ANNUAL REPORT ON RESULTS OF MAMMOTH COMMUNITY WATER DISTRICT GROUNDWATER MONITORING PROGRAM FOR OCTOBER 1995-SEPTEMBER 1996

Prepared for
Mammoth Community Water District
Mammoth Lakes, California

By
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Groundwater Quality Consultants
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December 12, 1996

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December 12, 1996

Mr. Dennis Erdman, General Manager
Mammoth Community Water District
P.O. Box 597
Mammoth Lakes, CA 93546

Re: Annual Report on Groundwater Monitoring

Dear Dennis:

Submitted herewith is our annual report on the results of the District groundwater monitoring program for the period October 1995-September 1996. I appreciate the cooperation of District personnel in conducting this monitoring and providing data tabulations.

Sincerely yours,

Kenneth D. Schmidt

KDS/pt

cc: Steve Kronick

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INTRODUCTION

In Summer 1992, the Mammoth County Water District contracted for the drilling of five new test wells in Mammoth Lakes. One of these wells (No. 15) was converted to a supply well and pumping began on an emergency basis in Summer 1992. In December 1992, the California Department of Fish and Game filed an action against the District in Superior Court. Concerns were expressed by the Department about the potential impact of pumping of these wells on wildlife, vegetation, and fishery resources of Mammoth Creek and the Hot Creek headsprings, which is located downstream of the District wells. Kenneth D. Schmidt and Associates completed a hydrogeologic evaluation (July 6, 1993) on behalf of the District, to respond to these concerns. In August 1993, a settlement agreement was made between the Department and the District. As part of this agreement, the District was to:

1. Conduct routine monitoring in all District supply and monitor wells.
2. Install a new monitor well tapping consolidated rock at a location south of the District office.
3. Conduct monitoring in the new monitor well.
4. Prepare an annual interpretive report on the results of groundwater monitoring for the water year.

Data available to the District from Wells SC-1 and SC-2 (part of the Long Valley hydrologic monitoring program) were to be included in this evaluation. This report comprises the fourth annual report pursuant to the settlement agreement. The Mammoth County Water District is now the Mammoth Community Water District.

SUMMARY AND CONCLUSIONS

The District pumped 927 acre-feet of water from eight supply wells during the 1996 water year. This was 25 percent less than during the previous water year. A comprehensive water-level monitoring program was conducted for District supply wells and monitor wells. In addition, water-level measurements were available for two other monitor wells east of the District wells, and flow measurements were available for a spring at the University of California Valentine Reserve.

Water levels in most shallow wells tapping the uppermost glacial till strata rose significantly during 1996, during and following a period of high runoff in the watershed. Groundwater is generally present in the uppermost strata only in the westerly part of the area, in the meadow and near Mammoth Creek. Water levels in most of the monitor wells tapping the consolidated rock rose substantially during the 1996 water year. A water-level elevation contour map was prepared for September 1996. This map and other information indicates that the extent of the cone of depression due to pumping of District wells was limited in size, and did not extend to the easterly District monitor well (No. 24).

The results of water quality monitoring indicate no significant changes during the water year, compared to previously.

The results of the 1995-96 monitoring indicate that District pumping did not influence Mammoth Creek streamflow or the spring at the Valentine Reserve. In addition, water-level declines due to pumping did not extend beyond the vicinity of the well field. Thus there was no influence on the Hot Creek headsprings, which are much more distant then the monitor wells utilized for the District monitoring program.

WELL CONSTRUCTION DATA

Figure 1 shows locations of District wells, a private supply well, a subsurface geologic cross section, two other monitor wells to the east (SC-1 and SC-2), and the spring area at the Valentine Reserve. Table 1 summarizes construction data for the District supply wells. All of these wells tap consolidated rock, primarily basalt and scoria layers, and some also tap interbedded glacial till and conglomerate. Well No. 1 has been in service since the 1970's. Wells No. 6 and 10 have been in service since 1988. These three wells are termed the "earlier" District supply wells in this report. Well No. 15 was first put in service in July 1992 on an emergency basis. Well No. 18 was put in service in September 1994. Wells No. 16 and 20 were put in service in March 1995, and Well No. 17 was put in service in June 1995. Wells put in service in 1992-95 are termed the "newer" District supply wells in this report. Wells No. 2, 3, 4, 5, and 7 (shown in Figure 1) were not put in

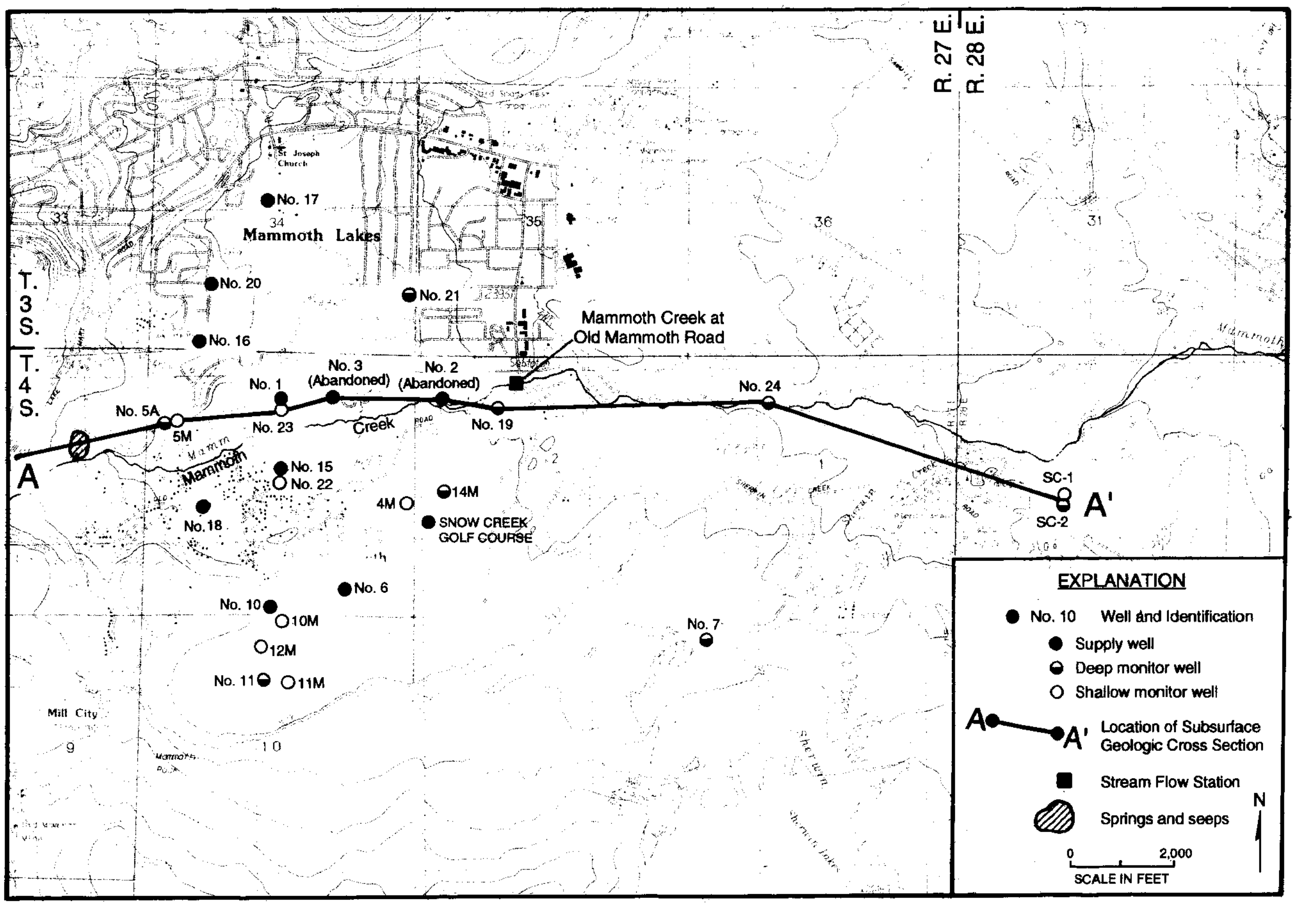

FIGURE 1 - LOCATION OF WELLS AND SUBSURFACE GEOLOGIC CROSS SECTION A-A'

TABLE 1 - CONSTRUCTION DATA FOR DISTRICT SUPPLY WELLS

Well No.	Date Drilled	Drilled Depth (feet)	Cased Depth (feet)	Perforated or Open Interval (feet)	Annular Seal (feet)
1	1976	382	370	200-370	0-90
6	11/87	670	670	146-670	0-52
10	10/87	700	700	136-700	0-52
15	8/92	720	407	407-720	0-135
16	8/92	710	715	420-470 500-680	0-60
17	7/92	710	513	400-710	0-60
18	8/92	710	480	90-150 240-470	0-60
20	9/92	710	420	420-710	0-60

Wells No. 16, 17, 18, and 20 were modified in June 1994 in preparation for being put into service. The test wells that were drilled in 1992 and subsequently converted to production wells are termed herein the "new District supply wells".

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15	8/92	720	407	407-720	0-135
16	8/92	710	715	420-470 500-680	0-60
17	7/92	710	513	400-710	0-60
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service because of low well yields. Wells No. 2 and 3 were subsequently destroyed, whereas the other wells were converted to monitor wells.

Table 2 summarizes construction data for District monitor wells. Five of these wells (No. 5A, 14M, 19, 21, and 24) are deep and primarily tap water in fractured volcanic rock. Well No. 7 is a deep well located south of the basalt flow and taps water in a glacial morraine near Sherwin Creek. Well No. 11 is a deep well located south of the basalt flow and taps water in glacial till and granitic rocks. Well No. 5M taps water in the shallow fractured volcanic rock, just beneath the glacial till. The remaining monitor wells are shallow and tap groundwater in the uppermost glacial till.

SUBSURFACE GEOLOGIC SECTION A-A'

Cross Section A-A' was developed during a previous evaluation, and was updated (Figure 2) by adding more recent water-level data. The locations of wells used for this section are shown in Figure 1. Cross Section A-A' shows that the uppermost till layer and volcanic rocks are continuous along the section. Groundwater has been found in the uppermost glacial till layer only in the vicinity of District Wells No. 1, 4, 6, 10, 11, 12, and 15. Most of these wells are either in the meadow or near Mammoth Creek. Water production in the District supply wells is from highly fractured rock, often scoria layers, and sometimes from interbedded glacial till. The intervening less fractured rock probably acts as local confining

TABLE 2 - CONSTRUCTION DATA FOR DISTRICT MONITOR WELLS

Well No.	Date Drilled	Drilled Depth (feet)	Cased Depth (feet)	Perforated or Open Interval (feet)	Annular Seal (feet)
4M	1984	89	89	69-89	0-50
5A	7/82 (8/93)	357	357	112-357	0-112
5M	8/93	80	80	20-75	0-20
7	8/87	480	480	290-480	0-50
10M	6/88	27	27	7-27	0-5
11	7/88	600	600	170-360	0-50
11M	6/88	43	43	5-43	0-5
12M	9/88	27	27	7-27	0-5
14M	9/88	520	501	100-310	0-100
19	8/92	700	344	200-700	0-140
21	10/92	640	145	145-640	-
22	9/92	85	85	55-85	0-25
23	9/92	65	65	30-65	0-25
24	8/93	450	430	300-450	0-20

Well No. 5 was modified in August 1993, so as to be sealed off opposite the glacial till and be perforated only opposite the volcanic rock, and re-designated Well No. 5A.

Figure 2 -

Subsurface Geologic Cross Section A-A'

(In Pocket)

layers. At Well No. 24, water was not found in the upper part of the basalt or in either of the till layers. Water in this well is in a fractured scoria layer. A lost circulation zone present in this well may influence the water level. In September 1996, there was a fairly uniform water-level slope (about 215 feet per mile) from Well No. 1 to No. 19 to No. 24. The water-level slope between Well No. 24 and SC-2 (farther east) was much less, only about 15 feet per mile.

DISTRICT PUMPAGE

Pumpage records for District supply wells are provided in Appendix A. Table 3 shows monthly pumpage from District wells during the 1996 water year. The total pumpage was 927 acre-feet, or 75 percent of that for the previous water year. Of this, 610 acre-feet were from Well No. 10, 121 acre-feet were from Well No. 17, 91 acre-feet were from Well No. 20, and 78 acre-feet were from Well No. 15. The remaining District pumpage (27 acre-feet) was from Wells No. 6 and 16. An additional 97 acre-feet of pumpage was measured between June 14 and September 30, 1996 from the Snow Creek Golf Course Well (in the general vicinity of Well No. 14M). This well is owned by Dempsey Construction and used to supply the golf course.

WATER LEVELS

District Supply Wells

Water-level measurements (static and pumping) for District

TABLE 3 - PUMPAGE FROM DISTRICT WELLS (ACRE-FEET)

Month	No. 1	No. 6	No. 10	No. 15	No. 16	No. 17	No. 18	No. 20	Total (Rounded)
Oct-95	0.0	0.0	1.2	2.5	0.0	0.0	0.0	14.8	19
Nov	0.0	2.3	9.4	0.4	0.2	0.0	0.0	0.0	12
Dec	0.0	4.2	38.9	0.2	2.2	3.8	0.0	0.9	50
Jan-96	0.0	11.8	23.6	0.5	0.0	0.5	0.0	0.5	37
Feb	0.0	0.2	39.1	0.0	0.0	0.0	0.0	0.0	39
Mar	0.0	0.4	33.8	0.1	0.0	0.0	0.0	0.0	34
Apr	0.0	0.0	13.2	0.0	1.0	0.0	0.0	0.0	14
May	0.0	0.0	26.7	0.7	4.5	0.0	0.0	0.0	32
Jun	0.0	0.0	94.9	22.4	0.0	0.1	0.0	0.2	118
Jul	0.0	0.0	117.3	0.0	0.0	45.2	0.0	18.0	181
Aug	0.0	0.0	112.1	35.9	0.0	46.3	0.0	34.7	229
Sep	0.0	0.0	99.4	15.2	0.0	25.0	0.0	22.2	162
Total (Rounded)	0	19	610	78	8	121	0	91	927

supply wells are provided in Appendix A. Water-level hydrographs for the earlier wells (No. 1, 6, and 10) are provided in Appendix B.

New Wells

Figure 3 is a water-level and pumpage hydrograph for Well No. 15, extending back to when it was initially put in service in July 1992. The static water level fell about 80 feet after several months of pumping, and normally ranged from about 260 to 280 feet during periods when the well was being significantly used. In Fall 1996, the depth to water in Well No. 15 was about the same as in July 1994. Depth to water in Well No. 15 appears to be influenced primarily by the previous pumping history of the well and recharge. During periods when the well has not been used much for supply (i.e., November 1995-May 1996), the water level has substantially risen.

Figure 4 is a water-level and pumpage hydrograph for Well No. 16. The water level in this well changed substantially after the casing was installed (July 1994) and after the pump was installed (February 1995). After the casing was installed and prior to the pump installation, an access tube was not in the well, and the measurements during that period were apparently affected by cascading water. The measurements for July 1994-early February 1995 are thus not considered representative. During heavy pumping periods of Well No. 20, the static level in Well No. 16 has been about 12 feet lower than during periods of lower pumping of Well

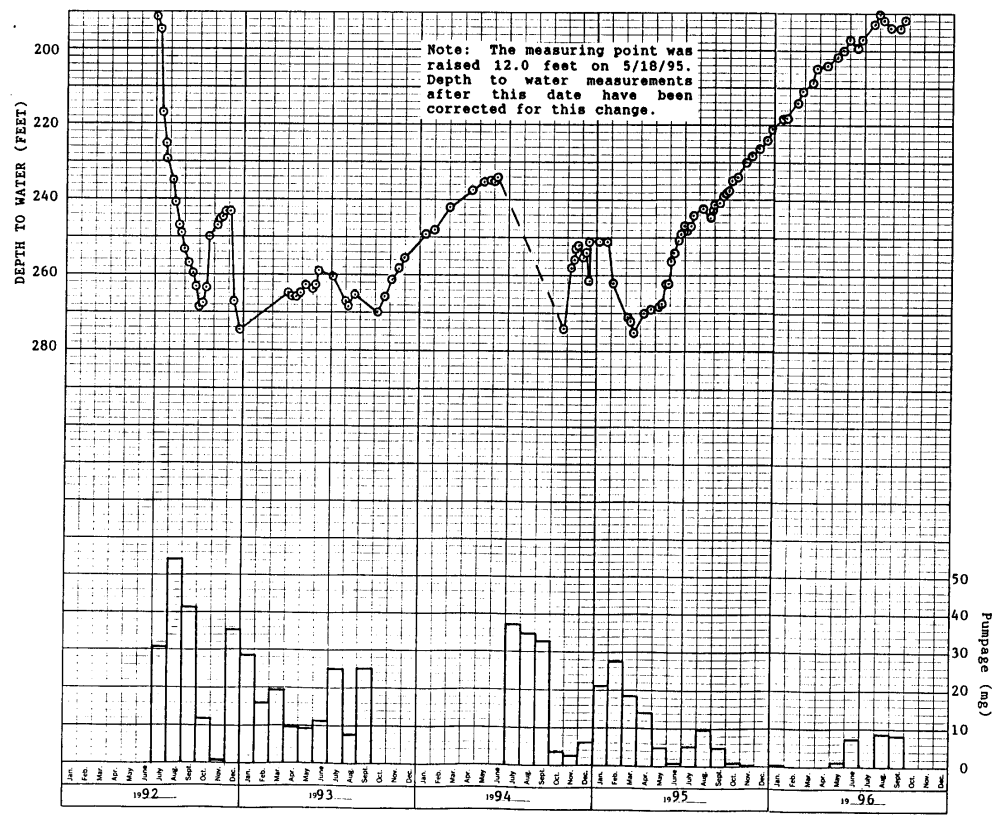


FIGURE 3 - WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 15

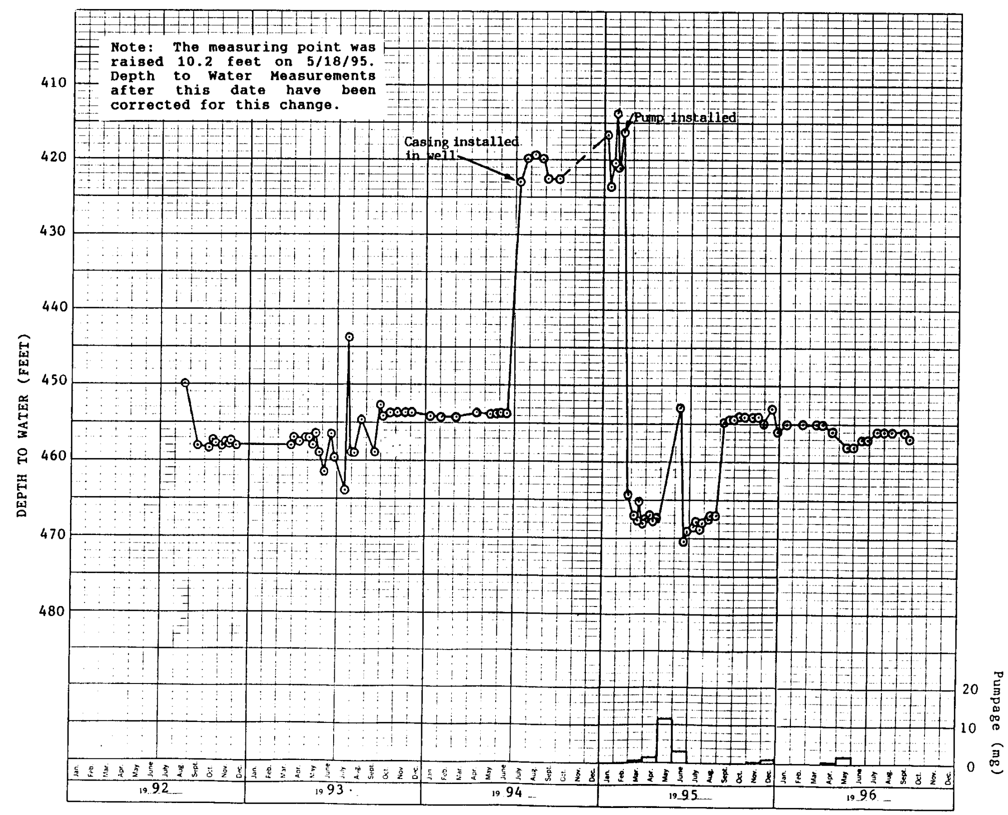


FIGURE 4 - WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 16

No. 20. Overall, static levels in Well No. 16 have been relatively stable since 1992.

Figure 5 is a water-level and pumpage hydrograph for Well No. 17. Measurements in early 1995 indicated that the water level apparently rose about eight feet, probably due to recharge. The water level in Well No. 17 appears to be influenced by pumpage of Well No. 20. During operational periods of both of these wells, the static level in Well No. 17 has been about four feet lower than during periods of little pumpage. The shallowest depth to water yet measured in this well was in January-February, 1995. During November 1995-September 1996, the water level in Well No. 17 gradually rose, except during some pumping periods in Summer 1996.

Figure 6 shows water levels and pumpage for Well No. 18. The overall trend for this well during non-operational periods has been a slight water-level rise. During pumping periods, the static level averaged about ten feet lower than during non-pumping periods. In July 1996, the water level in Well No. 18 was the shallowest yet measured in this well. The water level in Well No. 18 fell about five feet during July-September, 1996 probably partly due to pumping of Well No. 10.

Figure 7 is a water-level and pumpage hydrograph for Well No. 20. The water level in this well may be somewhat affected by pumpage of Well No. 17. However, the main reason for water level variations in Well No. 20 is pumping of the well itself. The shallowest levels in Well No. 20 to date were in February 1995. The water level in this well in June 1996 was within one foot of

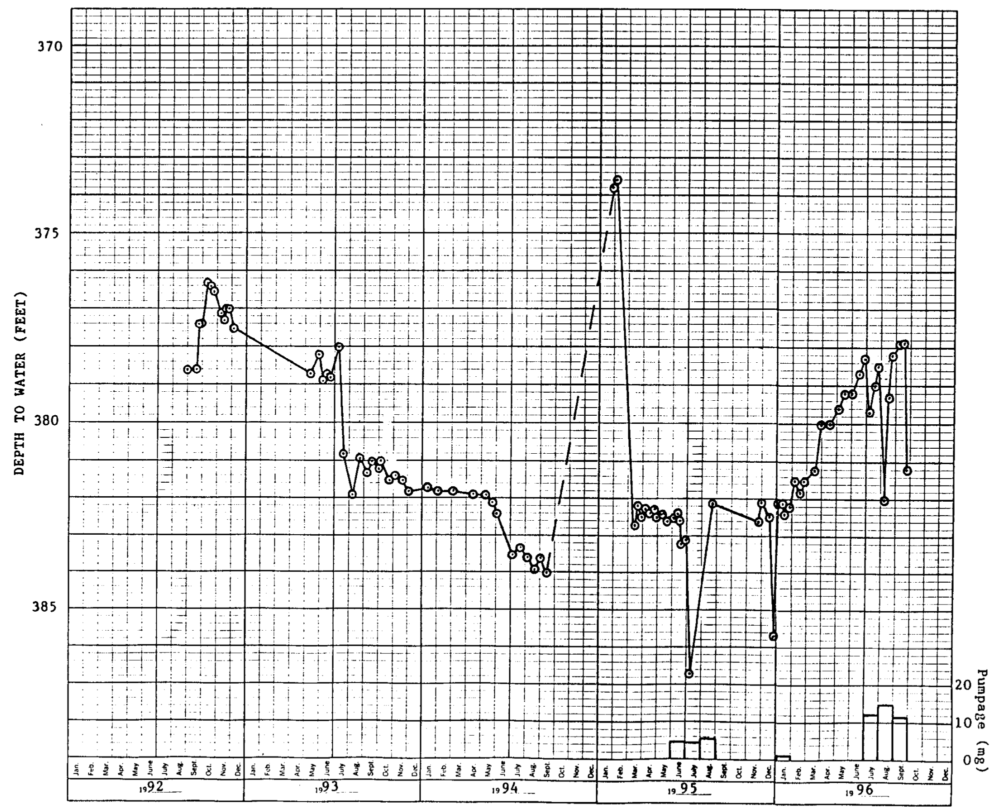


FIGURE 5 - WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 17

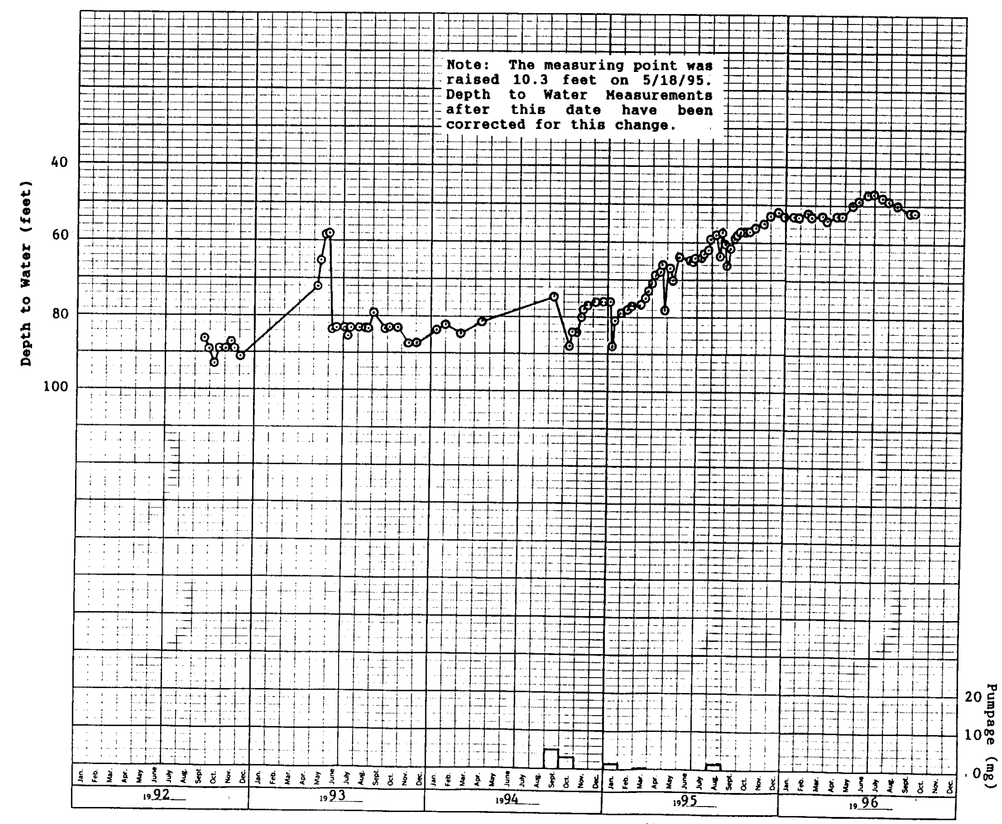


FIGURE 6 - WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 18

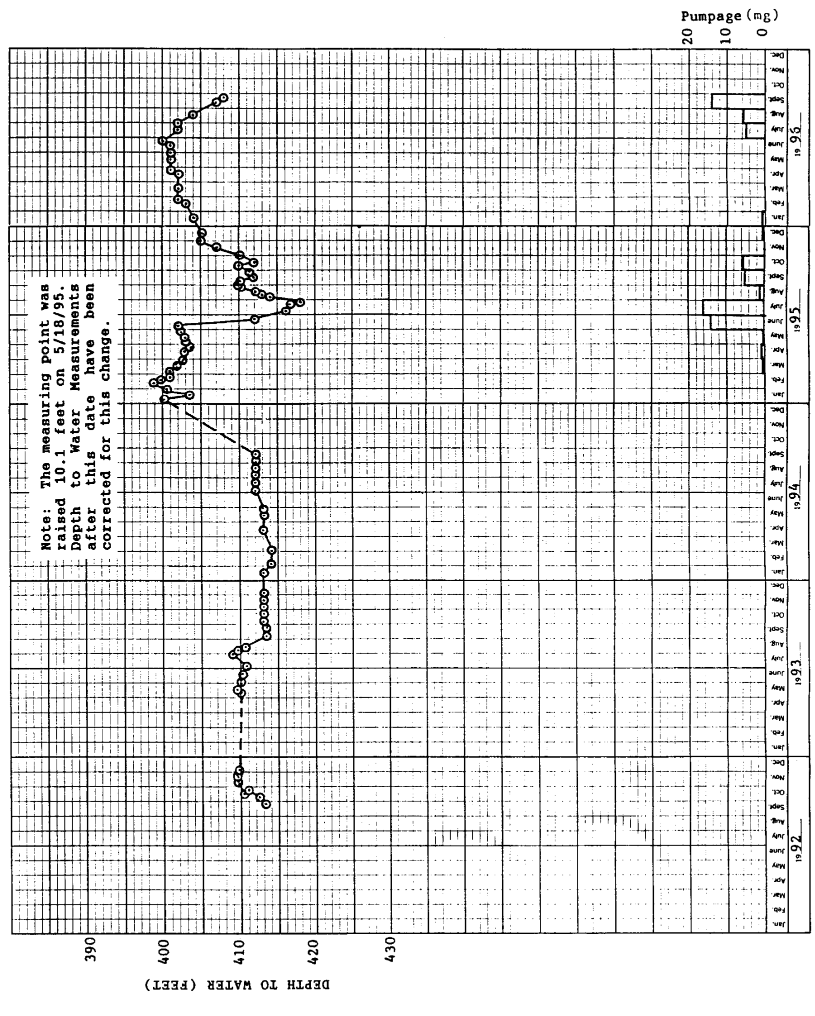


FIGURE 7 - WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 20

the shallowest level yet measured.

Earlier Wells

Water-level and pumpage hydrographs for Wells No. 1, 6, and 10 are provided in Appendix B. The static water level in Well No. 1 has ranged from about 180 to 200 feet during low pumping periods to an average of about 270 feet during heavy pumping periods (i.e., August 1994). In June 1996, depth to water in this well was about 178 feet, or the shallowest measured since 1990. The static water level in Well No. 6 has ranged from less than 30 feet during low pumping periods (after September 1995) to more than 160 feet during heavy pumping periods (August-September, 1994). After April 1996, the static level in this well was at or above the land surface. The static water level in Well No. 10 has ranged from less than 30 feet during low pumping periods (July 1995) to more than 160 feet during heavy pumping periods (Summer 1993). The combined pumpage of Wells No. 6 and 10 was about 93 acre-feet more during the 1996 water year than the previous year, and almost all of this was from Well No. 10. The static level in Well No. 10 could not be measured after June 1996, due to heavy pumping of the well in July-September, 1996. Depth to water in Well No. 10 was 15 feet in early June 1996, the shallowest measured since 1991.

Deep Monitor Wells

Water-level measurements for monitor wells are provided in Appendix C, and supplementary water-level hydrographs are provided in Appendix D. Transducers were installed in four of the deer monitor wells (M-14, No. 19, No. 21, and No. 24), and continuous water-level measurements commenced in December 1995. Well No. 5A is located between Well No. 1 and the Valentine Reserve North Spring (Figure 1). Measurements for Well No. 5A indicate that depth to water has ranged from near the land surface to about 6 feet. The water level began to rise in December 1995, and in May 1996, the water level was equal to the shallowest of record. Well No. 7 is located in the Sherwin Creek campground, about one and a third miles east of Well No. 6. Measurements for Well No. 7 indicate that depth to water has ranged from 244 to 288 feet. The influence of recharge during 1994, 1995, and 1996 is apparent. The shallowest water level of record in this well was measured in September 1996. The water level in this well appears to be primarily influenced by recharge from Sherwin Creek.

Well No. 11 is located in the meadow area, about one quarter mile south of Well No. 10. The water-level measurements for Well No. 11 indicate the deepest level (51 feet) in May 1993 and the shallowest level (near the land surface) in late 1995 and most of 1996. The water level in this well is influenced by pumping of Wells No. 6 and 10, and surface flow, particularly in the Bodle Ditch, which passes through the meadow area. The water level was deepest during drought conditions and heavy pumping of Wells No. 6 and 10. The shallowest water level occurred during wet years and less pumping of Wells No. 6 and 10. Well No. 14M is located about two-thirds mile east of Well No. 15. The manual water-level measurements for Well No. 14M indicate that the depth to water normally ranged from about 350 to 360 prior to June 1995. In 1995, the water level in this well rose almost 50 feet during May-August. This was primarily associated with recharge and the reduction in pumping of Wells No. 6 and 10. During April-July, 1996, the water level in Well No. 14M rose about 60 feet. This was primarily associated with recharge and the reduction in pumping of Well No. 6. In July 1996, depth to water was 266 feet, or the shallowest of record. The water level in this well shows the influence of recharge and pumping patterns of Wells No. 6 and 10, and the Snow Creek Golf Course well. Transducer measurements that are considered reliable are available for M-14 for December 1, 1995-May 5, 1996 and September 13-30, 1996. These measurements (Appendix D) indicate no drawdown due to pumpage of District wells in 1996.

