TECHNICAL REPORT 28

New Mexico State Engineer
Santa Fe, N. Mex.

Water Resources and Geology
of the
RIO HONDO DRAINAGE BASIN
Chaves, Lincoln, and Otero Counties, New Mexico

By
Walter A. Mourant

Prepared in cooperation with
the United States Geological Survey

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Bonito Dam and Lake on Rio Bonito, a principal tributary of Rio Hondo, high in the massive Sacramento Mountains which form the western rim of the Rio Hondo drainage basin in south-central New Mexico. Developed primarily for railroad uses, the headwater impoundment now serves municipalities in the upper Hondo Valley and in arid Tularosa Valley to the west, bounded by peaks in background (see p. 11-12). View is to the northwest.

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1963

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WATER RESOURCES AND GEOLOGY OF THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, NEW MEXICO

By

Walter A. Mourant

ABSTRACT

Both surface water and ground water have been used for domestic, stock, and irrigation supply for many years in the Rio Hondo drainage basin. The supply of water has fluctuated, because precipitation, which has been variable, affects the flow of streams and the storage of ground water. The supply, however, has been sufficient to meet the current demands. Water levels have remained relatively stable in the western and central parts of the basin. Water levels in the San Andres Limestone have been lowered in the eastern part of the basin because large amounts of water from the San Andres have been used for irrigation in the Roswell artesian basin, of which the Hondo Valley is hydrologically a part.

The geologic formations in the Hondo basin range in age from Permian to Recent. The San Andres Limestone of Permian age and the alluvium of Quaternary age are the only formations that yield large supplies of water to wells. The San Andres yields as much as 2,000 gpm (gallons per minute) of water to wells, and the alluvium in the main valleys of the Rio Hondo, Rio Bonito, and Rio Ruidoso yields as much as 3,500 gpm of water to wells. All formations in the Hondo basin yield adequate supplies of water for domestic and stock uses.

The concentrations of sulfate in both the ground and surface water range from 29 to 2,130 ppm (parts per million), and 72 percent of the water samples analyzed contained more than 250 ppm of sulfate, the recommended upper limit for domestic supplies; however, the water is generally satisfactory for irrigation and stock use. Ground water in the extreme eastern part of the basin is highly saline, and the

saline water is encroaching westward, because of reduced artesian pressure in the San Andres Limestone.

Surface water has been used for irrigation in the eastern part of the Hondo basin since about 1880. Water from the Rio Hondo, Rio Ruidoso, and Rio Bonito has been used to irrigate land west of Riverside for about a hundred years. About 3,650 acres are irrigated in these stream valleys under surface-water rights, but ground water is used as a supplemental supply on 2,650 of these acres during periods of low streamflow. Surface water from Rio Hondo tributaries also supplies in whole or in part a few municipal water systems, including that of Alamogordo which is outside the drainage basin.

A large amount of ground water from the San Andres Limestone and the valley alluvium is used in irrigation, and some is used for municipal supply. The city of Roswell obtains its water supply from wells that tap the San Andres Limestone. Ground water also serves domestic and stock needs throughout the basin.

The supply of water in the alluvial aquifer in the main valleys of the Rio Bonito and Rio Ruidoso and the upper Rio Hondo seems to be adequate for all the current demands. Little irrigable land remains that could be developed in these valleys. The amount of water in storage in the aquifer is fairly constant. Water levels in the alluvium of the main valleys and the underlying Yeso Formation generally have not been lowered during the period of record. Water levels in the San Andres Limestone in the eastern part of the basin have been lowered, and they probably will continue to be lowered, causing greater pumping lifts and inducing additional westward encroachment of saline water. The amount of water that is available from the San Andres in the eastern part of the basin determines the amount of land that can be irrigated.

INTRODUCTION

The Rio Hondo drainage basin, which lies in Chaves, Lincoln, and Otero Counties, southeastern New Mexico (fig. 1), has a diversified economy adapted to the climate, the topography, and the water supply. Irrigated farms on the alluvial plain near Roswell grow cotton, alfalfa, and small-grain crops. Stock raising also is important in this area, and much of the small-grain crop is used locally for livestock feed. The basin comprises about 1,400 square miles.

Apples and alfalfa are the principal crops of the irrigated farms in the main valleys of the Rio Hondo, Rio Bonito, and Rio Ruidoso west of Riverside. The apple crop in 1958 was estimated by the County Agricultural Agent to be 250,000 bushels. The upland slopes are utilized for sheep and cattle grazing. Logging on the Capitan and Sacramento Mountains supports several sawmills.

The basin is favorably situated for commerce. Roswell, the principal center of population in a large trade area, is served by major

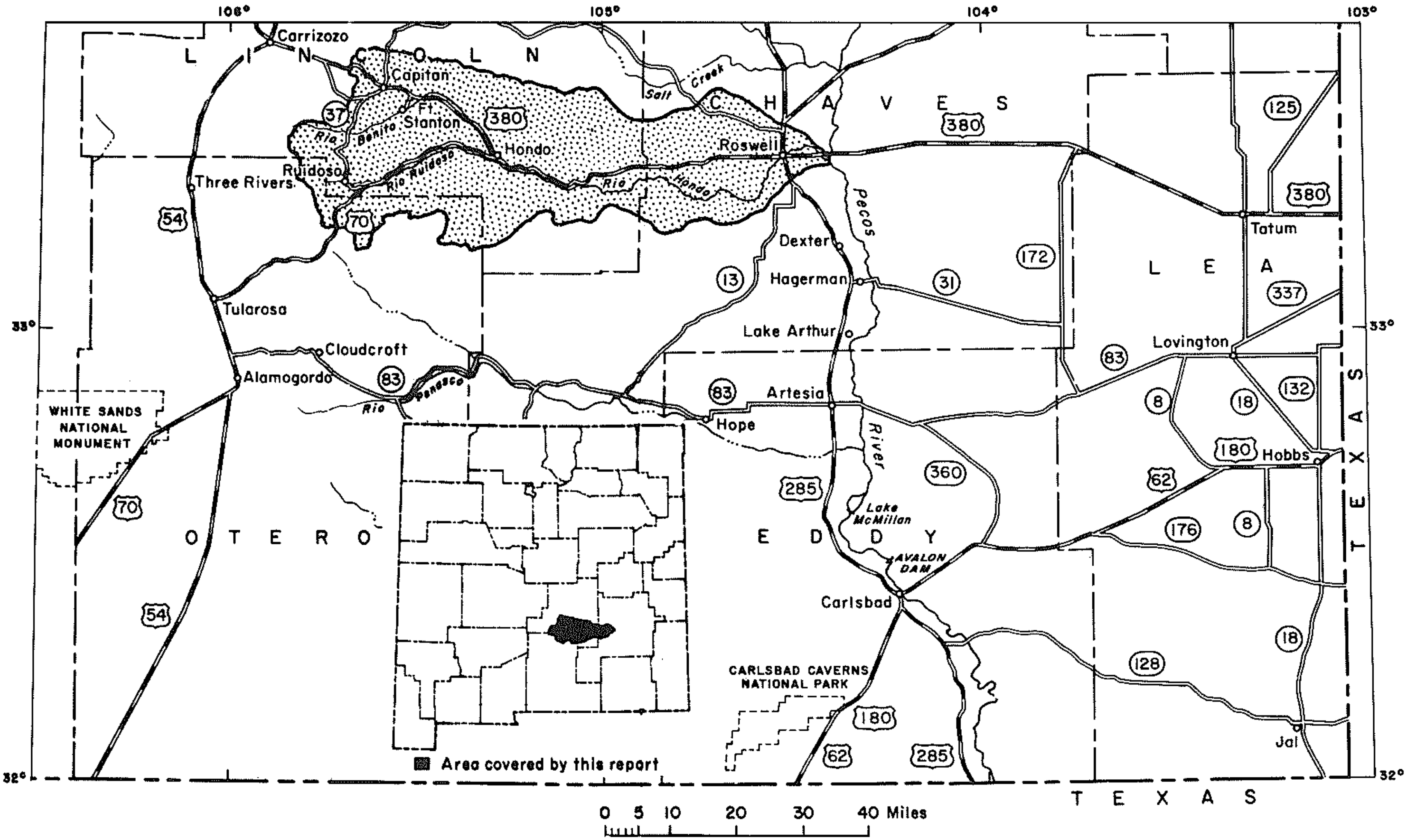


Figure 1.--Index map of southeastern New Mexico showing the Rio Hondo drainage basin, Chaves, Lincoln, and Otero Counties, N. Mex.

rail, air, bus, and truck lines. U.S. Highways 70 and 380 cross the Hondo basin from east to west and connect with U.S. Highway 285 which runs north-south through Roswell. Several State highways also serve the basin.

Growth of the economy of the Hondo basin has been hampered to some extent by a shortage of water. The agricultural industry has been affected especially.

The lower end of the Rio Hondo drainage basin is in the Roswell artesian basin, and part of the recharge water for the Roswell artesian basin moves underground from the upper part of the Hondo basin. The factors that affect the movement of ground water and the effect of additional water use in the Hondo basin on the recharge to the Roswell artesian basin have not been previously defined. Also, the interrelation of surface and ground water in the Rio Hondo drainage basin had not been investigated.

This study of the water resources and geology of the Rio Hondo drainage basin, made by the U.S. Geological Survey at the request of and in cooperation with the New Mexico State Engineer, was intended to supply information that would aid water users in planning future operations and aid the State Engineer in administering water rights in both the Hondo and Roswell underground-water basins.

Previous ground-water investigations in the area include a study of the eastern part of the Rio Hondo basin by Fisher (1906), by Fiedler and Nye (1933), and by Morgan (1938); a study in the vicinity of Ruidoso was made by Jones and Murray (1948) and the geology of the Hondo Reservoir area was investigated by Bean (1949) and Theis (1951). The occurrence of saline ground water near Roswell has been described by Hood, Mower, and Grogin (1960), and by Hood (1963). The geology of the Capitan quadrangle has been mapped by Dr. John E. Allen of New Mexico Institute of Mining and Technology, State Bureau of Mines and Mineral Resources. Many of his geologic data were made available to the author.

This investigation was begun in April 1955, and the ground-water resources of the central and western parts of the Rio Hondo drainage basin were emphasized. Water levels have been measured bimonthly in 24 observation wells since January 1956. Other field work included 1) collection of data pertaining to all irrigation wells in the basin, except for the wells in the Roswell area for which data already were on file, 2) inventory of domestic and stock wells for supplemental information, 3) reconnaissance geologic mapping of areas not previously mapped, and 4) determination of the altitude of the land surface at several wells by aneroid barometer. Samples of water were collected from selected springs, wells, and streams for chemical analysis. Streamflow was measured at several places and a recording gaging station was established at Picacho during the investigation.

System of Numbering Wells In New Mexico

All wells referred to in this report are identified by the location-number system used by the Geological Survey and the State Engineer for numbering water wells in New Mexico. The number is a description of the geographic location of the well, based on the common subdivision of public lands. It indicates the location of the well to the nearest 10-acre tract, when the well can be located that accurately. The location number consists of a series of digits corresponding to the township, range, section, and tract within a section, in that order, as illustrated below. If a well has not been located closely enough to be placed within a particular section or tract, a zero is used for that part of the number. The letter "S" preceding a location number is used to indicate a spring.

The system of numbering wells in sections which are not 1 mile square is as follows: Seven measurements of 1/8 of a mile each are made from the southeast corner of the section parallel to the south and east lines. The tracts are numbered in the same manner as those in the 1-mile-square sections, except that the location is scaled from the southeast corner.

The letters a, b, c, etc., are added to the last segment to designate the second, third, fourth, and succeeding wells in the same tract.

The system of numbering wells is illustrated in figure 2.

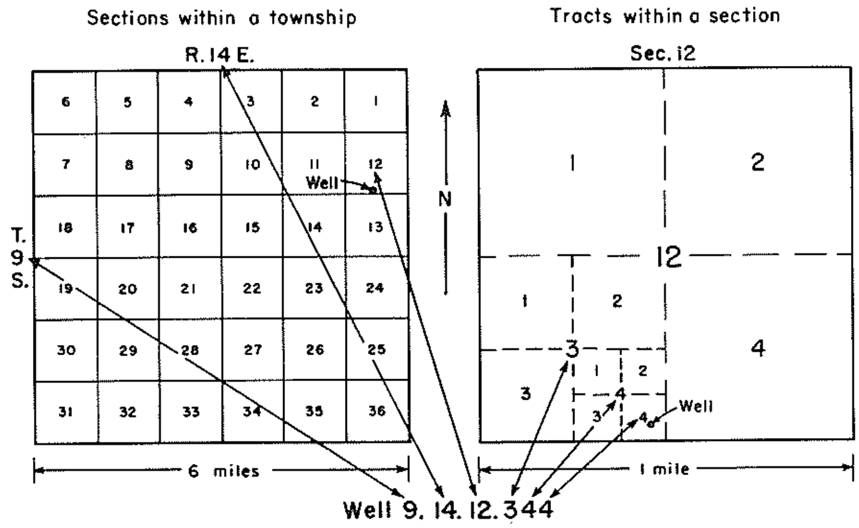


Figure 2.--System of numbering wells in New Mexico

Geographic Setting

Altitude and Relief

Precipitation and the proportional amount of stream runoff and ground-water recharge in any area are related to altitude and relief. Steep slopes are conducive to rapid runoff and immediate loss of the water from the area. Gentle slopes and plains favor infiltration of the water into the ground, where it moves slowly to points of discharge, mainly in stream valleys. The ground water is available for use in the area long after the precipitation has ended. The topography also influences the depths to which wells must be drilled because the configuration of the water table does not necessarily conform to that of the land surface. The depth to water is generally greater beneath the ridges than in the valleys.

Relief in the Rio Hondo drainage basin ranges from an almost level alluvial plain in the east to deeply dissected mountains in the west. The altitude at the confluence of the Rio Hondo and Pecos River is 3,445 feet; that of Sierra Blanca Peak in the western part of the basin is 12,003 feet.

The eastern alluvial plain comprises three terraces: the Lakewood, Orchard Park, and Blackdom (Fiedler and Nye, p. 10-12). The Lakewood terrace, which adjoins the Pecos River and the lower Rio Hondo, is about 20 to 30 feet higher than the bed of the Pecos River and about 10 to 20 feet higher than that of the Rio Hondo. The central part of the city of Roswell is built on the Lakewood terrace. The Orchard Park terrace is about 10 feet higher than the Lakewood terrace. It is the least dissected of the three, its surface being a smooth grassy plain. Most of the irrigated farms in the Pecos River and lower Rio Hondo valleys are on this terrace, and the city of Roswell has expanded extensively onto it in recent years. The Blackdom terrace is about 40 feet higher than the Orchard Park terrace. Only a few square miles of this terrace are in the Hondo basin drainage area.

Remnants of an ancient plain that probably extended through much of the region can still be traced on high mesas in parts of the Hondo basin. This plain was much higher and older than the alluvial terraces near the rivers.

The upland area west of the Pecos River alluvial plains is dissected deeply, especially at high altitudes in the western part of the Rio Hondo basin. The valleys are U-shaped in the eastern and central parts of the basin and are progressively more V-shaped westward in this upland area.

The mountainous areas consist of the Capitan Mountains, the Sacramento Mountains, and Pajarito Mountain. The Capitan Mountains, which rise about 4,000 feet above the surrounding terrain, trend east-west about 20 miles and form part of the north boundary of the Hondo basin. The altitude of the highest peak is 10,230 feet; the relief is sharp. Talus is common on the steep slopes and an alluvial fan of rounded boulders has been deposited around the flanks of the mountains. The Sacramento Mountains form a long north-south range, and a reach of about 15 miles of their crest forms the west boundary of the Hondo basin. Sierra Blanca, the highest peak in the Sacramento Mountains, has an altitude of 12,003 feet. Sierra Blanca was glaciated during the Pleistocene Epoch, and has a glacial cirque on its northeast slope (Ellis, 1935, p. 25). Pajarito Mountain forms part of the southern boundary of the Hondo basin. Pajarito Peak has an altitude of 8,014 feet.

Pine, spruce, cedar, juniper, and quaking aspen grow on the high hillsides, and thick grass grows in the V-shaped valleys of the mountainous areas. The central part of the basin is covered thinly by grass, weeds, cactus, and mesquite. The eastern part is covered mostly with grass; some saltcedars grow in the stream channels.

Climate

Altitude and relief contribute to a varied climate in the Hondo basin. The eastern plains in the vicinity of Roswell, which have a semiarid climate that is typical of the Southwest, receive an average annual precipitation of about 12 inches. The mountainous regions in the western part of the basin receive more than 20 inches of precipitation annually. The average annual precipitation at eight stations and the altitudes of the stations are given in the tabulation on page 8.

The eastern plains receive more than 50 percent of their precipitation as thundershowers during the summer months. The rainfall is insufficient for cultivated crops, and surface or ground water is used to irrigate the farms. Winters are generally mild and snowfall is light. The mean annual temperature at Roswell is 59 degrees; sunshine averages 70 percent of the amount possible for the year.

The area west of the plains has lower mean annual temperatures. This area receives an appreciable amount of snowfall, especially near the crests of the mountains. A few small areas are dry-farmed, but in general the precipitation is not dependable and irrigation is necessary for growing crops.

Drainage

The principal streams in the Rio Hondo basin drain generally eastward toward the Pecos River from their points of origin high on the Sierra Blanca and the Capitan Mountains. (See pl. 1.) The principal streams are perennial only where their canyons are cut below the water table. Most of the tributary streams are intermittent.

The drainage pattern in the Rio Hondo basin is influenced by the geology. The valleys generally are narrow where the resistant upper

SUMMARY OF PRECIPITATION AT EIGHT STATIONS IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

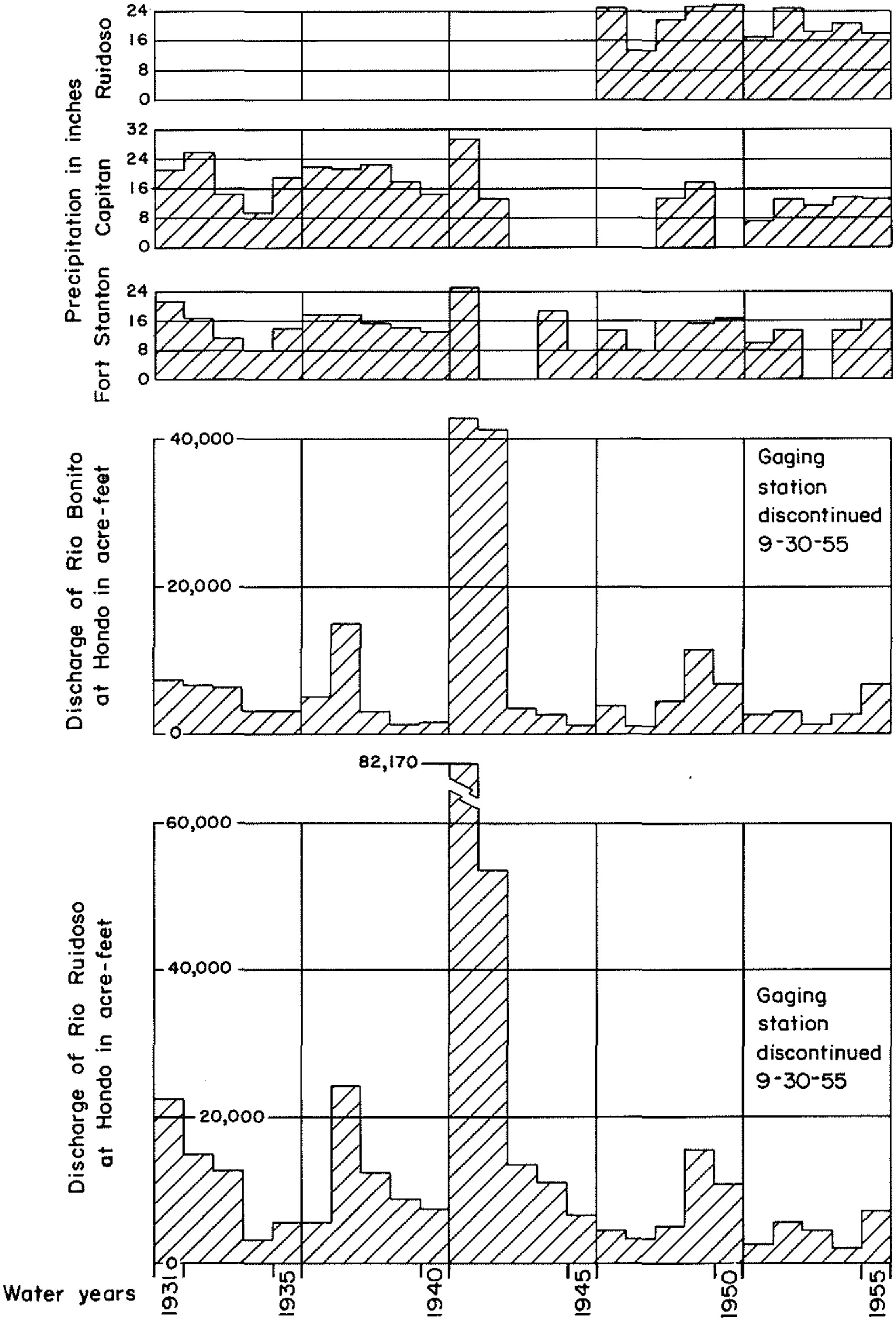
(From U.S. Weather Bureau records)

Station	Altitude (feet above sea level)	Average annual precipitation (inches)	Years of record
Roswell	3,612	12.6	1895-1960
Picacho	4,965	13.8	1945, 1954-55, 1957-60
Hondo	5,235	10.3	1945, 1947, 1951-60
Fort Stanton	6,230	15.1	1856-59, 1870, 1884-85, 1887-92, 1894, 1902-03 1906-25, 1927, 1930-40, 1944-52, 1954-60
Capitan	6,350	16.4	1911-42, 1947-49, 1951-60
Ruidoso	6,755	21.2	1942, 1946-60
Nogal Lake	7,163	13.5	1945-47, 1950-56, 1958-60
Bonito Dam	7,280	22.1	1949-51, 1953-60

part of the San Andres Limestone underlies the valley floors, and they are broader where the less resistant Hondo Sandstone Member of the San Andres or the Yeso Formation underlies the valley floors. Folds and faults have diverted some streams from their original courses. The Sixmile Hill structural zone has diverted the Rio Hondo and Eightmile Draw several miles to the northeast. The drainage in T. 10 S., R. 20 E., has been diverted to the northeast by the Border Hills structure, leaving a wind gap in the ridge where the stream had formerly flowed. Other wind gaps, cut by streams that were later diverted, are present in the Border Hills structure.

The flow of streams has been measured intermittently since 1903, and the data have been published in water-supply papers of the U.S. Geological Survey and in reports of the New Mexico State Engineer. The flows of Rio Bonito and Rio Ruidoso at Hondo were gaged from 1931 to 1955. Figure 3 shows a comparison of surface-water discharge with precipitation. The duration and intensity of the precipitation, the condition of the soil, the temperature, and the relative humidity all influence the amount of direct runoff from precipitation.

The main valleys are U-shaped in cross section, and they contain



Data from U.S. Weather Bureau records

Data from U.S. Geological Survey Water-Supply Papers, Surface-water supply of the United States, pt. 8, Western Gulf of Mexico Basins

Figure 3.-- Comparison of surface-water discharge at Hondo, Lincoln County, N. Mex., with precipitation on the watershed, water years 1931-55

(Example: Water year 1931 is from Oct. 1, 1930 to Sept. 30, 1931.)

thick deposits of alluvium. The streams are entrenched about 15 feet in the alluvium, and they meander along the relatively flat valley floors. The smaller valleys in the mountainous areas are V-shaped, and they contain little or no alluvium.

Rio Hondo

The Rio Hondo is formed by the confluence of Rio Bonito and Rio Ruidoso at Hondo, 50 miles west of Roswell, and it drains into the Pecos River 5 miles east of Roswell. The Rio Hondo is a perennial stream in the upper reach, and it generally gains in flow because the bed of the stream is below the water table from Hondo to Picacho. From Picacho east to Roswell the Rio Hondo loses water to the rocks beneath the bed of the stream. All the flow at Riverside is commonly diverted into an irrigation ditch for downstream use on the Diamond A Ranch. From Riverside to Roswell the Rio Hondo is dry most of the year; however, it is perennial in the reach from Roswell to the Pecos River because the bed of the stream is lower than the water table in the alluvium.

The loss in flow of the Rio Hondo from Riverside to Roswell has been measured or estimated many times. Flow records for 1904-06 indicate many days during which the Rio Hondo did not flow at Roswell. The Hondo Reservoir was constructed by the U.S. Reclamation Service (now Bureau of Reclamation) to utilize the flow in the Rio Hondo near Roswell, but the reservoir was ineffective because of rapid leakage into the underlying San Andres Limestone. An undated report of the project history is in the files of the Bureau of Reclamation in Albuquerque and the State Engineer Office in Santa Fe. From a study of streamflow data, Bean (p. 24) estimated that, during a year of normal precipitation (12 inches at Roswell and 15 inches at Fort Stanton), approximately 19,400 acre-feet of water is lost from the Rio Hondo east of Picacho and becomes recharge to the Roswell artesian basin. A seepage investigation in October 1955 when the flow at Riverside was 28 cfs (cubic feet per second) and a similar investigation in April 1958 when the flow at Riverside was 80 cfs indicated a seepage loss of about 1 cfs per mile of river channel between Riverside and the Diamond A gaging station in sec. 20, T. 11 S., R. 21 E., and a seepage loss of about 1.5 cfs per mile of stream channel east of the Diamond A gaging station.

The Rio Hondo east of Roswell gains in flow by seepage from the ground-water reservoir in the alluvium, and the flow is greatly increased at times by discharge into the stream channel of several thousand gallons of water per minute from two Hagerman Irrigation Company wells in sec. 35, T. 10 S., R. 24 E. These wells tap the San Andres artesian aquifer and flow naturally in winter, but they are pumped during the summer when the artesian pressure is less. Much of the flow of the Rio Hondo is diverted into the Hagerman Canal in sec. 31, T. 10 S., R. 25 E. From the diversion point eastward, the Rio Hondo has a perennial flow that is supplemented by the discharge of several drains, and it always contributes some flow to the Pecos River at the confluence of the two streams in sec. 9, T. 11 S., R. 25 E.

Rio Bonito

The headwaters of the Rio Bonito are in the Sacramento Mountains, and in the mountainous area the flow in the main channel is perennial. In about 1907 the flow in the headwaters was diverted into a pipeline system by the El Paso and Southwestern Railroad (later the Southern Pacific Railroad). In 1930-31 the Southern Pacific Railroad built a dam on Rio Bonito in sec. 12, T. 10 S., R. 12 E., to provide storage of Rio Bonito water to serve the pipeline system.

The Rio Bonito is generally a perennial stream from about 4 miles below Fort Stanton downstream to 10 miles northwest of Hondo. The 10-mile reach of the Rio Bonito northwest of Hondo has large seepage losses and is dry much of the year. The water table is about 12 feet below the streambed in parts of this reach.

Rio Ruidoso

The headwaters of the Rio Ruidoso are on the forested slopes of Sierra Blanca, an area that receives about 5 feet of snow each winter. The Rio Ruidoso is perennial throughout its length, except that a few short reaches may not flow when water is being diverted for irrigation.

The beds of the mountain streams are cut below the water table, so that they have some flow even during most periods of little or no precipitation.

Small tributaries

Flows in the smaller tributaries and subtributaries, such as Magado Creek, Eagle Creek, Little Creek, Salado Creek, Cienegita Creek, Carrizo Creek, Bluewater Creek, and the Berrendo Creek system, are perennial only in short reaches of their channels. Many of the small streams flow in the spring because of melt water from snowpacks on Sierra Blanca and the Capitan Mountains.

Lakes and Ponds

Nogal Lake is in a natural basin near the northwestern drainage divide of the Hondo basin. The El Paso and Southwestern Railroad used Nogal Lake as a storage reservoir in its pipeline system to supplement low flows of the Rio Bonito. The lake has a capacity of 400 million gallons (about 1,200 acre-feet), but it leaks excessively at high stages, so that the effective storage is probably about 163 million gallons (500 acre-feet).

Bonito Lake is formed by a dam across Rio Bonito in sec. 12,

T. 10 S., R. 12 E. The dam was built by the Southern Pacific Railroad to provide supplemental storage for the pipeline water system, when it was determined that Nogal Lake could not furnish the needed storage because of excessive leakage in its upper elevations. The dam is 480 feet long on the crest and has a maximum height of 111 feet. Water is drawn through a 24-inch cast iron pipe from an intake tower 140 feet upstream from the dam. The lake had an initial capacity of 400 million gallons.

The spillway was 30 feet below the top of the dam when it was built. In 1946 the spillway was raised 17 feet to recover the storage capacity lost by accumulation of sediments which washed into the reservoir during floods in 1941.

Many natural and artificial ponds in the Hondo basin contain water intermittently, depending on precipitation, evaporation, and seepage loss.

Floods

All the streams in the Hondo basin occasionally flood. A local cloudburst may transform a dry arroyo into a roaring stream within a period of a few minutes. Small floods occur every year, but usually they do only minor damage. Several times in the past 50 years major floods in the Hondo basin have washed out bridges, covered cultivated fields with debris, and inundated parts of Roswell.

A flood-retarding dam has been built on the Rio Salado in Lincoln County 6 miles east of Capitan in sec. 9, T. 9 S., R. 15 E. The dam was built on porous limestone where the water table was about 50 feet below the streambed. Some of the water temporarily impounded by the dam seeps into the ground and recharges the ground-water reservoir.

The Hondo Reservoir has been used to temporarily store some of the flood waters of the Rio Hondo. In past years nearly all the water impounded in the Reservoir seeped under ground (Bean, p. 27).

The Two Rivers Reservoir Project, about 12 miles west of Roswell, was proposed to control floods on the Rio Hondo and Rocky Arroyo and to prevent damage to Roswell and vicinity. Construction has been started (1961) on this project. The water table at the Two Rivers Reservoir site is about 400 feet below the streambed. Porous limestone crops out and underlies the land surface in the vicinity of the project site.

The alluvial terraces in the vicinity of Roswell are subject to floods from the Pecos River and the Rio Hondo. Rio Hondo has overflowed onto the Lakewood terrace several times in recent years.

WATER RESOURCES AND GEOLOGY

The earth's supply of water is constantly being recirculated, and the geologic formations and their structural attitudes are critical regulators in the circulation system. The hydrologic or water cycle includes precipitation, infiltration, runoff, underground storage, evaporation, and transpiration. Part of the precipitation infiltrates into the ground directly and is stored temporarily in the rocks, and part runs off in streams. Part of the water in streams also infiltrates into the ground. Water that is stored in openings in the rocks of the earth moves slowly underground to points of discharge as springs or as seepage to streams, or the water is evaporated or transpired by plants. Much of the ground water in storage probably accumulated for hundreds of years. The low or base flows of our streams are maintained chiefly by the discharge of ground water from the rocks, generally as springs.

The rocks below the land surface in the Rio Hondo drainage basin contain many openings which are interconnected and which persist to depths of many hundreds of feet below the land surface. The zone in which all the openings in the rocks are filled with water is termed the zone of saturation. The top of the zone of saturation in unconfined aquifers is the water table. The zone of aeration extends from the land surface to the water table, and this zone does not yield water to wells. Water takes material into solution as it moves through the crust of the earth, and it loses this material as it is evaporated.

The ground water in much of the Rio Hondo basin is unconfined; that is, the upper surface of the zone of saturation is under atmospheric pressure. The water table is not flat but is a sloping or undulating surface. In general the water table reflects in a subdued manner the topographic features in areas where recharge is distributed uniformly. The water table in the San Andres Limestone west of Roswell is almost flat, having an eastward gradient of about 2 feet per mile. (See pl.1.)

In the San Andres Limestone in the vicinity of Roswell ground water is confined under artesian pressure, a pressure great enough to cause the water to rise in wells above the top of the formation in which the water is confined. The upper confining beds are the less permeable Artesia Formation and alluvium. The lower confining beds are beds of the Yeso Formation or beds of the San Andres Limestone which are low in permeability. The altitude of the water table in the San Andres Limestone west of Roswell determines to a large extent the altitude to which water will rise in wells in the artesian area in the vicinity of Roswell. However, the altitude of water levels in the artesian wells near Roswell will always be somewhat lower than the altitude of the unconfined water levels west of Roswell. Clay lenses cause local artesian pressures in the alluvium in the Roswell area and in the valleys of the Rio Hondo, Rio Bonito, and Rio Ruidoso. These pressures do not affect significantly the height to which water will rise in a well.

Precipitation on the upland areas is the principal source of recharge for ground water in the Hondo basin. Most of the recharge water is from intense precipitation of short duration. The storm-runoff water collects in rocky arroyos and percolates downward through openings in the rock. Recharge from precipitation in 1941 was unusually large, because of greater than normal amounts of precipitation. Roswell and Capitan received 32.92 and 30.74 inches of precipitation, respectively, in 1941 -- more than half of which fell in May, September, and October.

The locations of wells, the depth to water and altitude of water levels in many of the wells, and the water-level contours in the Rio Hondo drainage basin are shown in plate 1. Additional data on the wells are given in table 1 and data on springs are given in table 2.

Geologic Formations and Their Water-bearing Properties

The rocks that crop out in the Rio Hondo drainage basin range in age from Permian to Recent. Their surface distribution is shown on the geologic map, plate 2, and the general physical and hydrologic properties of the rocks are summarized in the accompanying section. The basement rocks, according to logs of deep oil tests, consist of dacite, dacite porphyry, and granite or granite wash. These rocks probably are Precambrian in age. The geologic formations are described in ascending order on following pages.

Permian System

The Permian System in the Rio Hondo basin has been divided in ascending order into three formations: Yeso Formation, San Andres Limestone, and Artesia Formation. Rocks of Permian age but older than the Yeso Formation underlie the Yeso in the eastern part of the basin. Logs of two oil-test wells near Picacho indicate that the Yeso lies on Precambrian rocks, at least locally, in the central part of the basin. None of the rocks below the Yeso Formation are considered to be potential sources of ground water.

Yeso Formation

The Yeso Formation (Leonard Series) designated Nogal Formation in the Roswell basin by Nye (Fiedler and Nye, p. 70-76), consists of beds of siltstone, sandstone, shale, limestone, anydrite, gypsum, and salt. The bedding is generally thin, but varies from massive to very thin. Logs of oil-test wells indicate that the Yeso Formation is about 1,800 feet thick near Picacho and about 2,000 feet thick at Roswell.

The Yeso Formation underlies at varying depths most of the Hondo basin. The formation crops out in the valleys of the Rio Ruidoso and Rio Bonito and in the valley of the Rio Hondo west of Sunset (pl. 2). It also crops out on the flanks of the Pajarito and Capitan Mountains

GENERALIZED SECTION OF GEOLOGIC FORMATIONS AND THEIR HYDROLOGIC PROPERTIES IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

System	Stratigraphic Unit	Thickness (feet)	Physical Character	Hydrologic Properties	
				Yield (gallons per minute)	Water Quality
Quaternary	Alluvium	0-210±	Poorly sorted to well-sorted sand, gravel, and clay in lenses, stringers, and parallel beds.	10 to 3,500	Satisfactory for irrigation and stock use; usable for domestic supply.
	Alluvial fans	-	Mainly boulders and unsorted finer rock debris from intrusive igneous rocks.	-	Not utilized as a source of water
Quaternary(?) and Tertiary(?)	Pediment gravel	0-50±	Unsorted angular to rounded fragments of igneous, sedimentary, and metamorphic rocks.	-	Not utilized as a source of water.
	Unconformity				
Tertiary(?)	Intrusive and extrusive igneous rocks		Andesite, diorite, microgranite, and rhyolite dikes, sills, and stocks.	3±	Satisfactory for stock and domestic use.
	Cub Mountain Formation of Bodine (1956)	0-500±	Red and white sandstone and chert pebble conglomerate; varicolored shale.	5 to 50	Satisfactory for stock and domestic use.
	Unconformity				
Cretaceous	Mesaverde Formation	0-540±	Gray, yellow, and buff quartzose sandstone; gray shale; coal; and carbonaceous shale.	5 to 20	Satisfactory for stock; generally poor for domestic use.
	Mancos Shale	0-400±	Black fissile shale, thin-bedded limestone, and intercalated limestone and sandstone.	6 to 75	Generally highly mineralized; unsatisfactory for all common uses.
	Dakota Sandstone	0-130±	Ferruginous quartzose sandstone interbedded with gray shale and conglomerate.	5 to 125	Satisfactory for stock and domestic use.
	Unconformity				
Triassic	Chinle Formation	Unconformity 0-180±	Red and gray shale and white and gray dense limestone.	5+	Generally satisfactory for stock and domestic use.
	Santa Rosa Sandstone	0-380±	Gray, yellow, and tan sandstone; thin-bedded limestone; red and gray shale; and chert pebble conglomerate.	10±	Generally satisfactory for stock and domestic use.
Permian	Artesia Formation	0-450±	Gypsum, anhydrite, dolomite, impure limestone, siltstone, red shale and sandstone.	5±	Generally satisfactory for stock and domestic use in central part; poor to very poor in eastern part.
	Unconformity				
	San Andres Limestone	Unconformity 0-1,200	Mainly cherty limestone and dolomite; minor siltstone, sandstone, gypsum, anhydrite, and shale.	8 to 2,000	Generally satisfactory for irrigation, stock, and domestic use; highly saline in extreme eastern part.
	Glorieta Sandstone	0-160	Mainly light-tan to dark-red, medium-grained quartz sandstone; minor silty limestone, siltstone, gypsum, and anhydrite.	2 to 700	Generally satisfactory for irrigation, stock, and domestic use.
	Yeso Formation	1,000± to 2,000±	Thin-bedded red and yellow siltstone; some limestone, sandstone, shale, gypsum, anhydrite, and salt.	1 to 125	Generally fair for stock use; poor for domestic use.

and locally in the Mescalero Apache Indian Reservation. In the vicinity of Roswell the top of the formation is about 1,000 feet below the land surface.

