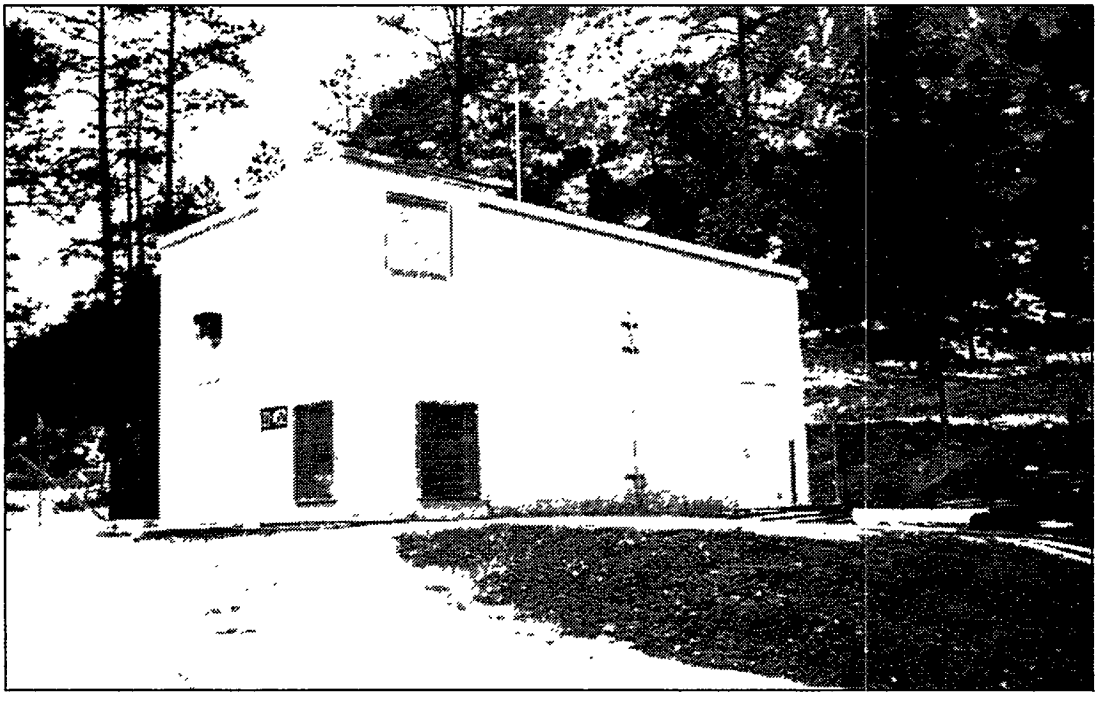
LA-13216-PR
Progress Report

Water Supply at Los Alamos during 1995



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Cover photo: *Well house at water supply well Otowi-4.*

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WATER SUPPLY AT LOS ALAMOS DURING 1995

by

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ABSTRACT

Production of potable municipal water supplies during 1995 totaled about 1,356.1 million gallons from wells in the Guaje and Pajarito well fields. Wells in the Otowi field were not operational during 1995. The nonpotable water supply for industrial use was about 1.6 million gallons from the spring gallery in Water Canyon, and another 1.6 million gallons from Los Alamos Reservoir was used for lawn irrigation. There was no water used from Guaje Reservoir in 1995. The total water usage in 1995 was about 1,359.3 million gallons. Groundwater pumpage during 1995 was the lowest on record since 1966.

I. INTRODUCTION

This report fulfills requirements specified in US Department of Energy (DOE) Order 5400.1 (Groundwater Protection Management Program), which requires the Laboratory to monitor and document groundwater conditions below Pajarito Plateau and to protect the main aquifer from contamination associated with Laboratory operations. Furthermore, this report also fulfills special conditions outlined in Module VIII of the Laboratory's Hazardous and Solid Waste Amendments (HSWA) portion of the Resource Conservation and Recovery Act (RCRA) operating permit (NM-0890010515), which was jointly issued by the US Environmental Protection Agency and the New Mexico Environment Department to the Laboratory and DOE. This report satisfies portions of those requirements by providing information on hydrologic characteristics of the main aquifer, including operating conditions of the municipal water supply system.

This report summarizes production statistics and aquifer conditions for water wells in the Guaje and Pajarito well fields (Fig. 1). During 1995 these wells supplied all of the potable water used for municipal and some industrial purposes in Los Alamos County, Los Alamos National Laboratory, and Bandelier National Monument. Wells in the Otowi well field were not operational during 1995. In 1992 some of the wells in the Los Alamos well field were plugged and abandoned in accordance with New Mexico State Engineer Office requirements, and ownership of the remaining wells in the field was transferred from DOE to San Ildefonso Pueblo. Hence no hydrological data were available from the Los Alamos well field in 1995. The spring gallery in Water Canyon supplied nonpotable water for industrial use, while Los Alamos Reservoir supplied some water for lawn irrigation. In 1995 no water was used from Guaje Reservoir. Due to high maintenance and operating costs associated with diverting water from these reservoirs, it was not economically feasible to continue their use for irrigation.

This report is a joint effort between the Laboratory's Water Quality and Hydrology Group (ESH-18) and the Utilities Department of Johnson Controls World Services, Inc. (JCI). The purpose of this report is twofold. First, it provides a continuing historical record of water usage. Second, it provides guidance to management for long-range water resources planning and operation of the water supply system. Furthermore, it also provides documentation of water level fluctuations in wells that penetrate into the main aquifer, detailed results of pump test analyses, and other important summaries of aquifer drilling and hydrological

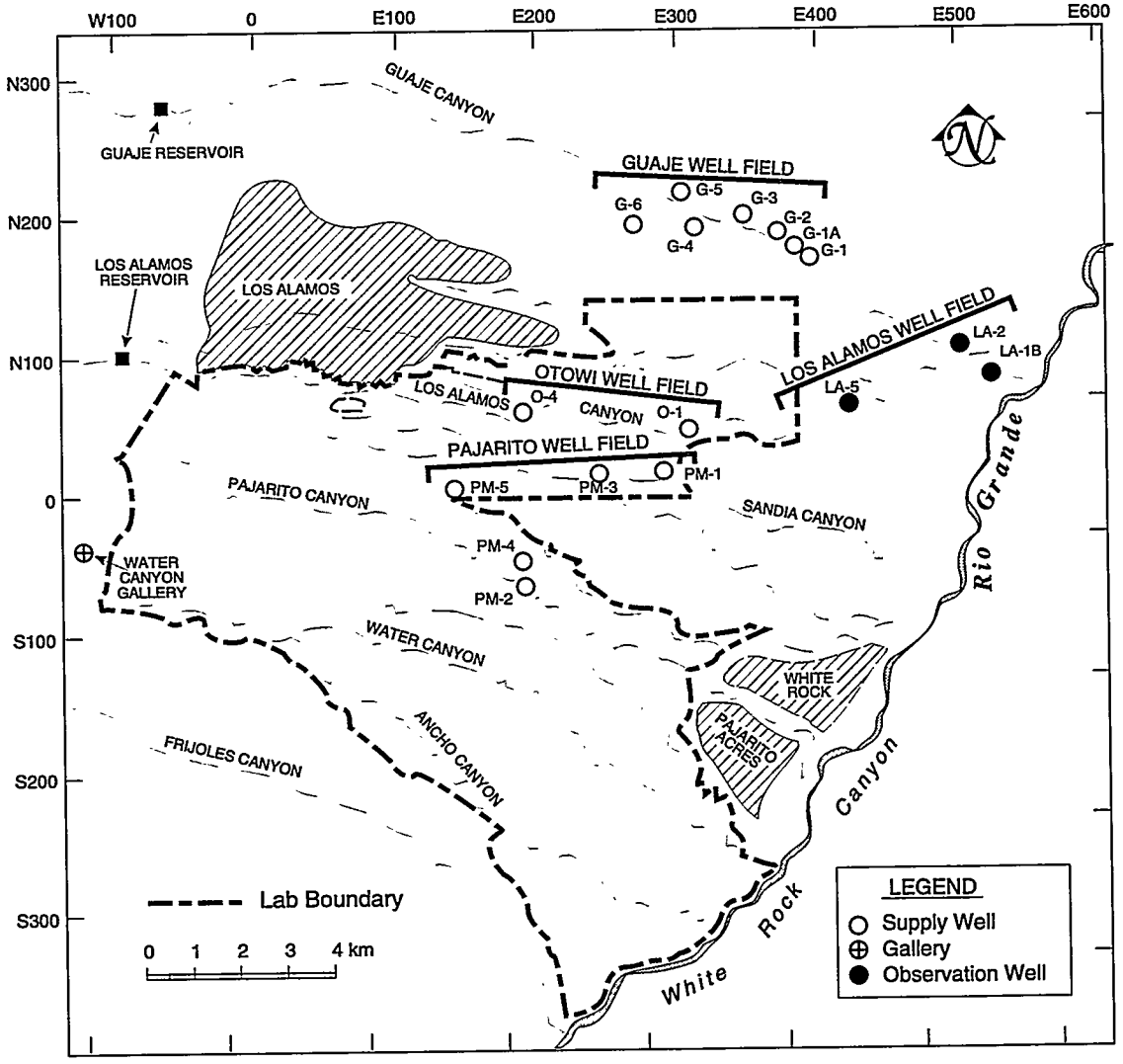


Fig. 1. Locations of reservoirs, well fields, water supply wells, and the water gallery supply. Letter designations indicate wells in the Guaje (G), Pajarito Mesa (PM), and Otowi (O) well fields. Ownership of the Los Alamos (LA) well field was transferred to San Ildefonso Pueblo in 1992.

testing programs. One summary report has been issued for the period of 1947 to 1971. Since then, 24 annual reports that contain the results of past water supply studies [1–25] have been published. An additional report summarized the hydrology of the main aquifer and made recommendations for future development of groundwater supplies [26]. A 1988 report examined the status of wells and future water supply [27]. Finally, a 1995 report described individual drilling logs from water supply and test wells [28].

JCI, the support contractor to the Laboratory and DOE at Los Alamos, maintains and operates the water supply system. DOE sells water to Los Alamos County for the communities of Los Alamos and White Rock and to the National Park Service for water supply at Bandelier National Monument. Annual water production statistics and data representing aquifer characteristics are contained in Appendix A. Historical water level data from main aquifer observation wells are summarized in Appendix B.

Potable water is pumped from the wells into the distribution lines. Booster pumps lift this water to reservoir storage tanks for distribution to the Laboratory and the community. The entire water supply is disinfected with chlorine before distribution to Los Alamos, White Rock, Bandelier National Monument, and Laboratory areas (Fig. 1). The nonpotable water used for industrial use at TA-16 flows by gravity from the gallery in Water Canyon to the steam plant. The transmission line from the gallery to the steam plant is separate from the potable supply.

JCI maintains a record of the hours of operation for each well along with records of daily and monthly water production using in-line flow meters. Monthly averages of nonpumping and pumping water levels are computed from air-line bubble-pressure measurements or pressure transducer data recorded at each well. These data are used to determine individual well pumping rates, drawdown, and other important well field performance statistics. Appendix A contains 1995 annual pumping and production information for all water supply wells.

Guaje, Pajarito, and Otowi well fields are located on Pajarito Plateau and in Guaje Canyon (Fig. 1). The supply wells are all completed into the main aquifer located below the Los Alamos area. This is the only local aquifer capable of municipal and industrial water supply. The piezometric surface of the main aquifer ranges from about 20 ft above ground level (artesian) in portions of the old well field in lower Los Alamos Canyon (i.e., near Well LA-1B), to about 753 ft below ground surface along the eastern edge of the plateau near Well PM-1, and to more than 1,230 ft below ground surface near the center of the plateau at Well PM-5. Water in the main aquifer generally moves eastward to southeastward beneath the plateau toward the Rio Grande, where at least a portion is discharged into the river through seeps and springs [26–28]. Most of these seeps and springs are located adjacent to the western side of the Rio Grande between Otowi Bridge and Cochiti Reservoir.

The Water Canyon Gallery, which is located west of the Laboratory on the flanks of the Sierra de los Valles, discharges water from a small, shallow, perched aquifer located in the volcanic rocks (Fig. 1). The two man-made reservoirs, Guaje and Los Alamos, are located on the flanks of the Sierra de los Valles to the northwest and west of Los Alamos (Fig. 1) and are replenished by rainfall and snowmelt runoff and by shallow ephemeral spring flows.

II. WELL FIELD CHARACTERISTICS

Total water production from the three well fields decreased about 70.5 million gallons from 1,426.6 million gallons in 1994 to about 1,356.1 million gallons in 1995 (Table 1). The months of heaviest production in 1995 were June, July, and August. The production during these months was 480.5 million gallons, a decrease of 42.6 million gallons from a similar period of heavy production in 1994. The months of lightest production were January, February, and March with a production of 233.2 million gallons, an decrease of 20.5 million gallons from a similar period in 1994.

The difference in demand between periods of heavy and light production (i.e., summer and winter demands) is mainly due to water usage for landscape irrigation. Nonpumping water levels in the wells respond accordingly, with the highest water levels observed during months of least production and the lowest water levels occurring during months of greatest production. The 1995 growing season, which required irrigation, occurred from May through October. About 62% (843.3 million gallons) of the total water (1,356.1 million gallons) used was during this time. The annual and monthly variation in water usage, however, could not be correlated with annual or monthly precipitation.

Peak-demand periods occur in the summer. For the past 10 years (1986–1995), these periods have ranged from 6 to 34 days in length (Table 2). The average daily production during these peak-demand periods has varied from 6.5 million gallons per day (mgpd) to 9.0 mgpd. The peak-demand period for 1995 was a 7-day interval from July 8 through July 14, with a total production of 49.3 million gallons (Table 2). This 1995 peak-demand period was shorter than the 1994 peak-demand interval, and only required an average daily water production rate of 7.1 mgpd as compared to 7.8 mgpd in 1994. Furthermore, the total water production for 1995 is the lowest on record since 1966 (Table 1).

The annual production and use of water at the Laboratory and in the community increased from about 231 million gallons in 1947, to 1,732 million gallons in 1976. Water usage in 1977 declined to about 1,531 million gallons. Annual usage has ranged from about 1,451 million gallons in 1979, to about 1,686 million gallons in 1989 (Fig. 2). The 1976 maximum has not been approached in recent years.

The change that occurred in the long-term use pattern is partly attributable to a decline in per-capita water use by Los Alamos County. Per-capita use has declined to about 48,000 gallons per year (130 gpd/person) since 1980 after reaching a peak of about 74,000 gallons per year (203 gpd/person) in 1974. Some of this decline may be related to the cost of water, which has increased by a factor of about 10 in the last 20 years. Laboratory use has been nearly constant at about 500 million gallons per year (1.37 mgpd) since the late 1970s [23].

Table 1. Potable Water Production from Wells and Gallery: 1947–1995 (in millions of gallons)

Year	Los Alamos Field	Guaje Field	Pajarito Field	Otowi Field	Water Canyon Gallery[1]	Annual Total
1947	147	0	0	0	84	231
1948	264	0	0	0	97	361
1949	302	0	0	0	92	394
1950	547	3	0	0	54	604
1951	702	68	0	0	39	809
1952	448	350	0	0	48	846
1953	444	372	0	0	39	855
1954	380	374	0	0	40	794
1955	407	375	0	0	33	815
1956	437	506	0	0	23	966
1957	350	378	0	0	40	768
1958	372	395	0	0	60	827
1959	391	478	0	0	54	923
1960	530	533	0	0	48	1,111
1961	546	624	0	0	54	1,224
1962	577	597	0	0	67	1,241
1963	539	654	0	0	51	1,244
1964	627	665	0	0	45	1,337
1965	447	571	99	0	72	1,189
1966	450	613	127	0	82	1,272
1967	373	464	481	0	56	1,374
1968	345	474	584	0	65	1,468
1969	331	435	569	0	80	1,415
1970	360	423	595	0	65	1,443
1971	412	484	657	0	37	1,590
1972	380	467	662	0	40	1,549
1973	406	475	685	0	49	1,615
1974	369	453	802	0	35	1,659
1975	356	431	749	0	42	1,578
1976	343	531	817	0	41	1,732
1977	345	515	614	0	57	1,531
1978	302	444	690	0	45	1,481
1979	289	456	662	0	44	1,451
1980	339	485	743	0	32	1,599
1981	336	469	701	0	45	1,551
1982	317	422	773	0	46	1,558
1983	221	338	904	0	38	1,501
1984	326	460	780	0	34	1,600
1985	290	456	841	0	37	1,624
1986	179	460	858	0	28	1,525
1987	217	485	892	0	34	1,628
1988	158	477	824	0	0	1,459
1989	219	506	961	0	0	1,686
1990	187	532	923	0	0	1,642
1991	125	502	820	0	0	1,447
1992	13	472	1,044	0	0	1,529
1993	0	298	876	284	0	1,458
1994	0	179	1,042	206	0	1,427
1995	0	230	1,126	0	0	1,356
Total	16,445	20,379	22,901	490	2,072	62,287

[1]Water Canyon Gallery not used as potable water supply after 1987; see nonpotable production, Table 6.

