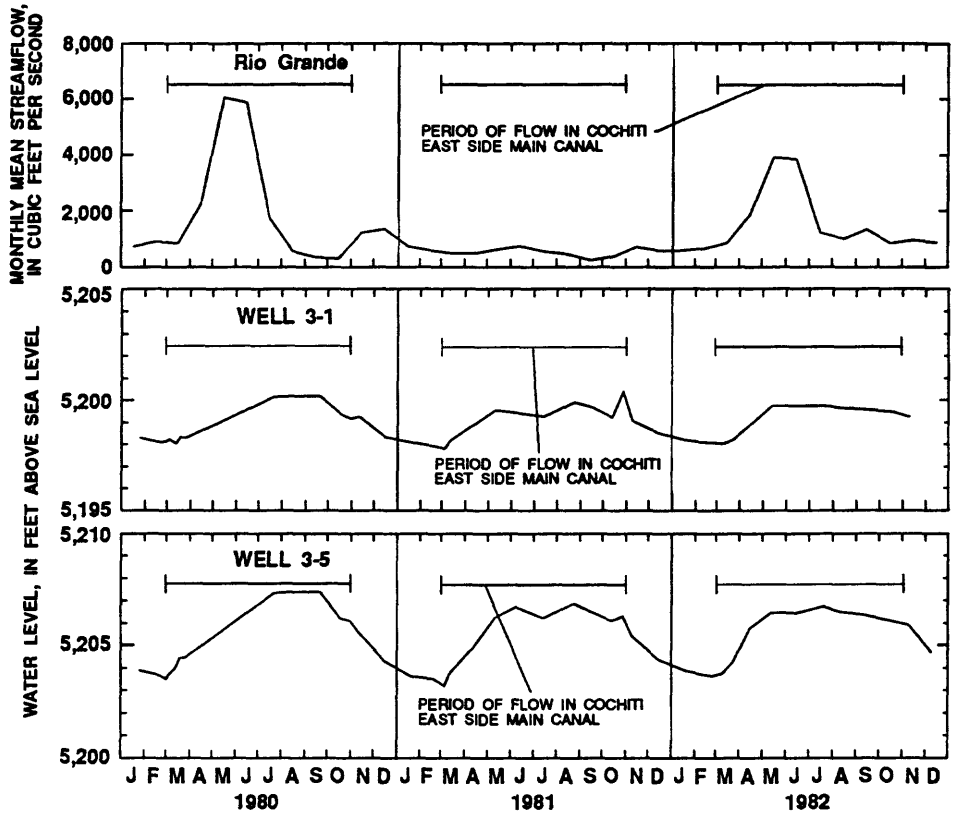


Figure 50.--Monthly mean streamflow in the Rio Grande below Cochiti Dam, gaging station 08317400, and water levels in wells 3-1 and 3-5, 1980-82.

The hydrographs of wells 3-1 and 3-5 for 1980-82 do not show these expected characteristics (fig. 50). No discernible peak in ground-water levels corresponds to peak flow in the Rio Grande in 1980 and 1982, and ground-water levels in 1981 are not substantially different from those in 1980 and 1982. The fluctuations in water levels typically are smaller at well 3-1 than at well 3-5. These observations indicate that the effect of the Rio Grande on water levels at these wells is small compared to that of the Cochiti East Side Main Canal.

The effect of the Cochiti East Side Main Canal on the nearby ground-water system has been altered three times by: (1) lining of a reach of the canal in 1978 (*A* to *B*, fig. 2), (2) lining of an additional reach of the canal in 1985 (*B* to *C*, fig. 2), and (3) installation of drains in the Rio Grande flood plain near well 2-1 in December 1988 (Subhas Shah, Middle Rio Grande Conservancy District, oral commun., 1989). The lining of the canal decreased infiltration of canal water to the surrounding area and reduced recharge to the flood-plain ground-water system. The installation of drains near well 2-1 provided a discharge pathway from the flood-plain ground-water system.

There is a similar annual fluctuation in water levels for each year from 1977 through 1982 at wells 3-1 and 3-5 (figs. 25 and 26), and for each year from 1980 through 1982 at wells 2-1, 2-6, 4-7, and 4-8 (figs. 23, 24, 30, and 31). The annual fluctuation in water levels is similar at well 1-1 in 1980 and 1981, but water levels were higher at this well in 1982 (fig. 22). Through 1982, annual minimum water levels in these wells occurred in February or March, prior to or at the beginning of the irrigation season and the beginning of seasonal flow in the Cochiti East Side Main Canal. Annual maximum water levels in wells 3-1 and 3-5 occurred most often in July or August, and in wells 1-1, 2-1, and 2-6 occurred most often in September or October during the irrigation season and flow in the canal.

Prior to the 1978 irrigation season, a reach of the Cochiti East Side Main Canal was lined with shotcrete (Subhas Shah, Middle Rio Grande Conservancy District, oral commun., 1989) (fig. 2). At well 2-6, which is about 120 feet from the lined reach, the annual water-level fluctuation in 1978 and subsequent years decreases compared with 1977 (fig. 43; table 9). The other wells in the Peña Blanca area more distant from the lined reach of the canal, wells 1-1, 2-1, 3-1, and 3-5, also typically had small declines in annual water-level fluctuations after the canal was lined (figs. 41, 42, 44, and 45; table 9).

The hydrographs of water levels in the wells in this area show trends in water levels from 1985 through 1988 that are different from those from 1977 through 1982 (figs. 22-26). The following generalizations can be made about water levels in these wells. In 1987, the water levels were near the annual maximum for a longer-than-normal time, and this period of near-maximum water levels was followed by a general decline in water levels through the winter of 1988-89. The length of the period of near-maximum water levels in 1987 and the date of the beginning of decline in water levels vary. This prolonged period of high water levels in these wells corresponds well to the prolonged high water levels in Cochiti Reservoir. From May 1987 to January 1988, the water level in Cochiti Reservoir was above 5,400 feet except for about 3 months. The general decline in water levels in these wells corresponds to the decline in water levels in Cochiti Reservoir from January 1988 to May 1988 and the nearly stable water levels in the reservoir from May 1988 through September 1989. A minimum water level in the winter of 1988-89 was followed by a rise in water level in spring 1989 in each of these wells except well 2-6, similar to the pre-1985 seasonal trend. Exceptions to these generalizations and details of the water-level record for each well in the Peña Blanca area are discussed in the following paragraphs.

At well 1-1, the 1986-88 annual maximum water levels were within the range of 1977-82 maximum water levels, but the 1986-88 annual minimum water levels ranged from 1.5 to 2.35 feet higher than the largest 1977-82 annual minimum (fig. 41). In 1988, the maximum water level was in January and the minimum was in December, indicating a general decline in water levels in 1988 during the general decline in water levels in Cochiti Reservoir (fig. 22). In 1989, the minimum water level occurred in February and the maximum occurred in July, which is similar to the pre-1985 seasonal trend.

Well 2-1 was flowing at 5,212.77 feet above sea level from August 1985 through April 1988 (fig. 23). The annual maximum water levels were higher than this altitude from 1985 through 1988, and the annual minimum water levels were higher than this altitude in 1986 and 1987 (fig. 42). This water level is higher than at any time prior to 1985 except in October 1982, ranges from 0.15 to 1.00 foot higher than the annual maximum water levels from 1977 through 1981, and ranges from 1.90 to 3.20 feet higher than the annual minimum water levels from 1978 through 1985 (fig. 42). In May 1988, well 2-1 ceased flowing; for the remainder of 1988, prior to the installation of drains in nearby fields, the altitude of the water level ranged from 5,211.99 to 5,212.70 feet. These data indicate that ground-water levels at well 2-1 were higher during the 1985-88 period of high water levels in Cochiti Reservoir, and declined following the lowering of water levels in the reservoir in 1988. Between December 1988, when drains were installed in nearby fields, and January 1989 the water level declined about 4.5 feet.

At well 2-6, water levels were higher and the annual fluctuation in water level was less in 1986 through 1988 than in 1980 through 1982 (figs. 24 and 43). The 1986-88 annual maximum water levels were 0.26 to 0.74 foot higher than the largest 1978-82 annual maximum, and the annual minimum water levels were 1.33 to 1.87 feet higher than the largest 1978-83 annual minimum. The smaller annual fluctuations may be a result of lining an additional reach of the Cochiti East Side Main Canal in 1985 (between *B* and *C*, fig. 2) (Subhas Shah, Middle Rio Grande

Conservancy District, oral commun., 1989). Between December 1988, when drains were installed in fields near well 2-1, and March 1989 the water level in well 2-6 declined 2.67 feet.

At wells 3-1 and 3-5, the two highest annual maximum and minimum water levels occurred in 1986 and 1987 (figs. 44 and 45). The water levels in well 3-1 generally declined throughout 1988; the maximum water level was in January and the minimum was in December (fig. 25). Water-level fluctuation in 1988 was 0.94 foot. The hydrograph of water levels in well 3-5 shows a seasonal rise in spring 1988 (fig. 26), but the maximum water level in 1988 was 1.77 feet lower than that of 1987 (fig. 45). This seasonal rise is due to the proximity of this well to the Cochiti East Side Main Canal (about 150 feet), and the hydrograph shows that this seasonal effect is superimposed on a generally declining water level.

From January through September 1989, a more characteristic seasonal trend of water levels in wells 3-1 and 3-5 resumed: the minimum water levels were in February, and the maximum water levels were in July (figs. 25 and 26). The 1989 minimum water levels were from 0.70 to 1.25 feet less than those of 1986 and 1987, and the 1989 maximum water levels were from 0.89 to 1.62 feet less than those of 1986 and 1987.

The hydrographs of water levels in wells 4-7 and 4-8, east of the flood plain of the Rio Grande, are similar to those of wells in the flood plain (figs. 30 and 31). The hydrographs of wells 4-7 and 4-8 show generally higher water levels in 1985 through 1988 compared with 1980 through 1982, a long period of near-maximum water levels in 1987 and 1988, and a general decline in water levels until spring 1989.

Effect of Precipitation on Ground-Water Levels

Ground-water levels in the Rio Grande flood plain correspond only occasionally in time to varying annual precipitation. Precipitation directly on the study area could have some minor effect on ground-water levels in the flood plain, but the data indicate that precipitation does not have a substantial effect on these ground-water levels.

The generally higher water levels in the wells in and near the Rio Grande flood plain in 1985 and 1986 correspond in time to the greater-than-average precipitation during these years--5.99 and 7.41 inches more than the 1976-88 average at Cochiti Dam (fig. 4). However, the continued high water levels in 1987 and the generally declining water levels in 1988 in these wells do not correspond in time to the less-than-average precipitation in 1987 and the greater-than-average precipitation in 1988--1.51 inches less and 2.55 inches more than the 1976-88 average at Cochiti Dam.

In 1980 through 1982, precipitation was 6.82, 9.66, and 12.00 inches, respectively, and is roughly one-half, three-fourths, and equal to the 13-year average precipitation of 12.45 inches at Cochiti Dam. During these years of substantial increases in precipitation, water levels rose substantially only in well 1-1 (fig. 22). The annual minimum water level in well 1-1 was about 1 foot higher in 1982 than in 1980, and the annual maximum water level was about 1.7 feet higher in 1982 than in 1980 (fig 41). The water-level fluctuations in this well do correspond in time to changes of precipitation in 1980 through 1982, but do not correspond in time to precipitation in 1987 and 1988.

SUMMARY AND CONCLUSIONS

Ground-water seepage was first observed near the town of Peña Blanca, about 3 miles south-southwest of Cochiti Dam and Cochiti Reservoir, in 1976, shortly after water levels in the reservoir reached the recreation pool level of 5,323 feet. Seepage was still occurring at the initiation of this study in September 1987.