Well No. 19 is located about four-fifths of a mile east of Well No. 1. Based on manual measurements (Figure 8), the water level in Well No. 19 has ranged from 320 to 345 feet deep. During the 1996 water year, depth to water usually ranged from about 325 to 335 feet. From September 1995 through September 1996, depth to water in this well was relatively constant. Transducer readings that are considered reliable are available for this well for December 1, 1995-August 20, 1995 (Appendix D). These measurements indicate a response to recharge in the spring and early summer, and no response to pumpage of District wells. Well No. 21 is located about three fourths of a mile east of Well No. 20. Based on manual

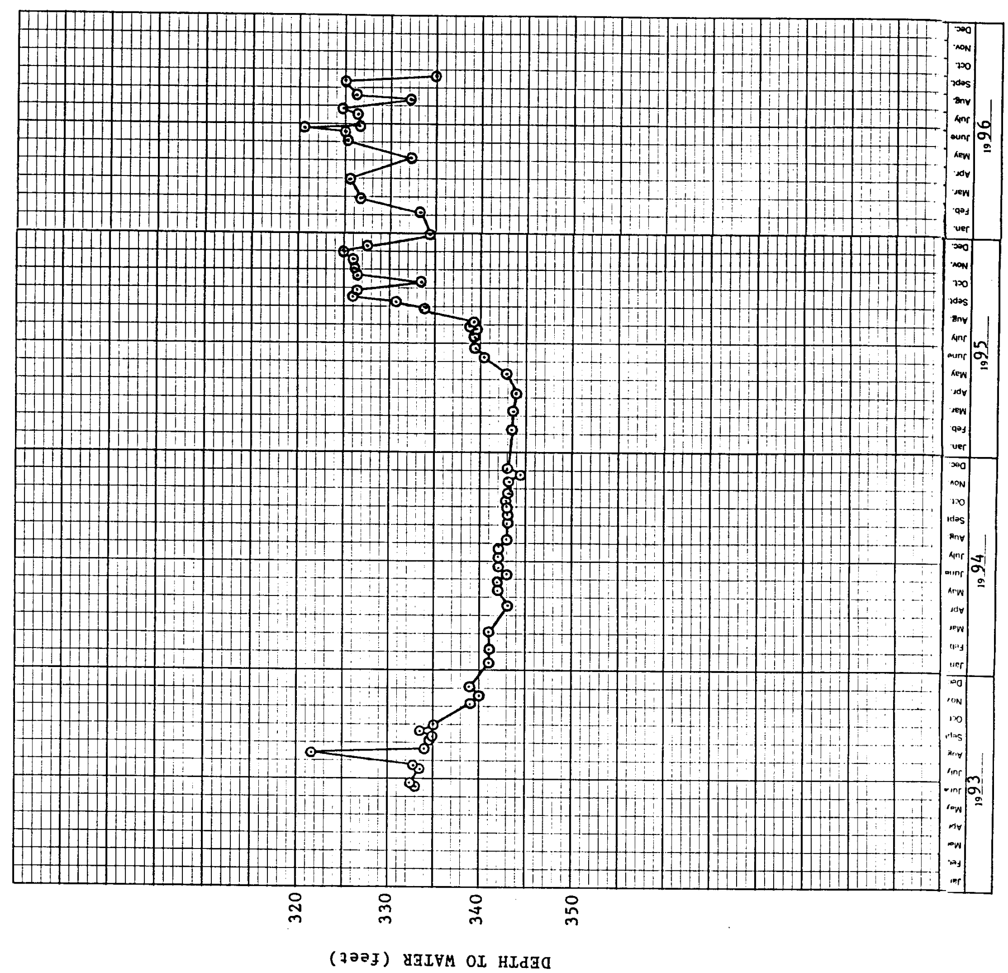


FIGURE 8 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 19

measurements, the water level in Well No. 21 (Figure 9) has ranged from about 240 to 370 feet in depth. The water level in this well rose about 30 feet during the first two years of record, rose another 75 feet during the 1995 water year, and rose about 43 feet during the 1996 water year. Most of the rises occurred in the spring and early summer and are attributed to recharge. In September 1996, the water level was the shallowest yet measured, or about 130 feet above the level measured in October 1992. Transducer measurements that are considered reliable are available for Well No. 21 from December 1, 1995-April 15, 1996 and September 14-30, 1996 (Appendix D). The water level in this well has indicated no response due to pumping of District wells. Well No. 24 is located about one mile east of Well No. 19. Figure 10 is a water-level hydrograph for Well No. 24, based on manual measurements. Measurements for this well began in Summer 1993, and depth to water has ranged from about 372 to 392 feet. The water level rose ten feet after early December 1995, to the shallowest depth yet measured in September 1996. Transducer measurements that are considered reliable are available for Well No. 24 for December 1, 1995-April 12, 1996 (Appendix D). The water level in this well obviously responds primarily to recharge, and no influence of District pumping is apparent.

Water levels in Wells No. 19, 21, and 24 rose significantly during water years 1995 and 1996. The best explanation for the historical water-level variations in these wells is due to the amount of recharge, which is primarily related to climatic pat-

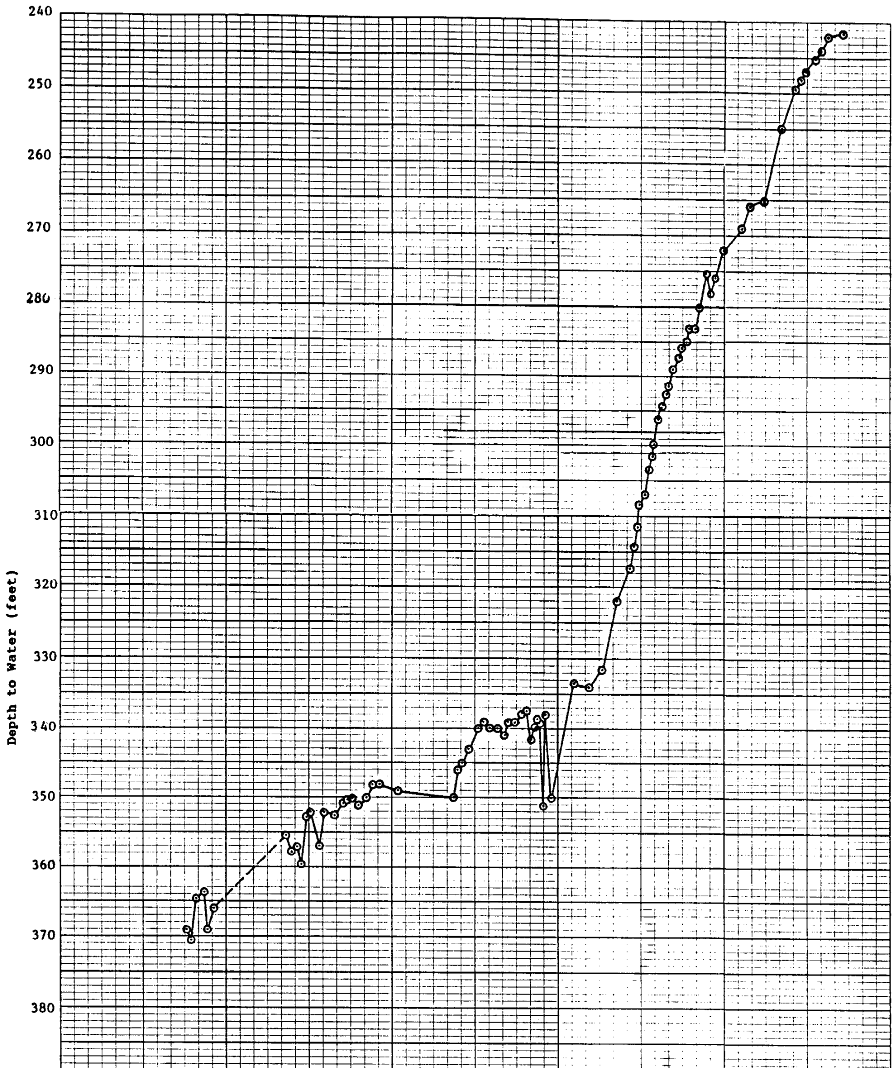


FIGURE 9 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 21

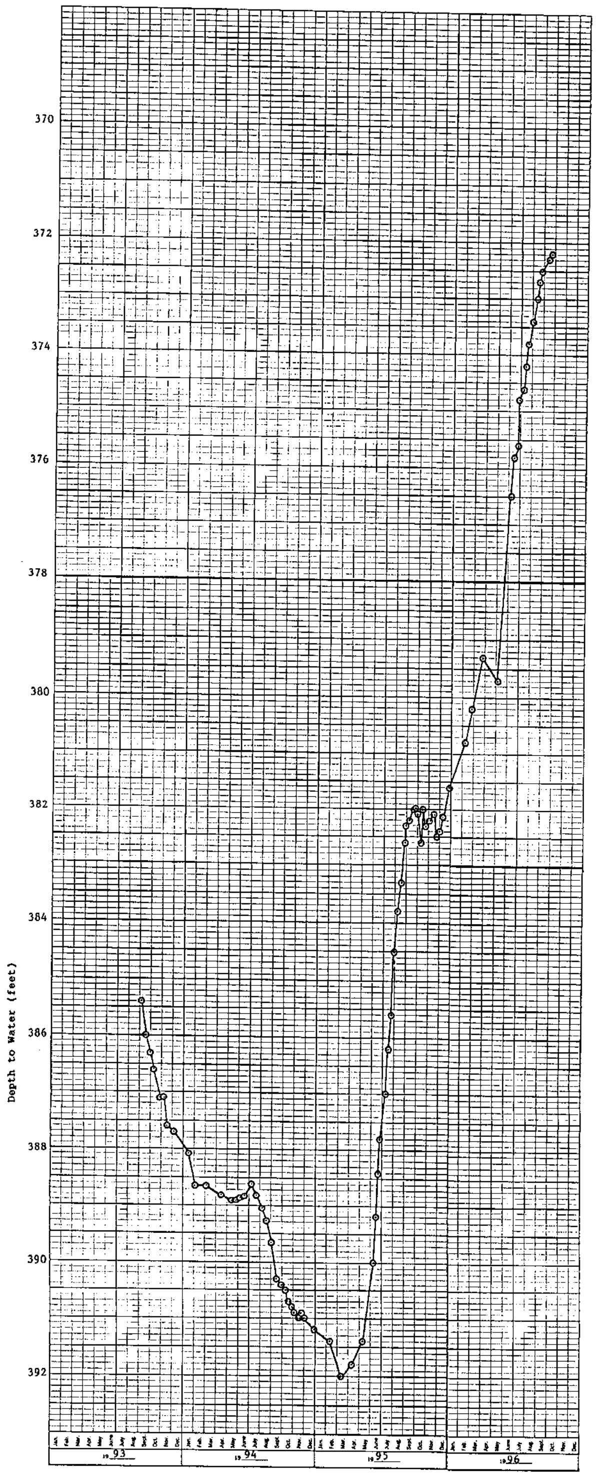


FIGURE 10 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 24

terns. Water levels in these wells rose during and following wet periods. In contrast, water levels in these wells temporarily fell during dry periods. Some operational problems were encountered with the transducers, primarily associated with large water-level rises in the spring and early summer and battery failures. This experience should allow better records to be obtained in the future.

Figure 11 is a water-level hydrograph for SC-1, which taps groundwater in the upper part of the basalt east of the District wells. The water level in this well generally fell from June 1983 through early 1993. Then later in 1993, 1994, 1995, and 1996 the water level rose temporarily due to recharge. The largest recharge event shown by these measurements was in Summer 1995, the second largest was in Summer 1983, and the third largest was in Summer 1996. The shallowest water levels measured were in June 1983 and late July 1995.

Figure 12 is a water-level hydrograph for SC-2, which taps groundwater in the deeper basalt near SC-1. Some recharge was indicated in 1993, 1994, 1995, and 1996. Comparison of the hydrographs for SC-1 and SC-2 indicates that water levels in the two wells fluctuate similarly. However, the water-level rises are less in the deeper monitor well than in the shallower monitor well, as would be expected if the rises are mainly due to recharge, the source of which is from the land surface. The water level in SC-2 in September 1996 was 49 feet lower than the shallowest level, which was measured in June 1984. This pattern is very different from that of any well in or near the District well field. Water-

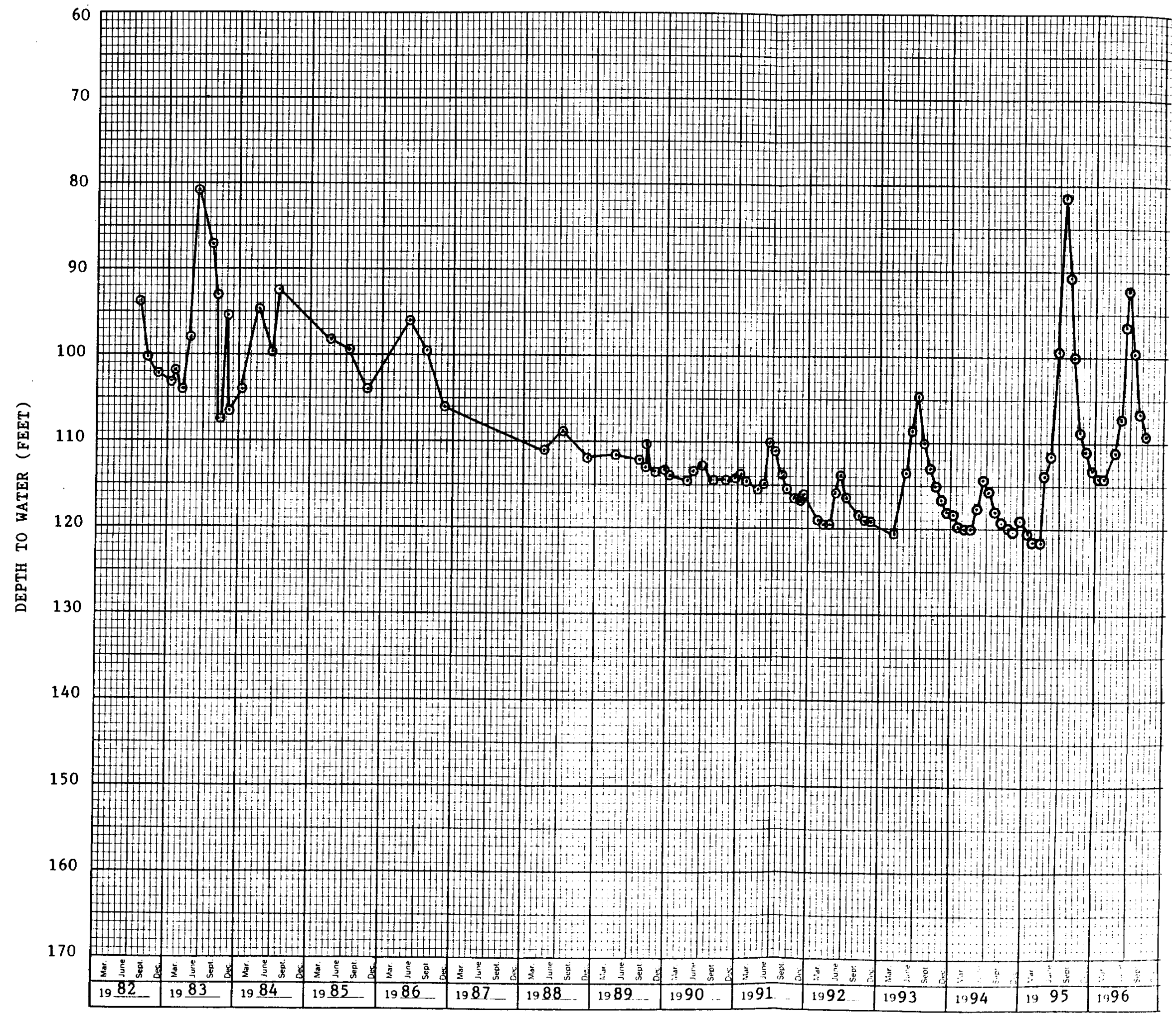


FIGURE 11 - WATER-LEVEL HYDROGRAPH FOR SC-1

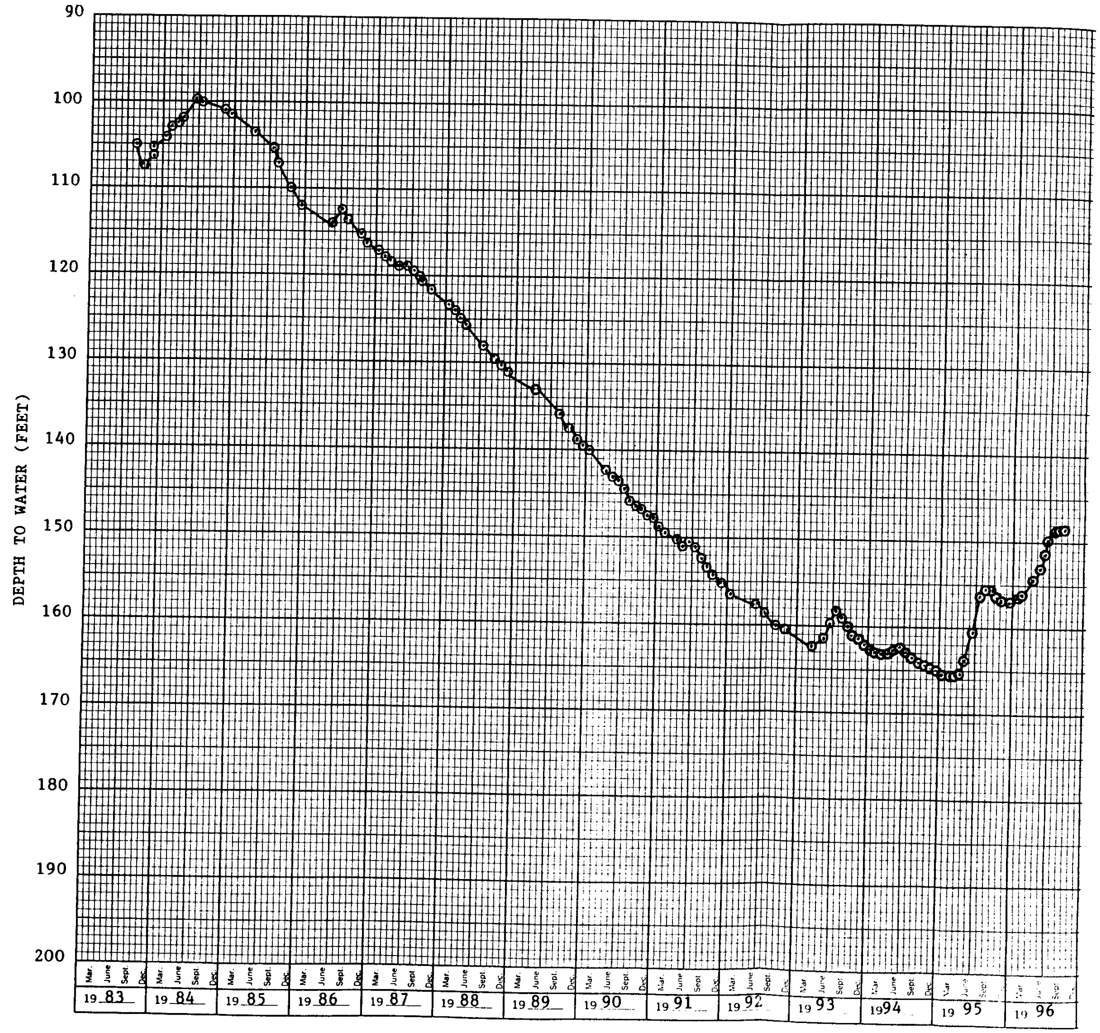


FIGURE 12 - WATER-LEVEL HYDROGRAPH FOR SC-2

level variations in SC-1 and SC-2 are not indicated to be due to District well pumpage, based on the water-level hydrographs for Wells No. 19, 21, and 24 and other evidence.

Shallow Monitor Wells

A water-level hydrograph for Well No. 22 is provided in Figure 13. Pumpage of nearby Well No. 15 is also plotted on this figure. The water level in Well No. 22 is not related to pumpage of Well No. 15, which taps groundwater in the deeper consolidated rock. This shallow well has only had water in it during or following significant runoff (Figure 14). Well No. 22 was dry until June 17, 1993 and during 1994-early 1995. Depth to water in this well rose about 12 feet during May-July, 1995, due to recharge corresponding to high flows (exceeding 40 cfs) in Mammoth Creek. In 1996, the water level in Well No. 22 rose about five feet, between January and June, and then stayed relatively constant, until September, when the water level fell about two feet. The water level in this well responds primarily due to recharge from Mammoth Creek streamflow, as opposed to pumping of Well No. 15.

A water-level hydrograph based on manual measurements for Well No. 23 and pumpage for nearby Well No. 1 are shown in Figure 15. Depth to water in Well No. 23 has ranged from about 5 to 16 feet during the period of record. The shallowest water levels were in the spring and early summer of 1993, 1995, and 1996. Depth to water in this well is not influenced by pumpage of Well No. 1, which taps groundwater in the deeper consolidated rock. Well No.

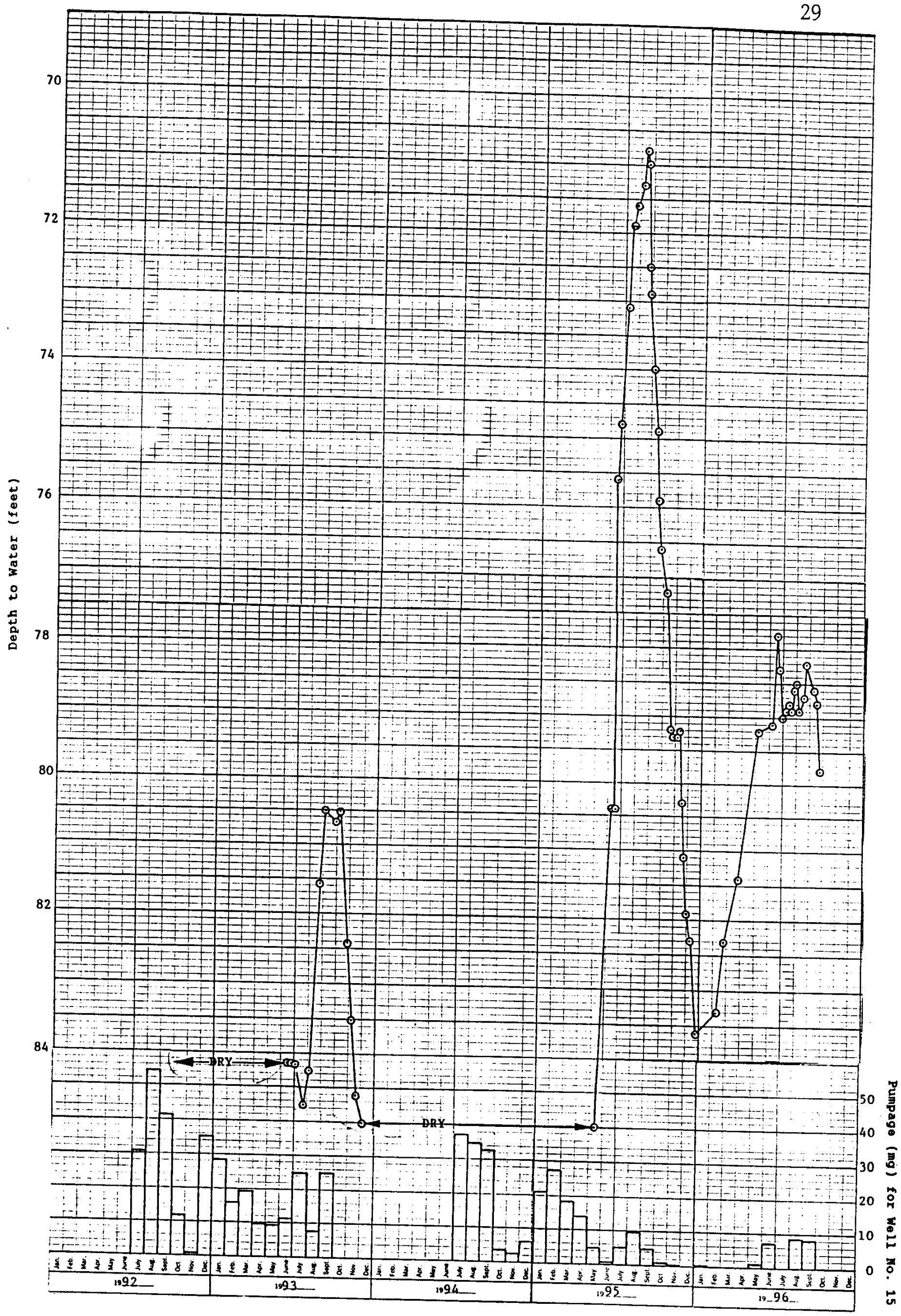


FIGURE 13 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 22 AND PUMPAGE FOR WELL NO. 15

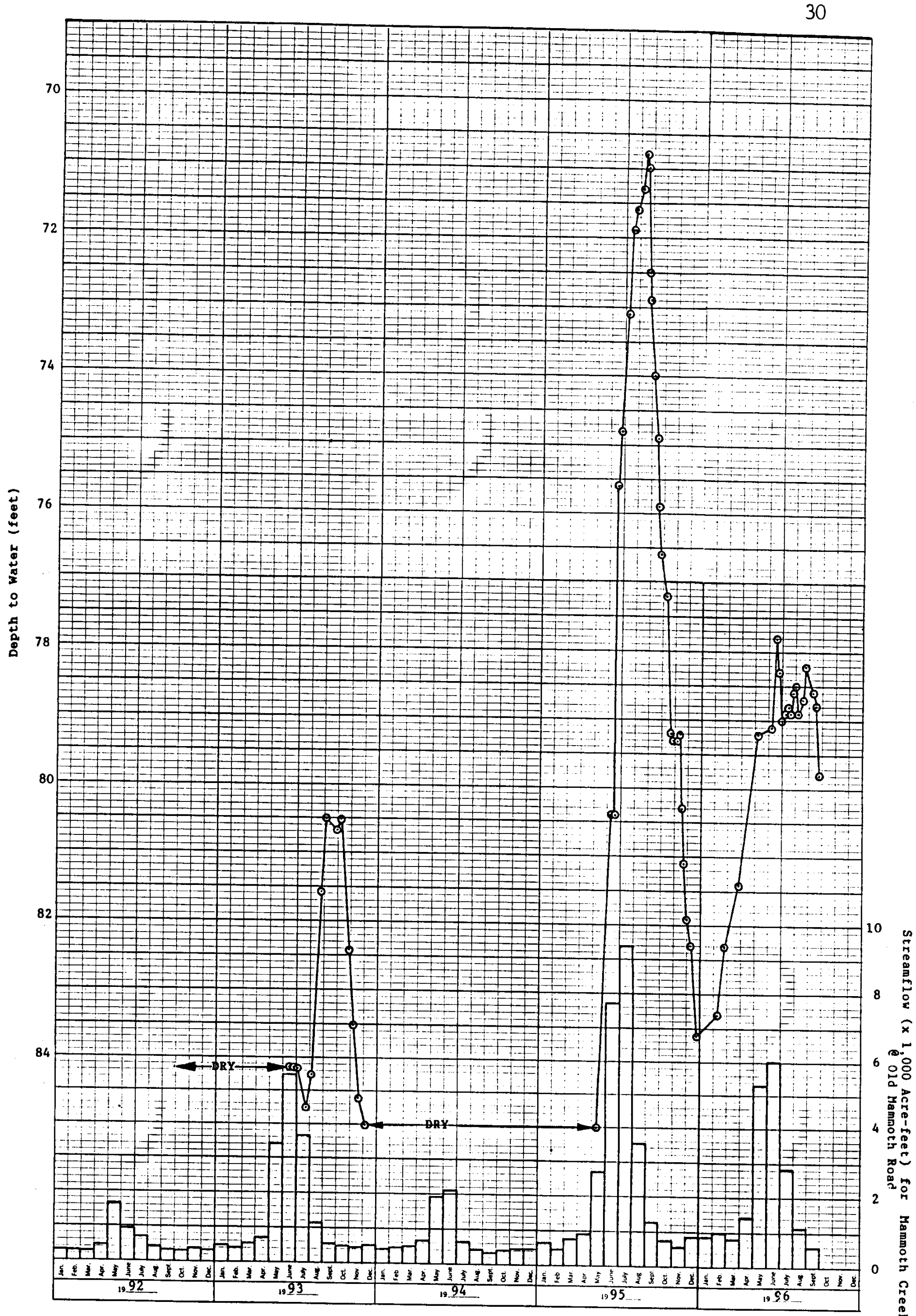


FIGURE 14 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 22 AND MAMMOTH CREEK STREAMFLOW

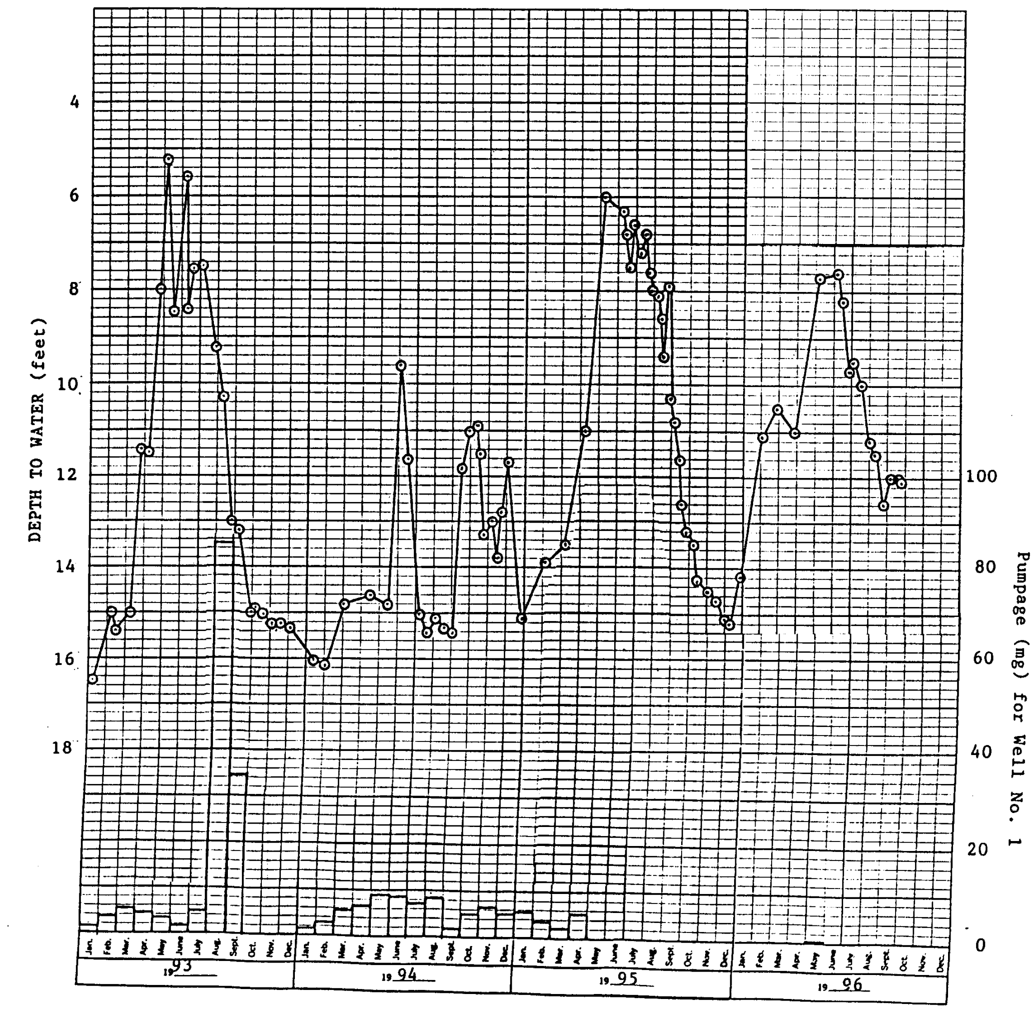


FIGURE 15 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 23 AND PUMPAGE FOR WELL NO. 1

23 is located relatively close to Mammoth Creek and is clearly influenced by recharge from streamflow (Figure 16), and possibly from other local sources of recharge. There were temporary water-level rises of about ten feet in Well No. 23 in both 1993 and 1995, due to recharge. From December 1995 through June 1996, the rise was about eight feet. After the peak monthly streamflow in June 1996, the water level in Well No. 23 fell about five feet. On August 1, 1996, a float-type continuous water-level recorder was installed in Well No. 23. Some problems were experienced with this recorder during August, but reliable measurements were obtained in September. A detailed hydrograph for September is provided in Appendix D.

Water-level hydrographs for the remaining shallow monitor wells are provided in Appendix D. Well No. 4M is located in the meadow area east of District Wells No. 6 and 10. The water level in this well rose during 1993, 1995, and 1996, due to significant surface water flow in the meadow. Depth to water fluctuations in this well have followed patterns of Bodle Ditch flows, rising during periods when flows are present in the ditch. In June 1996, the water level in this well was the shallowest water level since 1988.

Well No. 5M taps the shallow volcanic rock and no water was observed in the overlying glacial till at the time of drilling. Depth to water has ranged from about 2.5 to 9 feet. The shallowest levels have been in the spring and early summer, and the deepest in the summer. In 1996, the water level began to rise in January and

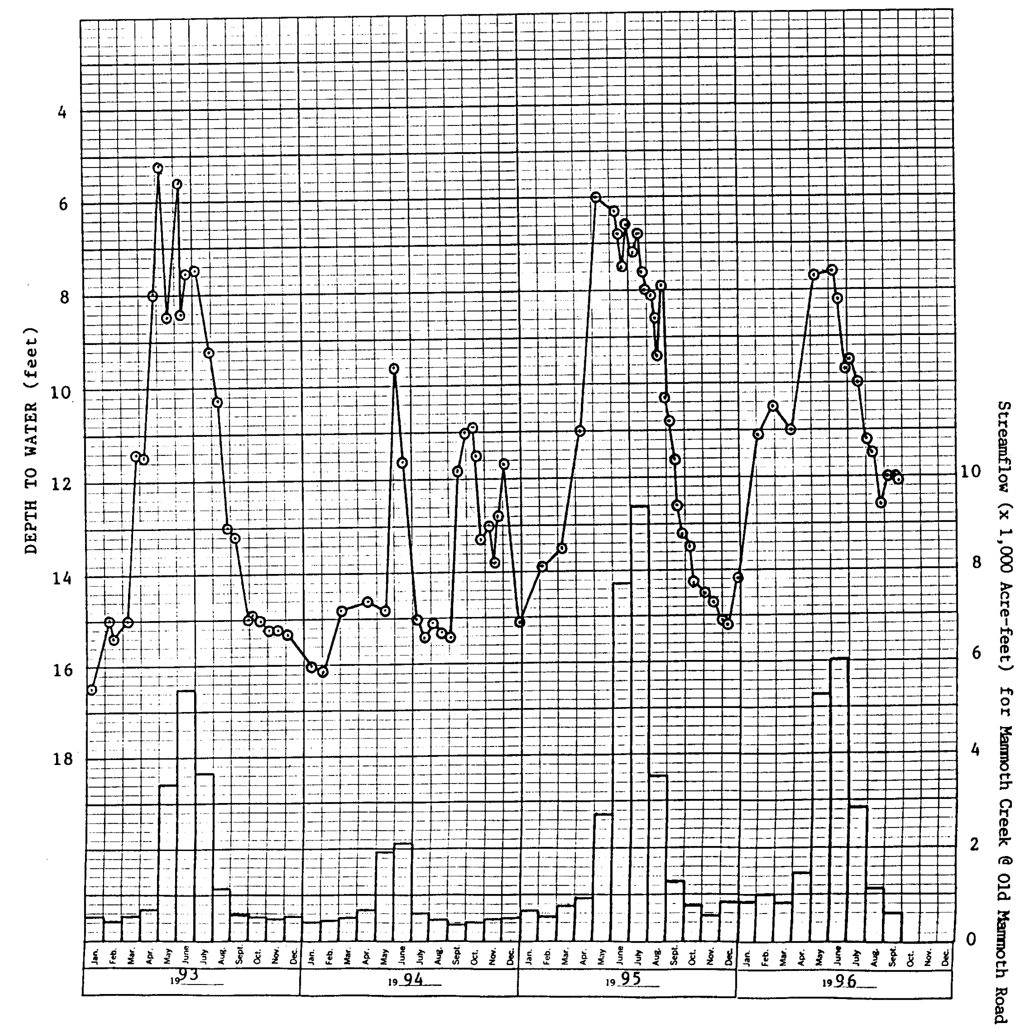


FIGURE 16 - WATER-LEVEL HYDROGRAPH FOR WELL NO. 23 AND MAMMOTH CREEK STREAMFLOW

the shallowest water level was in early May.

Well No. 10M was dry from October 1992 through June 10, 1993. Some water appeared in this well during June 17-August 19, 1993, and during June 6-June 20, 1996. The well has otherwise been dry since late 1992. This well is adjacent to District Well No. 10, and the water level is primarily influenced by pumping of this well and also by local recharge.