Table 2. Peak-Demand Periods for the Years 1986 Through 1995 (pumpage in millions of gallons)

Start Date	6/28	7/2	6/18	6/18	5/31	6/24	7/1	6/25	7/1	7/8
End Date	7/10	7/17	6/26	7/11	7/3	6/29	7/9	7/12	7/18	7/14
Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Total No. of Days	14	16	9	24	34	6	9	18	18	7
Total Pumpage	91.0	134.4	63.0	216.0	296.8	45.8	73.9	145.8	140.4	49.3
Average Daily Pumpage	6.5	8.4	7.0	9.0	8.7	7.6	8.2	8.1	7.8	7.1
No. of Days When Pumpage Was										
$>10 \times 10^6$ gal.	—	—	—	4	8	—	—	—	—	—
$>9 \times 10^6$ gal.	—	4	—	9	13	—	2	2	—	—
$>8 \times 10^6$ gal.	2	7	2	10	3	4	3	12	8	1
$>7 \times 10^6$ gal.	2	4	3	0	4	—	4	2	9	2
$<7 \times 10^6$ gal.	10	1	4	1	6	2	—	2	1	4

A projection of future water use is plotted along with observed total water production in Fig. 2. This projection is an extrapolation of a least-squares linear regression curve fit of actual production versus time, using the 19-year interval from 1977 through 1995. This trend line shows a slight decline of about 1.5 million gallons per year (4,009 gpd). Annual production is plotted for the four well fields to show a comparison of the distribution of production (Fig. 2). The production from any individual well field peaks as another well field is brought on-line. For example, the production from the Los Alamos well field peaked in 1951 as the Guaje well field became operational. Similarly, the production from the Guaje well field peaked in 1964 as the Pajarito well field was phased into use. The last year of municipal supply from the Los Alamos well field occurred in 1991. As a result, the loss of production from the Los Alamos well field has been offset by an

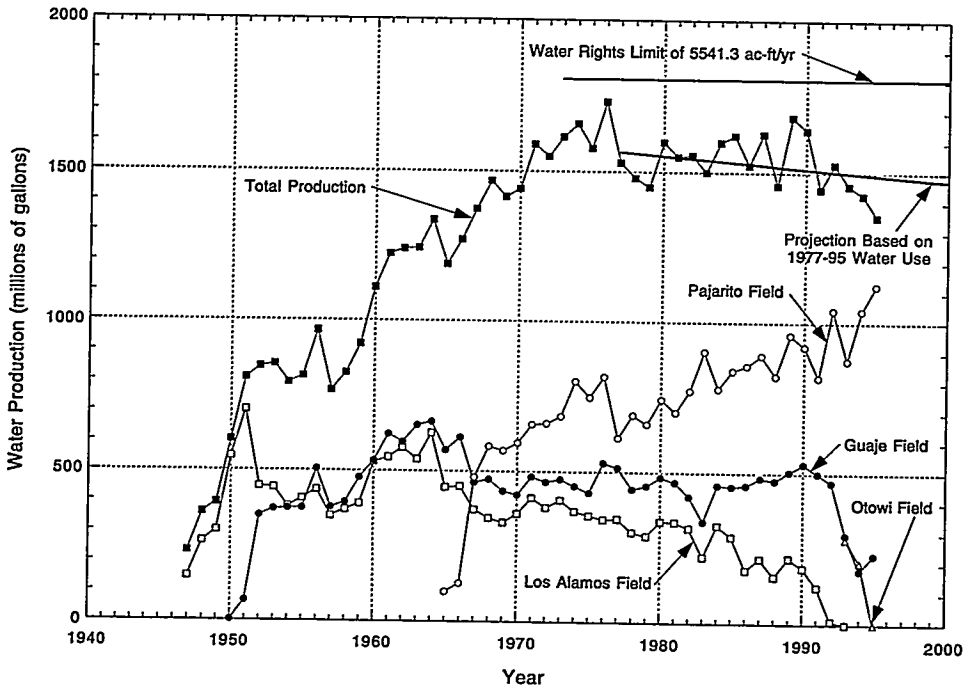


Fig. 2. Water production and usage from 1947 to 1995; projected water demands are based on 1977–1995 usage values.

increase in production from the Pajarito well field. This expansion of well fields is necessary as older wells deteriorate with age and their production rates decrease. New wells must be added to the system to keep up with demand.

The present annual aquifer water yield reflects the distribution of production among the various well fields, the impact of a pump failure at Otowi Well 4 (O-4) during all of 1995, and pump maintenance at Pajarito Mesa Well 2 (PM-2) from September through December. In addition, Guaje Well 3 (G-3) and Guaje Well 4 (G-4) were nonoperational during all of 1995, while Guaje Well 5 (G-5) was on-line only during the summer peak demand. The pump failure in O-4 was especially significant; it resulted in an unexpected decline in production from the Otowi well field and a corresponding increase in production in both the Guaje and Pajarito well fields. About 16% of total production came from the Guaje well field, about 84% from the Pajarito well field, and 0% from the Otowi well field. In 1994 the percentage of production was about 12% from the Guaje well field, 72% from the Pajarito well field, and 14% from the Otowi well field (Table 3).

A. Guaje Well Field

The Guaje well field consists of seven wells ranging in depths from 1,500 to 2,000 ft. Wells G-1, G-2, G-3, G-4, and G-5 were completed in 1950. Well G-1A was completed in 1954, and Well G-6 was placed in service in 1964. Almost all of the 1995 Guaje well field production came from only four of these wells (G-1, G-1A, G-2, and G-6). Attempted rehabilitation of Well G-3 in 1986 damaged the casing beyond repair and the well was permanently taken out of production. Hence no water levels have been collected from G-3 since 1986. Well G-4 was not pumped during 1995, and nonpumping water levels were reported for only eight months. Well G-5 was pumped for short periods over a three-month period in 1995, but no water levels were recorded. Because of deteriorating well casings, screens, and gravel packs, individual water yields in these two wells have declined to the point where it is not economically feasible to routinely pump them.

The total production from the Guaje well field increased about 50.4 million gallons from 179.4 million gallons in 1994, to 229.8 million gallons in 1995. The well field contributed about 16% of the total production in 1995 (Table 3). The total pumping rate, however, declined from 1,879 gpm in 1994 to 1,640 gpm in 1995 (Table 4). This decline was primarily due to a pump failure in Well G-4. A comparison of average annual pumping rates for individual wells in the Guaje field continues to reflect long-term declining yields of this aging well field. There were no significant changes in the specific capacities of individual pumped wells in 1995 compared to the previous year.

A comparison of the average nonpumping water levels in wells where data are available indicates slightly lower levels in 1995 compared to 1994 (Table 5). In the pumped wells (i.e., G-1, G-1A, G-2, and G-6), the water levels declined an average of about 3 ft. These lower water levels are due to the increase in total pumped volume from the field in 1995 compared to the previous year. These water level changes are normal and indicate some decline in response to increases in pumped volumes (Fig. 3 and Table 5).

B. Pajarito Well Field

The Pajarito well field consists of five wells. The wells were completed over an 18-year period, from 1965 through 1982, and range in depths from 2,300 to 3,100 ft. Because they are located on Pajarito Plateau, the depths to water range from about 753 ft at Well PM-1 to more than about 1,230 ft at Well PM-5. During 1995 Well PM-2 was out of service from September through December because the pump assembly was reset approximately 60 ft lower at a depth of 1,060 ft below the top of the surface casing. This pump reset was required because of long-term water level declines across the plateau. In addition, three months of nonpumping and seven months of pumping water level data were lost for PM-2. Well PM-4 operated from March through December; however, no water level data were collected at PM-4. Well PM-5 operated from February through December; however, no water level data were collected at PM-5.

The 1995 production from the Pajarito well field was about 1,126.3 million gallons, an increase of 84.8 million gallons from the 1,041.5 million gallons produced in 1994 (Table 3). The field contributed about 84% of the total 1995 production. The production from Wells PM-2, PM-4, and PM-5 represented about 69% of the total water produced at Los Alamos in 1995 (Table 3).

Table 3. Well Production Characteristics for 1994 and 1995

	Production					
	Amount (10^6 gal.)		Well Field (%)		Total Production (%)	
	1994	1995	1994	1995	1994	1995
Guaje Field						
Well G-1	18.5	28.5	10	12	1	2
Well G-1A	68.2	67.2	38	29	5	5
Well G-2	62.7	70.1	35	31	4	5
Well G-3	0.0	0.0	0	0	0	0
Well G-4	<0.1	0.0	<1	0	<1	0
Well G-5	2.5	17.6	1	8	<1	1
Well G-6	27.5	46.4	15	20	2	3
Subtotal	179.4	229.8	100	100	12	16
Pajarito Field						
Well PM-1	43.4	29.7	4	3	3	2
Well PM-2	298.9	217.7	29	19	21	16
Well PM-3	78.8	159.7	8	14	5	12
Well PM-4	463.4	428.2	44	38	32	32
Well PM-5	156.9	291.0	15	26	11	21
Subtotal	1041.5	1126.3	100	100	72	84
Otowi Field						
Well O-4	205.7	0.0	100	0.0	14	0
Subtotal	205.7	0.0	100	0.0	14	0
Total Potable	1426.6	1356.1	—	—	99	100
Water C. Gallery	11.6	1.6	100	50	<1	<1
Guaje Reservoir	0.0	0.0	0	0	0	0
Los Alamos Res.	0.0	1.6	0	50	0	<1
Total Nonpotable	11.6	3.2	100	100	<1	<1
Total Production from Permitted Sources	1438.2	1359.3	—	—	100	100

The average pumping rates of the Pajarito wells ranged from 569 to 1,350 gpm (Table 4). Four of the wells (PM-2, PM-3, PM-4, and PM-5) are high-yield wells with pumping rates over 1,000 gpm (Table 4). The pumping rates from the individual wells varied only slightly from 1994 to 1995. Furthermore, the entire well field showed an increase of about 14 gpm in total production rate from 5,683 gpm in 1994, to 5,697 gpm in 1995. There were no significant changes in the specific capacities of the wells from 1994 to 1995 in wells where data were available (Table 4).

The water levels in these wells fluctuated as would be expected from the amount of pumpage (Fig. 4). However where data are available, there were no significant changes in nonpumping and pumping water levels in 1995 compared to 1994.

Table 4. Average Pumping Rate and Specific Capacity, 1994 and 1995

	Average Pumping Rate (gpm)		Average Specific Capacity (gpm/ft of drawdown)	
	1994	1995	1994	1995
Guaje Field				
Well G-1	194	187	1.1	1.1
Well G-1A	432	409	12.3	12.0
Well G-2	426	413	13.7	14.2
Well G-3[1]	0	0	0.0	0.0
Well G-4[1]	163	0	1.0	0.0
Well G-5[1]	388	364	11.1	—
Well G-6	276	267	3.5	3.2
Total for Field	1879	1640		
Pajarito Field				
Well PM-1	577	569	25.1	24.7
Well PM-2	1270	1306	19.8	20.4
Well PM-3	1359	1350	56.6	56.3
Well PM-4	1250	1244	29.1	—
Well PM-5	1227	1228	15.3	—
Total for Field	5683	5697		
Otowi Field				
Well O-4[1]	1396	0	66.5	0.0
Total for Field	1396	0		

[1]Well not in service during all or part of 1995.

C. Otowi Well Field

The Otowi well field consists of two wells that were completed in 1990. Well O-1 was completed at a depth of 2,497 ft, and showed a main aquifer static depth-to-water reading at about 695 ft. Well O-4 was completed at a depth of 2,585 ft and showed a static depth-to-water level at 790 ft. Wells O-1 and O-4 were not operational in 1995 and contributed no water production to the system. Well O-1 has not entered routine service yet, and Well O-4 was off-line due to a pump installation problem.

During 1995 nonpumping water levels in Well O-1 averaged about 700 ft, while those in Well O-4 averaged about 762 ft below ground surface.

III. WATER CANYON GALLERY AND GUAJE AND LOS ALAMOS RESERVOIRS

Water Canyon Gallery was a source of potable water from the early days of the Manhattan Project until 1988 (Table 1). Rapid recharge to the gallery causes heavy sediment loads to enter the potable system. In 1988, to keep the sediments out of the potable system, the use of the gallery was discontinued. Instead, the water from the gallery is used as nonpotable supply for the steam plant at TA-16.

The spring gallery in Water Canyon is dug about 30 ft into the Bandelier Tuff. The gallery, or tunnel, is framed with timbers and sheet metal to keep the walls and overhead from collapsing. The floor of the gallery is constructed to form a basin to collect the spring flow. About one mile of water line connects the gallery to the power plant at TA-16 (S-Site). The water line is not part of the potable system.

Table 5. Average Depth to Water in Wells during Nonpumping and Pumping Periods and Average Drawdown, 1994 and 1995

	Average Depth to Water					
	Nonpumping (ft)		Pumping (ft)		Drawdown (ft)	
	1994	1995	1994	1995	1994	1995
Guaje Field						
Well G-1	277	278	451	450	174	172
Well G-1A	312	312	347	346	35	34
Well G-2	358	361	389	390	31	29
Well G-3	—	—	—	—	—	—
Well G-4	363	368	525	—	162	—
Well G-5	459	—	494	—	35	—
Well G-6	572	577	652	660	80	83
Pajarito Field						
Well PM-1	755	753	778	776	23	23
Well PM-2	870	870	934	934	64	64
Well PM-3	772	772	796	796	24	24
Well PM-4	1085	—	1128	—	43	—
Well PM-5	1234	—	1314	—	80	—
Otowi Field						
Well O-4	860	—	881	—	21	—

The water occurs in the fractures of a welded tuff, which is underlain by a nonwelded tuff (the fractures in the welded tuff contain the water which is perched on the nonwelded tuff). The gallery furnished only about 1.6 million gallons of water to the power plant during 1995 (Tables 3 and 6). The total discharge from the gallery was not utilized at the steam plant. The excess discharge was released back into the environment. The annual use, potable and nonpotable, during the period 1947–1995 is shown in Table 6.

Water from Guaje and Los Alamos Reservoirs was used for municipal and industrial water supply at Los Alamos during the early days of the Manhattan Project. Use of the reservoirs for potable water supply was discontinued in 1959 because of intermittent periods of turbidity caused by summer thunderstorm runoff. In addition, there were difficulties in maintaining bacteriological levels below allowable limits for a municipal water supply.

The water from the reservoirs is available for irrigation of lawns and shrubs in the community and at the Laboratory. Parts of the water lines are above ground and are subject to freezing; thus, water use from the reservoirs is limited to the period from late spring to early fall. During 1995 about 1.6 million gallons of water was diverted from Los Alamos Reservoir for lawn irrigation; no water was diverted from Guaje Reservoir for any purpose. The age of the distribution system and need for rehabilitation, along with operation costs, may cause the Laboratory to eventually abandon the irrigation system as it is not economically feasible to operate. The production from the Guaje and Los Alamos Reservoirs for the period of record is shown in Table 6.

IV. QUALITY OF WATER

The Laboratory conducts two separate programs to monitor the quality of both surface water and groundwater in the area and to meet multiple federal and state regulatory requirements. The first program, under the Laboratory's long-term environmental surveillance program, includes monitoring the quality of

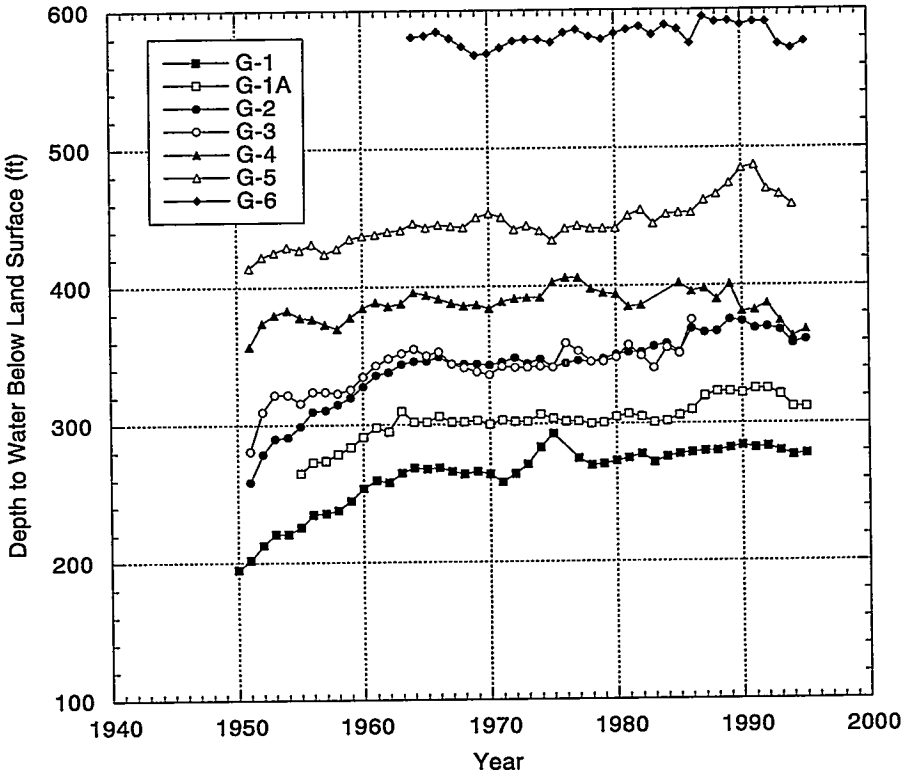


Fig. 3. Nonpumping water levels in wells from the Guaje well field.