Twelve well pairs were established to determine the vertical component of ground-water flow in the upper 150 feet of the saturated zone. The difference in the completed depths of the wells in each pair typically was about 100 to 125 feet. No substantial upward component of vertical flow was observed at any of the 12 sites. At nine sites, the median downward vertical hydraulic gradient was 0.014 or less. At the other three sites, located in the upland area along or south of the Santa Fe River, the median downward vertical hydraulic gradient was as large as 0.108.

Water levels in monitoring wells throughout the study area indicate that from 1980 through 1982, during nearly stable water levels in Cochiti Reservoir, the ground-water system was in approximate equilibrium with Cochiti Reservoir. Water levels in wells in the upland area were nearly stable throughout this period. Water levels in wells in and close to the Rio Grande flood plain had seasonal fluctuations related to the irrigation season and flow in the Cochiti East Side Main Canal: annual minimum water levels in these wells were in February or March prior to the irrigation season and flow in the canal, and annual maximum water levels were from May to October, during the irrigation season and flow in the canal. At each well except well 1-1, the annual fluctuation in water levels was about the same for these years.

From spring 1985 to spring 1988, water levels in Cochiti Reservoir fluctuated rapidly and were higher than the recreation pool level. The maximum water level in the reservoir during this period was 5,434 feet, 111 feet higher than the recreation pool level. Also during this time, water levels in wells in the upland area rose as much as about 40 feet, and water-level trends in these wells were similar in shape to the water-level trends in Cochiti Reservoir. Water levels in these wells generally declined from late winter or early spring of 1988 through September 1989, during decline and stabilization of water levels at or near the recreation pool level in Cochiti Reservoir, but still were about 2 to 9 feet higher in September 1989 than in May 1985.

Also during spring 1985 to spring 1988, water levels in wells in and close to the Rio Grande flood plain and north of the Santa Fe River rose about 4 to 7 feet, and water levels in wells in and close to the Rio Grande flood plain and south of the Santa Fe River near Peña Blanca rose about 1.4 to 2.8 feet. The water-level trends in these wells during these years also were different than those prior to 1985. From 1985 through 1988, water-level trends in most of the wells north of the Santa Fe River were similar to that in Cochiti Reservoir. In wells near Peña Blanca, water levels were near the annual maximum for a longer-than-normal time in 1987, when the water level in Cochiti Reservoir was above 5,400 feet for 9 months; water levels generally declined through the winter of 1988-89, when the water level in the reservoir declined to less than 5,350 feet. A seasonal trend similar to that prior to 1985 resumed in spring 1989.

High water levels in wells in 1985 and 1986 correspond in time to larger-than-average precipitation during these years; however, high water levels in 1987 and declining water levels in 1988 do not correspond in time to the less-than-average precipitation in 1987 and the greater-than-average precipitation in 1988. Water-level trends also do not correspond in time to precipitation patterns in 1980 through 1982. Precipitation probably has some minor effect on ground-water levels in and near the Rio Grande flood plain, but the data do not indicate a substantial effect on these ground-water levels.

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SUPPLEMENTAL INFORMATION

Table 1.--Drillers' logs of selected wells

[See figure 2 for location of monitoring wells]

Depth (feet below land surface)	Description
Well 4-7	
Log by Byrl Binkley Drilling	
0 - 10	Silt, sandy
10 - 20	Sand, fine- to medium-grained; gravel
20 - 46	Sand, gravel, and cobbles
46 - 55	Sand, fine- to medium-grained
55 - 61	Sand, cobbles, and gravel
61 - 83	Sand with intermittent pockets of gravel
83 - 85	Clay
Well 4-8	
Log by Byrl Binkley Drilling	
0 - 17	Sand, fine- to medium-grained; medium to coarse gravel, some cobbles
17 - 41	Same as above except more cobbles
41 - 66	Sand, minor gravel
66 - 70	Clay, gravel
70 - 72	Gravel, cobbles
72 - 82	Sand, fine to medium gravel
Well 13-2	
Log by Byrl Binkley Drilling	
0 - 2	Silt and very fine grained sand
2 - 7	Sand, poorly sorted, with some silt and clay
7 - 18	Silty sand and gravel
Well 13-4	
Log by Byrl Binkley Drilling	
0 - 12	Sand, coarse-grained; gravel
12 - 18	Clay, sandy
18 - 31	Sand, coarse-grained; gravel
Well 13-8	
Log by Byrl Binkley Drilling	
0 - 5	Silt
5 - 22	Sand with gravel and cobbles
22 - 29	Sand, medium- to coarse-grained
29 - 38	Basalt
38 - 45	Sand, fine- to medium-grained
45 - 60	Basalt; lost all water at 48 feet

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 13-9	
Log by Byrl Binkley Drilling	
0 - 52	Gravel, sandy, silty; some clay
52 - 124	Basalt; no water loss
124 - 126	Sand, fine-grained, some clay
126 - 153	Sand, fine- to medium-grained
153 - 156	Clay, silty
156 - 198	Silt with some clay, occasional gravel
198 - 235	Sandstone
Well 13-10	
Log by Byrl Binkley Drilling	
0 - 31	Silt, sandy
31 - 82	Gravel with some sand
82 - 94	Sand, medium-grained; minor gravel
94 - 148	Sand, fine-grained
148 - 152	Clay
152 - 164	Gravel, small, sandy
164 - 174	Clay, thin sand layer
Well 16-3	
Log by Byrl Binkley Drilling	
0 - 12	Sand, fine-grained; minor silt
12 - 20	Sand, fine-grained; some gravel, minor silt and clay
20 - 22	Gravel, fine to medium; minor sand
Well 18-1	
Log by Byrl Binkley Drilling	
0 - 24	Sand, silty, with occasional gravel and cobbles
24 - 35	Sand and gravel
35 - 54	Gravel with some sand
54 - 60	Clay
60 - 79	Sand and gravel; hole caving

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 18-2	
Log by Byrl Binkley Drilling	
0 - 25	Silt, sandy; minor gravel
25 - 28	Sand, gravelly; gravel
28 - 32	Gravel, fine to medium; minor clay
32 - 42	Clay
42 - 48	Sand, medium- to coarse-grained; clumps of clay
48 - 58	Clay, sandy
58 - 67	Sand and gravel, minor cobbles
67 - 74	Sand, medium- to coarse-grained; clay
74 - 123	Sand, gravel, and cobbles
123 - 146	Gravel, sandy, with thin clay layers
146 - 156	Sandstone, fine-grained
Well 18-4	
Log by Byrl Binkley Drilling	
0 - 5	Silt, sandy; minor clay
5 - 48	Gravel, sandy and clayey, with occasional cobbles
48 - 65	Sand and gravel
65 - 85	Basalt with cobbles and gravel
85 - 91	Sandstone, soft
91 - 99	Clay
99 - 110	Sand
110 - 126	Sand, gravelly, with some basalt and clay
126 - 142	Sandstone, soft, clayey, with occasional pebbles; losing water
142 - 166	Gravel, with occasional sand and clay
166 - 186	Sand, clayey, with very occasional gravel and pebbles
186 - 188	Basalt, clayey
188 - 209	Basalt
209 - 223	Sandstone; minor gravel
223	Bottom of hole

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 19-1	
Log by C.W. Lusby	
0 - 9	Surface sand
9 - 15	Sand
15 - 27	Gravel
27 - 61	Clay
61 - 72	Gravel
72 - 89	Clay
89 - 96	Gravel
96 - 113	Clay
113 - 119	Gravel
119 - 136	Clay
136 - 148	Coarse sand
Well 19-2	
Log by C.W. Lusby	
0 - 3	Surface
3 - 57	Gravel, medium to large
57 - 84	Clay with embedded gravel
84 - 87	Gravel
87 - 98	Clay
98 - 111	Cemented gravel
11 - 222	Clay
222 - 238	Gravel, small
238 - 255	Clay
255 - 274	Sand and gravel
274 - 276	Clay
Well 19-3	
Log by C.W. Lusby	
0 - 6	Surface sand
6 - 17	Gravel
17 - 23	Clay
23 - 61	Gravel
61 - 180	Clay with embedded gravel

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 19-4	
Log by C.W. Lusby	
0 - 11	Surface sand and gravel
11 - 35	Gravel
35 - 77	Clay
77 - 84	Gravel
84 - 112	Clay
112 - 122	Sand
122 - 137	Clay
137 - 145	Gravel
145 - 155	Sand and gravel
Well 19-5	
Log by C.W. Lusby	
0 - 10	Surface sand
10 - 47	Large gravel with pumice
47 - 60	Clay
60 - 73	Gravel
73 - 108	Clay
108 - 177	Sandstone
177 - 187	Clay
187 - 188	Cavity
188 - 200	Clay
Well 19-6	
Log by C.W. Lusby	
0 - 38	Surface clay and caliche
38 - 72	Gravel
72 - 127	Clay
127 - 139	Gravel
139 - 174	Clay
174 - 215	Gravel
215 - 248	Clay
248 - 249	Cavity
249 - 254	Sandstone
254 - 276	Gravel
276 - 280	Clay

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 19-7 Log by C.W. Lusby	
0 - 6	Surface
6 - 26	Mud, gravel
26 - 31	Clay
31 - 47	Sandstone
47 - 75	Clay
75 - 108	Coarse sand
108 - 146	Clay
146 - 153	Gravel
153 - 162	Clay
Well 19-8 Log by C.W. Lusby	
0 - 17	Surface sand
17 - 34	Clay
34 - 47	Gravel
47 - 61	Clay
61 - 75	Gravel, coarse
75 - 77	Clay
77 - 86	Sand and gravel
86 - 98	Clay
98 - 124	Clay, sandy
124 - 146	Sand and gravel
146 - 150	Clay
Well 19-9 Log by C.W. Lusby	
0 - 13	Surface sandy clay
13 - 17	Gravel
17 - 53	Clay
53 - 56	Sand and gravel
56 - 108	Clay
108 - 127	Sand and Gravel
127 - 135	Clay

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 19-10	
Log by C.W. Lusby	
0 - 8	Surface sand
8 - 20	Clay
20 - 42	Sandy clay
42 - 45	Gravel
45 - 53	Clay
53 - 56	Gravel and boulders
56 - 60	Sand and gravel, loose
Well 19-11	
Log by C.W. Lusby	
0 - 20	Surface sand and gravel
20 - 45	Gravel
45 - 50	Clay
50 - 64	Sand and gravel
64 - 75	Clay
75 - 115	Sand and gravel
115 - 135	Clay
135 - 150	Sand and gravel
150 - 160	Clay
160 - 180	Sand and gravel
Well 19-12	
Log by C.W. Lusby	
0 - 8	Surface sand
8 - 19	Gravel and boulders
19 - 37	Clay
37 - 40	Sand
40 - 47	Clay
47 - 60	Sand and gravel

Table 1.--Drillers' logs of selected wells--Continued

Depth (feet below land surface)	Description
Well 19-13	
Log by C.W. Lusby	
0 - 19	Surface gravel
19 - 47	Clay
47 - 65	Gravel with clay
65 - 78	Clay, gray shale
78 - 84	Gravel
84 - 96	Shale, red
96 - 117	Sand with clay streaks
117 - 122	Clay
122 - 130	Gravel
130 - 146	Clay
146 - 149	Gravel
149 - 157	Clay
157 - 170	Sand and gravel
Well 19-14	
Log by C.W. Lusby	
0 - 14	Surface sand
14 - 17	Sand
17 - 28	Gravel
28 - 42	Clay
42 - 115	Clay with embedded gravel and boulders
115 - 162	Clay
162 - 164	Gravel
164 - 173	Sand and gravel
173 - 180	Clay

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89

[See figure 2 for location of monitoring wells; -- indicates no data]