The logs of oil wells indicate that salt beds are present throughout the interval of the Yeso Formation in the vicinity of Roswell. The logs of oil-test wells near Picacho do not record salt beds in the lower 1,300 feet of the formation, and salt beds were not observed in outcrops of the Yeso Formation in the Hondo basin, even where as much as 1,000 feet of the formation is exposed in the area north of Ruidoso

Downs (pl. 2). None of the logs of water wells in the basin contain records of salt beds in this formation. Salt probably was not deposited in the upper 500 feet of the Yeso Formation west of Picacho.

A 150-foot-thick sandstone unit of the Yeso Formation, locally termed the Drinkard Sandy Member of King (1945), lies 1,200 feet below the top of the formation and reportedly contained fresh water at the Stanolind oil test well (12.18.10.121) near Picacho. The sandstone unit was not observed in outcrops of the formation. The sandy member may be a potential source of ground water.

The Yeso Formation does not transmit water readily. The openings in the rocks generally are small, and much of the water in the zone of saturation is held in the formation by molecular and capillary forces. The beds of limestone and sandstone apparently transmit water to wells more readily than the other rocks. Where the formation is tightly folded, as in the Tinnie fold zone, transmission of water is negligible (see pl. 3A and B). Several wells drilled into the Yeso Formation where it is tightly folded were called dry holes. Eventually these wells filled with water to the level of the regional water table, but they do not yield enough water even for stock supply.

The water table in the Yeso Formation in the upland areas generally is in the upper three hundred feet of the formation.

The Yeso Formation generally crops out in steep slopes which are not conducive to ground-water recharge. Most of the recharge is from downward percolation of water through the more permeable alluvium, or through the San Andres Limestone which crops out more extensively than the Yeso. For several miles east of Picacho the water table in the Yeso Formation is below the streambeds, and water percolates from the streambeds through the alluvium to the Yeso Formation.

The general direction of ground-water movement in the Yeso Formation is to the east. Local folds and faults, such as the Border Hills structural zone, probably retard the eastward movement of ground water but do not stop it. (See pl. 3A and B.)

Water discharges from the Yeso Formation to the overlying alluvium in the valleys of the Rio Hondo, Rio Bonito, and Rio Ruidoso, maintaining perennial flow in long reaches of those streams. Ground water moves from the Yeso Formation into the Hondo Sandstone Member in the subsurface in the central part of the Hondo basin, and eventually reaches the Roswell artesian basin.

Several hundred stock and domestic wells obtain water from the Yeso Formation (table 1). Most of these wells yield less than 5 gpm. The Yeso does not yield adequate supplies of water for irrigation where it has been tested. Figure 4, which shows the fluctuations of water levels in four wells that tap the Yeso Formation, indicates that the Yeso Formation has not been developed to the extent that ground-water levels have declined significantly.

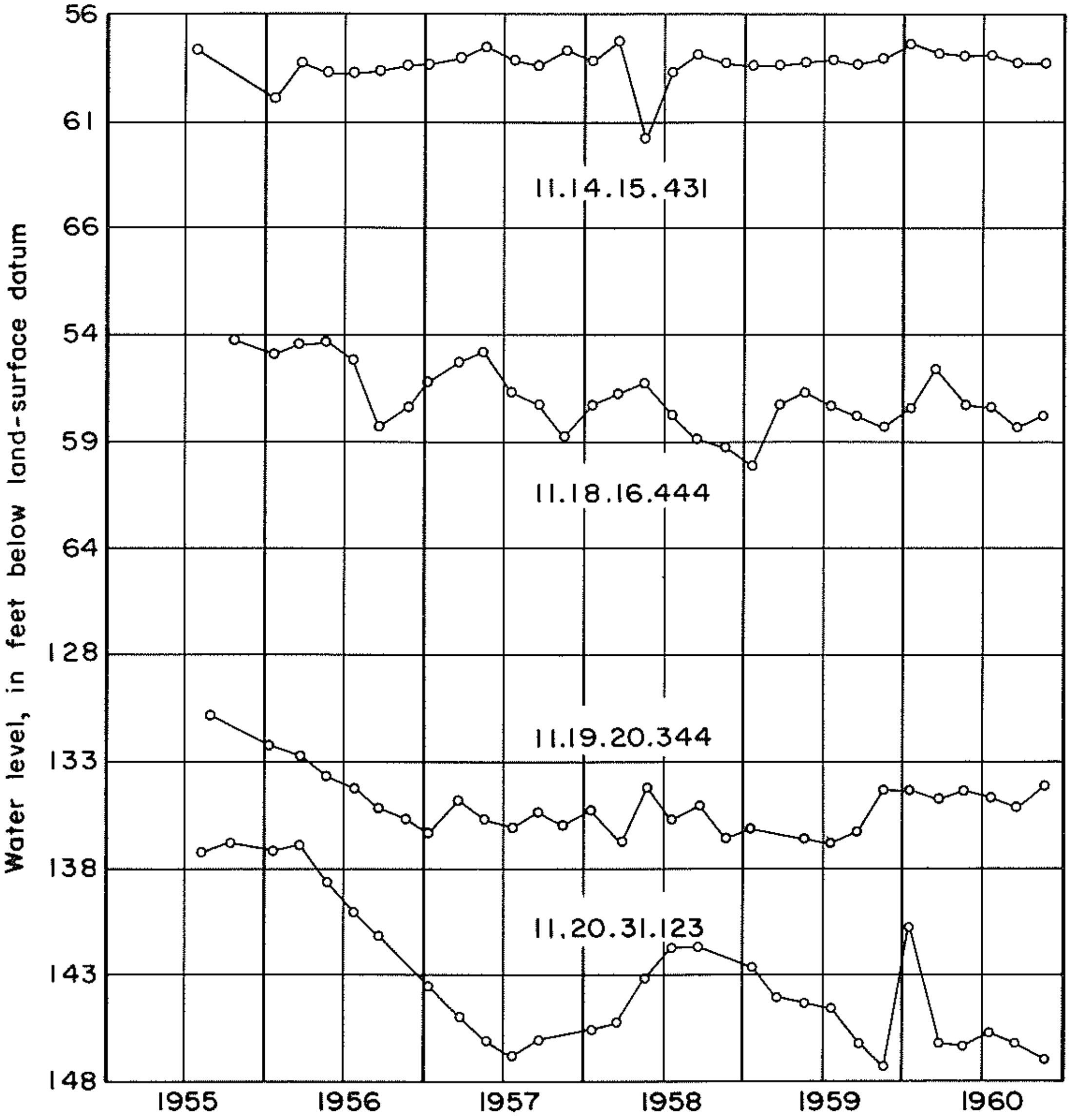


Figure 4.--Hydrographs of four wells that tap the Yeso Formation, Lincoln County, N. Mex.

Many more domestic and stock wells than now exist could obtain water from the Yeso Formation without noticeably lowering the regional water level in the formation. Stock wells that have been drilled into the zone of saturation in the Yeso Formation both from the tops of ridges and the bottoms of valleys generally have obtained sufficient amounts of water for stock.

Water in the Yeso Formation is hard, with a range of 404 to 2,520 ppm; and it is high in sulfate content, with a range of 541 to 2,130 ppm. (See table 3 and pl. 4.) Generally, the water from the Yeso Formation does not meet the U.S. Public Health standards for potable water of less than 1,000 ppm dissolved solids, but it has been used for domestic purposes for many years, apparently without ill effects.

San Andres Limestone

The Hondo Sandstone Member (Leonard Series) of the San Andres Limestone consists of a basal sandstone bed about 20 feet thick, beds of silty limestone, siltstone, gypsum, and anhydrite about 90 feet thick, and an upper bed of sandstone about 40 feet thick. The sandstone is friable, and it consists of well-sorted, medium, subangular, frosted grains of quartz cemented with limonite, which colors the sandstone light tan to dark red. The Hondo, as herein described, has been previously mapped as a member of the Chupadera Formation (Lang, 1937, p. 850), and is called the Glorieta Sandstone by Hood, Mower and Grogin (p. 13). The subangular, frosted, quartz grains and the absence of other minerals make the Hondo Sandstone Member a good marker bed, as it is easily distinguished from other formations in the area.

The Hondo Sandstone Member crops out in canyon walls in many places west of Riverside (pl. 2), and it underlies at varying depths most of the Hondo basin. The Hondo is an aquifer in much of the basin. It transmits water readily through the beds of sandstone, but some of the beds of siltstone are nearly impermeable. Cross sections through T. 9 S. and T. 11 S. indicate that the occurrence of water in the Hondo is influenced by both the structure and the stratigraphy of the formation. (See pl. 3A and B.) The thickness of the zone of saturation in the Hondo, as portrayed in the cross sections, ranges from 0 to 150 feet. The total volume of water in storage in the Hondo is large. The rock is highly permeable because the grains are well sorted and little of the intergranular space contains cement.

Fritz Spring (table 2), in sec. 29, T. 10 S., R. 17 E., discharges about 400 gpm of water from the Hondo Sandstone Member. In some parts of the basin water is discharged from the Hondo by evaporation and transpiration where the water table is near the land surface, as in T. 9 S., R. 18 E.

Many more stock and domestic wells could tap the Hondo without significantly lowering water levels. Figure 5 shows that the water levels in two wells that tap the Hondo have not been lowered by past withdrawal of water. Irrigation with water from the Hondo Sandstone is not feasible at most places, because the depth to water is too great or the land is unsuitable for cultivation.

Ground water in the Hondo is usually less saline than that in the Yeso Formation. (See table 3 and pl. 4.) The range in salinity is large, depending on whether the water has moved into the aquifer from the upper part of the San Andres Limestone, the Yeso Formation, or other sources. Water from the Hondo ranges in hardness (as calcium carbonate) from 287 to 830 ppm. The concentration of sulfate ranges from 128 to 617 ppm, that of chloride from 14 to 98 ppm.

The upper part (Guadalupe Series) of the San Andres Limestone consists of cherty limestone and dolomite and minor amounts of siltstone, sandstone, gypsum, anhydrite, and shale. Limestone or dolomite from the lower half of this unit is exposed in the Hondo basin from 3 miles to 60 miles west of Roswell (pl. 2). In the eastern part of the

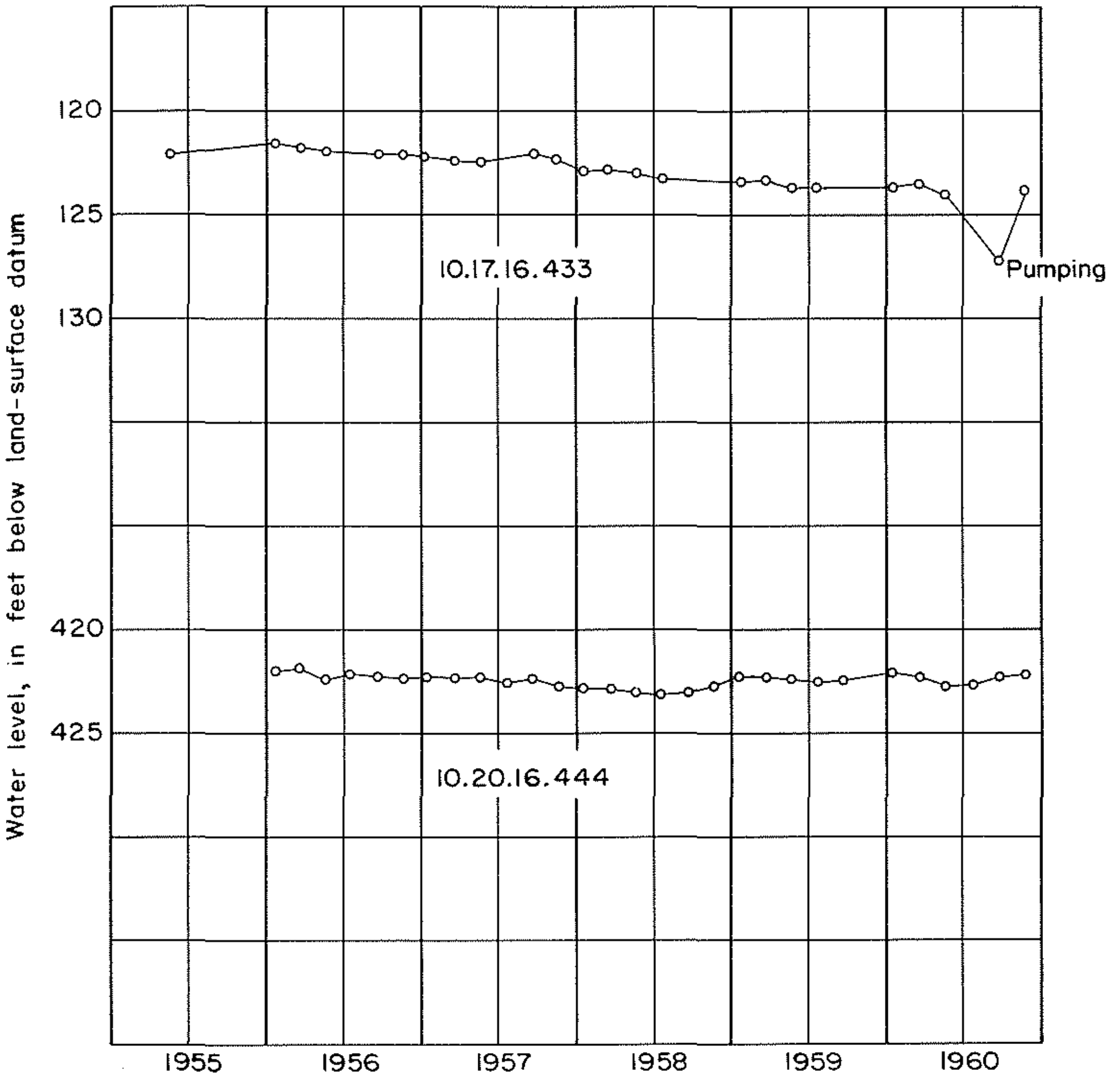


Figure 5.-- Hydrographs of two wells that tap the Hondo Sandstone Member of the San Andres Limestone, Lincoln County, N. Mex.

Hondo basin the San Andres Limestone is overlain by the Artesia Formation or by alluvium.

The upper part of the San Andres is about 1,200 feet thick east of the Pecos River in Tps. 10-11 S., Rs. 26-27 E., according to logs of oil wells. West of the Pecos River in Tps. 10-11 S., R. 24 E., the upper part of the San Andres is about 750 feet thick. Morgan states that evidence supports hypothesis that cavernous zones were formed in the San Andres Limestone during an erosional interval in Permian time (Morgan, 1941, p. 782). In the outcrop area the maximum thickness of the upper part of the San Andres is about 700 feet. Allen and Jones (1951) reported that the upper part of the San Andres was 685 feet thick in the Salado Creek area of Lincoln County. In that area the contact between the San Andres and the overlying Artesia Formation is not exposed. Kelley (1952, p. 69) stated that about 1,000 feet of the upper part of the San Andres is exposed in the area west of the Capitan Mountains in T. 8 S., R. 14 E., and that the complete thickness is not exposed. The San Andres as defined by Kelley includes the Artesia Formation of this report. An oil-test well near Capitan in sec. 36, T. 8 S., R. 14 E., penetrated 360 feet of San Andres.

Nearly all the wells that penetrate the San Andres Limestone intersect cavities, some more than 1 foot across, in the limestone and dolomite. The cavities were caused by the enlargement of joints and other openings by solution. The large solution channels transmit water readily through the San Andres Limestone, as is evidenced by the low gradient of the water table in the area west of Roswell and the rapid response of the water levels to pumpage from the artesian aquifer (fig. 6). Well logs indicate that the San Andres is porous throughout most of the basin. There are a few impermeable beds in the San Andres which result in perched water, but these beds are not extensive.

The westward-dipping beds of the San Andres Limestone in the western part of the basin appear to be very permeable in the outcrop area, but little is known of their character in the subsurface. The well used for a standby supply at Fort Stanton yields about 150 gpm at a drawdown of 54 feet, and it probably taps the westward-dipping beds of the San Andres. A short distance west of Fort Stanton the depth to the San Andres is several hundred feet, and wells have not been drilled to the formation.

The San Andres Limestone stores large amounts of ground water in the eastern part of the basin. The numerous large interconnected openings in the rocks are filled with water to the level portrayed on the cross section through T. 11 S. (see pl. 3). The San Andres does not contain ground water in most of the central part of the basin, except for perched water locally, because the formation is drained effectively by the permeable beds that it contains.

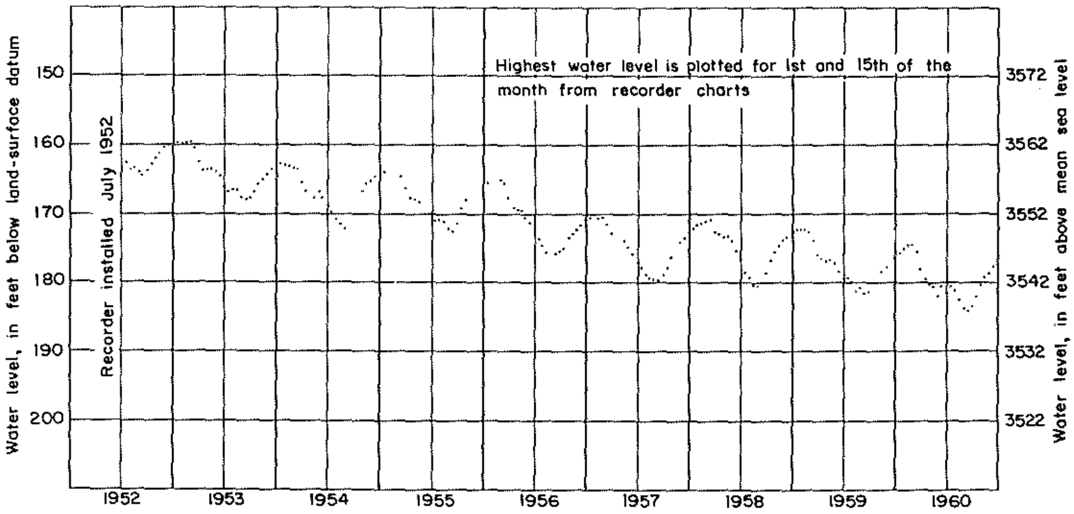


Figure 6.--Hydrograph of well 11.23.3.342, which taps unconfined water in the San Andres Limestone, Chaves County, N. Mex.

The ground water in the San Andres Limestone is recharged by precipitation on its outcrops and by ground water moving down the water table gradient from the Hondo Sandstone Member into the upper part of the San Andres Limestone. The extensive outcrop of San Andres in the Hondo basin provides excellent opportunity for water to enter the rock and recharge the San Andres Limestone and underlying formations.

Recharge from the above-normal precipitation of 1941 raised the water table in the San Andres Limestone west of Roswell about 17 feet, which indicates a large increase in ground water storage. The large rise in water level caused the springs in the vicinity of Roswell to start flowing again (Theis, p. 35). After 1942 the water level in the San Andres declined about 1½ feet per year but did not reach the 1940 level until 1950 (fig. 7). The amount of precipitation in 1941 was unusual, and it may not be duplicated for hundreds of years. Figure 8

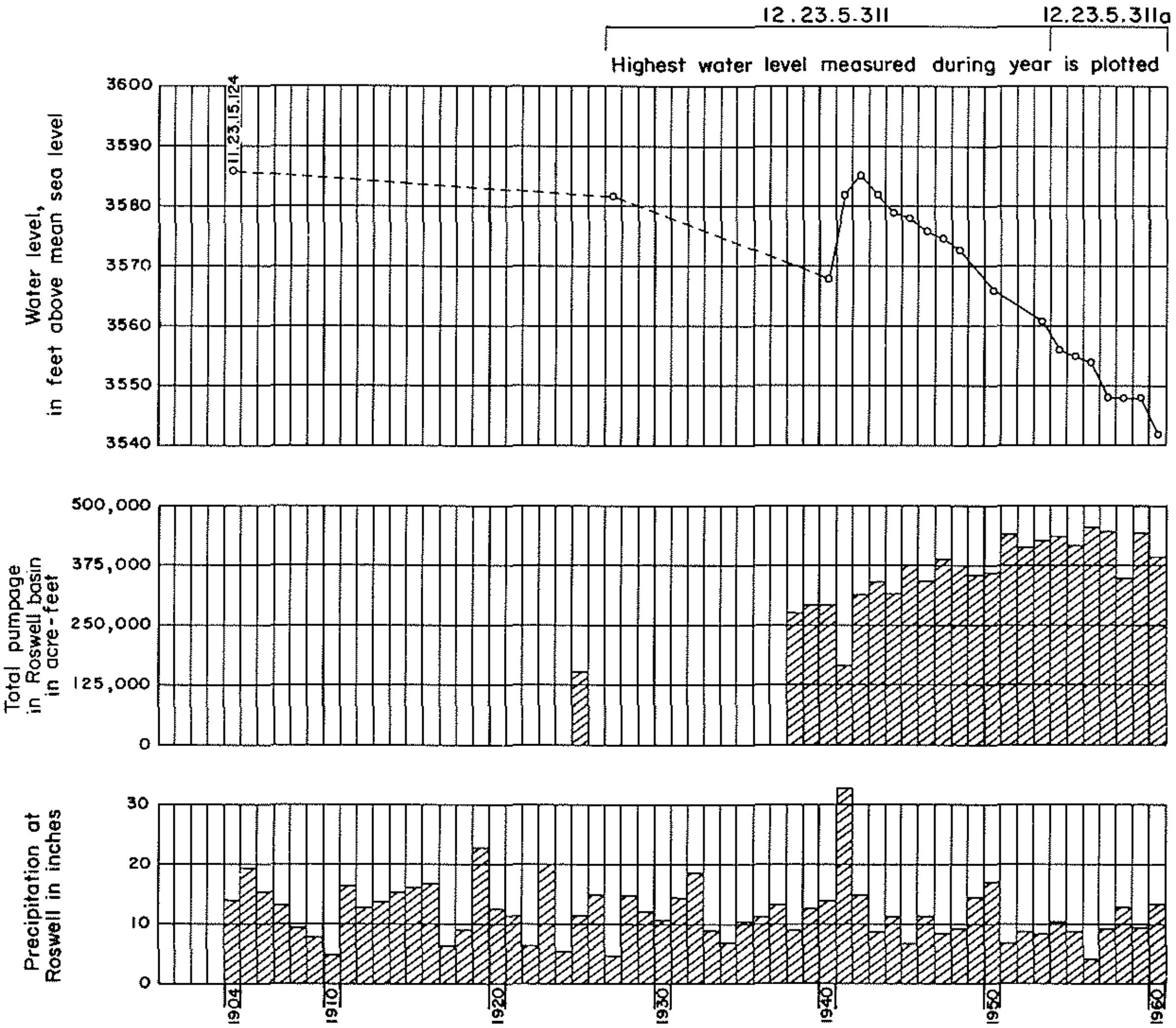


Figure 7.--Hydrograph showing the trend of the nonartesian water level in the San Andres Limestone in the vicinity of Hondo Reservoir, Chaves County, N. Mex., 1904-60, and its relation to precipitation and pumpage.

shows a comparison of water levels in well 11.23.3.342 with precipitation in 1960. The hydrograph indicates that water levels in the well are not affected as much by recharge from precipitation as by other factors.

Local rainfall may cause a decrease in pumpage with subsequent rise in water levels in the well, such as occurred in June and July, 1960. During periods of minor pumpage, such as October, the heavy rainfall (3.5 inches) did not cause a sharp rise in water levels, because the relative decrease in pumpage was small. This demonstrates that fluctuations in the water levels in the Roswell artesian basin are caused mainly by pumpage rather than by recharge from local precipitation.

The saturated zone in the westward-dipping San Andres Limestone in the western part of the Hondo basin is recharged by ground water moving down the water-table gradient from the overlying younger formations and from precipitation on the outcrop of the San Andres.

Water in the San Andres Limestone moves generally to the east, perpendicular to the contours on the water table west of Roswell. The Sixmile Hill structural zone does not appear to cause any change in the configuration of the water table, but it may retard slightly the movement of the ground water.

Ground water discharges naturally from the upper part of the San Andres Limestone by downward percolation into the Hondo Sandstone Member in the central part of the basin or by upward leakage into the semiconfining beds of alluvium and the Artesia Formation in the eastern part of the basin. North and South Springs and Berrendo Springs near Roswell were artesian springs that originally discharged large amounts of ground water.* These springs ceased to flow when the head in the artesian aquifer declined because of the withdrawal of ground water for irrigation, but the springs flowed again for several months following the rise in head in the artesian aquifer which resulted from more than normal precipitation in 1941 (Theis, p. 35). Ground water probably does not discharge from the San Andres Limestone east of the Pecos River, as logs of oil wells indicate that the water in the San Andres in that area is a brine. Also, in some areas east of the Pecos River oil is obtained from the San Andres Limestone. Some ground water may be moving from the westward-dipping beds of the San Andres Limestone in the western part of the basin into other formations in the Tularosa basin.

The discharge of ground water from the San Andres Limestone by Government Spring reportedly has diminished significantly since 1950. The diversion of water from the Rio Hondo drainage basin to the Tularosa basin probably has caused the flow of Government Spring to

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* North and South Springs were at the head of North Spring River and South Spring Creek, respectively. The Berrendo Springs were in sections 5, 8, and 9 of T. 10 S., R. 24 E.

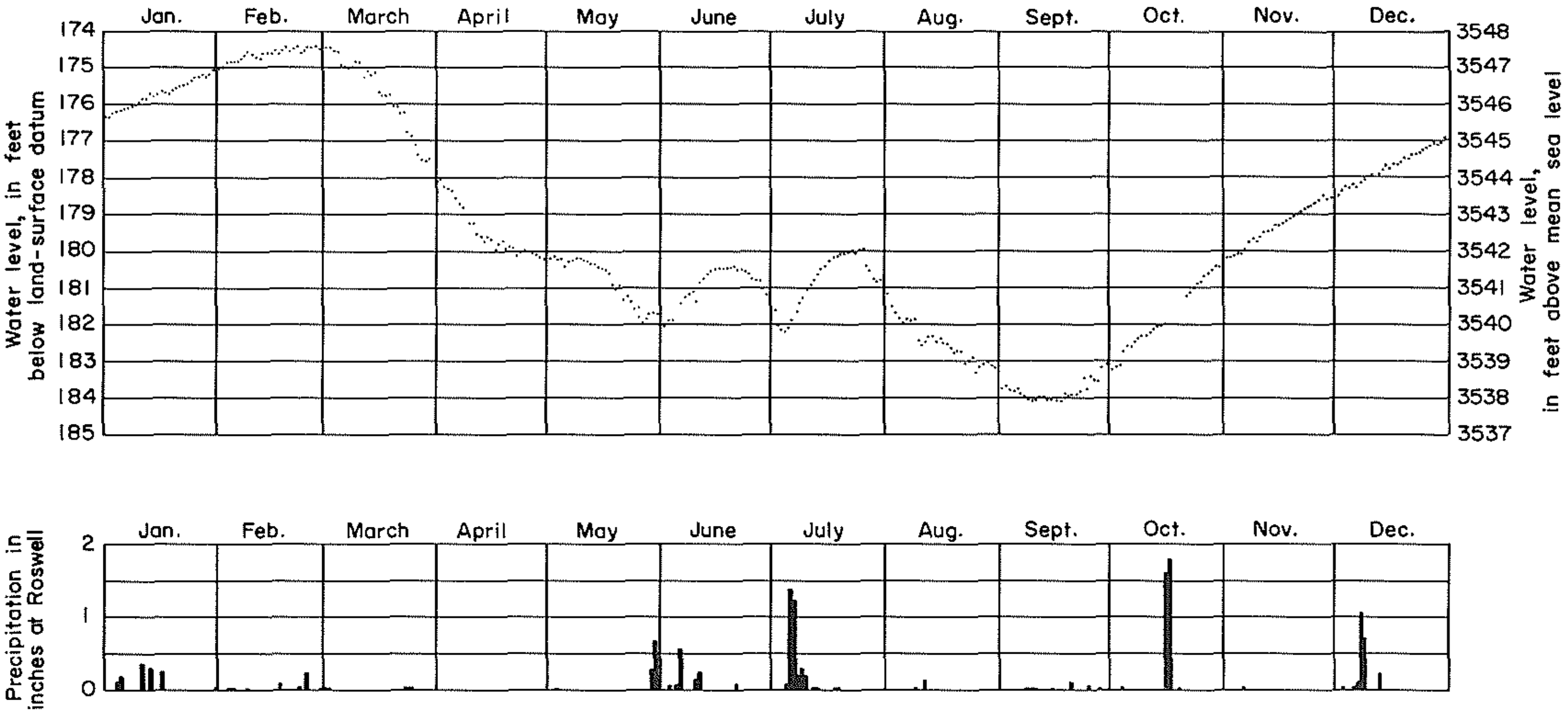

Figure 8.--Comparison of water levels in well 11.23.3.342 with precipitation at Roswell in 1960. Daily high from recorder graph is plotted.

diminish because of a reduction of ground-water recharge in the area above the springs. The report of the Hondo Hydrographic Survey (Sullivan, 1909, p. 11) says, "There is no relationship between the waters of the South Fork of the Bonito and the waters of the Government Springs." These waters are related, as there is a continuous water table between the two areas.

Ground water is discharged artificially by several hundred wells that tap the San Andres Limestone (table 1). Many of the irrigation and municipal wells yield about 2,000 gpm each from the San Andres Limestone in the Hondo basin near Roswell. The many stock and domestic wells discharge 5 to 10 gpm of water each from the San Andres Limestone.

The annual lowering of the water table in the San Andres Limestone west of Roswell (fig. 7) indicates that water is being removed from ground storage faster than it is being replaced. Additional development would result in more rapid depletion of the water in storage. Salt-water encroachment into the fresh water in the aquifer and higher pumping lifts will result from further lowering of the artesian pressure.

Water in the San Andres Limestone is very hard. (See table 3 and pl. 4.) The water is suitable for irrigation except in the area east of Roswell, where it contains excessive amounts of chloride. Hardness of the water ranged from 340 to 1,050 ppm, the sulfate concentration ranged from 119 to 765 ppm, and the chloride concentration ranged from 14 to 340 ppm (table 3 and pl. 4). Water from wells in the extreme eastern part of the Hondo basin contains more than 3,000 ppm chloride. This area contained saline water when the artesian basin was first discovered about the turn of the century. Because of decreased pressure in the artesian aquifer, the saline water has encroached into the fresh-water zone in a general westward direction. The rate of saline-water encroachment was about 0.1 mile annually between August 1952 and September 1957 (Hood, Mower, and Grogin, p. 33).

Artesia Formation

The Artesia Formation (Guadalupe Series) consists of siltstone, gypsum, shale, anhydrite, sandstone, and thin beds of impure limestone or dolomite. An erosional unconformity separates the Artesia Formation from the underlying San Andres Limestone. In the Hondo basin the Artesia Formation probably includes equivalents of the Bernal Formation the Whitehorse Group, undifferentiated rocks of Guadalupe age, and the lower formations of the Artesia Group. Tait and others (1962) proposed the term Artesia Group for the formations between the top of the Tansill Formation to the base of the Grayburg Formation.

The Artesia Formation crops out in a narrow belt in the western part of the basin and near Sixmile Hill (pl. 2), but it is generally poorly exposed in the basin. In the Fort Stanton area the formation includes tan and red siltstone, thin-bedded limestone, and gypsum. Because the formation is easily eroded and has little topographic expression, the outcrops are principally in roadcuts or in canyons where the formation is overlain by the more resistant beds of the Santa Rosa Sandstone.

The outcrops in the Sixmile Hill area consist of red beds and gypsum. Logs of wells that penetrate the formation in the subsurface in the vicinity of Roswell list the rocks as red beds, gypsum, sandstone, shale, clay, and limestone.

In the western part of the basin, the openings in the Artesia Formation are mainly joints and bedding planes in the beds of siltstone, limestone, and gypsum. In the vicinity of Roswell the limestone and gypsum are thicker, and they contain solution channels that are filled with ground water. The beds of siltstone in the Artesia Formation tend to confine the water in the San Andres Limestone in the vicinity of Roswell.

Water in the Artesia Formation in the eastern part of the Hondo basin is mainly recharged by upward leakage from the San Andres Limestone and moves into the overlying alluvium and is discharged eventually to the Pecos River.

The yield of water from the Artesia Formation is variable. In the western part of the Hondo basin the few wells that tap the Artesia yield about 5 gpm. In the eastern part of the basin yields of 20 gpm are common, and near the Pecos River where the water in the formation is under greater artesian pressure larger yields are obtained.

The chemical quality of water from the Artesia Formation was not determined, but the large quantities of gypsum in this formation suggest that the water would be high in calcium and sulfate concentrations.

Triassic System

Santa Rosa Sandstone

The Santa Rosa Sandstone (Upper Triassic), lower formation in the Dockum Group, consists of sandstone, siltstone, limestone, shale, and conglomerate. The Santa Rosa crops out (pl. 2) or is overlain by younger formations only in the western part of the Hondo basin. Allen and Jones reported a thickness of 295 feet for the formation in the southeastern part of the Capitan quadrangle. An oil-test well in sec. 19, T. 8 S., R. 14 E., penetrated 380 feet of Santa Rosa Sandstone. In the village of Capitan a test well penetrated 300 feet of the Santa Rosa.

The Santa Rosa Sandstone commonly yields about 10 gpm of water to wells. Larger yields probably could be obtained from fully developed wells in favorable areas. The water is generally satisfactory for stock and domestic use.

Figure 9 shows the fluctuations of water levels in well 9.14.12.324 which taps the Santa Rosa Sandstone. The cause of the large fluctuation in 1956-57 is not known.

Chinle Formation

The Chinle Formation (Upper Triassic), upper formation in the Dockum Group, consists mainly of red shale where it crops out near Capitan. Cuttings from a water well at Capitan indicate that the Chinle also contains gray shale and white, gray and pink, dense limestone. The Chinle crops out (pl. 2) or underlies younger formations only in the western part of the Hondo basin. Allen and Kottlowski (1958) reported that the formation was 181 feet thick, where measured.

The Chinle Formation yields about 5 gpm of water moderately low in dissolved solids to stock and domestic wells.

Rocks of Jurassic age have not been definitely identified in the Hondo basin. Allen and Jones (p. 3) mention the possibility that a few feet of limestone overlying the Chinle Formation may be a part of the Morrison Formation of Late Jurassic age. A reconnaissance geologic map of the Ruidoso area by G. H. Wood and C. R. Murray shows questionable Morrison Formation in fault contact with the San Andres Limestone (Jones and Murray). The preliminary geologic map of southeastern New Mexico by Dane and Bachman (1958) does not list Jurassic rocks in the Hondo basin. The rocks that have been tentatively assigned to the Jurassic System by previous investigators are included in the Chinle Formation in this report.