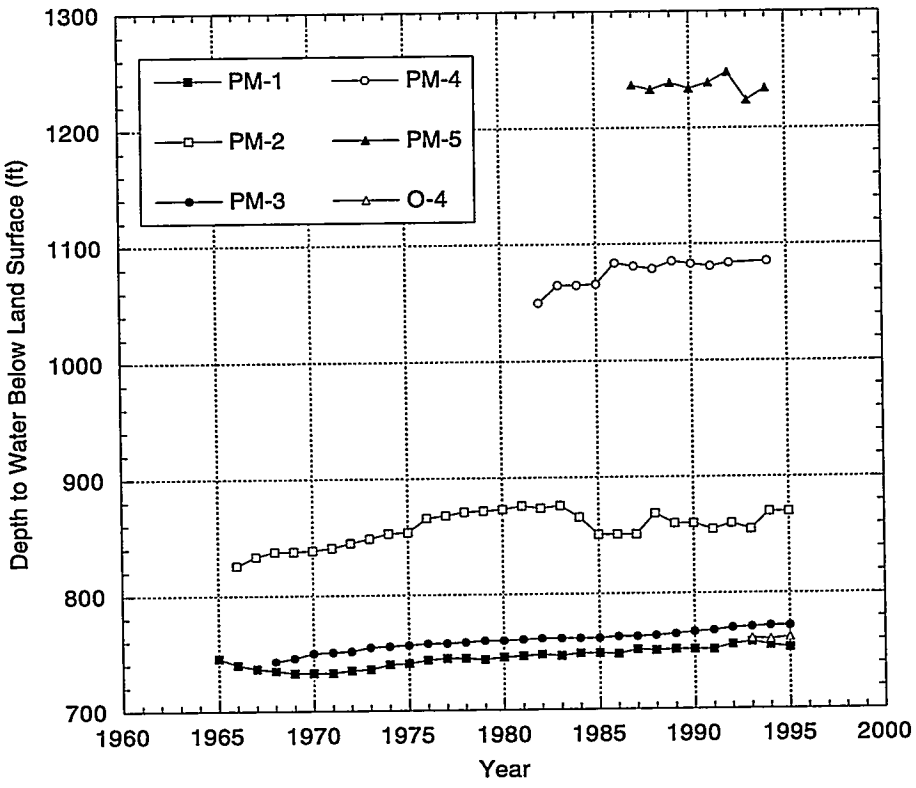


Fig. 4. Nonpumping water levels in wells from the Pajarito and Otowi well fields.

water from the supply wells, test wells, the gallery in Water Canyon, surface waters, and reservoirs in Guaje and Los Alamos Canyons. Analytical results for this program are reported in a series of annual environmental surveillance reports [29–33].

The second program monitors the quality of water in the Laboratory and county distribution systems to ensure compliance with the Safe Drinking Water Act (SDWA). Water samples are collected from the water distribution systems located at the Laboratory, Los Alamos County, and Bandelier National Monument on a routine basis. Furthermore, water samples are also routinely collected at individual wells before the water is chlorinated and pumped into the distribution system. This sampling methodology is designed to monitor the water at both the source and within the distribution system. These samples are analyzed for microbiological organisms, organic and inorganic chemical constituents, and radioactivity in the drinking water. During 1995, a total of 555 samples were analyzed for microbiological organisms. Two samples showed the presence of total coliforms, and one sample indicated the presence of fecal coliforms. Noncoliform bacteria were present in 14 samples. All other parameters regulated under the SDWA were in compliance with maximum contamination levels (MCLs) established by regulation. Historically, the Los Alamos water system has never incurred a violation for a SDWA-regulated chemical or radiological contaminant. The water supply wells have, on occasion, exceeded the proposed SDWA MCLs for arsenic (1995 MCL of 50 ppb; proposed MCL of 5 ppb) and radon (1995 MCL of 1,000 pCi/l; proposed MCL of 300 pCi/l). Both of these constituents are naturally occurring in main aquifer waters below Pajarito Plateau. Detailed results of this program are documented in the reports "Environmental Surveillance at Los Alamos during 1994" [30] and "Environmental Surveillance at Los Alamos during 1995" [33].

Complete chemical and radiochemical analyses, along with an interpretation of data related to the chemical quality in individual wells in the Los Alamos, Guaje, Pajarito, and Otowi well fields and in Water Canyon Gallery and Guaje and Los Alamos Reservoirs were presented in the report "Water Supply at Los Alamos during 1991" [22].

V. LONG-TERM WATER LEVEL TRENDS

A. Trends from Historical Data

Water levels have been measured in wells tapping the main aquifer since the late 1940s when the first exploratory wells were drilled by the US Geological Survey (USGS). These data have been documented in various reports over the years. They are summarized here in Appendices A and B. Appendix A lists all historical water production and aquifer characteristics data. Appendix B summarizes all historical water level data collected from main aquifer test (observation) wells. This portion of the water supply report compiles all available water level data for the main aquifer and summarizes the changes in graphic form.

The annual summary data on each water supply well has been documented since 1971 in this series of water supply reports. There is one table in Appendix A for each of the wells used as a water supply well at Los Alamos. Each table includes annual average information on the water levels obtained from both nonpumping and pumping conditions. Notes on each table provide information about the water level at the time of completion of the well.

Because all the wells in the Los Alamos field have either been plugged and abandoned in accordance with the State Engineer Office requirements or turned over to San Ildefonso Pueblo, this year's report no longer documents data for those water supply wells. It is anticipated, however, that some future measurement of water levels will be possible in the remaining Los Alamos field wells (i.e., LA-1A, LA-1B, LA-2, and LA-5) under cooperative agreements between the Pueblo, the Bureau of Indian Affairs, and the Department of Energy.

One additional table summarizes the data for the test wells reaching the main aquifer (see Appendix B). This table includes completion information, initial static water levels, and annual average water levels in main aquifer test wells.

The test well water level data were compiled from the original records in the files of the Water Quality and Hydrology Group. Some of the data in the table represent averages when more than one measurement was made during a given year. During 1995, a program was underway to equip each test well with a pressure transducer having an automatic data recording capability. The data in the table for both 1994 and 1995

Table 6. Production from Water Canyon Gallery and Guaje and Los Alamos Reservoirs[1]

Year	Water Canyon Gallery[2] (10^6 gal.)	Guaje Reservoir[3] (10^6 gal.)	Los Alamos Reservoir (10^6 gal.)
Municipal Water-Supply Production			
1947		87.8	21.7
1948		119.8	21.9
1949		116.1	14.7
1950		79.9	20.6
1951		41.0	10.5
1952		131.0	33.6
1953		58.0	14.8
1954		66.0	16.9
1955		71.0	18.1
1956		24.0	4.8
1957		213.0	54.8
1958		193.0	49.4
Nonpotable Water Production			
1972		5.8	0.0
1973		9.7	0.0
1974		4.9	0.0
1975		5.3	0.0
1976		4.4	0.0
1977		4.1	0.0
1978		2.8	0.0
1979		3.7	1.3
1980		4.7	2.3
1981		2.7	2.1
1982		3.4	2.8
1983		3.4	1.4
1984		3.0	1.3
1985		2.8	0.9
1986		2.4	1.5
1987		2.8	3.2
1988	0.0	2.4	1.4
1989	0.0	4.6	3.3
1990	9.3	2.2	4.6
1991	12.0	1.5	2.4
1992	0.1	0.0	0.0
1993	6.4	0.0	0.5
1994	11.6	0.0	0.0
1995	1.6	0.0	1.6

[1] Guaje and Los Alamos Reservoir municipal supply 1947–1958; irrigation 1972–1995.
[2] Water Canyon Gallery nonpotable industrial supply 1988–1995; see Table 1 and Appendix A for potable production for municipal supply from 1947–1987.
[3] Production from Guaje Reservoir for 1951–1958 is estimated.

represent the final reading of water levels recorded during 1994 or 1995, respectively. In future years it is intended that these automated data collection efforts will permit presentation of data summarizing both short-term (i.e., barometric and earth tidal effects) and long-term fluctuations (i.e., seasonal variations reflecting any potential canyon-bottom recharge patterns) in water levels throughout the reporting year.

A summary of the water level changes since the late 1940s is presented in several graphs (Figs. 5–8). For the most part, these figures are self-explanatory. Nonpumping water level data are presented for the Los Alamos (Fig. 5), Guaje (Fig. 6), and Pajarito (Fig. 7) water supply well fields. No graph was made for the Otowi field since data for only two years are available for the single well, O-4 (see Appendix A). Trends in the main aquifer test wells are depicted in a separate graph (Fig. 8). Collectively, all of these individual trends reflect a plateau-wide decline in main aquifer water levels in response to municipal water production.

The levels in the Los Alamos well field (Fig. 5) generally ranged from about 40 to 140 ft below initial levels until 1990 when the field was taken out of production. Since then levels have trended back toward initial conditions. The easternmost wells, which were artesian at completion, have regained much of their original water levels. Well LA-1B, with an installed mechanical packer and recording pressure transducer, has again become artesian. This well currently shows a packed-off water level that is about 21 ft above ground surface (i.e., above the overflow drain in the well casing, which is located about 6 ft below top-of-casing).

The levels in the Guaje field (Fig. 6) have ranged from almost no decline to about 120 ft of decline since 1950. In this field the westernmost wells show the least decline overall and have recovered significantly in recent years with somewhat lower production. Wells G-4 and G-6 recovered significantly in 1995 when they were not pumped.

The Pajarito field wells (Fig. 7) have always been the best producers, with generally much higher specific capacities. As expected, they show the least declines in water levels. Since 1990 these declines have varied between about 20 and 40 ft.

The test wells penetrating to the main aquifer show declines ranging from less than 10 to about 35 ft over the 47-year period of record (Fig. 8). They fall into geographic groups. The westernmost well, TW-4, shows less that 10 ft of change. The southernmost group of wells, DT-5A, DT-9, and DT-10, all located within TA-49, show a decline of about 10 to 15 ft since 1960. The one well in the central part of the plateau, TW-8, shows a decline of about 25 ft and is within the range of declines shown by the Pajarito supply wells. The north-central wells, TW-2 and TW-3, both show about 35 ft of decline over the 47-year period of record. It is important to note that these declines in test well water levels are gradual and have not been observed during recent intensive short-term pump testing of production wells [20–23].

Only one test well (TW-1) has shown an apparent increase in recent water levels after many years of no measurements (see Appendix B) and was not depicted in Fig. 8. The anomalous behavior of this well is not fully understood and is currently under investigation. Some preliminary tests to determine possible reasons for this behavior are discussed in two recently published environmental surveillance reports for Los Alamos [30, 31]. There is apparently some indication of communication with the surface as reflected by low-level tritium measurements [31]; however, major ion water quality and recent water level data suggest that TW-1 is hydraulically isolated from a nearby shallow test well (TW-1A) and adjacent surface waters within Pueblo Canyon. Hence the apparent communication of TW-1 with the atmosphere may actually be through the formation and not through a leaky wellbore as previously thought. An alternative possibility is that these observed water level increases in TW-1 may be in response to lost fluid circulation during the 1990 drilling of the O-1 water supply well, located approximately 1,000 ft to the west. If this is the case, then these water level increases should begin to decline, as recent measurements (i.e., 1994 and 1995) indicate. This interpretation suggests the unlikely possibility that elevated tritium levels must have originated either in O-4 water supplies used for the original drilling fluids or from atmospheric deposition in the open mud pit over the three-month drilling interval. Low-level tritium measurements have failed to detect any tritium in O-4 well waters. The investigation is continuing, and additional progress will be documented in future water supply reports.

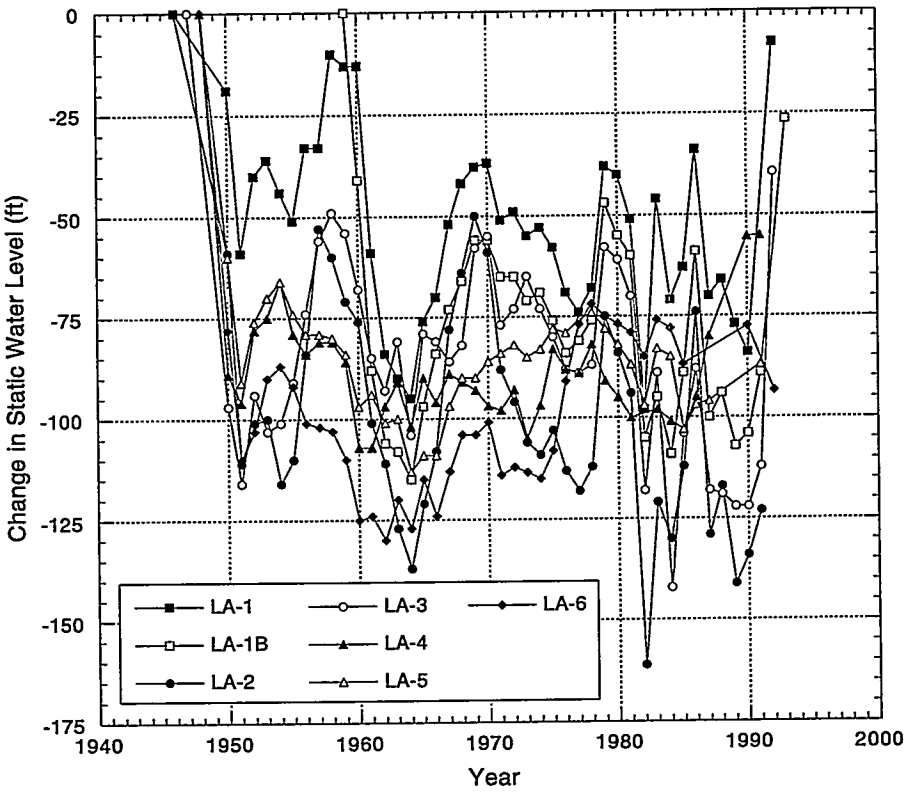


Fig. 5. Change from initial static water levels in wells from the Los Alamos well field.

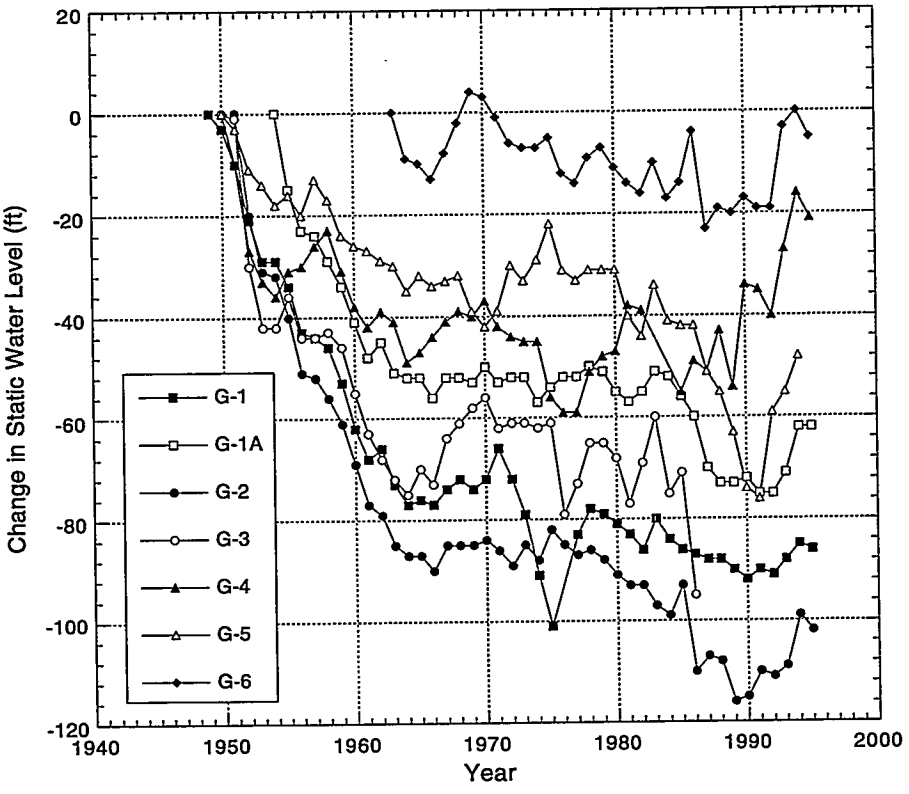


Fig. 6. Change from initial static water levels in wells from the Guaje well field.

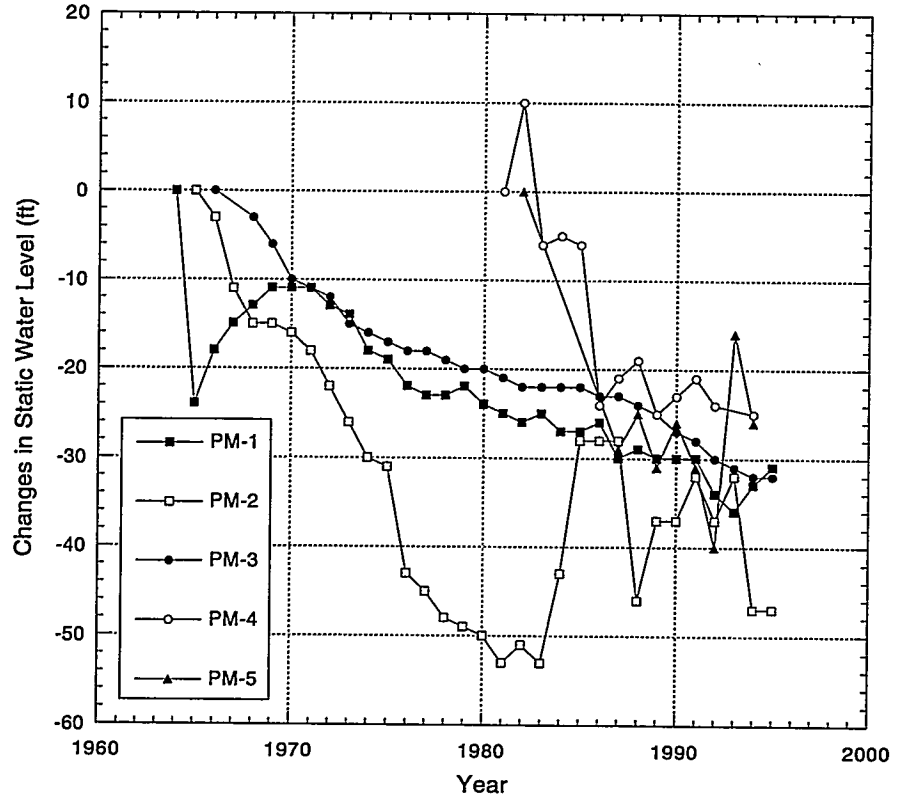


Fig. 7. Change from initial static water levels in wells from the Pajarito well field.