Date	Cochiti Reservoir	Water levels, in feet above sea level									
		Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
09-13-76	5,321.20	5,212.41	--	5,215.58	5,199.42	5,206.44	5,227.38	5,219.80	5,217.12	--	--
09-28-76	5,321.41	5,212.41	--	5,214.58	5,200.62	5,206.94	5,227.58	5,220.50	5,216.92	--	--
10-15-76	5,321.24	5,212.91	5,211.87	5,214.58	5,199.02	5,206.14	5,227.68	5,219.80	5,217.12	--	--
10-22-76	5,321.23	5,212.71	5,211.87	--	5,199.02	5,206.04	5,227.88	5,219.90	5,217.12	--	--
11-05-76	5,321.25	5,212.16	5,211.52	5,214.38	5,198.87	--	5,227.68	5,220.60	5,216.97	--	--
11-12-76	5,321.23	5,211.91	5,211.02	5,213.93	5,198.87	5,204.74	5,227.80	5,220.40	5,217.12	--	--
11-22-76	5,321.25	5,211.31	5,210.57	5,212.98	5,198.72	5,204.14	5,227.28	5,219.80	5,216.12	--	--
12-03-76	5,321.34	5,210.91	5,210.17	5,212.18	5,198.52	5,204.04	--	5,219.00	5,215.32	--	--
12-10-76	5,321.38	5,210.51	5,210.07	5,212.08	5,198.22	5,203.64	5,227.78	5,218.70	5,215.92	--	--
12-20-76	5,321.34	5,210.31	5,209.67	5,211.58	5,198.02	5,203.44	5,227.68	5,218.30	5,215.62	--	--
01-03-77	5,321.30	5,209.91	5,209.47	5,211.28	5,197.92	5,203.14	5,227.18	5,217.90	5,215.32	--	--
01-18-77	5,321.30	5,209.81	5,209.27	5,210.98	5,197.82	5,202.94	--	5,217.40	5,215.12	--	--
01-27-77	5,321.40	5,209.61	5,209.37	5,210.78	5,197.82	5,202.84	5,226.98	5,217.10	5,214.92	--	--
02-10-77	5,321.29	5,209.61	5,209.27	5,210.48	5,197.72	5,202.84	5,226.98	5,217.10	5,214.92	--	--
02-28-77	5,321.14	5,209.31	5,208.87	5,210.58	5,197.62	5,202.74	5,226.98	5,216.80	5,214.72	--	--
03-02-77	5,321.40	5,209.31	5,208.97	5,210.48	5,197.62	5,202.64	5,226.98	5,216.80	5,214.72	--	--
03-04-77	5,321.25	5,209.41	5,208.97	5,210.48	5,197.72	5,202.74	5,227.28	5,216.80	5,214.62	--	--
03-08-77	5,321.26	5,209.61	5,209.17	5,210.58	5,197.72	5,202.84	5,227.58	5,216.70	5,214.92	--	--
03-15-77	5,321.25	5,210.31	5,209.57	5,211.08	5,197.72	5,203.24	5,228.18	5,217.40	5,215.32	--	--
03-22-77	5,321.30	5,210.11	5,209.77	5,211.78	5,197.72	5,203.54	5,228.48	5,218.80	5,215.62	--	--
03-29-77	5,321.14	5,210.31	5,209.87	5,212.28	5,197.82	5,203.94	5,228.78	5,219.40	5,215.92	--	--
04-05-77	5,321.25	5,210.51	5,210.07	5,212.78	5,197.92	5,203.94	5,228.78	5,219.80	5,216.22	--	--
04-12-77	5,321.30	5,210.71	5,210.37	5,213.28	5,198.22	5,204.54	5,229.08	5,220.10	5,216.32	--	--
04-19-77	5,321.17	5,210.91	5,210.37	5,213.78	5,198.42	5,204.74	5,229.28	5,220.50	5,216.62	--	--
05-03-77	5,321.22	5,211.21	5,210.77	5,214.58	5,198.92	5,206.24	5,229.68	5,221.30	5,217.02	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
05-10-77	5,321.28	5,211.51	5,211.17	5,214.88	5,199.42	5,206.84	5,229.98	5,221.90	5,217.32	--	--
05-19-77	5,321.18	5,211.71	5,211.17	5,215.08	5,199.62	5,206.54	5,229.98	5,221.80	5,217.32	--	--
06-01-77	5,321.19	5,213.31	5,211.57	5,215.18	5,199.32	5,206.44	5,229.88	5,222.10	5,217.72	--	--
06-10-77	5,321.29	5,214.01	5,212.07	5,215.28	5,199.82	5,207.14	5,229.88	5,222.20	5,218.62	--	--
06-17-77	5,321.23	5,214.21	5,212.07	5,215.58	5,199.72	5,207.14	5,229.98	5,222.20	5,218.72	--	--
07-13-77	5,321.23	--	5,211.77	5,215.38	5,200.22	5,206.84	5,229.88	5,221.30	5,218.72	--	--
08-10-77	5,321.19	5,213.41	5,211.97	5,214.28	5,200.82	5,206.94	5,229.38	5,221.90	5,218.92	--	--
09-07-77	5,321.26	5,213.21	5,211.87	5,213.98	5,199.02	--	--	5,221.50	5,219.22	--	--
10-05-77	5,321.29	5,213.71	5,212.27	5,215.38	5,199.02	5,207.04	5,229.08	5,219.90	5,218.92	--	--
10-26-77	5,321.22	5,213.31	5,212.27	5,215.18	5,199.22	5,206.64	5,229.48	5,220.40	5,218.92	--	--
11-02-77	5,321.31	5,213.31	5,212.27	5,215.18	5,199.62	5,206.44	5,229.18	5,220.20	5,218.72	--	--
11-17-77	5,321.24	5,212.21	5,211.47	5,213.98	5,199.32	5,205.24	5,228.78	5,219.50	5,217.92	--	--
11-30-77	5,321.29	5,211.71	5,210.97	5,213.28	5,198.82	5,204.74	5,228.38	5,218.70	5,217.32	--	--
12-28-77	5,321.31	5,211.01	5,210.17	5,212.28	5,198.32	5,203.74	5,227.58	5,217.50	5,216.82	--	--
02-06-78	5,321.31	5,211.51	5,209.97	5,211.88	5,198.12	5,203.14	5,227.78	5,217.30	--	--	--
03-01-78	5,321.31	5,210.21	5,209.87	--	5,197.82	5,203.04	5,227.68	5,217.00	5,216.82	--	--
03-08-78	5,321.24	5,210.41	5,209.87	5,210.98	5,198.12	5,203.24	5,227.88	5,216.80	5,216.92	--	--
03-24-78	5,321.19	5,210.11	5,209.57	5,210.88	5,197.92	5,202.94	5,227.88	5,216.60	5,216.72	--	--
03-31-78	5,321.24	5,210.41	5,209.87	5,211.38	5,198.02	5,203.34	5,228.48	5,217.70	5,216.92	--	--
04-13-78	5,321.27	5,210.51	5,210.07	5,211.58	5,198.32	5,204.04	5,229.18	5,219.20	5,217.02	--	--
05-23-78	5,321.72	5,211.91	5,211.12	5,213.13	5,199.77	5,206.54	5,230.38	5,220.60	5,217.77	--	--
06-21-78	5,321.20	5,211.91	5,211.17	5,213.18	5,199.12	5,206.34	5,229.78	5,219.90	5,217.32	--	--
07-17-78	5,326.46	5,211.81	5,210.67	5,212.58	5,199.02	5,206.34	5,229.38	5,219.40	5,217.52	--	--
08-17-78	5,330.36	5,211.71	5,211.07	5,212.48	5,199.22	5,206.54	5,229.18	5,220.10	5,217.32	--	--
09-25-78	5,330.54	5,212.51	5,211.77	5,212.48	5,199.52	5,206.54	5,229.18	5,219.30	5,217.82	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
10-30-78	5,329.91	5,212.36	5,211.67	5,213.38	5,198.82	5,205.54	5,229.68	5,219.70	5,218.02	--	--
11-02-78	5,329.96	5,212.26	5,211.57	5,212.78	5,198.82	5,205.44	5,229.43	5,219.05	5,217.47	--	--
11-09-78	5,329.94	5,212.16	5,211.47	5,212.83	5,198.92	5,205.09	5,229.23	5,218.40	5,217.27	--	--
11-20-78	5,329.99	5,211.56	5,211.17	5,212.48	5,198.92	5,204.74	5,229.18	5,218.00	5,216.92	--	--
12-18-78	5,330.09	5,210.86	5,210.77	5,211.73	5,198.27	5,203.79	5,228.68	5,217.25	5,216.82	--	--
01-22-79	5,329.96	5,210.81	5,210.47	5,211.48	5,198.47	5,203.69	5,228.78	5,217.20	5,217.52	--	--
02-21-79	5,330.04	5,210.51	5,210.07	5,211.18	5,197.92	5,203.24	5,228.98	5,217.20	5,217.52	--	--
03-20-79	5,328.98	5,210.71	5,210.17	5,211.48	5,197.92	5,203.54	5,229.88	5,218.65	5,218.22	--	--
04-24-79	5,329.47	5,211.41	5,210.82	5,212.18	5,199.12	5,205.29	5,230.83	5,220.85	5,219.02	--	--
05-02-79	5,323.07	5,210.91	5,211.02	5,212.33	5,199.32	5,205.39	5,230.83	5,220.85	5,218.72	--	--
05-08-79	5,324.77	5,211.16	5,210.97	5,212.38	5,199.72	5,205.69	5,231.13	5,221.05	5,218.87	--	--
05-14-79	5,323.93	5,211.11	5,210.92	5,212.08	5,199.37	5,205.69	5,230.83	5,220.85	5,218.77	--	--
05-21-79	5,328.15	5,211.56	5,210.97	5,212.53	5,199.67	5,205.69	5,230.83	5,220.85	5,218.92	--	--
05-28-79	5,346.73	5,211.46	5,210.92	5,212.53	5,199.67	5,205.69	5,230.98	5,220.90	5,218.92	--	--
06-04-79	5,363.85	5,211.11	5,210.97	5,212.63	5,199.27	5,205.44	--	5,220.70	5,218.72	--	--
06-12-79	5,379.10	5,210.96	5,210.87	5,212.63	5,199.07	5,205.29	5,231.08	5,220.80	5,218.77	--	--
06-18-79	5,386.73	5,211.71	5,210.87	5,212.38	5,198.72	5,205.19	5,230.83	5,220.40	5,218.27	--	--
06-25-79	5,386.83	5,211.71	5,211.17	5,212.48	5,199.92	5,206.09	5,230.88	5,220.60	5,218.32	--	--
07-02-79	5,384.40	5,211.86	5,211.52	5,212.58	5,200.32	5,206.59	5,231.03	5,220.70	5,218.52	--	--
07-09-79	5,379.51	5,212.06	5,211.67	5,212.78	5,200.27	5,207.09	5,231.43	5,221.20	5,218.87	--	--
07-16-79	5,369.75	5,211.96	5,211.32	5,212.93	5,200.22	5,207.04	5,231.73	5,221.15	5,219.17	--	--
07-23-79	5,351.40	5,211.86	5,211.22	5,212.98	5,200.67	5,207.14	5,232.03	5,221.25	5,219.52	--	--
07-30-79	5,323.35	5,211.86	5,211.27	5,212.63	5,199.87	5,206.19	5,231.83	5,220.85	5,219.62	--	--
08-06-79	5,321.39	5,211.61	5,210.77	5,212.63	5,199.57	5,206.19	5,231.68	5,220.50	5,219.57	--	--
08-13-79	5,321.60	5,212.56	5,210.67	5,212.28	5,199.52	5,206.34	5,231.38	5,220.70	5,219.12	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
08-20-79	5,321.60	5,213.21	--	5,212.78	5,199.62	5,206.29	5,231.28	5,220.10	5,219.27	--	--
08-27-79	5,321.00	5,212.81	5,212.02	5,212.93	5,199.17	5,206.04	5,231.68	5,220.20	5,219.42	--	--
09-21-79	5,321.60	5,213.96	5,212.52	5,213.28	5,199.82	5,206.74	5,231.58	5,220.20	5,219.52	--	--
10-22-79	5,321.49	5,214.06	5,212.62	5,213.68	5,199.62	5,206.49	5,231.48	5,219.85	5,219.62	--	--
10-31-79	5,321.52	5,213.66	5,212.62	5,213.58	5,199.57	5,206.64	5,231.48	5,220.00	5,219.82	--	--
12-10-79	5,321.68	5,211.71	5,211.77	5,213.63	5,198.72	5,204.54	5,230.63	5,219.70	--	--	--
01-25-80	5,321.43	5,211.06	5,211.19	5,213.13	5,198.30	5,203.92	5,230.30	5,219.34	5,220.02	--	--
02-21-80	5,321.65	5,210.71	5,210.92	5,212.81	5,198.09	5,203.67	5,230.13	5,218.93	5,219.30	--	--
03-01-80	5,321.57	5,210.38	5,210.62	5,212.73	5,198.15	5,203.51	5,230.07	5,218.85	5,219.10	--	--
03-04-80	5,321.51	5,210.71	5,210.70	5,212.78	5,198.22	5,203.71	5,230.25	5,218.99	5,219.21	--	--
03-13-80	5,321.55	5,210.63	5,210.63	5,212.83	5,198.04	5,203.99	5,230.77	5,219.93	5,219.53	--	--
03-19-80	5,321.59	5,211.06	5,210.87	5,212.88	5,198.32	5,204.44	5,230.86	5,220.25	5,219.77	--	--
03-26-80	5,321.60	5,211.05	5,211.34	5,213.24	5,198.29	5,204.46	5,230.85	5,220.60	5,219.92	--	--
04-30-80	5,327.78	--	--	--	--	--	--	--	--	--	--
05-31-80	5,335.33	--	--	--	--	--	--	--	--	--	--
06-30-80	5,322.13	--	--	--	--	--	--	--	--	--	--
07-22-80	5,321.55	5,212.23	5,211.97	5,214.13	5,200.16	5,207.33	5,231.08	5,221.82	5,221.34	5,219.07	5,215.98
08-19-80	5,321.40	5,212.46	5,212.07	5,214.28	5,200.17	5,207.39	5,231.23	5,221.00	5,220.85	5,218.63	5,216.09
09-21-80	5,321.48	5,212.56	5,211.99	5,214.33	5,200.17	5,207.38	5,230.46	5,220.55	5,220.57	--	--
10-18-80	5,321.45	5,212.61	5,212.29	5,214.39	5,199.37	5,206.21	5,230.40	5,220.26	5,220.12	5,218.39	5,216.08
10-31-80	5,321.38	5,212.77	5,212.53	5,214.41	5,199.16	5,206.10	5,230.50	5,220.24	5,220.20	5,218.30	5,215.96
11-11-80	5,321.74	5,212.21	5,212.07	5,214.36	5,199.27	5,205.59	5,230.32	5,219.76	5,220.06	5,218.20	5,215.88
12-16-80	5,321.81	5,210.96	5,211.26	5,213.17	5,198.34	5,204.29	5,229.78	5,218.98	5,219.77	5,217.68	5,215.37
01-20-81	5,321.49	5,210.71	5,210.83	5,212.78	5,198.09	5,203.63	5,229.68	5,218.97	5,219.80	5,217.34	5,215.05
02-19-81	5,322.05	5,210.49	5,210.55	5,212.54	5,197.92	5,203.51	5,229.50	5,218.80	5,219.66	5,216.96	5,214.78