Well No. 11M is located in the southwest part of the meadow area near the Bodle Ditch. Water levels in this well have seasonal fluctuations, corresponding to flows in the ditch. The shallowest water levels have generally been in June-July. Water levels gradually declined during 1989-92, but rose significantly in 1993, 1995, and 1996. In 1996, the water level began to rise significantly in April, and the shallowest level yet measured (about four feet deep) was in June.

Well No. 12M is located in the western part of the meadow area. The water level in this well responded significantly to five recharge events (1989, 1990, 1993, 1995, and 1996). The water level was below the bottom of this well from October 1992 through June 10, 1993, and from December 1993 to April 1995. In 1996, the water level in this well began to rise significantly in April, and reached the shallowest level of record in June. The water levels in all four of the shallow wells referenced thus respond significantly to recharge, often associated with flow of nearby surface water.

Water-Level Elevation Contours

Figure 17 shows water-level elevation contours for mid-September 1996. The hydrologic boundary is shown north of Wells No. 1 and 5A and south of Wells No. 16, 17, and 20. This boundary is believed to be present only west of a line connecting Wells No. 14M and 21. A cone of depression was evident due to pumping of District Wells No. 10 and 15. This cone of depression did not extend east of Well No. 19. The overall direction of groundwater flow in September 1996 was similar to that shown in the previous three annual reports. This map shows only the horizontal component of groundwater flow in the basalt and interbedded glacial till. Other evidence (i.e., water levels in SC-1 and SC-2) indicates that there is also significant downward flow of groundwater in the area.

CHEMICAL QUALITY AND TEMPERATURE OF GROUNDWATER

The results of chemical analyses and temperatures of water for the supply wells and monitor wells during the 1996 water year are provided in Appendix E. The analyses for the supply wells are for water samples collected in June and early July. The shallow monitor wells were sampled in early September, and most of the deep monitor wells could not be sampled, because transducers had been installed in the wells to continuously measure water levels. The coldest water (53°F or less) has normally been from shallow monitor wells in the meadow area and in water from the supply wells tapping consolidated rock, south of the hydrologic boundary. In contrast, the warmest water (60°F or greater) normally has been from the

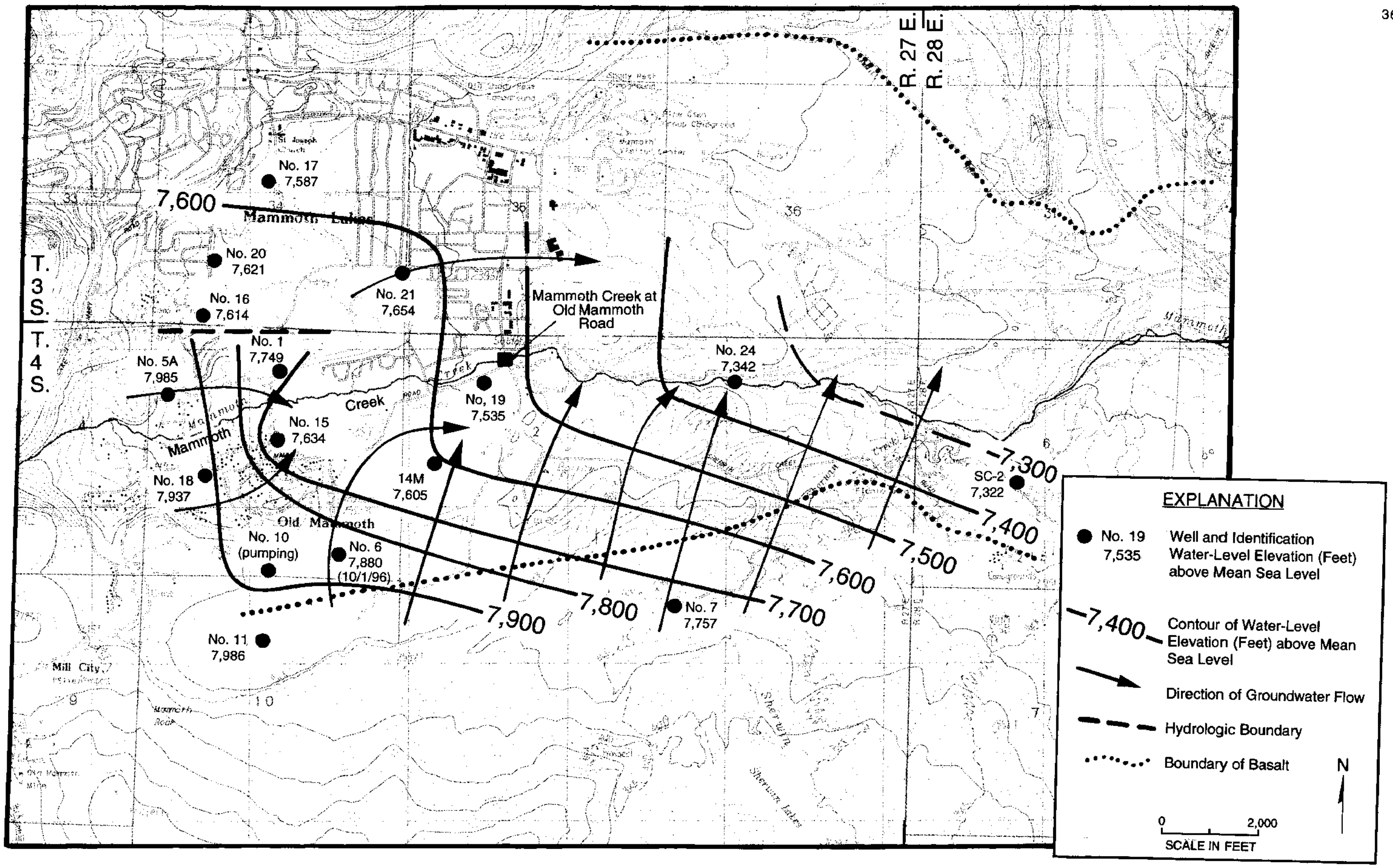


FIGURE 17 - WATER-LEVEL ELEVATIONS IN MID-SEPTEMBER 1996

wells tapping consolidated rock, north of the hydrologic boundary, closer to the known area of relatively shallow geothermal water in Mammoth Lakes. The lowest electrical conductivity values (less than 200 micromhos per centimeter at 25°C) have normally been for shallow monitor wells and Well No. 11. The highest values (greater than 430 micromhos) have been for wells tapping the consolidated rock in the western part of the area. There is no evidence of significant changes in chemical quality or temperature of well water during water year 1996, compared to previous information in the earlier annual reports.

MAMMOTH CREEK STREAMFLOW

Records of streamflow at the outlet from Twin Lakes and the Old Mammoth Road crossing during the 1996 water year are provided in Appendix F. The mean monthly flow at the Old Mammoth Road crossing ranged from 9.7 cfs in November 1995 to about 101 cfs in June 1996. In 1996, the flow at the Old Mammoth Road crossing began to rise significantly in late April, and the highest flows were during May 14-22 and June 4-18.

Average daily flows are plotted in Appendix F for both stations for each month during the 1996 water year, except for May and June. During these two months, flow at the Twin Lakes outlet exceeded the accurate measuring capability of the gage. A comparison of these daily flows indicates that the streamflow at the Old Mammoth Road crossing normally equaled or exceeded that of the Twin Lakes outflow. During most periods, the flow was greater at the downstream station, by from about several cfs to up to 10 cfs. This downstream increase in flow is attributed to inflow from ungaged tributaries below the Twin Lakes outlet and from groundwater flow entering Mammoth Creek. Historical records indicate that during the summers of drought years, there was little difference in streamflow between the two stations. There has never been a significant downstream decrease in streamflow between the two stations. This information indicates that pumpage of District wells did not influence Mammoth Creek streamflow during the 1996 water year.

VALENTINE RESERVE SPRINGFLOW

Rates of flow of the main spring at the University of California Eastern Sierra Valentine Reserve are provided in Appendix G. Figure 18 shows the variations in springflow during May 30-September 30, 1996. Pumpage from the closest District Wells (No. 15, 16, and 20) that were pumped during this period is also shown in this figure. The springflow in early June was about 80 gpm. By mid-June, the flow had decreased to about 55 gpm, and the flow then decreased slightly until early July. The flow then increased somewhat, and was relatively constant during August and September.

Well No. 15 was pumped primarily in June, August, and early September. Well No. 16 was pumped primarily in May, and Well No. 18 was not pumped during the 1996 water year. Well No. 20 was pumped primarily during July through early September. Careful examination of Figure 18 indicates that the variation in total

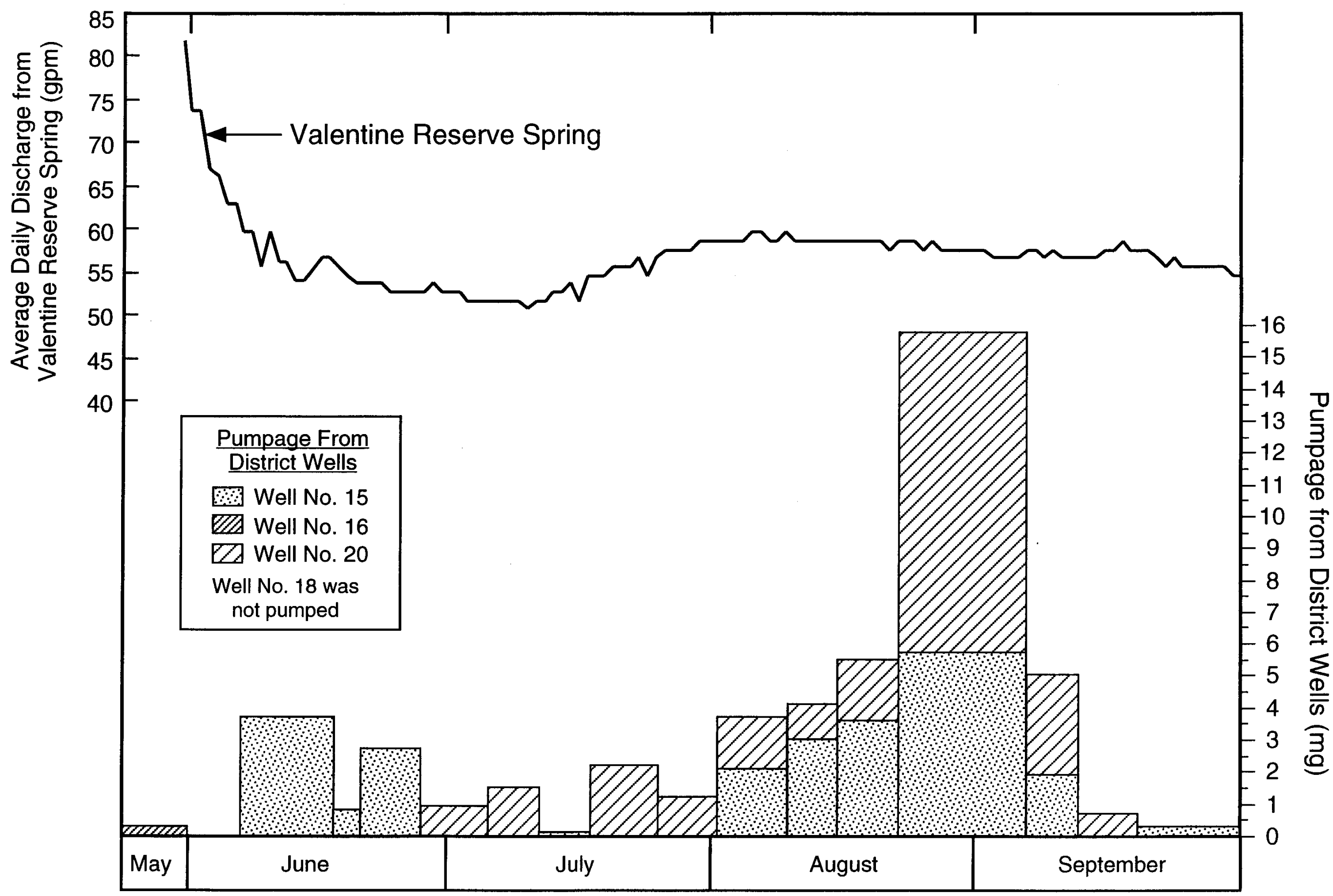


FIGURE 18 - FLOW FROM VALENTINE RESERVE SPRING AND DISTRICT WELL PUMPAGE (1996)

pumpage from Wells No. 15, 16, and 20 (the closest new District supply wells that were pumping) does not correlate with the springflow. For example, when the total pumpage of these wells increased in late July and August, the pattern of springflow continued as before. In late September, when the total pumpage of these wells decreased significantly, the springflow did not change significantly. In addition, pumpage of the individual wells does not correlate with springflow. For example, when pumpage of Well No. 20 increased in late August, the springflow stayed the same.

Springflow measurements for the four-year period of record (Figure 19) indicate that the pattern of springflow is related to runoff. In 1993, 1995, and 1996, springflow was lowest in July or August, and then increased near the end of the water year. This could have been due to lower air temperatures, which would result in decreased evapotranspiration of water by plants in the area. Another possible factor is increased runoff from higher land on Mammoth Mountain. There was no noticeable impact of District pumping during the 1996 water year on springflow at the Valentine Reserve. This is consistent with monitoring results during the previous three years.

DATA EVALUATION AND INTERPRETATION

Water-level hydrographs for the monitor wells tapping the uppermost glacial till strata and consolidated rock in and near the District well field indicate relatively constant or rising water levels during the 1996 water year. Substantial recharge was

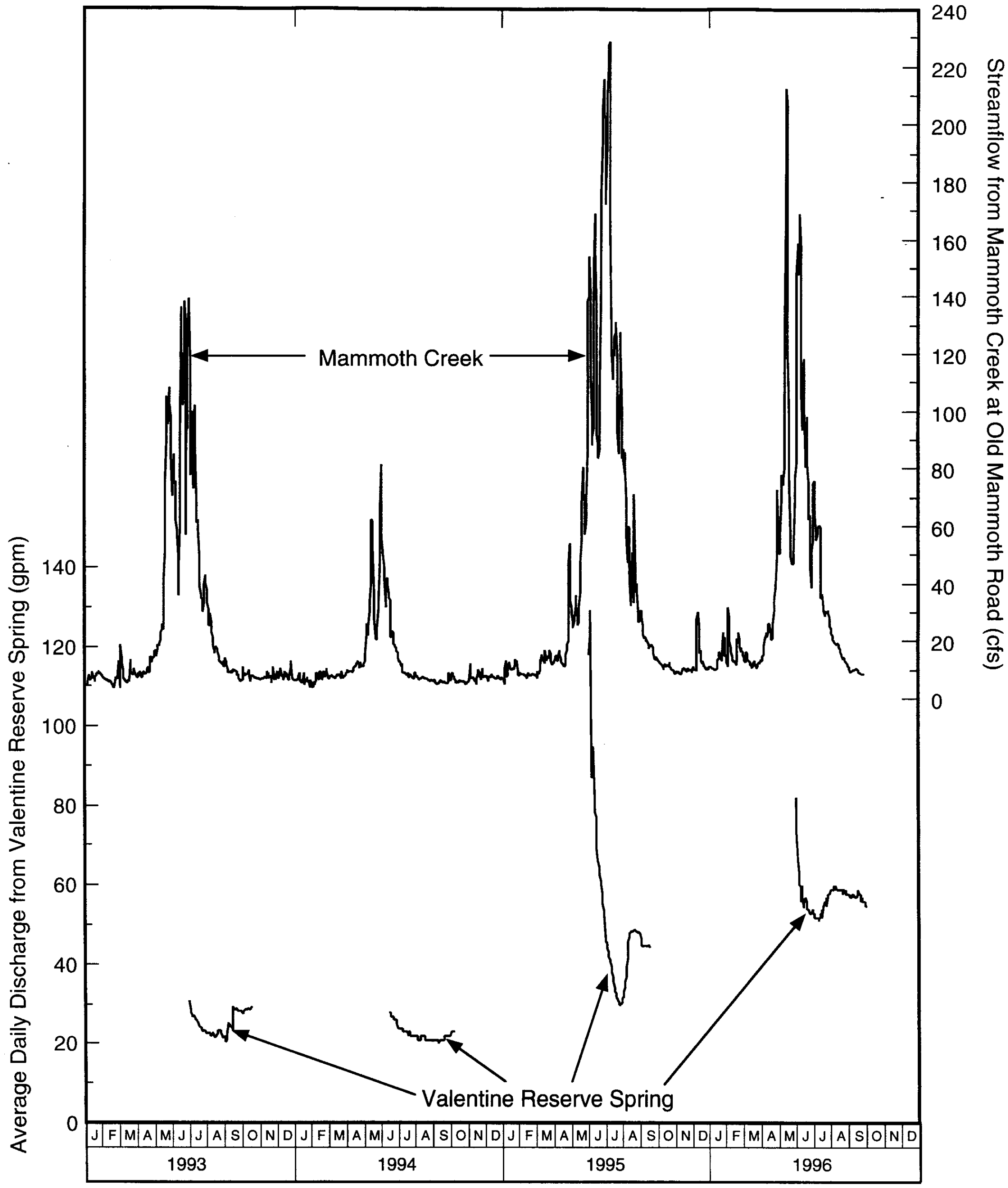


FIGURE 19 - FLOW FOR VALENTINE SPRING AND MAMMOTH CREEK STREAMFLOW (1993-1996)

indicated during the 1995 and 1996 water years, coincident with substantial runoff in the Mammoth Creek watershed. This recharge is indicated to have been more than in the 1993 or 1994 water years, by the larger water-level response in the monitor wells during 1995-1996 compared to previously. Water-level hydrographs for Wells No. 7, 21, 24, and SC-1, east of the District well field, also indicate substantial rises. Recharge was indicated to be the primary factor influencing water-level trends, except for some active District supply wells. Significant water-level declines due to pumping have only been observed in or near the pumped wells themselves.

The water-level elevation contour map for September 1996 confirms that the cone of depression due to pumping of District wells is localized, and does not extend east to Well No. 24. Because the water levels in the consolidated rock are well below the channel of Mammoth Creek, there is no apparent impact of District pumping on streamflow. This was confirmed by the Mammoth Creek streamflow measurements upstream and downstream of the well field. Water levels in the most westerly deep wells (No. 5A, 16, 18, and 20) that are closest to the Valentine Reserve were relatively stable or rose during the 1996 water year. Springflow measurements at the Valentine Reserve indicate much larger flow during 1995-96 than in 1993-94, due to higher runoff during the later period. There has been no impact on flow of the springs at the Valentine Reserve or on the flow of the Hot Creek headsprings due to pumping of the District supply wells.

REFERENCES

Kenneth D. Schmidt and Associates, "Results of Summer 1993 Aquifer Test, Mammoth County Water District Well No. 15", November 9, 1993, 22 p.

Kenneth D. Schmidt and Associates, "Annual Report on Results of Mammoth County Water District Groundwater Monitoring Program for October 1992-September 1993", December 13, 1993, 30 p.

Kenneth D. Schmidt and Associates, "Annual Report on Results of Mammoth Community Water District Groundwater Monitoring Program for October 1993-September 1994, December 14, 1994, 34 p.

Kenneth D. Schmidt and Associates, "Annual Report on Results of Mammoth Community Water District Groundwater Monitoring Program for October 1994-September 1995, December 11, 1995, 41 p.

APPENDIX A

PUMPAGE AND WATER-LEVEL DATA
FOR DISTRICT SUPPLY WELLS

MAMMOTH COMMUNITY WATER DISTRICT PRODUCTION WELL LEVEL DATA (OCT/1995-SEP/1996)

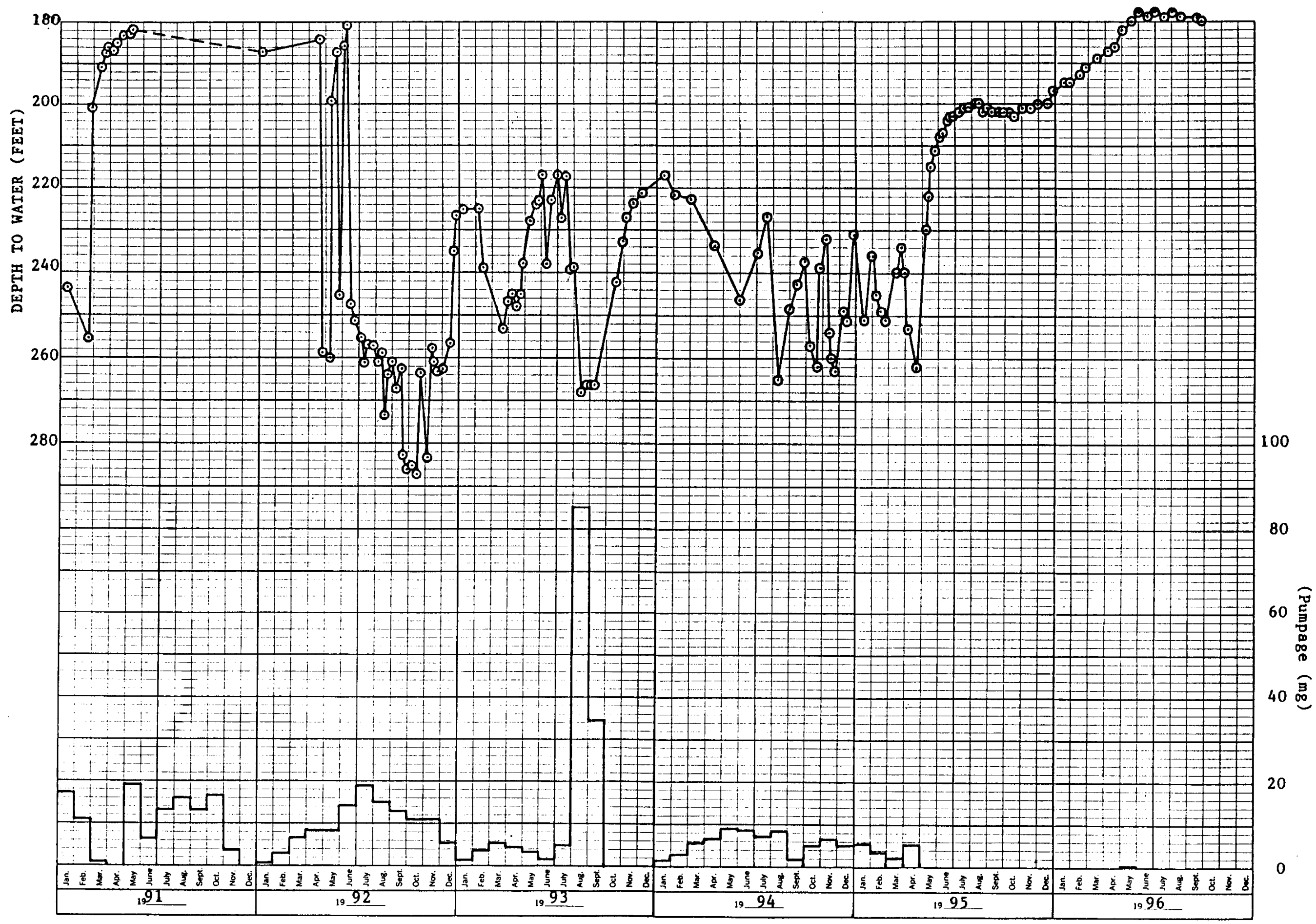
		WELL 1			WELL 6			WELL 10			WELL 15		
	Static	Pumping	1000	Static	Pumping	1000	Static	Pumping	1000	Static	Pumping	1000	Total
Date	Level	Level	Gallons	Level	Level	Gallons	Level	Level	Gallons	Level	Level	Gallons	Acre-Feet
10/4/95	-202.49		0	-31.14		0	-49.97		384	-247.42		0	1.2
10/13/95	-202.52		0	-21.27		0	-41.58		0	-245.76		0	0.0
10/19/95	-202.46		0	-19.93		0	-38.76		0	-245.57		816	2.5
10/26/95	-202.11		0	-16.88		0	-29.62		0	-243.75		0	0.0
11/2/95	-201.74		0	-15.48		0	-35.21		0	-242.16		0	0.0
11/9/95	-201.24		0	-20.98		0	-34.19		0	-241.34		0	0.0
11/16/95	-201.08		0	-13.10		128	-32.86		64	-239.97		32	0.7
11/22/95	-200.61		0	-13.27		0	-32.43		0	-239.09		32	0.1
11/30/95	-199.98		0	-15.26		616	-34.42		3008	-237.79		68	11.3
12/7/95	-199.45		0	-13.86			-33.27			-236.58			0.0
12/14/95	-199.91			-16.01			-38.35			-235.48			0.0
12/21/95	-198.26			-18.02				-98.92		-234.16			0.0
12/28/95	-197.42			-23.16				-108.73		-233.26			0.0
1/4/96	-196.49		0	-30.33		560	-51.61		6656	-232.27		116	22.5
1/11/96	-196.39		0	-25.09		1944	-45.30		1216	-231.16		0	9.7
1/17/96	-195.43		0	-26.48		1260	-43.02		512	-229.78		56	5.6
1/25/96	-194.74		4	-20.24		404	-41.08		832	-229.91		0	3.8
2/8/96	-193.35		0	-20.16		68	-41.97		5056	-226.86		0	15.7
2/14/96	-192.49		0	-19.51		0	-40.91		1600	-226.33		0	4.9
2/22/96	-191.75		0			0	-45.13		5184	-224.48		0	15.9
2/26/96	-190.58		0	-21.47		0		-103.48	2560	-222.86		0	7.9
3/14/96	-188.52		0	-23.72		0	-46.17		7744	-221.26		0	23.8
3/21/96	-188.04		0	-22.84		44	-45.13		1536	-218.47		0	4.8
3/27/96	-187.25		0	-20.32		0	-44.16		2496	-216.56		24	7.7
4/4/96	-187.42		0	-18.39		0	-41.78		704	-216.98		0	2.2
4/15/96	-186.18		0	-14.02		0	-36.88		2432	-216.16		0	7.5
4/18/96	-185.58		0	-17.06		0	-35.30		960	-216.08		0	2.9
4/24/96	-184.47		0	0		0	-30.92		192	-215.26		0	0.6
5/2/96	-181.77		0	0		0	-23.56			-213.71			0.0
5/9/96	-182.16		0	0		0	-22.16		1536	-212.33		316	5.7
5/16/96	-180.19		184	0		0	-22.16		2816	-212.04		484	10.7
5/23/96	-179.25		0	0		0		-75.44	2464	-210.56		0	7.6
5/30/96	-178.28		0	0		0	-15.31		2464	-209.11		8	7.6
6/6/96	-178.42		31	0		0		-87.80	5632	-208.48		0	17.4
6/17/96	-178.66		0	0		0	-19.17		9472	-210.78		3740	40.5
6/20/96	-178.01		0	0		0		-84.73	2496	-210.33		836	10.2
6/27/96	-178.22		0	0		0		-89.64	9216	-209.42		2712	36.6
7/5/96	-178.99		0	0		0		-92.97	10432	-207.86		0	32.0
7/11/96	-178.54		0	0		0		-95.77	7744	-205.37		0	23.8
7/17/96	-178.56		0	0		0		-97.34	7488	-205.35		0	23.0
7/25/96	-178.75		0	0		0		-100.16	9280	-204.16		0	28.5
8/1/96	-178.12		0	0		0		-105.23	8512	-201.64		0	26.1
8/9/96	-178.05		0	0		0		-108.73	9600	-204.21		2060	35.8
8/15/96	-178.56		0	0		0		-110.31	7168		-219.99	3016	31.3
8/22/96	-179.11		0	0		0		-112.42	8192	-206.04		3552	36.0
9/6/96	-179.42		0	0		0		-117.50	17216	-206.34		5732	70.4
9/12/96	-179.66		0	0		0		-117.58	6848	-205.88		1928	26.9
9/19/96	-179.56		0	0		0		-119.08	6656	-203.75		0	20.4
10/1/96	-179.45		0	-16.17		0		-122.23	14400	-200.92		344	45.3
Total			**219**			**5024**			**192768**			**25872**	**687.1**
Mean	**-188.36**		**5**	**-11.13**		**112**	**-36.41**	**-102.53**	**4381**	**-221.15**	**-219.99**	**588**	**15.6**
Max	**-178.01**		**184**	**0**		**1944**	**-15.31**	**-75.44**	**17216**	**-200.92**	**-219.99**	**5732**	**77.0**
Min	**-202.52**		**0**	**-31.14**		**0**	**-51.61**	**-122.23**	**0**	**-247.42**	**-219.99**	**0**	**0.0**

MAMMOTH COMMUNITY WATER DISTRICT PRODUCTION WELL LEVEL DATA (OCT/1995-SEP/1996)

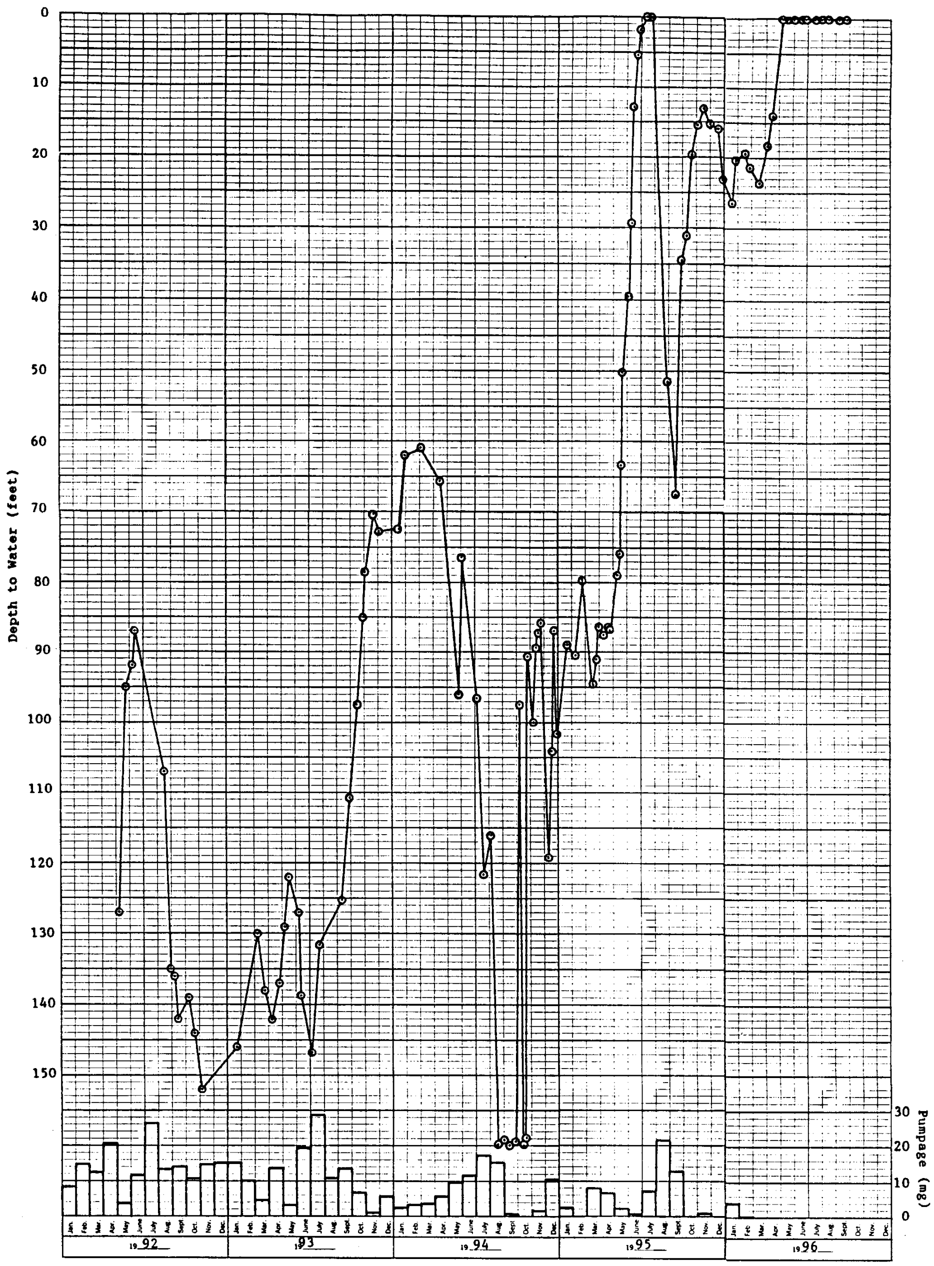
	WELL 16			WELL 17			WELL 18			WELL 20			
	Static	Pumping	1000	Static	Pumping	1000	Static	Pumping	1000	Static	Pumping	1000	Total
Date	Level	Level	Gallons	Level	Level	Gallons	Level	Level	Gallons	Level	Level	Gallons	Acre-Feet
10/4/95	-464.57		0			0	-67.71		0	-419.96		318	1.0
10/13/95	-464.52		0			0	-67.65		0	-422.21		462	1.4
10/19/95						0	-67.22		0	-420.42		2088	6.4
10/26/95	-464.28		0			0	-66.79		0	-423.35		2722	8.4
11/2/95	-464.52		0			0	-66.08		0	-420.08		0	0.0
11/9/95	-464.52		0			0	-65.32		0	-418.22		0	0.0
11/16/95	-464.52		0			0	-65.05		0	-417.34		0	0.0
11/22/95	-465.52		75	-382.58		0	-64.08		0	-416.67		0	0.2
11/30/95	-465.13		0	-382.12		0	-63.44		0	-415.52		0	0.0
12/7/95	-465.94		563			0	-62.48		0	-415.03		0	1.7
12/14/95	-462.93		150	-382.54		0	-62.42		0	-414.69		0	0.5
12/21/95	-465.56		3	-382.42		16	-66.98		6	-414.50		18	0.1
12/28/95	-466.34		0	-385.67		0	-62.97		0	-436.52		40	0.1
1/4/96	-464.94		0	-382.06		1394	-62.52		0	-415.13		386	5.5
1/11/96	-465.34		0	-382.09		0	-63.42		0	-414.50		0	0.0
1/17/96	-464.72		0	-382.35		0	-62.81		0	-413.88		0	0.0
1/25/96	-464.94		0	-382.18		0	-62.79		0	-413.88		0	0.0
2/8/96	-465.16		0	-381.48		0	-63.22		0	-413.06		0	0.0
2/14/96	-464.94		0	-381.75		0	-62.56		0	-412.84		0	0.0
2/22/96	-465.16		0	-381.81		0	-63.24		0	-412.44		0	0.0
2/26/96	-465.34		0	-381.47		0	-63.23		0	-412.44		0	0.0
3/14/96	-464.94		0	-381.23		0	-63.17		0	-411.81		0	0.0
3/21/96	-464.94		0	-381.14		0	-63.53		0	-411.63		0	0.0
3/27/96	-465.56		0	-379.95		0	-63.91		0	-411.81		0	0.0
4/4/96	-465.75		0	-379.86		0	-63.88		0	-411.81		0	0.0
4/15/96	-465.75		0	-379.93		0	-63.21		0	-411.63		0	0.0
4/18/96	-465.75		0	-379.89		0	-62.92		0	-411.81		0	0.0
4/24/96	-466.59		69	-379.85		0	-62.98		0	-411.41		0	0.2
5/2/96		-471.97	449	-379.58		0	-62.02		0	-411.22		0	1.4
5/9/96	-468.03		449	-379.89		0	-61.84		0	-411.22		0	1.4
5/16/96	-468.25		428	-379.16		0	-60.69		0	-411.00		0	1.3
5/23/96	-468.66		377	-379.08		0	-59.67		0	-411.00		0	1.2
5/30/96	-468.03		257	-379.24		0	-58.87		0	-410.78		0	0.8
6/6/96	-467.41		0	-378.89		0	-58.19		0	-410.78		0	0.0
6/17/96	-467.00		0	-378.68		0	-57.58		0	-410.59		0	0.0
6/20/96	-467.00		0	-378.39		0	-57.22		0	-410.59		0	0.0
6/27/96	-466.81		0	-378.25		0	-57.14		0	-410.38		0	0.0
7/5/96	-466.59		0		-382.76	2711	-57.49		0		-428.53	940	11.2
7/11/96	-466.59		0	-379.72		4046	-57.98		0	-412.25		1510	17.1
7/17/96	-466.19		1	-378.97		2751	-58.25		0	-411.81		68	8.7
7/25/96	-466.19		0	-378.52		2535	-58.52		0	-413.25		2238	14.6
8/1/96	-466.19		0		-382.31	2744	-59.35		0	-428.91		1152	12.0
8/9/96	-466.19		0	-381.98		4227	-59.99		0	-416.34		1580	17.8
8/15/96	-465.97		0	-379.25		3012	-60.12		0	-414.50		1134	12.7
8/22/96	-465.97		0	-378.22		4402	-60.18		0	-415.94		1862	19.2
9/6/96	-466.38		0	-377.91		3753	-61.67		0	-416.97		10132	42.6
9/12/96	-466.38		0	-377.86		509	-61.91		0	-417.52		3118	11.1
9/19/96	-466.81		0	-381.18		1922	-62.71		0	-418.00		704	8.1
10/1/96	-466.19		0	-377.86		5414	-63.46		0	-415.31		0	16.6
Total			**2821**			**39436**			**6**			**30472**	**223.2**
Mean	**-465.85**	**-471.97**	**59**	**-380.38**	**-382.54**	**805**	**-62.25**		**0.1**	**-415.06**	**-428.53**	**622**	**4.6**
Max	**-462.93**	**-471.97**	**563**	**-377.86**	**-382.31**	**5414**	**-57.14**		**6**	**-410.38**	**-428.53**	**10132**	**49.5**
Min	**-468.66**	**-471.97**	**0**	**-385.67**	**-382.76**	**0**	**-67.71**		**0**	**-436.52**	**-428.53**	**0**	**0.0**