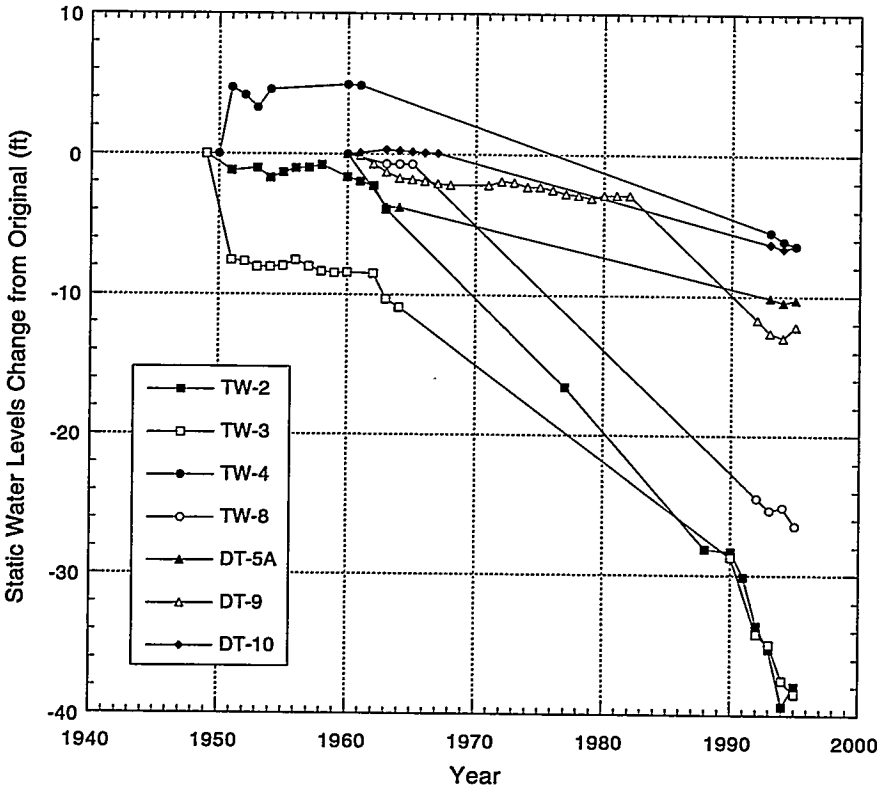


Fig. 8. Change from initial static water levels in main aquifer test wells.

B. Interpretation of Trends

An interpretation of the plateau-wide changes in main aquifer water levels is best represented in a series of a maps (Figs. 9–11). The first map (Fig. 9) depicts contours for "prepumping conditions" based on the initial water levels measured in each well when drilled. The second map (Fig. 10) depicts approximate conditions based on measured static or nonpumping water levels at the end of 1995. The third map (Fig. 11) provides a simplified indication of how main aquifer water levels have changed in a geographic context over the past 47 years. All of these maps, however, must be viewed with some understanding of their implied limitations. They are not perfectly idealized piezometric contour maps since nonpumping water levels from fully penetrating production wells were included in the database used to construct them. These maps simply represent approximate conditions in the main aquifer based on all available historical information.

A piezometric contour map is an idealized two-dimensional representation of a three-dimensional hydraulic surface. As such, it is spatially analogous to a topographic map; hence, uniformly distributed data generally increases map accuracy and detail. The piezometric surface is generally taken to be the sum of both the pressure and elevation heads from a uniform aquifer or hydrogeological unit at some instant in time. Presently this is not practical for Pajarito Plateau because of insufficient areal well coverage and individual well completion techniques. Hence it was decided to use water level data from multiple sources; these sources included springs tapping the main aquifer, test wells (with relatively short well screens), and nonpumping water levels from supply wells (with relatively long screens) in order to get sufficient areal coverage. Springs that tap into the main aquifer characterize a point measurement on the real piezometric surface and represent the highest quality measurements available. The main aquifer test wells penetrate only the uppermost water bearing layers of this hydrogeological unit; typical screen lengths vary between 10 and 100 ft. These test well water level measurements vary in quality because of variations in individual screen lengths; hence when taken collectively, these measurements probably represent data of secondary quality. Finally, the screened intervals of the supply wells penetrate much thicker water bearing zones and may actually cross several different geological units. Typically individual screen lengths vary between several hundreds of feet and more than 1000 ft. Nonpumping water levels from these supply wells represent depth-averaged values and obscure important information about vertical hydraulic gradients. These nonpumping water levels also reflect some influence of recent pumping in the producing wells that may not have fully recovered to static conditions. Hence these measurements probably represent data of tertiary quality. Additionally, the "prepumping contours" shown in Fig. 9 are based on data collected at different times, as the various wells were drilled. Hence such data are the closest approximation we have to "undisturbed" conditions. Regardless of these obvious limitations, it was decided to generate the piezometric contour maps shown in Figs. 9 and 10 in order to depict hydrological conditions below Pajarito Plateau and to satisfy certain regulatory requirements.

Several important generalizations can be inferred from the piezometric contour maps shown in Figs. 9 and 10. First, it is implied by the piezometric maps that groundwater flow is generally from west to east toward the Rio Grande and that significant aquifer recharge is apparently located west of the Laboratory's western boundary. Furthermore, this regional pattern has not significantly changed in the past 47 years. Unfortunately, neither of the maps shown in Figs. 9 or 10 provides sufficient detail to signify any potential recharge patterns from canyon bottoms located within the Laboratory boundary. Second, a generalized regional groundwater discharge pattern along the Rio Grande is strongly suggested in Figs. 9 and 10. This pattern is further supported by the occurrence of main aquifer artesian conditions near Well LA-1B and by approximately 35 springs and seeps along the western margins of the Rio Grande between Otowi Bridge and Cochiti Reservoir. An idealized conceptual representation of this regional flow regime is shown in Fig. 12. Third, it seems that the overall annual pumping rate histories on Pajarito Plateau have exceeded natural recharge rates to the main aquifer because regional water level declines are obvious (Fig. 11). Furthermore, when aquifer pumping ceases for long periods (i.e., several months to years), then water levels begin to slowly recover toward original static conditions. This third observational conclusion strongly suggests an approximate upper limit for the regional main aquifer recharge rate at a 1970–1990 average water production rate of approximately 1.6 billion gallons per year (see Fig. 2). In all likelihood, the actual recharge rate to the main aquifer below Pajarito Plateau is spatially and temporally variable and is somewhat less than this upper limit.

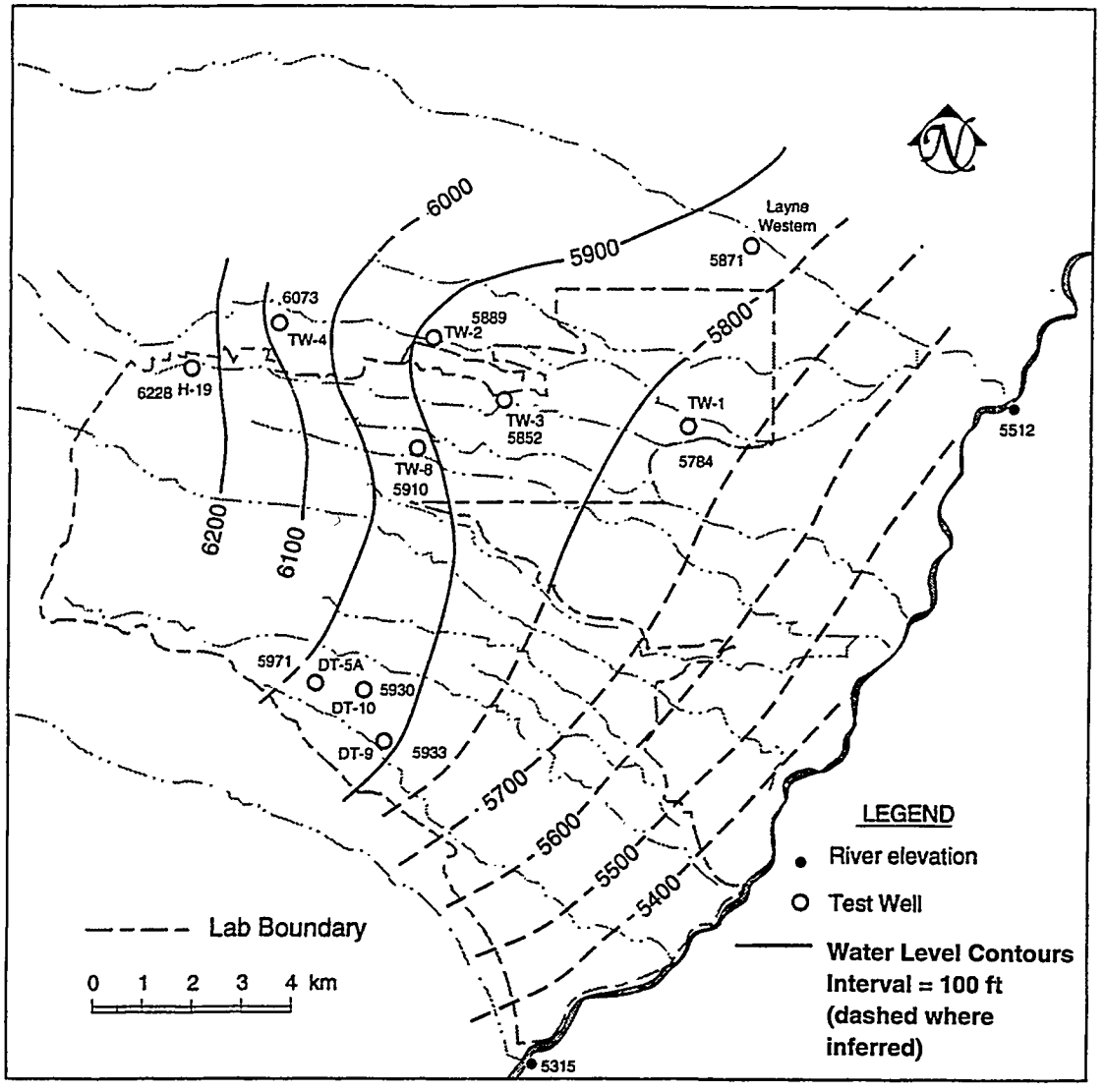


Fig. 9. Water level contour map for Los Alamos vicinity showing predevelopment water levels (modified after Rogers et al., 1996 [34]).

Despite the data limitations discussed above, the map shown in Fig. 11 still permits an accurate visualization of the relative changes in main aquifer water levels over different parts of the Los Alamos area. The largest changes, represented by about 100 ft of drawdown, occur in the vicinity of the Guaje and Los Alamos well fields. Intermediate changes, represented by about 50 ft of drawdown, occur in the central portion of the plateau that is generally influenced by the higher-yielding Pajarito and Otowi well fields. The smallest changes, represented by about 10 ft of drawdown, occur to the western and southern portions of the plateau where no production wells are located. Finally, in those areas adjacent to the Rio Grande near Otowi Bridge, artesian conditions have resulted in nearly complete recovery in the easternmost wells in the Los Alamos field. In actually, these "artesian" conditions simply reflect a regional groundwater discharge boundary that is approximately located along the Rio Grande between the Otowi Bridge and Cochiti Reservoir, as implied in Fig. 12.

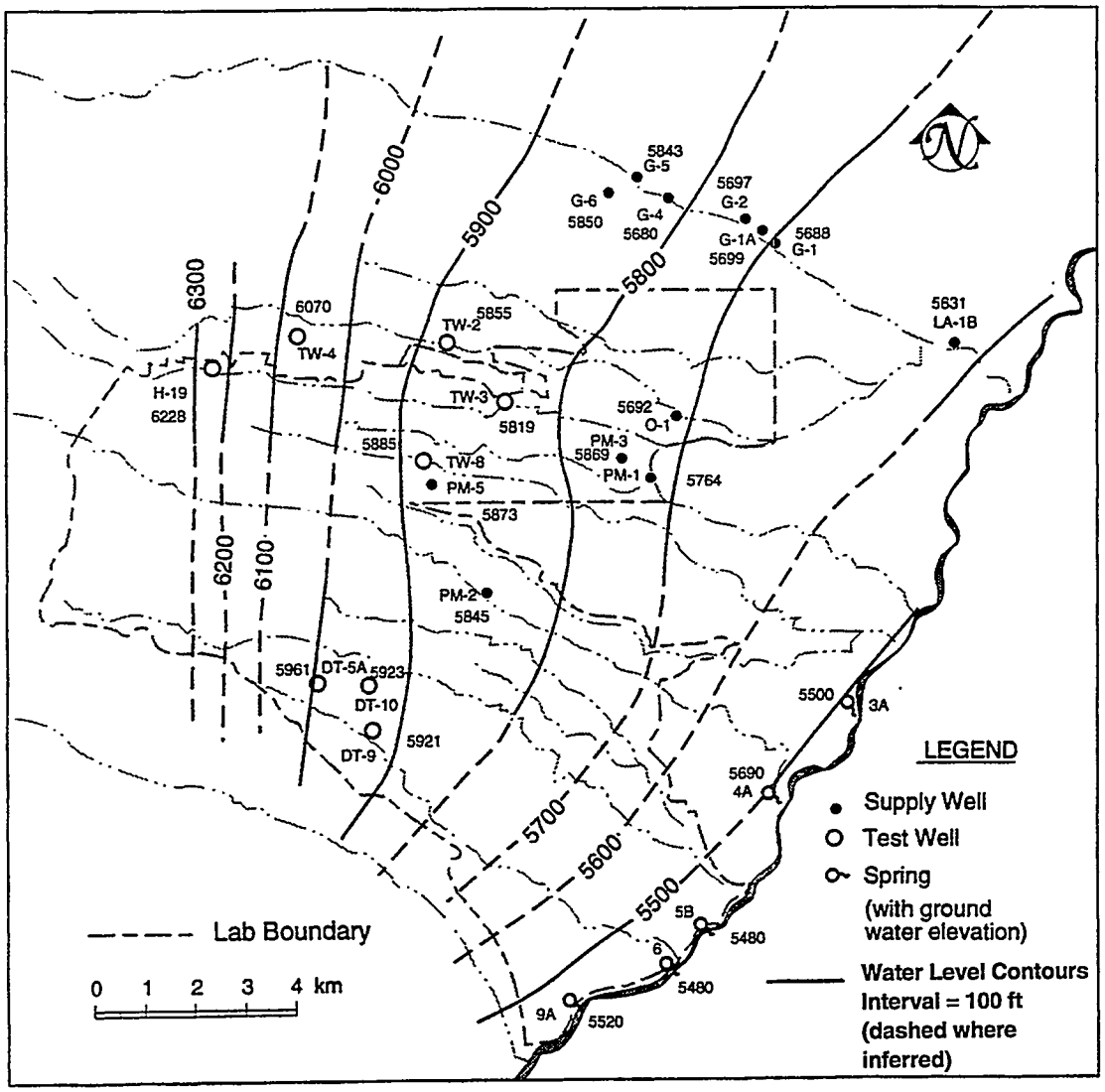


Fig. 10. Water level contour map for Los Alamos vicinity on December 31, 1995 (modified after Rogers et al., 1996 [34]).

C. Conclusions and Recommendations

The importance of the long-term water level declines discussed above is unclear at the present. A simple hydraulic comparison of these drawdown levels with the known saturated thickness of the main aquifer suggests that impacts are relatively insignificant. However, water quality variations at depth within the main aquifer are not fully understood. Hence excessive drawdown associated with concentrated and prolonged well field pumpage may induce vertically upward flow of naturally contaminated geothermal fluids, as was apparently the situation at Well LA-6 [35]. This well began to yield excessive arsenic concentration levels in 1976, and the well was subsequently removed from production. In 1992, Well LA-6 was plugged and abandoned in accordance with New Mexico State Engineer Office regulations. It was suspected that this arsenic originated from naturally contaminated groundwater migrating vertically upward from formations located below the bottom of the well screen. Conceptually similar conditions of saltwater upconing commonly occur in freshwater oceanic island or coastal wells when they are excessively pumped or are drilled too deep relative to the freshwater/saltwater interface.