Cretaceous System

Dakota Sandstone

The Dakota Sandstone, which crops out (pl. 2) or underlies younger formations only in the western part of the Hondo basin, consists of ferruginous, quartzose sandstone interbedded with gray shale and conglomerate. The Dakota is a cliff-forming sandstone, and the faces of the cliffs commonly are stained with iron oxide. A water well drilled at Capitan penetrated 130 feet of the Dakota Sandstone, and Allen and Jones reported a thickness of 134 feet for the Dakota. In the Hondo basin the Dakota grades into the Mancos Shale, and a sharp contact is not discernible. Allen and Kottlowski (p.22) have described the contact as the place where the beds contain more than 50 percent shale in relation to sandstone.

The Dakota Sandstone generally is an excellent aquifer for small to moderate water supplies in the western part of the basin. Yields of 5 to 125 gpm have been obtained. The water in the Dakota appears to be of excellent chemical quality, except where it has moved into the Dakota from the overlying Mancos Shale.

Mancos Shale

The Mancos Shale (Upper Cretaceous) which crops out (pl. 2) or underlies younger formations only in the western part of the basin

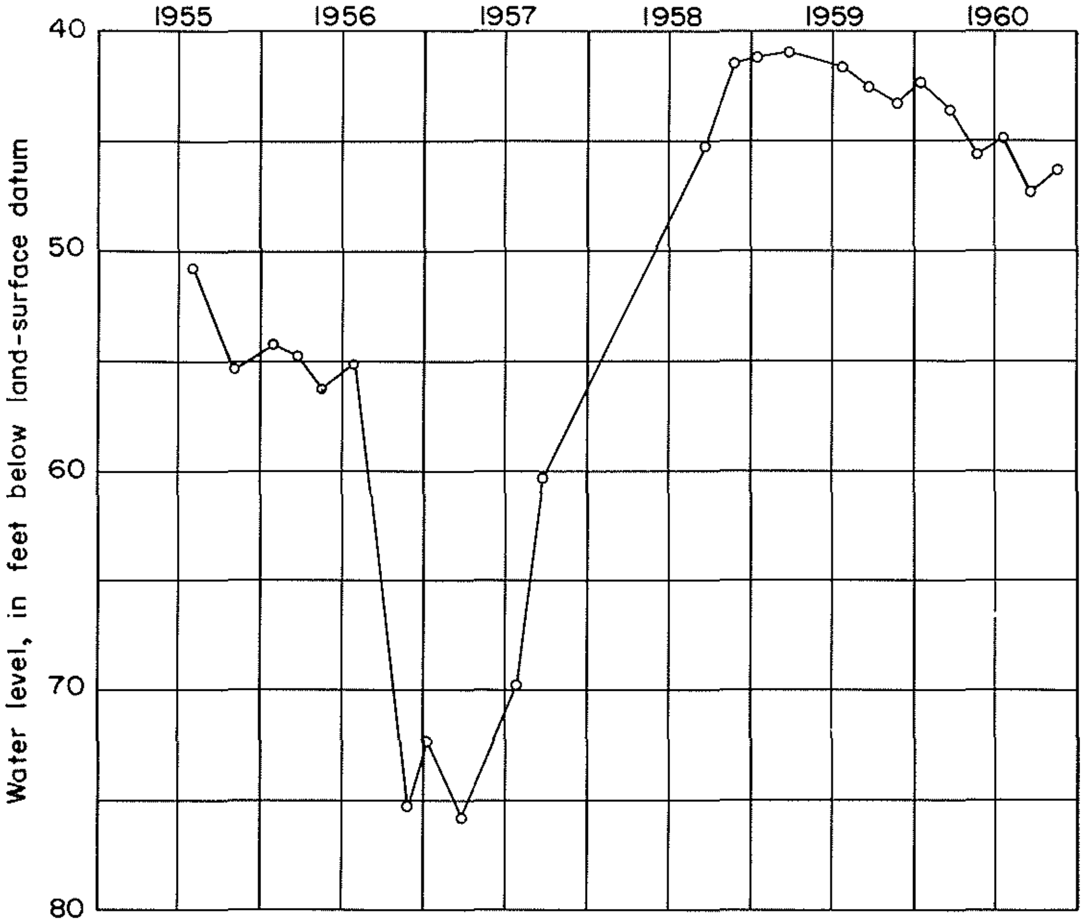

Figure 9.--Hydrograph of well 9.14.12.324, which taps the Santa Rosa Sandstone, Lincoln County, N. Mex.

consists of black fissile shale and thin-bedded or fissile limestone, intercalated with beds of sandstone in the upper part of the formation. The Mancos underlies many of the grass-covered valleys in the vicinity of the villages of Capitan and Ruidoso. The Mancos was reported to be 389 feet thick by Allen and Jones.

The Mancos Shale yields 6 to 75 gpm of water containing the greatest concentration of dissolved solids in the Hondo basin. (See table 3.)

Mesaverde Formation

The Mesaverde Formation (Upper Cretaceous) which crops out (pl. 2) or underlies younger formations only in the western part of the basin consists of quartzose sandstone, thin beds of limestone, siltstone, shale, and coal. The sandstone is gray, yellowish-brown, and buff. The sandstone is thin bedded to massive and partly crossbedded. It generally is coarse grained, although in part it is poorly sorted. The grains are angular to well rounded. The limestone is interbedded with gray shale. The shale generally is fissile, dark colored, and carbonaceous. Bituminous coal is common, but the beds are thin.

Bodine (1956, p. 6) divided the Mesaverde into three units: a lower sandstone unit about 156 feet thick, a middle shale unit about 275 feet thick, and an upper sandstone unit about 60 feet thick. Bodine stated that the upper sandstone unit may be part of the Cub Mountain Formation of Bodine.

The Mesaverde yields 5 to 20 gpm of water of poor chemical quality to domestic and stock wells. The coal beds and the carbonaceous shale contribute to the poor quality of the water.

Tertiary(?) System

Cub Mountain Formation of Bodine (1956)

Bodine (p.8-11) describes the Cub Mountain Formation, which crops out only in the western part of the area (pl. 2), as a chert-pebble conglomerate overlain by a series of poorly indurated beds of sandstone, siltstone, and variegated shale. He states that the formation must be at least 500 feet thick in the Capitan area. Allen and Kottlowski (p. 25) state that the Cub Mountain Formation is at least 2,200 feet thick at Cub Mountain south of Carrizozo, a few miles west of the area of this report.

The Cub Mountain Formation of Bodine yields 5 to 50 gpm of water to wells. The chemical quality generally is poor for domestic use but satisfactory for stock. The depth to the water table generally is within 200 feet of the land surface.

Igneous Rocks

Intrusive igneous rocks of the Hondo basin crop out on Sierra Blanca, in the Capitan Mountains, on Pajarito Mountain, and in many sills and dikes west of Tinnie (pl. 2). Extrusive igneous rocks crop out on Sierra Blanca, and they probably make up a large part of the mountain. The extrusive igneous rocks are complexly interspersed with the intrusive rocks. All the igneous rocks probably are Tertiary in age. They consist mainly of granite, rhyolite, trachyte, and diorite. The Capitan Mountains are composed of microgranite that is remarkably uniform in texture throughout its length and breadth.

Pajarito Mountain is an igneous intrusive body, probably Tertiary in age, that has domed the rocks of the Yeso Formation, the Hondo Sandstone Member, and the upper part of the San Andres Limestone. Motts and Gaal studied the intrusive body and concluded that the core is syenite and that the rocks grade outward into granite adjacent to their contact with the Hondo (Ward S. Motts, written communication).

Many dikes and sills have intruded Permian and younger strata west of the Tinnie fold zone. Many sills have intruded the Permian rocks along the contacts of the Yeso, Hondo, and San Andres. The intensity of intrusions increased progressively westward. In the Sierra Blanca area the contact between the sedimentary and the igneous rocks is difficult to determine because of the great amount of igneous activity that has taken place.

Most of the dikes or sills have altered or baked a few inches of the intruded rock on each side of the intrusive body. Near the Sacramento Mountains the intrusive activity was so intense that the Mesaverde Group and the Cub Mountain Formation of Bodine (1956) have been greatly altered in character and composition.

Most of the water in the igneous rocks is in joints, which generally decrease in size and number with depth. Many small springs discharge ground water from igneous rocks of the Sacramento Mountains and the Capitan Mountains. Most of these springs probably are gravity springs, that is, springs at places where the water table coincides with the land surface. Some of the springs may be along the contacts between intrusive and extrusive rocks which have different capacities for storage and transmission of water.

Only small domestic supplies of water have been obtained from the igneous rocks in the Hondo basin. Two analyses of water from igneous rocks are given in table 3. The quality of this water is by far the best of any ground water in the area.

Tertiary(?) and Quaternary(?) Rocks

Pediment gravels of probable Tertiary and Quaternary age, consisting of angular to rounded unsorted fragments of igneous, sedimentary, and metamorphic rocks, cap several flat-topped, high ridges in the western part of the basin (pl. 2). These deposits range in thickness from 0 to 50 feet, and they lie on an erosional plane that truncates rocks ranging in age from Permian to Cretaceous. The pediment gravels probably do not contain ground water.

Quaternary System

Alluvium

Alluvium of Quaternary age has accumulated in a large area in the eastern part of the Hondo basin, in the main stream valleys, around the base of the Capitan Mountains, and in a few upland areas (pl. 2).

The alluvial plain in the eastern part of the basin consists of unconsolidated to partly consolidated sand, gravel, and clay. Most of the alluvium was derived from the San Andres Limestone. Porphyritic igneous rocks from the Sacramento Mountains and microgranite from the Capitan Mountains have been observed also. Nye (Fiedler and Nye, p. 28-40) and Morgan (1938, p. 167-171) have described the alluvium of the eastern plain in detail. The thickness of the alluvium in the eastern part of the basin ranges from 0 to 210 feet.

The alluvium in the eastern part of the Hondo basin is recharged mainly by upward leakage of water from the underlying Artesia Formation or San Andres Limestone. Additional recharge comes from irrigation water and direct precipitation. Yields of 1,000 gpm from wells that tap the alluvium are common, but the yields of wells vary widely even between wells that are only a few hundred feet apart. The ground water in the alluvium in the eastern part of the Hondo basin moves in an easterly direction and some discharges into the Pecos River.

The ground water in the alluvium in the eastern part of the Hondo basin is satisfactory for irrigation except in the extreme eastern area where it is too saline for irrigation. The ground water in this part of the area has been saline since before the turn of the century when the development of the artesian basin was begun. As the salt water encroaches westward in the San Andres Limestone, because of lowering pressures, saline water can be expected to encroach into the alluvium also, because the principal recharge to the alluvium is from the San Andres.

Alluvium has accumulated in narrow, irregular bands in the valleys of Rio Hondo, Rio Bonito, and Rio Ruidoso, and in the small tributary canyons. The alluvium consists of poorly sorted, unconsolidated to weakly consolidated, angular to well-rounded particles ranging from clay to boulders as much as a foot in diameter. The material is stratified in stringers, lenses, and even parallel beds at places, especially in the eastern part of the basin. The clay lenses are semiconfining layers locally, and where they are extensive they cause artesian conditions in the underlying coarser material. Some of the springs in the river channels discharge water from the artesian beds. Nye stated that perched ground water exists locally in the alluvial deposits of the Rio Hondo, in a well in sec. 20, T. 11 S., R. 21 E. (Fiedler and Nye, p. 120).

Ground water in the valley alluvium is recharged by migration of water from the zone of saturation in the Yeso Formation and by floodflows, irrigation, and precipitation.

Natural discharge is by numerous springs and seeps that issue into the entrenched meanders of the Rio Hondo, Rio Bonito, and Rio Ruidoso, and by evapotranspiration where the water table is shallow.

The hydrographs of water levels in 10 wells that tap the valley alluvium of the Hondo basin indicate that the water supply in the alluvium has not been overdeveloped (figs. 10-13).

The chemical quality of the ground water in the valley alluvium and that of the base flow of the Rio Hondo, Rio Bonito, and Rio Ruidoso is similar at most places, because the base flow is maintained by ground-water discharge from the alluvium. The water in the valley alluvium is hard (720 to 1,080 ppm hardness); the range of sulfate concentrations is 511 to 796 ppm, and the range of chloride concentrations is 37 to 67 ppm. The water is satisfactory for irrigation use, but most is too hard and too high in sulfate content to be desirable for domestic supply, even though it is widely used for this purpose.

The alluvium around the base of the Capitan Mountains forms a series of coalescing fans which consist of unsorted rock debris from the microgranite intrusive rocks. The fans slope about 500 feet to the mile away from the Capitan Mountains. The alluvium ranges from a fine sand to boulders several feet in diameter. The thickness is not known. A well drilled in sec. 10, T. 9 S., R. 16 E., near the front of the alluvial-fan material, penetrated 60 feet of boulders. Only a few wells have been drilled through this alluvium, mainly because of the difficulty of drilling through boulder deposits.

A few springs on the lower slopes of the Capitan Mountains discharge ground water from the alluvium. Most of the alluvium in the fans does not contain water, because the coarse texture of the material permits rapid percolation of the water downward into underlying formations.

The alluvium in the upland areas probably is less than 20 feet thick, and it occurs in broad valleys or canyons. Most of the upland alluvium overlies the Yeso or Hondo and forms a treeless, grass-covered surface. The upland alluvium does not contain ground water.

Structure

The rock strata in the Rio Hondo drainage basin dip generally eastward at about 1 degree. The gentle eastward dip is interrupted locally by many sharp folds (pl. 3A, B, and C). The strata in the western part of the area dip westward at angles of several degrees, as determined by well logs (pl. 3A and B). The westward dipping beds are on the east flank of the Sierra Blanca synclinorium.

Some of the other structural features in the Hondo basin are Sixmile Hill structural zone, Border Hills structural zone, Picacho anticline, McKnight anticline, Tinnie fold zone, McDaniel anticline, and the anticlinal area from Salazar Canyon through Ruidoso.

The Sixmile Hill structural zone is less than a mile wide and about 70 miles long, trending northeast from T. 17 S., R. 17 E., to T. 9 S., R. 24 E. Twenty miles of this zone is in the Hondo basin. The structure rises about 200 feet above the surrounding area in the southern part and about 50 feet in the northern part of the Hondo basin. The structure is anticlinal with many minor folds which can be seen in the road cuts 6 miles west of Roswell. The structural relief caused by the folding is about 300 feet. Escarpments of westward-dipping strata on the east side of the structural zone in T. 10 S. mark a fault zone with the downthrown side on the east. The magnitude

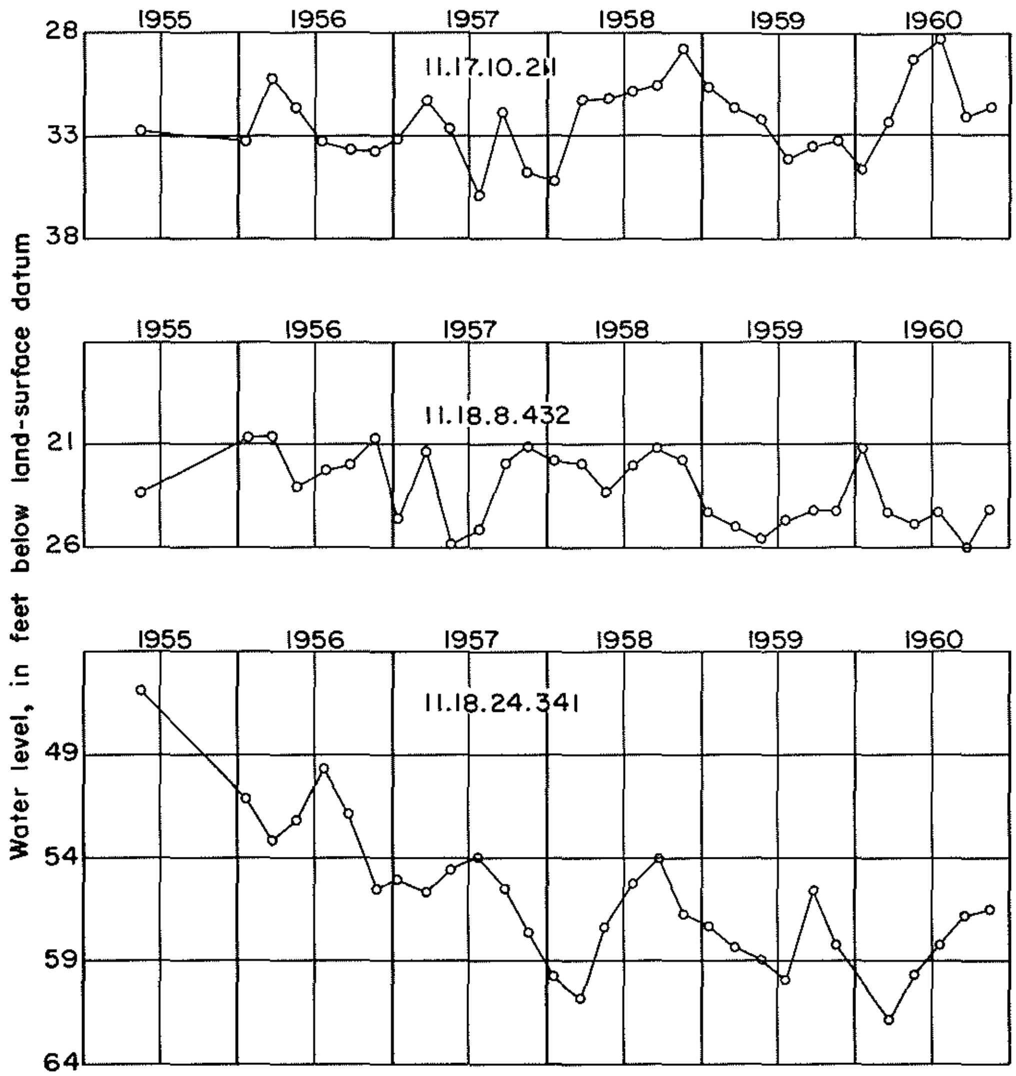

Figure 10.-- Hydrographs of three wells that tap the alluvium of the Rio Hondo, Lincoln County, N. Mex.

of displacement probably was a little less than 100 feet. No evidence of faulting is present in T. 11 S. in the vicinity of the Hondo Reservoir.

The Border Hills structural zone forms a prominent topographic ridge less than a mile wide and about 50 miles long, which extends from T. 7 S., R. 23 E., to T. 14 S., R. 18 E. Twenty-three miles of this zone is in the Hondo basin. The ridge rises about 300 feet above the surrounding area in the southern part and about 50 feet in the northern part of the Hondo basin. It appears to be a very narrow fold combined with a thrust fault. Stipp (1956, p. 17) states that the Border Hills and Sixmile Hill structural zones probably are surface

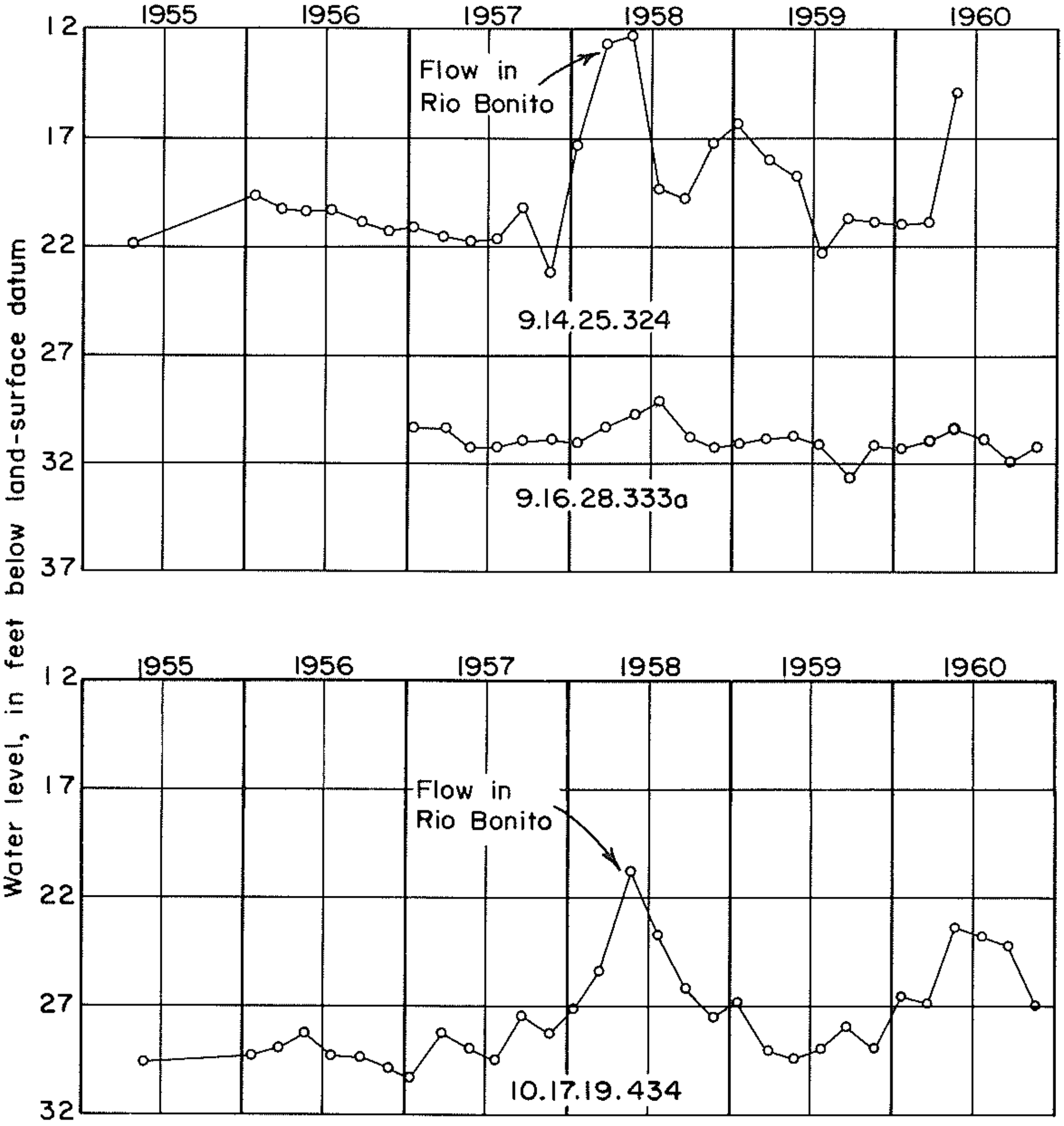

Figure 11.-- Hydrographs of three wells that tap the alluvium of the Rio Bonito, Lincoln County, N. Mex.

expressions of faults extending up from the Precambrian basement rocks. Some of the strata in the structural zone are vertical. The structural relief caused by the folding and faulting is about 800 feet.

Several large faults have been mapped in the area near Capitan (pl. 2). Bodine (p. 14) states that many faults in the Capitan area have displacements of 5 to 10 feet.

Some springs in the Hondo basin reflect the control of geologic structure on the movement of ground water. Two such springs are Hale Spring and Fritz Spring. (See table 2.) These springs issue from rock$ which have been folded and faulted in such a manner that normal ground-

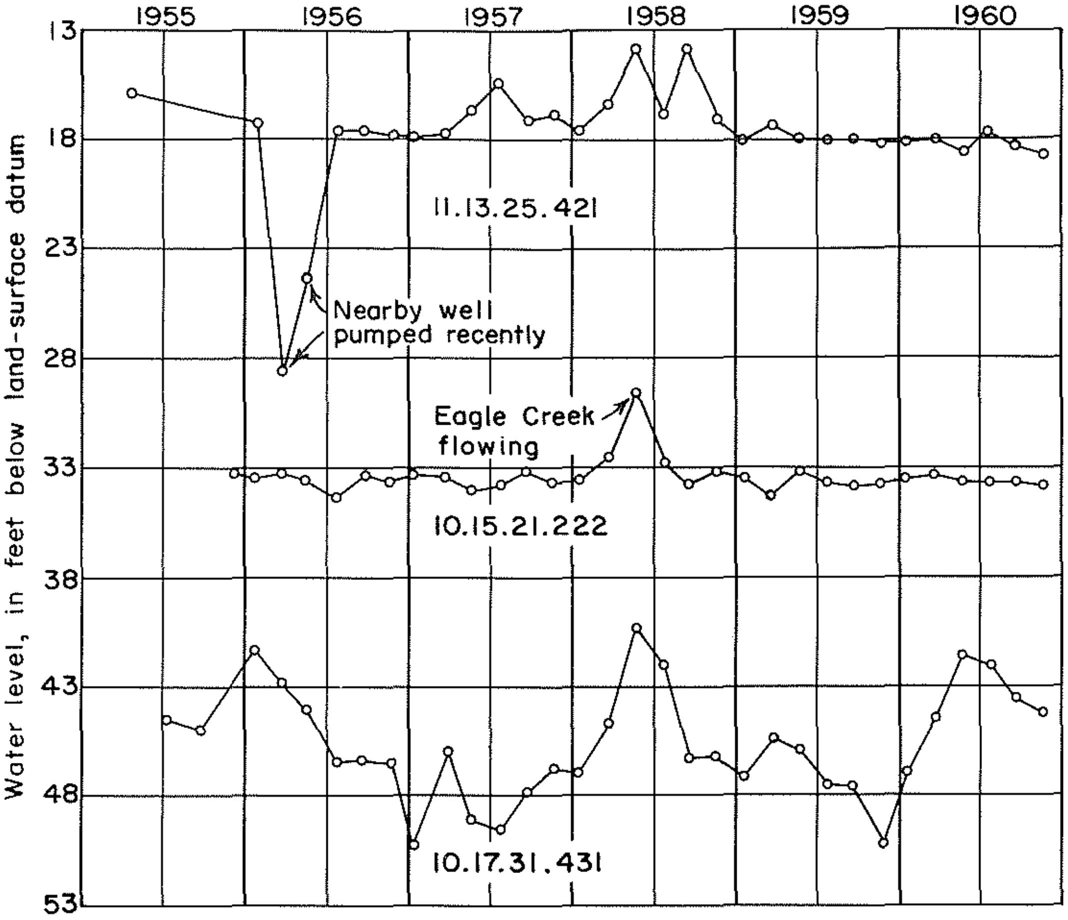

Figure 12.--Hydrographs of three wells that tap the alluvium of Eagle Creek and Rio Ruidoso, Lincoln County, N. Mex.

water movement has been restricted. Lincoln Spring probably is controlled by structural deformation also.

Chemical Quality of Water

Water is often called a universal solvent, and it dissolves and retains in solution, until evaporated, some part of most substances with which it comes in contact. The relative abundance and the solubility of the many types of minerals varies widely in the Rio Hondo drain age basin, so that the chemical quality of the water necessarily varies The chemical quality of either surface water or ground water at any particular place reflects the kinds of rocks over or through which the water has passed.

Chemical analyses of water from a large number of wells and springs in the Hondo basin are listed in table 3, and analyses of surface-water samples are listed in table 4. Selected partial analyses of

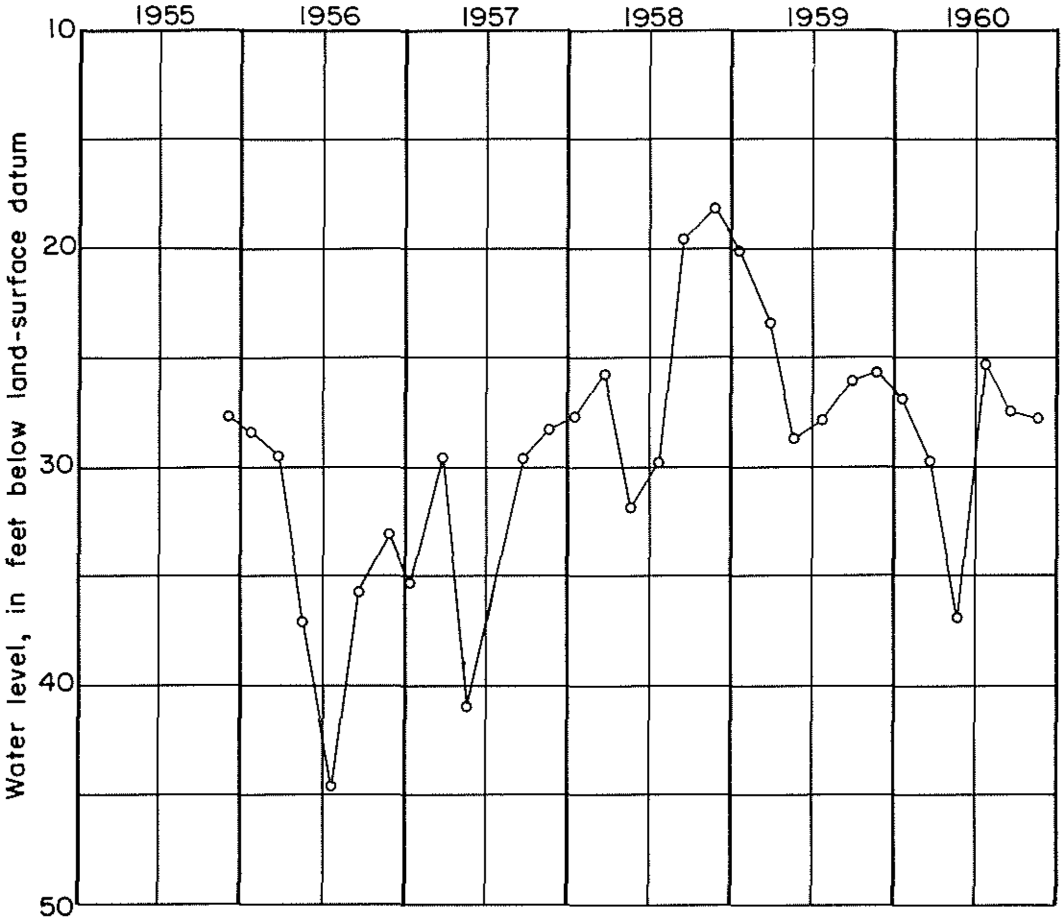

Figure 13.--Hydrograph of well 9.13.25.113, which taps the alluvium of Magado Creek, Lincoln County, N. Mex.

both surface water and ground water are presented in plate 4 to show the areal distribution of chemical quality.

Floodflow water in the Rio Hondo drainage basin contains fewer dissolved solids than the low or base-flow water, because the base flow is derived primarily from the discharge of ground water containing relatively high concentrations of dissolved solids and the floodflow is derived from precipitation which has had little opportunity to dissolve rock materials. In the mountainous part of the basin where the rocks consist predominantly of low-solubility minerals, such as the silicate minerals of the igneous rocks, even the base-flow water in the streams (Eagle Creek, Rio Ruidoso, and Rio Bonito) generally is low in dissolved solids. Base-flow water in Magado Creek is high in dissolved solids, because the water has been in contact with highly soluble minerals in the shale and sandstone of the Mesaverde Formation and the Mancos Shale The base-flow water of the Rio Bonito, Rio Ruidoso, and Rio Hondo from R. 13 E. to R. 19 E., where most of the irrigation supply is available, is high in dissolved solids, as it has passed through carbonate rocks of the upper part of the San Andres Limestone, the sandstone and limestone of the Hondo Sandstone Member, and the gypsiferous rocks of the Yeso Formation. Generally, ground water contains more dissolved solids than the surface water does in the same area.

The chemical suitability of water can be evaluated only on the basis of its intended use. The chemical analyses of water in the Hondo basin are compared with recommended limits for selected uses, and the principal sources and significance of constituents or properties of the water are summarized in table 5. For a more comprehensive dissertation on the origin and significance of the chemical quality of water, the reader is referred to a publication by the (California) State Water Pollution Control Board, 1952, and to a U.S. Geological Survey publication by John D. Hem (1959).

Water Utilization

Surface Water

Surface water has been used for irrigation in the eastern part of the Hondo basin since about 1880 by diversion from the North Spring River, South Spring Creek, and Berrendo Creek. The Northern Canal, now part of the Hagerman Canal, was built to divert water from these streams to irrigate land south of Roswell. A few acres of land east of Roswell are still irrigated with water from these streams, but the original ditches were abandoned when the flow in the upper part of the streams declined or stopped. Flood water is diverted into several irrigation ditches when it is available.

Water from the Rio Hondo, Rio Ruidoso, and Rio Bonito has been used to irrigate land west of Riverside for about a hundred years. Many ditches are used to divert the surface water onto the flood plains of the main streams. The use of ground water to supplement the supply of surface water during low-flow periods probably began about 1920. About 3,650 acres are irrigated in the flat-floored valleys of the Rio Hondo, Rio Bonito, and Rio Ruidoso from surface water. Ground water is used to supplement the surface-water supply for 2,650 acres of this land during periods of low streamflow. Records of the quantity of surface or ground water used have not been kept, but assuming an average duty of water of 3 acre-feet per acre and a 50 percent supplemental use of ground water, it is estimated that an average of 7,000 acre-feet of surface water is used annually in the Hondo basin. Mower (1960) states that about 20 percent of the water applied to the fields in the Roswell basin percolates downward to the water table and 80 percent is consumed. These figures, if applied to the Hondo basin, indicate that about 5,600 acre-feet of surface water is consumed annually.

The flow from the headwaters area of the Rio Bonito is stored in Bonito Lake, which was built to provide uniform diversion of 5 cfs (3,600 acre-feet per year) of water to a pipeline system that now furnishes water to the city of Alamogordo in the Tularosa basin. The diversion of water from Bonito Lake to another drainage basin decreases the water supply available to downstream users in the Hondo basin. The average amount of water that has been diverted out of the Hondo basin since the pipeline was installed has been a little more than 1,000 acre-feet per year. The Southern Pacific Railroad, which constructed the reservoir and pipeline, sold the system to the city of Alamogordo, and the city began using water from the system about the middle of 1957. In 1960 about 1,660 acre-feet of water was diverted from Bonito Lake for use by the city of Alamogordo.

The pipeline system also collects water from the headwaters of Eagle Creek. In addition to Alamogordo, water from the pipeline system is supplied to Fort Stanton, Capitan, Ruidoso, and a few mountain ranches.

Ruidoso, a resort town which has a transient summer population of 15,000 (estimated) and a permanent winter population of 1,557 (U.S. Bureau of the Census, 1960) obtains most of its water supply from Rio Ruidoso. This supply is supplemented with water from the Eagle Creek part of the Rio Bonito pipeline system. Ruidoso also has two wells for standby use. About 44 million gallons of water was delivered to the residents of Ruidoso in 1954. Water treatment includes flocculation, rapid sand filtration, and chlorination. The intake and treatment plant is at the Otero-Lincoln County line on the Rio Ruidoso.

Fort Stanton, which had a population of about 500 in 1960, has a contract right to use water from the Rio Bonito pipeline, and the community obtains about 100,000 gallons per day (70 gpm) from the system. A well has been rehabilitated and equipped with a turbine pump, which will deliver about 150 gpm, for standby use. Water treatment includes flocculation, filtration, and chlorination. The pipeline system uses water from Rio Bonito and Eagle Creek.

Capitan, which had a population of 552 in 1960 (U.S. Bureau of the Census, 1960), formerly used wells which obtained water of poor quality from the Mancos Shale. In 1957 the town became affiliated with the Eagle Creek Inter-Community Water Supply Association, which supplies the town with water from the Rio Bonito pipeline system. Storage is provided by a 100,000-gallon steel tank. Treatment consists of filtration, settling, and chlorination. About 15 million gallons were used in 1960.

Water from some of the small streams on the south side of the Capitan Mountains is diverted into pipes and delivered to storage tanks several miles down the slopes for domestic and livestock use. Many natural depressions and man-made earth tanks in the upland areas are utilized for watering stock.

Ground Water

Data on a large number of wells in the Hondo basin are listed in table 1, and the locations of the wells are shown in plate 1. Listed are all irrigation and public-supply wells, except for those at Roswell, and many, but not all, of the stock and domestic wells. The locations of most of the irrigation and public-supply wells in the eastern part of the basin are not shown in this report, because these have been shown previously by Mower (fig. 5). Logs of 23 selected wells are presented in table 6.

Irrigation wells in the eastern part of the Hondo basin obtain water from the San Andres Limestone or from the overlying alluvium. The wells that tap the San Andres generally are cased only to the top of the limestone. Many of the artesian wells flow during the winter, but they do not flow during the summer because of the heavy withdrawal of artesian water. All the irrigation wells are equipped with pumps.

Most of the irrigation wells that tap the alluvium are cased to the bottom, and 20 to 40 feet of the casing is perforated in the zone of saturation. The perforations in the casing, which generally are cut with a welding torch, vary in size and distribution. Factory-manufactured well screens are seldom used in wells in the Hondo basin. Development generally consists of pumping the well for several hours at a high rate. None of the water contains large amounts of sand. The sources of power for the turbine pumps are electricity, gasoline, diesel fuel, butane, propane, and natural gas.