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
03-05-81	5,321.46	5,211.08	5,210.52	5,212.24	5,197.80	5,203.20	--	--	--	5,216.82	5,214.62
03-06-81	--	--	--	--	--	--	--	--	--	--	--
03-07-81	5,321.56	--	--	--	--	--	5,229.93	5,219.14	5,219.49	--	--
03-11-81	--	--	--	--	--	--	--	--	5,216.81	5,214.55	--
03-12-81	5,323.30	5,211.36	5,210.89	5,212.45	5,198.16	5,203.75	5,230.12	5,219.60	5,219.68	--	--
04-10-81	5,321.59	5,212.02	5,211.53	5,213.51	5,198.84	5,204.81	--	5,220.71	5,220.48	5,217.43	5,215.16
05-11-81	5,321.23	5,213.18	5,212.08	5,214.29	5,199.55	5,206.23	--	5,221.86	5,221.27	5,217.91	5,215.58
06-08-81	5,321.39	5,213.28	5,212.18	5,214.71	5,199.43	5,206.72	5,230.68	5,222.11	5,221.58	5,218.59	5,216.09
07-14-81	5,321.78	5,212.41	5,211.77	5,214.20	5,199.26	5,206.21	5,229.95	5,221.21	5,221.14	5,218.54	5,215.87
08-24-81	5,321.65	5,213.01	5,211.97	5,214.24	5,199.91	5,206.87	5,229.73	5,221.54	5,220.92	5,218.73	5,216.11
09-15-81	5,321.60	5,213.00	5,212.19	5,214.42	5,199.70	5,206.52	5,229.75	5,220.55	5,220.42	5,218.67	5,216.14
10-13-81	5,321.43	5,213.42	5,212.49	5,214.49	5,199.22	5,206.09	5,229.92	5,220.68	5,220.41	5,218.85	5,216.30
10-28-81	5,321.67	5,212.98	5,212.40	5,214.43	5,200.38	5,206.29	5,229.94	5,220.30	5,220.30	5,218.67	5,216.25
11-09-81	5,321.63	5,212.55	5,212.01	5,214.18	5,199.06	5,205.41	5,229.38	5,219.75	5,219.99	5,218.48	5,216.03
12-15-81	5,321.48	5,211.85	5,211.37	5,213.38	5,198.50	5,204.36	5,229.23	5,218.97	5,219.62	5,217.93	5,215.56
01-19-82	5,321.49	5,211.51	5,211.07	5,212.97	5,198.19	5,203.88	5,229.14	5,218.83	--	5,217.57	5,215.26
02-12-82	5,321.37	5,211.43	5,210.97	5,212.78	5,198.09	5,203.70	5,229.19	5,218.82	5,219.58	5,217.20	5,215.06
02-25-82	5,321.46	5,211.31	5,210.74	5,212.69	5,198.07	5,203.64	5,229.26	5,218.70	5,219.08	5,217.13	5,214.90
03-10-82	5,321.40	5,211.34	5,210.80	5,212.70	5,198.02	5,203.75	5,229.79	5,218.34	5,219.19	5,217.11	5,214.84
03-24-82	5,321.39	5,211.58	5,211.01	5,212.77	5,198.23	5,204.26	5,230.23	5,220.33	5,219.60	5,216.96	5,214.90
04-15-82	5,321.37	5,212.12	5,211.37	5,213.54	--	5,205.77	5,230.57	5,220.92	5,219.84	5,217.11	5,215.06
05-13-82	5,322.68	5,212.44	5,211.71	5,214.06	5,199.74	5,206.45	5,230.94	5,221.08	5,220.35	5,217.45	5,215.39
06-15-82	5,321.62	5,213.11	5,211.81	5,214.14	--	5,206.44	5,230.85	5,221.78	5,221.22	5,217.94	5,215.66
07-20-82	5,322.78	5,214.48	5,212.23	5,213.96	5,199.75	5,206.74	5,230.09	5,221.69	5,221.42	5,218.30	5,215.84
08-11-82	5,322.97	5,213.38	5,212.07	5,214.06	5,199.65	5,206.49	5,229.74	5,221.05	5,223.09	5,218.50	5,216.00