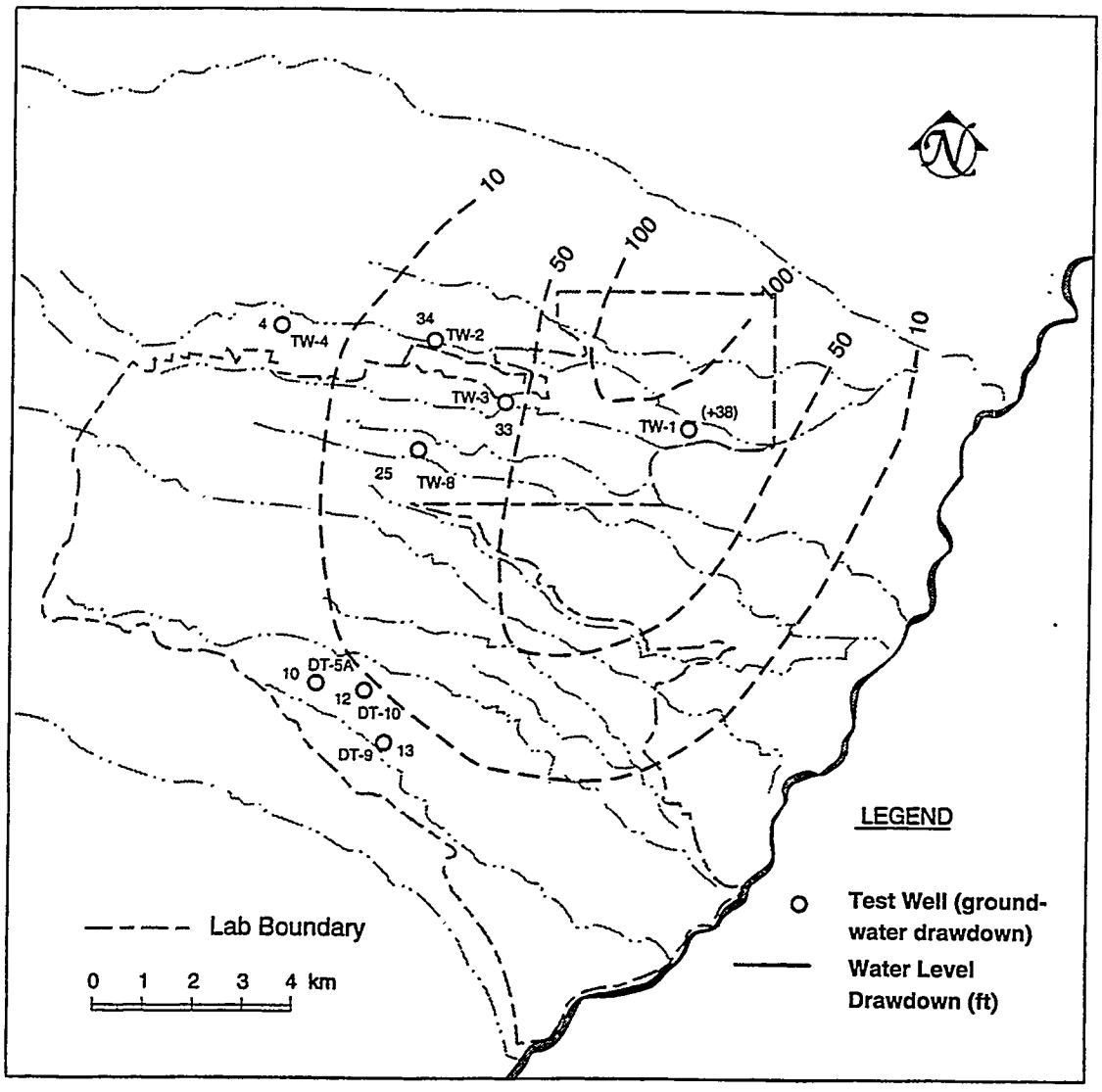
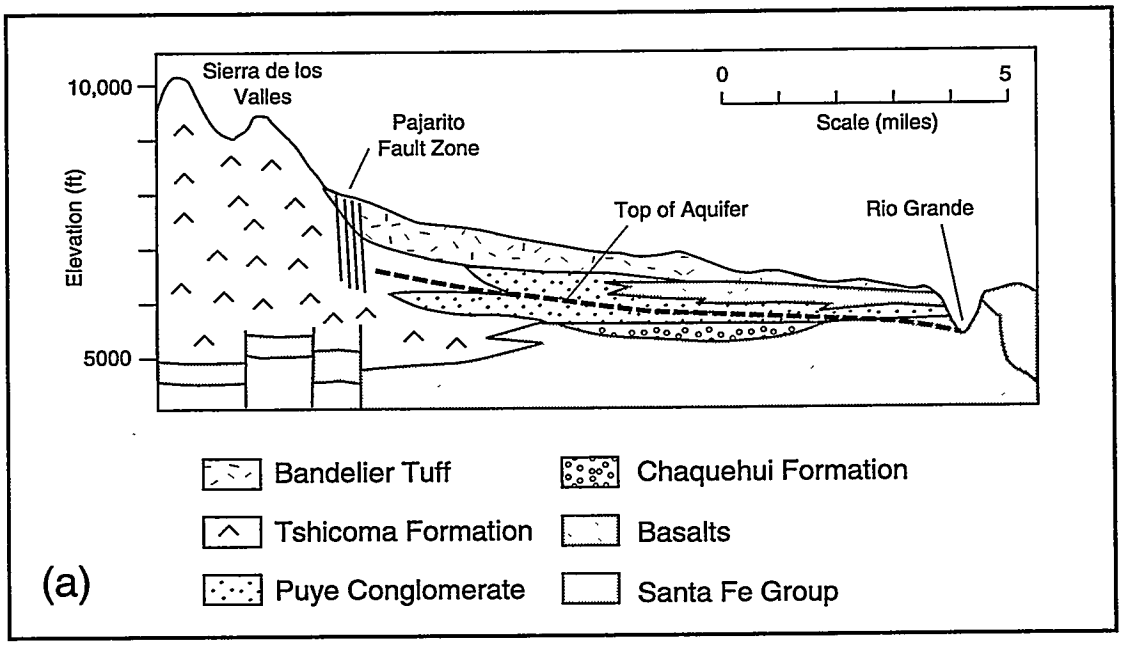


Fig. 11. Drawdown contours for Los Alamos vicinity: 1949–1995 (modified after Rogers et al., 1996 [34]).

The interpretation presented above suggests that long-term declines in water levels, or excessive drawdown near individual production wells, may represent a significant potential impact to water quality, which in turn might affect water supplies. A major goal of future investigations should be to delineate vertical changes in water quality so that this significant point can be clarified. It is important to recognize that potential main aquifer contamination may originate at or near the land surface in recharge areas or from natural contamination located at depth in discharge areas. Control of Laboratory activities to minimize the first threat is a major component of the Groundwater Protection Management Program. However, the second potential contaminant source should not be overlooked since it can be controlled by prudent management of groundwater resources (i.e., locations and completion depths of future water supply wells and control of individual production rates).



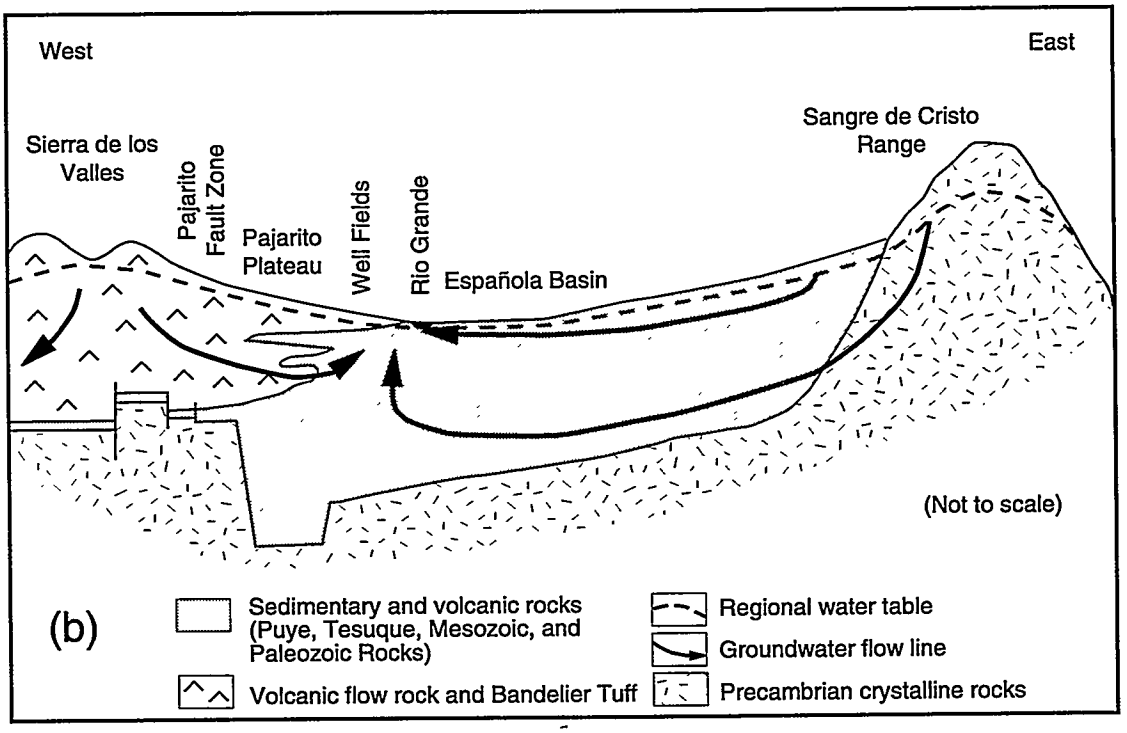


Fig. 12. Idealized two-dimensional groundwater flow pattern near the Los Alamos–Santa Fe vicinity, showing inferred recharge and discharge areas (modified after Rogers et al., 1996 [34]).

VI. SUMMARY

Operations of wells and well fields in 1995 were satisfactory. Water level trends in the wells were as expected under the current amount of annual pumpage. Since the Los Alamos well field was abandoned in 1992, however, there are fewer wells that supply a larger percentage of the total water production for the system. Hence, efforts must be made to keep each of these high-yield wells on-line. Furthermore, the O-1 well should be equipped so that it can enter production. Fortunately, the demand during 1995 was the lowest since 1966. A dry year, coupled with numerous equipment failures, could cause summer demand to exceed production capability.

Some effort should be made to ensure that all water level recorders and wellhead flow meters are operational. These data are essential in documenting the operation of individual wells and summarizing well field performance characteristics. Furthermore, these data are vital in planning future well field operations and expansions.

Finally, any newly constructed municipal supply wells should utilize corrosion-resistant, high-alloy steel casing and louvered screen containing more than 0.4% copper, 0.5% nickel, and 0.5% chrome alloys. Gravel filter pack material should contain a high percentage (i.e., more than 90%) of quartz or quartzite to resist potential chemical treatment techniques during future well rehabilitation efforts. Furthermore, a high-quality gravel filter pack that is 4–6 inches thick should be employed during well construction. This design will tend to reduce wellbore entrance velocities and thereby minimize well screen corrosion. These construction practices should increase well service life beyond 50 years on Pajarito Plateau.

ACKNOWLEDGMENTS

Summary statistics on well production rates were collected by personnel from Utilities Department of Johnson Control World Services Inc.; these data were compiled for this report by the Laboratory's Water Quality and Hydrology Group.

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APPENDIX A

ANNUAL STATISTICS ON AQUIFER CHARACTERISTICS

Well LA-1

Year	Pumping Time (h)	Production (10^6 gal.)	Pumping Rate (gpm)	Water Level (Nonpumping) (ft)
1947	3,468	54.0	259.5	—
1948	2,988	34.7	193.6	—
1949	1,361	26.7	327.0	—
1950	563	10.5	310.8	19.0
1951	1,215	14.6	200.3	59.0
1952	286	3.4	198.1	40.0
1953	0	0.0	0.0	36.0
1954	0	0.0	0.0	44.0
1955	690	9.7	234.3	51.0
1956	39	0.0	0.0	33.0
1957	0	0.0	0.0	33.0
1958	0	0.0	0.0	10.0
1959	0	0.0	0.0	13.0
1960	0	0.0	0.0	13.0
1961	0	0.0	0.0	59.0
1962	0	0.0	0.0	84.0
1963	0	0.0	0.0	90.0
1964	0	0.0	0.0	95.0
1965	0	0.0	0.0	76.0
1966	0	0.0	0.0	70.0
1967	0	0.0	0.0	52.0
1968	0	0.0	0.0	42.0
1969	0	0.0	0.0	38.0
1970	0	0.0	0.0	37.0
1971	0	0.0	0.0	51.0
1972	0	0.0	0.0	49.0
1973	0	0.0	0.0	55.0
1974	0	0.0	0.0	53.0
1975	0	0.0	0.0	58.0
1976	0	0.0	0.0	69.0
1977	0	0.0	0.0	74.0
1978	0	0.0	0.0	68.0
1979	0	0.0	0.0	38.0
1980	0	0.0	0.0	40.0
1981	0	0.0	0.0	51.0
1982	0	0.0	0.0	98.0
1983	0	0.0	0.0	46.0
1984	0	0.0	0.0	71.0
1985	0	0.0	0.0	63.0
1986	0	0.0	0.0	34.0
1987	0	0.0	0.0	70.0
1988	0	0.0	0.0	66.0
1989	0	0.0	0.0	77.0
1990	0	0.0	0.0	84.0

NOTE: Well completed Nov. 1946; initial depth to water: flowing; surface elev. 5624 ft. Air line and recorder removed in 1990; depth to water on 3/12/92 was 7.61 ft below top of brass valve. Facility demolished in 1990; well plugged in 1993.

Well LA-1B

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1960	415	36.3	1,457.8	7.0	111.0	104.0	14.0
1961	3,727	124.7	557.6	54.0	154.0	100.0	5.6
1962	3,936	129.1	546.7	72.0	169.0	97.0	5.6
1963	3,649	117.4	536.2	74.0	170.0	96.0	5.6
1964	4,174	130.3	520.3	81.0	183.0	102.0	5.1
1965	3,007	97.9	542.6	63.0	170.0	107.0	5.1
1966	2,589	83.9	540.1	50.0	169.0	119.0	4.5
1967	2,519	84.9	561.7	39.0	153.0	114.0	4.9
1968	2,183	74.0	565.0	32.0	147.0	115.0	4.9
1969	2,244	75.7	562.2	22.0	142.0	120.0	4.7
1970	2,369	79.7	560.7	22.0	143.0	121.0	4.6
1971	2,633	89.1	564.0	31.0	162.0	131.0	4.3
1972	2,215	75.3	566.6	31.0	163.0	132.0	4.3
1973	2,628	87.2	553.0	37.0	170.0	133.0	4.2
1974	2,282	73.9	539.7	35.0	161.0	126.0	4.3
1975	2,308	74.4	537.3	42.0	168.0	126.0	4.3
1976	2,521	79.6	526.2	50.0	176.0	126.0	4.2
1977	2,782	84.2	504.4	47.0	167.0	120.0	4.2
1978	2,306	75.6	546.3	42.0	162.0	120.0	4.6
1979	1,354	45.9	564.6	13.0	134.0	121.0	4.7
1980	1,955	62.9	536.3	21.0	146.0	125.0	4.3
1981	2,299	73.9	537.7	26.0	144.0	118.0	4.5
1982	3,707	108.1	486.0	71.0	180.0	109.0	4.5
1983	407	12.1	495.0	61.0	160.0	99.0	5.0
1984	2,673	96.9	604.0	75.0	201.0	126.0	4.8
1985	1,919	68.5	595.0	55.0	179.0	124.0	4.8
1986	1,598	54.9	573.0	25.0	144.0	119.0	4.8
1987	2,753	97.3	589.0	66.0	187.0	121.0	4.9
1988	2,187	75.4	574.0	60.0	192.0	132.0	4.4
1989	2,864	97.8	569.0	73.0	197.0	124.0	4.6
1990	2,072	68.6	552.0	70.0	196.0	126.0	4.4
1991	1,488	50.4	565.0	55.0	180.0	125.0	4.5
1992	0	0	0	—	—	—	—
1993	0	0	0	flowing	—	—	—
1994	0	0	0	–18.7[1]	—	—	—
1995	0	0	0	–19.3[1]	—	—	—

NOTE: Well completed Mar. 1960; initial depth to water: +34 ft artesian pressure head; surface elev. 5622 ft. Well out of service in 1992; well and pumphouse transferred to San Ildefonso Pueblo in 1992.
[1]Artesian pressure head above overflow pipe reference level at 5616 ft, as measured with a mechanical packer and pressure transducer.