APPENDIX B

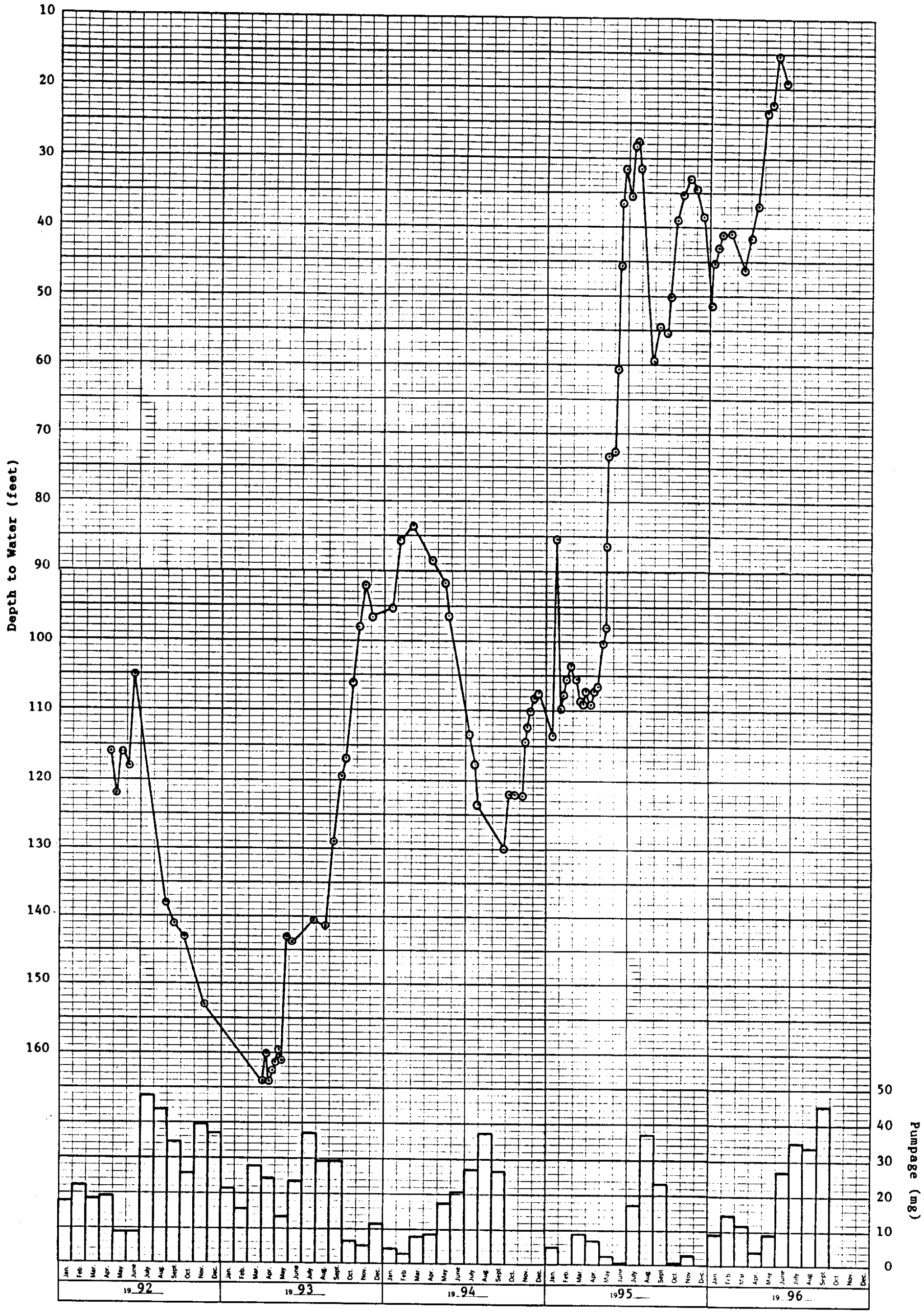
PUMPAGE AND WATER-LEVEL HYDROGRAPHS FOR EARLIER SUPPLY WELLS



WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 1



WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 6



WATER-LEVEL AND PUMPAGE HYDROGRAPH FOR WELL NO. 10

APPENDIX C

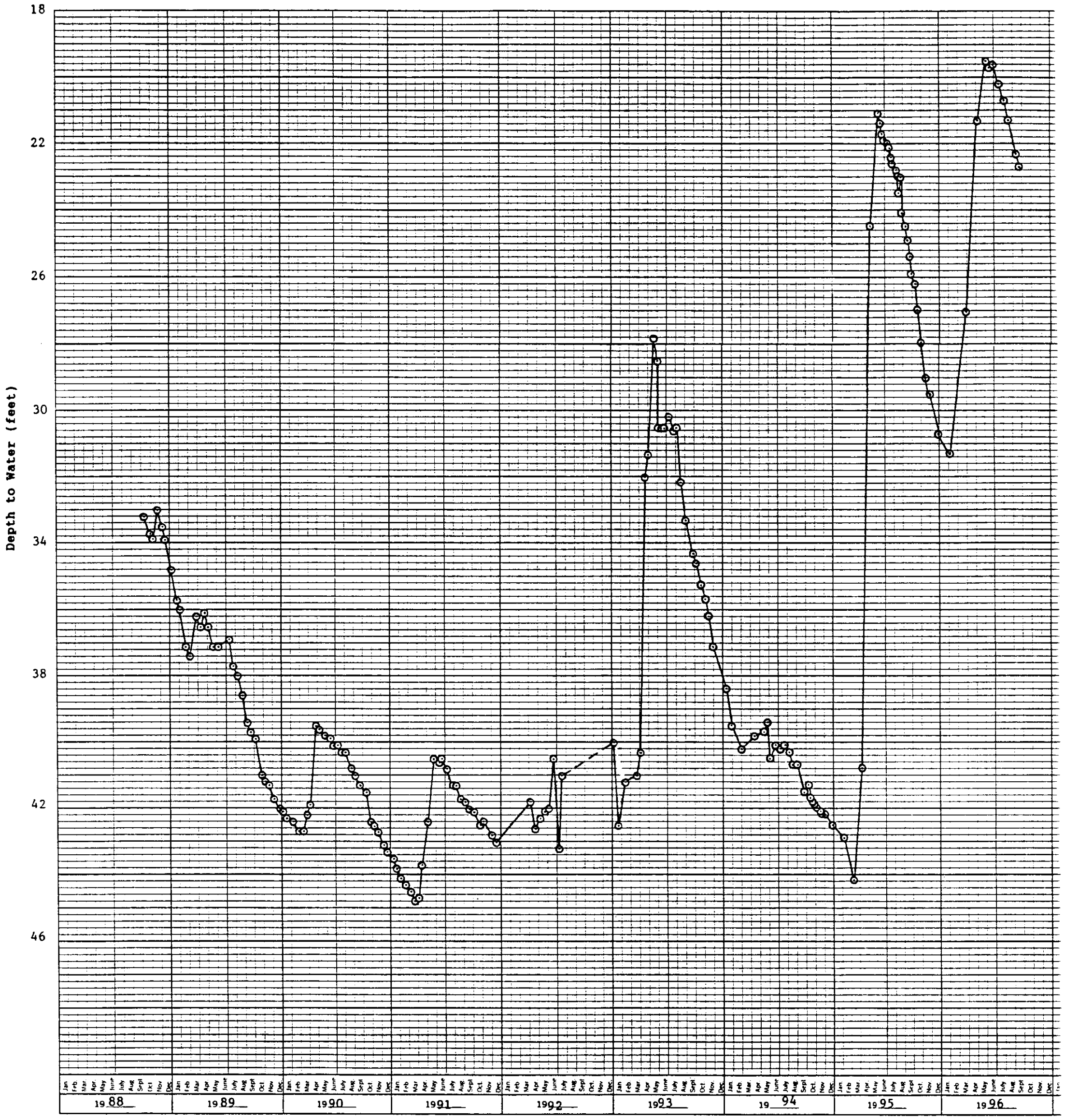
WATER-LEVEL MEASUREMENTS
FOR MONITOR WELLS

MAMMOTH COMMUNITY WATER DISTRICT MONITOR WELL LEVEL DATA (OCT/1995-SEP/1996)

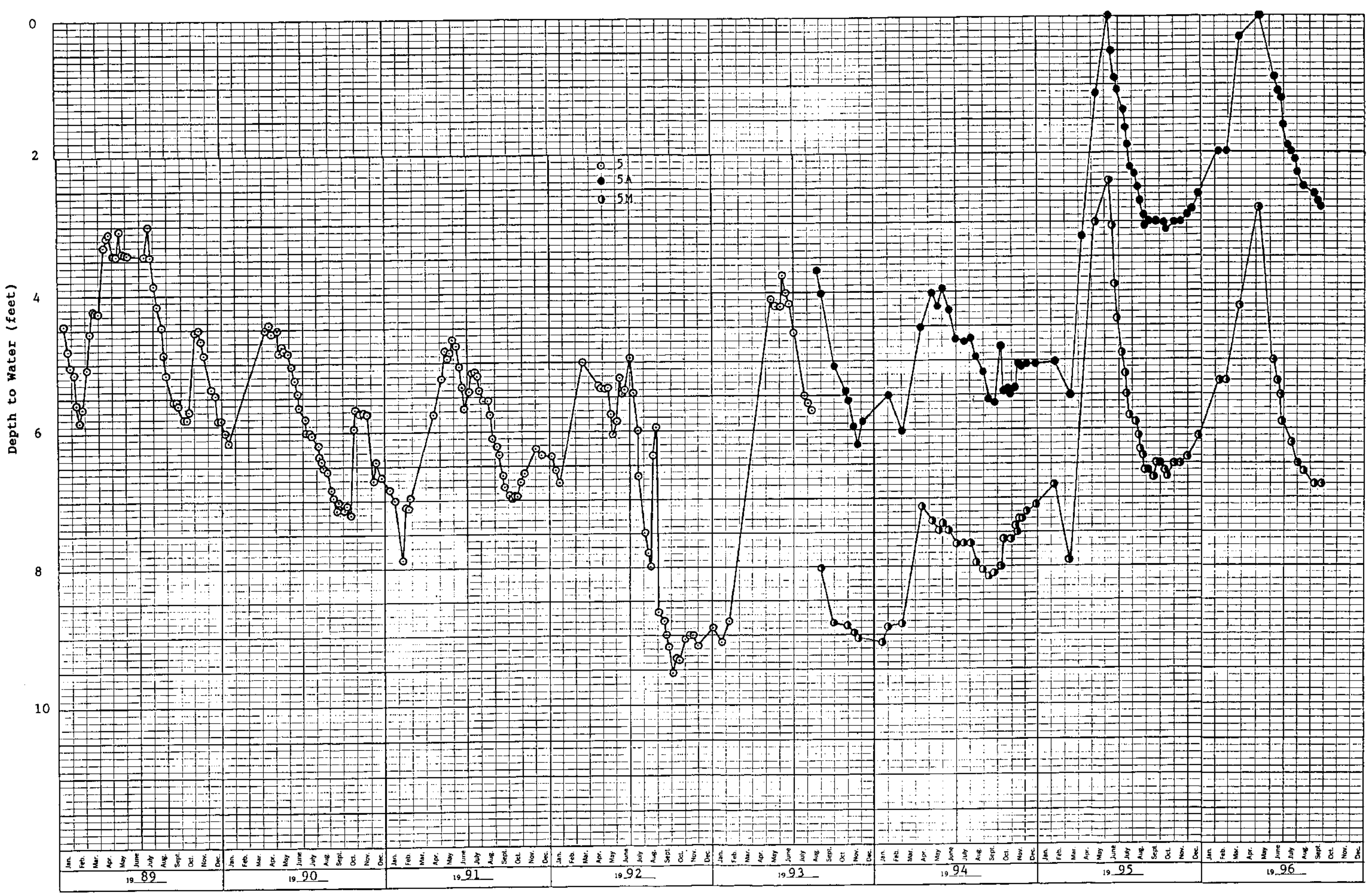
Date	Well 4	Well 5A	Well 5M	Well 7	Well 10M	Well 11	Well 11M	Well 12M	Well 14M	Well 19	Well 21	Well 22	Well 23	Well 24
10/4/95	-26.24	-3.03	-6.56	-246.85	-27.00	0.00	-19.11	-19.57	-318.45	-333.61	-284.78	-77.23	-13.45	-382.59
10/13/95	-26.97	-3.14	-6.67	-246.01	-27.00	0.00	-19.52	-19.94	-321.78	-326.45	-283.23		-14.29	-381.95
10/19/95	-27.85	-3.14	-6.69	-245.92	-27.00	0.00	-19.81	-20.15	-322.64	-326.25	-283.21	-79.18	-14.38	-382.27
10/26/95	-27.83	-3.06	-6.62	-245.41	-27.00	0.00	-20.05	-20.28	-323.42	-326.31	-283.16	-79.28	-14.32	-382.19
11/2/95	-27.95	-2.98	-6.53	-245.03	-27.00	0.00	-20.26	-20.43	-323.97	-326.32	-279.78	-79.27	-14.52	-382.24
11/9/95	-28.54	-2.94	-6.49	-244.79	-27.00	0.00	-20.49	-20.58	-324.51	-326.03	-276.23	-79.23	-14.59	-382.11
11/16/95	-29.07	-2.95	-6.48	-244.51	-27.00	0.00	-20.87	-20.94	-324.98	-326.11	-275.08	-80.31	-14.71	-382.14
11/22/95	-29.32	-2.94	-6.48	-244.73	-27.00	0.00	-21.15	-21.19	-326.11	-326.31	-279.52	-81.09	-14.83	-382.49
11/30/95	-29.45	-2.88	-6.42	-244.92	-27.00	0.00	-21.64	-21.89	-324.77	-325.11	-278.04	-81.88	-15.07	-382.42
12/7/95	-29.98	-2.82	-6.37	-245.07	-27.00	0.00	-22.05	-22.42	-325.54	-327.71	-275.78	-82.32	-15.21	-382.29
12/28/95	-30.65	-2.61	-6.09		-27.00	0.00	-22.91	-24.19	-324.34	-334.47	-272.41	-83.59	-14.19	-381.57
2/8/96	-31.32	-1.96	-5.28		-27.00	0.00	-23.95	-26.51	-326.71	-333.28	-269.41	-83.29	-11.06	-380.78
2/29/96		-2.04	-5.25	-248.55	-27.00	0.00	-23.91	-26.53	-327.48	-326.75	-265.82	-82.31	-10.46	-380.17
3/27/96	-26.97	-0.28	-4.16		-27.00	0.00	-24.06	-26.57	-327.14	-325.45	-265.44	-81.37	-10.95	-379.34
5/2/96	-21.26	0.00	-2.78		-27.00	0.00	-19.17	-20.59	-318.41	-332.31	-254.91	-79.18	-7.74	-379.72
6/6/96	-19.49	-0.87	-5.03	-248.34	-25.16	4.00	-4.78	-4.57	-301.13	-325.17	-249.48	-79.07	-7.59	-376.51
6/17/96	-19.71	-1.08	-5.29	-248.21	-21.13	4.00	-4.92	-4.49	-292.42	-324.95	-248.02	-77.79	-8.18	-375.81
6/20/96	-19.48	-1.19	-5.54	-248.17	-25.71	4.00	-4.14	-4.25	-288.56	-320.49	-247.48	-78.33	-8.97	-375.59
6/27/96	-19.64	-1.57	-5.93	-246.59	-27.00	3.00	-6.89	-4.86	-285.61	-326.55	-246.85	-79.02	-9.71	-374.76
7/5/96	-19.83	-1.66	-5.98	-246.21	-27.00	3.00	-6.87	-4.95	-278.78	-326.39	-246.04	-78.85	-9.47	-374.59
7/11/96	-20.16	-1.89	-6.12	-246.18	-27.00	0.00	-11.38	-6.04	-272.48	-326.35	-247.35	-78.77	-9.72	-374.19
7/17/96	-20.18	-1.95	-6.21	-245.62	-27.00	0.00	-13.35	-7.41	-266.52	-326.33	-245.13	-78.89	-10.03	-373.83
7/25/96	-20.49	-2.11	-6.49	-245.11	-27.00	0.00	-13.41	-7.78	-269.57	-324.86	-244.18	-78.59	-11.15	-373.42
8/1/96	-20.73	-2.32	-6.49	-244.97	-27.00	0.00	-12.79	-7.89	-274.21		-244.02	-78.51	-11.24	-373.37
8/9/96	-21.17	-2.47	-6.61	-245.08	-27.00	0.00	-14.01	-8.91	-270.82	-332.41	-243.58	-78.87	-11.53	-373.04
8/15/96	-21.32	-2.47	-6.64	-245.15	-27.00	0.00	-14.61	-9.88	-270.31	-326.37	-242.08	-78.74		-372.74
8/22/96	-21.49	-2.51	-6.68	-244.91	-27.00	0.00	-15.24	-10.67	-270.12	-326.41	-242.43	-78.22	-12.58	-372.51
9/6/96	-22.01	-2.62	-6.75	-243.95	-27.00	0.00	-15.55	-11.31	-269.29	-326.42	-241.87	-78.64	-11.97	
9/12/96	-22.29	-2.69	-6.81	-243.78	-27.00	0.00	-15.74	-11.56	-271.59	-325.01	-241.69	-78.75	-12.04	-372.32
9/19/96	-22.69	-2.81	-6.79	-243.83	-27.00	0.00	-15.87	-11.72	-272.84	-335.08	-241.49	-79.81	-12.14	-372.17
10/1/96	-23.79	-2.68	-6.80	-243.63	-27.00	0.00	-16.47	-12.59	-278.51	-326.26	-240.83	-78.81	-12.32	-371.98
Mean	**-24.26**	**-2.25**	**-6.10**	**-245.61**	**-26.71**	**0.58**	**-16.29**	**-14.86**	**-299.77**	**-327.38**	**-259.33**	**-79.64**	**-11.95**	**-377.70**
Max	**-31.32**	**-3.14**	**-6.81**	**-248.55**	**-27.00**	**0.00**	**-24.06**	**-26.57**	**-327.48**	**-335.08**	**-284.78**	**-83.59**	**-15.21**	**-382.59**
Min	**-19.48**	**0.00**	**-2.78**	**-243.63**	**-21.13**	**4.00**	**-4.14**	**-4.25**	**-266.52**	**-320.49**	**-240.83**	**-77.23**	**-7.59**	**-371.98**