The wells that tap the San Andres Limestone west of the artesian zone, where the limestone is at or near the land surface, generally are cased to depths of only 20 to 40 feet.

The quantity of ground water that is withdrawn annually from the wells in the eastern part of the Hondo basin, many of which yield as much as 2,000 gpm, has not been computed, except as a part of the overall pumpage in the Roswell artesian basin.

About 85 irrigation wells obtain water from the alluvium in the flat-floored valleys of the Rio Hondo, Rio Bonito, and Rio Ruidoso in the central part of the Hondo basin. These wells yield as much as 3,500 gpm. The amount of ground water that is pumped from these wells has not been measured nor computed. Most of the wells are used intermittently, because ground water is used mainly as a supplement to the surface-water supply. Only about 350 acres of land is irrigated entirely by ground water.

A close interrelation of ground water and surface water in the Rio Hondo valley west of Picacho has been observed. When the surface flow is insufficient for irrigation needs, irrigation wells are used to supplement or replace the surface supply. The ground-water withdrawal lowers water levels in the shallow aquifer, which causes an additional lessening of seepage to the stream and a reduction in streamflow.

The water supply for the city of Roswell, which had a population of 39,593 in 1960 (U.S. Bureau of the Census, 1960) is entirely ground water. The pumpage for the city in 1960 was 3.6 billion gallons or 11,000 acre-feet. The water was obtained from 13 wells that tap the

San Andres Limestone. The wells, which yield 350 to 2,000 gpm each, are in the eastern part of the Hondo basin. The water is untreated, and it is pumped directly into the mains or into storage tanks.

Ruidoso Downs (formerly Greentree), which had a population of 407 in 1960 (U.S. Bureau of the Census, 1960), and the adjoining Agua Fria Development share equally the yield of Hale Spring. The yield of Hale Spring reportedly has been almost constant at about 250 gpm for many years. The spring is fed by water in beds of limestone of the Yeso Formation on the hillside south of town. The water is not treated before use.

Lincoln, an unincorporated village of about 100 population, is served by the Lincoln Mutual Domestic Water Consumers Association, which uses a community well that taps the Yeso Formation. The water is untreated. Storage is in a 10,000-gallon capacity steel tank on a hillside with gravity feed to the water mains.

Ground water serves most stock and domestic needs in the upland areas of the Hondo basin. Many wells are used to supply domestic and stock requirements in the valley areas, too. Most of the stock and domestic wells are cased to their full depth, and the lower 20 to 40 feet of the casing is perforated with torch-cut slots. Some of the beds of siltstone in the Yeso Formation tend to cave in uncased wells, although many uncased wells in the Hondo basin have never caved. The stock and domestic wells usually have lift-type pumps in which a piston or plunger lifts the water and causes it to flow out of the discharge pipe. These pumps are powered by wind, electricity, gasoline, diesel fuel, butane, and propane.

Several springs in the Hondo basin have been developed for irrigation, municipal, stock, or domestic use. Fritz Spring and Peter Hurd's spring are used mainly for irrigation. Several residents of the valley haul water from Fritz Spring for their domestic supplies, because the water from the spring is less saline than most of the well water in the area. Hale Spring supplies Ruidoso Downs and a housing development. Several springs on the slopes of the Sacramento Mountains and Capitan Mountains have been developed for stock and domestic use. The development usually consists of a minor amount of excavation at the spring openings and the construction of a small reservoir and pipelines to control the flow.

Data on many of the springs in the Hondo basin are listed in table 2. Many of the springs on the slopes of the mountains and a few in the stream channels are not listed.

CONCLUSIONS

The decline of the water table in the San Andres Limestone in the eastern part of the Hondo basin can be expected to continue at a rate of 1½ to 2 feet a year, if the pumpage and recharge remain the same. (See figs. 6 and 7.) Automatic water-level recorders in observation wells about 8 miles and 15 miles west of Roswell, where the gradient of the water-table in the San Andres is low, would be useful in detecting changes in ground water storage in these areas. The recorders should be located as far as possible from pumping wells.

A definite trend of lowering of ground water levels in the central and western parts of the Hondo basin has not been established. (See figs. 4, 5, and 9-13.) The ground water in those areas has not been affected measurably by pumpage in the Roswell artesian basin. Ground water from these areas moves eastward and recharges the artesian aquifer near Roswell. Any additional consumptive use of water in the upper two-thirds of the Hondo basin or diversion of water out of the basin would reduce the amount of water that would be available for recharge to the Roswell basin.

Successful wells have been drilled in all townships of the Rio Hondo drainage basin. The few wells that have been abandoned as unsatisfactory either were not drilled to the regional water table, or the yield was insufficient for the intended use. The regional water table is more than 500 feet below the land surface at many places in the basin. (See pl. 3.)

The chemical quality of the surface and ground water is generally satisfactory for irrigation and stock use, except in the extreme eastern part of the basin (see pl. 4). Locally, as in the upper drainage areas of tributaries to the Rio Hondo, the surface water is satisfactory for municipal supply. The ground water is generally objectionable for domestic or municipal use, but it is used for those purposes because water of better quality is scarce throughout most of the region.

The use of water in the Rio Hondo drainage basin, especially in the eastern part, may change gradually from principally agricultural to principally industrial, municipal, and domestic. Industrial, municipal, and domestic users can afford to pay more than agriculture can for treated and piped water, and such users may represent a potential market for desalinized water. According to the Office of Saline Water, U.S. Department of the Interior, the cost of desalting inland brackish water per 1,000 gallons was $4 in 1952 and $1 in 1962. Present cost in Roswell of municipal water delivered to the tap is about 20 cents per 1,000 gallons, of which amount about 18 cents per 1,000 gallons is spent for distribution and administration. Cost of irrigation water at the well head in the area is about 2 cents per 1,000 gallons. Even with present overdraft, aquifers in the region have sufficient usable water in storage to last for many years, and it is apparent that the cost of producing desalinized water will, for some time, continue to be a factor in its use.

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TABLE 1

RECORDS OF WELLS IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

EXPLANATION:

Location number: See text for explanation of well-numbering system.

Depth of well: Depths are in feet below land surface. Reported depths are given to nearest foot. Measured depths are given to nearest tenth of a foot.

Character of material: Cl, clay; Gv, gravel; Ls, limestone; Sd, sand; Ss, sandstone; Sh, shale; Slts, siltstone.

Stratigraphic unit: Qal, alluvium; Ti, igneous intrusive and extrusive rocks; Tc, Cub Mountain Formation of Bodine(1956); Kmv, Mesaverde Formation; Km, Mancos Shale; Kd, Dakota Sandstone; TR c, Chinle Formation; TR s, Santa Rosa Sandstone; Pa, Artesia Formation; Psu, upper part of San Andres Limestone; Psh, Hondo Sandstone Member; Py, Yeso Formation.

Altitude: Altitude of land surface at well, above mean sea level. Altitudes determined by aneroid and interpolated from topographic maps to nearest 10 feet. Other altitudes taken directly from topographic maps, except altitudes at wells owned by the Pecos Valley Artesian Conservancy District determined by spirit leveling.

Water level: Reported depths are given to nearest foot, above mean sea level. Measured depths are given to nearest tenth of a foot.

Type of pump: C, centrifugal; J, jet; N, none; P, plunger or piston; S, submersible; T, turbine.

Yield and drawdown: Test data as reported by owner or usual yield of present pump.

Use of water: D, domestic; I, irrigation; N, none; O, observation; Ps, public supply: S, stock.

Remarks: All wells are drilled unless otherwise noted. Ca, chemical analysis in table 3.

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
8.13.13.332	Domecio Peralta	Ray Taylor	1952	76	5	76	-	Kmv	7,040	60	1952	6,980	P	-	-	-	-	S	
14.210	Tranquilino Silva	do.	1954	80	8	19	Sh	Km	7,200	60	1957	7,140	-	-	-	-	-	-	
22.140	Do.	do.	1953	125	5	125	Sh	Kmv	7,100	100	1957	7,000	P	-	-	-	-	S	
26.130	Nellie Guevara	Murray Drill. Co.	1956	100	6	100	-	Ti	6,960	60	1956	6,900	-	-	-	-	-	-	
8.14. 7.334	Ross Flatley	-	-	35	36	35	-	Km	7,070	32	1954	7,038	P	-	-	-	-	D,S	Dug.
14.113	U.S. Forest Service	U.S. Bureau Mines	1948	278.0	4	-	-	Psu	6,900	233.2	5-8-56	6,667	N	-	-	-	-	N	Iron ore test hole.
14.334	F. W. Lawrence	-	-	120	6	-	-	Psu	6,620	100	1952	6,520	P	-	-	-	-	D,S	
18.114	Johnny Martin	-	-	90	5	-	-	Kmv	7,060	70	1954	6,990	P	-	-	-	-	S	
18.413	J. F. Morris	K. A. Huey	1953	232	7	80	-	Kd	6,960	93.3	3-1-56	6,867	P	125	1953	-	2	D,S	
18.413a	Do.	do.	1953	100	6	100	-	Kd	6,960	92.4	3-1-56	6,868	N	-	-	-	-	N	Originally a dug well.
19.241	Western Ranchers Oil Co.	Steinberger Drill. Co	1959	1,342	5	712	-	-	6,840	-	-	-	N	-	-	-	-	N	Oil test.
19.340	J. D. Guye	Wilson Bros.	1954	161	6	161	Ss	Kmv	6,800	130	1954	6,670	-	-	-	-	-	S	
19.411	Do.	Williams	1955	120	5	-	-	Km	6,870	100.2	3-1-56	6,770	P	-	-	-	-	S	
21.411	George Herrera	M. Herrera	1907	78.0	36	78	-	Km	6,640	76.1	3-1-56	6,564	P	-	-	-	-	D,S	Dug.
22.142	D. H. Galloway	-	1920's	145	-	-	-	Km	6,660	130	1945	6,530	P	-	-	-	-	S	
22.231	Do.	-	1920's	147	-	-	-	Km	6,660	130	1945	6,530	P	-	-	-	-	D,S	
24.232	J. M. Bonnell	-	-	97	6	20	-	TR c	6,680	78	1950	6,602	P	-	-	-	-	D,S	
24.234	Do.	-	-	86	6	20	-	TR c	6,670	59.7	3-6-56	6,610	P	-	-	-	-	S	
26.314	Mrs. A. N. Spencer	-	-	20.0	36	20	-	Km	6,460	18.3	2-29-56	6,442	P	-	-	-	-	S	Dug.
27.431	D. H. Galloway	-	1920's	126	6	20	-	Km	6,530	121.5	5-9-56	6,408	P	-	-	-	-	S	
30.432	Jack Robinson	K. A. Huey	1952	210	10	10	Sh	Tc	6,650	60	1952	6,590	P	-	-	-	-	S	
36.413	Mrs. A. N. Spencer	-	-	140	-	-	-	TR c	6,330	-	-	-	N	-	-	-	-	N	Insufficient yield for stock; filled in.
36.423	Do.	Ray Taylor	1954	179	5	179	Ss	TR s	6,300	60	1954	6,240	P	-	-	-	-	S	
8.15.20.224	Mrs. Pearl Hammett	-	1946	580	4	-	-	-	6,820	-	-	-	P	-	-	-	-	D,S	
28.211	F. W. Lawrence	-	-	88	5	20	-	TR s	6,670	54.6	3-6-56	6,615	P	-	-	-	-	S	Ca.
33.114	Do.	-	-	400	10	-	-	Pa	6,420	-	-	-	P	-	-	-	-	S	
33.314	Do.	-	1948	360	7	-	-	Pa	6,300	303.8	6-20-57	5,996	P	-	-	-	-	S	
9.13.19.414	Fred Pfingsten	Elzy Perry, Sr.	1953	70	6	25	-	Tc	7,430	35	1953	7,395	P	-	-	-	-	D,S	
20.312	Do.	do.	1907	68	6	25	-	Tc	7,270	42	1956	7,228	P	-	-	-	-	S	
21.312	H. A. Peebles	Elzy Perry, Jr.	1954	125	6	10	-	Km	7,120	81.0	5-10-56	7,039	P	-	-	-	-	D,S	
23.231	Cora Dutton	do.	1952	90	6	-	-	Ti	6,950	25	1952	6,925	J	-	-	-	-	D,S	
24.242	Ralph Pearson	K. A. Huey	1952	55	6	45	Gv,Ss	Tc	6,690	15	1952	6,675	P	-	-	-	-	S	
25.112	M. W. Coll	Steinberger Drill.Co	1953	55	8	50	-	Qal	6,740	40	1953	6,700	T	125	1953	-	-	I	
25.112a	Do.	do.	1953	55	8	50	-	Qal	6,740	40	1953	6,700	T	200	1953	-	-	I	
25.113	Do.	George Mellon	1953	90	8	40	-	Qal	6,750	28.4	1-26-56	6,722	T	70	1953	-	-	D,I,O	
25.114	Do.	do.	1953	60	8	40	-	Qal	6,740	38	1953	6,702	T	75	1954	-	-	I	
25.223	C.C. Ferguson	Elzy Perry,Sr.	1954	70	6	40	-	Kmv	6,700	15	1954	6,685	J	-	-	-	-	D,S	
25.223a	Do.	-	-	8	36	-	-	Kmv	6,690	5.4	6-1-56	6,685	N	-	-	-	-	N	Dug.
25.231	Do.	Murray Drill. Co.	1952	65.0	12	-	-	Qal	6,710	9.7	6-1-56	6,700	N	175	1952	-	-	N	
26.344	LaMoyne Peters	H. Neal	1943	126	6	6	-	Tc	6,890	75	1943	6,815	P	-	-	-	-	N	
27.311	Guy Dabney	-	-	18.0	48	18	-	Ti	6,960	16.3	5-24-56	6,944	P	-	-	-	-	S	Dug.

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
9.13.27.311a	Guy Dabney	Ray Taylor	1950	130.0	6	-	-	Ti	6,990	42.6	5-24-56	6,947	N	-	-	-	-	N	
29.121	Ben Pfingsten	-	-	205	6	25	-	Km	7,330	195	1955	7,135	-	-	-	-	-	-	
29.413	Fred Pfingsten	-	1946	70	6	25	-	Km	-	-	-	-	P	40	1946	-	-	S	
33.223	A. N. Runnels	-	-	42	6	-	-	Ti	7,060	33.4	5-24-56	7,027	P	-	-	-	-	N	
33.340	L. R. LaMay	Elzy Perry, Jr.	1953	71	8	6	-	Ti	-	-	-	-	P	-	-	-	-	S	
35.122	LaMoyne Peters	do.	1953	75	6	18	-	Tc	6,870	46	1954	6,824	J	20	1953	-	-	D,S	
36.134	M. W. Coll	-	-	-	8	-	-	Kmv	-	49.0	7-3-57	-	P	-	-	-	-	S	
9.14. 2.144	Mrs. A. N. Spencer	Ray Taylor	-	280	5	280	-	Kd	6,690	250	1955	6,440	P	-	-	-	-	S	
3.131	do.	-	-	19.0	48	-	-	Km	6,390	13.5	2-29-56	6,376	P	-	-	-	-	S	Dug.
10.132	Village of Capitan	Layne Texas Co.	1946	324	8	271	Ss	Km	6,340	59.4	1-26-56	6,281	T	70	4-55	-	-	Ps,O	Ca.
10.141	do.	do.	1946	320	8	224	Sh	Km	6,340	-	-	-	T	-	-	-	-	Ps	
12.314	J. D. Cone-Pearson	Glover Drill. Co.	1959	960	6	737	Ss	T̄R s	6,270	120	1959	6,150	-	-	-	-	-	N	See log.
12.324	Mrs. A. N. Spencer	George Perry	1943	120	8	-	-	T̄R s	6,220	54.2	1-26-56	6,166	P	-	-	-	-	S,O	
13.121	Ralph Pearson	K. A. Huey	1951	138	8	28	Ss	T̄R c	6,270	120	1951	6,150	P	-	-	-	-	S	
14.324	do.	do.	1951	620	8	40	Ss	T̄R s	6,630	-	-	-	P	-	-	-	-	S	
15.112	do.	do.	-	150	-	-	-	Km	6,400	-	-	-	P	-	-	-	-	D,S	
20.320	do.	do.	1954	205	9	32	Ss	Km	6,780	71	1954	6,709	P	-	-	-	-	S	
20.323	do.	do.	1953	240	7	108	Ss	Km	6,780	38	1953	6,742	P	12	1953	-	-	S	
21.333	do.	-	-	150	5	20	-	Km	6,620	48.8	3-28-57	6,571	P	-	-	-	-	S	
25.233	Fort Stanton Hospital	George Perry	1942	394	6	394	-	Psu	6,240	203	1959	6,037	T	150	1959	54	2	Ps	
25.324	do.	-	1893	45.0	8	-	-	Qal	6,210	19.6	1-27-56	6,190	N	-	-	-	-	O	
25.423	do.	-	1912	165	-	-	-	Pa	-	-	-	-	N	-	-	-	-	N	Insufficient yield; filled in.
29.241	do.	-	1931	325	8	325	Ls	Km	6,650	84	1931	6,566	P	-	-	-	-	S	
31.343	E. J. Blaylock	Murray Drill. Co.	1941	170	6	75	-	Kmv	-	70	1941	-	P	12	1941	-	-	S	
35.231	Fort Stanton Hospital	-	1932	35	-	-	-	Pa	6,270	-	-	-	P	-	-	-	-	N	
36.214	do.	-	1904	540	-	-	-	Pa	6,360	-	-	-	P	-	-	-	-	N	
9.15. 5.412	F. W. Lawrence	-	-	180	6	-	-	Pa	6,260	162.8	3-6-56	6,097	P	-	-	-	-	S	
6.411	Mrs. E. Petree	-	1946	180	6	-	-	Pa	6,220	71.3	2-29-56	6,149	P	-	-	-	-	S	
8.441	Fort Stanton Hospital	-	1938	138	-	-	Ls	Pa	6,100	100	1938	6,000	P	-	-	-	-	S	See log.
12.331	T. O. Hayes	-	-	26	36	-	-	Py	6,050	23	1954	6,027	P	-	-	-	-	S	Dug.
15.331	A. T. Pfingsten	Leroy Perry	1939	120	12	70	-	Psh	5,980	12.1	7-23-57	5,968	T	700	-	31	8	I	Ca.
15.414	K. O. Hayes	-	-	67	-	-	-	Qal	6,000	60	1954	5,940	J	-	-	-	-	D,S	
15.423	I. A. & R. Aldaz	Murray Drill. Co.	1956	125	5	122	Sd,Gv	Qal	5,980	72	1956	5,908	-	-	-	-	-	D	See log.
25.334	A. T. Pfingsten	Buck Nosker	1941	75	7	60	-	Psh	-	22	1950	-	P	-	-	-	-	S	
34.132	Fort Stanton Hospital	H. Kersey	1931	375	6	370	Ls	Psu	-	364	1931	-	P	-	-	-	-	S	May be perched water.
9.16. 4.434	V. M. Grantham	Elzy Perry, Sr.	1940	425	4	-	-	Py	6,500	390	1940	6,110	P	-	-	-	-	S	
9.214	do.	do.	1940	400	10	20	-	Py	6,470	375	1956	6,095	P	-	-	-	-	S	Ca.
10.112	J. V. Morris	Murray Drill. Co.	1944	380	5	380	-	-	6,470	280	1944	6,190	P	-	-	-	-	D,S	See log.
11.431	do.	Ray Taylor	1945	350	5	350	-	Py	6,340	310	1952	6,030	N	-	-	-	-	N	
11.434	do.	do.	1945	380	5	380	-	Py	6,360	320	1952	6,040	P	-	-	-	-	D,S	
20.334	A. T. Pfingsten	O. B. Lewis	1956	212	8	212	Sd	Qal	5,750	21.5	5-1-56	5,728	T	280	4-56	74	24	I	
25.222	W. A. Sterrett	Hazelwood	1945	400	8	10	-	Py	6,100	350	1945	5,750	P	-	-	-	-	D,S	Ca.
28.333	Ray Taylor	Ray Taylor	1951	125	8	125	Gv	Qal	5,690	36.2	1-25-56	5,654	N	125	1951	-	12	N	
28.333a	Christobal Zamora	Murray Drill. Co.	1946	61	6	50	-	Qal	5,720	30.3	1-3-57	5,690	T	-	-	-	-	I,O	
28.334	Percy Parker	Wilson Bros.	1955	72	7	66	-	Qal	5,700	40	1955	5,660	J	-	-	-	-	D	
29.442	A. T. Pfingsten	O. B. Lewis	1956	94	15	45	Sd,Gv	Qal	5,690	9.0	5-17-56	5,681	T	380	1956	66	36	I	
29.444	Mrs. Robert Romero	-	-	34.3	-	-	-	Py	5,730	33.1	12-15-55	5,697	N	-	-	-	-	D	Dug well, bucket on rope.
29.444a	L. C. Baca	-	-	44.0	-	-	-	Py	5,730	36.0	12-15-55	5,694	P	-	-	-	-	D	Dug.
29.444b	Community of Lincoln	Ray Taylor	1955	110	6	110	Cl	Py	5,730	36.4	12-15-55	5,694	T	60	12-55	44	5	Ps	Ca.
33.111	D. R. Brenton	do.	1954	177	7	98	Ls	Py	5,710	43	1954	5,667	T	125	1954	70	-	D,I	Ca.
33.111a	D. A. Giles	do.	1948	100	5	100	-	Py	5,710	-	-	-	J	-	-	-	-	D	
33.111b	do.	do.	1948	120	8	120	-	Py	5,720	-	-	-	T	50	1948	-	6	I	
9.17. 7.124	W. A. Sterrett	Elzy Perry, Sr.	-	781	8	8	-	Py	6,620	600	1954	6,020	P	-	-	-	-	S	
13.444	E. J. Whitaker	Kendrix	1910's	315	6	20	-	Py	5,640	290	1940	5,350	P	-	-	-	-	D,S	
15.241	do.	-	-	500+	6	-	-	Py	6,210	500	1954	5,710	P	-	-	-	-	S	
26.113	do.	Sam Butler	1941	100+	6	-	-	Py	5,830	100	1941	5,730	P	-	-	-	-	S	
26.334	Doran Wood	Elzy Perry, Jr.	-	90	6	90	-	Psu	5,740	45	1952	5,695	P	450	1952	-	-	D,S	Ca.
31.433	E. J. Whitaker	-	1920's	390	6	-	-	Py	-	360	1952	-	P	-	-	-	-	S	
34.214	Doran Wood	-	-	350	-	-	-	Py(?)	5,780	290	1954	5,490	P	-	-	-	-	S	Ca.
9.18. 4.310	Elvira Maes	C. D. Wilson	1955	152	6	152	Ls	Py	5,480	-	-	-	-	-	-	-	-	-	
5.233	Claudio Romero	-	1953	66	5	-	-	Py	5,510	37.0	4-12-56	5,473	P	-	-	-	-	D,S	
5.234	Richard Pryor	Richard Pryor	-	24.5	-	-	-	Py	5,500	-	-	-	N	-	-	-	-	N	Partly filled in; originally 26 ft. deep. Dug (dry).

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
9.18. 5.344	E. H. Latham	Sam Butler	-	52.0	-	-	-	Py	5,500	44.4	4-13-56	5,456	P	-	-	-	-	D,S	
5.411	do.	Ray Taylor	1954	150	-	-	-	Py	5,500	-	-	-	N	-	-	-	-	N	Originally a geophysical test hole.
5.442	Dudley Rue	-	-	42	10	-	-	Py	5,460	-	-	-	T	-	-	-	-	D,I,S	
8.212	Antonio Sanchez	Bill Myer	1937	192	6	192	-	Py	5,590	142	1955	5,448	P	-	-	-	-	D,S	
9.323	E. H. Latham	Ray Taylor	1946	90	6	90	-	Psu(?)	5,380	79.3	5-8-57	5,301	P	-	-	-	-	S	Ca.
15.432	L. A. Pacheco	K. A. Huey	1952	217	5	198	-	Psh(?)	5,240	165.4	4-10-56	5,075	P	30	1952	-	5	S	Ca.
16.233	do.	W. C. Nelson	1954	76	8	76	Sd,Gv	Qal	5,320	25.9	4-10-56	5,294	T	800	6-54	6	19	I	
16.412	do.	Ray Taylor	1947	39.0	6	40	-	Qal	5,320	30.3	4-10-56	5,290	J,P	-	-	-	-	D,S	
17.422	Antonio Sanchez	K. A. Huey	1945	127.0	6	20	Ss	Psh	5,420	117.4	4-13-56	5,303	P	-	-	-	-	S	See log.
19.431	L. A. Pacheco	-	1910's	200.0	8	-	-	Py	5,540	193.1	4-10-56	5,347	P	-	-	-	-	N	
21.424	do.	-	-	170	6	-	-	-	5,380	162	1950	5,218	N	-	-	-	-	N	
23.341	J. A. Cooper	-	1939	60	4	40	-	-	5,110	40	1950	5,070	P	-	-	-	-	S	
25.334	do.	-	1910's	78	6	-	-	Psh(?)	5,030	60	1955	4,970	P	-	-	-	-	S	Ca.
26.443	do.	Elzy Perry,Jr.	1948	136	6	22	-	Psh	5,070	90	1956	4,980	S	-	-	-	-	D	
26.444	do.	-	1920's	130	8	-	-	Psh	5,050	75	1954	4,975	P	-	-	-	-	S	
27.120	L. A. Pacheco	Leroy Case	1952	170	9	40	-	Psh	5,400	160	1952	5,240	P	-	-	-	-	S	
30.323	G. S. Sisneros	do.	1948	240	8	14	-	Py	5,570	223.9	4-9-56	5,346	P	-	-	-	-	D,S	
30.413	do.	-	1931	230	6	-	-	Py	5,540	200.8	4-9-56	5,339	P	-	-	-	-	S	
31.141	do.	Ray Taylor	1939	260	6	60	-	Psh	5,580	248	1955	5,332	S	-	-	-	-	S	
34.331	do.	K. A. Huey	1952	317	6	7	-	Psh	5,500	287.5	4-9-56	5,212	P	-	-	-	-	S	
9.19.11.140	G. H. Shanks	-	-	-	-	-	-	-	4,870	465	1950	4,405	P	-	-	-	-	S	
12.344	S. C. Marley	-	-	700	-	-	-	-	4,940	-	-	-	N	-	-	-	-	N	Sealed over; reported as dry hole.
20.110	Leopoldo Pacheco	Leroy Case	1951	330	6	330	-	Py	5,200	300	1951	4,900	P	-	-	-	-	S	
21.120	S. C. Marley	C. L. Bowen	1956	370	7	370	Slts	Py	5,000	230	1956	4,770	P	-	-	-	-	S	
22.430	do.	H. R. Davis	1952	290	7	290	-	Py	4,800	260	1952	4,540	P	-	-	-	-	S	
24.444	do.	-	-	380	6	-	-	Py	4,620	350	1954	4,270	P	-	-	-	-	D,S	
27.213	do.	H. R. Davis	1943	300	-	-	Ss	Psh(?)	4,740	280	1955	4,460	P	-	-	-	-	S	Ca.
30.213	J. A. Cooper	Bill Marschbanks	1920's	68	6	-	-	Psh	4,950	44	1955	4,906	P	-	-	-	-	S	
33.243	S. C. Marley	C. L. Bowen	1953	310	10	18	Ss	Psh	-	-	-	-	P	8	1953	-	-	S	
34.333	J. A. Cooper	-	1920's	225	6	-	-	Psh	-	185	1954	-	P	-	-	-	-	S	
35.333	S. C. Marley	-	1940	280	-	-	-	Psh	4,750	222.2	5-16-57	4,528	P	-	-	-	-	S	
9.20.11.233	Texam #1 Boyle	-	1955	3,562	-	-	-	-	-	-	-	-	-	-	-	-	-	-	See log.
17.110	Robert Marley	W. E. Doolin	1950	395	8	-	-	Psh	4,780	365.8	4-18-50	4,414	N	-	-	-	-	S	
17.311	S. C. Marley	do.	1927	420	-	-	Ss	Psh	-	385	1954	-	P	-	-	-	-	S	
21.410	do.	A. Cole	1939	550	-	-	-	Psh	4,490	440	1955	4,050	P	-	-	-	-	S	
31.322	do.	do.	-	580	-	-	Slts	Psh	-	400+	1954	-	P	-	-	-	-	S	
32.333	do.	-	-	900	-	-	-	-	-	-	-	-	N	-	-	-	-	N	Reported as dry hole.
9.21. 9.410	J. Mims	-	-	755	-	-	Ss	Psh	4,250	680	1940	3,570	P	5	1940	-	-	S	
23.140		-	1940	-	-	-	-	-	4,240	-	-	-	P	-	-	-	-	S	
31.133	Marley and Whitney	-	-	425	-	-	-	-	4,300	365	1950	3,935	-	-	-	-	-	S	
9.22. 1.240	W. T. F. Marley	W. E. Doolin	1950	510	-	-	Ls	Psu	-	475	1950	-	P	-	-	-	-	D,S	
20.444	Alton Corn	H. R. Davis	-	725	-	-	Ss	Psh	4,230	675	-	3,555	P	15	-	-	-	S	
35.323	Dick Alexander	do.	1956	575	8	85	Ls	Psu	4,100	525	1956	3,575	-	-	-	-	-	D	
35.330	Alton Corn	-	-	540	-	-	-	Psu	4,080	530	1950	3,550	P	-	-	-	-	D,S	
9.23.25.324	Elmer Sons	W. E. Doolin	1948	775	10	297	Ls	Psu	3,680	109	1949	3,571	T	2,000	1948	-	-	I	
26.442	do.	do.	-	610	10	297	Ls	Psu	3,690	107.5	1-30-51	3,582	T	1,200	-	-	-	I	
33.321	Billy Stewardson	Murray Drill. Co.	1952	381	7	9	-	Psu	3,840	284	1954	3,556	-	-	-	-	-	S	
35.423	C. A. Marley Estate	W. E. Doolin	1949	175	7	174	Slts	Pa	3,721	165	1949	3,556	P	-	-	-	-	D,S	
35.424	Elmer Sons	do.	1947	825	10	329	Ls	Psu	3,690	136	1954	3,554	T	1,800	-	-	-	I,O	
36.133	Glen Estes	R. J. Johnston	1947	820	10	289	Ls	Psu	3,692	123	1949	3,569	T	1,800	-	-	-	I	
10.13. 1.441	E. J. Blaylock	-	-	200	6	-	-	Kmv	-	-	-	-	P	-	-	-	-	S	
2.314	D. O. Jones	Fulton Dugar	1930's	60	6	60	-	Kmv	7,070	38.0	12-1-55	7,032	S	7	-	-	-	D,S	Ca.
2.431	Gilbert Peters	-	-	35.0	48	35	-	-	-	29.0	12-1-55	-	P	-	-	-	-	S	Dug.
4.441	Roy LaMay	Murray Drill. Co.	1944	100	6	-	-	Tc	7,200	40	1954	7,160	S	-	-	-	-	D,S	
14.213	Gilbert Peters	Elzy Perry, Sr.	1947	123	-	-	-	Kmv	-	14	1952	-	J	12	-	-	-	D,S	
14.231	do.	-	1940's	45	6	16	-	Kmv	-	10	1951	-	C	20	-	-	-	N	
15.142	Nazarene Camp	-	1948	90	8	-	-	Kmv	6,970	70	1948	6,900	J	-	-	-	-	D	
15.214	Boyd Lucas	-	1955	154.0	6	-	-	Kmv	6,900	36.9	1-26-56	6,863	S	-	-	-	-	D,S	
15.444	Gilbert Peters	George Perry	1940's	580	6	-	-	Kmv	-	480	1950	7,120	P	5	-	-	-	S	
22.131	F. B. Lindamood	Elzy Perry, Jr.	1948	472	6	20	-	Kmv	-	80	1954	-	P	-	-	-	-	D	
23.242	E. J. Blaylock	-	-	80	6	-	-	Kmv	-	-	-	-	P	-	-	-	-	S	