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
09-09-82	5,323.03	5,213.40	5,212.15	5,214.20	5,199.59	5,206.37	5,229.73	5,220.77	5,222.80	5,218.42	5,216.02
10-19-82	5,322.80	5,214.50	5,212.77	5,214.33	5,199.46	5,206.08	5,229.99	5,220.58	5,220.72	5,218.60	5,216.37
11-09-82	5,322.74	5,214.26	5,212.67	5,214.58	5,199.26	5,205.92	5,229.86	5,220.11	5,220.87	5,219.03	5,216.80
12-09-82	5,322.81	--	5,211.86	5,213.76	--	5,204.68	--	--	--	5,218.13	5,215.83
01-12-83	5,323.53	--	5,211.33	5,213.21	5,198.32	5,204.16	5,229.16	--	--	5,217.55	5,215.33
02-15-83	5,323.41	--	5,211.26	5,212.93	5,198.31	5,203.89	5,229.17	--	--	5,217.24	5,215.04
03-15-83	5,323.52	--	5,210.87	5,212.68	--	5,203.87	--	--	--	5,216.79	5,214.82
05-26-83	5,325.18	--	--	--	--	--	5,230.78	--	--	--	--
05-31-83	5,339.04	--	--	--	--	--	--	--	--	--	--
06-30-83	5,329.53	--	--	--	--	--	--	--	--	--	--
07-31-83	5,326.59	--	--	--	--	-	--	--	--	--	--
08-31-83	5,326.54	--	--	--	--	--	--	--	--	--	--
09-30-83	5,326.40	--	--	--	--	--	--	--	--	--	--
10-31-83	5,326.22	--	--	--	--	--	--	--	--	--	--
11-30-83	5,326.45	--	--	--	--	--	--	--	--	--	--
12-31-83	5,326.85	--	--	--	--	--	--	--	--	--	--
01-31-84	5,326.39	--	--	--	--	--	--	--	--	--	--
02-29-84	5,326.32	--	--	--	--	--	--	--	--	--	--
03-31-84	5,326.15	--	--	--	--	--	--	--	--	--	--
04-30-84	5,326.97	--	--	--	--	--	--	--	--	--	--
05-31-84	5,346.90	--	--	--	--	--	--	--	--	--	--
06-30-84	5,326.67	--	--	--	--	--	--	--	--	--	--
07-31-84	5,328.01	--	--	--	--	--	--	--	--	--	--
08-31-84	5,327.88	--	--	--	--	--	--	--	--	--	--
09-30-84	5,327.63	--	--	--	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
10-31-84	5,327.48	--	--	--	--	--	--	--	--	--	--
11-30-84	5,327.51	--	--	--	--	--	--	--	--	--	--
12-31-84	5,327.55	--	--	--	--	--	--	--	--	--	--
01-31-85	5,330.55	--	--	--	--	--	--	--	--	--	--
02-28-85	5,327.46	--	--	--	--	--	--	--	--	--	--
03-31-85	5,342.17	--	--	--	--	--	--	--	--	--	--
04-30-85	5,349.95	--	--	--	--	--	--	--	--	--	--
05-29-85	5,392.96	--	--	--	--	--	--	--	--	--	--
05-30-85	5,393.65	--	--	--	--	5,205.97	--	5,222.10	5,222.76	--	--
06-05-85	5,397.07	--	--	--	--	--	--	5,222.17	5,223.15	--	5,215.57
06-06-85	5,397.11	5,211.75	--	--	5,199.72	5,205.87	--	--	--	--	--
06-12-85	5,399.14	--	--	--	--	--	--	5,222.29	5,224.04	5,218.08	5,215.68
06-13-85	5,400.70	5,212.63	--	--	5,200.35	5,206.85	--	--	--	--	--
06-19-85	5,409.20	5,211.31	--	--	5,200.60	5,207.46	--	5,222.50	--	5,218.32	5,215.69
06-20-85	5,410.10	--	--	--	--	--	--	--	--	--	--
06-26-85	5,412.98	5,212.58	--	--	5,200.57	--	--	5,223.01	5,225.54	5,218.49	5,215.88
07-02-85	5,412.66	5,210.99	--	--	5,200.87	5,207.50	--	5,223.00	5,226.20	--	5,215.93
07-10-85	5,402.90	5,213.76	5,211.89	--	5,200.74	5,207.68	--	5,223.63	--	5,219.09	5,215.88
07-11-85	5,401.59	--	--	--	--	--	--	--	5,229.01	--	--
07-22-85	5,388.50	5,212.20	5,212.19	5,213.59	--	--	--	--	--	--	--
07-23-85	5,388.05	--	--	--	5,200.00	5,207.34	--	5,224.32	5,228.78	--	5,216.23
07-24-85	5,388.02	--	-	--	-	--	-	--	--	5,219.46	--
08-05-85	5,388.03	5,211.51	5,212.52	5,214.38	5,200.39	5,207.49	--	--	--	--	--
08-06-85	5,387.97	--	--	--	--	--	--	5,224.60	5,229.02	--	5,216.43
08-07-85	5,387.86	--	--	--	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
08-20-85	5,387.77	5,213.06	5,212.77	5,214.03	5,199.70	5,207.27	--	5,224.77	5,229.51	5,220.46	5,216.80
09-04-85	5,387.40	5,212.36	5,212.77	5,214.21	5,200.04	5,207.60	--	5,225.02	5,229.92	5,220.85	5,217.00
09-05-85	5,387.48	--	--	--	--	--	--	--	--	--	--
09-16-85	5,387.43	5,212.56	5,212.77	5,214.28	5,200.42	5,207.86	--	5,225.10	5,230.22	5,221.16	5,217.20
10-01-85	5,387.34	5,212.41	5,212.77	5,214.50	5,199.87	5,207.19	--	5,224.90	5,229.50	5,221.24	5,217.40
10-15-85	5,387.72	5,212.32	5,212.77	5,214.64	5,200.09	5,206.89	--	5,224.62	5,228.53	5,219.03	5,217.54
12-24-85	5,400.90	5,213.14	5,212.42	5,214.19	5,198.77	5,204.99	5,232.30	5,222.37	5,224.69	5,218.98	5,217.01
03-06-86	5,365.65	--	--	5,214.06	5,199.22	5,205.29	5,236.33	5,222.20	5,222.88	5,219.37	5,216.73
05-01-86	5,375.00	5,213.66	5,212.77	5,214.56	5,200.60	5,207.10	5,234.35	5,223.01	5,224.11	5,219.98	5,217.09
06-24-86	5,415.12	5,214.10	5,212.77	5,214.59	5,200.89	5,207.91	5,234.71	5,223.29	5,225.92	5,220.45	5,217.44
07-09-86	5,416.40	5,213.93	5,212.77	5,214.54	5,200.67	5,207.55	--	5,223.50	5,226.39	5,220.65	5,217.55
07-23-86	5,413.81	--	--	5,214.73	5,199.89	5,206.72	5,235.12	5,223.65	5,227.12	5,220.81	5,217.62
08-06-86	5,401.50	5,214.29	5,212.77	5,214.73	--	--	5,235.25	5,223.87	5,227.81	5,221.14	5,217.74
09-17-86	5,332.86	--	5,212.77	5,214.97	5,200.10	5,206.91	5,235.30	5,224.72	5,226.83	5,221.75	5,218.15
11-25-86	5,336.70	--	5,212.77	5,214.89	5,199.77	5,205.98	5,233.39	5,222.77	5,224.50	5,221.08	5,218.01
01-08-87	5,330.70	--	5,212.77	5,214.56	5,199.28	5,205.33	5,232.92	5,221.64	5,222.88	5,220.26	5,217.53
03-26-87	5,352.38	--	5,212.77	5,214.17	5,198.96	5,204.84	5,233.12	5,220.96	5,221.94	5,219.25	5,216.92
05-11-87	5,417.05	--	5,212.77	5,214.45	5,199.83	5,206.65	5,234.09	5,222.02	5,223.09	5,219.74	5,217.16
05-18-87	5,423.21	--	--	5,214.43	5,200.08	5,207.15	5,234.28	5,222.01	5,223.28	5,219.79	5,217.20
05-26-87	5,431.26	--	5,212.77	5,214.52	5,200.34	5,206.95	5,234.62	5,222.23	5,223.75	--	--
06-01-87	5,430.79	--	5,212.77	5,214.45	5,201.10	5,207.84	5,234.71	5,223.32	5,225.09	5,220.89	5,218.22
06-08-87	5,426.17	--	5,212.77	5,214.98	5,200.94	5,207.81	5,234.78	5,222.91	5,225.32	5,220.47	5,217.74
06-15-87	5,430.40	--	5,212.77	5,215.01	5,200.66	5,207.61	5,234.86	5,223.00	5,225.81	5,220.68	5,217.88
06-22-87	5,434.18	5,213.56	5,212.77	5,214.98	5,201.06	5,208.23	5,234.92	5,223.17	5,226.28	5,220.73	5,217.92
06-29-87	5,433.33	5,213.96	5,212.77	5,214.96	5,201.32	5,208.29	5,235.51	5,223.49	5,226.91	5,220.98	5,217.87

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
07-06-87	5,426.98	5,213.68	5,212.77	5,215.01	5,201.16	5,207.94	5,235.20	5,223.65	5,227.28	5,221.19	5,218.03
07-13-87	5,416.86	5,213.76	5,212.77	5,214.97	5,201.20	5,208.32	5,235.39	5,223.93	5,227.44	5,221.26	5,217.95
07-20-87	5,404.01	5,214.12	5,212.77	5,214.96	5,200.76	5,207.94	5,235.46	5,224.00	5,227.44	5,221.55	5,218.09
07-27-87	5,391.87	5,213.91	--	5,215.06	5,200.54	5,207.74	5,235.46	5,224.10	5,227.54	5,221.72	5,218.21
08-03-87	5,382.70	5,213.96	5,212.77	5,214.99	5,200.48	5,207.70	5,235.47	5,224.28	5,227.65	5,221.88	5,218.27
08-12-87	5,379.85	5,214.35	5,212.77	5,215.05	5,201.45	5,207.91	5,235.29	5,224.14	5,227.47	5,222.13	5,218.31
08-17-87	5,382.38	5,214.13	5,212.77	5,205.09	5,200.67	5,207.55	5,235.33	5,224.12	5,227.20	5,222.19	5,218.37
09-02-87	5,388.54	5,214.40	5,212.77	5,215.30	5,200.45	5,207.47	5,235.38	5,223.90	5,226.79	5,222.25	5,218.51
09-14-87	5,392.77	5,213.84	5,212.77	5,215.32	5,200.81	5,207.26	5,235.35	5,223.55	5,226.40	5,222.16	5,218.64
09-28-87	5,397.28	5,214.36	5,212.77	5,215.34	5,200.97	5,207.94	5,235.48	5,223.33	5,226.07	5,222.03	5,218.66
10-12-87	5,401.78	5,214.40	5,212.77	5,215.35	5,201.34	5,207.82	5,235.42	5,223.10	5,225.86	5,222.08	5,218.67
10-13-87	5,402.08	5,213.93	5,212.77	5,214.97	5,201.62	5,207.33	5,235.51	5,222.74	5,225.62	5,221.89	5,218.44
10-26-87	5,405.69	5,214.40	5,212.77	5,215.45	5,200.72	5,207.71	5,235.44	--	5,225.93	5,222.26	5,218.99
11-09-87	5,411.83	5,214.06	5,212.77	5,215.09	5,199.94	5,206.62	5,234.68	5,222.54	5,225.49	5,221.92	5,218.52
12-09-87	5,410.08	5,213.92	5,212.77	5,214.96	5,199.54	5,205.88	5,234.44	5,222.58	5,226.00	5,221.97	5,218.48
12-22-87	5,408.10	5,214.01	5,212.77	5,214.94	5,199.51	5,205.78	5,234.54	5,222.68	5,226.36	5,221.82	5,218.36
01-08-88	5,405.46	5,214.11	5,212.77	5,215.02	5,199.49	5,205.71	5,234.58	5,222.84	5,226.00	5,222.09	5,218.60
02-09-88	5,396.21	5,213.97	5,212.77	5,214.99	5,199.42	5,205.65	5,234.60	5,222.76	5,225.47	5,221.84	5,218.53
03-03-88	5,385.71	5,213.90	5,212.77	5,214.93	5,199.35	5,205.60	5,234.75	5,222.75	5,225.38	5,221.78	5,218.46
04-08-88	5,360.37	5,213.93	5,212.77	5,214.97	5,199.30	5,205.69	5,234.78	5,222.79	5,225.43	5,221.86	5,218.57
05-09-88	5,349.95	5,213.83	5,212.53	5,215.20	5,199.49	5,206.55	5,235.59	5,224.01	5,226.71	5,222.45	5,218.76
06-09-88	5,331.65	5,213.59	5,212.24	5,215.08	5,199.44	5,205.55	5,235.46	5,223.87	5,226.59	5,222.41	5,218.76
07-12-88	5,330.87	5,213.29	5,212.25	5,214.94	5,199.43	5,206.29	5,235.44	5,223.36	5,226.06	5,222.37	5,218.64
08-09-88	5,331.30	5,213.02	5,212.28	5,214.82	5,198.95	5,206.27	5,234.80	5,222.81	5,225.58	5,222.06	5,218.46
09-13-88	5,333.42	5,213.42	5,212.70	5,214.75	5,199.18	5,206.46	--	5,222.79	5,225.43	5,221.95	5,218.39

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level									
		Well 1-1	Well 2-1	Well 2-6	Well 3-1	Well 3-5	Well 4-2	Well 4-4	Well 4-5	Well 4-7	Well 4-8
10-13-88	5,332.03	5,213.72	5,212.25	5,214.84	5,198.88	5,205.55	5,234.27	5,222.28	5,224.77	5,221.69	5,218.34
11-09-88	5,338.31	5,213.21	5,212.00	5,214.77	5,198.67	5,205.09	5,233.60	5,221.90	5,224.38	5,221.49	5,217.85
12-09-88	5,332.69	5,212.81	5,211.99	5,215.60	5,198.55	5,204.74	5,233.20	5,221.49	5,223.29	5,220.92	5,217.91
01-20-89	5,332.82	5,211.93	5,207.57	5,214.25	5,198.32	5,204.42	5,233.16	5,220.69	5,221.88	5,220.17	5,217.30
02-09-89	5,332.97	5,211.62	5,207.54	5,213.44	5,198.26	5,204.04	5,233.19	5,219.96	5,221.65	5,219.59	5,216.85
03-09-89	5,332.23	5,212.03	5,207.45	5,212.93	5,198.44	5,204.58	5,233.24	5,221.01	5,222.06	5,219.31	5,216.50
04-07-89	5,336.06	5,211.77	5,207.58	5,212.94	5,198.82	5,205.28	5,233.40	5,222.36	5,223.01	5,219.62	5,216.50
05-09-89	5,331.93	5,212.66	5,207.68	5,213.19	5,199.82	5,206.12	5,233.33	5,222.82	5,224.03	5,220.27	5,216.83
06-12-89	5,332.00	5,212.11	5,207.63	5,213.02	5,199.42	5,206.24	5,232.99	5,222.44	5,224.04	5,220.44	5,216.89
07-10-89	5,330.31	5,213.43	5,207.76	5,212.92	5,200.00	5,206.84	5,232.89	5,222.64	5,224.38	5,220.41	5,216.95
08-10-89	5,332.68	5,212.06	5,207.54	5,213.08	5,199.32	5,205.96	5,232.54	5,222.14	5,224.00	5,220.36	5,216.87
09-11-89	5,331.62	5,212.47	5,207.65	5,213.12	5,199.42	5,206.24	5,232.91	5,222.14	5,224.08	5,220.46	5,216.99