APPENDIX D

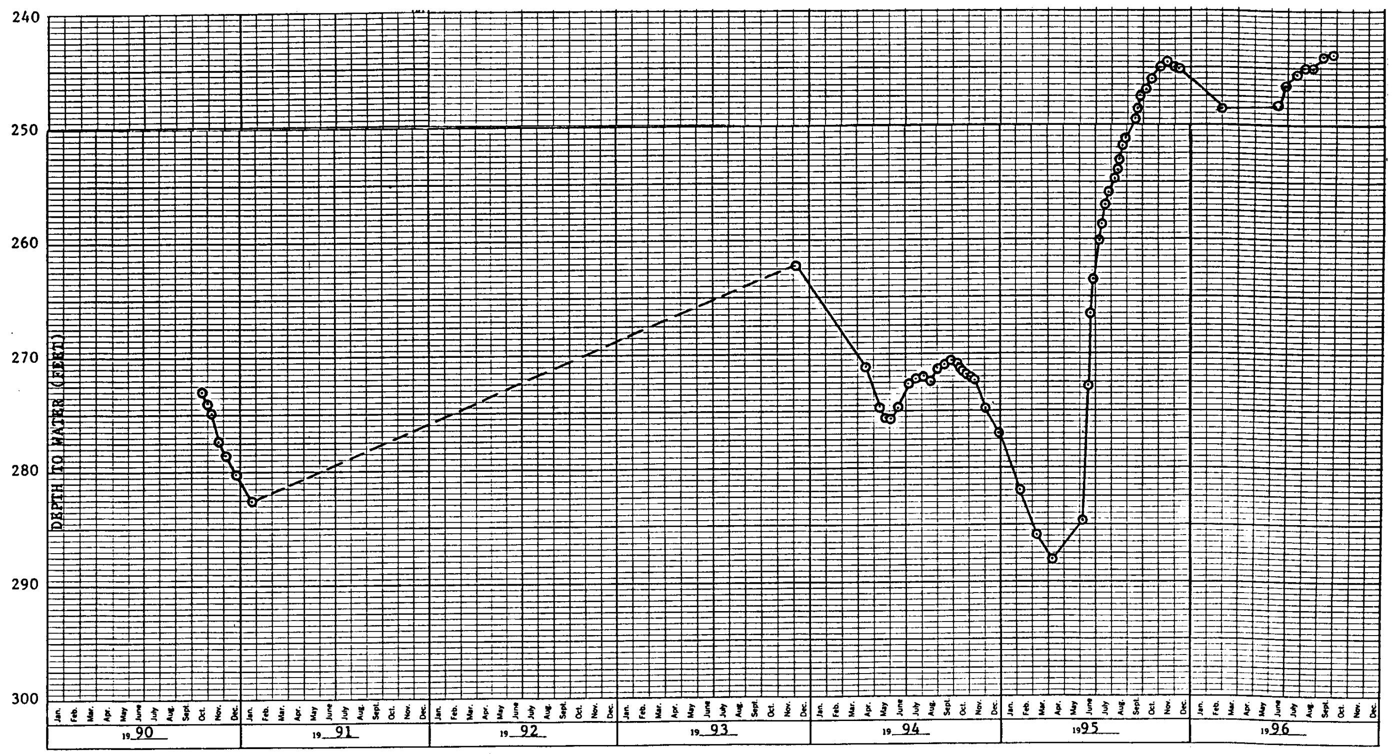
SUPPLEMENTARY WATER-LEVEL HYDROGRAPHS FOR MONITOR WELLS



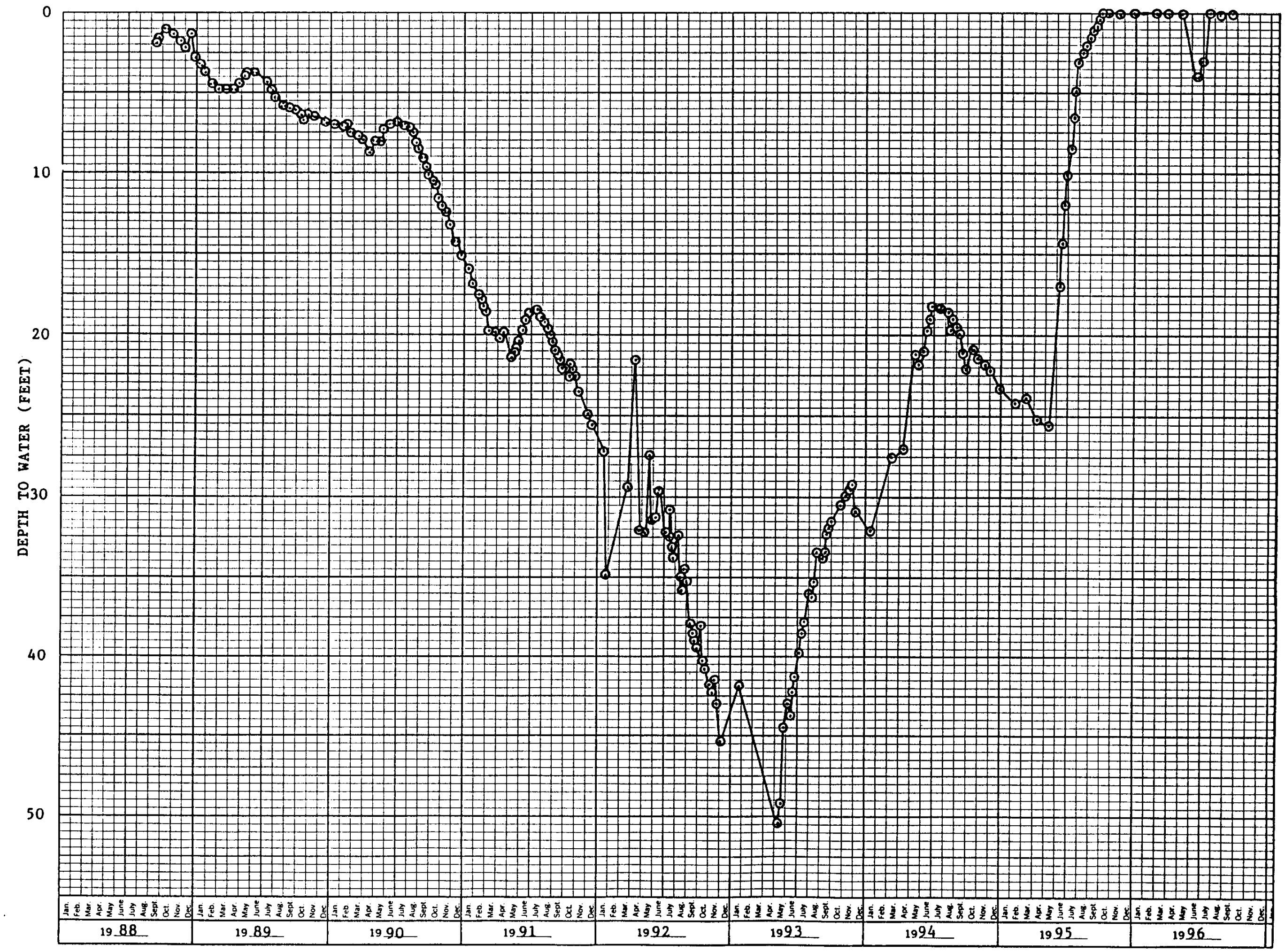
WATER-LEVEL HYDROGRAPH FOR WELL NO. 4M



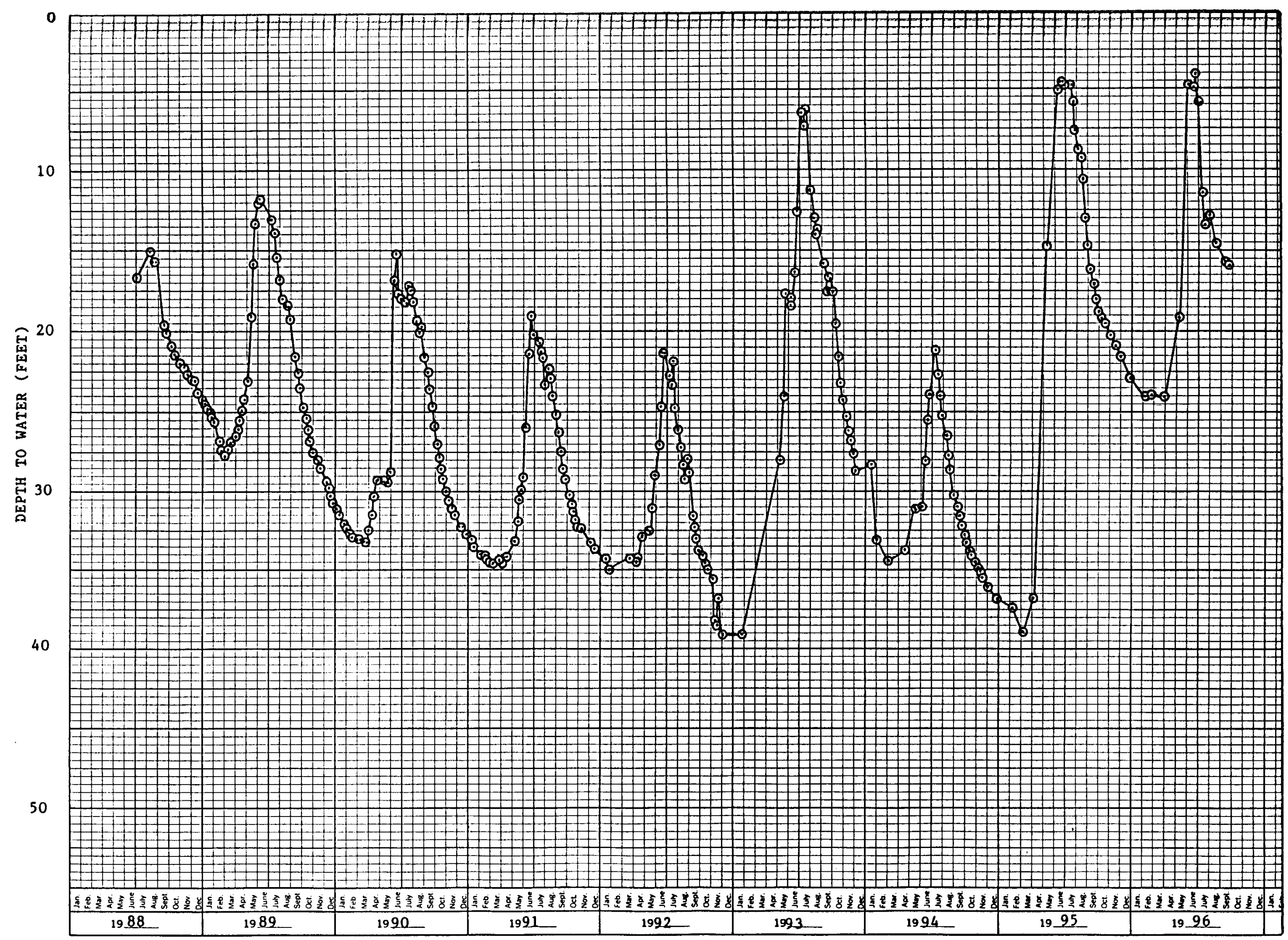
WATER-LEVEL HYDROGRAPHS FOR WELLS NO. 5, NO. 5A, AND NO. 5M



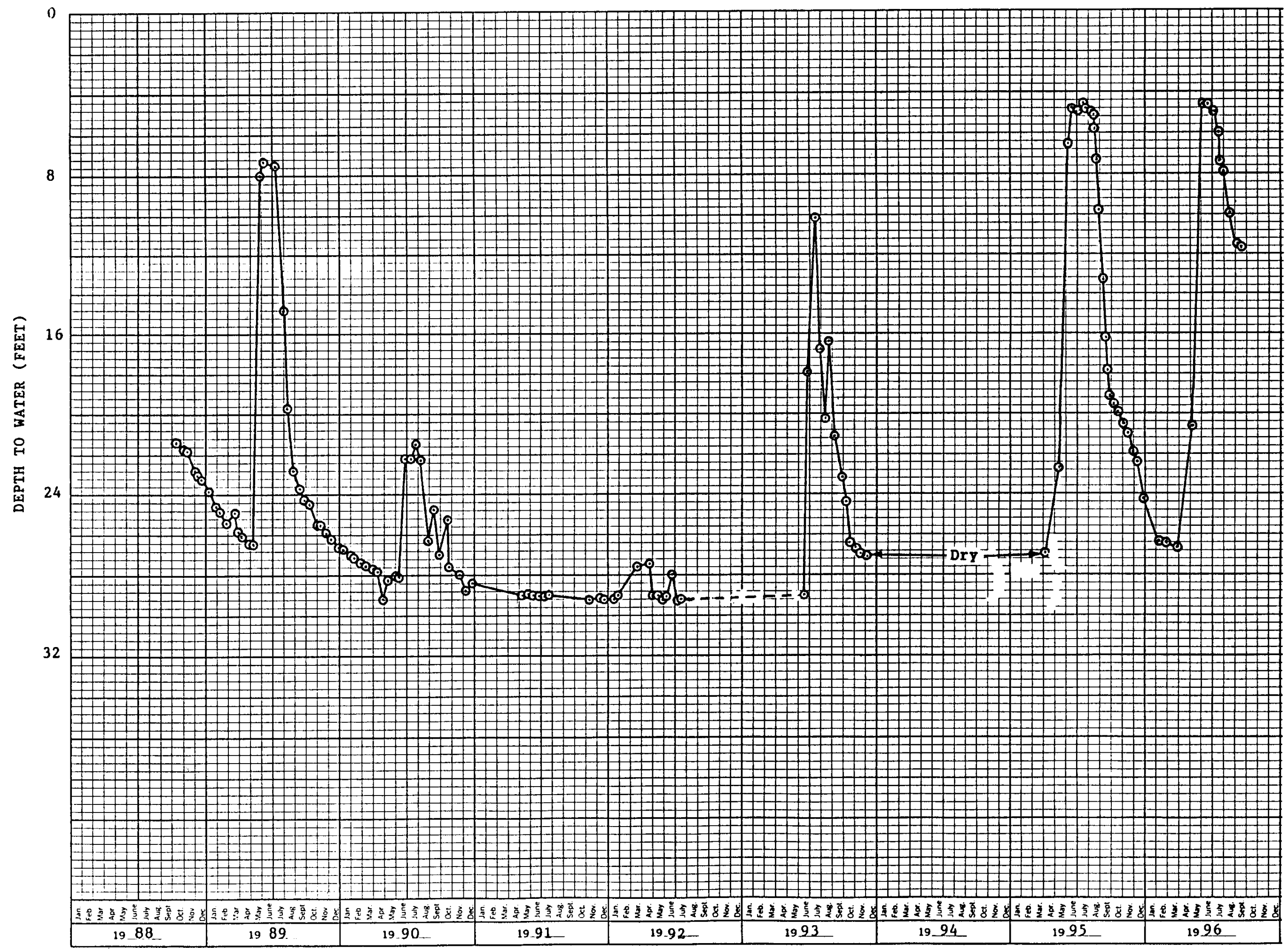
WATER-LEVEL HYDROGRAPH FOR WELL NO. 7



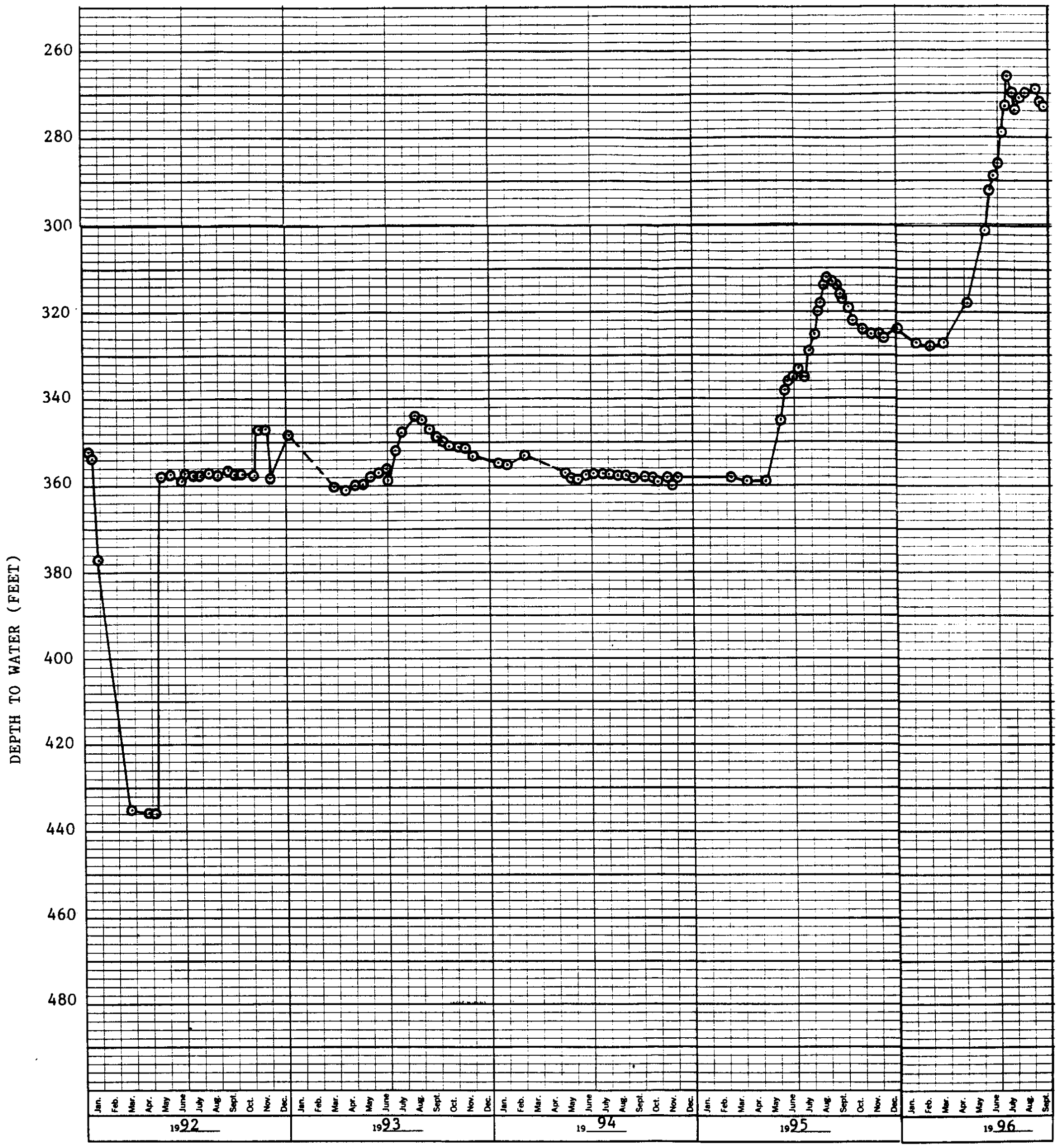
WATER-LEVEL HYDROGRAPH FOR WELL NO. 11



WATER-LEVEL HYDROGRAPH FOR WELL NO. 11M

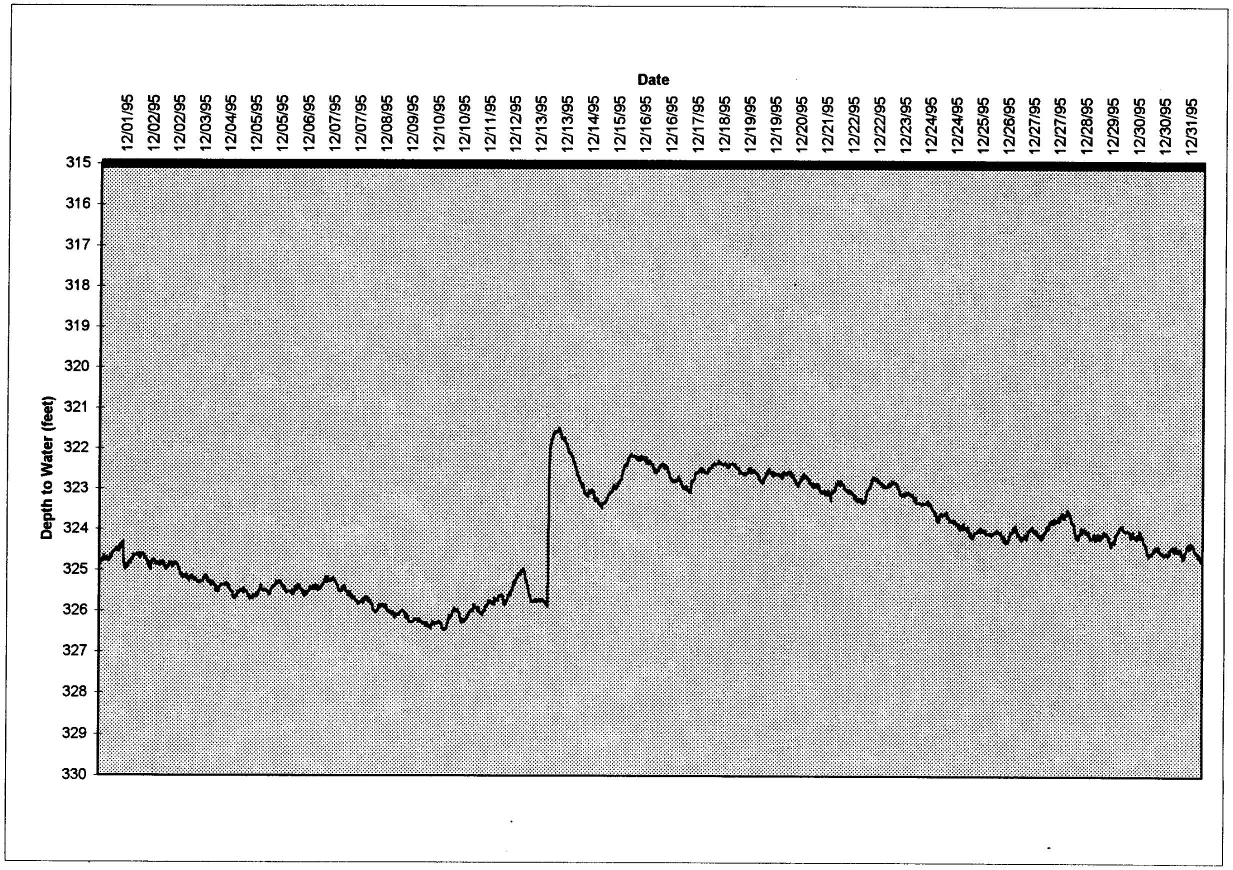


WATER-LEVEL HYDROGRAPH FOR WELL NO. 12M



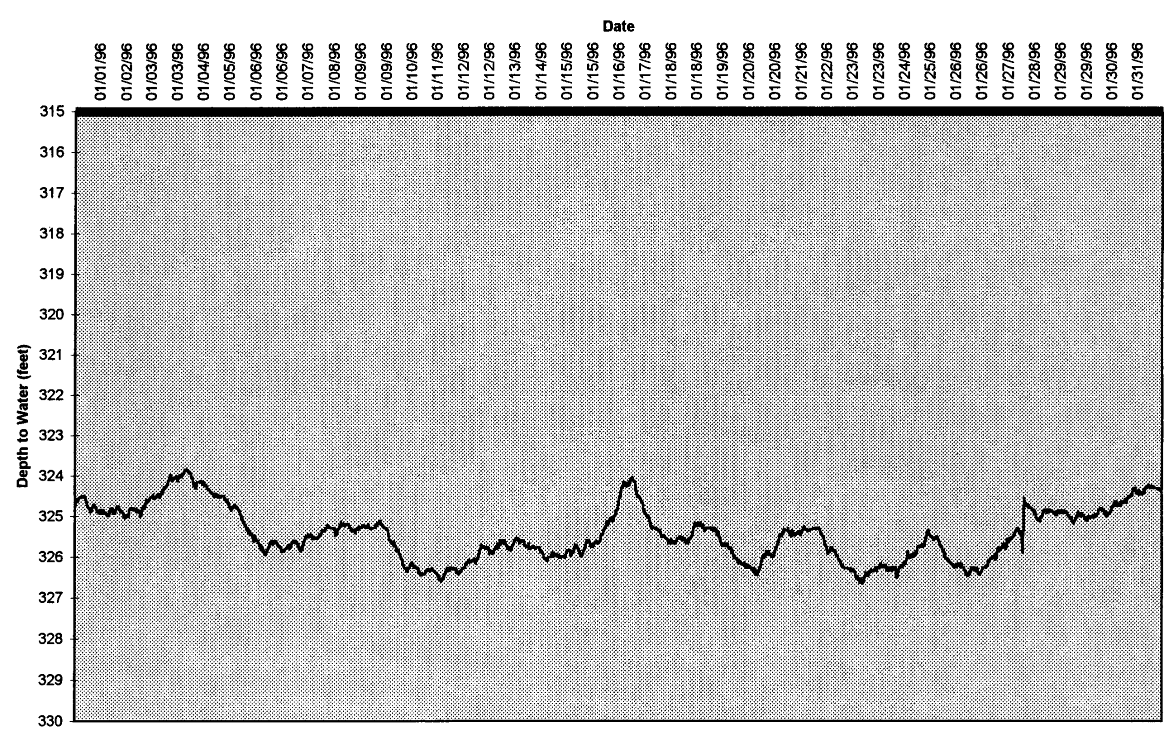
WATER-LEVEL HYDROGRAPH FOR WELL NO. 14M

Well #14 Data Logger



Dec 95 Chart

Well #14 Data Logger



Jan 96 Chart

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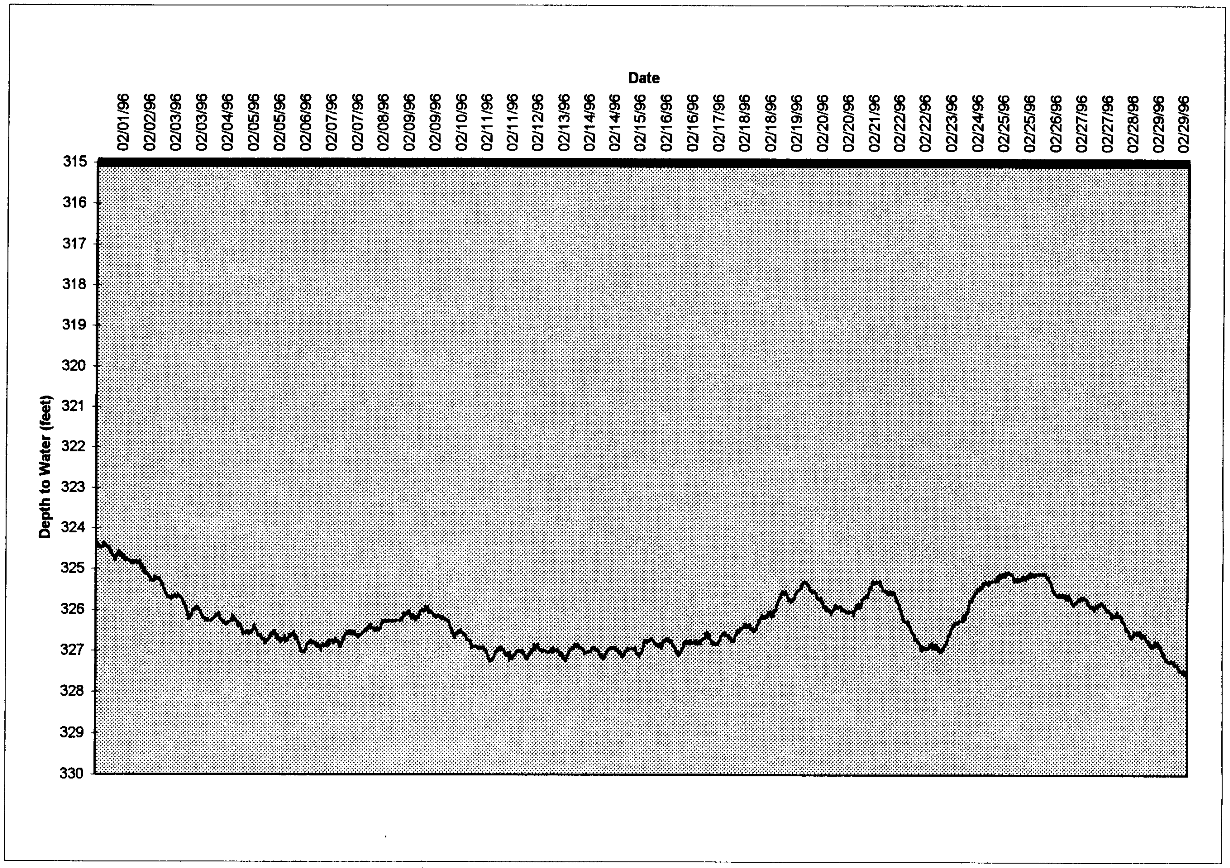

Feb 96 Chart

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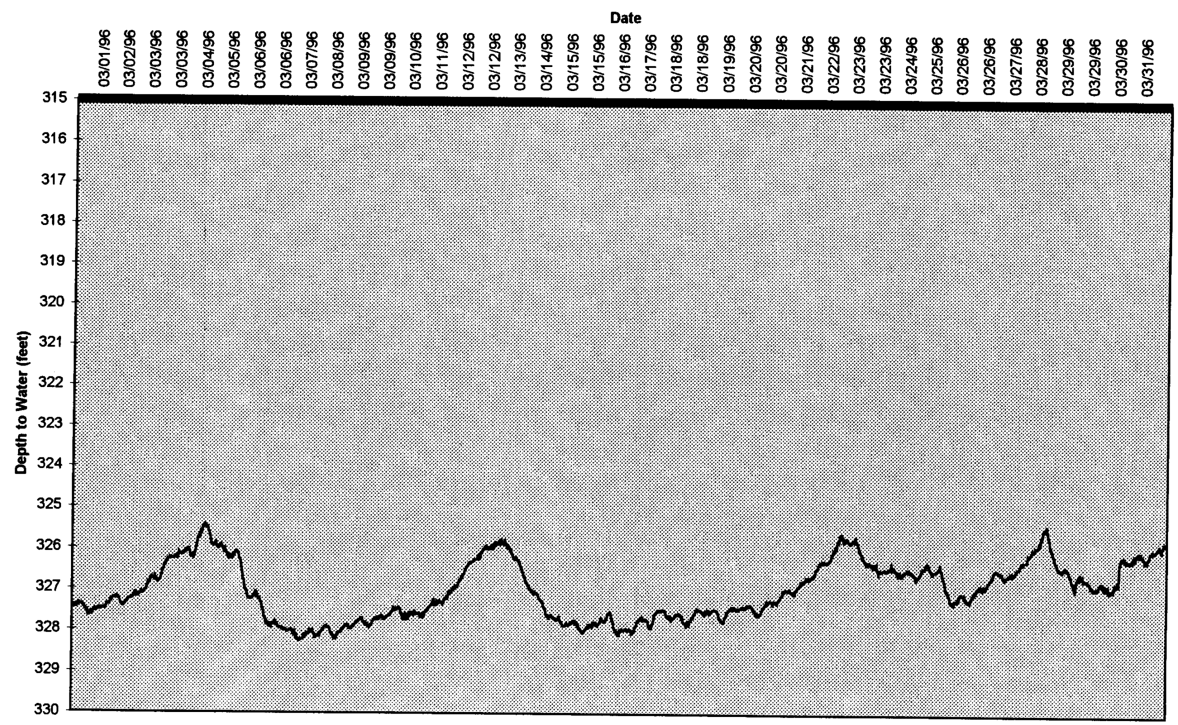
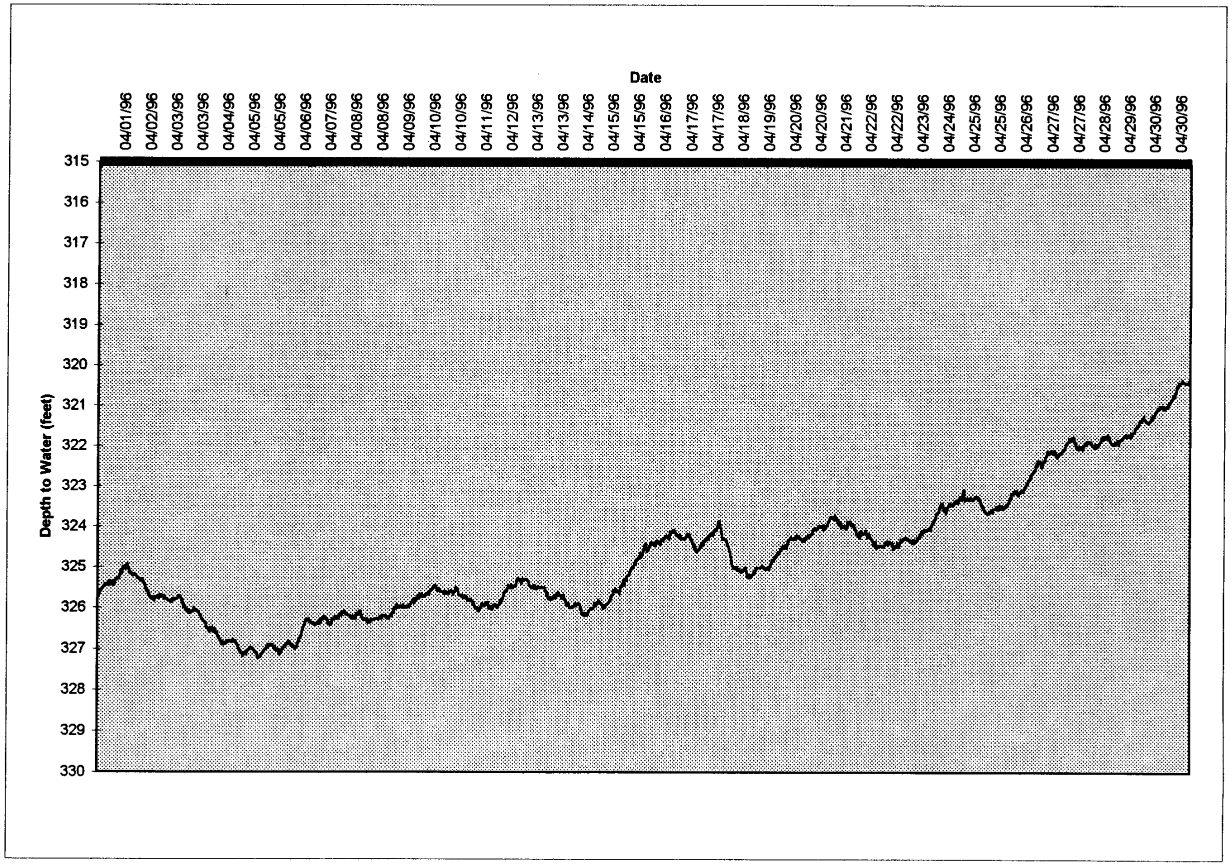


Mar 96 Chart


Date
04/01/96
04/02/96
04/03/96
04/03/96
04/04/96
04/05/96
04/05/96
04/06/96
04/07/96
04/08/96
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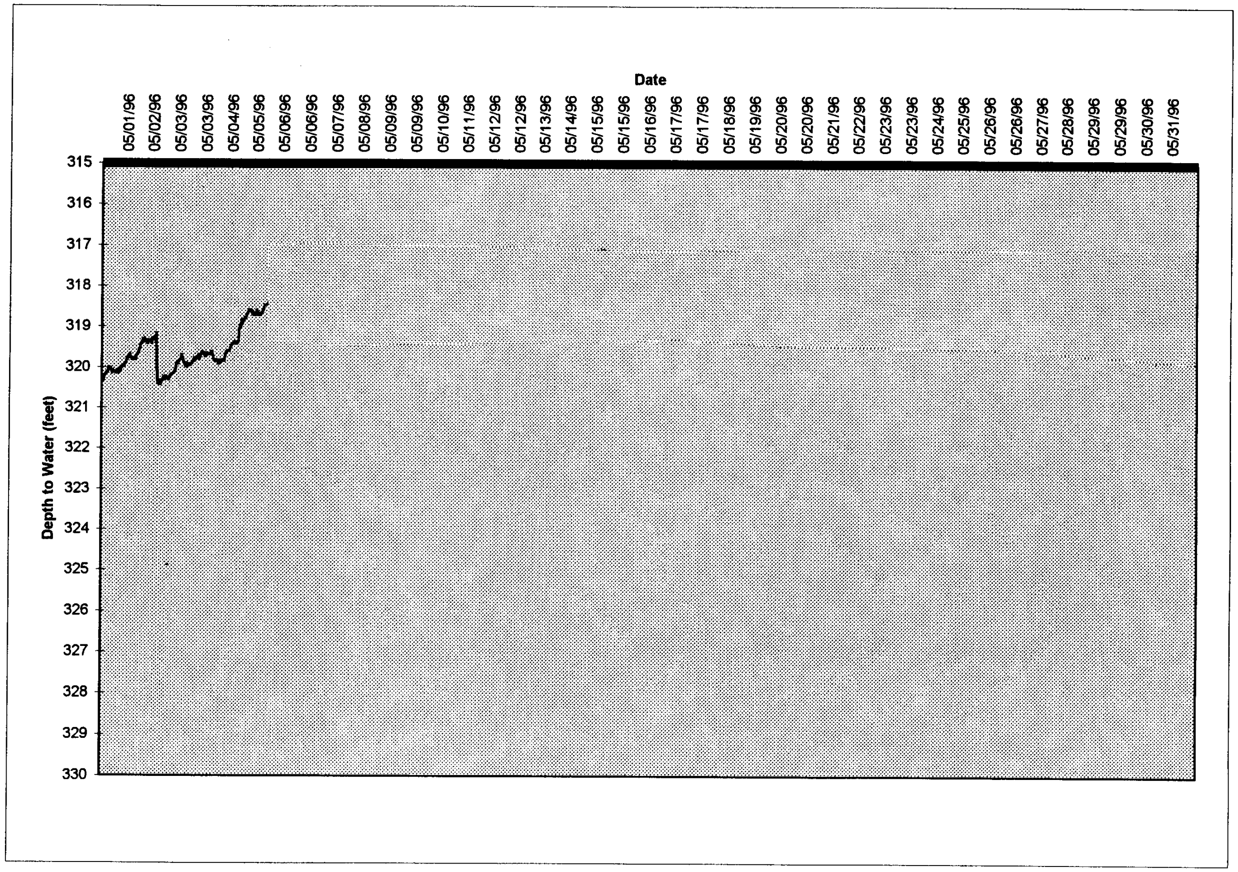
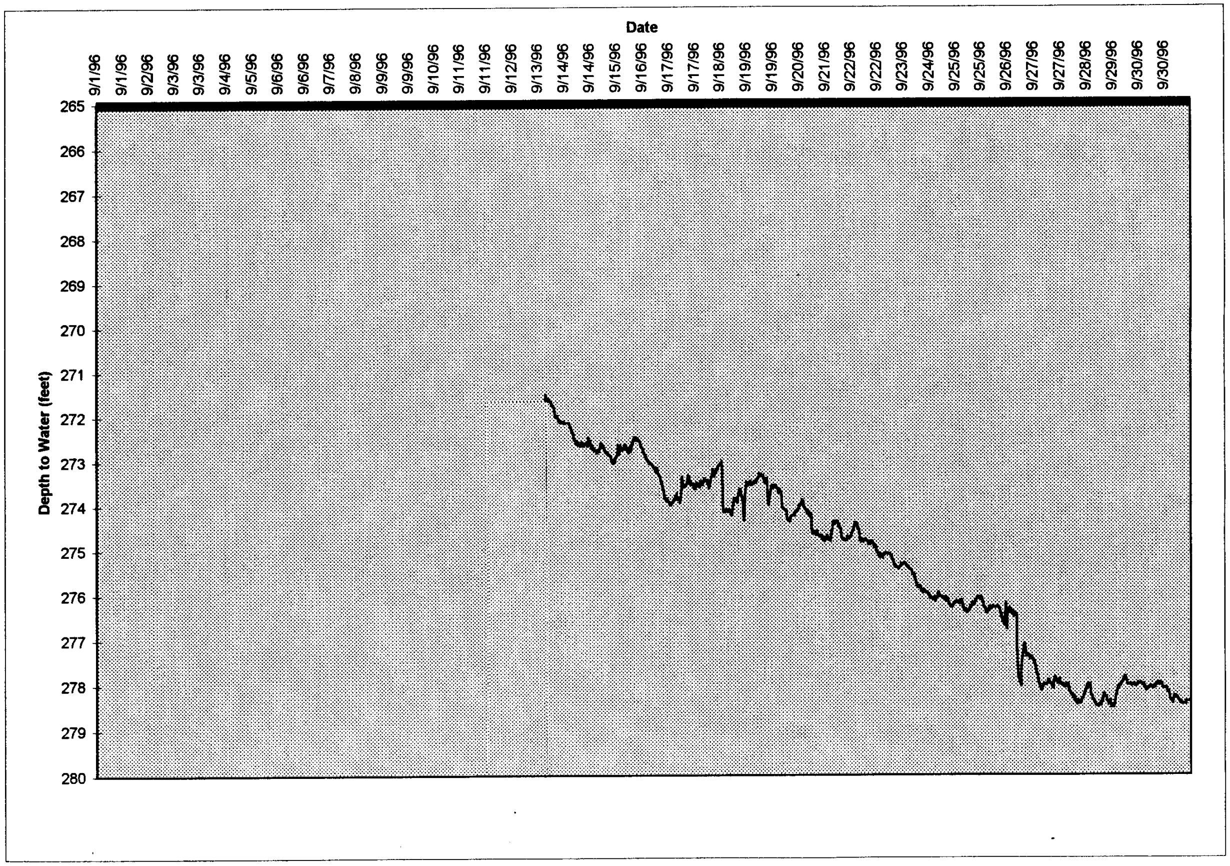
04/25/96
04/25/96
04/26/96
04/27/96
04/27/96
04/28/96
04/29/96
04/30/96
04/30/96
Depth to Water (feet)
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330