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
10.13.23.431	E. J. Blaylock	-	-	70	6	-	-	Kmv	-	-	-	-	P	-	-	-	-	S	
24.212	do.	-	-	90	6	-	-	Kmv	-	-	-	-	J	-	-	-	-	D,S	
27.222	C. L. Peebles	Elzy Perry, Jr.	1953	40	8	10	Sh	Kmv	-	21	1953	-	P	-	-	-	-	S	
29.400	U.S. Air Force	Morrison Drill.Co.	1960	600	6	20		Tc	-	98	10-1960	-	N	3	1960	-	-	D	Ca.
10.14. 7.424	E. J. Blaylock	Wilson Bros.	1955	55	7	30	Sh	Km	-	12.2	7-3-57	-	P	-	-	-	-	S	
8.241	Albert Watson	-	-	100	6	-	Sh	Km	-	15	1955	-	P	-	-	-	-	S	
16.323	do.	Leroy Perry	1946	653	-	-	-	Kd	6,970	-	-	-	N	-	-	-	-	N	Reported dry hole.
16.331	do.	do.	1946	399.0	5	20	-	Kd	6,970	336.3	5-17-56	6,634	N	.5	-	-	-	N	Insufficient yield; perched water.
19.233	do.	Elzy Perry, Jr.	1942	43	16	-	-	Km	6,820	45.9	5-9-56	6,774	J	75	-	-	-	D,S	
19.234	do.	Elzy Perry, Sr.	1942	104	10	-	Sh	Km	6,840	35	1942	6,805	P	8	-	-	-	D,S	
31.343	J. D. Guye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	
10.15.18.234	J. V. Tully	-	-	18	48	-	-	Psh	-	15	1956	-	P	-	-	-	-	N	Dug.
21.222	do.	Starkey	1914	40	6	40	-	Py	5,860	33.4	1-27-56	5,827	P	-	-	-	-	S,O	
22.124	J. M. Bonnell	-	-	19.0	8	19	-	Qal	5,820	14.4	10-12-55	5,806	P	-	-	-	-	S	
22.412	do.	George Perry	-	96.0	8	100	Sd,Gv	Qal	5,780	32.8	12-8-55	5,747	N	300	1935	-	-	N	
23.433	do.	W. Coe	-	60	8	-	-	-	5,730	46	1954	5,684	P	-	-	-	-	S	
25.132	W. F. Coe	Elzy Perry, Sr.	1947	70	10	70	Sd,Gv	Qal	-	10	1947	-	T	1,250	1947	25	24	I	
25.143	do.	do.	1947	72	12	72	Sd,Gv	Qal	-	7.4	7-14-55	-	N	1,500	1947	-	-	N	
26.241	H. F. Ellis	-	1947	60	6	60	Sd,Gv	Qal	-	30	1947	-	J	-	-	-	-	D	
26.331	George Perry	Buck Nosker	1940	25	5	-	Sd,Gv	Qal	-	-	-	-	N	-	-	-	-	N	
26.332	Buck Nosker	do.	1946	50	10	-	Sd,Gv	Qal	-	-	-	-	T	-	-	-	-	I	
26.332a	Ralph Bonnell	Elzy Perry, Sr.	1946	55	10	55	Sd,Gv	Qal	5,730	11.3	9-10-57	5,719	T	480	9-10-57	24	5	I	
26.333	George Perry	Leroy Perry	1946	56	10	56	Sd,Gv	Qal	-	25	1946	-	T	-	-	-	-	I	
26.341	Elzy Perry,Sr.	Elzy Perry,Sr.	-	120	8	120	Ls	Qal	5,740	80	1955	5,660	T	400	1955	40	12	I	
26.343	do.	do.	-	60	12	60	-	Qal	5,820	20	1954	5,800	T	750	1954	-	-	I	
26.344	do.	do.	-	60	12	60	Sd,Gv	Qal	-	20	1955	-	N	800	1954	40	12	N	
26.411	Bert Bonnell	do.	1945	106.0	5	112	-	Py	5,740	64.3	1-26-56	5,676	N	-	-	-	-	O	
26.421	do.	George Perry	1931	110	10	40	Sd,Gv	Qal	-	18	1931	-	T	900	1931	-	-	I	
27.444	P. C. Ambriz	Duane Graham	1956	60	6	-	Cl,Sd	Qal	-	47.9	9-17-57	-	N	-	-	-	-	N	
29.441	J. V. Tully	George Perry	1940	110	5	7	-	-	-	54	1940	-	P	5	1940	-	-	S	
32.322	U.S. Forest Service	-	-	-	-	-	-	-	-	63.1	7-19-56	-	P	-	-	-	-	S	
33.242	J. V. Tully	Elzy Perry, Sr.	-	100	12	60	Sd,Gv	Qal	-	20	1955	-	N	500	1955	60	8	N	
33.412	D. A. Storm	Dave Agnew	1930	130	6	-	-	-	-	81.9	7-26-55	-	J	-	-	-	-	D	
33.421	Genovevo Yvarra	H. Neal	1948	168	7	140	Sd,Gv	Qal	-	44.7	7-14-55	-	P	15	1948	-	-	N	
34,110	Juan Montes	Elzy Perry, Jr.	1956	110	10	84	Sd,Gv	Qal	-	43	1956	-	T	800	1956	6	4	I	
34.113	Genovevo Yvarra	do.	1956	156	10	140	Sd,Gv	Qal	-	56	1956	-	T	1,000	1956	5	36	I	
34.123	J. V. Tully	do.	1955	90	10	90	Sd,Gv	Qal	-	41.8	2-17-56	-	T	1,150	1955	3	3	I	
34.443	R. W. New	Harold Coe	1946	28.0	10	60	-	-	-	40	1952	-	N	-	-	-	-	N	Well partly filled in.
35.132	do.	Elzy Perry, Sr.	1949	180	6	-	-	-	5,930	100	1949	5,830	N	-	-	-	-	N	
10.16.11.441	A. T. Pfingsten	H. R. Davis	1922	85	6	-	-	Py	5,590	71.1	4-3-56	5,519	P	-	-	-	-	S	
12.411	do.	Perry Bros.	1957	425	16	84	Sd,Gv	Qal	5,500	14.6	8-29-57	5,485	T	430	1957	-	-	I	
19.434	K. Nosker and F. Slauson	do.	1957	170	12	72	Sd,Gv	Qal	-	28	1957	-	J	-	-	-	-	D	
20.330	Samuel Sanchez	Murray Drill.Co.	1957	100	10	100	Sd,Gv	Qal	-	14	1957	-	-	-	-	-	-	-	
20.332	Robert & Ernest McDaniel	Elzy Perry, Sr.	1948	82	12	50	Sd,Gv	Qal	5,570	7.6	7-6-55	5,562	T	580	1948	4	2	I	
20.443	Eva and J.S. Montoya and S. Sanchez	Buck Nosker	1947	95	10	95	Sd,Gv	Qal	5,560	32.6	7-6-55	5,527	T	900	1954	-	12	D,I	
20.444	V. D. Herrera and Leopolda Pena	Ray Taylor	1947	90	10	90	Sd,Gv	Qal	5,550	-	-	-	T	300	1947	-	-	I	
25.332	P. H. Montoya	Wilson Bros.	1954	83	7	65	Sd,Gv	Qal	-	47	1954	-	-	-	-	-	-	D	
25.343	Mrs. E. B. Rigsby	Elzy Perry, Jr.	1950	70	10	-	Sd,Gv	Qal	5,370	38.8	7-5-55	5,331	T	350	1950	-	-	I	
25.344	do.	-	1946	51.0	6	-	Sd,Gv	Qal	5,380	-	-	-	N	-	-	-	-	N	
25.344a	do.	Elzy Perry, Jr.	1950	50	8	50	Sd,Gv	Qal	5,350	25	1955	5,325	J	300	1955	-	-	D,I	
26.440	Tom Babors	do.	1957	120	12	80	Sd,Gv	Qal	-	21	1957	-	-	800	1957	36	-	I	
27.113	J. V. Tully and J. O. Balzer	do.	1954	128	8	128	Sd,Gv	Qal	-	18.5	7-15-55	-	T	1,000	1954	65	-	I	
27.234	O. T. Lucero	G. & W. Drill. Co.	1955	55	7	49	Sd,Gv	Qal	5,440	29.1	7-15-55	5,411	J	-	-	-	-	D	
27.243	John Thomas	John Agnew	1947	48	8	48	Sd,Gv	Qal	5,430	16	1947	5,414	T	665	1947	32	2	I	
27.420	George Rassuro, Jr.	Elzy Perry, Sr.	1954	108	6	108	Sd,Gv	Qal	-	65	1954	-	-	-	-	-	-	D	
28.114	Aristeo Chavez	-	1945	150	8	130	Sd,Gv	Qal	-	55	1945	-	T	500	1945	-	3	D,I	
28.211	J. V. Tully	-	-	80	10	49	Sd,Gv	Qal	-	18	1956	-	T	600	1956	45	8	I	
29.214	F. G. Gonzales	Elzy Perry, Jr.	1955	56	12	51	Sd,Gv	Qal	5,560	25.8	7-17-55	5,534	T	900	1955	-	-	I	
30.111	V. S. Gomez	Wilson Bros.	1954	54	7	54	Sd,Gv	Qal	-	39	1954	-	-	-	-	-	-	D	

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
10.16.30.112	Alberto Gomez	Wilson Bros.	1954	59	7	59	Sd,Gv	Qal	-	35	1955	-	S	30	1954	-	-	D	
30.213	Kenneth Nosker	Dave Agnew	1947	100	8	100	Sd,Gv	Qal	-	18	1954	-	T	800	1954	-	-	I	
36.111	Peter Hurd	Don Perry	1949	100	12	92	Sd,Gv	Qal	-	9.1	7-6-55	-	N	450	1948	48	5	I	
36.141	do.	Sam Butler	1935	80	6	-	-	Py	-	64	1935	-	P	-	-	-	-	D	
36.242	Paul Gardner	Buck Nosker	1947	180	6	-	Sd,Gv	Qal	5,350	-	-	-	T	200	1947	-	-	I	
36.244	do.	-	-	39.0	48	39	Sd,Gv	Qal	5,340	35.0	9-22-55	5,305	P	-	-	-	-	D	Dug.
10.17. 6.124	A. T. Pfingsten	-	1954	320	8	-	-	Psh	-	275	1954	-	P	-	-	-	-	S	
6.444	Wilbur McKnight	Buck Nosker	-	325	5	120	-	Psh	-	290	1950	-	P	-	-	-	-	S	
13.131	Doran Wood	Elzy Perry, Sr.	1941	840	6	-	-	-	-	825	1941	-	P	-	-	-	-	S	
16.131	Wilbur McKnight	-	1918	220	8	-	-	Psh(?)	-	210	1954	-	P	-	-	-	-	S	Ca.
16.433	do.	-	1943	140	8	-	-	Psh(?)	5,540	121.6	1-26-56	5,418	P	-	-	-	-	S,O	
19.433	A. T. Pfingsten	V. Ross	1936	35.0	5	100	-	-	-	-	-	-	N	40	1936	-	12	N	Partly filled in.
19.434	do.	Ray Taylor	1935	95.0	8	105	Sd,Gv	Qal	5,340	29.3	1-25-56	5,311	N	250	1935	-	-	O	
25.222	Mrs. Edna Purcella	Elzy Perry, Jr.	1952	530	8	12	Ss	Psh	5,680	515	1952	5,165	P	-	-	-	-	S	
25.234	do.	-	-	600	8	-	-	Py	5,570	413.7	4-11-56	5,156	N	-	-	-	-	N	Insufficient yield.
27.122	Wilbur McKnight	Don Perry	1951	170	8	30	-	Psh(?)	5,430	111.4	3-21-56	5,319	P	3	1951	-	-	S	Ca.
27.431	do.	Bill Johns	1915	63	8	-	-	Psh	5,360	60	1940	5,300	P	-	-	-	-	D,S	
29.233	Stephen Hernandez	Bentlett	1940	288	8	288	-	Py	5,420	133.9	1-25-56	5,286	N	-	-	-	-	O	
29.324	A. T. Pfingsten	Leroy Perry	1939	76	12	70	Sd,Gv	Qal	-	3	1955	-	T	2,000	1939	-	-	I	Ca.
29.423	Stephen Hernandez	S. Hernandez	1940	78	48	78	-	Py	5,370	63.0	8-3-55	5,307	P	-	-	-	-	D,S	Dug.
30.221	A. T. Pfingsten	George Perry	1941	205	9	200	-	Qal	-	39	1955	-	T	900	1941	-	-	I	
30.224	do.	do.	1936	119	12	100	Sd,Gv	Qal	5,330	42	1954	5,288	T	1,500	1936	-	-	I	Ca.
31.131	B. E. Martin	Harold Case	1949	74	7	-	Sd,Gv	Qal	-	-	-	-	J	-	-	-	-	D	
31.431	Limacher Bros.	Elzy Perry, Sr.	1946	85	8	85	Sd,Gv	Qal	5,280	41.3	1-26-56	5,239	N	750	1946	-	-	O	
31.433	John Bell	Elzy Perry,Jr.	1955	65	7	65	Gv	Qal	-	35	1955	-	-	-	-	-	-	D	
32.344	Limacher Bros.	Elzy Perry, Sr.	1946	69.0	10	70	Sd,Gv	Qal	-	9.8	7-5-55	-	N	-	-	-	-	N	
33.332	Andrew Richardson	Elzy Perry, Jr.	1955	158	4	158	-	Py	5,310	140	1955	5,170	S	-	-	-	-	D	
33.334	Candelario Benavides	-	1955	85	5	-	-	Qal	-	-	-	-	-	-	-	-	-	I	
35.134	Manuel Torrez	-	1917	171.0	6	-	-	Py	5,300	157.4	7-30-57	5,143	N	-	-	-	-	N	
10.18. 2.222	G. S. Sisneros	-	1920's	280	7	100	Ss	Psh	5,260	223.6	4-9-56	5,036	P	-	-	-	-	S	
4.210	do.	K. A. Huey	1953	328	8	7	Ss	Psh	5,500	284	1953	5,216	P	10	1953	-	-	S	
7.423	E. J. Whitaker	Fears	1910's	563	6	-	-	Py	5,690	500	1952	5,190	P	-	-	-	-	S	Ca.
23.124	E. W. Nelson	Bill Johns	1910	365	6	20	-	Psh(?)	5,370	345	1930's	5,025	P	-	-	-	-	D,S	Ca.
25.431	A. S. Patterson	-	1915	400	-	-	-	-	-	-	-	-	P	12	-	-	-	S	
28.140	Porfirio Fresquez	Elzy Perry, Jr.	1955	360	5	360	-	-	-	-	-	-	-	-	-	-	-	-	
30.443	Mrs. Edna Purcella	Bill Johns	1915	354	6	-	-	-	5,390	340	1950	5,050	P	-	-	-	-	S	
10.19. 1.232	S. C. Marley	A. Cole	1942	350	-	-	-	-	-	-	-	-	P	-	-	-	-	S	
10.343	J. A. Cooper	-	1919	350	-	-	-	Psh(?)	4,970	319.6	5-16-57	4,650	P	7	-	-	-	S	Ca.
18.331	E. W. Nelson	Bill Kendricks	1917	285	6	20	-	-	5,250	268	1930's	4,982	P	-	-	-	-	S	
22.421	A. S. Patterson	-	1915	400	-	-	-	-	-	278	1950	-	P	12	-	-	-	S	
29.133	do.	-	1915	500	-	-	-	-	-	-	-	-	P	10	-	-	-	S	
10.20. 8.134	S. C. Marley	-	-	486	5	-	-	Psh(?)	4,600	426	1950	4,174	P	-	-	-	-	S	Ca.
16.444	Pecos Valley Artesian Conservancy District	Keyes Drill. Co.	1956	503	6	503	Ss	Psh	4,504	421.9	1-31-56	4,082	N	-	-	-	-	O	See log. Equipped with automatic water level recorder. Ca.
22.110	Marley & Whitney	-	-	615	6	-	-	Psh	4,430	375	1956	4,055	P	-	-	-	-	S	
24.411	do.	-	-	480+	-	-	-	-	4,410	400.5	12-17-58	4,009	P	-	-	-	-	S	
10.21.13.224	do.	-	-	575	-	-	-	-	4,060	500	1957	3,560	P	-	-	-	-	D,S	
16.222	Pecos Valley Artesian Conservancy District	Keyes Drill. Co.	1956	672	7	670	Ss	Psh	4,190	589	1957	3,601	N	-	-	-	-	O	Equipped with automatic water level recorder. Ca.
20.430	Marley & Whitney	-	-	706	-	-	-	-	4,190	507	1960	3,683	P	-	-	-	-	S	
24.322	do.	-	-	630	-	-	Ss	Psh	4,090	500	-	3,590	P	-	-	-	-	N	Abandoned because of crooked hole.
24.322a	do.	K. G. Miller	1958	603	8	205	Ss	Psh	4,090	530	1958	3,560	P	-	-	-	-	S	
10.22.22.111	do.	do.	1958	653	6	368	Ss	Psh	4,160	618	1958	3,542	P	-	-	-	-	S	
23.413	do.	-	-	300	-	-	-	-	3,950	-	-	-	P	-	-	-	-	S	
31.433	do.	-	-	450	-	-	-	-	4,000	440	1958	3,560	P	-	-	-	-	S	
10.23. 1.432	Louis Chaves	Ross Ledbetter	1947	110	6	-	-	-	3,677	-	-	-	P	-	-	-	-	D	
9.124	J.W. and J.P. McKnight	W. E. Doolin	1949	733	12	310	Ls	Psu	3,808	-	-	-	T	1,200	1949	-	-	I	Ca.
9.410	J. A. Cooper	T. M. Thornton	1956	550	11	265	Ls	Psu	3,780	228	1956	3,552	-	-	-	-	-	I	
9.440	Joyce Cooper	Man Woods	1920's	180	-	-	-	-	3,750	176	-	3,574	P	-	-	-	-	S	
10.211	C. C. Bogard	R. J. Johnston	1948	806	12	245	Ls	Psu	3,750	-	-	-	T	-	-	-	-	I	

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
10.23.11.431	L. C. French	Case Drill. Co.	1949	143	7	143	-	-	3,680	-	-	-	P	10	-	-	-	D,S	
12.212	Juan Sena	Murray Drill. Co.	1956	167	6	137	Ls	Psu	3,670	110	1956	3,560	-	-	-	-	-	I	
12.443	J. B. Roundtree	T. M. Thornton	1947	98	6	-	Ls	Psu	3,640	100	1954	3,540	-	10	-	-	-	D,S	
13.122	Tom Rooker	do.	1946	110	-	-	-	-	3,640	88	1946	3,552	-	-	-	-	-	-	
15.131	J.D. and R.D. Pyeatt	-	1948	700	13	-	Ls	Psu	3,730	174.6	1-22-57	3,555	T	-	-	-	-	I,O	
15.131a	J.W. and J.P. McKnight and J. A. Cooper	T. M. Thornton	1956	270	7	203	Ls	Psu	3,720	180	1956	3,540	S	8	-	-	-	D	
15.434	L. G. Bonham and C. E. Daniels	W. E. Doolin	1948	370	16	162	Ls	Psu	3,700	126	1948	3,574	T	1,200	1948	-	-	I,O	
15.434a	C. E. Daniels	do.	1949	370	16	-	Ls	Psu	3,700	-	-	-	T	1,600	1949	-	-	I	
15.444	Cecil pendergrass and C. E. Daniels	do.	1950	373	16	-	Ls	Psu	3,680	109	1950	3,571	T	1,600	1950	-	-	I	
20.134	Joyce Cooper	-	-	257	-	-	Ls	Psu	3,810	220	-	3,590	P	-	-	-	-	D,S	
21.244	Mrs. L. C. Meneke	-	-	150	-	-	-	-	3,710	90	1950	3,620	P	-	-	-	-	S	
22.444	E. H. Patterson	Dee Storey	1949	300	16	-	Ls	Psu	3,690	-	-	-	T	1,500	1949	-	-	I	
23.122	L.G. and W.E. Bonham	Joe Hester	1952	140	6	96	Gv	Qal	3,670	112	1952	3,558	J	7	1952	-	-	D	
25.331	R. T. Bevins	Case Drill. Co.	1950	91	-	-	-	-	3,640	-	-	-	-	-	-	-	-	D	
27.222	E. M. Haley	A. H. Lewis	1949	265	16	-	Ls	Psu	3,690	-	-	-	T	1,300	1949	-	-	I	Ca.
27.234	do.	do.	1949	425.0	16	168	Ls	Psu	3,730	172.1	5-3-57	3,558	T	1,200	-	-	-	I,O	
28.423	W. W. Orr	do.	1949	212.0	10	210	Ls	Psu	3,760	191.1	1-11-56	3,569	T	1,800	-	-	-	I,O	
30.422	Marley and Whitney	-	-	300	-	-	-	-	3,790	240	1950	3,550	P	-	-	-	-	S	
33.142	W. W. Orr	A. H. Lewis	1949	582	8	516	Ls	Psu	3,770	193.8	7-11-57	3,576	T	800	-	-	-	I,O	
33.433	C. O. Morrow	do.	1953	303	7	51	Ls	Psu	3,840	273	1953	3,567	P	-	-	-	-	D	
33.441	C. C. Woolridge	Case Drill. Co.	1951	250	-	-	Ls	Psu	3,810	220	1951	3,590	J	-	-	-	-	D	
34.433	P. D. Reed	A. H. Lewis	1952	215	6	150	Ls	Psu	3,730	175	1952	3,555	-	-	-	-	-	-	
35.333	Peter Kopanos	J. W. Akin	1946	129	7	-	Ls	Psu	3,680	120	1946	3,560	-	-	-	-	-	D	
11.13. 7.322	Ruidoso Realty Co.	Keyes Drill. Co.	1946	22	6	-	-	Ti	-	14	1952	-	N	3	1952	-	-	N	
7.412	do.	Buck Nosker	-	108	7	60	-	Ti	7,270	11	1955	7,259	J	-	-	-	-	D	Fire protection well.
8.311	do.	Lloyd Perry	1948	65	7	-	-	Ti	7,170	15	1955	7,155	J	-	-	-	-	D	Fire protection well. Ca.
8.322	do.	Wilson Bros.	1950	16.0	48	16	-	Tc	7,100	13.6	4-17-56	7,086	J	-	-	-	-	D	Dug.
8.322a	do.	do.	1955	50	6	15	-	Tc	7,100	12.8	4-17-56	7,087	N	-	-	-	-	N	
9.333	do.	Buck Nosker	1947	100	8	39	-	Tc	-	19.6	11-18-47	-	J	50	1954	-	-	D	Fire protection well.
15.214	Ralph Brown	Ray Taylor	1951	150	6	150	-	Km	-	-	-	-	J	-	-	-	-	D	
15.214a	do.	do.	1954	82	6	78	Ls	Km	-	45	1954	-	J	-	-	-	-	D	
15.422	H. M. Morgan	Caprock Drill. Co.	1945	240	6	-	-	Km	-	39.5	11-19-47	-	N	-	-	-	-	N	Insufficient yield.
15.422a	do.	do.	1945	240	6	-	-	Km	-	28.0	11-19-47	-	N	-	-	-	-	N	Do.
16.444	U.S. Forest Service	Ray Taylor	1954	215	7	215	Sh	Km	6,840	26	1954	6,814	S	-	-	-	-	D,S	
20.343	W. B. Blankenship	Wilson Bros.	1953	75	6	75	Sh	Kmv	-	53	1953	-	-	-	-	-	-	D	
22.134	Cree Meadows Golf Club	Buck Nosker	1947	225.0	5	580	Sh	Km	6,810	62.7	1-26-56	6,747	N	-	-	-	-	O	
22.313	do.	Ray Taylor	1952	57.0	6	6	-	Km	-	23.7	12-2-55	-	N	12	1952	-	-	N	
22.342	do.	Elzy Perry, Jr.	1949	100	6	-	-	Km	6,720	48.5	12-2-55	6,672	P	18	1955	-	-	D,I	
22.343	do.	Ray Taylor	1952	60.0	6	-	-	Km	6,700	30.0	12-2-55	6,670	N	12	1954	-	-	N	
22.344	do.	do.	1955	119	7	119	Sh	Km	6,700	20	1955	6,680	T	37	1955	-	-	D,I	Ca.
25.322	Harlan McCraw	Elzy Perry, Jr.	1954	50	6	38	Gv	Qal	6,460	21	1954	6,439	C	65	1954	-	-	D	
25.323	Ruidoso Schools	-	1948	90	6	-	-	-	6,510	58.4	4-17-56	6,452	N	-	-	-	-	N	
25.324	do.	Wilson Bros.	1954	76	-	-	Cl,Sh	Py	-	30	1954	-	N	-	-	-	-	N	Filled in; insufficient yield.
25.324a	do	do.	1954	199	7	40	Gv	Qal	6,480	57	1954	6,423	T	25	1954	-	10	D,I	
25.421	Village of Ruidoso	Elzy Perry, Jr.	1948	95	8	40	Sd,Gv	Qal	6,450	17.3	1-26-56	6,433	N	400	1953	68	20	O	
25.421a	do.	do.	1948	95	8	40	Sd,Gv	Qal	6,440	13	1948	6,427	T	430	1953	42	48	Ps	Standby use only.
26.324	Jack Lockart	do.	1954	57	7	49	Gv	Qal	6,530	42	1954	6,488	J	10	1954	-	3	D	
28.223	Ruidoso Realty Co.	Buck Nosker	1938	555	6	20	Ss	Km	-	20	1947	-	J	20	1947	-	-	D	
35.434	C. L. Allison, Jr.	-	1950	75	8	-	Sd,Gv	Qal	-	Flowing	4-19-56	-	T	350	1956	-	4	I,S	
36.130	U.S. Forest Service	V. E. Wilson	1957	54	6	54	Gv	Qal	-	42	1957	-	-	-	-	-	-	-	
36.141	Clayton Bennett	Elzy Perry, Jr.	1954	90	6	90	Sd,Gv	Qal	-	65	1954	-	J	-	-	-	-	D	
36.142	do.	-	1920's	51.0	-	-	Sd,Gv	Qal	6,560	47.2	4-19-56	6,513	J	-	-	-	-	N	Dug.
36.240	W. R. Long	Wilson Bros.	1954	92	6	85	Sh	Py	-	50	1954	-	-	-	-	-	-	D	
36.311	Aycock	-	-	50	-	-	-	-	-	20	1956	-	N	-	-	-	-	N	
36.311a	W. R. Long	Wilson Bros.	1952	41	6	41	-	-	-	19	1952	-	J	-	-	-	-	D	
36.312	do.	-	1940's	41	6	41	-	-	-	19	-	-	C	-	-	-	-	I	
36.313	W. C. Campbell	Elzy Perry, Jr.	1953	80	6	-	-	Qal	-	-	-	-	T	200	-	-	-	D,I	
36.321	E. R. Poteet	-	1944	42.0	6	20	-	Qal	6,620	37.5	4-19-56	6,582	N	-	-	-	-	N	
36.321a	do.	Elzy Perry, Jr.	1945	66	8	61	-	Qal	6,620	35	1947	6,585	T	150	1945	8	10	D,I	
11.14. 6.121	J. D. Guye	-	-	45.0	6	-	-	-	-	24.0	5-23-56	-	N	-	-	-	-	N	
6.212	Albert Watson	-	-	38	6	20	-	-	-	10	1958	-	P	-	-	-	-	S	

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
11.14.12.314	Bruce Griffith	Leroy Perry	1942	100	10	-	-	Qal	-	45	1942	-	T	1,000	1942	-	4	I	
12.314a	do.	Buck Nosker	-	100	9	60	-	Qal	-	25.2	7-27-55	-	J	-	-	-	-	D	
14.224	S. S. Cowan	Elzy Perry, Jr.	1956	80	8	80	-	-	-	19-	1956	-	-	-	-	-	-	I	
14.231	C. C. Pior	Ray Taylor	1948	28	7	28	-	-	-	6	1955	-	J	-	-	-	-	D	
14.231a	do.	Elzy Perry, Jr.	1954	70	10	60	-	Qal	-	28	1955	-	T	760	1954	-	-	I	
15.413	Earl Paxton	Elzy Perry, Sr.	1949	100	12	100	Sd,Gv	Qal	6,200	24.6	3-7-56	6,175	T	750	1949	-	12	I	
15.431	E. H. Fuchs	Elzy Perry, Jr.	1951	90+	8	-	Sd,Gv	Qal	6,240	59.9	1-26-56	6,180	N	-	-	-	-	O	
21.214	E. E. Miller	Ray Taylor	1954	110	7	70	Sd,Gv	Qal	-	22.5	9-17-57	-	N	-	-	-	-	N	
21.233	Tull and E. Stansell	Elzy Perry, Jr.	1949	61	12	55	Sd,Gv	Qal	-	24.5	9-17-57	-	T	850	1949	8	-	I	
21.412	R. E. Carter	do.	1940	65	6	65	Sd,Gv	Qal	-	16.7	7-27-55	-	J	-	-	-	-	D,S	
21.414	do.	do.	1949	65	10	-	Sd,Gv	Qal	-	27.9	9-11-57	-	T	1,000	1949	-	8	I	
21.421	Tull Stansell	Leroy Perry	1952	200	16	87	Ls	Py	-	62	1955	-	T	1,120	1952	76	-	I	
21.431	J. E. Reese	-	1949	123	12	123	Gv	Qal	-	56.8	7-27-56	-	T,J	260	1949	-	-	D,I	
29.113	Ruidoso Downs Racing Association	-	1947	87	10	70	Sd	Qal	-	68	1954	-	T	75	-	-	-	D,S	
30.241	do.	-	1948	260	10	-	-	Qal	-	-	-	-	T	-	-	-	-	D,S	
30.312	J. W. Armstrong Estate	Ray Taylor	1950	65	6	-	-	Qal	-	-	-	-	J	-	-	-	-	D	
11.15.12.112	Paul Jones, Elzy Perry,Sr., U.S. Forest Service	Joe Donowho	1955	800	6	791	Ls,Sh	Py	6,590	584	1955	6,006	P	7	1955	-	4	S	See Log. Ca.
21.421	Paul Jones, W. & H. Hale, U.S. Forest Service	Haskell Harris	1955	571	7	547	Ls	Py	-	320	1955	-	P	3	1955	250	4	S	
27.332	Wm. & Henry Hale	H. R. Davis	1927	565	5	565	-	Py	6,720	510	1955	6,210	P	-	-	-	-	S	
30.321	do.	H. Neal	1945	420	5	150	-	Py	-	410	1945	-	P	-	-	-	-	S	
34.142	E. & R. McDaniel	-	1925	650	4	300	-	Py	6,640	640	1954	6,000	P	-	-	-	-	D,S	Ca.
11.16. 8.344	J. V. Tully	George Perry	1939	210	4	210	-	Psh(?)	6,300	176	1954	6,124	P	-	-	-	-	S	Perched water? Ca.
14.432	do.	Elzy Perry, Jr.	1946	340	6	7	-	-	-	315	1946	-	P	5	-	-	-	S	
19.144	L. P. Gipson & Son	-	-	410	6	410	-	Py	6,300	365	1955	5,935	P	-	-	-	-	D,S	Ca.
21.442	do.	-	-	390	6	365	-	Py	-	-	-	-	P	-	-	-	-	D,S	
22.321	Leroy McKnight	Elzy Perry, Sr.	1917	320	6	20	-	Py	-	275	1955	-	P	20	-	-	-	D,S	Ca.
24.331	Fred Montes	-	1942	265	6	-	-	Py	-	240	1942	-	P	-	-	-	-	S	Ca.
26.332	Leroy McKnight	Elzy Perry, Sr.	1943	435	6	20	-	-	-	275	1948	-	P	3	-	-	-	S	
34.424	do.	Bill Johns	1916	800	8	20	-	-	-	275	1950	-	N	-	-	-	-	N	Hole has filled in to 75 feet.
11.17. 3.244	Manuel Torrez	-	1919	130	6	80	-	Py	5,260	115	1954	5,145	P	-	-	-	-	D,S	Ca.
3.334	H. M. Dow & C. J. Rohr	-	-	-	12	-	Sd,Gv	Qal	5,180	15.5	1-5-56	5,164	N	-	-	-	-	N	
3.334a	do.	W. E. Doolin	1951	260	10	60	Sd,Gv	Qal	5,180	19.8	7-11-57	5,160	T	1,600	1951	50	-	I	
3.444	Fernando Gutierrez	Elzy Perry, Jr.	1955	180	12	113	Ls	Qal	-	71.4	9-12-57	-	T	275	1955	-	-	S	
4.112	Fernando Gonzales	Sam Butler	1946	100	6	100	-	Qal	5,230	20	1954	5,210	T	150	1946	-	-	D,I	
4.112a	Fred McTeigue	-	-	-	-	-	-	Qal	5,230	-	-	-	T	-	-	-	-	I	
4.121	J. & R. Phillip	-	1940	65	6	-	-	Qal	5,240	47.5	1-13-56	5,192	J	-	-	-	-	D	
4.124	do.	-	1940	60	6	-	-	Qal	5,230	50.4	1-13-56	5,180	J	-	-	-	-	D	
4.213	Hiram M. Dow	-	-	108	6	-	-	Py	5,250	67.7	1-13-56	5,182	P	-	-	-	-	N	Ca.
5.221	M. L. Torrez	Elzy Perry, Sr.	1936	65	6	-	-	Py	5,290	47.2	3-2-56	5,243	P	-	-	-	-	S	
5.223	do.	-	1955	82	7	82	Sd,Gv	Qal	-	45	1955	-	T	300	1955	-	12	I	
10.121	H. M. Dow & C. J. Rohr	-	1948	260	15	-	-	Qal	5,190	25.6	5-17-55	5,164	N	-	-	-	-	I,N	
10.122	do.	W. E. Doolin	1952	190	14	60	Sd,Gv	Qal	5,190	34.9	7-30-57	5,155	T	1,200	1952	10	-	I	
10.210	F. G. Torrez	Leroy Case	1951	120	8	-	-	Qal	-	-	-	-	T	180	-	-	-	I	
10.211	Hiram M. Dow	-	1948	128.0	7	-	Sd,Gv	Qal	5,190	33.2	1-25-56	5,157	N	-	-	-	-	O	
10.221	Fernando Gutierrez	Elzy Perry, Jr.	1955	77.0	12	100	Gv	Qal	-	53.2	9-12-57	-	N	-	-	-	-	N	
10.241	J. G. Gutierrez	Leroy Case	1951	75	12	75	-	Qal	5,180	45.5	11-30-55	5,134	T	1,600	1951	-	-	I	
10.242	J. H. Gallagher	do.	1949	150	7	80	-	Qal	5,190	58.6	5-17-55	5,131	N	-	-	-	-	N	
10.242a	do.	do.	1953	120	7	90	Gv	Qal	5,180	54.8	5-17-55	5,125	T	200	1953	-	-	I	
10.243	Fred Montes	Case Drill.Co.	1942	75	8	-	-	Qal	5,180	40	1949	5,140	T	180	1955	-	-	D,I	
10.244	J. H. Gallagher	Leroy Case	1950	90	7	81	Gv	Qal	5,180	51.6	5-17-55	5,128	J	-	-	-	-	D	
10.414	Aristotle Romero	Ray Taylor	1949	140	8	140	-	Qal	5,160	47.4	1-19-56	5,113	T	250	1949	-	-	I	
10.422	Mrs. A. G. Gutierrez	do.	1945	93	8	93	-	Qal	5,170	60	1954	5,110	T	350	1945	-	-	I	
11.143	do.	-	-	125	8	-	-	-	5,200	102.0	12-16-55	5,098	P	-	-	-	-	D,S	
11.311	do.	Leroy Case	1948	70.0	12	80	-	Qal	5,170	52.0	5-17-55	5,118	N	450	1953	-	-	N	
11.324	C. P. Radcliff	Case Drill.Co.	1948	52	16	52	-	Qal	5,130	35.5	11-30-55	5,094	N	1,800	1948	-	2	N	
11.342	E. W. Nelson	Ray Taylor	1946	82	10	82	-	Qal	5,140	65	1946	5,075	T	-	-	-	-	I	
11.413	do.	Smith	-	70	5	20	-	Qal	5,150	57.2	6-1-55	5,093	P	-	-	-	-	D,S	Ca.
12.121	Mrs. Edna Purcella	Elzy Perry, Sr.	1924	154	6	-	-	-	5,220	130	-	5,090	P	-	-	-	-	D,S	
12.134	Lowen Counts	-	1915	100+	5	-	-	-	5,170	88.1	8-11-55	5,082	P	-	-	-	-	D	
12.311	Frank Peters	W. E. Doolin	1951	168	8	120	-	-	5,150	57.4	11-30-55	5,093	J	-	-	-	-	D,S	
12.334	do.	do.	1951	68	16	40	Sd,Gv	Qal	5,120	7	1951	5,113	T	3,500	1951	4	3	I	Ca.