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
06-01-77	5,321.19	--	5,224.90	--	--	--	--	--	--	--
06-10-77	5,321.29	5,217.63	5,224.90	--	--	--	--	--	--	--
06-17-77	5,321.23	5,217.53	5,224.80	--	--	--	--	--	--	--
07-13-77	5,321.23	5,217.53	5,224.40	--	--	--	--	--	--	--
08-10-77	5,321.19	5,217.53	5,224.80	--	--	--	--	--	--	--
09-07-77	5,321.26	5,217.43	5,225.60	--	--	--	--	--	--	--
10-05-77	5,321.29	5,217.63	5,224.40	--	--	--	--	--	--	--
10-26-77	5,321.22	5,217.63	5,224.80	--	--	--	--	--	--	--
11-02-77	5,321.31	5,217.53	5,224.50	--	--	--	--	--	--	--
11-17-77	5,321.24	5,216.73	5,225.50	--	--	--	--	--	--	--
11-30-77	5,321.29	5,216.23	5,228.00	--	--	--	--	--	--	--
12-28-77	5,321.31	5,215.73	5,229.50	--	--	--	--	--	--	--
02-06-78	5,321.31	5,215.93	5,228.60	--	--	--	--	--	--	--
03-01-78	5,321.31	5,216.03	5,228.10	--	--	--	--	--	--	--
03-08-78	5,321.24	5,215.83	5,228.10	--	--	--	--	--	--	--
03-24-78	5,321.19	5,215.43	5,228.00	--	--	--	--	--	--	--
03-31-78	5,321.24	5,215.43	5,227.70	--	--	--	--	--	--	--
04-13-78	5,321.27	5,215.63	5,227.50	--	--	--	--	--	--	--
05-23-78	5,321.72	5,216.98	5,227.10	--	--	--	--	--	--	--
06-21-78	5,321.20	5,216.93	5,227.00	--	--	--	--	--	--	--
07-17-78	5,326.46	5,216.53	5,226.60	--	--	--	--	--	--	--
08-17-78	5,330.36	5,216.43	5,226.50	--	--	--	--	--	--	--
09-25-78	5,330.54	5,216.93	5,226.80	--	--	--	--	--	--	--
10-30-78	5,329.91	5,216.53	5,227.10	--	--	--	--	--	--	--
11-02-78	5,329.96	5,216.53	5,226.90	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
11-09-78	5,329.94	5,216.58	5,227.60	--	--	--	--	--	--	--
11-20-78	5,329.99	5,216.33	5,228.30	--	--	--	--	--	--	--
12-18-78	5,330.09	5,215.73	5,227.50	--	--	--	--	--	--	--
01-22-79	5,329.96	5,216.43	5,229.80	--	--	--	--	--	--	--
02-21-79	5,330.04	5,216.53	5,229.45	--	--	--	--	--	--	--
03-20-79	5,328.98	5,217.43	5,228.40	--	--	--	--	--	--	--
04-24-79	5,329.47	5,218.13	5,227.45	--	--	--	--	--	--	--
05-02-79	5,323.07	5,217.83	5,227.50	--	--	--	--	--	--	--
05-08-79	5,324.77	5,217.78	5,227.55	--	--	--	--	--	--	--
05-14-79	5,323.93	5,217.73	5,227.50	--	--	--	--	--	--	--
05-21-79	5,328.15	5,217.63	5,227.35	--	--	--	--	--	--	--
05-28-79	5,346.73	5,217.63	5,227.45	--	--	--	--	--	--	--
06-04-79	5,363.85	5,217.53	5,227.30	--	--	--	--	--	--	--
06-12-79	5,379.10	5,217.53	5,227.25	--	--	--	--	--	--	--
06-18-79	5,386.73	5,217.73	5,230.05	--	--	--	--	--	--	--
06-25-79	5,386.83	--	5,230.90	--	--	--	--	--	--	--
07-02-79	5,384.40	5,217.78	5,231.90	--	--	--	--	--	--	--
07-09-79	5,379.51	5,218.78	5,232.75	--	--	--	--	--	--	--
07-16-79	5,369.75	5,218.58	5,233.40	--	--	--	--	--	--	--
07-23-79	5,351.40	5,218.68	5,233.75	--	--	--	--	--	--	--
07-30-79	5,323.35	5,218.38	5,234.40	--	--	--	--	--	--	--
08-06-79	5,321.39	5,218.13	5,233.70	--	--	--	--	--	--	--
08-13-79	5,321.60	5,217.23	--	--	--	--	--	--	--	--
08-20-79	5,321.60	5,217.13	5,234.40	--	--	--	--	--	--	--
08-27-79	5,321.00	5,217.13	5,233.30	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
09-21-79	5,321.60	5,216.83	5,232.70	--	--	--	--	--	--	--
10-22-79	5,321.49	5,217.03	5,232.30	--	--	--	--	--	--	--
10-31-79	5,321.52	5,217.13	5,232.20	--	--	--	--	--	--	--
12-10-79	5,321.68	5,219.98	5,230.72	--	--	--	--	--	--	--
01-25-80	5,321.43	5,218.38	5,228.98	--	--	--	--	--	--	--
02-21-80	5,321.65	5,217.87	5,228.20	--	--	--	--	--	--	--
03-01-80	5,321.57	5,217.68	5,228.20	--	--	--	--	--	--	--
03-04-80	5,321.51	--	--	--	--	--	--	--	--	--
03-13-80	5,321.55	5,217.88	5,228.55	--	--	--	--	--	--	--
03-19-80	5,321.59	--	--	--	--	--	--	--	--	--
03-26-80	5,321.60	5,217.93	5,229.40	--	--	--	--	--	--	--
04-30-80	5,327.78	--	--	--	--	--	--	--	--	--
05-31-80	5,335.33	--	--	--	--	--	--	--	--	--
06-30-80	5,322.13	--	--	--	--	--	--	--	--	--
07-22-80	5,321.55	5,219.05	5,231.70	5,237.53	--	--	--	--	--	--
08-19-80	5,321.40	5,218.23	5,231.85	5,237.94	5,318.18	--	5,232.91	5,230.42	5,237.10	5,321.77
09-21-80	5,321.48	5,217.77	5,231.89	5,238.09	--	--	--	--	--	--
10-18-80	5,321.45	5,217.48	5,231.96	5,237.51	5,317.86	5,237.48	5,233.18	5,229.94	5,236.97	5,320.98
10-31-80	5,321.38	5,217.63	5,232.08	5,237.30	5,317.81	5,237.08	5,232.99	5,230.08	5,236.76	5,320.62
11-11-80	5,321.74	5,217.45	5,232.06	5,237.34	5,317.79	5,237.46	5,233.16	5,230.20	5,236.73	5,320.64
12-16-80	5,321.81	5,217.26	5,232.83	5,236.64	5,317.87	5,237.34	5,232.95	5,229.78	5,236.43	5,320.34
01-20-81	5,321.49	5,218.47	5,228.77	5,236.40	5,318.24	5,237.38	5,232.60	5,228.44	5,236.31	5,320.14
02-19-81	5,322.05	5,218.34	5,228.08	5,236.29	5,318.30	5,237.38	5,232.67	5,227.72	5,236.25	5,320.30
03-05-81	5,321.46	--	5,228.11	5,236.32	5,318.41	5,237.58	5,232.43	5,227.61	5,236.30	5,320.38
03-06-81	--	5,217.86	--	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
		Water levels, in feet above sea level								
03-07-81	5,321.56	--	--	--	--	--	--	--	--	--
03-11-81	--	--	5,228.14	5,236.30	5,318.42	5,237.31	5,232.34	5,227.54	5,236.11	5,320.26
03-12-81	5,323.30	5,217.81	--	--	--	--	--	--	--	--
04-10-81	5,321.59	5,218.13	5,229.90	5,236.65	5,318.63	5,238.50	5,232.18	5,227.65	5,236.17	5,320.45
05-11-81	5,321.23	5,218.66	5,229.82	5,236.84	5,318.58	5,238.06	5,232.01	5,227.97	5,236.13	5,320.51
06-08-81	5,321.39	5,218.46	5,229.75	5,237.18	5,318.50	5,237.59	5,231.86	5,228.30	5,236.12	5,320.25
07-14-81	5,321.78	5,217.94	5,231.70	5,237.39	5,318.29	5,237.39	5,231.86	5,228.85	5,236.11	5,319.96
08-24-81	5,321.65	5,218.26	5,234.60	5,237.43	5,318.14	5,237.40	5,232.12	5,229.40	5,236.14	5,319.80
09-15-81	5,321.60	5,217.72	5,234.50	5,237.47	5,318.16	5,237.45	5,232.91	5,229.56	5,236.14	5,319.72
10-13-81	5,321.43	5,217.87	5,232.20	5,237.45	5,318.33	5,237.67	5,232.41	5,229.84	5,236.23	5,319.81
10-28-81	5,321.67	5,217.71	5,232.54	5,237.36	5,318.43	5,237.52	5,232.49	5,229.99	5,236.27	5,319.74
11-09-81	5,321.63	5,217.53	5,232.58	5,237.28	5,318.81	5,237.50	5,232.50	5,230.00	5,236.19	5,319.66
12-15-81	5,321.48	5,217.12	5,232.80	5,237.03	5,318.57	5,237.48	5,232.75	5,230.03	5,236.16	5,319.68
01-19-82	5,321.49	5,218.23	5,229.07	5,236.90	5,318.59	5,237.38	5,232.56	5,229.03	5,236.08	5,319.96
02-12-82	5,321.37	5,218.33	5,227.14	5,236.89	5,318.60	5,237.59	5,232.43	5,228.87	5,235.94	5,320.17
02-25-82	5,321.46	5,217.81	5,226.61	5,236.89	5,318.53	5,237.61	5,232.33	5,228.45	5,235.96	5,319.77
03-10-82	5,321.40	5,217.74	5,225.78	5,236.87	5,318.58	5,237.55	5,232.19	5,227.17	5,235.88	5,319.94
03-24-82	5,321.39	5,217.99	5,225.60	5,236.72	5,318.56	5,237.37	5,231.84	5,226.81	5,235.66	5,319.70
04-15-82	5,321.37	5,218.07	5,225.64	5,236.89	5,318.54	5,237.43	5,231.81	5,226.74	5,235.84	5,319.98
05-13-82	5,322.68	5,218.71	5,226.24	5,236.85	5,318.44	5,237.35	5,231.33	5,226.68	5,235.67	5,319.61
06-15-82	5,321.62	5,218.75	5,228.35	5,237.44	5,318.24	5,237.43	5,231.26	5,227.36	5,235.85	5,319.53
07-20-82	5,322.78	5,218.96	5,229.05	5,237.48	5,317.90	5,237.14	5,231.08	5,227.80	5,235.88	--
08-11-82	5,322.97	5,218.92	5,229.41	5,237.56	5,317.92	5,237.33	5,231.13	5,227.94	5,236.23	5,319.25
09-09-82	5,323.03	5,218.45	5,229.37	5,237.61	5,317.94	5,237.30	5,231.02	5,227.98	5,236.20	5,319.21
10-19-82	5,322.80	5,218.12	5,231.52	5,237.62	5,318.55	5,237.42	5,231.49	5,228.86	5,236.02	5,319.68