Well #14 Data Logger



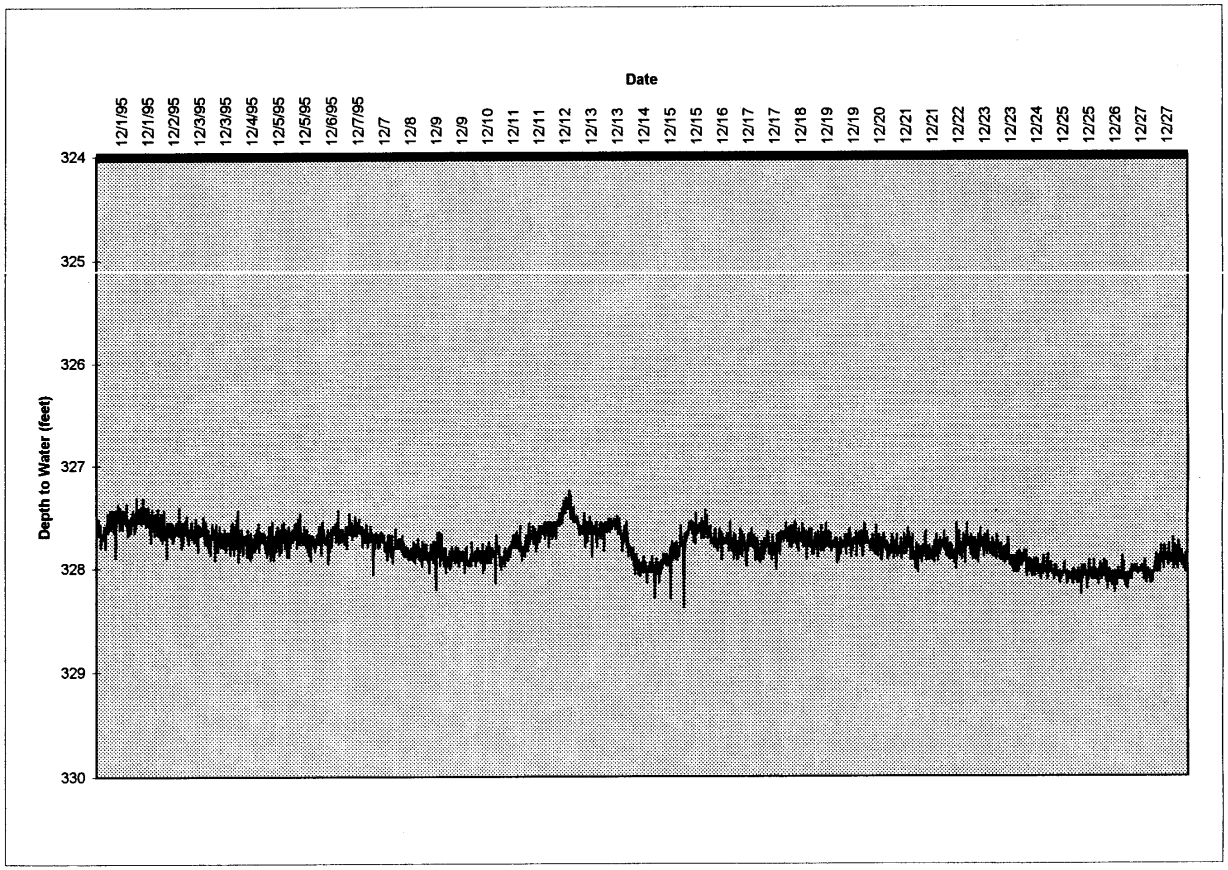
May 96 Chart

Well #14 Data Logger



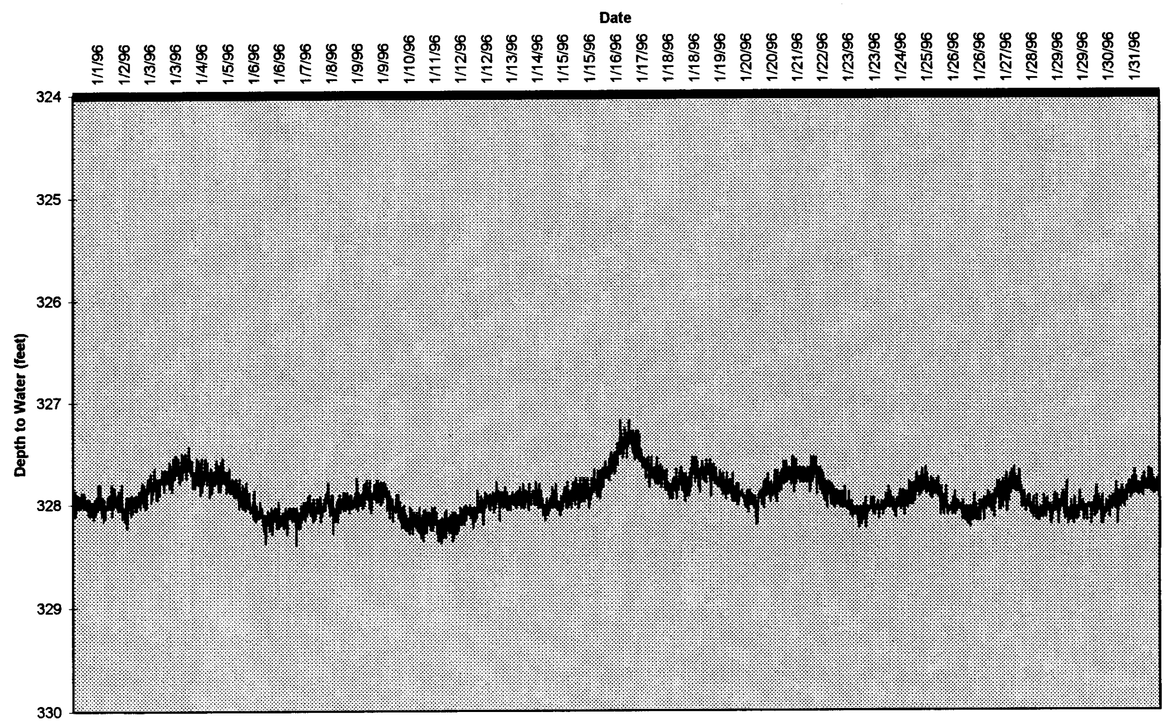
Sep 96 Chart

Well #19 Data Logger



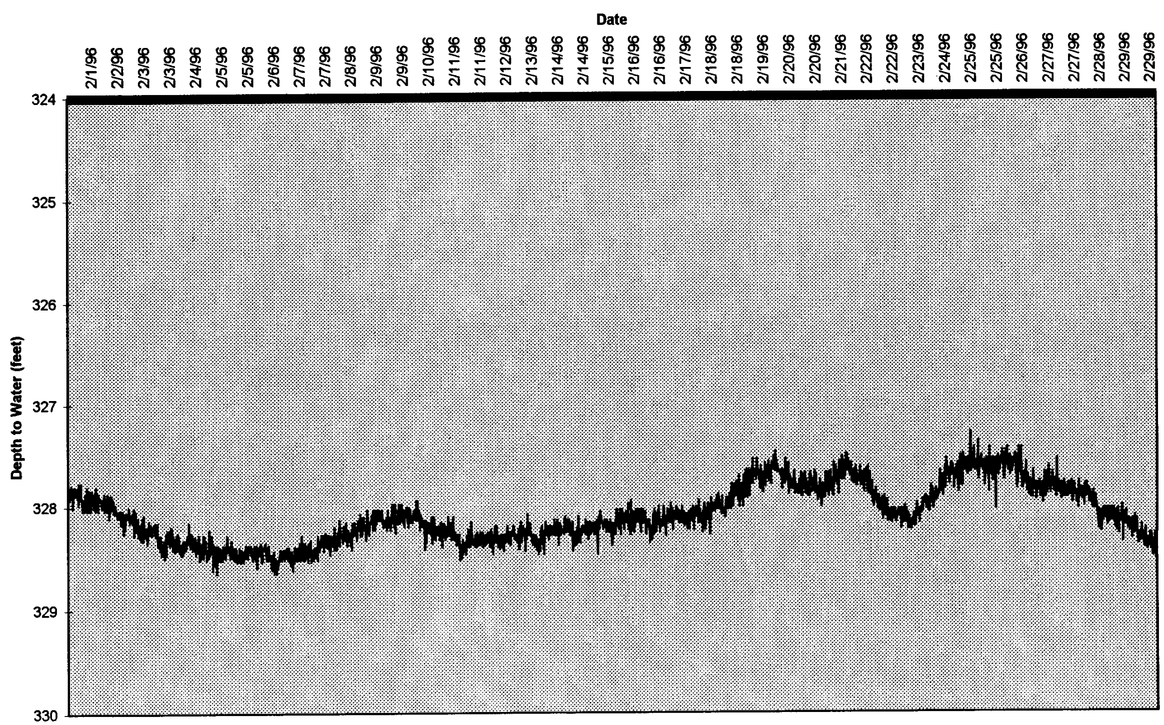
Dec 95 Chart

Well #19 Data Logger



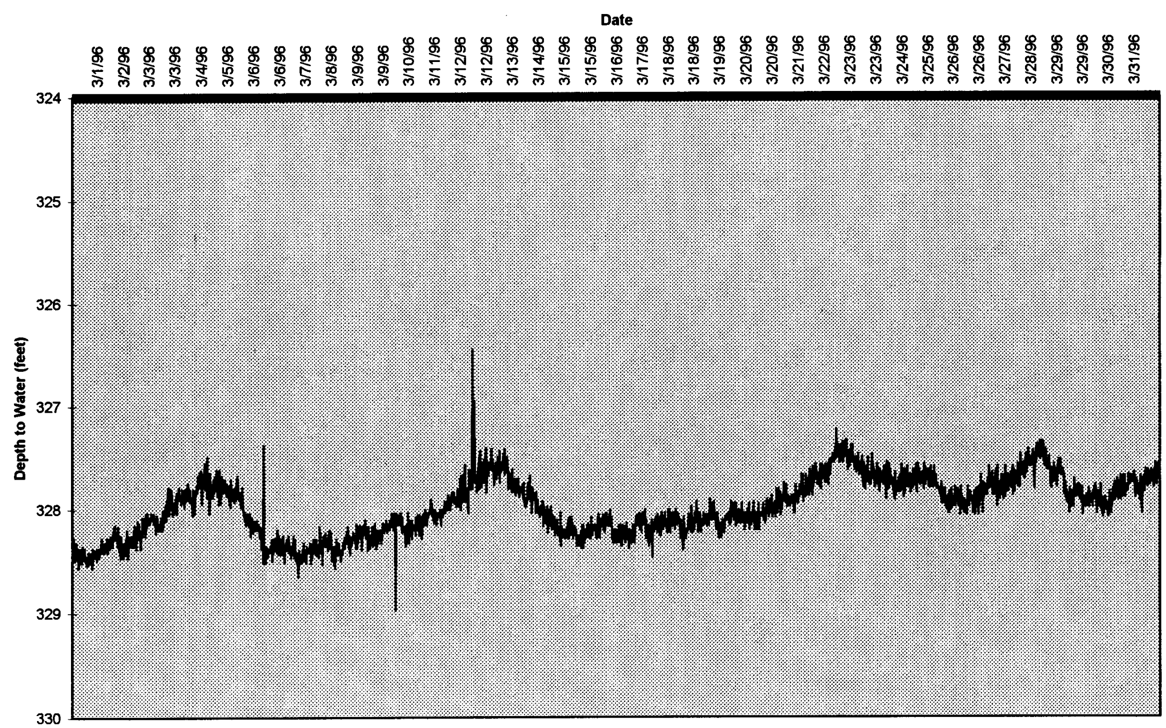
Jan 96 Chart

Well #19 Data Logger



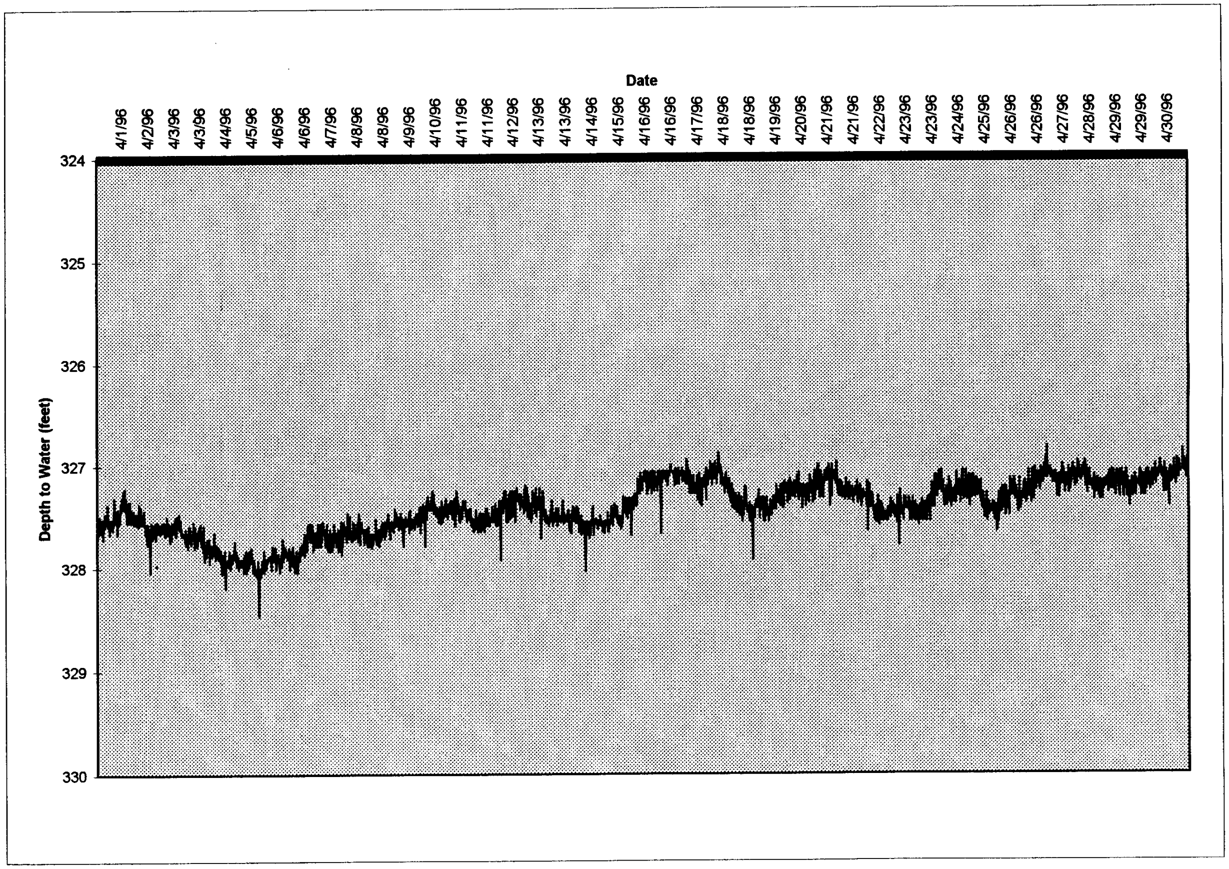
Feb 96 Chart

Well #19 Data Logger



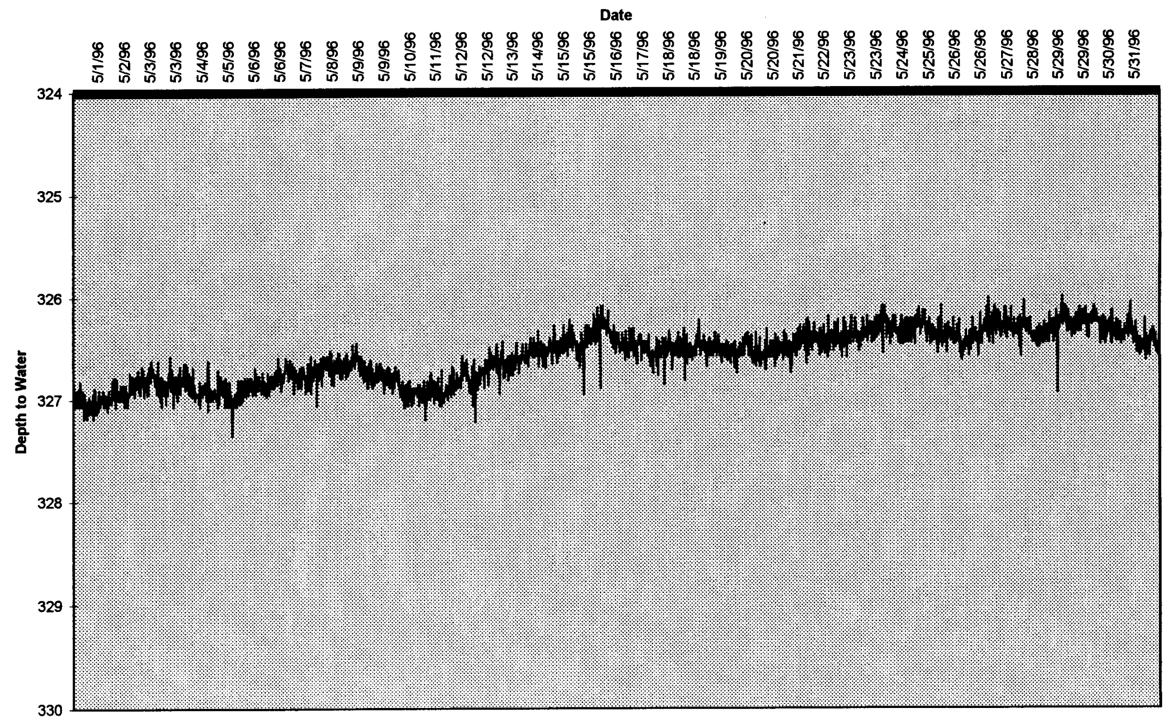
Mar 96 Chart

Well #19 Data Logger



Apr 96 Chart

Well #19 Data Logger



May 96 Chart

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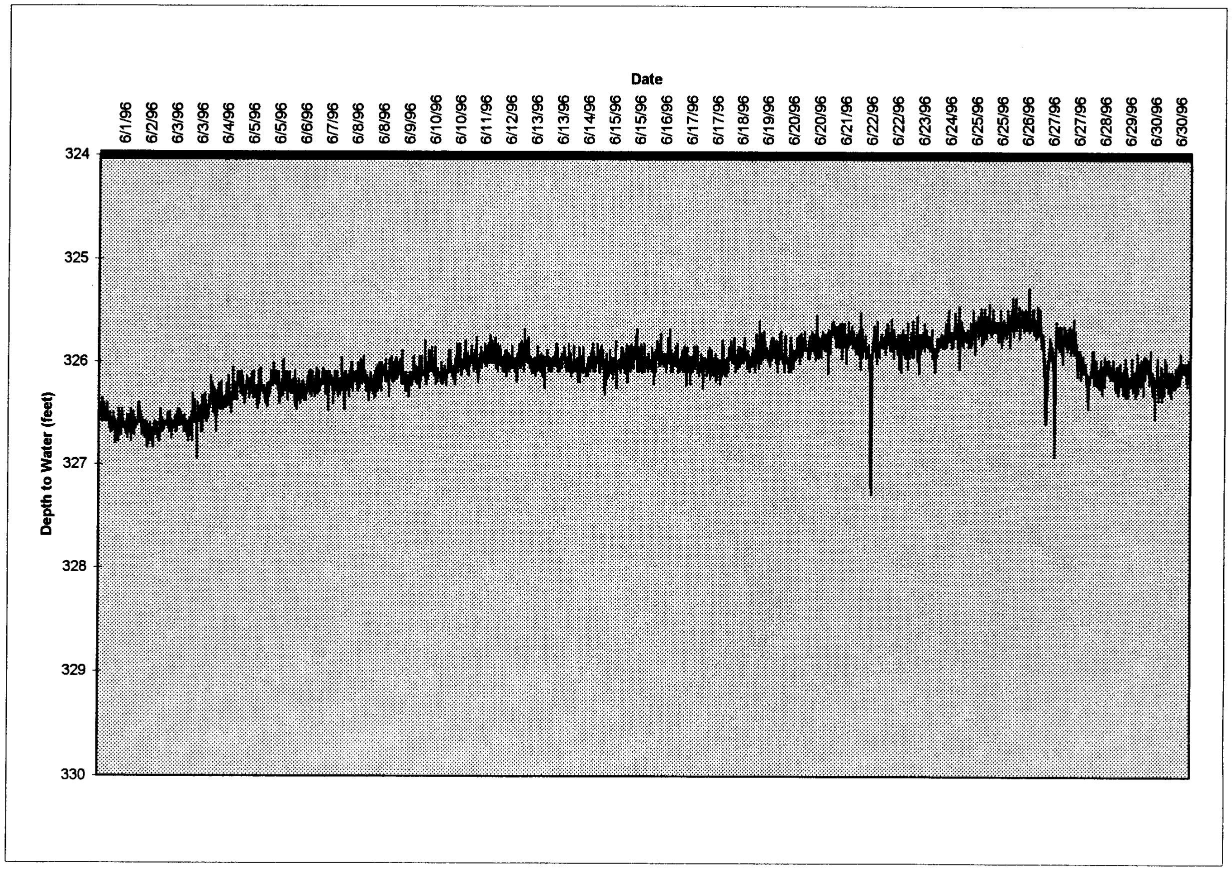
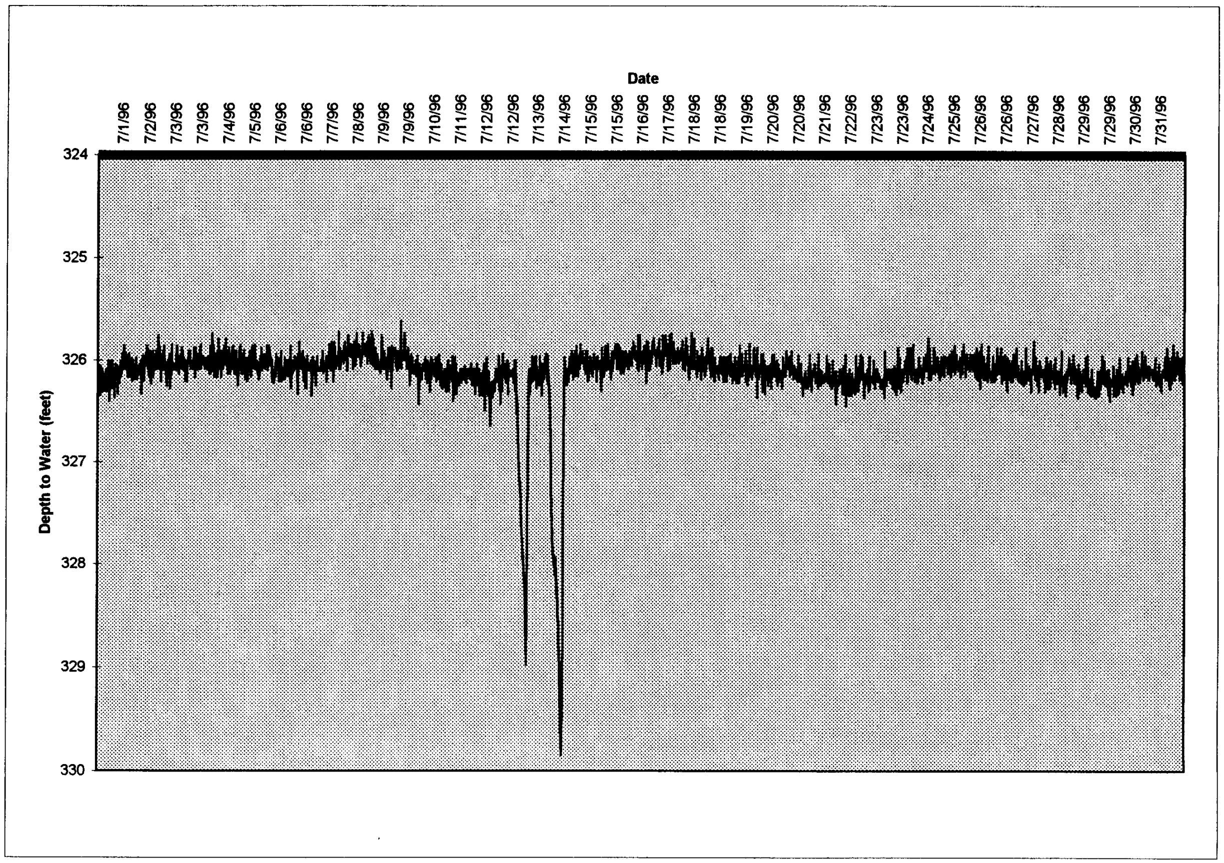