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
11.17.12.411	Mrs. Oney Raymond	Bill Johns	1919	160	8	30	-	-	5,140	67.8	1-12-56	5,072	P	-	-	-	-	D,S	
12.412	C. G. Smith	W. E. Doolin	1951	200	10	150	-	Qal	5,120	-	-	-	T	550	1951	-	-	I	
12.422	do.	Ray Taylor	1954	156	6	142	Gv	Qal	-	60	1954	-	S	100	1954	-	-	D	
14.121	Alvy Mosteller	-	-	-	8	-	-	-	5,180	81.1	12-16-55	5,099	P	-	-	-	-	D,S	
14.121a	do.	-	-	-	12	-	Sd,Gv	Qal	5,180	81.7	12-16-55	5,098	T	-	-	-	-	I	
14.132	Frank Peters	-	-	160	6	-	-	-	5,190	90.3	12-16-55	5,100	P	-	-	-	-	D,S	
15.233	Aristotle Romero	Case Drill. Co.	1951	88.0	8	-	-	-	5,210	63.5	12-16-55	5,146	N	-	-	-	-	N	
16.313	Sylvester Salcido	S. Salcido	1935	23.0	36	22	-	Qal	5,340	21.8	5-17-55	5,318	P	-	-	-	-	D,S	Dug. Ca.
16.313a	Pedro Salcido	-	1940	96	6	96	-	-	5,340	72.3	5-17-55	5,268	P	-	-	-	-	D,S	Ca.
16.330	do.	Murray Drill. Co.	1957	160	6	160	Ls,Sh	Py	-	50	1957	-	-	-	-	-	-	-	
17.424	Proceso Salcido	-	-	18	48	18	-	Qal	5,350	16	1954	5,334	P	20	1954	-	-	D,S	Dug. Ca.
17.441	Joe Salcido	-	-	30	60	30	-	Qal	5,350	17.3	5-18-55	5,333	P	-	-	-	-	S	Ca.
18.244	Fred Montes	-	1955	195	6	-	-	-	5,520	153.3	5-17-55	5,367	N	-	-	-	-	S	
18.340	do.	Joe Donowho	1955	190	6	190	Ls	Psh	-	-	-	-	-	-	-	-	-	-	
18.424	Faustino Salcido	Ray Taylor	1949	112	6	112	-	-	5,450	82.1	5-17-55	5,368	P	-	-	-	-	S	Ca.
20.131	do.	-	1950	105	16	50	-	Qal	5,410	30	1954	5,380	T	700	1955	-	-	D,I,S	Ca.
20.212	Mrs. P. V. Salcido	Elzy Perry, Sr.	1954	50.0	12	55	Gv	Qal	5,370	16.7	5-18-55	5,353	N	800	1954	-	18	N	
20.212a	Joe Salcido	-	-	57	7	-	-	Py(?)	5,390	41.1	5-18-55	5,349	P	-	-	-	-	D,S	Ca.
21.223	Eustacio Chavez and Harry Romero	-	-	160	6	-	-	-	5,280	105.4	12-13-55	5,175	P	-	-	-	-	D,S	
23.324	Frank Peters	-	-	350	8	-	-	Py	5,380	200	-	5,180	P	-	-	-	-	S	
27.311	do.	-	1936	700	8	-	-	Py	5,650	475.7	1-26-56	5,174	N	-	-	-	-	O	
30.212	Faustino Salcido	Ray Taylor	1948	142	6	142	-	Psh	5,500	100.6	5-18-55	5,399	P	-	-	-	-	S	Ca.
33.411	Frank Peters	-	-	-	-	-	-	Py	5,660	-	-	-	P	-	-	-	-	S	
11.18. 7.242	Mrs. Edna Purcella	-	-	90	6	-	-	Py	5,100	82.8	9-28-55	5,017	P	-	-	-	-	S	Ca.
7.243	do.	Ray Taylor	1951	74	4	-	-	Py	5,110	62	1951	5,048	P	-	-	-	-	D	
7.313	Milton Mabie and B. M. Pavey	Buck Nosker	1949	100	14	100	Sd,Gv	Qal	5,080	20	1949	5,060	T	1,000	1949	65	8	I	Ca.
7.424	Mrs. Edna Purcella	-	-	35.0	36	-	-	Qal	5,060	34.3	9-28-55	5,026	N	-	-	-	-	D	Dug;use bucket to raise water.
8.232	Dan Salas	-	1905	135	6	-	-	Qal	5,120	111.5	12-28-55	5,008	P	-	-	-	-	D,I	
8.313	Milton Mabie	Don Perry	1947	125	10	125	-	Qal	5,080	40	1947	5,040	T	900	1947	-	-	D,I	
8.342	R. F. Casey	Case Drill. Co.	1949	80	12	80	Gv	Qal	5,050	30	1949	5,020	T	600	1949	-	-	N	
8.431	do.	Dave Agnew	1948	81	14	80	-	Qal	5,030	20	1948	5,010	T	1,000	1948	-	-	I	
8.432	do.	-	1920	50	6	40	Sd,Gv	Qal	5,030	20.5	1-25-56	5,009	P	-	-	-	-	D,S,O	
8.432a	do.	Dave Agnew	1948	81	13	80	-	Qal	5,040	20	1948	5,020	T	1,200	1948	27	4	I	Ca.
10.134	Porfirio Fresquez	Elzy Perry, Jr.	1935	240	6	-	-	Py	5,160	210	1947	4,950	P	-	-	-	-	S	
13.413	A. S. Patterson	-	1916	250	-	-	-	-	-	-	-	-	P	16	-	-	-	N	
14.314	Mrs. P. P. Kimbrell	Lloyd Perry	1949	250	6	80+	-	Py	5,050	161.4	5-11-55	4,889	T	-	-	-	-	S	
14.343	Dr. L. F. Hamilton	-	-	-	-	-	-	Qal	4,970	64	1955	4,906	T	-	-	-	-	I	
15.211	D. and A. Fresquez	Elzy Perry, Jr.	1952	270	6	-	-	Py	5,160	250	1952	4,910	P	-	-	-	-	S	
15.323	Porfirio Fresquez	Case Drill. Co.	-	42.0	6	40	-	Qal	4,960	38.8	5-11-55	4,921	P	-	-	-	-	D,S	
15.413	Linda Darnell	Elzy Perry, Sr.	1950	300	8	-	-	Qal	4,970	60	1954	4,910	J	-	-	-	-	S	
15.414	A. N. Kimbrell	-	1947	85	8	45	-	Qal	4,970	50.9	1-25-56	4,919	P	-	-	-	-	O	
15.431	Linda Darnell	Elzy Perry, Sr.	1948	200	14	-	-	Qal	4,960	33.3	5-11-55	4,927	T	200	1948	-	-	D,I	
15.441	Mrs. P. P. Kimbrell	Don Perry	1948	160	12	160	-	Qal	4,950	31.8	5-11-55	4,918	N	800	1948	-	-	N	
16.444	B. G. Robinson	Dave Agnew	1950	125	12	110	-	Py	5,010	54.9	1-25-56	4,955	P	-	-	-	-	D,S,O	
18.412	Fuller Ranch	-	1950	125	6	112	-	Py	-	87	1950	-	P	-	-	-	-	S	
21.212	Nat'l Exploration Co.	-	1929	2,191	7	-	-	Py	5,050	113	1929	4,937	P	-	-	-	-	N	See log.
21.232	Fuller Ranch	-	-	250	-	-	-	Py	5,070	147.4	10-25-55	4,923	P	-	-	-	-	D,S	
21.323	do.	-	-	159	6	-	-	Py	5,060	100.7	8-23-55	4,959	S	-	-	-	-	D,S	
23.131	Dr. L. F. Hamilton	-	-	-	12	-	-	Qal	4,930	6.3	7-10-57	4,924	T	2,000	-	-	-	I	Ca.
23.231	do.	-	-	-	6	-	-	Qal	4,920	34.1	5-12-55	4,886	S	-	-	-	-	D,S	
24.113	D. and A. Fresquez	-	1936	140	6	5	-	Py	4,970	100	1950	4,870	P	-	-	-	-	D,S	
24.213	A. S. Patterson	Ray Taylor	1947	154	7	30	-	-	-	124	1956	-	P	-	-	-	-	S	
24.341	Dr. L. F. Hamilton	-	-	-	6	-	-	Qal	4,900	51.1	1-25-56	4,849	J	-	-	-	-	D,S,O	
25.143	Fuller Ranch	-	-	201	4	-	-	Py	5,050	180	1950	4,870	P	-	-	-	-	S	Ca.
30.423	do.	-	-	155	-	-	-	Psh(?)	5,220	149	1954	5,071	P	50	-	-	-	S	Ca.
35.132	do.	-	1937	275	-	-	-	Psh(?)	5,250	250	1955	5,000	P	-	-	-	-	S	Ca.
11.19. 1.331	A. S. Patterson	-	1914	400	-	-	-	-	-	-	-	-	P	16	-	-	-	D,S	
9.311	do.	-	1927	380	10	-	-	-	-	-	-	-	P	12	-	-	-	S	
20.344	George Clements	Don Perry	1947	160	5	-	-	Py	4,830	132.8	1-25-56	4,697	J	-	-	-	-	D,S,O	
21.311	do.	do.	1945	300	14	300	-	Qal	4,780	179	1954	4,601	T	800	1954	-	-	I	
24.344	J. P. White	H. R. Davis	1943	400	6	-	-	Py	4,790	335	1943	4,455	P	8	1943	-	-	S	
26.311	do.	do.	1943	158	6	158	-	Py	4,740	120.3	1-25-56	4,620	P	2	1955	-	-	D,S,O	Ca.

TABLE 1 (continued)

					Casing		Principal aquifer			Water level				Yield		Drawdown			
Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit	Altitude (ft)	Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)	Type of pump	Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)	Use of water	Remarks
11.19.27.114	J. P. McKnight	Elzy Perry, Jr.	-	240+	8	20	-	Py	4,750	60	1949	4,690	T	45	-	-	-	I	Ca.
27.114a	do.	do.	1950	140	-	-	-	-	-	-	-	-	N	-	-	-	-	N	Filled in;insufficient yield.
27.123	do.	do.	1951	130	-	-	-	-	-	-	-	-	N	-	-	-	-	N	do.
27.124	do.	T. M. Thornton	1955	360	-	-	-	Py	4,740	275	1955	4,465	N	-	-	-	-	N	Insufficient yield. See log.
27.132	do.	Elzy Perry, Jr.	-	130	6	40	-	Py	4,760	60	1952	4,700	J	-	-	-	-	D,S	
27.132a	do.	W. E. Doolin	1950	-	-	-	-	-	4,760	60	1950	4,700	N	-	-	-	-	N	
27.141	do.	Elzy Perry, Jr.	1951	130	-	-	-	-	-	-	-	-	N	-	-	-	-	N	Filled in. Insufficient yield.
27.143	do.	T. M. Thornton	1953	126	6	60	Sd,Gv	Qal	4,760	103	1954	4,657	T	100	1954	-	-	I	Ca.
27.144	do.	do.	-	85.0	8	20	-	-	4,760	113	1954	4,647	N	-	-	-	-	N	
28.231	George Clements	Sam Butler	1944	300	11	300	-	Qal	4,760	218	1954	4,542	T	700	1954	-	-	I	
30.333	C. D. Fuller	Elzy Perry, Jr.	1958	221	6	221	Ls	Py	-	149	1958	-	P	-	-	-	-	S	
31.211	George Clements	do.	1952	126	16	126	-	Qal	4,840	67	1954	4,773	T	2,000	1954	-	-	I	Ca.
11.20. 1.322	J. P. White	-	-	500	-	-	-	-	4,340	460	-	3,880	P	-	-	-	-	S	
4.433	Curtis Hill	-	1936	-	-	-	-	-	4,600	620	1956	3,980	P	-	-	-	-	S	
9.323	do.	Elzy Perry, Jr.	1950	530	8	10	-	-	4,650	508	1950	4,142	P	5	1950	-	24	S	
16.224	J. P. White	H. R. Davis	-	777	6	706	-	-	4,580	660	1956	3,920	P	10	1956	-	-	S	
20.442	R. C. Nunez	Elzy Perry, Jr.	1955	561	8	20	Ss	Psh	4,700	520	1955	4,180	P	-	-	-	-	S	See log.
30.443	J. P. White	-	-	-	-	-	-	-	4,620	-	-	-	P	-	-	-	-	S	
31.123	do.	W. A. Nelson	1947	260	7	260	-	Py	4,610	137.2	1-25-56	4,473	P	15	-	-	-	S,O	
31.132	do.	-	-	104.0	13	-	-	-	4,610	86.1	7-24-56	4,524	N	-	-	-	-	N	
11.21. 9.333	do.	Smith and Gibson	1944	687	-	-	-	Psh	4,310	620	1956	3,690	P	10	-	-	-	S	
13.423	Cole Bros.	-	-	585	-	-	-	-	4,148	565	1950	3,583	P	-	-	-	-	S	
15.444	A. J. Cole	Keyes Drill. Co.	1954	777	8	10	Ss	Psh	4,282	710	1954	3,572	P	-	-	-	-	S	See log.
18.333	Pecos Valley Artesian Conservancy District	A. H. Lewis	1957	524	7	524	Ss	Psh	4,283	398	1958	3,885	N	-	-	-	-	O	See log. Equipped with automatic water level recorder.
24.412	Cole Bros.	Cole Bros.	-	564	6	20	-	Psu	4,136	550	1926	3,586	P	-	-	-	-	S	
28.144	J. P. White	L. L. Pate and L. A. Hanson	1946	675	6	658	Ss	Psh	4,278	593	1946	3,685	P	-	-	-	-	S	See log.
32.111	Tom White	H. R. Davis	1954	600	6	438	-	-	4,302	570	1956	3,732	P	12	1954	-	24	S	
11.22. 1.311	H. L. Woods	-	-	290	-	-	-	Psu	3,836	273.8	1-7-55	3,562	P	-	-	-	-	S,O	Ca.
2.131	do.	-	-	326.0	-	-	-	Psu	3,888	312.8	5-6-47	3,575	P	-	-	-	-	D,S	Ca.
3.240	do.	-	-	-	-	-	-	Psu	3,900	-	-	-	P	-	-	-	-	S	
4.221	Marley & Whitney	-	-	433	-	-	-	Psu	3,960	412	1957	3,548	P	-	-	-	-	S	
9.321	H. L. Woods	W. A. Nelson	1954	435	7	-	Ls	Psu	3,954	400	1954	3,554	P	-	-	-	-	D,S	
18.211	do.	Cole Bros.	1947	515	8	18	Ls	Psu	4,066	484.1	7-14-47	3,582	N	-	-	-	-	N	
18.211a	do.	H. R. Davis	1956	560	8	15	Ls	Psu	4,066	500	1956	3,566	P	-	-	-	-	S	See log.
22.111	J. P. White	-	-	410	-	-	Ls	Psu	3,940	362.8	5-5-47	3,577	P	-	-	-	-	S	Ca.
25.331	J. B. Patterson	-	1949	-	8	-	Ls	Psu	3,895	318.5	5-5-47	3,577	Pg	-	-	-	-	S	Ca.
33.122	Cole Bros.	H. R. Davis	-	525	8	-	Ls	Psu	4,030	479.3	10-24-56	3,551	P	10	-	-	-	S	
11.23. 1.220	O. Williams	-	-	72	6	-	-	-	3,610	44	1937	3,566	P	-	-	-	-	-	
1.413	L. L. Lane	George Sterrett	1945	160	18	160	Ls	Psu	3,620	75	1945	3,545	T	1,200	1945	-	-	I	
1.433	S. M. Wiggins	-	1938	200	14	-	Ls	Psu	3,630	80.4	1-18-57	3,550	T	-	-	-	-	I,O	
3.334	J. L. Mask	Perry Bros.	1948	622	16	20	Ls	Psu	3,739	183.3	1-11-56	3,556	T	-	-	-	-	I	
3.342	do.	Cole and Case	1948	595	15	-	Ls	Psu	3,720	170.4	1-21-57	3,550	N	-	-	-	-	O	Equipped with automatic water level recorder. See log.
8.222	Gibson Oil Co.	-	1926	657	-	-	Ls	Psu	3,840	-	-	-	-	-	-	-	-	N	See log.
8.232	E. I. Egger	-	1927	690	-	-	Ls	Psu	3,845	265.1	5-6-47	3,580	P	-	-	-	-	D,S	Ca.
11.213	C. E. Smith	Murray Drill. Co.	1954	140	6	-	Ls	Psu	3,650	-	-	-	J	-	-	-	-	D,S	
12.221	S. P. Hannifin	-	-	85	6	-	Ls	Psu	3,630	74.4	1-11-56	3,556	P	-	-	-	-	D,S,O	
12.233	C. E. Smith	Murray Drill. Co.	1954	130	7	130	Ls	Psu	3,630	82	1954	3,548	-	-	-	-	-	D,S	
14.224	J. P. Mayfield	T. M. Thornton	1945	106	6	20	Ls	Psu	3,650	105	1953	3,545	P	-	-	-	-	D	
15.222	C. E. Smith	W. E. Doolin	1949	649	16	57	Ls	Psu	3,670	121.2	1-21-57	3,549	T	1,600	-	-	-	I,O	Ca.
22.343	B. L. Brown	-	1950	-	-	-	Ls	Psu	3,720	157.9	3-6-51	3,562	T	-	-	-	-	I	
22.343a	do.	A. H. Lewis	1952	231	18	86	Ls	Psu	3,730	175.4	1-21-57	3,555	T	-	-	-	-	I,O	
22.444	do.	Case Drill. Co.	1949	196	16	85	Ls	Psu	3,700	147.2	1-11-56	3,553	T	1,800	-	-	-	I	
27.133	W. A. Patterson	A. H. Lewis	1954	224	16	-	Ls	Psu	3,730	177.4	1-11-56	3,553	T	2,000	-	-	-	I	
27.233	A. S. Patterson	Rupe Bros.	1949	200	16	-	Ls	Psu	3,720	165.9	1-11-56	3,554	T	2,000	-	-	-	I	
27.424	B. L. Brown	-	-	-	-	-	Ls	Psu	3,720	148.9	5-5-47	3,571	P	-	-	-	-	D	Ca.
27.441	do.	Case Drill. Co.	1949	216	16	90	Ls	Psu	3,720	150	1949	3,570	T	1,800	-	-	-	I	
28.243	W. A. Patterson	A. H. Lewis	1952	246	13	78	Ls	Psu	3,740	186	1952	3,554	T	-	-	-	-	I	
29.422	B. L. Brown	-	1941	2,000	-	-	Ls	Psu	3,791	260	1941	3,531	-	-	-	-	-	-	Oil test.
33.213	R. O. and J. D. Pyeatt	Rupe Bros.	1949	289	16	-	Ls	Psu	3,750	195.4	1-5-55	3,555	T	-	-	-	-	I	
33.313	G. C. and Pete Albarez	R. B. McEntire	1949	386	-	-	Ls	Psu	3,780	218.7	1-11-56	3,561	T	-	-	-	-	I	
34.143	B. L. Brown	Case Drill. Co.	1949	500	10	360	Ls	Psu	3,750	199.2	1-22-57	3,551	T	-	-	-	-	I,O	

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
11.24. 1.430	J. P. White	M. Morrissey	1927	500	8	358	Ls	Psu	3,540	-	-	-	-	-	-	-	-	N	See log.
3.412	J. A. Nieto	A. H. Lewis	1952	365	10	136	Ls	Psu	3,570	-	-	-	-	-	-	-	-	-	See log.
4.114d	City of Roswell	Pearson Bros.	1926	1,471	12	299	Ls	Psu	3,570	-	-	-	-	-	-	-	-	N	See log.
6.331	W. G. McGuire	G. M. Sterrett	1958	173	9	100	Ls	Psu	3,620	72	1958	3,548	T	330	1959	-	-	I	See log.
11.25. 8.311	Fred Payton	R. I. Willson	1940	440	8	440	Ls	Psu	3,520	-	-	-	C	-	-	-	-	I	See log.
12.13.30.233	Mescalero Apache Res.	W. L. Case and Son	1935	304	6	300	Sh	Km	7,500	250	1935	7,250	P	6	1935	-	-	S	
35.333	do.	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	S	
12.14.31.134	do.	-	-	480	-	-	-	-	8,150	-	-	-	P	-	-	-	-	S	
12.15. 8.443	do.	W. L. Case and Son	1935	616	7	616	Cl	Py	6,700	530	1935	6,170	P	7	1935	-	-	S	Ca.
32.244	do.	do.	1934	405	7	405	Ls	Py	7,300	-	-	-	P	16	1934	-	-	S	
12.16. 7.320	do.	-	-	-	-	-	-	Py	6,450	-	-	-	P	-	-	-	-	S	
15.441	do.	-	-	-	-	-	-	-	6,400	-	-	-	P	-	-	-	-	S	
29.100	do.	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	S	
12.17. 2.241	Fuller Ranch	-	-	265	-	-	-	Psh(?)	5,510	250	1950	5,260	P	-	-	-	-	S	Ca.
4.443	Frank Peters	-	-	600	-	-	-	Py	5,750	560	1955	5,190	P	-	-	-	-	D,S	
7.441	do.	-	-	460	6	-	-	Psh(?)	5,920	430	1955	5,490	P	-	-	-	-	S	Ca.
9.422	do.	-	-	480	6	-	-	-	-	-	-	-	P	-	-	-	-	S	
12.332	H. P. Joyce	-	-	635	6	-	Ss	Psh	5,720	600	1955	5,120	P	-	-	-	-	S	
19.322	do.	H. R. Davis	1952	600	8	43	Ss	Psh	5,970	570	1952	5,400	P	-	-	-	-	S	
19.414	do.	-	-	760	6	-	-	-	-	-	-	-	-	-	-	-	-	N	Water gyppy and sulphurous.
32.443	do.	-	-	635	6	-	-	-	5,900	590	-	5,310	P	-	-	-	-	D,S	Ca.
35.141	do.	-	-	625	6	-	-	-	5,810	590	-	5,220	P	-	-	-	-	S	Ca.
12.18.10.121	Stanolind Co.	-	1945	2,843	-	-	-	-	5,960	-	-	-	N	-	-	-	-	N	See log.
12.234	Joe McKnight	W. Butler	1941	755	6	755	-	Py	5,430	695	-	4,735	P	-	-	-	-	S	
14.311	T. V. Slaughter	Elzy Perry, Sr.	1941	900	6	40	-	Py	5,780	850	-	4,930	P	-	-	-	-	S	Ca.
16.124	do.	do.	1938	575	8	-	-	Py(?)	5,590	550	1954	5,040	P	-	-	-	-	S	Ca.
18.213	do.	do.	1920's	550	-	-	-	-	5,610	520	-	5,090	N	-	-	-	-	N	Well caved in.
18.221	do.	Elzy Perry, Jr.	1951	900	6	300	-	Py	5,740	580	1954	5,160	P	-	-	-	-	S	Ca.
27.131	do.	do.	1938	550	6	-	-	Py	-	500	-	-	P	-	-	-	-	S	
28.333	do.	do.	1947	550	6	-	-	Py	-	500	-	-	P	-	-	-	-	S	
35.341	do.	Elzy Perry, Sr.	1920's	380	8	-	-	Py	-	340	-	-	P	-	-	-	-	D,S	
12.19. 1.424	J. P. McKnight	Buck Nosker	1943	240	6	-	-	-	4,730	235	-	4,495	P	-	-	-	-	S	
2.342	do.	Bill Marschbanks	1926	420	5	-	-	Py	4,840	380	-	4,460	P	18	-	-	-	S	
3.332	do.	Sam Butler	1941	400	-	-	-	Py	4,950	360	-	4,590	P	-	-	-	-	S	
9.141	Joe McKnight	T. M. Thornton	1946	454	5	-	-	Py	5,020	320	-	4,700	P	-	-	-	-	S	
13.113	J. P. McKnight	-	1912	280	6	-	-	-	4,890	270	-	4,620	P	12	-	-	-	D,S	
18.244	Joe McKnight	-	1909	600	5	550	-	-	5,240	514	1954	4,726	P	5	-	-	-	S	
12.20. 1.131	L. B. and Harold Corn	H. R. Davis	1945	550	8	-	-	Psh	4,560	475	-	4,085	P	-	-	-	-	S	
8.243	J. P. White	do.	1943	870	6	762	-	Py	5,040	810	-	4,230	P	-	-	-	-	S	
11.341	Lee Corn	-	1916	600	-	-	-	-	4,680	550	-	4,130	P	-	-	-	-	S	
12.21. 2.334	J. P. and Tom White	H. R. Davis	1948	600+	-	-	-	-	4,223	-	-	-	P	-	-	-	-	S	
16.222	Tom White and S. P. Johnson, Jr.	do.	1942	800	6	-	-	Py	4,407	580	-	3,827	P	-	-	-	-	S	
18.113	Lee Corn	do.	-	600	-	-	-	Psh	4,520	570	-	3,950	P	-	-	-	-	S	
19.123	S. P. Johnson, Jr.	W. A. Nelson	1952	600	8	-	-	Psh(?)	4,660	557	1953	4,103	P	-	-	-	-	D,S	Ca.
25.211	J. P. and Tom White	-	-	589	-	-	-	Psh	4,100	510	-	3,590	P	15	-	-	-	N	
25.211a	do.	Keyes Drill. Co.	1952	770	6	651	-	Psh	4,110	525	1952	3,585	P	-	-	-	-	D,S	
27.121	Tom White	do.	1953	712	8	10	-	Psh(?)	4,460	600	1956	3,860	P	-	-	-	-	S	Ca.
12.21½.36.444	do.	-	1942	700	-	-	-	Psu	4,220	670	-	3,550	P	-	-	-	-	S	Ca.
12.22. 5.333	J. P. and Tom White	-	-	460	6	-	-	Psu	4,021	425	-	3,596	P	14	-	-	-	S	
12.144	Mrs. J. E. Bloom	-	-	360	-	-	-	Psu	3,874	293.7	5-5-47	3,580	P	-	-	-	-	S	Ca.
15.344	J. B. Patterson	-	-	357.0	-	-	-	Psu	3,929	347.5	5-21-57	3,581	N	-	-	-	-	N	
15.433	do.	-	-	390	-	-	-	Psu	3,930	-	-	-	P	-	-	-	-	S	Ca.
18.111	Tom White	H. R. Davis	1943	600	6	15	-	Psu	4,090	510	-	3,580	P	-	-	-	-	S	Ca.
12.23. 1.313	Rosendo Casarez	T. M. Thornton	1948	366	10	306	Ls	Psu	3,710	-	-	-	T	2,000	-	-	-	I	
5.311	J. B. Patterson	-	-	250	-	-	Ls	Psu	3,810	237.3	5-5-47	3,573	P	-	-	-	-	D,S	Ca.
5.311a	do.	W. A. Nelson	1949	691	14	-	Ls	Psu	3,810	265.6	1-22-57	3,544	T	1,000	-	-	-	I	Ca.
5.341	J. E. Pack	R. J. Johnston	1949	458	15	143	Ls	Psu	3,810	249.7	1-11-56	3,560	T	-	-	-	-	I	
6.214	J. B. Patterson	-	1949	600	-	-	Ls	Psu	3,830	277.1	1-28-57	3,553	T	-	-	-	-	I,0	
6.224	Mrs. J. E. Bloom	-	-	-	-	-	-	Psu	3,840	248.4	5-5-47	3,592	N	-	-	-	-	N	
8.210	J. E. Pack	Murray Drill. Co.	1956	271	-	-	Ls	Psu	3,790	255	1956	3,535	-	-	-	-	-	-	
9.131	F. L. Sherman	Pat Farr	-	244	7	-	Ls	Psu	3,780	212.1	5-5-47	3,568	P	-	-	-	-	D	Ca.
10.331	B. L. Brown	H. R. Davis	1956	260	7	165	Ls	Psu	3,776	220	1956	3,556	-	-	-	-	-	-	
24.233	Boyd Williams	K. A. Huey	1949	515	13	288	Ls	Psu	3,710	152	1949	3,558	T	1,750	1949	-	-	I	

TABLE 1 (continued)

Location No.	Owner or name	Driller	Year completed	Depth of well (ft)	Casing		Principal aquifer		Altitude (ft)	Water level			Type of pump	Yield		Drawdown		Use of water	Remarks
					Diameter (in.)	Depth (ft)	Character of material	Stratigraphic unit		Depth below land-surface (ft)	Date of measurement	Altitude of water level (ft)		Rate (gpm)	Date of measurement	Amount (ft)	Duration of test (hr)		
13.13. 5.100	Mescalero Apache Res.	W. L. Case and Son	1935	272	6	265	Ls	Psu	7,500	-	-	-	P	8	-	-	-	D,S	
13.15.12.100	do.	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	S	
13.16.10.123	do.	W. L. Case and Son	1935	504	7	501	Ss	Py	6,400	460	1935	5,940	P	15	-	-	-	S	
13.18.35.120	Joe Skeen	W. A. Nelson	1957	590	6	143	Cl	Py	-	-	-	-	-	-	-	-	-	-	
13.20.13.222	Pecos Valley Artesian Conservancy District	Keyes Drill. Co.	1955	386	7	238	Ss	Psh	4,524	259	1959	4,265	N	-	-	-	-	O	See log. Equipped with automatic water level recorder. Ca.
13.22.10.123	H. H. McGee	-	-	520	8	-	-	Psu	4,050	440	-	3,610	P	-	-	-	-	S	Ca.
20.133	do.	-	-	530	-	-	-	Psu	-	-	-	-	P	-	-	-	-	S	
28.232	Ivan Chesser	A. F. Smith	1952	560	8	10	-	Psu	4,050	500	1952	3,550	P	-	-	-	-	D,S	Ca.

TABLE 2

RECORDS OF SPRINGS IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

EXPLANATION:

Location number: See explanation in text.

Altitude: Refers to land surface at well as determined by aneroid or estimated from topographic map.

Geologic source: Qal, alluvium; Ti, igneous intrusive; Kmv, Mesaverde Formation; Psu, upper part of San Andres Limestone; Psh, Hondo Sandstone Member; Py, Yeso Formation.

Use of water: D, domestic; I, irrigation; N, none; PS, public supply; S, stock.

Remarks: Ca, chemical analysis in table 3.

Location	Owner	Name	Topographic situation	Altitude	Geologic source	Rate (estimated gpm)	Date	Use of water	Temperature °F.	Remarks
S 8.15.24.242	V. M. Grantham	Upper Padilla Spring	Moderate slope	8,280	Ti	3	May 8, 1956	N	51	Ca
S 8.16.30.343	do.	Lower Padilla Spring	do.	7,040	Ti	450	Nov. 3, 1955	D, S	49	Yield 150 gpm (est) May 8, 1956. Ca
S 9.15.15.331	A. T. Pfingsten	Government Spring	Valley fill terrace	5,972	Psu?	250	Sept. 4, 1957	N	56	Possible fault zone; flow intermittent. Ca
S 9.16.16.134	U. S. Forest Service	Lincoln Spring	Valley stream-bed	6,060	Py?	10	Jan. 13, 1956	N	-	Highly folded and faulted zone.
S 9.18. 5.123	Richard Pryor	Bluewater Spring	Base of Capitan Mountains	5,540	Py?	10	Apr. 13, 1956	D, S	63	Ca
S10.13.26.144	E. J. Blaylock		Valley	-	Kmv	2	Dec. 8, 1955	S	53	Seepage at stream bank.
S10.16.12.322	A. T. Pfingsten		Arroyo	-	Py?	5	Sept. 29, 1955	D, S	63	Ca
26.441	Peter Hurd		River terrace	-	Qal	100	Aug. 23, 1955	I	59	Ca
27.000	Manuel Corona	Crouse Spring	do.	-	Qal	-	-	N	-	Spring has ceased to flow. Ca.
S10.17.29.414	A. T. Pfingsten	Fritz Spring	Base of slope	5,320	Psh	390	Oct. 19, 1955	D, I	63	Ca
S11.14.28.321	Bruce Griffith and Ruidoso Downs	Hale Spring	Moderate slope	-	Py	246	Apr. 27, 1955	PS	54	Ca
S11.20.34.114	J. P. White	Bar H Spring	Steep slope	-	Psu	0.5	Nov. 25, 1957	S	-	Perched water.
S12.13. 3.121	Mescalero Apache Indian Reservation	Carrizo Spring	Base of slope	-	Psu	3	Dec. 22, 1947	N	46	Ca

TABLE 3

CHEMICAL ANALYSES OF WATER FROM WELLS AND SPRINGS, IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

(ANALYSES BY U. S. GEOLOGICAL SURVEY. CHEMICAL CONSTITUENTS ARE IN PARTS PER MILLION.)

EXPLANATION:

Location number: See explanation in text.

Stratigraphic unit: Qal, alluvium; Ti, igneous intrusive; Tc, Cub Mountain Formation of Bodine (1956); Kmv, Mosaverde Formation; Km, Mancos Shale; T̄R s, Santa Rosa Sandstone; Psu, upper part of San Andres Limestone; Psh, Hondo Sandstone Member of San Andres Limestone; Py, Yeso Formation.

* Sum of determined constituents.

✓ Residue on evaporation.

Location No.	Owner or name	Date collected	Stratigraphic unit	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (as Na)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (Parts per million)	Hardness as $CaCO_3$ (Parts per million) Calcium magnesium	Hardness as $CaCO_3$ (Parts per million) Non carbonate	Percent sodium	Sodium adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
S 8.15.24.242	V. M. Grantham	5- 8-56	Ti	51	-	-	-	-	-	41	0	35	6.5	-	-	-	53	20	-	-	158	6.4
8.15.28.211	F. W. Lawrence	3- 6-56	T̄R s	58	-	-	-	-	-	248	0	475	51	-	-	-	640	437	-	-	1,360	7.1
S 8.16.30.343	V. M. Grantham	5- 8-56	Ti	49	-	-	-	-	-	34	0	29	6.0	-	-	-	53	25	-	-	140	6.7
9.14.10.132	Village of Capitan	4-27-55	Km	59	12	0.13	500	171	121	411	0	1,220	428	0.4	1.7	2,660*	1,950	1,610	12	1.2	3,470	6.7
S 9.15.15.331	Government Spring (A. T. Pfingsten)	5-17-39	Psu?	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	580	-
Do.	do.	10- 6-55	Psu?	56	-	-	-	-	-	175	0	221	33	-	-	-	362	218	-	-	773	7.7
9.15.15.331	A. T. Pfingsten	5-23-55	Psh	54	-	-	-	-	-	158	0	617	98	-	-	-	830	700	-	-	1,570	7.7
9.16. 9.214	V. M. Grantham	5-10-57	Py	59	-	-	-	-	12	181	0	691	34	1.5	.1	-	895	746	3	1.7	1,450	7.4
25.222	W. A. Sterrott	5-10-57	Py	61	-	-	-	-	-	210	0	810	46	-	-	-	1,080	908	-	-	1,680	7.3
29.444b	Community of Lincoln	9-12-57	Py	58	20	-	187	62	47	208	0	541	60	.5	5.0	1,100✓	722	551	12	.8	1,380	7.4
33.111	D. R. Brenton	7-22-55	Py	57	-	-	-	-	-	220	0	701	65	-	-	-	910	730	-	-	1,650	7.1
9.17.26.334	Doran Wood	5- 8-57	Psu	64	-	-	-	-	-	171	0	179	14	-	-	-	340	200	-	-	628	7.5
34.214	do.	5- 8-57	Py?	66	-	-	-	-	-	271	0	293	22	-	-	-	550	328	-	-	950	7.4
S 9.18. 5.123	Bluewater Spring (Richard Pryor)	4-13-56	Py?	63	-	-	-	-	-	242	0	1,190	39	-	-	-	1,470	1,270	-	-	2,200	7.1
9.18. 9.323	E. H. Latham	5- 8-57	Psu?	61	-	-	-	-	-	245	0	94	14	-	-	-	316	115	-	-	580	7.3
15.432	L. A. Pacheco	5- 8-57	Psh?	65	-	-	-	-	-	250	0	324	25	-	-	-	580	375	-	-	989	7.3
25.334	J. A. Cooper	5- 8-57	Psh?	65	-	-	-	-	-	227	0	212	31	-	-	-	442	256	-	-	836	7.6
9.19.27.213	S. C. Marley	5-16-57	Psh?	75	-	-	-	-	-	260	0	169	24	-	-	-	420	207	-	-	779	7.4
10.13. 2.314	D. O. Jones	12- 1-55	Kmv	51	24	-	234	71	95	372	0	631	73	0.4	21	1,380✓	876	571	19	1.4	1,770	7.4
29.400	U. S. Air Force	10-12-60	Tc	-						283	0	371	72	-	-	-	-	-	-	-	1,290	7.0
S10.16.12.322	A. T. Pfingsten	9-29-55	Py?	63	-	-	-	-	-	154	0	532	24	-	-	-	655	529	-	-	1,200	7.7
26.441	Peter Hurd	8-23-55	Qal	59	-	-	-	-	-	274	0	776	67	-	-	-	1,080	856	-	-	1,820	7.2
27.000	Crouse Spring	4-16-39	Qal	-	-	-	272	78	40	289	0	721	67	-	6.0	1,420✓	1,000	763	8	.6	1,720	-
10.17.16.131	Wilbur McKnight	5-23-55	Psh?	67	-	-	-	-	14	261	0	222	20	-	2.8	-	445	231	6	.3	825	7.7
16.433	do.	5-23-55	Psh?	64	-	-	-	-	6.7	223	0	195	25	-	4.5	-	410	228	3	.1	771	7.5
27.122	do.	5-23-55	Psh?	67	-	-	-	-	-	278	0	197	24	-	-	-	450	222	-	-	823	7.5
29.324	A. T. Pfingsten	5-23-55	Qal	61	-	-	-	-	-	233	0	712	53	-	-	-	1,000	809	-	-	1,630	7.4
S10.17.29.414	Fritz Spring (A. T. Pfingsten)	5-23-55	Psh	63	-	-	-	-	-	253	0	235	24	-	-	-	450	242	-	-	861	8.2
10.17.30.224	A. T. Pfingsten	5-25-55	Qal	61	-	-	-	-	-	244	0	730	56	-	-	-	955	755	-	-	1,680	7.4
10.18. 7.423	E. J. Whitaker	5- 7-57	Py	63	-	-	-	-	-	149	0	931	75	-	-	-	755	633	-	-	1,250	7.2
23.124	E. W. Nelson	5- 7-57	Psh?	70	-	-	-	-	-	197	0	109	20	-	-	-	304	142	-	-	584	7.3
10.19.10.343	J. A. Cooper	5-16-57	Psh?	67	-	-	-	-	-	188	0	136	19	-	-	-	314	160	-	-	590	7.3
10.20. 8.134	S. C. Marley	5- 6-50	Psh?	-	13	-	82	29	16	184	0	151	32	0.5	5.7	419*	324	172	10	0.4	670	-
16.444	Pecos Valley Artesian Conservancy District	1- -55	Psh	-	-	-	-	-	-	197	0	139	22	-	-	-	287	126	-	-	625	7.6
Do.	do.	1- -55	Psh	-	-	-	-	-	-	239	0	128	24	-	-	-	316	120	-	-	675	7.2
10.21.16.222	do.	3- -56	Psh	-	-	-	-	-	-	250	0	155	25	-	-	-	375	170	-	-	777	7.9
Do.	do.	3-31-56	Psh	-	-	-	-	-	-	229	0	236	20	-	-	-	430	242	-	-	863	7.5
10.23. 9.124	J. W. & J. P. McKnight	3-30-55	Psu	68	-	-	-	-	-	192	0	445	340	-	-	-	640	482	-	-	2,130	7.6
27.222	E. M. Haley	4-25-55	Psu	68	-	-	-	-	-	223	0	508	155	-	-	-	740	558	-	-	1,690	7.4
11.13. 8.311	Ruidoso Realty Co.	5-15-56	Ti	49	-	-	-	-	-	386	0	562	82	-	-	-	960	644	-	-	1,690	7.2
22.344	Cree Meadows Golf Club	4-30-56	Km	55	-	-	-	-	-	164	0	1,330	302	-	-	-	1,650	1,520	-	-	3,090	7.2
S11.14.28.321	Hale Spring (Ruidoso Downs, Bruce Griffith)	4-27-55	Py	54	18	-	240	84	11	266	0	649	52	.1	.8	1,190✓	944	726	2	.2	1,570	7.1
11.15.12.112	Paul Jones, Elzy Perry, Sr., U. S. Forest Service	5- 9-57	Py	57	-	-	-	-	-	137	0	2,130	101	2.0	.3	-	2,520	2,370	-	-	3,250	7.6
Do.	do.	8-27-57	Py	72	-	-	-	-	-	196	0	2,060	97	-	-	-	2,360	2,200	-	-	3,250	7.3
11.15.34.142	Ernest & Robert McDaniel	5- 9-57	Py	61	-	-	-	-	51	276	0	563	47	0.3	1.2	-	770	544	13	8.0	1,420	7.3