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
		Water levels, in feet above sea level								
11-09-82	5,322.74	5,218.12	5,232.02	5,237.51	5,318.82	5,237.70	5,231.56	5,229.20	5,236.16	5,319.96
12-09-82	5,322.81	--	5,230.37	5,237.17	5,318.62	5,237.03	--	5,228.84	5,235.84	5,319.57
01-12-83	5,323.53	--	5,226.97	5,236.88	5,318.63	5,237.10	5,231.43	5,228.83	5,235.82	5,319.57
02-15-83	5,323.41	--	5,225.58	5,236.64	5,318.75	5,237.29	5,231.25	5,227.01	5,235.81	5,319.98
03-15-83	5,323.52	--	5,225.25	5,236.68	5,318.87	5,237.17	5,231.13	5,226.66	5,235.74	5,320.11
05-26-83	5,325.18	--	5,227.70	5,237.14	5,319.02	--	--	5,227.04	5,235.73	5,320.27
05-31-83	5,339.04	--	--	--	--	--	--	--	--	--
06-30-83	5,329.53	--	--	--	--	--	--	--	--	--
07-31-83	5,326.59	--	--	--	--	--	--	--	--	--
08-31-83	5,326.54	--	--	--	--	--	--	--	--	--
09-30-83	5,326.40	--	--	--	--	--	--	--	--	--
10-31-83	5,326.22	--	--	--	--	--	--	--	--	--
11-30-83	5,326.45	--	--	--	--	--	--	--	--	--
12-31-83	5,326.85	--	--	--	--	--	--	--	--	--
01-31-84	5,326.39	--	--	--	--	--	--	--	--	--
02-29-84	5,326.32	--	--	--	--	--	--	--	--	--
03-31-84	5,326.15	--	--	--	--	--	--	--	--	--
04-30-84	5,326.97	--	--	--	--	--	--	--	--	--
05-31-84	5,346.90	--	--	--	--	--	--	--	--	--
06-30-84	5,326.67	--	--	--	--	--	--	--	--	--
07-31-84	5,328.01	--	--	--	--	--	--	--	--	--
08-31-84	5,327.88	--	--	--	--	--	--	--	--	--
09-30-84	5,327.63	--	--	--	--	--	--	--	--	--
10-31-84	5,327.48	--	--	--	--	--	--	--	--	--
11-30-84	5,327.51	--	--	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
12-31-84	5,327.55	--	--	--	--	--	--	--	--	--
01-31-85	5,330.55	--	--	--	--	--	--	--	--	--
02-28-85	5,327.46	--	--	--	--	--	--	--	--	--
03-31-85	5,342.17	--	--	--	--	--	--	--	--	--
04-30-85	5,349.95	--	--	--	--	--	--	--	--	--
05-29-85	5,392.96	--	5,230.10	5,237.37	5,322.59	5,237.64	--	5,227.64	5,237.88	5,324.65
05-30-85	5,393.65	5,220.33	--	--	--	--	--	--	--	--
06-05-85	5,397.07	5,220.55	5,231.48	5,237.54	5,323.82	5,237.97	--	5,227.79	5,237.03	5,326.15
06-06-85	5,397.11	--	--	--	--	--	--	--	--	--
06-12-85	5,399.14	5,220.79	5,232.82	5,237.60	5,324.84	5,237.88	--	--	5,237.16	5,327.41
06-13-85	5,400.70	--	--	--	--	--	--	--	--	--
06-19-85	5,409.20	--	--	--	--	--	--	--	--	--
06-20-85	5,410.10	5,221.63	5,234.01	5,238.09	5,327.94	5,237.89	--	5,228.84	5,237.53	5,332.86
06-26-85	5,412.98	5,222.11	5,235.02	5,239.19	5,328.01	5,237.99	--	5,229.32	5,237.70	5,334.76
07-02-85	5,412.66	5,223.28	5,235.42	5,238.21	5,328.50	5,237.99	--	5,229.86	5,237.91	5,335.21
07-10-85	5,402.90	--	--	--	--	--	--	--	--	--
07-11-85	5,401.59	5,225.03	5,236.96	5,240.42	--	--	--	5,231.63	--	--
07-22-85	5,388.50	--	--	--	--	--	--	--	--	--
07-23-85	5,388.05	5,225.75	5,237.08	5,238.90	5,329.96	5,238.34	--	5,232.21	--	5,337.40
07-24-85	5,388.02	--	--	--	--	--	--	--	--	--
08-05-85	5,388.03	--	--	--	--	--	--	--	--	--
08-06-85	5,387.97	--	--	--	--	--	--	--	--	--
08-07-85	5,387.86	5,226.05	5,236.60	5,240.70	5,330.14	5,238.43	--	5,233.19	5,239.26	5,339.43
08-20-85	5,387.77	5,226.26	5,236.10	5,240.41	5,330.59	5,238.61	--	5,233.68	5,239.85	5,341.13
09-04-85	5,387.40	--	--	--	--	--	--	--	--	--

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
09-05-85	5,387.48	5,226.41	5,235.52	5,240.64	5,330.83	5,238.79	--	5,234.03	5,240.29	--
09-16-85	5,387.43	5,226.65	5,235.17	5,240.76	5,331.22	5,239.06	--	5,234.21	5,240.76	5,343.68
10-01-85	5,387.34	5,226.52	5,234.23	5,240.89	5,331.62	5,239.25	--	5,233.93	5,241.23	5,344.62
10-15-85	5,387.72	5,226.40	5,231.95	5,241.10	5,331.70	5,239.36	--	5,233.77	--	5,345.43
12-24-85	5,400.90	5,222.54	5,231.02	5,241.29	5,332.92	5,240.56	5,232.89	5,231.89	5,243.19	5,349.72
03-06-86	5,365.65	--	5,230.48	5,242.60	5,332.27	5,242.19	5,233.05	5,230.60	5,241.91	5,348.36
05-01-86	5,375.00	5,222.40	5,231.36	5,243.00	5,330.45	5,243.06	5,232.97	5,232.29	5,244.57	--
06-24-86	5,415.12	5,224.05	--	5,243.83	5,333.87	5,243.82	5,233.21	5,233.34	5,245.41	5,350.55
07-09-86	5,416.40	5,224.91	--	5,244.36	5,335.04	5,244.12	5,233.35	5,234.06	5,245.96	5,354.02
07-23-86	5,413.81	5,225.34	--	5,244.86	5,335.61	5,244.33	5,233.46	5,234.71	5,246.22	5,355.97
08-06-86	5,401.50	5,225.55	--	5,245.25	5,336.73	5,244.61	5,233.73	5,235.41	5,246.71	5,356.98
09-17-86	5,332.86	5,224.37	5,234.61	5,245.56	5,333.63	5,245.35	5,234.43	5,235.95	5,247.16	5,348.93
11-25-86	5,336.70	5,221.83	5,231.33	5,243.60	5,330.30	5,245.97	5,234.60	5,234.41	5,245.96	5,339.76
01-08-87	5,330.70	5,220.66	5,230.99	5,243.18	5,329.06	5,246.11	5,234.33	5,233.28	5,245.03	5,336.78
03-26-87	5,352.38	5,219.82	5,230.77	5,242.67	5,327.58	5,245.74	5,233.76	5,232.16	5,243.69	5,333.66
05-11-87	5,417.05	5,221.06	5,231.54	5,242.49	5,330.63	5,245.71	5,233.85	5,232.34	5,243.73	5,338.68
05-18-87	5,423.21	5,221.32	5,231.77	5,242.38	5,331.78	5,245.70	5,233.94	5,232.43	5,243.99	5,341.14
05-26-87	5,431.26	5,222.06	5,231.98	5,242.55	5,333.17	5,245.79	5,234.05	5,232.73	5,244.30	5,344.65
06-01-87	5,430.79	5,223.66	5,233.29	5,243.57	5,334.97	5,246.73	5,234.88	5,233.96	5,245.34	5,348.15
06-08-87	5,426.17	5,223.83	5,233.42	5,243.33	5,335.32	5,246.31	5,234.44	5,233.94	5,245.05	5,350.46
06-15-87	5,430.40	5,224.69	5,234.19	5,243.54	5,338.98	5,246.34	5,234.68	5,234.39	5,245.45	5,353.08
06-22-87	5,434.18	5,224.98	5,235.19	5,243.80	5,336.74	5,246.58	5,234.66	5,234.92	5,245.73	5,355.79
06-29-87	5,433.33	5,225.61	5,236.31	5,243.95	5,337.47	5,246.57	5,234.84	5,235.35	5,246.15	5,358.53
07-06-87	5,426.98	5,225.22	5,237.55	5,244.25	5,338.02	5,246.68	5,234.90	5,236.02	5,246.47	5,360.02
07-13-87	5,416.86	5,225.01	5,238.21	5,244.48	5,338.25	5,246.74	5,234.92	5,236.54	5,246.82	5,360.86

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
07-20-87	5,404.01	5,224.72	5,238.68	5,244.81	5,338.11	5,246.93	5,235.10	5,236.99	5,247.04	5,360.66
07-27-87	5,391.87	5,224.63	5,238.88	5,245.09	5,337.75	5,247.05	5,235.36	5,237.49	5,247.35	5,359.79
08-03-87	5,382.70	5,224.66	5,239.17	5,245.33	5,337.54	5,247.16	5,235.37	5,237.75	5,247.68	5,358.84
08-12-87	5,379.85	5,224.42	5,238.73	5,245.57	5,336.48	5,247.38	5,235.59	5,237.08	5,247.85	--
08-17-87	5,382.38	5,224.11	5,238.13	5,245.71	5,336.60	5,247.52	5,235.49	5,238.01	5,247.96	5,356.45
09-02-87	5,388.54	5,223.38	5,236.70	5,245.97	5,336.44	5,247.68	5,235.74	--	5,248.37	5,355.30
09-14-87	5,392.77	5,223.02	5,235.99	5,246.04	5,336.46	5,248.01	5,235.76	5,237.54	5,248.64	5,355.12
09-28-87	5,397.28	5,222.55	5,235.59	5,246.19	5,336.73	5,248.19	--	5,237.34	5,248.86	5,355.28
10-12-87	5,401.78	5,221.98	5,235.78	5,245.99	5,336.78	--	5,235.83	5,236.93	5,249.04	5,355.96
10-13-87	5,402.08	5,222.10	5,235.44	5,246.08	5,336.62	5,248.35	5,235.64	5,237.15	5,249.10	5,356.03
10-26-87	5,405.69	5,222.55	5,235.99	5,246.27	5,337.44	5,248.52	--	5,237.68	5,249.41	5,357.20
11-09-87	5,411.83	5,222.13	5,237.18	5,246.34	5,337.41	5,248.57	5,235.39	5,237.60	5,249.19	5,358.11
12-09-87	5,410.08	5,222.97	5,237.84	5,246.58	5,337.92	5,249.05	5,235.57	5,238.17	5,249.77	5,360.42
12-22-87	5,408.10	5,223.38	5,237.22	5,246.55	5,338.01	5,248.92	5,235.31	5,238.18	5,249.95	5,360.48
01-08-88	5,405.46	5,223.54	5,235.90	5,246.91	5,337.81	5,249.58	5,235.75	5,238.11	5,250.35	5,360.63
02-09-88	5,396.21	5,223.21	5,234.93	5,247.11	5,337.31	5,249.90	5,235.53	5,237.54	5,250.49	5,359.10
03-03-88	5,385.71	5,222.68	5,234.82	5,247.16	5,336.73	5,250.32	5,235.64	5,237.52	5,250.54	5,357.04
04-08-88	5,360.37	5,222.76	5,235.42	5,247.30	5,335.27	5,250.50	5,235.71	5,237.80	5,250.39	5,352.43
05-09-88	5,349.95	5,223.42	5,235.97	5,247.10	5,333.53	5,250.79	5,235.49	5,238.10	5,249.91	5,347.29
06-09-88	5,331.65	5,223.30	5,235.74	5,247.40	5,332.21	5,250.71	5,235.63	5,238.10	5,249.37	5,343.51
07-12-88	5,330.87	5,222.62	5,235.60	5,247.29	5,331.27	5,250.65	5,235.74	5,237.81	5,248.56	5,340.61
08-09-88	5,331.30	5,222.46	5,235.29	5,246.96	5,330.53	5,250.51	5,236.05	5,237.14	5,247.82	5,338.77
09-13-88	5,333.42	5,222.16	5,234.60	5,246.67	5,329.93	5,250.19	5,235.53	5,236.37	5,246.93	5,337.11
10-13-88	5,332.03	5,221.85	5,233.99	5,246.22	5,329.42	5,249.89	5,235.45	5,235.53	5,246.35	5,336.02
11-09-88	5,338.31	5,220.80	5,233.49	5,245.81	5,328.74	5,249.07	5,235.34	5,234.94	5,245.64	5,335.35