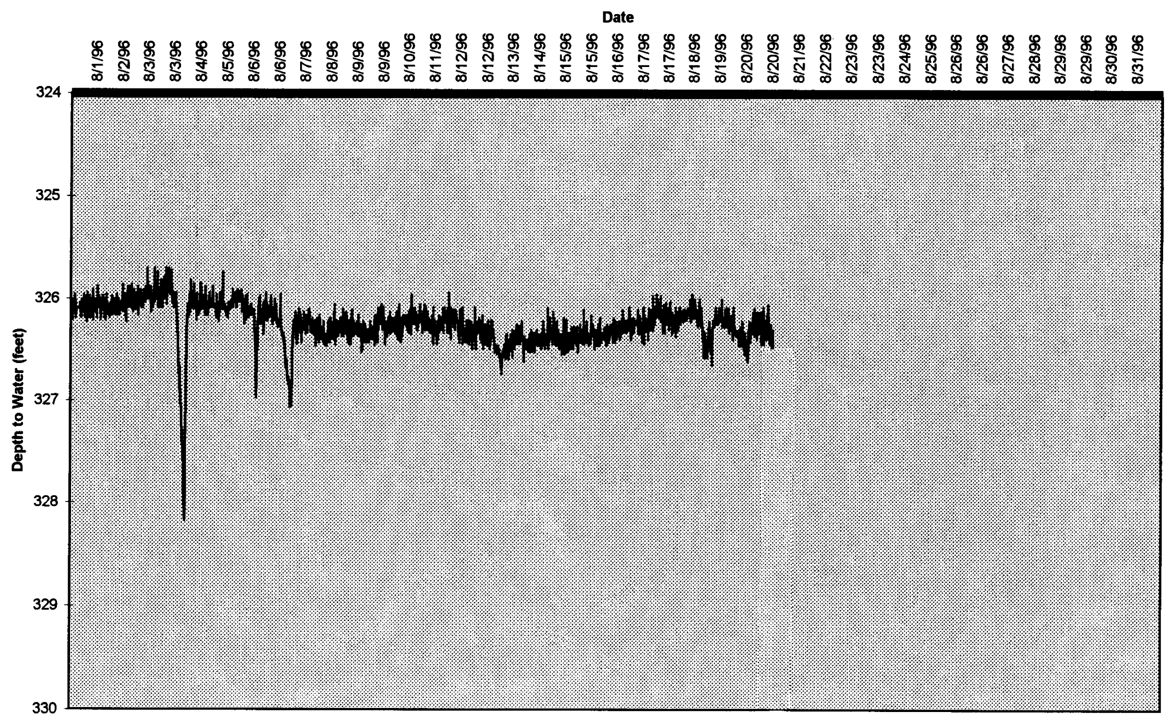
Jun 96 Chart

Well #19 Data Logger



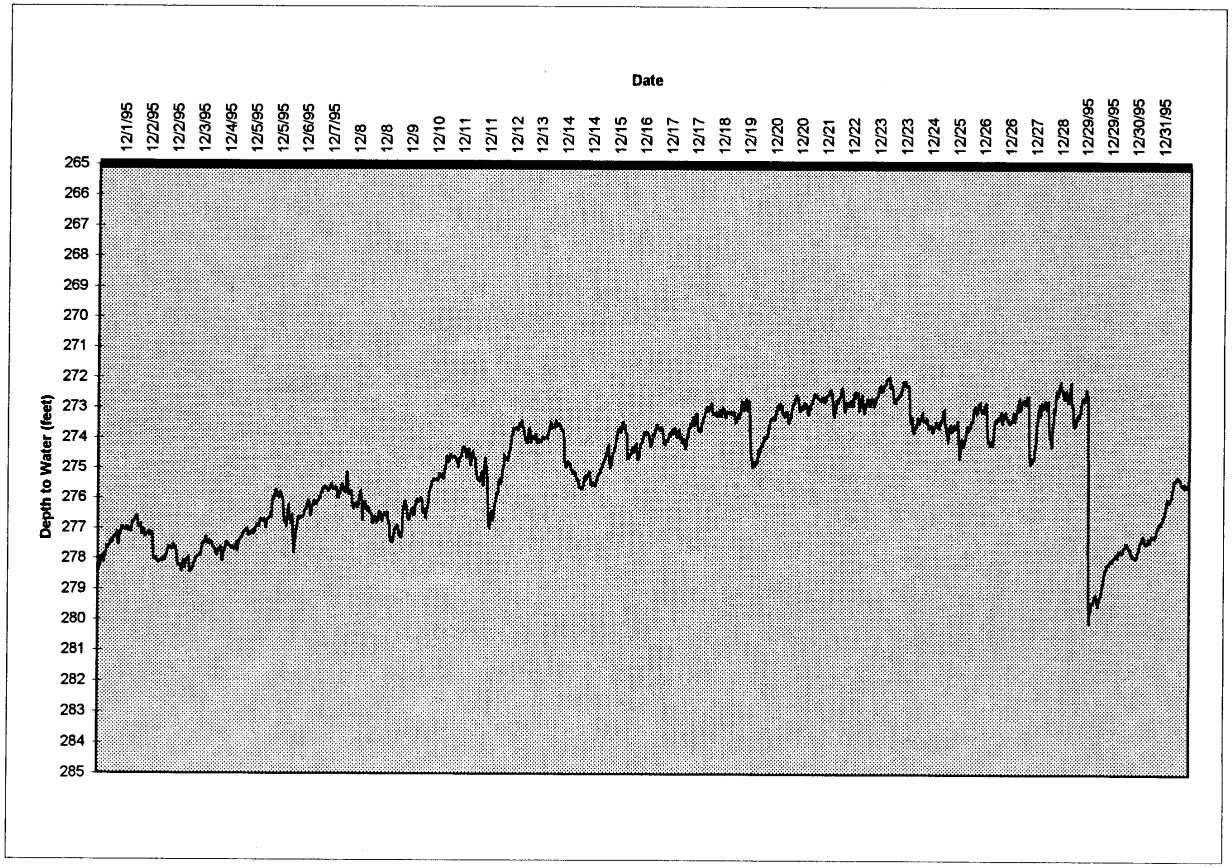
Jul 96 Chart

Well #19 Data Logger



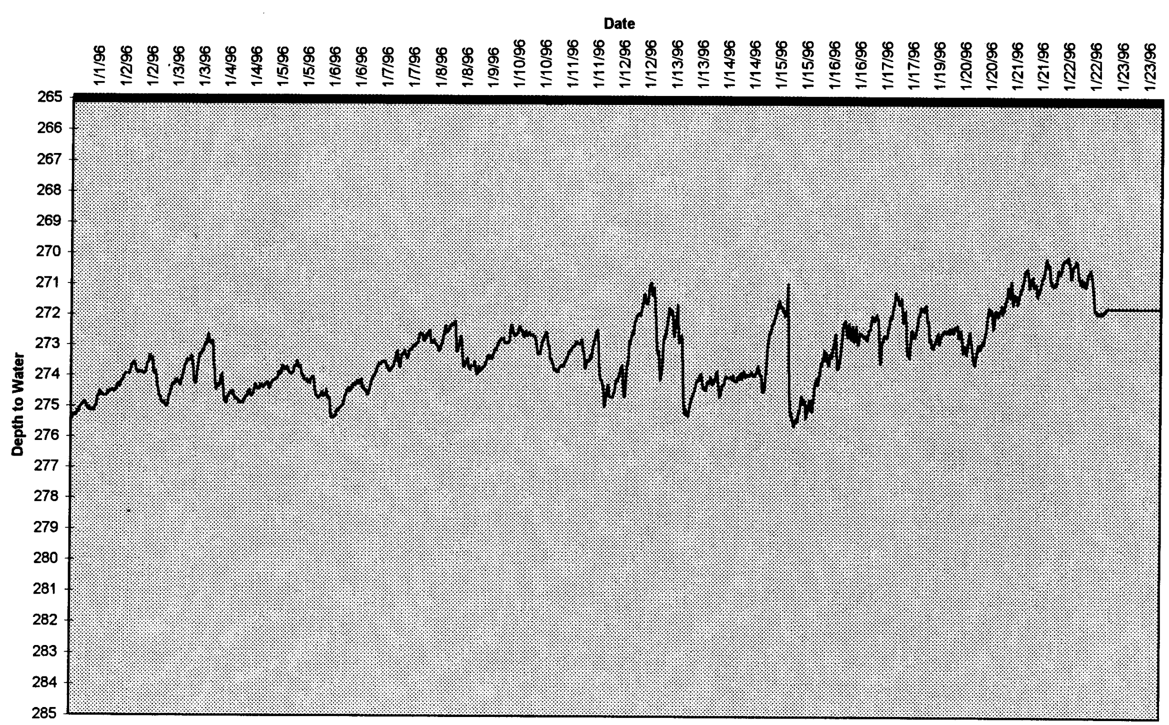
Aug 96 Chart

Well #21 Data Logger



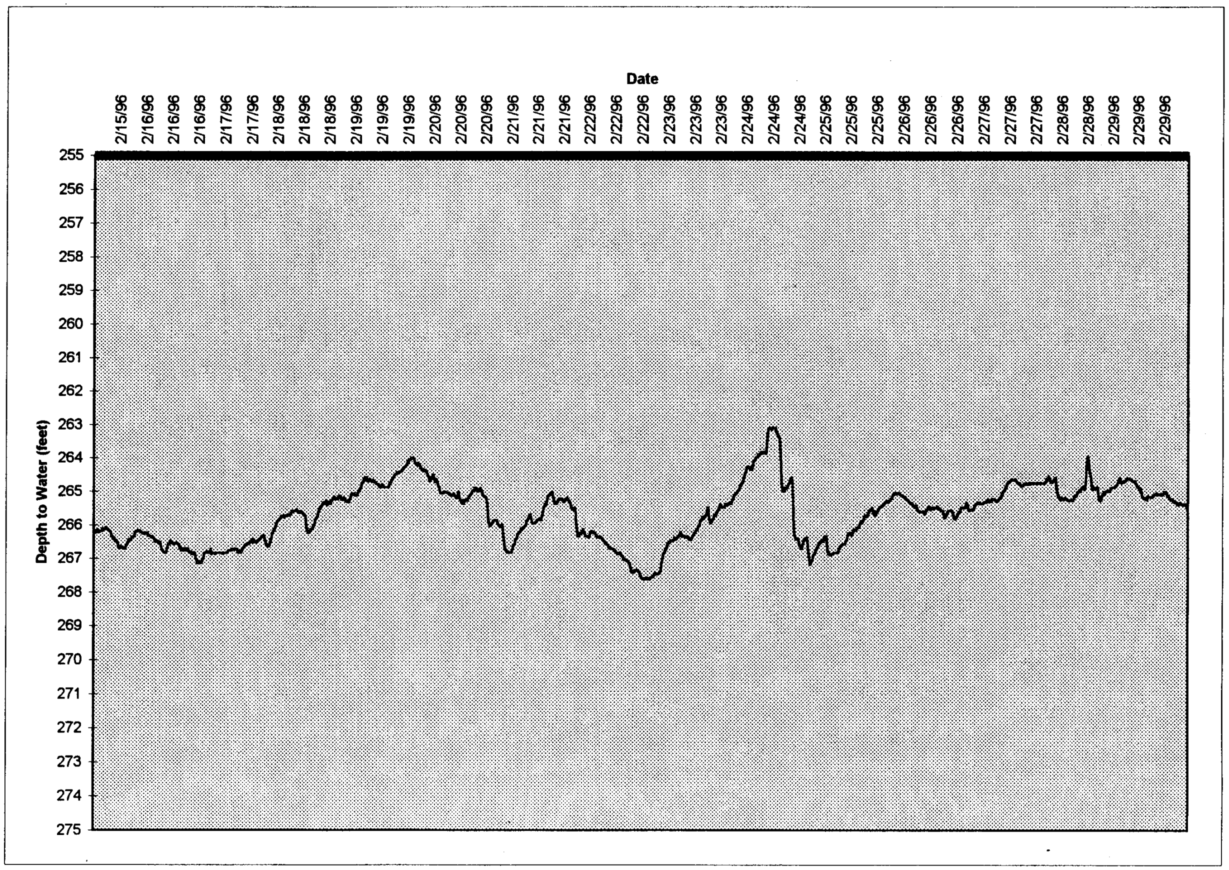
Dec 95 Chart

Well #21 Data Logger



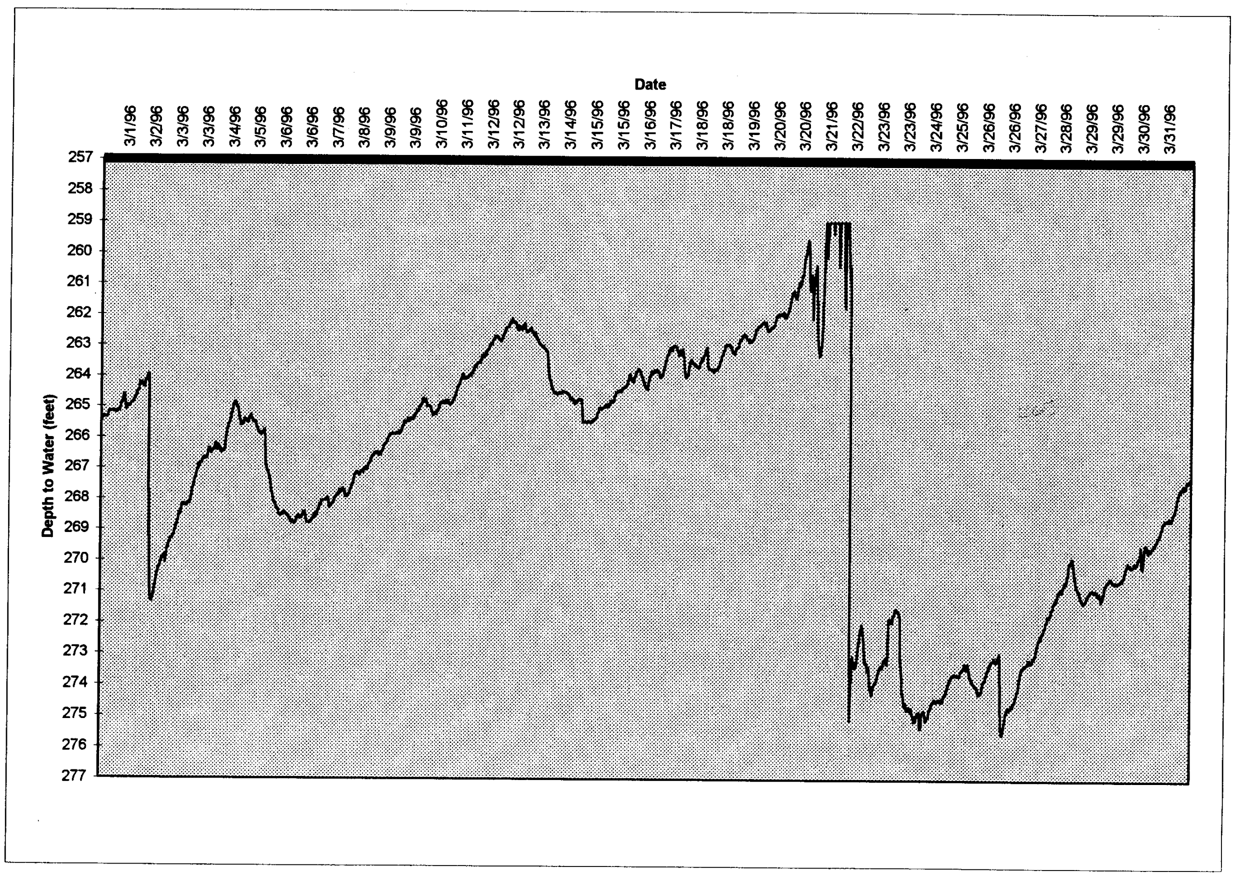
Jan 96 Chart

Well #21 Data Logger



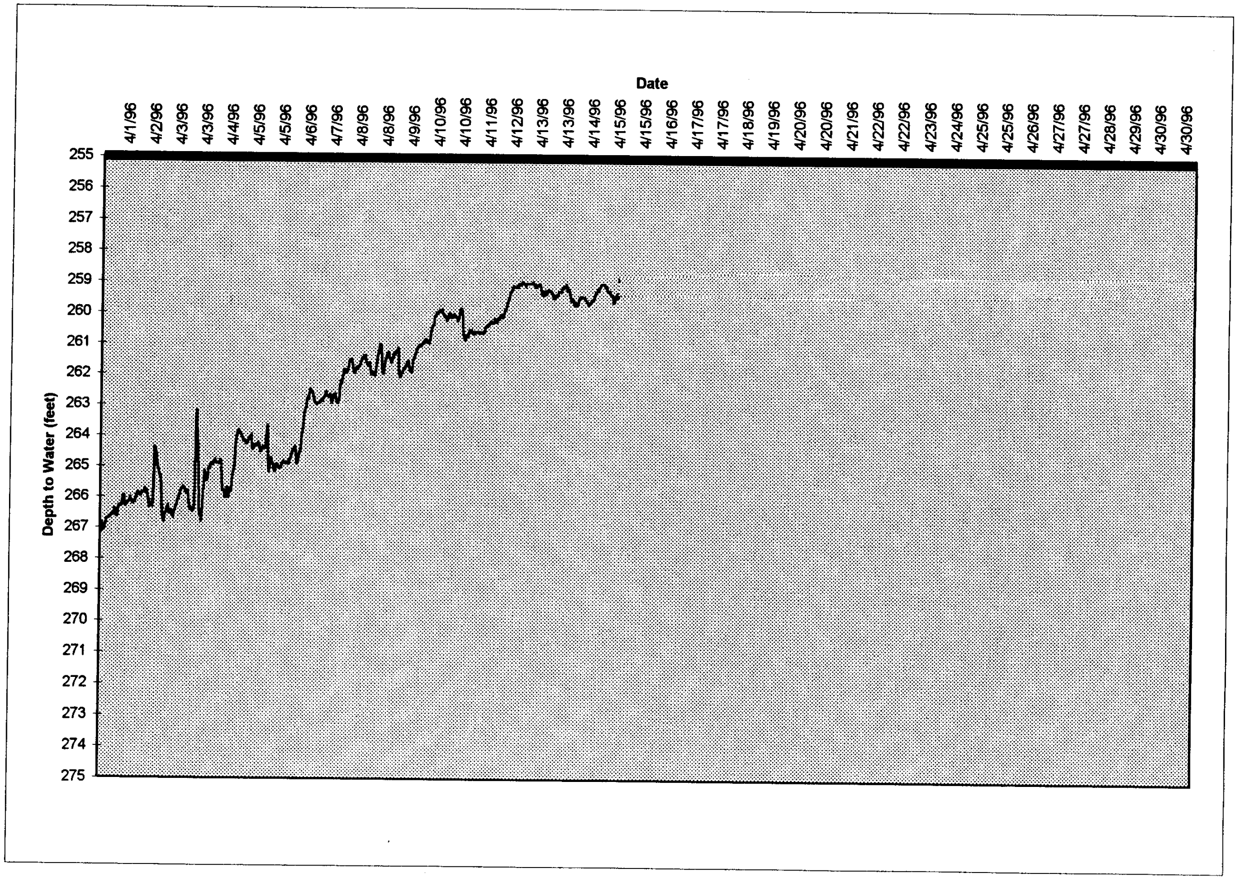
Feb 96 Chart

Well #21 Data Logger



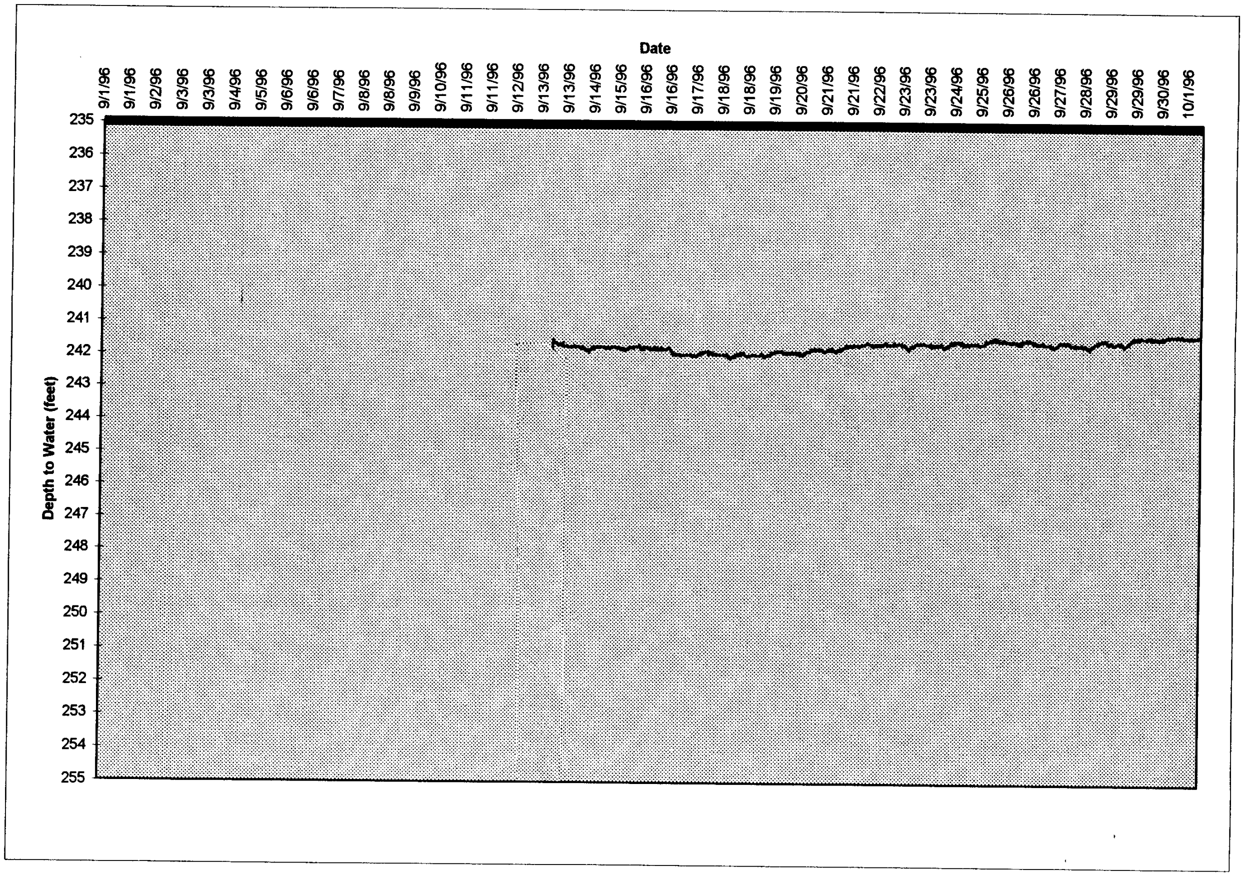
Mar 96 Chart

Well #21 Data Logger

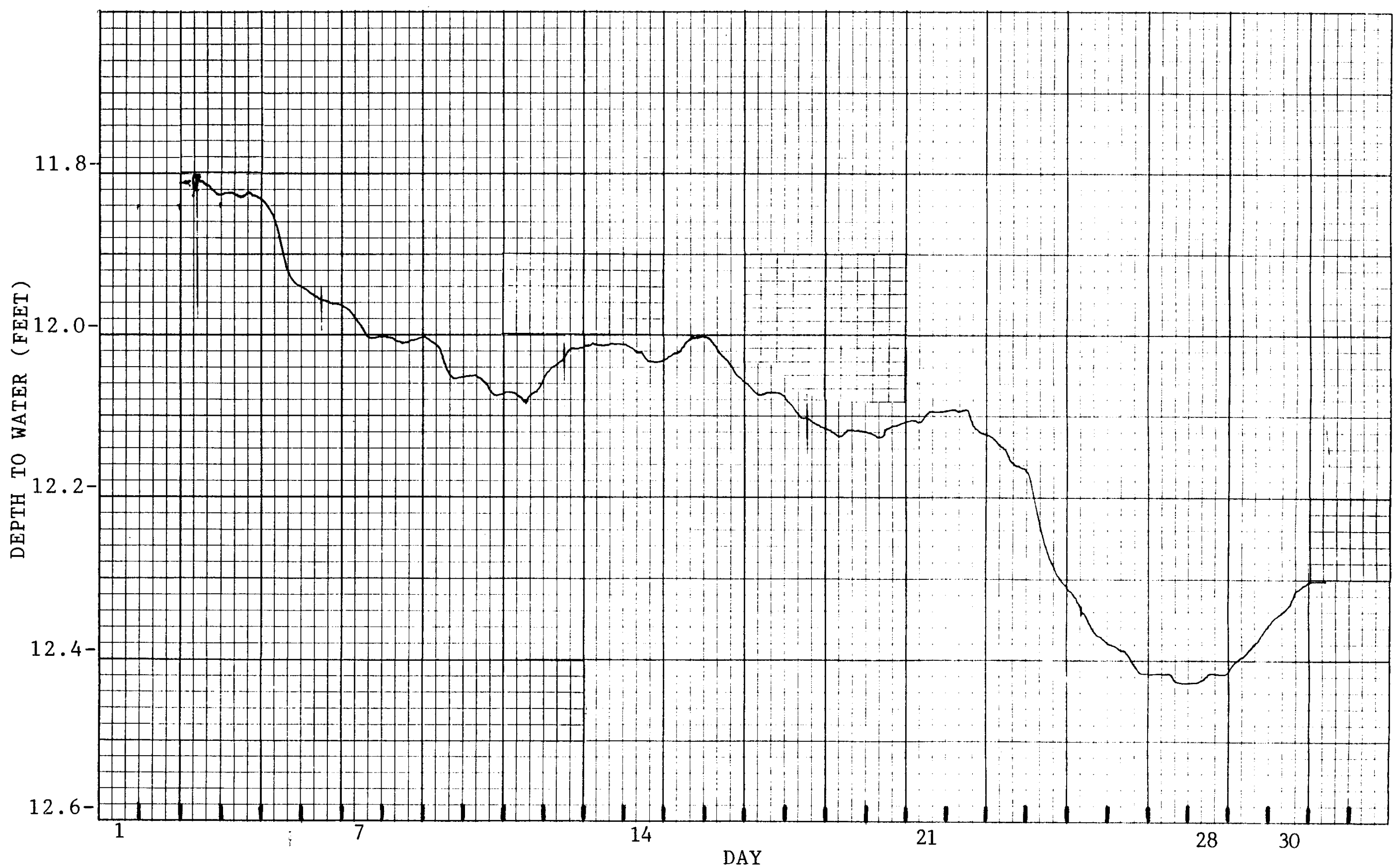


Apr 96 Chart

Well #21 Data Logger

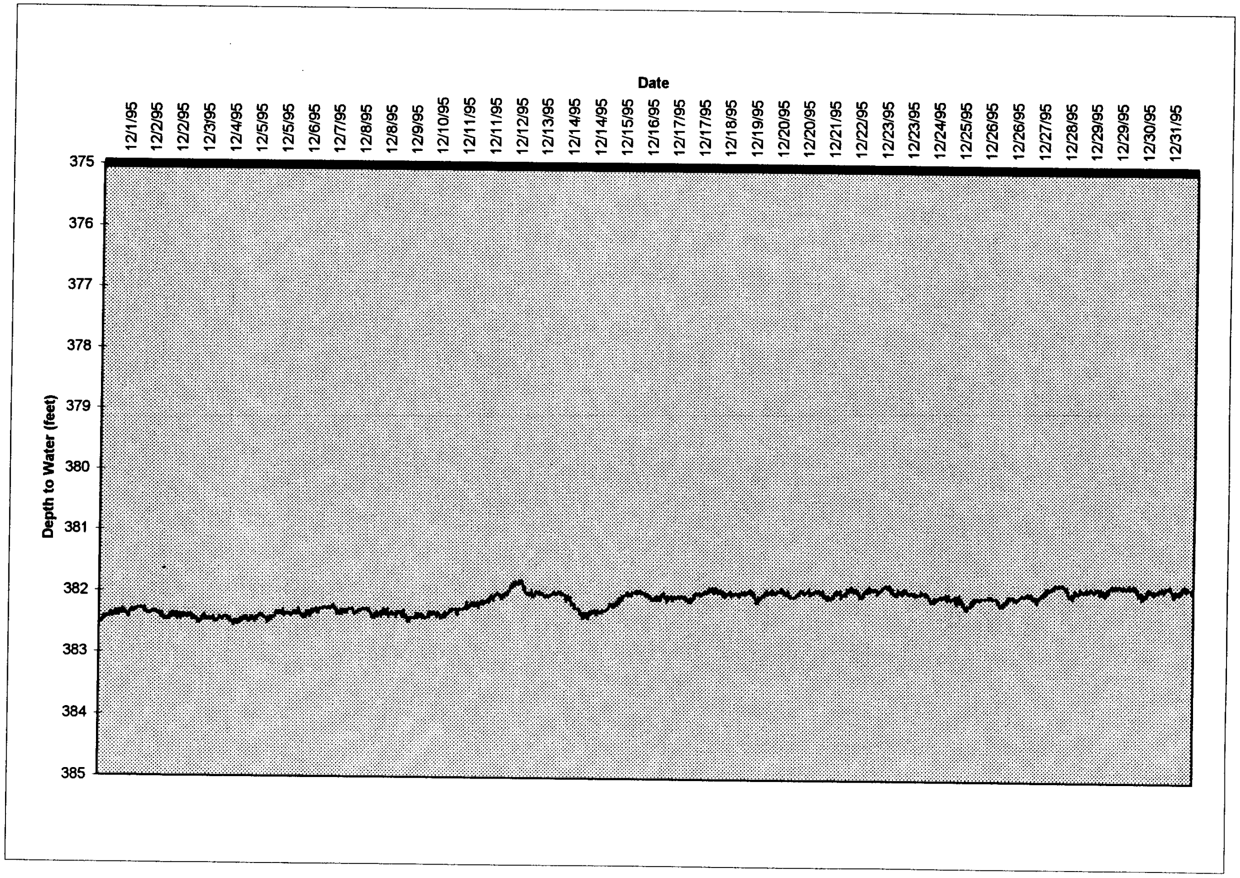


Sept 96 Chart



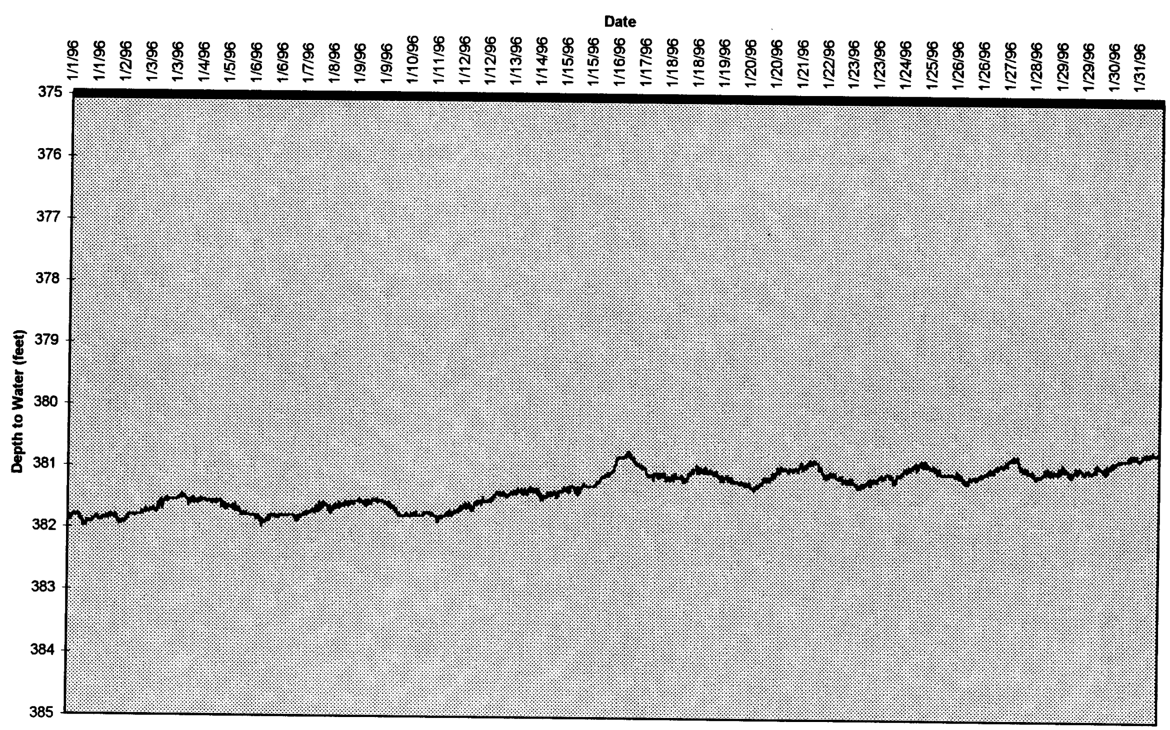
WATER-LEVEL HYDROGRAPH FOR MW-23 (SEPTEMBER 1996)

Well #24 Data Logger



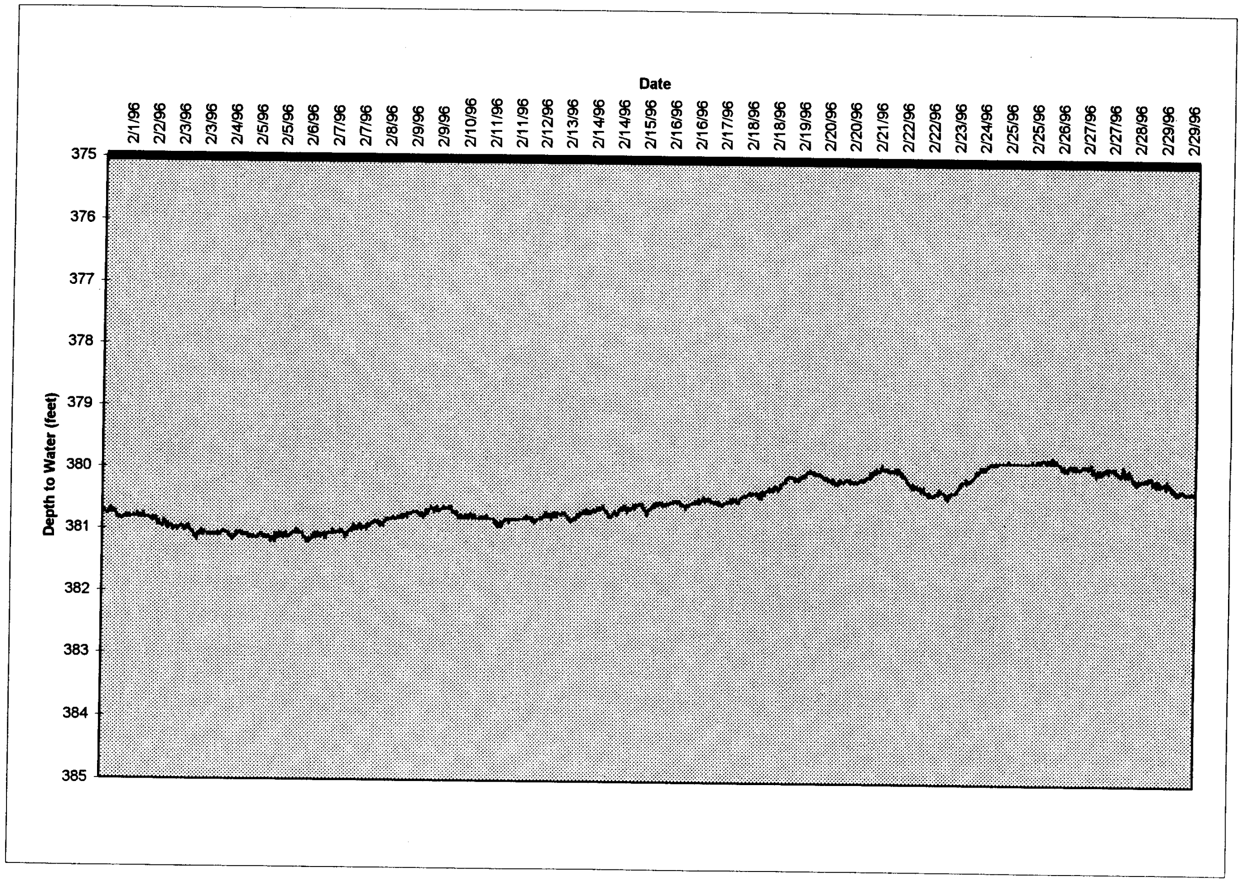
Dec 96 Chart

Well #24 Data Logger



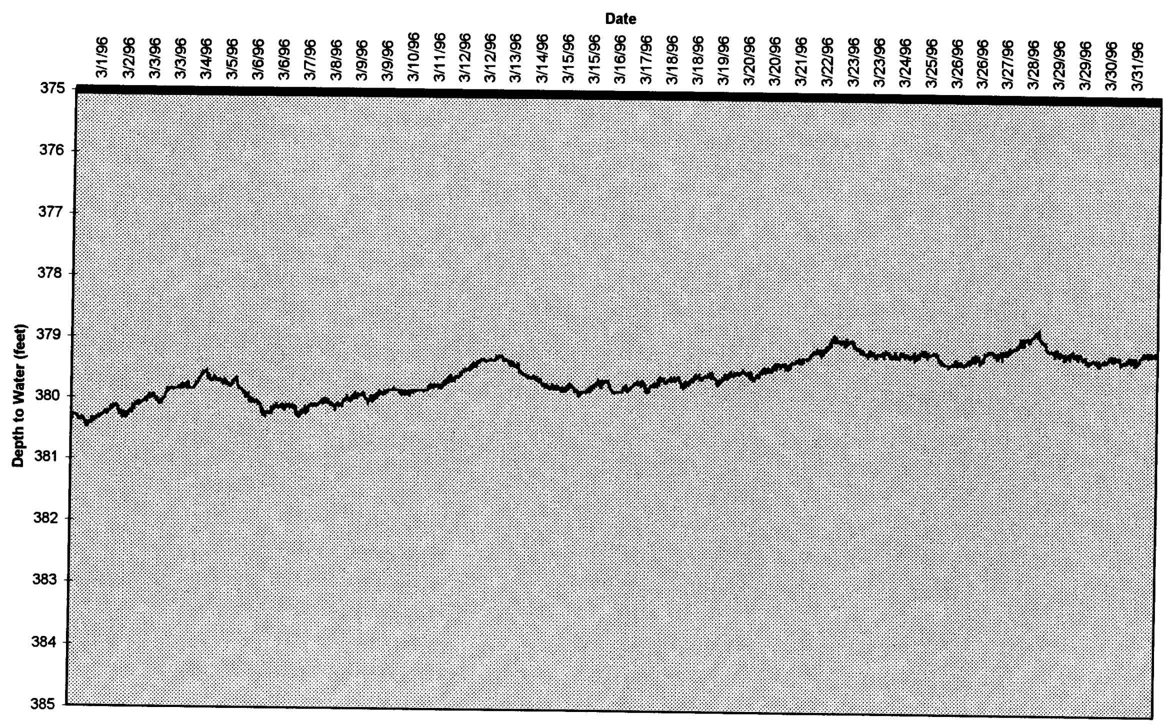
Jan 96 Chart

Well #24 Data Logger



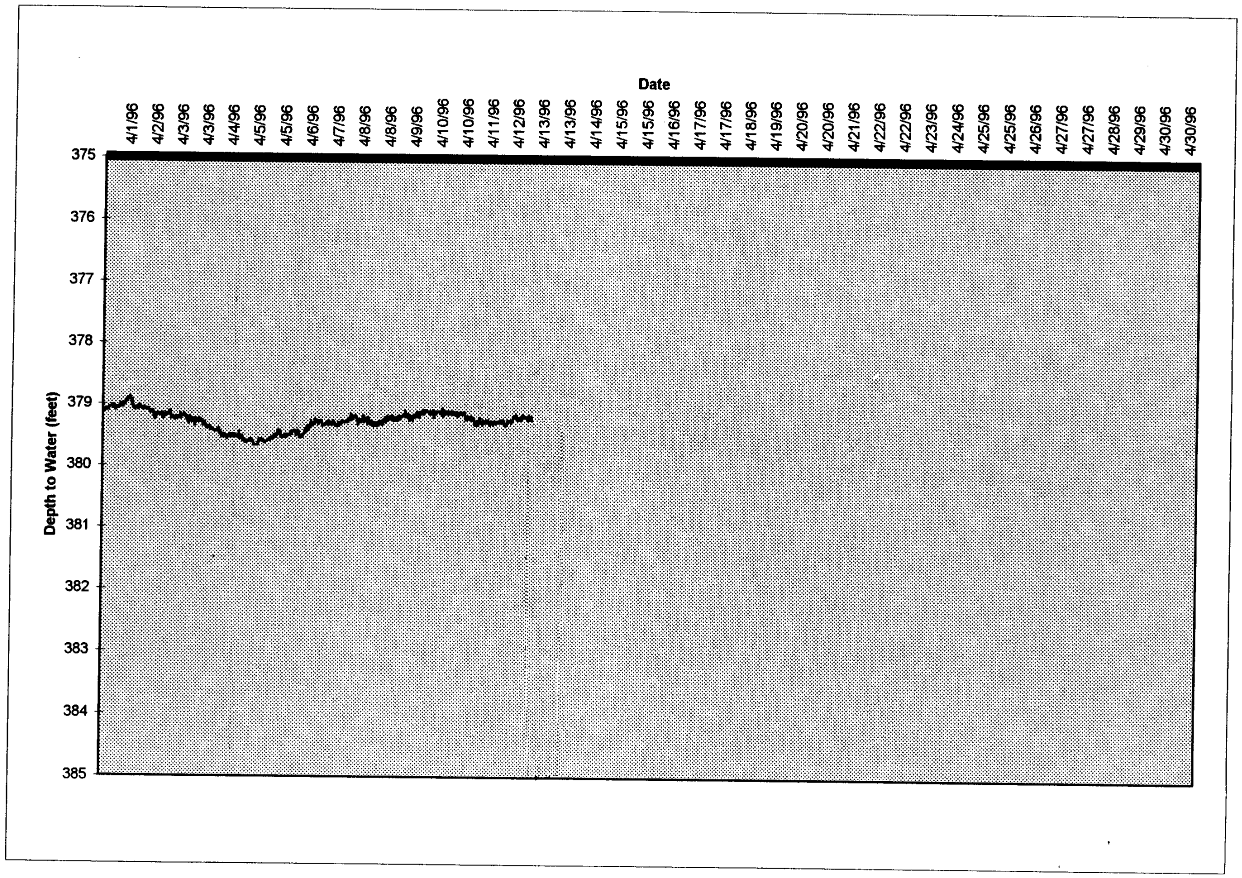
Feb 96 Chart

Well #24 Data Logger



Mar 96 Chart

Well #24 Data Logger



Apr 96 Chart

APPENDIX E

CHEMICAL ANALYSES OF WATER FROM DISTRICT WELLS

PRODUCTION WELL WATER QUALITY

Well Site	Sample Date	Sample Time	Conductivity umho/cm	TDS mg/L	Temp F	pH
1	6/6/96	8:20	240	168	47	7.4
6	6/6/96	9:05	470	283	49	7.5
10	6/6/96	9:20	465	315	50	7.3
15	6/6/96	9:45	240	152	55	7.4
16	7/11/96	9:00	660	432	70	7.5
17	7/11/96	8:45	360	265	65	7.3
18	7/11/96	8:15	540	332	47	7.1
20	7/11/96	9:20	217	164	59	7.1

MONITOR WELL WATER QUALITY

Well Site	Sample Date	Sample Time	Conductivity umho/cm	TDS mg/L	Temp F	pH
4M	9/9/96	8:05	162	84	47	7.4
5A	9/9/96	8:30	674	339	60	6.7
5M	9/9/96	8:40	430	217	56	6.4
7	No sample					
10M			No water in well			
11	9/9/96	9:30	96	50	51	7.4
11M	9/9/96	9:40	283	144	52	7.5
12M	9/9/96	10:05	267	137	52	7.5
14M	No sample					
19	No sample					
21	No sample					
22	No sample					
23	9/9/96	10:50	93	47	52	7.3
24	No sample					

Note: not able to collect samples from 14M, 19, 21 & 24 due to transducer and data logger installation.

APPENDIX F

MAMMOTH CREEK STREAMFLOW

TWIN LAKES OUTFLOW

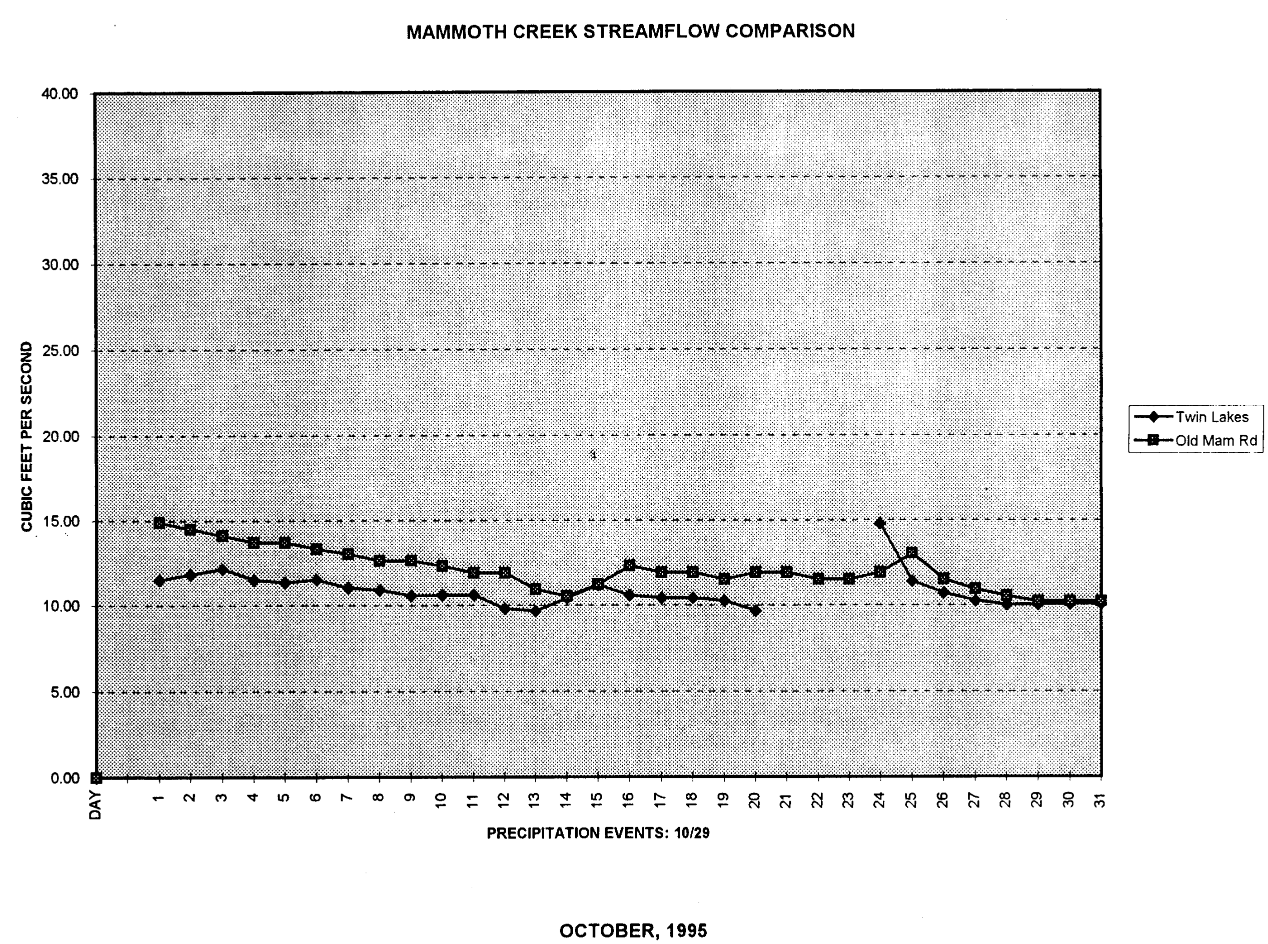
Daily discharge in cubic feet per second

Day	1995 OCT	NOV	DEC	1996 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.5	9.8	9.4	8.9	9.6	10.2	7.2	>32.4	>32.4	>32.42	23.0	9.8
2	11.8	9.6	8.1	7.2	8.5	9.4	7.9	>32.4	>32.4	>32.42	22.2	10.0
3	12.1	9.6	8.5	7.4	9.6	9.1	8.5	>32.4	>32.4	>32.42	21.4	9.6
4	11.5	9.8	9.6	8.3	9.6	8.9	9.8	>32.4	>32.4		19.7	9.7
5	11.3	10.5	10.0	8.1	19.5		9.6	32.4	>32.4	>32.42	19.2	8.5
6	11.5	9.8	9.8	7.6	19.2		9.6	>32.4	>32.4	>32.42	17.9	8.7
7	11.0	10.0	10.5	7.6	15.5		9.8	>32.4	>32.4	>32.42	17.9	9.1
8	10.9	10.7	10.5	7.9	12.1		10.2	>32.4	>32.4	>32.42	17.3	9.1
9	10.6	10.2	10.5	7.2	10.7		10.5	>32.4	>32.4	>32.42	17.3	9.1
10	10.6	9.6	10.5	7.2			10.7	>32.4	>32.4	>32.42	17.1	9.1
11	10.6	9.8	11.6	6.8			11.2	>32.4	>32.4	>32.42	16.6	9.1
12	9.8	9.6	19.0	6.4	8.9		11.6	>32.4	>32.4	>32.42	16.6	8.5
13	9.7	9.6		7.2	7.9	7.0	13.3	>32.4	>32.4	>32.42	16.8	7.9
14	10.4	9.8	32.4	7.2		6.6	13.3	>32.4	>32.4	>32.42	17.3	8.3
15	11.2	10.0	28.5	6.8	7.4	6.2	14.5	>32.4	>32.4	>32.42	17.6	9.4
16	10.6	9.8	28.5		7.2	5.7	15.0	>32.4	>32.4	29.4	17.1	8.1
17	10.4	9.8		10.7	7.2	5.1	15.8	>32.4	>32.4	28.8	16.0	8.3
18	10.4	9.8	13.8	10.7	6.8	6.4	17.3	>32.4	>32.4	30.6	15.0	7.9
19	10.3	9.6		11.4		6.4	15.5	>32.4	>32.4	30.9	14.8	
20	9.7	8.9	11.9			6.8	14.5	>32.4	>32.4	26.8	13.8	7.9
21		10.2	10.0		19.5	7.0	14.3	>32.4	>32.4	27.3	13.8	7.9
22		8.9	9.8	11.6	19.5	7.2	14.3	>32.4	>32.4	27.0	12.6	7.9
23		8.7	9.8	11.4	17.9	7.2	14.3	>32.4	>32.4	25.6	11.9	7.4
24	14.8	8.9	10.9	9.8	14.5	6.8	15.5	>32.4	>32.4	21.7	11.6	7.4
25	11.4	9.4			14.3	7.0	17.1	>32.4	>32.4	27.3	11.6	7.0
26	10.7	8.5	9.6	9.8	13.3	6.6	20.3	>32.4	>32.4	26.8	11.6	7.0
27	10.2	8.7	7.0		12.6	6.6	22.5	>32.4	>32.4	26.5	12.3	7.0
28	10.0	8.9	8.7		12.3	7.2	24.7	>32.4	32.1	27.3	10.9	7.0
29	10.0	8.9	8.5	10.7	11.4	7.4	25.0	>32.4	31.5	27.6	10.9	7.0
30	10.0	9.1	8.7	10.5		6.8	31.8	>32.4	>32.4	25.9	11.2	7.0
31	10.0		8.7	9.8		7.0		>32.4		24.7	10.2	
Mean	10.8	9.6	12.4	8.7	12.3	7.2	14.5	>32.4	>32.4	>32.4	15.6	8.3
Maximum	14.8	10.7	32.4	11.6	19.5	10.2	31.8	>32.4	>32.4	>32.4	23.0	10.0
Minimum	9.7	8.5	7.0	6.4	6.8	5.1	7.2	32.4	31.5	21.7	10.2	7.0