TABLE 3 (continued)

Location No.	Owner or name	Date collected	Stratigraphic unit	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (as Na)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (Parts per million)	Hardness as $CaCO_3$ Calcium magnesium (Parts per million)	Hardness as $CaCO_3$ Non carbonate (Parts per million)	Percent sodium	Sodium adsorption ratio (SAR)	Specific conductance (micromhos at 25° C)	pH
11.16. 8.344	J. V. Tully	5- 9-57	Psh?	63	-	-	-	-	-	175	0	276	41	-	-	-	452	308	-	-	876	8.2
19.144	L. P. Gipson and Son	5- 9-57	Py	70	-	-	-	-	14	210	0	1,580	64	1.7	-	-	1,880	1,710	2	1.5	2,650	7.4
22.321	Leroy McKnight	5- 9-57	Py	61	-	-	-	-	-	189	0	719	52	-	-	-	945	790	-	-	1,550	8.2
24.331	Fred Montes	5- 9-57	Py	63	-	-	-	-	-	144	0	514	37	-	-	-	685	567	-	-	1,190	7.3
11.17. 3.244	Manuel Torrez	5-18-55	Py	64	-	-	-	-	-	190	0	404	33	-	-	-	620	464	-	-	1,090	7.8
4.213	Hiram M. Dow	11- 8-26	Py	-	14	1.2	279	90	59	285	0	822	66	-	4.8	1,530✓	1,066	832	11	.8	-	-
11.413	E. W. Nelson	6- 1-55	Qal	62	-	-	-	-	-	251	0	747	61	-	-	-	995	790	-	-	1,730	7.4
12.334	Frank Peters	5-16-55	Qal	61	-	-	-	-	-	273	0	793	56	-	-	-	1,080	856	-	-	1,780	7.4
16.313	Sylvester Salcido	5-18-55	Qal	61	-	-	-	-	-	202	0	532	37	-	-	-	750	584	-	-	1,300	7.7
16.313a	Pedro Salcido	5-17-55	-	70	-	-	-	-	-	178	0	718	53	-	-	-	905	759	-	-	1,600	7.9
17.424	Proceso Salcido	5-18-55	Qal	61	-	-	-	-	-	189	0	511	39	-	-	-	720	565	-	-	1,260	7.7
17.441	Joe Salcido	5-18-55	Qal	61	-	-	-	-	12	219	0	556	38	-	4.0	-	790	610	3	.2	1,350	7.6
18.424	Faustino Salcido	5-17-55	-	62	-	-	-	-	23	164	0	516	44	-	7.4	-	690	556	7	.4	1,270	7.6
20.131	do.	5-18-55	Qal	61	-	-	-	-	-	222	0	589	39	-	-	-	795	613	-	-	1,400	7.5
20.212a	Joe Salcido	5-18-55	Py?	61	-	-	-	-	-	204	0	973	91	-	-	-	1,120	953	-	-	2,070	7.6
30.212	Faustino Salcido	5-18-55	Psh	61	-	-	-	-	-	228	0	274	35	-	-	-	455	268	-	-	939	7.9
11.18. 7.242	Mrs. Edna Purcella	9-28-55	Py	63	-	-	-	-	-	210	0	1,050	60	-	-	-	1,200	1,030	-	-	2,150	7.4
7.313	Milton Mabie and B. M. Pavey	5-12-55	Qal	59	-	-	-	-	-	300	0	796	57	-	-	-	1,060	814	-	-	1,820	7.3
8.432a	R. F. Casey	5-12-55	Qal	61	-	-	-	-	-	278	0	751	55	-	-	-	990	762	-	-	1,740	7.4
23.131	Dr. L. F. Hamilton	5-12-55	Qal	62	-	-	-	-	-	260	0	780	53	-	-	-	1,020	807	-	-	1,740	7.5
25.143	Fuller Ranch	10-26-55	Py	61	-	-	-	-	-	256	0	741	63	-	-	-	990	780	-	-	1,730	7.3
30.423	do.	5-14-57	Psh?	63	-	-	-	-	-	178	0	268	30	-	-	-	468	322	-	-	837	7.6
35.132	do.	10-26-55	Psh?	63	-	-	-	-	-	169	0	339	18	-	-	-	484	346	-	-	911	6.9
11.19.26.311	J. P. White	10-10-55	Py	-	-	-	-	-	-	176	0	1,100	155	-	-	-	1,320	1,180	-	-	2,380	7.1
27.114	J. P. McKnight	5-10-55	Py	65	-	-	-	-	-	255	0	906	96	-	-	-	1,120	911	-	-	2,020	7.6
27.143	do.	5-10-55	Qal	64	-	-	-	-	-	256	0	752	52	-	-	-	980	770	-	-	1,710	7.3
31.211	Geo. Clements	5-11-55	Qal	62	-	-	-	-	-	206	0	789	64	-	-	-	940	771	-	-	1,730	7.5
11.22. 1.311	H. L. Woods	6- 2-47	Psu	-	-	-	144	50	55	234	0	350	88	-	4.4	-	565	374	17	1.0	1,210	-
2.131	do.	12-28-26	Psu	-	14	2.4	194	62	63	221	0	523	96	-	6.8	1,120✓	739	-	16	1.0	-	-
Do.	do.	6-30-47	Psu	-	-	-	190	57	69	215	0	496	118	-	.6	-	708	532	18	1.1	1,510	-
22.111	J. P. White	6- 2-47	Psu	-	-	-	178	55	23	234	0	448	42	-	4.6	-	670	478	7	.4	1,230	-
25.331	J. B. Patterson	6- 2-47	Psu	-	-	-	198	54	30	215	0	523	43	-	.4	-	716	540	8	.5	1,290	-
11.23. 8.232	E. T. Egger	6- 2-47	Psu	-	-	-	146	47	25	243	0	333	45	-	4.4	-	558	359	9	.5	1,070	-
15.222	C. E. Smith	6- 3-55	Psu	66	-	-	-	-	-	230	0	167	51	-	-	-	685	496	-	-	1,290	7.4
27.424	B. L. Brown	7-19-47	Psu	-	-	-	138	43	20	237	0	381	39	-	6.4	-	522	311	8	0.4	1,010	-
S12.13. 3.121	Carizzo Spring	12-19-47	Psu	53	-	-	196	50	19	299	0	453	58	0.1	1.1	-	694	450	13	.8	1,330	-
Do.	do.	12-22-47	Psu	46	-	-	184	57	35	302	0	433	50	.2	1.1	-	694	446	10	.6	1,280	-
12.15. 8.443	Mescalero Apache Indian Reservation	5- 9-57	Py	58	-	-	-	-	-	241	0	721	116	-	-	-	1,110	910	-	-	1,800	7.2
12.17. 2.241	Fuller Ranch	5-14-57	Psh?	62	-	-	-	-	-	148	0	251	59	-	-	-	428	306	-	-	881	7.6
7.441	Frank Peters	5-15-57	Psh?	68	-	-	-	-	-	184	0	174	23	-	-	-	342	191	-	-	661	7.3
32.443	H. P. Joyce	5-14-57	-	62	-	-	-	-	-	218	0	327	27	-	-	-	544	366	-	-	972	7.5
35.141	do.	5-14-57	-	61	-	-	-	-	-	180	0	200	19	-	-	-	380	232	-	-	691	7.7
12.18.14.311	T. V. Slaughter	12-17-41	Py	-	-	-	362	-	-	292	0	-	24	-	-	1,120✓	-	-	-	-	1,310	-
Do.	do.	1- 1-42	Py	-	-	-	-	-	-	278	0	-	25	-	-	-	-	-	-	-	1,360	-
16.124	do.	5-14-57	Py?	64	-	-	-	-	-	185	0	245	28	-	-	-	422	270	-	-	811	7.4
18.221	do.	5-14-57	Py	65	-	-	-	-	-	129	0	647	43	1.9	1.1	-	860	754	-	-	1,330	7.4
Do.	do.	8-27-57	Py	62	-	-	-	-	-	128	0	617	42	-	-	-	790	685	-	-	1,320	8.0
12.21.19.123	S. P. Johnson, Jr.	5-23-57	Psh?	68	-	-	-	-	-	242	0	240	19	-	-	-	460	262	-	-	848	7.5
27.121	Tom White	5-23-57	Psh?	70	-	-	-	-	-	220	0	147	18	-	-	-	340	160	-	-	663	7.6
12.21½.36.444	do.	5-23-57	Psu	67	-	-	-	-	-	236	0	244	18	-	-	-	460	266	-	-	847	-
12.22.12.144	Mrs. J. E. Bloom	6-16-47	Psu	-	-	-	106	46	9.7	323	0	162	29	-	.5	-	454	189	4	.2	830	-
15.433	J. B. Patterson	5-21-57	Psu	65	-	-	-	-	-	233	11	119	20	-	-	-	358	149	-	-	698	7.4
18.111	Tom White	5-23-57	Psu	68	-	-	-	-	-	236	0	309	29	-	-	-	548	354	-	-	965	7.2
12.23. 5.311	J. B. Patterson	8- -40	Psu	-	-	-	244	65	38	244	0	654	56	-	-	1,270✓	876	676	9	0.6	1,560	-
Do.	do.	7-19-47	Psu	-	-	-	256	68	35	243	0	677	56	-	15	-	918	719	8	.5	1,620	-
5.311a	do.	11- 4-55	Psu	-	-	-	-	-	-	300	0	765	55	-	-	-	1,050	804	-	-	1,840	7.2
9.131	F. L. Sherman	6- 2-47	Psu	-	-	-	108	36	19	228	0	217	24	-	14	-	418	230	9	.4	836	-
13.20.13.222	Pecos Valley Artesian Conservancy District	11-26-55	Psh	-	-	-	-	-	-	253	0	213	26	-	-	-	420	212	-	-	826	7.4
Do.	do.	12- 8-55	Psh	-	-	-	-	-	-	261	0	188	14	-	-	-	410	196	-	-	758	7.5
13.22.10.123	H. H. McGee	5-23-57	Psu	67	-	-	-	-	-	256	0	204	40	-	-	-	428	218	-	-	868	7.4
28.232	Ivan Chesser	5-22-57	Psu	75	-	-	-	-	-	257	-	267	27	-	-	-	498	288	-	-	931	7.5

TABLE 4

CHEMICAL ANALYSES OF WATER FROM STREAMS IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

(ANALYSES BY U.S. GEOLOGICAL SURVEY. CHEMICAL CONSTITUENTS ARE IN PARTS PER MILLION.)

EXPLANATION:

*	Collected at parshall flume above Bonito Lake.	**	Collected at pipeline valve ½ mile below Bonito Lake.
/	Sum of determined constituents.	//	Collected at pipeline diversion dam.
#	Residue on evaporation.	##	Floodflow.

Location	Stream	Date collected	Flow at time of collection (estimated) (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (as Na)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$		Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
																(Parts per million)	Calcium magnesium (Parts per million)	Non-carbonate				
NW¼ sec.10, T. 9 S.,R. 14 E.	Magado Creek	5-24-55	0.02	67	-	-	-	-	-	172	0	1,670	278	-	-	-	1,970	1,830	-	-	3,430	8.0
NE¼ sec.17, T. 9 S.,R. 14 E.	do.	5-24-55	.04	74	-	-	-	-	-	123	0	1,920	318	-	-	-	2,160	2,060	-	-	3,790	8.0
Do.	do.	10-27-55	.1	50	-	-	-	-	-	153	0	1,730	245	-	-	-	1,930	1,800	-	-	3,360	7.2
Do.	do.	4-30-56	.04	58	-	-	-	-	-	134	0	1,910	282	-	-	-	2,100	1,990	-	-	3,690	7.4
SE¼ sec.16, T. 9 S.,R. 15 E.	Rio Bonito	5-24-55	.02	57	-	-	-	-	-	210	0	759	122	-	-	-	1,100	928	-	-	1,890	7.6
Do.	do.	10-27-55	.4	58	-	-	-	-	-	199	-	649	101	-	-	-	850	687	-	-	1,660	7.4
Do.	do.	5- 1-56	.04	71	-	-	-	-	-	198	0	731	118	-	-	-	945	782	-	-	1,800	7.6
SW¼ sec.28, T. 9 S.,R. 16 E.	do.	5-25-55	1	63	-	-	-	-	-	166	0	683	62	-	-	-	915	779	-	-	1,550	7.7
Do.	do.	10-27-55	2	61	-	-	-	-	-	184	-	652	57	-	-	-	825	674	-	-	1,610	7.5
Do.	do.	5- 1-56	.6	65	-	-	-	-	-	161	0	682	61	-	-	-	860	728	-	-	1,530	7.7
NW¼ sec.12, T.10 S.,R. 12 E.*	do.	5-24-55	2	64	14	-	36	14	1.2	59	0	83	10	0.2	0.5	188/	148	99	2	0.0	308	7.7
Do.	do.	6-14-55	2	58	12	0.02	42	9.4	13	68	0	97	9.5	.7	.2	229#	144	88	17	.5	349	7.7
Do.	do.	4-30-56	.6	58	-	-	-	-	-	84	0	146	20	-	-	-	217	148	-	-	483	6.9
NE¼ sec.12, T.10 S.,R. 12 E.**	do.	6-14-55	1.4	49	7.3	.00	59	13	16	96	0	130	13	.7	.5	307#	200	122	15	.5	459	7.2
Do.	do.	9- 1-55	3	56	11	.01	56	14	10	97	0	117	11	.6	.9	282	197	118	10	.3	430	7.2
NW¼ sec.13, T.10 S.,R. 13 E.	do.	5-24-55	.2	69	41	-	129	45	29	194	0	333	46	.1	.3	778*	507	348	11	.6	1,010	7.8
NE¼ sec.15, T.10 S.,R. 13 E.	do.	5-24-55	2	69	-	-	-	-	-	128	0	172	20	-	-	-	306	201	-	-	594	8.0
Do.	do.	10-27-55	1	49	-	-	-	-	-	197	0	259	33	-	-	-	404	242	-	-	863	7.2
Do.	do.	4-30-56	.1	70	-	-	-	-	-	175	0	292	40	-	-	-	426	282	-	-	909	7.9
SW¼ sec.31, T.10 S.,R. 13 E.//	Eagle Creek	4-27-55	.5	56	-	-	-	-	-	41	6	45	7.0	-	-	-	104	60	-	-	208	8.7
Do.	do.	5-24-55	1	67	12	-	26	8.3	6.9	56	0	54	8.0	.2	.3	144/	99	53	13	.3	232	7.3
Do.	do.	6-14-55	.3	71	12	.01	33	5.9	9.2	75	0	53	6.2	.5	.5	157/	107	46	16	.4	265	7.7
Do.	do.	4-30-56	.3	62	-	-	-	-	-	82	0	70	13	-	-	-	133	66	-	-	315	7.0
SE¼ sec.33, T.10 S.,R. 13 E.	do	4-30-56	.3	61	-	-	-	-	-	164	0	152	24	-	-	-	273	138	-	-	611	7.6
SE¼ sec.12, T.10 S.,R. 16 E.	Rio Bonito	6-21-55	1	75	-	-	-	-	-	216	0	778	62	-	-	-	1,000	823	-	-	1,720	7.8
Do.	do.	10-27-55	2	60	-	-	-	-	-	214	-	741	61	-	-	-	960	784	-	-	1,670	7.2
Do.	do.	4-30-56	3	61	-	-	-	-	-	227	0	777	64	-	-	-	1,000	814	-	-	1,730	7.6
SW¼ sec.21, T.10 S.,R. 16 E.	Rio Ruidoso	4-27-55	.5	64	-	-	-	-	-	237	0	655	66	-	-	-	920	726	-	-	1,590	7.5
Do.	do.	10-27-55	10	54	-	-	-	-	-	245	0	529	50	-	-	-	730	529	-	-	1,370	7.6
Do.	do.	4-30-56	1	55	-	-	-	-	-	293	0	662	65	-	-	-	945	705	-	-	1,660	7.7
NW¼ sec.19, T.10 N.,R. 17 E.	Rio Bonito	5-25-55	1	69	-	-	-	-	-	166	0	783	63	-	-	-	945	809	-	-	1,700	7.6
Do.	do.	10-27-55	2	57	-	-	-	-	-	193	-	747	60	-	-	-	940	782	-	-	1,650	7.5
SW¼ sec.19, T.11 S.,R. 13 E.	Rio Ruidoso	4-27-55	2	52	-	-	-	-	-	-	-	41	7.5	-	-	-	92	52	-	-	192	-
Do.	do.	6- 1-55	2	56	11	-	21	5.0	3.4	35	0	41	6.5	.2	.3	105/	73	44	9	.2	174	7.1
Do.	do.	10-27-55	4	49	-	-	-	-	-	56	0	57	9.5	-	-	-	94	48	-	-	239	6.7
Do.	do.	4-30-56	3	57	-	-	-	-	-	56	0	53	11	-	-	-	89	43	-	-	238	6.9
SW¼ sec.34, T.11 S.,R. 13 E.	Carrizo Creek	12-22-47	2	53	-	-	184	56	34	300	0	432	48	.2	1.3	-	690	444	10	.6	1,280	-
NW¼ sec.14, T.11 S.,R. 14 E.	Rio Ruidoso	4-27-55	2	58	-	-	-	-	12	158	0	371	42	-	1.0	-	550	420	4	.2	1,070	7.6
Do.	do.	10-27-55	10	53	-	-	-	-	-	220	0	404	41	-	-	-	590	410	-	-	1,140	7.0
Do.	do.	4-30-56	2.	62	-	-	-	-	-	236	0	562	55	-	-	-	785	592	-	-	1,420	7.6
SW¼ sec. 4, T.11 S.,R. 17 E.	Rio Ruidoso	5-25-55	4	69	-	-	-	-	-	185	0	972	71	-	-	-	1,250	1,100	-	-	1,960	7.5
Do.	do.	6-21-55	.4	77	-	-	-	-	-	235	0	975	71	-	-	-	1,220	1,030	-	-	2,020	7.6
Do.	do.	10-27-55	12	59	-	-	-	-	-	255	0	756	64	-	-	-	970	761	-	-	1,730	7.8
Do.	do.	4-30-56	3	61	-	-	-	-	-	250	0	965	73	-	-	-	1,240	1,040	-	-	2,040	7.6
SW¼ sec.11, T.11 S.,R. 17 E.	Rio Hondo	7-11-57	30	-	-	-	337	78	53	252	0	-	71	-	-	1,740*	1,160	955	9	.7	1,970	7.3
SW¼ sec.12, T.11 S.,R. 17 E.	do.	5-16-55	2	75	-	-	-	-	-	211	0	794	56	-	-	-	1,030	857	-	-	1,720	7.5
Do.	do.	6-21-55	2	61	-	-	-	-	-	277	0	822	58	-	-	-	1,080	853	-	-	1,840	7.3
Do.	do.	10-27-55	20	60	-	-	-	-	-	232	0	736	56	-	-	-	940	750	-	-	1,660	7.5
Do.	do.	4-30-56	5	66	-	-	-	-	-	227	0	783	56	-	-	-	1,020	834	-	-	1,720	7.4
NW¼ sec.15, T.11 S.,R. 18 E.##	Rio Hondo**	7-24-56	30	68	19	.33	149	31	15	173	0	338	25	.5	1.1	707#	500	358	6	.3	943	7.5

TABLE 4 (continued)

Location	Stream	Date collected	Flow at time of collection (estimated) (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na + K) (as Na)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$		Percent sodium	Sodium-adsorption ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
																(Parts per million)	Calcium magnesium (Parts per million)	Non-carbonate (Parts per million)				
SE¼ sec.24, T.11 S.,R. 18 E.	Rio Hondo	4-28-55	0.6	67	-	-	-	-	3.9	184	0	779	53	-	2.6	-	1,030	879	1	0.1	1,680	7.6
Do.	do.	6-21-55	2	77	-	-	-	-	-	197	0	820	56	-	-	-	1,050	888	-	-	1,740	7.6
Do.	do.	10-27-55	20	60	-	-	-	-	-	228	0	758	52	-	-	-	955	768	-	-	1,670	7.4
Do.	do.	4-30-56	5	59	-	-	-	-	-	214	0	769	53	-	-	-	985	810	-	-	1,680	7.4
NW¼ sec.27, T.11 S.,R. 19 E.	do.	5-10-55	2	66	-	-	-	-	-	168	0	803	57	-	-	-	960	822	-	-	1,690	7.8
Do.	do.	6-21-55	.02	81	-	-	-	-	-	138	0	965	70	-	-	-	1,130	1,020	-	-	1,920	7.7
Do.	do.	10-27-55	15	61	-	-	-	-	-	202	0	766	55	-	-	-	945	780	-	-	1,660	7.9
Do.	do.	4-30-56	3	62	-	-	-	-	-	165	0	803	56	-	-	-	985	850	-	-	1,680	7.4
NE¼ sec.20, T.11 S.,R. 21 E.	do.	8-18-57	920	66	18	-	-	-	6.6	209	0	-	6.0	-	-	-	230	58	6	.2	457	7.6
Do.	do.	8-20-57	42	77	12	-	-	-	23	142	0	-	18	-	-	-	530	414	9	.4	1,080	7.7
Do.	do.	9- 9-57	4	68	19	-	-	-	38	115	0	-	47	-	-	-	690	596	11	.6	1,310	8.0
NE¼ sec. 3, T.12 S.,R. 23 E.	do.	10-10-55	20	-	-	-	-	-	-	173	0	680	51	-	-	-	840	698	-	-	1,510	7.2
Do.	do.	10-27-55	1	57	-	-	-	-	-	142	0	815	59	-	-	-	950	834	-	-	1,680	7.5

TABLE 5

COMMON CHEMICAL CONSTITUENTS AND CHARACTERISTICS OF WATER AND SUMMARY OF ANALYSES OF WATER IN THE RIO HONDO DRAINAGE BASIN, CHAVES, LINCOLN, AND OTERO COUNTIES, N. MEX.

[Recommended limits are mostly those set forth by the California State Water Pollution Control Board (1957). Constituent has no harmful physiological effect, unless specified.]

Constituent or property	Principal source	Principal significance	Recommended limits for selected uses	Range in concentration for samples analyzed	Number of determinations	Number of determinations more than (>) or less than (<) selected concentrations
Silica (SiO_2)	Siliceous materials are present in virtually all rocks.	Forms hard scale in boilers and pipes.	1 ppm for high-pressure to 40 ppm for low-pressure boiler feed; 10 to 50 ppm for other industrial processes.	7.3 to 41 ppm	19	18 > 10 ppm 1 > 40 ppm
Iron (Fe)	Iron-bearing minerals, well casing, pipes and storage tanks.	More than about 0.3 ppm stains laundry and utensils. Objectionable for many industrial, food-processing, and beverage uses. Imparts objectionable taste when greater than about 1.0 ppm.	Traces for electroplating; less than 0.2 ppm for most industrial use. Maximum of 0.3 ppm for the sum of iron and manganese in domestic supplies.	0.00 to 2.4 ppm	8	5 < 0.2 ppm 3 > 0.3 ppm
Calcium (Ca)	Limestone, dolomite, gypsum.	Causes hardness and scale-forming properties of water. Beneficial in irrigation water.	See hardness.	2.1 to 500 ppm	32	
Magnesium (Mg)	Dolomite and some igneous rocks, connate brines.	Similar to calcium. Salts of magnesium are cathartics.	125 ppm for domestic supply.	5.0 to 171 ppm	31	1 > 125 ppm
Sodium (Na) plus potassium (k)	Some igneous rocks, salt, and clay.	Causes foaming in boilers when concentration of sodium plus potassium exceeds 50 ppm. High concentrations are toxic to plants, harmful to soil conditions, and are cathartic.	50 ppm of sodium plus potassium for boiler water; see SAR for effect on irrigation water.	1.2 to 121 ppm	43	8 > 50 ppm
Bicarbonate (HCO_3) and carbonate (CO_3)	Carbonate minerals and carbon dioxide in air.	In combination with calcium and magnesium form scale and release corrosive carbon dioxide gas. Carbonate and bicarbonate in excess of equivalents of alkaline earths may cause water to be unsuitable for irrigation.	100 ppm for boiler use.	34 to 411 ppm	167	14 < 100 ppm
Sulfate (SO_4)	Gypsum and anhydrite.	In combination with calcium forms hard scale. Magnesium and sodium sulfate are cathartics.	250 ppm for domestic use.	29 to 2,130 ppm	162	117 > 250 ppm
Chloride (Cl)	Salt and other chloride minerals.	High concentrations of chloride salts impart salty taste; may be toxic to plants; may accelerate corrosion of pipes.	250 ppm for domestic use.	6.0 to 428 ppm	169	6 > 250 ppm
Fluoride (F)	Some types of igneous rocks	Reduces incidence of tooth decay in children when concentration is 0.5 to 1.5 ppm; more than about 1.5 ppm causes mottling of tooth enamel in children.	1.0 ppm for domestic use.	0.1 to 2.0 ppm	22	4 > 1.0 ppm 3 > 1.5 ppm
Nitrate (NO_3)	Decayed organic matter, sewage, and nitrate fertilizers.	Values higher than 5 ppm may suggest pollution; more than about 44 ppm may cause methemoglobanemia (infant cyanosis).	44 ppm for domestic use.	0.1 to 21 ppm	39	3 > 10 ppm
Dissolved solids	All rock minerals.	High concentrations are harmful to plant and animal life and can cause foaming in boilers.	1,000 ppm for domestic use; 1,000 ppm for most industrial uses.	105 to 2,660	20	10 > 1,000 ppm
Hardness (as $CaCO_3$)	Mainly calcium and magnesium in solution.	Hard water causes excessive soap consumption scale in boilers and pipes, toughening of cooked vegetables.	Water having a hardness of more than 100 ppm generally considered to be hard; 0 to 50 ppm for laundering; 80 ppm for boiler feed water at 0 to 150 pounds per square inch pressure.	53 to 2,520 ppm	165	109 > 500 ppm 49 = 100 to 500 ppm 7 < 100 ppm
Sodium-adsorption ratio (SAR)		Index of sodium hazard in irrigation water.	Less than 3.0 generally satisfactory on all soils. More than 26 generally unsatisfactory.	0.0 to 8.0	25	1 > 3 24 < 3.0
Specific conductance (micromhos at 25° C)		Specific conductance values are directly proportional to the dissolved solids concentration.	More than 1,500 generally exceeds standards for domestic water. More than 3,000 unsuitable for irrigation under most conditions.	140 to 3,790	167	73 > 1,500 8 > 3,000
pH (logarithm of the reciprocal of the hydrogen-ion concentration in moles per liter)	pH is a function of the hydrogen-ion concentration in water. It is affected by the amount and type of dissolved gases, agricultural and industrial wastes, etc.	Values less than 7 indicate acidity; values more than 7 indicate alkalinity.		6.7 to 8.7	147	138 > 7.0 3 = 7.0 6 < 7.0

TABLE 6

LOGS OF SELECTED WELLS IN THE RIO HONDO DRAINAGE BASIN, CHAVES AND LINCOLN COUNTIES, N. MEX.

Logs were modified slightly for uniformity of presentation. Stratigraphic correlations were made by W. A. Mourant, unless otherwise indicated.

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 9.15.15.423 I. A. and R. Aldaz		
QUATERNARY SYSTEM:		
Alluvium:		
Boulders	50	50
PERMIAN SYSTEM:		
Yeso Formation:		
Shale, yellow	40	90
Redbeds	17	107
Shale, yellow	8	115
Sand and gravel	10	125
Well 9.16.10.112 J. V. Morris		
QUATERNARY SYSTEM:		
Alluvium:		
Boulders	60	60
PERMIAN SYSTEM:		
Upper part of San Andres Limestone, Hondo Sandstone Member, and Yeso Formation	320	380
Well 9.18.17.422 Anthony Sanchez		
Not recorded	120	120
PERMIAN SYSTEM:		
Hondo Sandstone Member (?):		
Sandstone, yellow	10	130
Rock; water	10	140
Sand	8	148

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 9.20.11.233 Texam No. 1 - Boyle		
Samples described by R. L. Borton, New Mexico State Engineer Office		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
No sample	138	138
Limestone, brown and gray, very fine grained, argillaceous; contains fragments of red limestone, some calcite crystals in vugs, traces of clear broken calcite crystals, yellowish-gray sandy limestone, dark gray, and very fine grained dolomitic limestone from 142 to 147 feet	9	147
Limestone, gray-brown, very fine grained; traces of "intruded" pink very fine grained limestone with manganese stain; trace of pink-brown drusy-surfaced cavity lining calcite from 150 to 157 feet	10	157
Limestone, gray-brown, very fine grained; some calcite crystals up to 4 mm across included in gray limestone; some limonite stain from 164 to 184 feet	27	184
Limestone, gray-brown, very fine grained; traces of pink very fine grained limestone; some light-green very fine grained limestone from 194 to 200 feet	16	200
Limestone, 80 percent gray and brown, very fine grained; 20 percent light-yellow-red silty limestone	6	206
Limestone, 50 percent gray and brown, very fine grained; 50 percent light-yellow-red silty limestone; trace of mica in silty limestone; trace of milky white chert from 212 to 216 feet	10	216
Limestone, gray-brown, very fine grained, and some milky white chert	4	220
No sample	5	225
Limestone, 50 percent dark gray, very fine grained, and 50 percent light-brown, dolomitic, very fine grained	13	238
Limestone, gray, very fine grained, and traces of yellow siltstone and gray limestone fragments	7	245
Limestone, 50 percent light-gray and soft; 50 percent medium-gray and hard; both very fine grained	9	254
No sample	111	365

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 9.20.11.233 Texam No. 1 - Boyle (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
Limestone, light- and dark-gray very fine grained	5	370
Limestone, medium-gray, very fine grained; dolomitic	5	375
Limestone, 70 percent medium-gray, very fine grained, and dolomitic; 30 percent light-gray silty, finely crystalline	5	380
Limestone, 90 percent medium-gray, very fine grained, and dolomitic; 10 percent brown, limey siltstone	5	385
Limestone, gray-brown, argillaceous	5	390
Limestone, dove-gray, very fine grained	7	397
No sample	12	409
Limestone, gray and pink, very fine grained; trace of orange-yellow siltstone	3	412
Limestone, gray and buff, very fine grained	7	419
Limestone, medium-gray, very fine grained; trace of light-gray, very fine grained limestone from 446 to 451 feet	32	451
Limestone, gray-brown, very fine grained and medium soft	12	463
Limestone, gray-brown; some vugs filled with calcite; trace of dark-brown, hard, highly ferruginous limestone from 474 to 479 feet	16	479
Limestone, light gray; some pink, very fine grained limestone	4	483
Hondo Sandstone Member:		
Limestone, 70 percent light-gray and some pink, very fine grained; 30 percent white calcareous, medium grained, angular, well-sorted sandstone	7	490
Sandstone, white calcareous, medium-grained, angular, well-sorted	7	497
No sample	7	504
Sandstone, white, calcareous, medium-grained, angular, well-sorted; stained yellow from 543 to 546 feet	42	546
Sandstone, 70 percent calcareous, medium-grained angular, well-sorted, stained yellow; 30 percent light-gray, very fine grained limestone and traces of mica	5	551
Limestone, 80 percent gray and yellow with traces of white chert; 20 percent calcareous, medium-grained, angular, well-sorted sandstone stained yellow; sandstone decreasing and some clear quartz fragments (2-4 mm) from 557 to 568 feet	17	568

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 9.20.11.233 Texam No. 1 - Boyle (continued)		
PERMIAN SYSTEM: (continued)		
Hondo Sandstone Member (continued)		
Limestone, 70 percent, gray-buff, very fine grained; 30 percent yellow-stained sandstone ..	12	580
Sandstone, 90 percent white, fine-grained friable well-sorted, yellow stained; 10 percent gray, very fine grained limestone	9	589
Sandstone, 70 percent, white, fine-grained, friable well-sorted, yellow-stained; 30 percent gray, very fine grained limestone	4	593
Sandstone, 95 percent white, fine-grained, friable well-sorted, yellow stained; 5 percent gray, very fine grained limestone	7	600
Sandstone, 70 percent; 30 percent gray, very fine grained, limestone	5	605
Sandstone, 95 percent white, fine-grained, friable, well-sorted, yellow stained	13	618
Sandstone, white, fine-grained, friable, well-sorted, yellow stained; some gray siltstone ...	6	624
Sandstone 50 percent, white, fine-grained friable well-sorted, yellow stained; 50 percent gray and gray-brown limestone; trace of gray siltstone	4	628
Limestone, 90 percent, dark-gray and buff, very fine grained; trace of white chert; some pink limestone intergrown with gray limestone from 631 to 635 feet	7	635
Limestone, 50 percent, and 50 percent sandstone with trace of brown and gray, very calcareous siltstone	5	640
Sandstone, 90 percent, silty, very calcareous, fine-grained, angular; 10 percent medium-gray, very fine grained, limestone; trace of black chert	5	645
Sandstone, 80 percent, silty, very calcareous, fine-grained, angular; 20 percent gray and yellow, calcareous, arenaceous siltstone	4	649
No sample	8	657
Sandstone, 95 percent, yellow and white, calcareous; 5 percent red, calcareous siltstone; trace of limestone grains; some silty gray sandstone from 661 to 664 feet	7	664
Sandstone, 60 percent, yellow and white, calcareous; 40 percent red, very calcareous, arenaceous siltstone	6	670

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 9.20.11.233 Texam No. 1 - Boyle (continued)		
PERMIAN SYSTEM: (continued)		
Hondo Sandstone Member (continued)		
Sandstone, 50 percent, yellow and white, calcareous; 50 percent red and mustard siltstone	4	674
Yeso Formation:		
No sample	3	677
Siltstone, white, gray, red and mustard, arenaceous and calcareous; trace of gray chert, and yellow siltstone with ironstone inclusions from 681 to 684 feet	7	684
Siltstone, brown, red, and gray, calcareous, arenaceous; trace of white anhydrite; increase in gray siltstone from 693 to 700 feet	16	700
Siltstone, red-brown, calcareous, arenaceous	31	731
No sample	5	736
Siltstone, red gray, and white; trace of very fine grained, gray limestone	39	775
No sample	6	781
Siltstone, red-brown, light-gray, calcareous	22	803
Siltstone, red, brown, buff, mustard, and gray; buff siltstone is hard with scattered limestone fragments in it	5	808
Limestone, 90 percent, gray, very fine grained, trace of pyrite; 10 percent red siltstone	5	813
Limestone, 95 percent, medium-gray, very fine grained; trace of white anhydrite	15	828
Limestone, 60 percent, gray; 40 percent gray and brown-red siltstone	5	833
Siltstone, 90 percent, gray, calcareous	4	837
Siltstone, 75 percent gray; 25 percent white gypsum	4	841
Anhydrite, gray	4	845
Anhydrite and gypsum, white and gray	15	860
Anhydrite and siltstone, gray	2	862
Mudstone, gray, gyppy	2	864
Mudstone and siltstone, gray and buff; some white gypsum	9	873
Mudstone, blue-gray and mottled	4	877
Siltstone, gray and dark-gray, arenaceous, calcareous; red-brown and gray from 880 to 890 feet	13	890
Siltstone, gray	5	895
Siltstone, gray, buff, and some mustard	6	901
No sample	99	1000

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 9.20.11.233 Texam No. 1 - Boyle (continued)		
PERMIAN SYSTEM: (continued)		
Yeso Formation (continued)		
Sandstone, 90 percent, gray, very calcareous, fine grained; clear subangular, fairly well sorted quartz grains	6	1006
Sandstone, 60 percent, gray, very calcareous, fine-grained; clear subangular, fairly well-sorted; quartz grains, 40 percent gray siltstone; trace of white gypsum and selenite fragments; some brown, poorly sorted, slightly calcareous sandstone from 1,012 to 1,017 feet	11	1017
Sandstone, 90 percent, brown, poorly sorted, slightly calcareous	6	1023
Siltstone, gray and brown	7	1030
No sample	14	1044
Siltstone, gray, very calcareous	9	1053
Siltstone, 80 percent, gray, brown, and red; 20 percent white gypsum	5	1058
Siltstone, gray, brown, and red	5	1063
Siltstone, red and gray; some gypsum and gray sandstone	1	1064
Siltstone, red, calcareous	3	1067
Siltstone, brown and gray; traces of white gypsum and muscovite from 1,081 to 1,086 feet	19	1086
Anhydrite, 90 percent, brown; 10 percent brown siltstone	4	1090
Anhydrite, 50 percent, brown; 50 percent brown siltstone	5	1095
Siltstone, brown-red, calcareous	8	1103
(Log from U.S. Geological Survey, Branch of Oil and Gas Leasing):		
Yeso Formation (continued)		
Anhydrite, sand and shale, lime shale, and lime; water	165	1268
Dolomite, anhydrite, sand, shale and lime	982	2250
Abo Formation:		
Dolomite, anhydrite, sand, shale and lime	260	2510
PRECAMBRIAN:		
Granite wash, shale, and streaks of lime and shale, metamorphic	1052	3562