Well LA-2

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1947	963	27.6	477.7	—	—	—	—
1948	3,659	59.3	270.1	—	—	—	—
1949	1,654	41.8	421.2	—	—	—	—
1950	614	15.6	423.5	59.0	285.0	226.0	1.9
1951	2,415	57.7	398.2	111.0	305.0	194.0	2.1
1952	1,980	46.3	389.7	101.0	300.0	199.0	2.0
1953	2,201	47.2	357.4	100.0	301.0	201.0	1.8
1954	2,601	56.8	364.0	116.0	—	—	—
1955	2,223	49.4	370.4	110.0	—	—	—
1956	1,805	44.2	408.1	84.0	—	—	—
1957	1,066	29.6	462.8	53.0	277.0	224.0	2.1
1958	1,166	31.1	444.5	60.0	270.0	210.0	2.1
1959	1,599	40.7	424.2	71.0	303.0	232.0	1.8
1960	2,169	51.6	396.5	76.0	305.0	229.0	1.7
1961	2,149	44.4	344.3	101.0	313.0	212.0	1.6
1962	1,823	35.7	326.4	111.0	314.0	203.0	1.6
1963	1,999	40.7	339.3	127.0	332.0	205.0	1.7
1964	1,924	34.2	296.3	137.0	347.0	210.0	1.4
1965	1,911	39.8	347.1	121.0	330.0	209.0	1.7
1966	1,070	21.4	333.3	108.0	340.0	232.0	1.4
1967	238	4.9	343.1	78.0	304.0	226.0	1.5
1968	502	11.3	375.2	64.0	305.0	241.0	1.6
1969	155	3.8	408.6	50.0	297.0	247.0	1.7
1970	341	7.2	351.9	59.0	310.0	251.0	1.4
1971	1,787	31.8	296.6	88.0	318.0	230.0	1.3
1972	2,189	39.3	299.2	96.0	322.0	226.0	1.3
1973	2,625	46.7	296.5	106.0	334.0	228.0	1.3
1974	2,033	36.8	301.7	109.0	325.0	216.0	1.4
1975	2,310	40.2	290.0	103.0	320.0	217.0	1.3
1976	2,488	39.9	267.3	113.0	322.0	209.0	1.3
1977	2,775	42.5	255.3	118.0	314.0	196.0	1.3
1978	2,299	39.5	286.4	112.0	338.0	226.0	1.3
1979	1,353	26.2	323.0	75.0	316.0	241.0	1.3
1980	1,960	33.8	287.4	84.0	318.0	234.0	1.2
1981	1,991	34.4	300.0	94.0	336.0	242.0	1.2
1982	3,174	51.2	269.0	161.0	348.0	187.0	1.4
1983	2,752	54.5	330.0	121.0	321.0	200.0	1.6
1984	2,753	53.7	325.0	130.0	323.0	193.0	1.7
1985	2,027	37.1	305.0	112.0	291.0	179.0	1.7
1986	1,289	24.1	312.0	74.0	252.0	178.0	1.8
1987	2,619	39.6	252.0	129.0	319.0	190.0	1.3
1988	1,936	33.0	284.0	117.0	296.0	179.0	1.6
1989	2,647	43.2	272.0	141.0	329.0	188.0	1.4
1990	2,399	40.3	280.0	134.0	330.0	196.0	1.4
1991	1,705	32.7	320.0	123.0	333.0	210.0	1.5
1992	—	13.4	—	—	—	—	—
1993	—	3.6	—	—	—	—	—

NOTE: Well completed Dec. 1946; initial depth to water: flowing; surface elev. 5651 ft.
Well out of service in 1992; 1992–93 production was for road construction.
Well and pumphouse transferred to San Ildefonso Pueblo in 1992.

Well LA-3

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1947	1,476	64.9	732.8	—	—	—	—
1948	3,647	82.5	377.0	—	—	—	—
1949	1,505	41.7	461.8	—	—	—	—
1950	2,793	57.8	344.9	97.0	231.0	134.0	2.6
1951	3,554	66.9	313.7	116.0	233.0	117.0	2.7
1952	2,514	58.6	388.5	94.0	218.0	124.0	3.1
1953	3,104	69.7	374.2	103.0	229.0	126.0	3.0
1954	2,595	57.3	368.0	101.0	225.0	124.0	3.0
1955	2,195	48.7	369.8	91.0	226.0	135.0	2.7
1956	1,849	42.1	379.5	74.0	222.0	148.0	2.6
1957	1,080	26.1	402.8	56.0	219.0	163.0	2.5
1958	1,612	33.6	347.4	49.0	225.0	176.0	2.0
1959	1,821	35.0	320.3	54.0	231.0	177.0	1.8
1960	2,174	38.4	294.4	68.0	230.0	162.0	1.8
1961	1,939	34.7	298.3	85.0	189.0	104.0	2.9
1962	2,361	45.4	320.5	93.0	192.0	99.0	3.2
1963	2,128	42.5	332.9	81.0	197.0	116.0	2.9
1964	2,574	50.4	326.3	104.0	217.0	113.0	2.9
1965	1,961	43.3	368.9	79.0	220.0	141.0	2.6
1966	2,236	46.1	343.6	81.0	219.0	138.0	2.5
1967	2,274	47.4	347.4	86.0	218.0	132.0	2.6
1968	2,127	42.7	334.6	82.0	251.0	169.0	2.0
1969	2,072	40.1	322.6	58.0	246.0	188.0	1.7
1970	2,303	44.0	318.4	55.0	241.0	186.0	1.7
1971	2,556	45.4	296.0	77.0	250.0	173.0	1.7
1972	2,205	39.7	300.1	73.0	251.0	178.0	1.7
1973	977	20.3	346.3	65.0	248.0	183.0	1.9
1974	2,291	43.5	316.5	73.0	244.0	171.0	1.9
1975	2,306	43.3	313.0	80.0	253.0	173.0	1.8
1976	2,474	42.3	285.0	88.0	260.0	172.0	1.7
1977	2,779	47.3	283.7	89.0	248.0	159.0	1.8
1978	2,308	42.4	306.4	87.0	250.0	163.0	1.9
1979	1,343	28.1	348.1	58.0	243.0	185.0	1.9
1980	1,952	35.1	299.9	61.0	237.0	176.0	1.7
1981	2,297	41.5	301.1	70.0	240.0	170.0	1.8
1982	3,691	54.9	247.0	118.0	246.0	128.0	1.9
1983	949	14.7	258.0	89.0	203.0	129.0	2.0
1984	838	16.6	329.0	142.0	301.0	159.0	2.0
1985	2,078	41.9	336.0	104.0	280.0	176.0	1.9
1986	1,328	26.9	338.0	88.0	255.0	167.0	2.0
1987	2,710	50.9	313.0	118.0	289.0	171.0	1.8
1988	2,130	40.1	313.0	119.0	272.0	153.0	2.0
1989	2,808	51.9	308.0	122.0	298.0	176.0	1.8
1990	2,461	44.6	302.0	122.0	295.0	173.0	1.8
1991	1,398	23.4	278.0	112.0	284.0	172.0	1.6

NOTE: Well completed May 1947; initial depth to water: flowing; surface elev. 5672 ft.
Air line and recorder removed in late 1991; depth to water on 3/13/92 was 39.55 ft below brass valve.
Well out of service in 1992; facility demolished in 1992; well plugged in 1993.

Well LA-4

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1948	1,570	42.7	453.3	—	—	—	—
1949	940	37.5	664.9	—	—	—	—
1950	4,350	164.9	631.8	278.0	353.0	75.0	8.4
1951	4,909	173.6	589.4	285.0	357.0	72.0	8.2
1952	3,429	119.6	581.3	267.0	339.0	72.0	8.1
1953	3,034	109.1	599.3	264.0	335.0	71.0	8.4
1954	2,133	78.2	611.0	255.0	329.0	74.0	8.3
1955	2,647	94.5	595.0	268.0	341.0	73.0	8.2
1956	3,402	120.0	588.9	273.0	346.0	73.0	8.1
1957	2,844	105.4	617.7	270.0	345.0	75.0	8.2
1958	2,973	110.3	618.3	270.0	342.0	72.0	8.6
1959	3,084	113.5	613.4	275.0	346.0	71.0	8.6
1960	4,084	145.6	594.2	296.0	365.0	69.0	8.6
1961	3,687	129.7	586.3	296.0	365.0	69.0	8.5
1962	3,688	129.3	584.3	286.0	359.0	73.0	8.0
1963	3,718	130.5	585.0	280.0	351.0	71.0	8.2
1964	4,500	155.0	574.1	291.0	361.0	70.0	8.2
1965	3,110	111.4	597.0	279.0	349.0	70.0	8.5
1966	3,279	115.6	587.6	285.0	356.0	71.0	8.3
1967	2,127	77.1	604.1	278.0	350.0	72.0	8.4
1968	2,276	81.7	598.3	280.0	351.0	71.0	8.4
1969	1,694	61.8	608.0	282.0	358.0	76.0	8.0
1970	2,333	83.5	596.5	286.0	363.0	77.0	7.7
1971	2,519	89.0	588.9	287.0	373.0	86.0	6.8
1972	2,322	82.6	592.9	282.0	367.0	85.0	7.0
1973	2,616	92.4	588.7	294.0	377.0	83.0	7.1
1974	2,306	82.2	594.1	286.0	367.0	81.0	7.3
1975	2,319	82.3	591.5	272.0	355.0	83.0	7.1
1976	2,802	98.2	584.1	277.0	373.0	96.0	6.1
1977	2,741	96.4	586.2	278.0	374.0	96.0	6.1
1978	2,248	80.1	594.2	271.0	368.0	97.0	6.1
1979	2,964	104.6	587.9	280.0	376.0	96.0	6.1
1980	3,322	115.3	578.5	284.0	385.0	101.0	5.7
1981	2,573	89.4	579.1	289.0	393.0	104.0	5.6
1982	0	0	0	—	—	—	—
1983	1,840	61.5	577.0	287.0	392.0	105.0	5.3
1984	2,695	87.1	539.0	290.0	383.0	93.0	5.8
1985	2,667	86.4	540.0	292.0	378.0	86.0	6.3
1986	1,172	38.8	552.0	284.0	377.0	93.0	5.9
1987	38	1.6	701.8	269.0	357.0	88.0	8.0

NOTE: Well completed Aug. 1948; initial depth to water: 189 ft; surface elev. 5975 ft.
Well out of service in 1988. Air line and recorder removed in 1990; depth to water 244.4 ft on 6/22/90 and 244.2 ft on 3/11/91, both measurements below top of brass valve. Facilities demolished in 1992; well plugged in 1993.

Well LA-5

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1948	1,171	40.4	575.0	—	—	—	—
1949	1,763	58.5	553.0	—	—	—	—
1950	4,052	130.1	535.1	131.0	254.0	123.0	4.4
1951	6 004	187.4	520.2	162.0	272.0	110.0	4.7
1952	3,425	109.6	533.3	147.0	259.0	112.0	4.8
1953	3,278	103.9	528.3	141.0	257.0	116.0	4.6
1954	2,546	80.1	524.4	137.0	259.0	122.0	4.3
1955	3,158	97.3	513.5	145.0	267.0	122.0	4.2
1956	3,476	104.5	501.1	150.0	276.0	126.0	4.0
1957	2,868	86.0	499.8	150.0	277.0	127.0	3.9
1958	3,009	89.9	498.0	151.0	277.0	126.0	4.0
1959	3,088	93.5	504.6	155.0	280.0	125.0	4.0
1960	4,088	119.1	485.6	168.0	288.0	120.0	4.0
1961	3,534	100.3	473.0	165.0	288.0	123.0	3.8
1962	3,735	107.7	480.6	172.0	—	—	—
1963	3,726	105.0	469.7	171.0	—	—	—
1964	4,236	118.8	467.4	184.0	—	—	—
1965	1,740	50.5	483.7	180.0	—	—	—
1966	2,817	79.3	469.2	180.0	—	—	—
1967	2,533	73.7	484.9	168.0	—	—	—
1968	2,233	63.3	472.5	161.0	300.0	139.0	3.4
1969	2,402	68.5	475.3	161.0	298.0	137.0	3.5
1970	2,353	66.1	468.2	157.0	300.0	143.0	3.3
1971	2,659	74.4	466.3	155.0	302.0	147.0	3.2
1972	2,301	64.4	466.5	153.0	304.0	151.0	3.1
1973	2,476	68.3	459.7	156.0	308.0	152.0	3.0
1974	1,903	52.5	459.8	154.0	306.0	152.0	3.0
1975	2,318	63.9	459.4	149.0	309.0	160.0	2.9
1976	2,799	77.6	462.1	150.0	310.0	160.0	2.9
1977	2,665	74.8	467.8	147.0	303.0	156.0	3.0
1978	2,274	64.9	475.8	145.0	299.0	154.0	3.1
1979	2,964	84.0	472.4	149.0	301.0	152.0	3.1
1980	3,316	92.2	463.6	153.0	300.0	147.0	3.2
1981	3,523	96.5	456.5	158.0	304.0	146.0	3.1
1982	3,654	102.3	467.0	168.0	299.0	136.0	3.4
1983	2,842	78.1	458.0	154.0	295.0	141.0	3.2
1984	2,889	72.1	416.0	156.0	281.0	125.0	3.1
1985	2,153	55.8	432.0	174.0	308.0	134.0	3.2
1986	1,376	34.6	419.0	168.0	310.0	142.0	2.9
1987	1,148	27.9	405.0	167.0	314.0	147.0	2.8
1988	351	9.9	406.0	—	—	—	—
1989	1,074	26.5	411.0	—	—	—	—
1990	1,388	33.3	400.0	—	—	—	—
1991	783	18.5	393.8	—	—	—	—

NOTE: Well completed Sept. 1948; initial depth to water: 71 ft; surface elev. 5840 ft.
Air line and recorder removed in late 1991; depth to water on 12/4/91 (TV Log) was 158 ft below top of pump base (5,856.5 ft). Well out of service in 1992; well and pump transferred to San Ildefonso Pueblo in 1992.

Well LA-6

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1948	116	4.9	704.0	—	—	—	—
1949	2,451	95.8	651.4	—	—	—	—
1950	4,490	167.9	623.2	83.0	136.0	53.0	11.8
1951	5 882	201.6	571.2	115.0	160.0	45.0	12.7
1952	3,168	110.3	580.3	108.0	151.0	43.0	13.5
1953	3,177	113.8	597.0	95.0	139.0	44.0	13.6
1954	2,894	107.1	616.8	92.0	135.0	43.0	14.3
1955	2,911	108.0	618.3	97.0	140.0	43.0	14.4
1956	3,438	125.8	609.9	106.0	149.0	43.0	14.2
1957	2,833	102.4	602.4	107.0	152.0	45.0	13.4
1958	2,957	106.9	602.5	108.0	131.0	43.0	14.0
1959	3,096	108.3	583.0	115.0	158.0	43.0	13.6
1960	4,084	138.6	565.6	130.0	172.0	42.0	13.5
1961	3,284	112.5	571.0	129.0	171.0	42.0	13.6
1962	3,886	129.4	555.0	135.0	175.0	40.0	13.9
1963	2,953	102.9	580.8	125.0	171.0	46.0	12.6
1964	4,244	138.3	543.1	132.0	172.0	40.0	13.6
1965	3,145	103.8	550.1	120.0	160.0	40.0	13.8
1966	3,173	104.0	546.3	129.0	169.0	40.0	13.7
1967	2,511	85.4	566.8	118.0	158.0	40.0	14.2
1968	2,111	71.6	565.3	109.0	150.0	41.0	13.8
1969	2,402	81.6	566.2	109.0	151.0	42.0	13.5
1970	2,337	79.1	564.1	106.0	149.0	43.0	13.1
1971	2,472	82.5	556.2	119.0	160.0	41.0	13.6
1972	2,317	79.2	569.7	117.0	155.0	38.0	15.0
1973	2,638	90.6	572.4	118.4	155.0	37.0	15.5
1974	2,337	79.8	569.1	120.0	156.0	36.0	15.8
1975	1,571	51.9	550.6	113.0	151.0	38.0	14.5
1976	175	5.1	485.7	96.0	—	—	—
1977	—	—	—	82.0	—	—	—
1978	33	1.1	572.7	77.0	142.0	65.0	8.8
1979	6	0.2	555.6	80.0	146.0	66.0	8.4
1980	4	0.1	520.8	82.0	142.0	60.0	8.7
1981	2.3	<0.1	579.8	84.0	141.0	57.0	10.2
1982	—	—	—	90.0	—	—	—
1983	—	—	—	81.0	—	—	—
1984	—	—	—	83.0	—	—	—
1985	—	—	—	92.0	—	—	—
1986	—	—	—	—	—	—	—
1987	—	<0.1	—	—	—	—	—
1988	—	<0.1	—	—	—	—	—
1989	—	<0.1	—	—	—	—	—
1990	—	—	—	—	—	—	—

NOTE: Well completed Dec. 1948; initial depth to water: 5 ft; surface elev. 5770 ft.
Air line and recorder removed in 1990; depth to water on 5/9/90 was ~82.5 ft below LSD (5,770 ft); on 3/11/92 it was 98.35 ft below brass valve. Well out of service in 1977 but has been pumped since that time for collection of water samples. Pump removed in 1990; facility demolished in 1991; well plugged in 1993.