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 13-2	Well 13-4	Well 13-6	Well 13-8	Well 13-9	Well 13-10	Well 18-1	Well 18-2	Well 18-4
12-09-88	5,332.69	5,220.76	5,232.72	5,245.28	5,328.77	5,249.39	5,235.38	5,234.11	5,245.05	5,334.66
01-20-89	5,332.82	5,219.75	5,231.48	5,244.51	5,328.40	5,248.81	5,234.99	5,232.90	5,244.20	5,333.74
02-09-89	5,332.97	5,219.61	5,231.30	5,244.27	5,328.28	5,248.43	5,234.69	5,232.60	5,243.93	5,333.45
03-09-89	5,332.23	5,220.00	5,231.20	5,243.80	5,328.11	5,248.19	5,234.59	5,232.44	5,243.50	5,333.06
04-07-89	5,336.06	5,221.17	5,231.46	5,243.52	5,327.89	5,247.85	5,234.69	5,232.70	5,243.37	5,332.88
05-09-89	5,331.93	5,221.91	5,232.00	5,243.34	5,327.68	5,247.63	5,234.61	5,232.95	5,243.01	5,332.28
06-12-89	5,332.00	5,221.69	5,232.31	5,243.18	5,327.43	5,247.34	5,234.67	5,233.05	5,242.85	5,331.92
07-10-89	5,330.31	5,221.91	5,232.30	5,243.00	5,327.17	5,247.15	5,234.69	5,232.99	5,242.67	5,331.58
08-09-89	5,332.46	--	5,232.18	5,242.81	5,327.06	5,246.83	5,234.59	5,232.83	5,242.47	5,331.33
08-10-89	5,332.68	5,221.63	--	--	--	--	--	--	--	--
09-11-89	5,331.62	5,221.68	5,232.13	5,242.62	5,327.00	5,246.65	5,234.53	5,232.72	5,242.24	5,331.10

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level							
		Well 16-3	Well 19-1	Well 19-2	Well 19-3	Well 19-4	Well 19-5	Well 19-6	Well 19-7
11/09/88	5,338.31	5,229.67	5,229.36	5,245.65	5,224.34	5,225.60	5,221.09	5,223.53	5,196.08
12/09/88	5,332.69	5,230.78	5,228.57	5,244.98	5,223.36	5,224.71	5,220.52	5,223.39	5,198.10
01/20/89	5,332.82	5,230.56	5,228.45	5,244.18	5,222.15	5,223.50	5,219.85	5,222.63	5,197.78
02/09/89	5,332.97	5,230.45	5,228.67	5,243.84	5,221.74	5,223.22	5,219.22	5,222.29	5,197.73
03/09/89	5,332.23	5,230.51	5,228.69	5,243.44	5,222.15	5,223.18	5,219.06	5,221.95	5,197.90
04/07/89	5,336.06	5,230.65	5,229.93	5,243.21	5,223.25	5,223.68	5,219.41	5,222.00	5,198.35
05/09/89	5,331.93	5,230.05	5,229.33	5,242.94	5,224.06	5,224.29	5,220.11	5,222.04	5,199.33
06/12/89	5,332.00	5,229.33	5,228.75	5,242.78	5,224.05	5,224.44	5,220.16	5,222.16	5,198.97
07/10/89	5,330.31	5,229.20	5,228.74	5,242.61	5,224.35	5,224.54	5,220.13	5,222.18	5,199.31
08/09/89	5,332.46	--	5,242.38	--	5,224.38	--	5,222.14	--	--
08/10/89	5,332.68	5,229.01	5,228.53	--	5,223.99	--	5,220.03	--	5,198.72
09/11/89	5,331.62	5,229.19	5,228.51	5,242.20	5,224.07	5,224.47	5,220.17	5,222.14	5,198.85

Table 2.--Selected water levels in Cochiti Reservoir and in monitoring wells, 1976-89--Continued

Date	Cochiti Reservoir	Water levels, in feet above sea level: Well 19-8	Well 19-9	Well 19-10	Well 19-11	Well 19-12	Well 19-13	Well 19-14
11/09/88	5,338.31	5,212.98	5,210.87	5,201.60	5,200.08	5,214.86	5,211.54	5,221.57
12/09/88	5,332.69	5,212.79	5,210.68	5,200.95	5,199.63	5,214.61	5,211.24	5,221.25
01/20/89	5,332.82	5,211.93	5,209.80	5,200.25	5,198.96	5,214.19	5,210.63	5,220.47
02/09/89	5,332.97	5,211.77	5,209.68	5,200.04	5,198.91	5,213.90	5,210.27	5,220.74
03/09/89	5,332.23	5,211.72	5,209.73	5,200.15	5,199.27	5,213.66	5,210.37	5,220.46
04/07/89	5,336.06	5,212.10	5,209.97	5,201.34	5,200.29	5,213.83	5,211.04	5,221.56
05/09/89	5,331.93	5,212.36	5,210.24	5,202.39	5,201.38	5,214.17	5,211.45	5,222.01
06/12/89	5,332.00	5,212.18	5,209.91	5,202.80	5,201.27	5,214.20	5,211.38	5,221.63
07/10/89	5,330.31	5,212.35	5,210.26	5,203.65	5,201.83	5,214.33	5,211.55	5,221.71
08/10/89	5,332.68	5,212.02	5,209.80	5,202.96	5,201.19	5,214.27	5,211.09	5,221.44
09/11/89	5,331.62	5,212.11	5,209.89	5,203.20	5,201.34	5,214.47	5,211.30	5,221.48

Table 3.--Measured streamflow and losses in the Santa Fe River, 1989

[--, no data. All values in cubic feet per second]

Site number (fig. 2)	Site location	July 10, 1989		August 9, 1989		September 11, 1989	
		Streamflow	Loss	Streamflow	Loss	Streamflow	Loss
SF-1	1/3 mile upstream from well 13-6	8.50	--	9.05	--	--	--
SF-2	Near well 13-6	7.83	0.67	8.84	0.21	7.75	--
SF-3	Near well 13-4	6.02	1.81	7.10	1.74	6.29	1.46
SF-4	Near well 13-2	3.15	2.87	--	--	3.63	2.66
SF-5	Near mouth of Santa Fe River	--	--	--	--	2.89	0.74

Table 4.--Streamflow loss in the Santa Fe River

[--, no data]

Reach (fig. 2)	Streamflow loss, in percent		
	July 10, 1989	September 9, 1989	September 11, 1989
Between SF-2 and SF-3	29	20	19
Between SF-3 and SF-4	48	--	42
Between SF-4 and SF-5	--	--	20

Table 5.--Flow in the Cochiti East Side Main Canal, September 15, 1987

Measurement site number (fig. 2)	Flow, in cubic feet per second
C-1	126
C-2	109
C-3	122
C-4	125
C-5	125
C-6	118

Table 6.--Selected records of monitoring wells

[See figure 2 for location of monitoring wells; -- indicates no data]

Well number	Altitude of land surface (feet above sea level)	Depth of well (feet below land surface)	Bottom of casing (feet below land surface)	Top of screened interval (feet below land surface)	Bottom of screened interval (feet below land surface)	Top of gravel pack (feet below land surface)	Water level 3/9/89 (feet below land surface)
1-1	5,216.91	13.5	13.5	--	--	--	4.88
19-9	5,216.57	127	127	121	127	110	6.84
2-1	5,212.77	13.5	13.5	--	--	--	5.32
2-6	5,233.98	31	31	--	--	--	21.05
19-8	5,233.16	145	145	139	145	124	21.44
3-1	5,203.22	13	13	--	--	--	4.78
19-7	5,204.53	127	12	121	127	110	6.63
3-5	5,212.04	13.5	13.5	--	--	--	7.46
4-2	5,236.08	27	27	--	--	--	2.84
4-4	5,237.70	29.5	29.5	--	--	--	16.69
19-14	5,237.01	172	172	167	172	153	16.55
4-5	5,239.72	31	31	--	--	--	17.66
19-3	5,238.81	61	61	55	61	44	16.66
4-7	5,290.79	85.5	85.5	--	--	--	71.48
19-5	5,290.01	181	181	175	181	160	71.04
4-8	5,273.88	82	82	--	--	--	57.38
13-2	5,227.73	18	18	--	--	--	7.73
13-4	5,254.40	33.5	33.5	--	--	--	23.20
19-4	5,254.40	155	155	149	155	134	31.22
13-6	5,276.64	43.5	43.5	--	--	--	32.84
13-8	5,341.87	59.5	59.5	--	--	--	13.76
13-9	5,444.29	235	232.5	--	--	--	196.10
13-10	5,369.43	174	162.5	--	--	--	134.84
19-6	5,369.42	276	276	270	276	252	147.47
16-3	5,235.89	22	21.5	--	--	--	5.36
19-1	5,235.53	146.5	146.5	140.5	146.5	129	6.84
18-1	5,282.14	79	73.5	--	--	--	4.97
18-2	5,360.61	156	156.5	--	--	--	117.11
19-2	5,360.10	273.5	273.5	267.5	273.5	248	116.66
18-4	5,449.48	233	233.5	--	--	--	116.42
19-10	5,231.34	60	60	54	60	38	31.19
19-11	5,231.03	180	179	173	179	157	31.76
19-12	5,250.59	59.5	59.5	53.5	59.5	40	36.93
19-13	5,249.73	168	168	162	168	151	39.36

Table 7.--Ratio of median difference in water levels to difference in completed depths of the shallow and deep wells

[See figure 2 for location of wells. -, indicates upward gradient]

Well pair	Median downward vertical hydraulic gradient
1-1/19-9	0.014
2-6/19-8	.009
3-1/19-7	.005
4-4/19-4	.006
4-5/19-3	-.001
4-7/19-5	.003
13-4/19-4	.065
13-10/19-6	.108
16-3/19-1	.006
18-2/19-2	.001
19-10/19-11	.011
19-12/19-13	.029

Table 8.--Fluctuation in water levels in upland wells from June 1985 to September 1989
[See figure 2 for location of monitoring wells]

Well number	Distance from Rio Grande arm of Cochiti Reservoir (miles)	Range in water levels (feet)
18-4	0.3	35.98
18-2	.8	13.51
13-8	.9	16.39
18-1	1.1	10.54
13-6	1.1	10.03
13-4	1.4	9.07
13-9	1.5	13.15
13-10	1.7	4.62

Table 9.--Annual water-level fluctuations for selected monitoring wells in the Rio Grande flood plain
[See figure 2 for location of monitoring wells]

Well number	Annual fluctuation, 1977 (feet)	Largest annual fluctuation, 1978-82 (feet)	Percent decrease
1-1	4.90	3.55	28
2-1	3.40	2.55	25
2-6	5.10	2.50	51
3-1	3.20	2.75	14
3-5	4.50	3.90	13