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 10.20.16.444 Pecos Valley Artesian Conservancy District		
Samples described by R. L. Borton, New Mexico State Engineer Office		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Limestone, light- and medium-brown, dolomitic finely to very finely crystalline, slightly silty; traces of clear yellow vug-filling calcite, from 20 to 30 feet	30	30
Limestone, light- to medium-brown, dolomitic; lighter limestone is silty, appears to be clastic darker limestone very finely crystalline	10	40
Limestone, medium-gray-brown, very finely crystalline, dolomitic; traces of yellow and clear, vug- and fracture-filling calcite..	20	60
Limestone, light- and medium-gray-brown, finely to very finely crystalline, dolomitic; trace of yellowish-gray, soft, silty, very finely crystalline limestone	33	93
Limestone, buff, partly silty, very finely crystalline, and light brown, silty very finely crystalline dolomite; trace of blue-gray chert and scattered loose crinoid buttons up to 2 mm in diameter	11	104
Dolomite, medium-gray-brown, very finely crystalline slightly fossiliferous with crinoid buttons	31	135
Dolomite, light-gray, very finely crystalline; hard; some fragments with scattered pinpoint porosity; trace of light-gray medium crystalline dolomite	25	160
Limestone, buff, dolomitic, slightly silty, very finely crystalline, and gray-white, soft, very silty, dolomitic limestone	5	165
Limestone, medium-gray-brown and scattered yellow staining, fine to medium crystals	5	170
Dolomite, gray-brown, very finely crystalline, and light gray, very silty limestone; very light gray, cryptocrystalline, very silty, soft dolomite from 193 to 205 feet	35	205
Dolomite, medium- to light-gray-brown, very finely crystalline; hard	20	225
Limestone, mottled cream and gray-brown, dolomitic, finely to very finely crystalline..	5	230
Limestone, medium-gray-brown, dolomitic, very finely crystalline	10	240

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
10.20.16.444 Pecos Valley Artesian Conservancy District (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
No sample	10	250
Limestone, yellowish-gray-brown, semitranslucent, finely to very finely crystalline, dolomitic	15	265
Limestone, gray, very finely crystalline, dolomitic	20	285
Limestone, gray-brown, semitranslucent, very finely crystalline, dolomitic	5	290
Limestone, gray, very finely crystalline, and light gray-brown, very silty, scattered pinpoint porosity, soft limestone	10	300
Limestone, light-gray-brown, very finely crystalline, medium silty, dolomitic; scattered aggregates of clear calcite crystals	10	310
Limestone, light-gray-brown, semitranslucent, finely to very finely crystalline, and light-gray, very silty dolomite; trace of white chert	15	325
Hondo Sandstone Member:		
Sandstone, gray-white, friable, quartzose, calcareous, well-sorted, grains subangular to subrounded; zones within this interval are silty, highly iron-stained, or contain partings of yellow clay; some fragment of white gypsum.	53	378
Sandstone, gray-white, friable, quartzose, calcareous, well-sorted, grains subangular to subrounded; abundant light-gray, silty, very finely crystalline dolomite; sandstone is well-cemented with calcite	12	390
Dolomite, dove-gray, very finely crystalline, slightly silty; some white, friable sandstone from 415 to 440 feet, becoming iron-stained and well cemented at base of interval	50	440
Sandstone, yellow to brown, silty, fine-grained well-cemented with calcite and iron; grades into dirty-gray, very finely crystalline dolomite; gray, brownish-yellow, calcareous siltstone; scattered fragments of soft white gypsum; traces of pyrite in the gray siltstone	24	464
Dolomite, dove-gray and dark-gray, very finely crystalline; poorly cemented quartzose sandstone, (cavings?) from 480 to 485 feet	21	485
Yeso Formation:		
Siltstone, light-gray, salmon-red, and yellowish green, slightly calcareous, gypsiferous	10	495
Siltstone, pink, calcareous, slightly micaceous	8	503

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.15.12.112 P. Jones - E. Perry, Sr., U.S. Forest Service		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone		
Limestone, white, broken, and conglomerate	25	25
Crevices	10	35
Conglomerate, white	25	58
Crevices	3	61
Limestone, white; broken	13	74
Crevices	2	76
Limestone, white; broken	8	84
Crevices	18	102
Limestone, white; broken	10	112
Limestone, white; broken and crevices	38	150
Crevice	17	167
Limestone, white; broken	53	220
Limestone, yellow; honeycomb	5	225
Limestone, white; broken	110	335
Limestone, yellow	50	385
Hondo Sandstone Member:		
Sand, white	35	420
Limestone, white	60	480
Limestone, yellow	20	500
Shale, blue	20	520
Limestone, gray	10	530
Shale, blue	20	550
Yeso Formation:		
Shale, red	135	685
Shale, blue	10	695
Limestone, black	10	705
Anhydrite, gray	39	744
Limestone, dark-gray, and shale; water 765 feet	31	775
Shale, red, and gypsum	20	795
Anhydrite, gray	5	800
Well 11.18.21.212 National Exploration Co.		
QUATERNARY SYSTEM:		
Alluvium:		
Sand, boulders, and clay	113	113
PERMIAN SYSTEM:		
Yeso Formation:		
Clay, changeable	117	230
Lime; hard	10	240
Shale, yellow	15	255
Shale, blue	5	260
Shale, blue, and gyp	70	330

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.18.21.212 National Exploration Co. (continued)		
PERMIAN SYSTEM: (continued)		
Yeso Formation (continued)		
Shale, blue	18	348
Lime	2	350
Shale, blue	40	390
Lime	10	400
Shale, blue, and gyp	45	445
Clay, red	5	450
Clay, red, and gyp	60	510
Clay, red	20	530
Lime, gray; soft	55	585
Lime and shale	5	590
Lime, white; hard	29	619
Clay, boulders and gravel	9	628
Lime and sandstone	7	635
Lime, gray; hard	4	639
Lime, dark; hard	27	666
Lime, gray; hard; sand	12	678
Sand, red	10	688
Lime, shale, and sand	7	695
Lime, black; hard	22	717
Sand, gray	4	721
Lime, gray	21	742
Lime, gray; hard	18	760
Sandrock	5	765
Lime, hard, and gray sandstone	13	778
Sand; water	11	789
Lime and sand	13	802
Sand, fine; hard	17	819
Sand, white; hard; traces of lime; water raised to 190 feet from top of hole. Some non-inflammable gas in sand	11	830
Sand; soft	18	848
Sand, white	7	855
Sand, yellow	10	865
Sand, red; hard	17	882
Clay, red, sandy; non-inflammable gas in hole at 904 feet	33	915
Conglomerate; hard	6	921
Clay, red, sandy	29	950
Boulders	3	953
Clay, red	15	968
Lime, gray	58	1026
Sand, gray, hard and gravel	47	1073
Clay, red	7	1080
Sand; hard	29	1109

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.18.21.212 National Exploration Co. (continued)		
PERMIAN SYSTEM: (continued)		
Yeso Formation (continued)		
Rock salt	16	1125
Sand	11	1136
Lime and sand	22	1158
Salt	12	1170
Salt and sand; hard	15	1185
Sand; very hard	10	1195
Lime; hard	15	1210
Clay and a layer of shale	18	1228
Lime	10	1238
Salt	12	1250
Lime	48	1298
Shale, blue	7	1305
Lime	4	1309
Clay, red	2	1311
Lime	3	1314
Shale, blue	9	1323
Lime, gray	12	1335
Rock, red	5	1340
Lime, gray	15	1355
Shale, brown	10	1365
Lime	5	1370
Slate, blue	15	1385
Shale, brown	3	1388
Shale, blue	2	1390
Rock, red	18	1408
Shale, blue	20	1428
Sand	20	1448
Sand and a little lime	17	1465
Lime, black	10	1475
Shale, brown	17	1492
Shale, blue	13	1505
Shale, brown	40	1545
Lime, hard	7	1552
Shale, brown	28	1580
Sand	40	1620
Shale, blue	10	1630
Granitic sand or conglomerate	561	2191
Well 11.19.27.124 J. P. McKnight		
QUATERNARY SYSTEM:		
Alluvium:		
Soil, gravelly	3	3
Boulders, small	49	52

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.19.27.124 J. P. McKnight (continued)		
PERMIAN SYSTEM:		
Yeso Formation:		
Clay, red	14	66
Boulders and rock	38	104
Clay, yellow	12	116
Limestone	12	128
Clay, red	70	198
Rock; loose	77	275
Sand and gravel; water	11	286
Redbed	74	360
Well 11.20.20.442 R. C. Nunez		
Not recorded	530	530
PERMIAN SYSTEM:		
Hondo Sandstone Member:		
Limerock	15	545
Sandrock, yellow	16	561
Well 11.21.15.444 A. J. Cole		
Not recorded	736	736
PERMIAN SYSTEM:		
Hondo Sandstone Member:		
Lime, sandy	10	746
Limestone; hard	20	766
Sandstone; porous	4	770
Loose sand	7	777
Well 11.21.18.333 Pecos Valley Artesian Conservancy District		
Samples described by R. L. Borton, New Mexico State Engineer Office		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Limestone, medium-gray-brown, finely crystalline, and dove-gray, finely crystalline, silty dolomite	20	20
Dolomite, dove-gray, and medium-gray-brown, finely crystalline, very calcitic, finely crystalline, medium-gray dolomite from 30 to 40 feet	20	40

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.21.18.333 Pecos Valley Artesian Conservancy District (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
Dolomite, light to medium gray-brown, finely crystalline, silty, calcitic; contains areas of light gray-brown, finely crystalline dolomite	30	70
Dolomite, dove-gray and light pink, finely crystalline	10	80
Limestone, light gray-brown, finely crystalline, dolomitic, silty	10	90
Limestone, pink, finely crystalline, slightly fossiliferous (brachiopod), and light gray-brown, fine to medium grained dolomitic, silty limestone	30	120
Limestone, medium gray-brown, finely crystalline, silty; some light tan, finely crystalline limestone partly stained yellow	30	150
No sample	10	160
Limestone, gray, finely crystalline, dolomitic, silty; some light buff, finely crystalline, very silty limestone	30	190
Dolomite, medium gray-brown, finely crystalline, silty, and light buff, finely crystalline, very silty limestone	10	200
Limestone, gray-brown, finely crystalline, very dolomitic, silty	80	280
Limestone, very light buff, finely crystalline, dolomitic, very silty	10	290
Limestone, medium gray-brown, finely crystalline, dolomitic, and light gray, fine to medium-grained limestone from 330 to 340 feet	50	340
Limestone, medium gray-brown, finely crystalline	20	360
Dolomite, dove-gray, finely crystalline, very silty, slightly calcitic	10	370
Limestone, light gray-brown, fine to medium grained slightly dolomitic	10	380
Hondo Sandstone Member:		
Sandstone, light yellow to white, quartzose, fine to medium-grained, well-sorted, subangular to rounded, friable, calcareous; some iron stain	10	390
Dolomite, dove-gray, finely crystalline	10	400
Sandstone, light yellow to white, quartzose, fine to medium-grained, well-sorted, subangular to rounded, friable, calcareous; some iron stain	60	460

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.21.18.333 Pecos Valley Artesian Conservancy District (continued)		
PERMIAN SYSTEM: (continued)		
Hondo Sandstone Member (continued)		
Dolomite, medium-gray-brown, finely crystalline	20	480
No sample	20	500
Limestone, light and medium-gray-brown, fine to medium-grained dolomitic	24	524
Well 11.21.28.144 J. P. White		
Casing record:		
7-inch casing from 0 - 505 feet		
5½-inch liner from 483 - 685 feet		
TERTIARY AND QUATERNARY SYSTEMS:		
Pediment gravels:		
Boulders	23	23
Gravel	3	26
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Lime; broken	20	46
Gravel	4	50
Lime; broken	65	115
Crevice: lost drilling water	2	117
Lime, brown; broken; lost drilling water	103	220
Crevice	3	223
Lime, brown; broken, rotten	44	267
Shale, soft	3	270
Lime shells	70	340
Lime, brown	17	357
Lime, broken	98	455
Lime, brown	18	473
Lime, gray	22	495
Hondo Sandstone Member:		
Quicksand, white	11	506
Lime shell, yellow shale, and hard sand	16	522
Sand	8	530
Sand, brown, and yellow clay	4	534
Lime shell, brown	1	535
Sand, hard	25	560
Lime, gray; rotten; lost drilling water	2	562
Lime, gray; hard	26	588
Lime, shells and yellow clay	7	595
Lime	6	601

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.21.28.144 J. P. White (continued)		
PERMIAN SYSTEM: (continued)		
Hondo Sandstone Member (continued)		
Sand; hard	5	606
Sand; hard streaks; water	13	619
Sand and sandy shale	26	645
Lime, rotten, and sandy shale	9	654
Yeso Formation:		
Lime, gray	16	670
Shale, gray, sandy	5	675
Well 11.22.18.211a H. L. Woods		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Caliche and gravel	20	20
Lime, gray; soft	80	100
Clay, blue	5	105
Lime and clay	25	130
Clay, yellow	15	145
Lime, gray	55	200
Lime, gray, and shale	150	350
Lime, gray, hard, and shale	40	390
Lime, gray; hard	10	400
Shale, yellow	125	525
Lime, gray and black	35	560
Well 11.23.3.342 J. L. Mask		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Caliche	53	53
Clay, yellow, and broken lime	101	154
Lime, gray and brown	286	440
Lime, gray, sandy; broken	38	478
Well 11.23.8.222 Forsythe No. 1 - Gibson		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Limestone, brown; soft	36	36
Lime, pink; soft	9	45
Lime, gray; hard	35	80
Lime, yellow; hard	35	115

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.23.8.222 Forsythe No. 1 - Gibson (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
Lime, gray; hard	5	120
Lime, gray; very hard	50	170
Lime, brown; hard	10	180
Lime, gray; hard	15	195
Lime, dark; hard	15	210
Lime, brown; soft	15	225
Lime, black and gray; hard	9	234
Lime, gray; hard	9	243
Lime, brown and gray; soft	7	250
Lime, gray; soft	25	275
Lime, dark-brown; soft	10	285
Lime, brown sandy; water	2	287
Lime, black and brown	13	300
Lime, black and brown; calcite crystals	5	305
Lime, gray; hard	10	315
Lime, gray; soft	5	320
Lime, gray; soft; calcite crystals	10	330
Lime, brown; calcite crystals	20	350
Lime, black and gray; hard	10	360
Lime, gray; hard	90	450
Lime, brown; hard; calcite crystals	5	455
Lime, dark; hard	5	460
Lime, brown, sandy; calcite	5	465
Lime, black; hard	16	481
Lime, brown; hard	7	488
Lime, gray; hard	26	514
Lime, black and gray; hard	8	522
Lime, gray; hard	53	575
Lime, gray; hard; calcite crystals	7	582
Lime, gray; soft; calcite crystals	18	600
Lime, gray; soft	10	610
Lime, gray; hard	20	630
Lime, gray; soft	15	645
Hondo Sandstone Member:		
Sand, white, quartz, iron pyrites; quartz crystals	10	655
Sand, white, quartz, iron pyrites; hematite and quartz crystals	2	657

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.24.1.430 J. P. White		
Casing record:		
10-inch casing from 0 to 55 feet.		
8-inch casing from 0 358 feet.		
Samples described by Morgan Davis, Humble Oil Co., 1927		
QUATERNARY SYSTEM:		
Alluvium:		
Not sampled	90	90
Sand (quartz) coarse, and gravel consisting of limestone, chert, igneous rocks, and purple quartzite pebbles	5	95
Clay, brick-buff, and caliche	5	100
Clay, gray, and caliche	20	120
Sand (quartz) coarse, and gravel	10	130
Sand, tan, fine to medium; a few small pebbles.	10	140
Sand, buff, fine	7	147
Sand, yellowish-tan, fine, argillaceous and calcareous	9	156
Clay, gray, sandy; lime nodules	9	165
Sand, yellow, fine; calcareous	10	175
Sand, dark-gray, fine, argillaceous and calcareous; clayey sand or sandy clay from 195 to 205 feet; lighter color from 205 to 210 feet	35	210
PERMIAN SYSTEM:		
Artesia Formation:		
Shale, dark-gray	20	230
Shale, gray	15	245
Shale, gray, and dull-brick-red, fine, argillaceous sand; pebbles from above(?)	5	250
Sand, dull-brick-red, fine, argillaceous; pebbles from above	10	260
Clay, brownish-red, sandy (or argillaceous fine sand)	10	270
Sand, dull-brick-red, argillaceous, fine, (or sandy clay) green lumps from 290 to 300 feet.	30	300
Sand, dull-brick-red, argillaceous, fine (or sandy clay)	20	320
Sandstone fragments, light-brick-red, fine; rounded chert and quartz pebbles from above(?)	5	325
Sand, brick-red, fine	20	345
Sand, quartz; red and white, sandy, red clay and limestone and chert pebbles	5	350

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.24.1.430 J. P. White (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone:		
Limestone, purplish-red and light-gray; calcite crystals; few chert fragments and pebbles from above(?)	10	360
Sandstone, white and red, as fine fragments; small amount of red clay	5	365
Limestone, light-gray fragments; calcite crystals and some hard, red, fine sandstone	5	370
Sand; red, argillaceous sandstone; light-gray, calcareous clay; light-gray, calcareous shale and calcite crystals	5	375
Limestone, purplish-red to yellowish-gray	5	380
Limestone, yellow, gray, and purple; calcite crystals	5	385
Limestone, yellow, finely granular, sandy	5	390
Limestone, dark and light gray and red streaks vesicular, and red sandy? limestone	10	400
Dolomite, gray and dark-gray; dolomitic limestone some red limestone partly vesicular	10	410
Clay, creamy, calcareous, and dolomitic limestone	40	450
Sand (quartz), finely granular, argillaceous limestone; some red sandstone particles	17	467
Limestone, granular, vesicular; chert and granular limestone; quartz and calcite crystals; some fragments of dolomitic, gray, argillaceous limestone	13	480
Limestone, finely granular, creamy-gray and gray, and some argillaceous quartz	15	495
Well 11.24.3.412 J. A. Nieto		
QUATERNARY SYSTEM:		
Alluvium:		
Soil	5	5
Caliche	20	25
Sand; water	10	35
Clay, yellow	15	50
Clay, blue	110	160
Sand	5	165
PERMIAN SYSTEM:		
Artesia Formation:		
Clay, blue	62	227

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.24.3.412 J. A. Nieto (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone:		
Lime rock	20	247
Clay and rock	23	270
Lime rock	10	280
Water rock	12	292
Clay and rock	13	305
Rock and water	13	318
Lime rock	32	350
Clay and rock	4	354
Water rock	11	365
Well 11.24.4.114d City of Roswell		
Samples described by Morgan Davis, Humble Oil Co., 1926		
QUATERNARY SYSTEM:		
Alluvium:		
Soil, limestone pebbles, and dark clay	44	44
Caliche, and clay or silt	21	65
Clay, gray and brown, and large (1 inch +) rounded pebbles	20	85
Clay, bluish-gray, and caliche	30	115
Pebbles, rounded	10	125
Clay, red and gray, and limestone or quartzose gravel	40	165
PERMIAN SYSTEM:		
Artesia Formation:		
Limestone, dark-gray, slightly pitted with outer white chalk-like shell, white grading into gray, giving burned appearance	15	180
Clay, calcitic, red and gray; some caliche(?)	25	205
Upper part of San Andres Limestone:		
Limestone, light-creamy, dense; some few iron stains	25	230
Limestone, gray, vesicular, dolomitic, and calcitic, pink to red shale	20	250
Limestone, dark-gray and creamy-gray, some of the dark-gray limestone is pitted and vesicular, coarse, clean fragments ¼-inch across	31	281
Limestone, gray "sand" (fine), fine dirty limestone fragments	54	335
Clay, yellow and grayish-tan	10	345
Limestone, creamy-gray and light-gray; dolomitic limestone; calcite crystals; coarser from 400 to 450 feet	105	450

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.24.4.114d City of Roswell (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
Limestone, light- and dark-gray	50	500
Limestone, light- and dark-gray; gray-black, petroliferous limestone	350	850
Limestone, light- to dark-gray, and flakey limestone and black petroliferous limestone from 900 to 1,005 feet	155	1005
Hondo Sandstone Member:		
Sand (quartz) fine, subangular to subrounded	85	1090
Quartz grains and dolomitic limestone fragments	22	1112
Sand (quartz), some iron stain; dolomitic limestone fragments; blue-gray shale	10	1122
Yeso Formation:		
Shale, red, brown, and gray	178	1300
No sample	171	1471
Well 11.24.6.331 W. G. McGuire		
QUATERNARY SYSTEM:		
Alluvium:		
Soil, brown	3	3
Clay, light red	17	20
Clay and gravel	48	68
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Rock, gray; porous concrete	12	80
Lime, red and gray	20	100
Water rock, gray	24	124
Lime, gray; hard	14	138
Water rock and crevices	32	170
Lime, gray; hard	3	173
Well 11.25.8.311 Fred Payton		
QUATERNARY SYSTEM:		
Alluvium:		
Soil	6	6
Caliche	6	12
Clay and rock	78	90
Sand and coarse gravel; water	70	160

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 11.25.8.311 Fred Payton (continued)		
PERMIAN SYSTEM:		
Artesia Formation:		
Sand, red	210	370
Clay, red	20	390
Upper part of San Andres Limestone:		
Limerock, hard	6	396
Not recorded	9	405
Lime; first flow of water	3	408
Not recorded	10	418
Sand, red; second flow of water	5	423
Not recorded	13	436
Rock and gravel; third flow of water	4	440
Well 12.18.10.121 Stanolind - Picacho No. 1		
Casing record:		
13-inch casing from 0 to 20 feet		
10 3/4-inch casing from 794 to 1171 feet		
8 5/8-inch casing from 1578 to 1876 feet		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Lime	352	352
Hondo Sandstone Member:		
Lime and sand	9	361
Sand; ½ gpm of water from 300-400 feet	48	409
Lime	59	468
Lime and sand	7	475
Sand	25	500
Yeso Formation:		
Redbeds	115	615
Anhydrite	80	695
Anhydrite and lime; good supply of water	5	700
Anhydrite	55	755
Lime	20	775
Shale, yellow	69	844
Shale, blue, and lime shells	36	880
Redbeds, yellow shale and lime shells	37	917
Anhydrite	33	950
Redbeds	6	956
Shale, blue	58	1014
Redbeds	6	1020
Shale, blue and gypsum	32	1052
Redbeds	20	1072
Shale, blue	10	1082

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 12.18.10.121 Stanolind - Picacho No. 1 (continued)		
PERMIAN SYSTEM: (continued)		
Yeso Formation (continued)		
Lime	14	1096
Gypsum	10	1106
Redbeds	19	1125
Gypsum, anhydrite, and shells	19	1144
Anhydrite	66	1210
Redbeds	26	1236
Anhydrite	24	1260
Lime	37	1297
Redbeds	3	1300
Shale, blue, and lime shells	10	1310
Shale, blue	10	1320
Lime	45	1365
Redbeds	9	1374
Anhydrite	16	1390
Lime	55	1445
Redbeds	9	1454
Lime	106	1560
Salt and redbeds	10	1570
Lime	20	1590
Lime and redbeds	20	1610
Lime	102	1712
Sand; fresh water (1712-38)	141	1853
Sand and redbeds	11	1864
Anhydrite	19	1883
Sand	29	1912
Redbeds and brown shale	53	1965
Redbeds	5	1970
Lime	10	1980
Redbeds	20	2000
Anhydrite	27	2027
Redbeds	13	2040
Salt and anhydrite	10	2050
Lime and brown shale	25	2075
Redbeds	5	2080
Lime	25	2105
Redbeds	10	2115
Gypsum	10	2125
Salt	9	2134
Anhydrite	41	2175
Lime	45	2220
Shale, brown	5	2225
Anhydrite	90	2315
Granite wash	528	2843

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 13.20.13.222 Pecos Valley Artesian Conservancy District		
Samples described by R. L. Borton, New Mexico State Engineer Office		
PERMIAN SYSTEM:		
Upper part of San Andres Limestone:		
Soil, gravel, and limestone boulders	15	15
Limestone, medium-gray, finely crystalline, slightly silty; trace of light-cream, semi-translucent, finely crystalline limestone from 30 to 35 feet	20	35
Limestone, medium-gray, finely crystalline, slightly silty; some light-reddish-brown, slightly calcareous claystone	5	40
No sample	10	50
Limestone, light-gray-buff, very finely crystalline; lightly flecked with red and medium-gray, very finely crystalline limestone; one large fragment of dark limestone may be fossiliferous and appears to be of clastic origin	5	55
Limestone, medium-gray, very finely crystalline, and light-gray, clastic appearing silty, very fine-grained limestone; crinoid stem fragments and tiny brachiopods; trace of red-brown and slightly calcareous claystone	5	60
Limestone, medium-gray, finely to very finely crystalline; some light-gray brown, very silty limestone; some crinoid buttons; trace of white gypsum (satinspar)	20	80
Limestone, light-buff flecked lightly with black manganese stain, microcrystalline to very finely crystalline limestone; trace of very light gray, chalky, very silty limestone	5	85
Limestone, chalky, light-buff flecked lightly with black manganese stain, microcrystalline to very finely crystalline, and medium gray, very finely crystalline limestone, and numerous calcite stringers	15	100
Limestone, light-gray-brown, slightly stained red,very finely crystalline, silty	5	105
Limestone, light-gray-brown, finely to very finely crystalline, semi-translucent, hard light-gray, very fine-grained, silty limestone trace of very finely crystalline limestone light-cream mottled faintly with red from 110 to 115 feet	10	115

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 13.20.13.222 Pecos Valley Artesian Conservancy District (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
Limestone, light-gray-brown, finely to very finely crystalline, semi-translucent; trace of medium-gray, very finely crystalline limestone and red-brown, slightly calcareous claystone	5	120
Limestone, light-buff lightly stained by manganese finely to very finely crystalline, slightly silty; trace of white, earthy gypsum; crinoid stems and some red-brown claystone from 130 to 135 feet	15	135
Limestone, medium-gray, finely to very finely crystalline, slightly silty; abundant cavity-filling calcite aggregates; some tiny crinoid stems	5	140
Limestone, medium-gray, finely to very finely crystalline; some light-gray-brown, very silty fairly soft, very finely crystalline dolomite	5	145
Limestone, light-buff, very finely crystalline slightly fossiliferous (crinoid stems), mottled lightly yellow; some scattered pinpoint porosity; some marly, tan, very soft and highly silty limestone	5	150
Limestone, light-gray-brown, very finely crystalline, and light-gray, very silty, very finely crystalline dolomite	5	155
Limestone, medium-gray, very finely crystalline	5	160
Limestone, light-gray-brown, slightly fossiliferous (crinoid stems and sponge spicules poorly preserved), very finely crystalline; hard; abundant, light gray, silty, microcrystalline to very finely crystalline dolomite from 180 to 185 feet	25	185
Dolomite, light-gray, silty, microcrystalline to very finely crystalline	10	195
Limestone, light-gray, very finely crystalline (poor sample)	5	200
Limestone, light- to medium-gray, finely to very finely crystalline; some gray, silty, very finely crystalline dolomite; trace of red-brown claystone	5	205
Limestone, light- to medium-gray, finely to very finely crystalline; some gray, silty, very finely crystalline dolomite; trace of red-brown claystone and finely crystalline, mottled yellow limestone	5	210

TABLE 6 (continued)

Stratigraphic unit and material	Thickness (feet)	Depth (feet)
Well 13.20.13.222 Pecos Valley Artesian Conservancy District (continued)		
PERMIAN SYSTEM: (continued)		
Upper part of San Andres Limestone (continued)		
No sample	5	215
Limestone, light-gray-brown, very finely crystalline, and light-gray-brown, moderately silty, very finely crystalline dolomite; trace of gypsum (clear selenite)	5	220
Dolomite, light-gray-brown, moderately silty, very finely crystalline; some limestone; trace of cavity-filling calcite aggregate	23	243
Hondo Sandstone Member:		
Sandstone quartz, fine to very fine grained, fairly well-sorted, poorly cemented, angular to subrounded, calcareous cement, grains clear to slightly milky and gray-brown to medium-gray very finely crystalline dolomite	5	248
No sample	2	250
Limestone, light-gray, finely to very finely crystalline; some quartz sandstone	2	252
Sandstone, and some light-gray limestone	38	290
Sandstone, quartzose, white, fine-grained, well-sorted, mostly subrounded, poorly cemented with calcite; and dove-gray, very finely crystalline slightly silty dolomite; scattered pinpoint porosity	10	300
Sandstone, quartzose, white; trace of light-gray very finely crystalline dolomite	23	323
Sandstone, quartzose, white; some white, sandy very finely crystalline limestone	6	329
Sandstone, limy, and sandy, light-brown to yellow limestone	11	340
Dolomite, dirty-gray, very finely crystalline silty; trace of pink calcite (aragonite?) with intergrown columnar texture (dogtooth); some sandstone	5	345
Sandstone, very limy; sandy limestone; and light-gray, very finely crystalline dolomite	5	350
Sandstone, quartzose, white partly stained yellow, calcareous; some dolomite	5	355
Sandstone, quartzose, white partly stained yellow, calcareous; well-cemented, silty; contains some ironstone; some gray dolomite	19	374
Sandstone, gray, very calcareous, and very sandy, gray, finely crystalline limestone	6	380
Siltstone, pink and buff, moderately calcareous; trace of white gypsum; some sandstone	4	384

Compiled by W. A. Mourant, 1961

Base compiled from U.S. Geological Survey quadrangle maps, SCS quadrangle maps, and BLM Grazing Service maps

Plate I. -- Well-location and water-level contour map of the Rio Hondo drainage basin, Chaves, Lincoln, and Otero Counties, N. Mex.

Base compiled from U.S. Geological Survey quadrangle maps, SCS quadrangle maps, and BLM Grazing Service maps

EXPLANATION

QUATERNARY

Qal

ALLUVIUM

Unsorted sand, gravel, and clay. Yields 10 to 3,500 gpm of water to irrigation, stock, and domestic wells.

Qaf

ALLUVIAL FANS

Boulders and unsorted rock debris from intrusive microgranite. Not known to yield water to wells.

QUATERNARY(?)

QTp

PEDIMENT GRAVELS

Unsorted angular to rounded fragments of igneous, sedimentary, and metamorphic rocks. Not known to yield water to wells.

TERTIARY(?)

Ti

INTRUSIVE AND EXTRUSIVE IGNEOUS ROCKS

Andesite, diorite, microgranite, rhyolite, and basic dikes and sills. Yields about 3 gpm of water to stock and domestic wells.

Tc

CUB MOUNTAIN FORMATION OF BODINE (1956)

Red and white sandstone, chert pebble conglomerate, and variegated shale. Yields 5 to 50 gpm of water of poor quality to wells.

CRETACEOUS

Upper Cretaceous

Kmv

MESAVERDE FORMATION

Gray, yellow, and buff quartzose sandstone; gray shale, coal, and carbonaceous shale. Yields 5 to 20 gpm of water of poor quality to wells.

Km

MANCOS SHALE

Black, fissile shale, thin-bedded limestone, and intercalated limestone and sandstone. Yields 6 to 75 gpm of water of very poor quality to wells.

Kd

DAKOTA SANDSTONE

Ferruginous quartzose sandstone interbedded with gray shale and conglomerate. Yields 5 to 125 gpm of water of fair quality to wells.

TRIASSIC

Upper Triassic

TRc

CHINLE FORMATION

Red and gray shale, white and gray dense limestone. Yields about 5 gpm of fair quality water to wells.

TRs

SANTA ROSA SANDSTONE

Gray, yellow, and tan sandstone, thin-bedded limestone, red and gray shale, and chert pebble conglomerate. Yields about 10 gpm of water of fair quality to wells.

PERMIAN

Guadalupe

Pa

ARTESIA FORMATION

Gypsum, anhydrite, dolomite, impure limestone, red beds, siltstone, red shale, and sandstone. Yields about 5 gpm of water to wells. The water is of fair quality in the central part, of poor quality in the eastern part, and saline in the extreme eastern part of the Rio Hondo drainage basin.

Leonard and Guadalupe

Psu
Psh

SAN ANDRES LIMESTONE

Psu, Upper part, cherty limestone, dolomite, siltstone, sandstone, gypsum, anhydrite, and shale. Yields 8 to 2,000 gpm of water to wells. The quality of the water is generally satifactory for irrigation, stock, and domestic use, except in the extreme eastern part of Rio Hondo drainage basin where water is highly saline.

Psh, Hondo Sandstone Member, light-tan to dark-red, medium-grained, frosted, quartz sandstone, silty limestone, siltstone, gypsum, and anhydrite. Yields 2 to 700 gpm of water of satisfactory quality to wells.

Leonard

Py

YESO FORMATION

Thin-bedded, red and yellow siltstone, some limestone, sandstone, shale, gypsum, anhydrite, and salt. Yields 1 to 125 gpm of water to wells. The water is of fair quality for stock but poor for domestic use.

CONTACT BETWEEN GEOLOGIC FORMATIONS; DASHED WHERE APPROXIMATE

FAULT

D, downthrown block; U, upthrown block; dashed where approximate

STRUCTURAL ZONE

A zone along which joints, small faults, and flexures have a similar or parallel alignment.

TRACE OF AXIAL PLANE OF ANTICLINE; DASHED WHERE APPROXIMATELY LOCATED

TRACE OF AXIAL PLANE OF SYNCLINE

A A'

LINE OF DIAGRAMMATIC SECTION

GEOLOGIC SOURCE INFORMATION

Reconnaissance mapping and photo interpretation by the author with the following sources used as guides:

1. Allen, J. E., and Jones, S. M., 1951, Preliminary geologic map of the Capitan Quadrangle, Lincoln County, New Mexico, in Roswell Geol. Soc. Guidebook 5th Field Conf., Capitan-Carrizozo-Chupadera Mesa region, New Mexico: insert map.
2. Bachman, G. O., 1954, Reconnaissance map of an area southeast of Sierra Blanca in Lincoln, Otero, and Chaves Counties, New Mexico, in N. Mex. Geol. Soc. Guidebook 5th Field Conf., Southeastern New Mexico, 1954: p. 94b.
3. Wood, G. H., and Murray, C. R., 1948, Geologic map of vicinity of Ruidoso, Lincoln County, New Mexico, in Jones, R. S., and Murray, C. R., 1948, Reconnaissance study of ground water in the vicinity of Ruidoso, New Mexico: U. S. Geol. Survey open-file rept.

④ Craddock, Campbell, 1960, The origin of the Lincoln fold system, southeastern New Mexico, in Report of the International Geological Congress, XXI Session, Norden, 1960, pt. XVIII, Structure of the earth's crust and deformation of rocks: Copenhagen.

Plate 2. — Geologic map of the Ri

EXPLANATION

SOURCE OF WATER

● Well

Spring

■ Stream

CHEMICAL DATA

●
Formation symbol

Hardness as $CaCO_3$ (ppm)	536	1320	Specific conductance (Micromhos at 25° C)
Chloride (ppm)	112	374	Sulfate (ppm)

FORMATIONS

Qal, Quaternary alluvium; Ti, intrusive and extrusive igneous rocks; Tc, Cub Mountain Formation; Kmv, Mesaverde Formation; Km, Mancos Shale; T̄Rs, Santa Rosa Sandstone; Psu, upper part San Andres Limestone; Psh, Hondo Sandstone Member of San Andres Limestone; Py, Yeso Formation

500

Generalized isochlor line, dashed where inferred or doubtful. Contours show 500 and 2500 parts per million of chloride content. After J. W. Hood, 1960

Base compiled from U.S. Geological Survey quadrangle maps, SCS quadrangle maps, and BLM Grazing Service maps

Hydrology by W. A. Mourant, 1961

Plate 4.--Chemical analyses of water from selected wells, springs, and streams in the Rio Hondo drainage basin, Chaves, Lincoln, and Otero Counties, N.M.