Well G-1

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1950	0	2.8	0.0	195.0	—	—	—
1951	1,168	37.7	538.0	202.0	309.0	107.0	5.0
1952	2,476	75.5	508.2	213.0	295.0	82.0	6.2
1953	3,275	97.3	495.2	221.0	292.0	71.0	7.0
1954	2,616	77.8	495.7	221.0	290.0	69.0	7.2
1955	2,406	70.5	448.4	226.0	295.0	69.0	7.1
1956	2,958	83.2	468.8	235.0	303.0	68.0	6.9
1957	2,098	55.9	444.1	236.0	307.0	71.0	6.3
1958	2,460	68.1	461.4	238.0	308.0	70.0	6.6
1959	2,952	82.4	465.2	245.0	314.0	69.0	6.7
1960	3,564	96.0	448.9	254.0	325.0	71.0	6.3
1961	4,236	112.4	442.2	260.0	333.0	73.0	6.1
1962	3,431	93.6	454.7	258.0	342.0	84.0	5.4
1963	4,519	114.9	423.8	265.0	348.0	83.0	5.1
1964	4,374	113.8	433.6	269.0	352.0	83.0	5.2
1965	3,530	90.7	428.2	268.0	352.0	84.0	5.1
1966	4,074	102.6	419.7	269.0	363.0	94.0	4.5
1967	2,615	69.9	445.5	266.0	362.0	96.0	4.6
1968	2,996	78.9	438.9	264.0	366.0	102.0	4.3
1969	2,657	68.3	428.4	266.0	376.0	110.0	3.9
1970	2,712	64.7	397.6	264.0	377.0	113.0	3.5
1971	2,908	67.9	389.2	258.0	378.0	120.0	3.2
1972	2,865	66.1	384.5	264.0	389.0	125.0	3.1
1973	2,997	67.5	375.4	271.0	403.0	132.0	2.8
1974	2,767	62.3	375.3	283.0	412.0	129.0	2.9
1975	2,467	55.7	376.3	293.0	411.0	118.0	3.2
1976	2,962	65.1	366.3	—	—	—	—
1977	2,734	57.9	353.0	275.0	426.0	151.0	2.3
1978	2,656	56.0	351.4	270.0	419.0	149.0	2.4
1979	2,998	61.7	342.9	271.0	422.0	151.0	2.3
1980	3,459	68.3	329.0	273.0	428.0	155.0	2.1
1981	4,427	81.6	307.2	275.0	444.0	169.0	1.8
1982	3,678	69.0	313.0	278.0	443.0	165.0	1.9
1983	2,871	52.2	303.0	272.0	443.0	171.0	1.8
1984	3,804	62.8	275.0	276.0	448.0	172.0	1.5
1985	3,004	48.3	268.0	278.0	450.0	172.0	1.6
1986	2,027	30.3	249.0	279.0	450.0	171.0	1.5
1987	2,070	29.2	235.0	280.0	451.0	171.0	1.4
1988	395	5.4	227.0	280.0	445.0	165.0	1.4
1989	2,010	26.9	223.0	282.0	451.0	169.0	1.3
1990	2,121	30.8	242.0	284.0	454.0	170.0	1.4
1991	1,730	20.9	201.0	282.0	451.0	169.0	1.2
1992	1,077	12.0	186.0	283.0	439.0	156.0	1.2
1993	2.5	0.03	200.0	280.0	—	—	—
1994	1,585	18.5	194.5	277.0	451.0	174.0	1.1
1995	2,542	28.5	186.9	278.0	450.0	172.0	1.1

NOTE: Well completed July 1950; initial depth to water: 192 ft; surface elev. 5973 ft.

Well G-1A

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1954	108	4.6	709.0	—	—	—	—
1955	1,531	53.0	577.0	265.0	316.0	51.0	11.3
1956	3,130	107.7	573.5	273.0	323.0	50.0	11.5
1957	2,470	87.0	587.0	274.0	327.0	53.0	11.1
1958	2,670	92.5	577.4	279.0	331.0	52.0	11.1
1959	2,965	102.7	577.3	284.0	333.0	49.0	11.8
1960	3,641	122.8	562.1	291.0	342.0	51.0	11.0
1961	4,297	147.3	571.3	298.0	350.0	52.0	11.0
1962	3,972	136.1	571.1	295.0	344.0	49.0	11.7
1963	4,525	149.7	551.4	301.0	350.0	49.0	11.3
1964	3,852	129.3	559.4	302.0	353.0	51.0	11.0
1965	3,505	116.5	554.0	302.0	353.0	51.0	10.9
1966	3,964	133.4	560.9	306.0	355.0	49.0	11.4
1967	2,720	91.3	559.4	302.0	351.0	49.0	11.4
1968	3,089	103.2	556.8	302.0	352.0	50.0	11.1
1969	2,695	90.7	560.9	303.0	356.0	53.0	10.6
1970	2,772	92.5	556.2	300.0	357.0	57.0	9.8
1971	3,313	111.8	562.4	303.0	361.0	58.0	9.7
1972	2,879	94.0	544.2	302.0	361.0	59.0	9.2
1973	2,760	87.9	530.8	302.0	362.0	60.0	8.8
1974	2,974	92.7	519.5	307.0	355.0	48.0	10.8
1975	2,740	85.3	518.9	304.0	351.0	47.0	11.0
1976	2,983	91.6	511.8	302.0	350.0	48.0	10.7
1977	2,942	88.7	502.5	302.0	350.0	48.0	10.5
1978	2,631	77.9	493.5	300.0	345.0	45.0	11.0
1979	2,974	88.0	493.9	301.0	345.0	44.0	11.0
1980	3,480	103.2	494.4	305.0	345.0	40.0	12.4
1981	4,212	131.2	519.1	307.0	347.0	40.0	13.0
1982	3,618	109.7	505.0	305.0	347.0	42.0	12.0
1983	2,901	86.7	498.0	301.0	336.0	35.0	14.2
1984	3,789	113.9	501.0	302.0	345.0	43.0	11.7
1985	4,430	128.4	483.0	306.0	348.0	42.0	11.5
1986	4,644	130.4	468.0	310.0	351.0	41.0	11.4
1987	4,468	122.5	457.0	320.0	362.0	42.0	10.9
1988	5,016	133.5	443.0	323.0	364.0	41.0	10.8
1989	4,663	131.5	470.0	323.0	359.0	36.0	13.1
1990	4,860	145.5	499.0	322.0	362.0	40.0	12.5
1991	5,120	150.2	489.0	325.0	361.0	36.0	13.6
1992	4,676	134.1	478.0	325.0	361.0	36.0	13.3
1993	3,862	108.2	467.0	321.0	355.0	34.0	13.7
1994	2,629	68.2	432.3	312.0	347.0	35.0	12.3
1995	2,736	67.2	409.4	312.0	346.0	34.0	12.0

NOTE: Well completed Dec. 1954; initial depth to water: 250 ft; surface elev. 6014 ft.

Well G-2

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1951	123	3.9	528.5	259.0	—	—	—
1952	2,372	78.3	550.2	279.0	327.0	48.0	11.5
1953	3,254	105.6	540.9	290.0	334.0	44.0	12.3
1954	2,682	86.3	536.3	291.0	335.0	44.0	12.2
1955	2,487	78.8	528.1	299.0	345.0	46.0	11.5
1956	3,109	95.8	513.6	310.0	357.0	47.0	10.9
1957	2,458	76.1	516.0	311.0	360.0	49.0	10.5
1958	2,707	80.1	493.2	315.0	361.0	46.0	10.7
1959	2,938	84.6	479.9	320.0	363.0	43.0	11.2
1960	3,535	96.6	455.4	328.0	370.0	42.0	10.8
1961	3,982	105.3	440.7	336.0	375.0	39.0	11.3
1962	4,076	99.8	408.1	338.0	374.0	36.0	11.3
1963	4,563	105.7	386.1	344.0	379.0	35.0	11.0
1964	4,541	105.3	386.5	346.0	380.0	34.0	11.4
1965	3,535	82.6	389.4	346.0	381.0	35.0	11.1
1966	3,994	94.7	395.2	349.0	383.0	34.0	11.6
1967	2,743	67.6	410.7	344.0	379.0	35.0	11.7
1968	2,732	66.5	405.7	344.0	379.0	35.0	11.6
1969	2,679	68.6	426.8	344.0	381.0	37.0	11.5
1970	2,431	62.8	430.5	343.0	381.0	38.0	11.3
1971	3,420	87.4	425.9	345.0	384.0	39.0	10.9
1972	2,887	73.4	423.7	348.0	388.0	40.0	10.6
1973	2,816	72.4	428.5	344.0	385.0	41.0	10.5
1974	3,056	82.0	447.2	347.0	390.0	43.0	10.4
1975	2,724	74.5	455.8	341.0	384.0	43.0	10.6
1976	2,990	81.1	452.1	344.0	388.0	44.0	10.3
1977	2,981	80.4	449.5	346.0	388.0	42.0	10.7
1978	2,562	71.6	451.9	345.0	386.0	41.0	11.0
1979	2,975	80.0	448.0	347.0	388.0	41.0	11.0
1980	3,478	92.4	443.0	350.0	389.0	39.0	11.4
1981	1,432	38.3	445.8	352.0	390.0	38.0	11.7
1982	2,833	25.7	476.0	352.0	399.0	47.0	10.1
1983	624	16.5	441.0	356.0	399.0	43.0	10.3
1984	2,018	43.7	361.0	358.0	385.0	27.0	13.4
1985	4,339	96.6	371.0	352.0	381.0	29.0	12.8
1986	4,769	109.3	382.0	369.0	395.0	26.0	14.7
1987	4,526	109.7	404.0	366.0	399.0	33.0	12.2
1988	4,836	132.8	457.0	367.0	400.0	33.0	13.9
1989	4,820	133.9	463.0	375.0	408.0	33.0	14.0
1990	5,060	134.5	443.0	374.0	407.0	33.0	13.4
1991	4,792	123.3	428.0	369.0	401.0	32.0	13.4
1992	5,075	129.0	424.0	370.0	401.0	31.0	13.7
1993	3,871	97.1	418.0	368.0	399.0	31.0	13.5
1994	2,450	62.7	426.4	358.0	389.0	31.0	13.7
1995	2,829	70.1	413.0	361.0	390.0	29.0	14.2

NOTE: Well completed Aug. 1951; initial depth to water: 259 ft; surface elev. 6056 ft.

Well G-3

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1951	192	7.3	633.7	281.0	—	—	—
1952	2,379	65.4	458.2	310.0	358.0	48.0	9.5
1953	3,192	76.4	398.9	322.0	360.0	38.0	10.5
1954	2,675	66.1	411.8	322.0	370.0	48.0	8.6
1955	2,369	69.4	488.3	316.0	368.0	52.0	9.4
1956	3,149	87.9	465.2	324.0	380.0	56.0	8.3
1957	2,517	70.2	464.8	324.0	385.0	61.0	7.6
1958	2,562	69.5	452.1	323.0	386.0	63.0	7.2
1959	2,931	74.6	424.2	326.0	395.0	69.0	6.1
1960	3,591	82.5	382.9	335.0	407.0	72.0	5.3
1961	3,612	79.9	368.7	343.0	414.0	71.0	5.2
1962	4,057	83.7	343.9	348.0	418.0	70.0	4.9
1963	4,555	86.7	317.2	352.0	422.0	70.0	4.5
1964	4,487	78.6	292.0	355.0	424.0	69.0	4.2
1965	3,498	65.6	312.6	350.0	419.0	69.0	4.5
1966	3,991	73.7	307.8	353.0	420.0	67.0	4.6
1967	2,752	52.9	320.4	344.0	418.0	74.0	4.3
1968	3,086	56.5	305.1	341.0	418.0	77.0	4.0
1969	2,672	50.8	316.9	338.0	417.0	79.0	4.0
1970	2,736	55.4	337.5	336.0	419.0	83.0	4.1
1971	3,337	64.2	320.6	342.0	423.0	81.0	4.0
1972	2,838	50.9	298.9	341.0	421.0	80.0	3.7
1973	2,843	47.3	277.3	341.0	418.0	77.0	3.6
1974	3,006	49.3	273.3	342.0	424.0	82.0	3.3
1975	2,632	43.1	272.9	341.0	428.0	87.0	3.1
1976	2,971	82.6	463.4	359.0	447.0	88.0	5.3
1977	2,961	78.9	444.1	353.0	448.0	95.0	4.7
1978	2,590	66.4	427.5	345.0	443.0	98.0	4.4
1979	3,014	69.0	381.0	345.0	450.0	105.0	3.6
1980	3,448	61.8	298.6	348.0	453.0	105.0	2.8
1981	4,315	66.6	257.2	357.0	467.0	110.0	2.3
1982	3,550	51.0	239.0	349.0	459.0	110.0	2.2
1983	2,183	31.3	239.0	340.0	463.0	123.0	1.9
1984	1,211	19.0	267.0	355.0	475.0	120.0	2.2
1985	1,587	22.1	232.0	351.0	470.0	119.0	2.0
1986	2,266	26.7	196.0	375.0	492.0	117.0	1.7
1987	—	<0.1	—	—	—	—	—
1988	—	3.4	—	—	—	—	—
1989	—	<0.1	—	—	—	—	—
1990	—	—	—	—	—	—	—
1991	—	—	—	—	—	—	—

NOTE: Well completed July 1951; initial depth to water: 280 ft; surface elev. 6139 ft.
Well out of service in 1989 due to pumpage of excessive sand.

Well G-4

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1951	—	12.5	—	357.0	477.0	120.0	—
1952	2,401	56.9	395.0	374.0	474.0	100.0	3.9
1953	2,677	55.2	343.7	380.0	472.0	92.0	3.7
1954	2,256	58.8	434.4	383.0	526.0	143.0	3.0
1955	1,172	22.7	322.8	378.0	481.0	103.0	3.1
1956	1,800	33.9	313.9	377.0	491.0	114.0	2.8
1957	1,324	24.2	304.6	373.0	498.0	125.0	2.4
1958	1,970	35.9	303.7	370.0	490.0	120.0	2.5
1959	1,819	31.6	289.5	378.0	494.0	116.0	2.5
1960	2,457	37.0	251.0	385.0	509.0	124.0	2.0
1961	2,787	45.0	269.1	389.0	512.0	123.0	2.2
1962	2,738	41.7	253.8	386.0	505.0	119.0	2.1
1963	3,519	46.4	219.8	388.0	504.0	116.0	1.9
1964	3,561	42.9	200.8	396.0	499.0	103.0	1.9
1965	2,100	23.8	188.9	394.0	492.0	98.0	1.9
1966	2,219	33.6	252.4	391.0	498.0	107.0	2.4
1967	2,690	44.8	277.6	388.0	509.0	121.0	2.3
1968	2,083	31.4	251.2	386.0	509.0	123.0	2.0
1969	1,309	17.4	221.5	387.0	505.0	118.0	1.9
1970	606	7.7	211.8	384.0	504.0	120.0	1.8
1971	1,640	21.0	213.4	389.0	503.0	114.0	1.9
1972	2,840	33.3	195.4	391.0	507.0	116.0	1.7
1973	3,006	37.2	206.3	392.0	521.0	129.0	1.6
1974	2,672	34.3	213.9	392.0	519.0	127.0	1.7
1975	1,977	41.0	345.6	403.0	559.0	156.0	2.2
1976	2,859	57.8	336.9	406.0	571.0	165.0	2.0
1977	2,954	62.4	352.1	406.0	589.0	183.0	1.9
1978	2,607	49.5	316.5	398.0	589.0	191.0	1.7
1979	2,974	52.9	296.4	395.0	586.0	191.0	1.6
1980	2,235	35.6	265.7	394.0	580.0	186.0	1.4
1981	432	8.2	316.4	385.0	573.0	188.0	1.7
1982	3,657	65.2	297.0	386.0	578.0	192.0	1.5
1983	2,604	42.2	270.0	—	—	—	—
1984	3,766	49.7	220.0	—	—	—	—
1985	1,747	21.7	207.0	402.0	572.0	170.0	1.2
1986	2,678	33.9	211.0	396.0	574.0	178.0	1.2
1987	2,011	25.1	208.0	398.0	573.0	175.0	1.2
1988	301	4.1	227.0	390.0	545.0	155.0	1.4
1989	1,739	21.6	207.0	401.0	562.0	161.0	1.3
1990	1,539	16.8	182.0	381.0	564.0	183.0	1.0
1991	1,254	13.7	181.0	382.0	559.0	177.0	1.0
1992	1,116	12.0	179.0	387.0	544.0	157.0	1.1
1993	0	0.0	0.0	374.0	—	—	—
1994	8	<0.1	162.5	363.0	525.0	162.0	1.0
1995	0	0.0	0.0	368.0	—	—	0.0

NOTE: Well completed May 1951; initial depth to water: 347 ft; surface elev. 6229 ft.

Well G-5

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1951	—	6.7	—	414.0	—	—	—
1952	2,579	73.8	476.9	422.0	480.0	58.0	8.2
1953	1,433	37.8	439.6	425.0	467.0	42.0	10.5
1954	2,617	80.9	515.2	429.0	473.0	44.0	11.7
1955	2,529	80.4	529.9	427.0	472.0	45.0	11.8
1956	3,052	97.0	529.7	431.0	478.0	47.0	11.3
1957	2,385	64.1	447.9	424.0	466.0	42.0	10.7
1958	1,523	49.1	537.3	428.0	477.0	49.0	11.0
1959	2,917	101.7	581.1	435.0	495.0	60.0	9.7
1960	2,828	98.0	577.6	437.0	501.0	64.0	9.0
1961	3,908	134.0	571.5	438.0	507.0	69.0	8.3
1962	4,186	142.0	565.4	440.0	511.0	71.0	8.0
1963	4,528	151.0	555.8	441.0	513.0	72.0	7.7
1964	4,532	150.4	553.1	446.0	516.0	70.0	7.9
1965	3,520	117.1	554.5	443.0	516.0	73.0	7.6
1966	2,555	83.2	542.7	445.0	520.0	75.0	7.2
1967	2,405	80.0	554.4	444.0	519.0	75.0	7.4
1968	2,513	81.2	538.5	443.0	517.0	74.0	7.3
1969	2,649	83.3	524.1	450.0	520.0	70.0	7.5
1970	2,771	88.9	534.7	453.0	521.0	68.0	7.9
1971	2,657	88.3	553.9	450.0	521.0	71.0	7.8
1972	2,902	92.4	530.7	441.0	514.0	73.0	7.3
1973	3,003	97.5	541.1	444.0	515.0	71.0	7.6
1974	2,054	69.0	559.9	440.0	513.0	73.0	7.7
1975	2,266	74.7	549.4	433.0	500.0	67.0	8.2
1976	2,955	95.0	535.8	442.0	504.0	62.0	8.6
1977	2,836	92.1	541.3	444.0	504.0	60.0	9.0
1978	2,608	84.2	538.4	442.0	502.0	60.0	9.0
1979	2,766	86.5	521.5	442.0	502.0	60.0	8.7
1980	2,896	89.0	512.4	442.0	502.0	60.0	8.5
1981	2,124	66.7	523.4	451.0	528.0	77.0	6.8
1982	1,219	38.2	522.0	455.0	510.0	55.0	9.5
1983	2,904	73.2	420.0	445.0	492.0	47.0	8.9
1984	3,838	115.4	501.0	452.0	507.0	55.0	9.4
1985	2,193	67.9	516.0	453.0	509.0	56.0	9.2
1986	2,219	52.5	394.0	453.0	494.0	41.0	9.6
1987	5,732	116.7	379.0	462.0	504.0	42.0	9.0
1988	4,841	115.3	396.0	466.0	507.0	41.0	9.7
1989	4,715	110.9	392.0	474.0	514.0	40.0	9.8
1990	5,094	119.2	390.0	485.0	526.0	41.0	9.5
1991	4,981	113.0	378.0	487.0	534.0	47.0	8.0
1992	5,006	114.4	376.0	470.0	508.0	38.0	9.9
1993	3,859	92.2	398.0	466.0	503.0	37.0	10.8
1994	109	2.5	388.0	459.0	494.0	35.0	11.1
1995	807	17.6	363.5	—	—	—	—

NOTE: Well completed May 1951; initial depth to water: 411 ft; surface elev. 6306 ft.

Well G-6

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1964	1,912	45.0	392.3	581.0	659.0	78.0	5.0
1965	3,200	74.9	390.1	582.0	660.0	78.0	5.0
1966	3,931	92.2	390.9	585.0	658.0	73.0	5.4
1967	2,454	57.8	392.6	580.0	653.0	73.0	5.4
1968	2,597	56.2	360.7	574.0	647.0	73.0	4.9
1969	2,698	55.6	343.5	568.0	636.0	68.0	5.1
1970	2,765	51.0	307.4	569.0	634.0	65.0	4.7
1971	2,932	42.8	243.3	573.0	629.0	56.0	4.3
1972	2,516	57.0	377.6	578.0	670.0	92.0	4.1
1973	2,991	65.3	363.9	579.0	667.0	88.0	4.1
1974	2,950	63.8	360.5	579.0	665.0	86.0	4.2
1975	2,717	56.7	347.8	577.0	659.0	82.0	4.2
1976	2,966	57.8	324.8	584.0	662.0	78.0	4.2
1977	2,954	54.4	306.9	586.0	659.0	73.0	4.2
1978	2,218	38.4	288.9	581.0	645.0	64.0	4.5
1979	1,030	18.2	295.1	579.0	645.0	66.0	4.8
1980	1,789	34.5	321.5	583.0	670.0	87.0	3.7
1981	4,302	76.5	296.4	586.0	673.0	87.0	3.4
1982	3,763	63.6	281.0	588.0	669.0	81.0	3.5
1983	1,960	35.4	301.0	582.0	668.0	86.0	3.5
1984	3,010	55.3	306.0	589.0	666.0	77.0	3.9
1985	3,980	71.4	299.0	586.0	664.0	78.0	3.8
1986	4,420	76.7	293.0	576.0	654.0	78.0	3.8
1987	5,100	81.4	266.0	595.0	671.0	76.0	3.5
1988	5,121	82.1	267.0	591.0	669.0	78.0	3.4
1989	5,000	81.6	272.0	592.0	669.0	77.0	3.5
1990	5,202	84.9	272.0	589.0	670.0	81.0	3.4
1991	5,063	81.2	267.0	591.0	674.0	83.0	3.2
1992	4,382	70.2	268.0	591.0	673.0	82.0	3.3
1993	—	—	—	575.0	—	—	—
1994	1,660	27.5	276.0	572.0	652.0	80.0	3.5
1995	2,892	46.4	267.4	577.0	660.0	83.0	3.2

NOTE: Well completed Mar. 1964; initial depth to water: 572 ft; surface elev. 6422 ft.

Well PM-1

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1965	2,754	99.2	600.3	746.0	786.0	40.0	15.0
1966	3,086	108.0	583.3	740.0	779.0	39.0	15.0
1967	2,870	111.0	644.6	737.0	781.0	44.0	14.6
1968	1,846	68.1	614.8	735.0	769.0	34.0	18.1
1969	951	34.4	602.9	733.0	766.0	33.0	18.3
1970	1,781	66.2	619.5	733.0	769.0	36.0	17.2
1971	2,728	101.0	617.1	733.0	766.0	33.0	18.7
1972	2,415	84.9	585.9	735.0	762.0	27.0	21.7
1973	1,688	46.5	459.1	736.0	755.0	19.0	24.2
1974	2,649	96.3	605.9	740.0	768.0	28.0	21.6
1975	2,567	94.8	615.5	741.0	766.0	25.0	24.6
1976	2,933	106.8	606.9	744.0	767.0	23.0	26.4
1977	2,969	105.4	591.7	745.0	767.0	22.0	26.9
1978	2,544	90.6	593.3	745.0	767.0	22.0	27.0
1979	2,350	83.4	591.5	744.0	766.0	22.0	26.9
1980	2,786	98.5	588.6	746.0	769.0	23.0	25.7
1981	2,789	98.5	588.6	747.0	769.0	22.0	26.8
1982	2,820	99.6	589.0	748.0	770.0	22.0	26.8
1983	2,464	86.5	585.0	747.0	769.0	22.0	26.6
1984	2,667	92.8	580.0	749.0	772.0	23.0	25.6
1985	2,760	95.4	576.0	749.0	770.0	21.0	27.4
1986	2,130	73.9	578.0	748.0	770.0	22.0	26.3
1987	2,912	102.4	586.0	752.0	773.0	21.0	27.9
1988	2,758	98.0	592.0	751.0	775.0	24.0	24.7
1989	3,014	104.9	580.0	752.0	774.0	22.0	26.4
1990	2,620	88.2	561.0	752.0	772.0	20.0	28.0
1991	2,600	88.6	568.0	752.0	774.0	22.0	25.8
1992	2,503	92.7	617.0	756.0	780.0	24.0	25.7
1993	1,802	63.9	591.0	758.0	779.0	21.0	28.1
1994	1,254	43.4	576.9	755.0	778.0	23.0	25.1
1995	870	29.7	569.0	753.0	776.0	23.0	24.7

NOTE: Well completed Mar. 1965; initial depth to water: 722.1 ft; surface elev. 6520 ft.

Well PM-2

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1966	221	18.9	1,425.3	826.0	889.0	63.0	22.6
1967	4,336	370.0	1,422.2	834.0	888.0	54.0	26.3
1968	3,865	328.2	1,415.3	838.0	889.0	51.0	27.8
1969	3,304	279.9	1,411.9	838.0	890.0	52.0	27.2
1970	3,529	300.6	1,419.7	839.0	893.0	54.0	26.3
1971	4,035	339.5	1,402.3	841.0	898.0	57.0	24.6
1972	4,611	385.3	1,392.7	845.0	902.0	57.0	24.4
1973	4,571	380.6	1,387.7	849.0	907.0	58.0	23.9
1974	5,443	450.9	1,380.7	853.0	912.0	59.0	23.4
1975	4,644	385.3	1,382.8	854.0	913.0	59.0	23.4
1976	5,382	442.0	1,368.8	866.0	924.0	58.0	23.6
1977	3,306	272.8	1,375.3	868.0	924.0	56.0	24.6
1978	4,743	388.4	1,364.9	871.0	928.0	57.0	23.9
1979	4,671	381.8	1,262.2	872.0	924.0	52.0	26.2
1980	5,023	409.6	1,359.2	873.0	931.0	58.0	23.4
1981	4,551	370.1	1,355.4	876.0	934.0	58.0	23.4
1982	4,319	359.3	1,386.0	874.0	934.0	60.0	23.1
1983	1,922	157.9	1,369.0	876.0	935.0	59.0	23.2
1984	996	81.6	1,365.0	866.0	930.0	64.0	21.7
1985	1,749	143.3	1,365.0	851.0	916.0	65.0	21.0
1986	1,036	84.4	1,359.0	851.0	915.0	64.0	21.2
1987	351	28.3	1,340.0	851.0	907.0	56.0	23.9
1988	1,843	146.8	1,328.0	869.0	931.0	62.0	21.4
1989	1,639	130.0	1,322.0	860.0	920.0	60.0	22.0
1990	3,164	250.4	1,319.0	860.0	928.0	68.0	19.4
1991	2,141	170.7	1,329.0	855.0	918.0	63.0	21.1
1992	3,486	277.7	1,328.0	860.0	929.0	69.0	19.2
1993	3,420	267.8	1,305.0	855.0	924.0	69.0	18.9
1994	3,922	298.9	1,270.3	870.0	934.0	64.0	19.8
1995	2,778	217.7	1,306.1	870.0	934.0	64.0	20.4

NOTE: Well completed July 1965; initial depth to water: 823 ft; surface elev. 6715 ft.

Well PM-3

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1968	2,327	187.4	1,342.2	743.0	771.0	28.0	47.9
1969	3,241	254.7	1,309.8	746.0	772.0	26.0	50.4
1970	2,905	227.8	1,306.9	750.0	774.0	24.0	54.5
1971	2,774	216.3	1,299.6	751.0	774.0	23.0	56.5
1972	2,445	192.1	1,309.5	752.0	775.0	23.0	56.9
1973	3,256	257.8	1,319.6	755.0	778.0	23.0	57.4
1974	3,241	255.3	1,312.9	756.0	779.0	23.0	57.1
1975	3,421	269.3	1,312.0	757.0	780.0	23.0	57.0
1976	3,171	268.3	1,410.2	758.0	784.0	26.0	54.2
1977	2,792	235.5	1,405.8	758.0	784.0	26.0	54.1
1978	2,516	211.0	1,397.6	759.0	784.0	25.0	55.9
1979	2,359	197.2	1,393.0	760.0	784.0	24.0	58.0
1980	2,796	234.4	1,397.2	760.0	785.0	25.0	55.9
1981	2,784	232.4	1,391.3	761.0	786.0	25.0	55.6
1982	2,831	238.1	1,402.0	762.0	785.0	23.0	60.9
1983	2,496	207.6	1,386.0	762.0	785.0	23.0	60.3
1984	3,317	275.6	1,385.0	762.0	787.0	25.0	55.4
1985	2,643	221.2	1,395.0	762.0	784.0	22.0	63.4
1986	2,920	244.8	1,397.0	763.0	787.0	24.0	58.2
1987	2,984	250.2	1,397.0	763.0	788.0	25.0	55.9
1988	2,766	232.0	1,397.0	764.0	788.0	24.0	58.2
1989	2,656	221.0	1,386.0	765.0	791.0	26.0	53.3
1990	2,949	244.6	1,382.0	767.0	790.0	23.0	60.0
1991	2,752	229.5	1,385.0	768.0	791.0	23.0	60.2
1992	3,610	307.4	1,419.0	770.0	794.0	24.0	59.1
1993	2,018	168.5	1,391.0	771.0	797.0	26.0	53.5
1994	966	78.8	1,358.9	772.0	796.0	24.0	56.6
1995	1,971	159.7	1,350.4	772.0	796.0	24.0	56.3

NOTE: Well completed Nov. 1966; initial depth to water: 740 ft; surface elev. 6640 ft.

Well PM-4

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1982	869	76.2	1,460	1,050	1,091	41	35.6
1983	5,267	452.5	1,432	1,066	1,101	35	40.9
1984	4,059	325.8	1,338	1,065	1,104	39	34.3
1985	4,759	379.2	1,328	1,066	1,101	35	37.9
1986	3,925	307.4	1,305	1,084	1,119	35	37.3
1987	5,071	392.2	1,289	1,081	1,117	36	35.8
1988	2,435	218.7	1,313	1,079	1,117	38	34.6
1989	5,387	418.9	1,296	1,085	1,122	37	35.0
1990	2,827	219.3	1,293	1,083	1,123	40	32.3
1991	2,832	219.5	1,292	1,081	1,123	42	30.8
1992	2,064	158.3	1,278	1,084	1,125	41	31.2
1993	3,901	249.7	1,295	—	—	—	—
1994	6,178	463.5	1,250	1,085	1,128	43	29.1
1995	5,736	428.2	1,244	—	—	—	—

NOTE: Well completed Aug. 1981; initial depth to water: 1060 ft; surface elev. 6920 ft.

Well PM-5

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1985	—	2.0	—	—	—	—	—
1986	2,047	147.3	1,199	—	—	—	—
1987	1,620	118.6	1,220	1,237	1,345	108	11.3
1988	1,754	128.6	1,221	1,233	1,345	112	10.9
1989	1,184	86.2	1,213	1,239	1,352	113	10.7
1990	1,611	121.0	1,252	1,234	1,347	113	11.1
1991	1,497	112.1	1,248	1,239	1,346	107	11.7
1992	2,823	208.4	1,233	1,248	1,345	97	12.7
1993	1,709	126.0	1,229	1,224	1,321	97	12.6
1994	2,131	156.9	1,227	1,234	1,314	80	15.3
1995	3,948	291.0	1,228	—	—	—	—

NOTE: Well completed Sept. 1982; initial depth to water: 1208 ft; surface elev. 7095 ft.

Well O-4

Year	Pump Time (h)	Production (10^6 gal.)	Pump Rate (gpm)	Water Level		Drawdown (ft)	Specific Capacity (gpm/ft)
				Nonpumping (ft)	Pumping (ft)		
1993	2,942	283.8	1,603	761	789	28	57.3
1994	2,456	205.7	1,396	760	781	21	66.5
1995	0	0.0	0	762	—	—	0.0

NOTE: Well completed Mar. 1990; initial depth to water: 780 ft; surface elev. 6627 ft.

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APPENDIX B

STATIC WATER LEVELS IN MAIN AQUIFER TEST WELLS

Depth-to-Water Measurements from Main Aquifer Test Wells (feet below surface elevation datum)

Year	TW-1	TW-2	TW-3	TW-4	TW-8	DT-5A	DT-9	DT-10	LA-1B
Drilled:	**1950**	**1949**	**1949**	**1950**	**1960**	**1959**	**1960**	**1960**	**1960**
Datum:	**6369.19**	**6647.63**	**6595.31**	**7244.56**	**6877.62**	**7143.86**	**6936.71**	**7019.92**	**5622.00**
Init WL	**584.9**	**758.9**	**743.3**	**1170.8**	**968.0**	**1173.2**	**1003.3**	**1090.6**	**–34.0[1]**
1949		758.9	743.3						
1950	584.9			1170.8					
1951	592.3	760.1	750.9	1166.1					
1952	591.4		751.0	1166.6					
1953	591.2	759.9	751.4	1167.5					
1954	591.8	760.6	751.4	1166.2					
1955		760.2	751.3						
1956	592.0	759.9	750.9						
1957	593.1	759.9	751.3						
1958	593.8	759.7	751.7						
1959	593.9		751.8						
1960	593.4	760.5	751.8	1165.9	968.0	1173.2	1003.3	1090.6	–34.0[1]
1961	591.8	760.8		1165.9			1003.4	1090.6	54.0
1962	590.0	761.2	751.8				1004.0		72.0
1963	588.3	762.8	753.6		968.7	1176.9	1004.6	1090.3	74.0
1964	587.8		754.2		968.7	1177.0	1005.0	1090.4	81.0
1965	588.4				968.7		1005.1	1090.5	63.0
1966							1005.2	1090.6	50.0
1967							1005.4	1090.6	39.0
1968							1005.5		32.0
1969									22.0
1970									22.0
1971							1005.5		31.0
1972							1005.2		31.0
1973							1005.3		37.0
1974							1005.6		35.0
1975							1005.6		42.0
1976							1005.8		50.0
1977		775.5					1006.1		47.0
1978							1006.2		42.0
1979							1006.4		13.0
1980							1006.2		21.0
1981							1006.2		26.0
1982							1006.2		71.0
1983									61.0
1984									75.0
1985									55.0
1986									25.0
1987									66.0
1988		787.0							60.0
1989									73.0
1990	508.4	787.2	772.0						70.0
1991	507.0	789.0							55.0
1992	536.5	792.5	777.5						
1993[2]	545.76	794.17	778.22	1176.29	993.31	1183.35	1015.96	1096.92	–14.83[1,3]
1994	548.70	798.25	780.80	1176.89	993.11	1183.65	1016.31	1097.21	–18.72[1,3]
1995	550.15	796.84	781.78	1177.23	994.43	1183.47	1015.50	1097.03	–19.29[1,3]

[1]Negative values indicate feet above surface elevation datum at 5616 ft.
[2]Continuous hourly water level measurements begin on June 19, 1993, using pressure transducers; table values represent end-of-year measurement.
[3]Mechanical packer and hourly pressure transducer measurements begin on July 27, 1993.