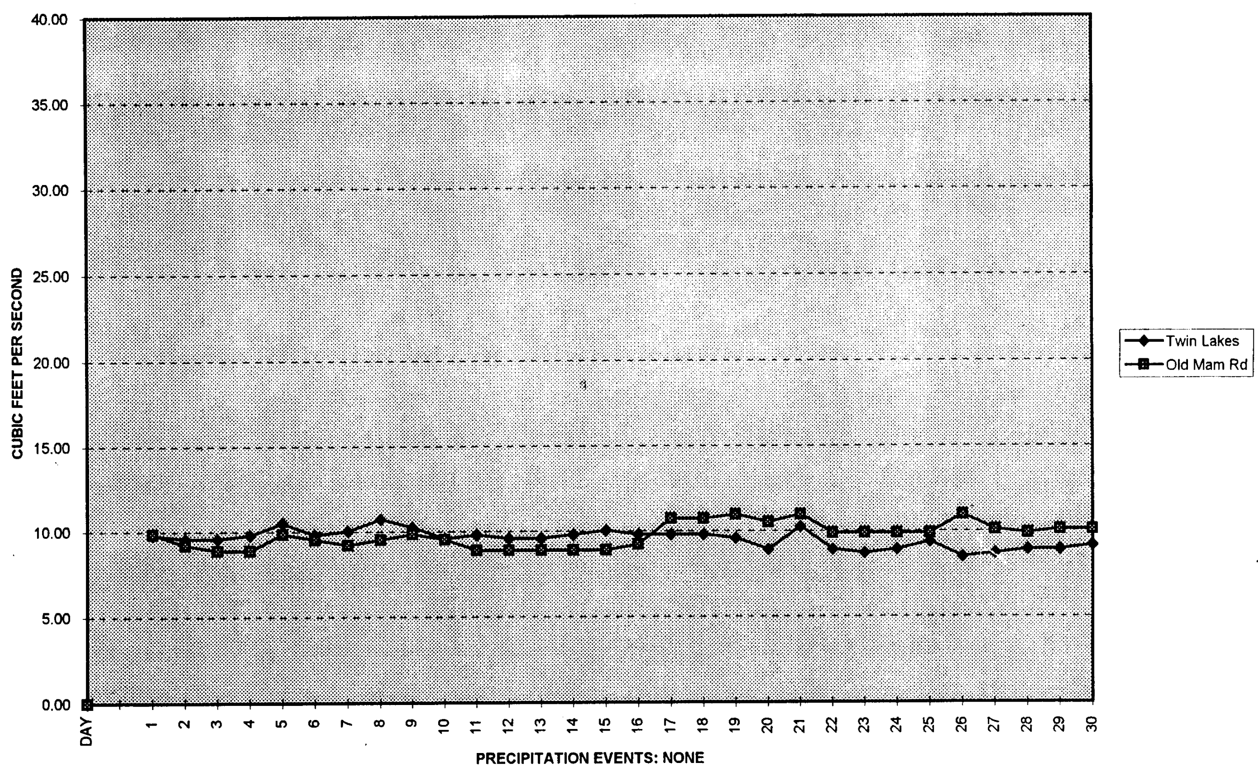
MAMMOTH CREEK FLOW AT OLD MAMMOTH ROAD

Daily discharge in cubic feet per second

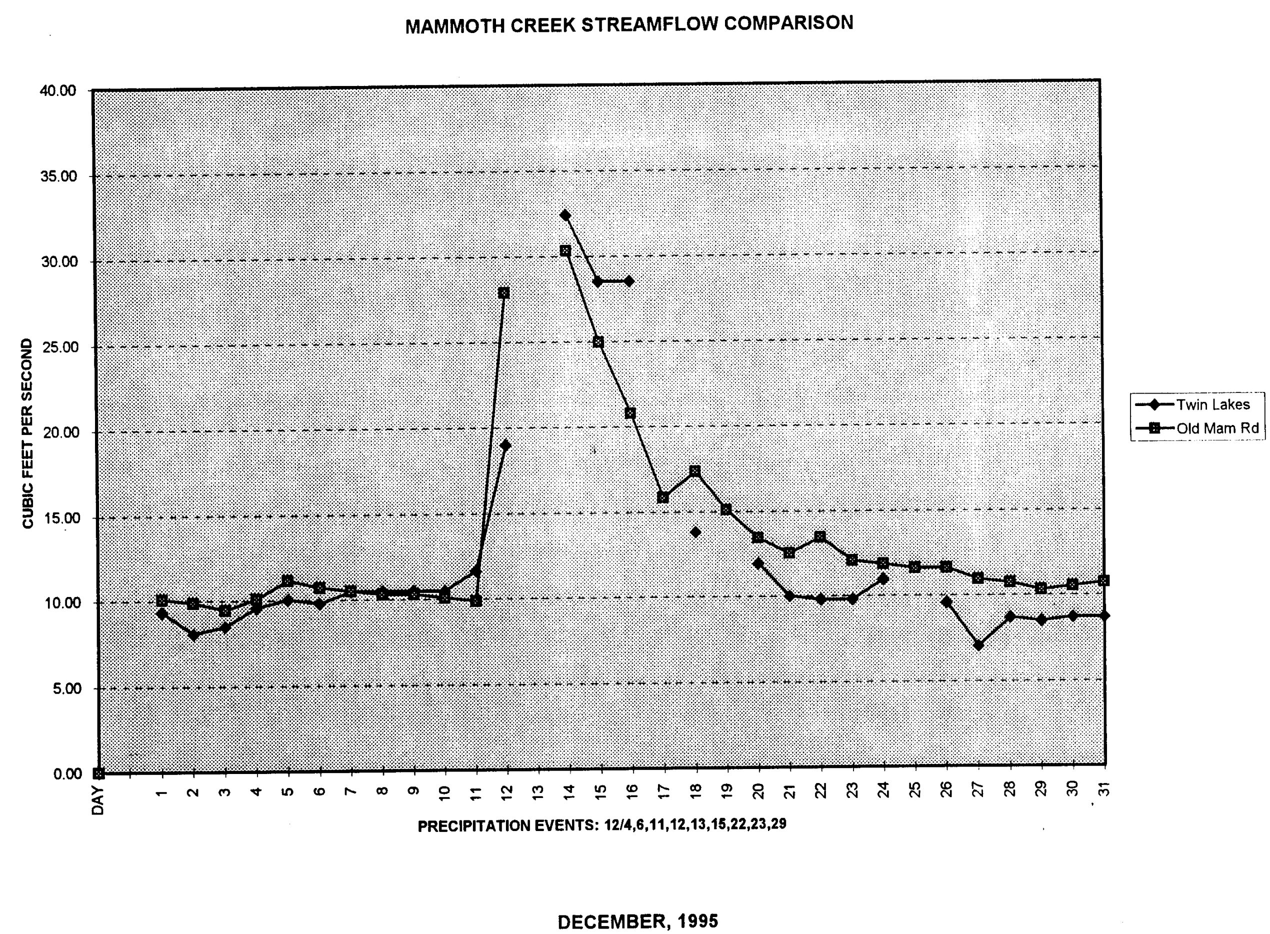
	1995			1996								
Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14.9	9.8	10.1	10.3	15.3	16.6	13.4	72.9	77.9	51.8	25.6	12.24
2	14.5	9.2	9.9	11.2	12.7	15.6	14.1	70.2	77.2	55.6	25.1	11.19
3	14.1	8.9	9.4	11.2	11.8	14.6	13.7	58.1	82.3	57.5	24.6	11.20
4	13.7	8.9	10.1	11.4	11.4	14.9	13.7	51.2	108.7	75.1	22.8	10.17
5	13.7	9.8	11.2	11.2	31.9	13.7	14.9	50.6	148.6	75.8	22.4	10.20
6	13.3	9.5	10.7	10.9	28.2	12.7	15.6	51.8	158.8	64.0	21.9	9.51
7	13.0	9.2	10.5	10.9	23.5	16.8	16.8	57.5	147.7	58.8	20.6	9.84
8	12.6	9.5	10.3	10.9	20.0	15.8	18.5	70.8	148.6	58.8	20.2	9.84
9	12.6	9.8	10.3	10.9	17.9	14.4	21.5	77.9	156.0	55.6	19.7	9.84
10	12.3	9.5	10.1	10.7	16.6	13.9	21.5	76.5	169.3	57.5	19.7	9.84
11	11.9	8.9	9.9	10.3	15.1	13.4	21.0	74.3	157.9	59.4	19.7	10.17
12	11.9	8.9	27.9	10.3	14.6	13.4	23.3	75.8	142.2	59.4	19.3	9.84
13	10.9	8.9		10.3	13.7	13.2	21.5	80.8	107.8	60.7	19.3	10.20
14	10.5	8.9	30.3	10.1	13.4	12.7	23.3	92.0	93.6	60.7	19.7	10.20
15	11.2	8.9	25.0	10.1	12.7	12.1	24.6	108.6	103.0	60.1	19.7	10.50
16	12.3	9.2	20.8	10.7	13.2	11.8	26.5	188.0	118.6	42.3	19.3	10.90
17	11.9	10.7	15.8	11.6	13.7	10.9	26.5	212.7	116.1	35.1	18.0	10.50
18	11.9	10.7	17.3	13.9	12.7	11.4	25.6	206.4	101.4	35.7	17.6	10.50
19	11.5	10.9	15.1	13.9	12.1	11.6	22.8	176.1	83.8	36.8	16.4	10.20
20	11.9	10.5	13.4	16.8	18.6	13.0	21.5	120.3	80.8	31.5	16.4	9.51
21	11.9	10.9	12.5	15.6	21.0	12.3	20.6	99.0	84.5	30.5	15.6	9.51
22	11.5	9.9	13.4	15.3	19.4	13.7	21.0	89.7	98.2	31.0	14.9	9.51
23	11.5	9.9	12.1	14.9	23.3	12.5	22.8	76.5	82.3	29.0	14.9	9.19
24	11.9	9.9	11.8	13.2	20.8	11.6	26.1	56.9	75.1	29.0	14.1	8.87
25	13.0	9.9	11.6	13.9	18.1	11.6	30.5	49.4	65.4	30.5	14.5	8.87
26	11.5	10.9	11.6	23.5		10.9	34.6	47.0	62.7	30.5	14.5	8.87
27	10.9	10.1	10.9	22.1	16.8	11.6	39.5	47.6	64.0	30.0	14.1	8.56
28	10.5	9.9	10.7	18.1	17.9	12.5	40.6	47.0	45.8	30.5	13.3	8.56
29	10.2	10.1	10.3	21.6	17.3	13.0	39.5	47.0	38.9	31.0	13.0	8.56
30	10.2	10.1	10.5	15.8		12.5	50.0	51.8	44.0	30.0	12.6	8.56
31	10.2		10.7	14.9		12.5		70.8		28.5	12.2	
Mean	12.1	9.7	13.5	13.4	17.3	13.1	24.2	85.7	101.4	45.9	18.1	9.8
Maximum	14.9	10.9	30.3	23.5	31.9	16.8	50.0	212.7	169.3	75.8	25.6	12.2
Minimum	10.2	8.9	9.4	10.1	11.4	10.9	13.4	47.0	38.9	28.5	12.2	8.6


MAMMOTH CREEK STREAMFLOW COMPARISON
CUBIC FEET PER SECOND
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
DAY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
PRECIPITATION EVENTS: 10/29
Twin Lakes
Old Mam Rd
OCTOBER, 1995

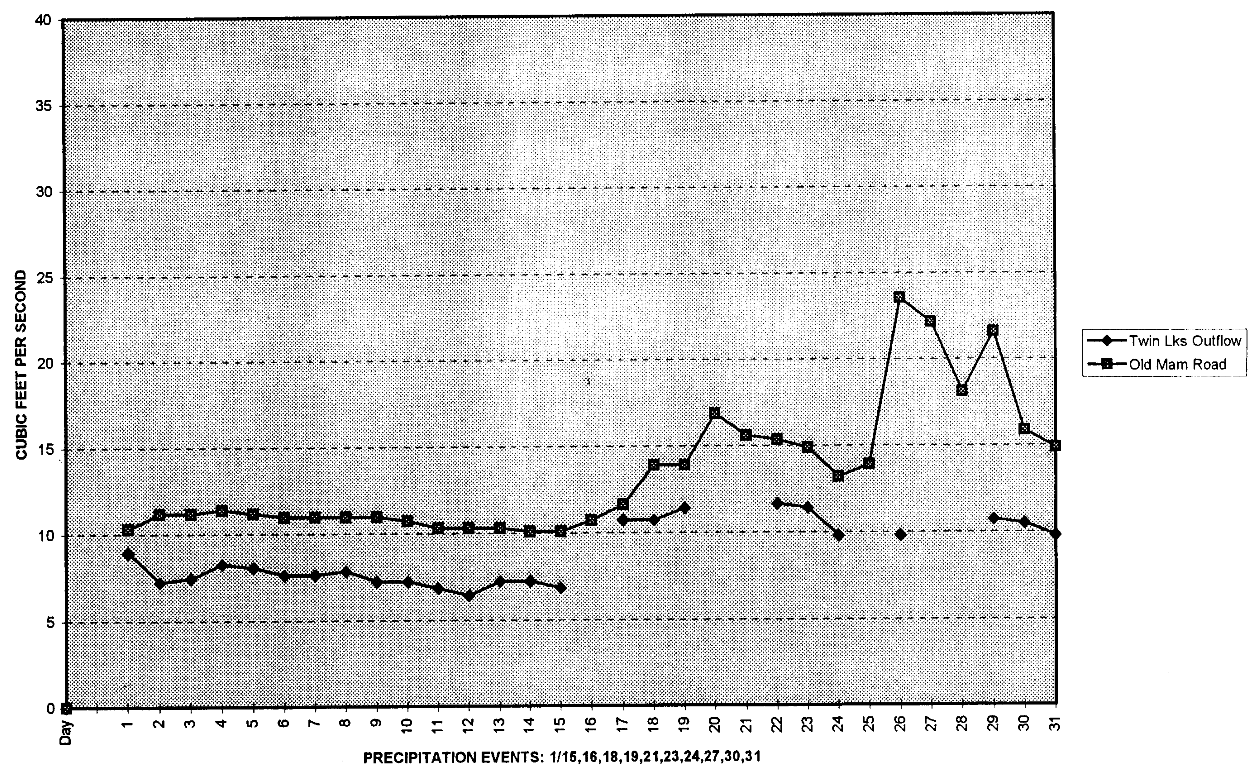
MAMMOTH CREEK STREAMFLOW COMPARISON



NOVEMBER, 1995


MAMMOTH CREEK STREAMFLOW COMPARISON
CUBIC FEET PER SECOND
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
DAY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
PRECIPITATION EVENTS: 12/4,6,11,12,13,15,22,23,29
Twin Lakes
Old Mam Rd
DECEMBER, 1995

MAMMOTH CREEK STREAMFLOW COMPARISON



JANUARY, 1996

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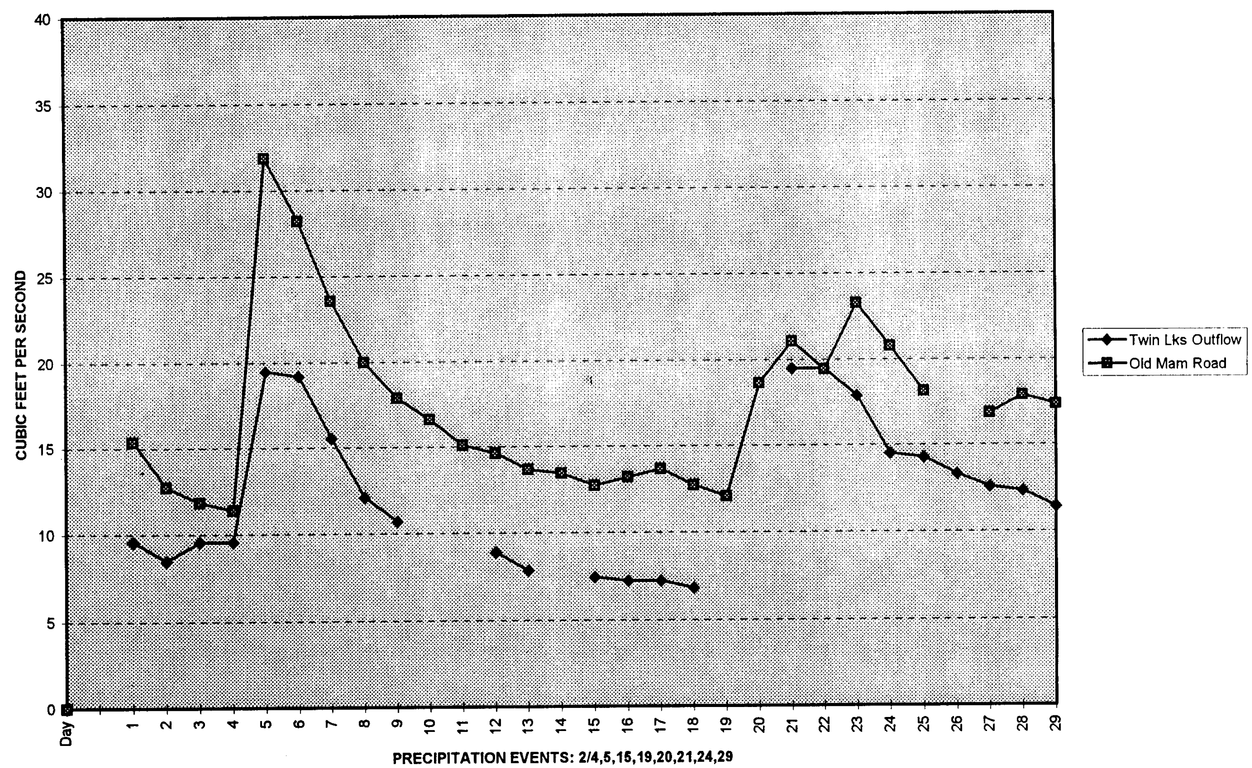

FEBRUARY, 1996

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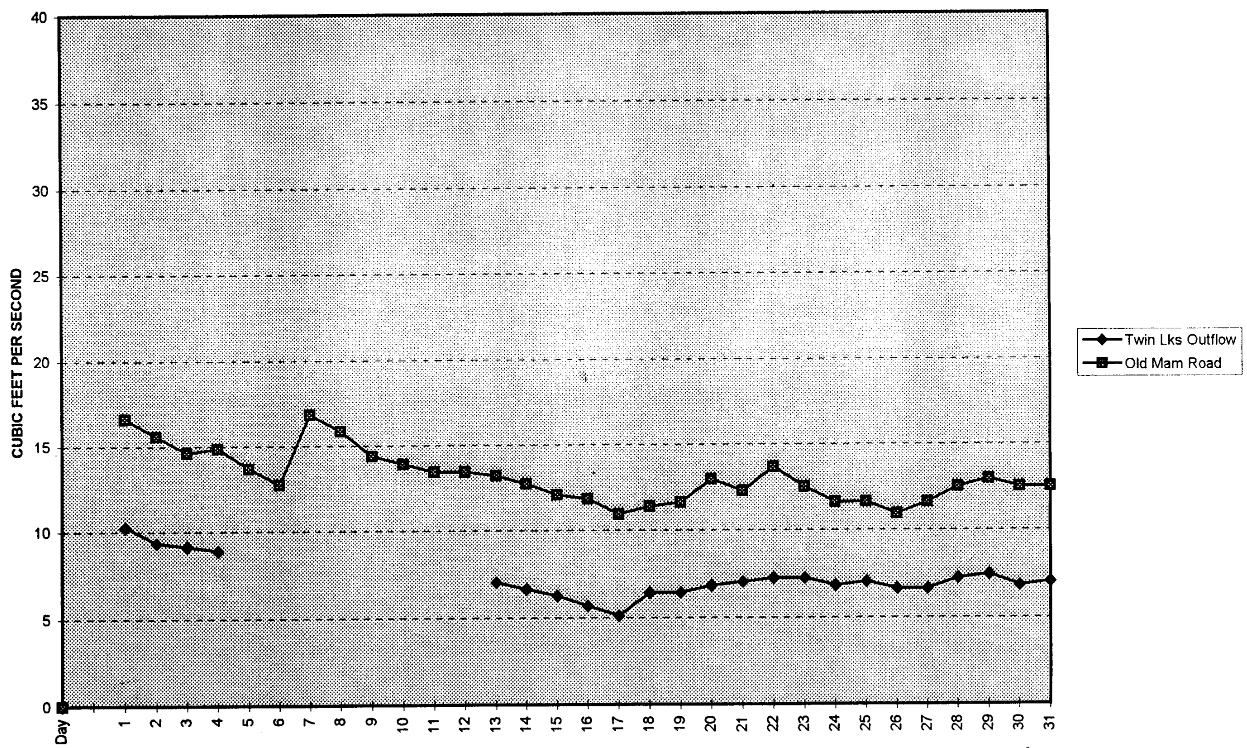
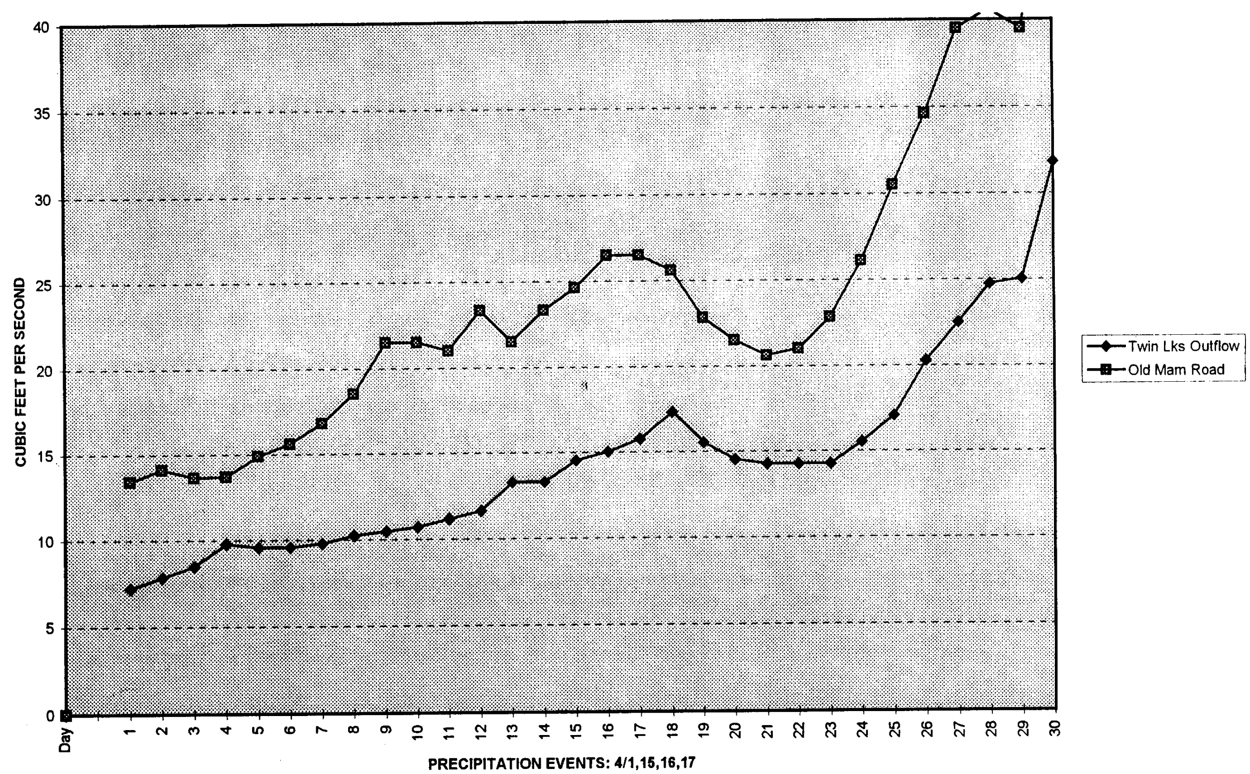


PRECIPITATION EVENTS: 3/4,5,11,12,13,25,28

MARCH, 1996

MAMMOTH CREEK STREAMFLOW COMPARISON



APRIL, 1996

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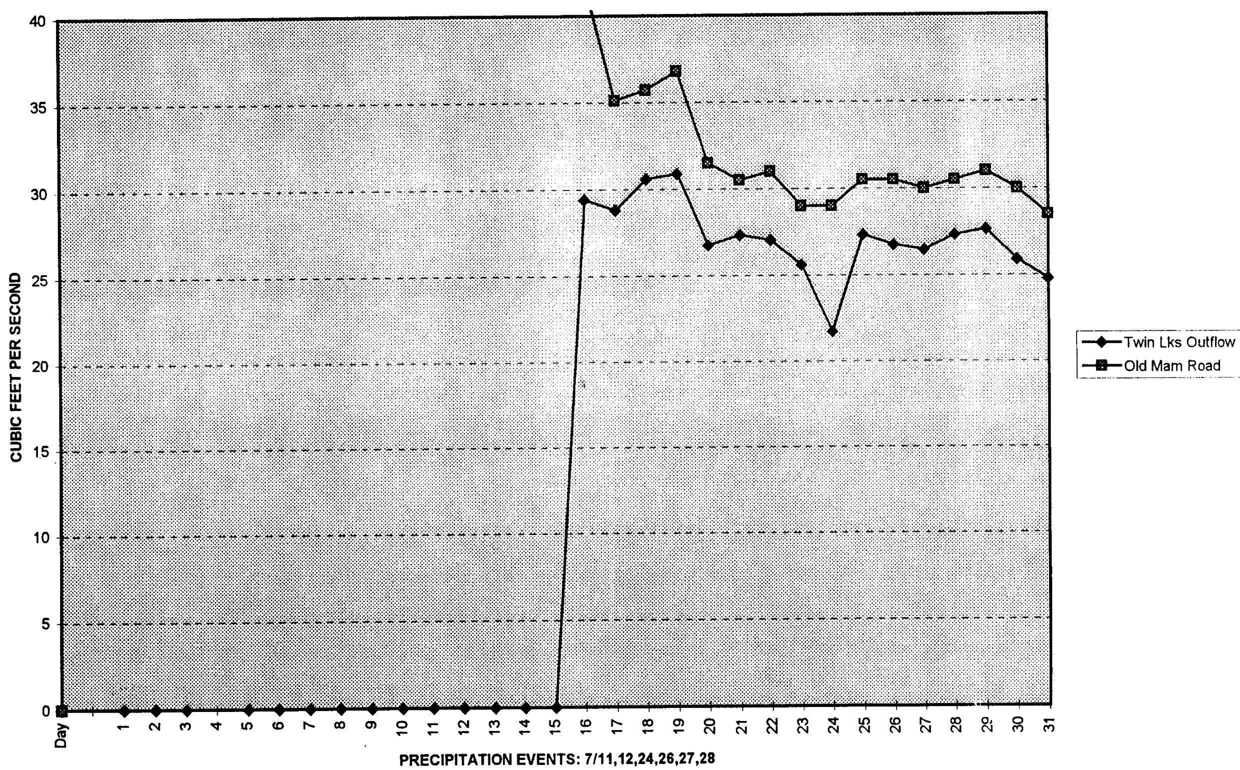

JULY, 1996

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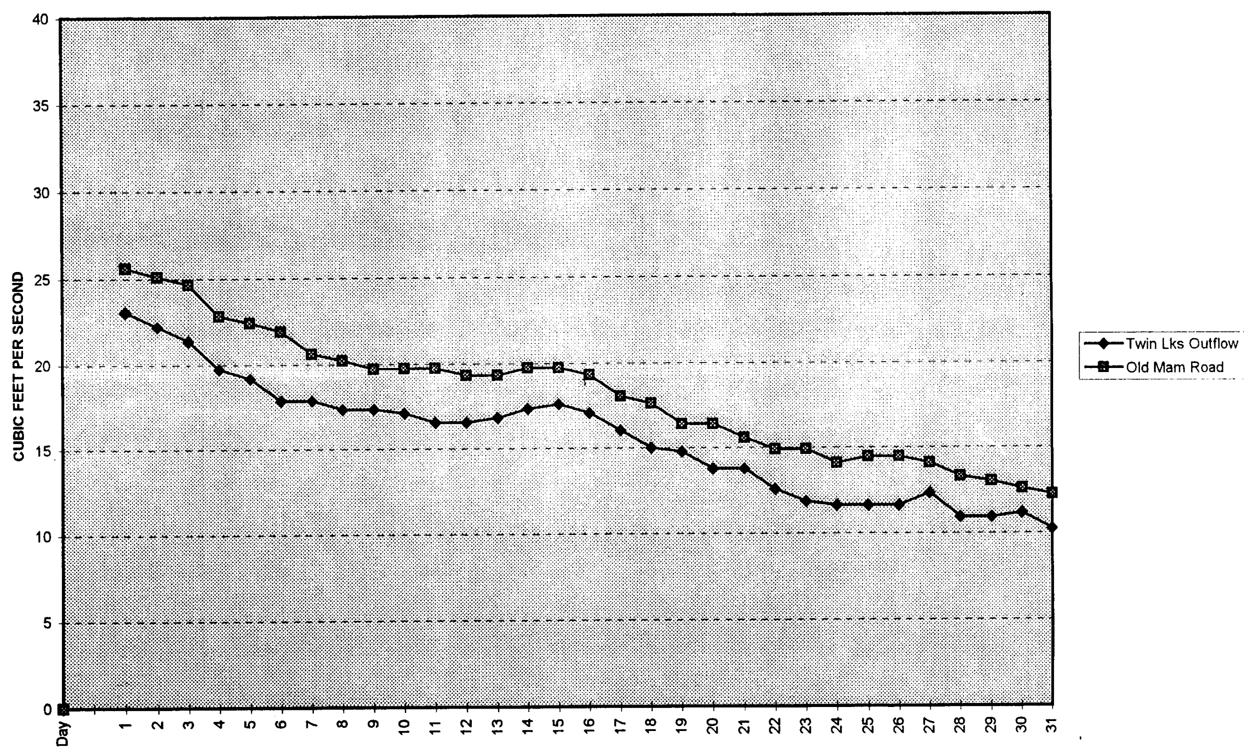

PRECIPITATION EVENTS: 8/12,24

AUGUST, 1996

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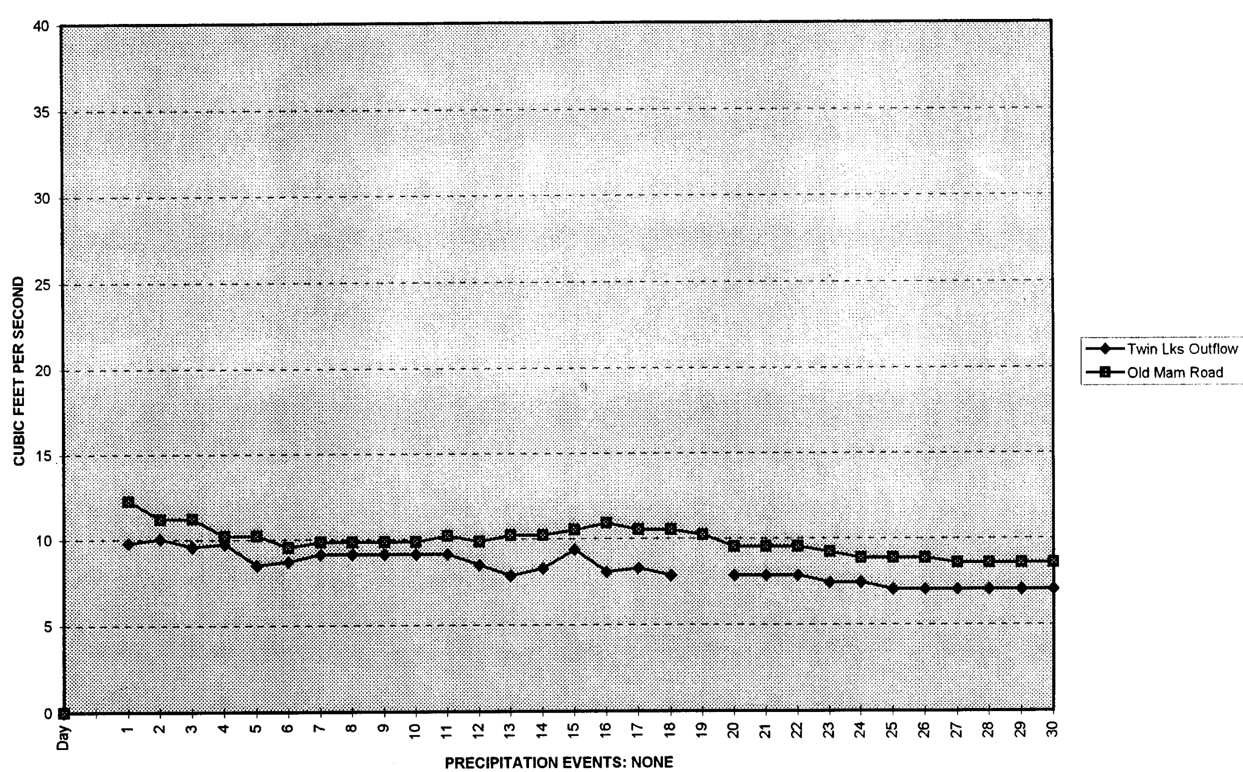

SEPTEMBER, 1996

APPENDIX G

VALENTINE RESERVE SPRINGFLOW

valentine springs 1996

Date	End of interval	Discharge (gpm)
30-May	instantaneous	82.2
31-May	instantaneous	74.1
1-Jun	instantaneous	74.1
2-Jun	instantaneous	67.4
3-Jun	instantaneous	66.7
4-Jun	instantaneous	63.2
5-Jun	instantaneous	63.2
6-Jun	instantaneous	60.0
7-Jun	instantaneous	60.0
8-Jun	instantaneous	56.1
9-Jun	instantaneous	60.0
10-Jun	instantaneous	56.6
11-Jun	instantaneous	56.6
12-Jun	instantaneous	54.5
13-Jun	instantaneous	54.5
14-Jun	instantaneous	55.6
15-Jun	instantaneous	57.0
16-Jun	instantaneous	57.0
17-Jun	instantaneous	56.0
18-Jun	instantaneous	55.0
19-Jun	instantaneous	54.0
20-Jun	instantaneous	54.0
21-Jun	instantaneous	54.0
22-Jun	instantaneous	54.0
23-Jun	instantaneous	53.0
24-Jun	instantaneous	53.0
25-Jun	instantaneous	53.0
27-Jun	instantaneous	53.0
28-Jun	6:00	53.5
28-Jun	12:00	53.6
28-Jun	18:00	53.3
29-Jun	0:00	53.2
29-Jun	6:00	53.3
29-Jun	12:00	53.0
29-Jun	18:00	44.2
30-Jun	0:00	52.7
30-Jun	6:00	53.1
30-Jun	12:00	52.7
30-Jun	18:00	52.6
1-Jul	0:00	52.6
1-Jul	6:00	52.7
1-Jul	12:00	43.8
1-Jul	18:00	52.4
2-Jul	0:00	43.5
2-Jul	6:00	52.3

instantaneous measurements are the average of
ten time measurements into a 10 gallon bucket

valentine springs 1996

2-Jul	12:00	52.3
2-Jul	18:00	51.8
3-Jul	0:00	51.9
3-Jul	6:00	52.3
3-Jul	12:00	52.1
3-Jul	18:00	51.8
4-Jul	0:00	51.9
4-Jul	6:00	52.0
4-Jul	12:00	51.6
4-Jul	18:00	51.4
5-Jul	0:00	51.4
5-Jul	6:00	51.8
5-Jul	12:00	51.7
5-Jul	18:00	51.2
6-Jul	0:00	51.4
6-Jul	6:00	52.1
6-Jul	12:00	51.7
6-Jul	18:00	51.4
7-Jul	0:00	51.2
7-Jul	6:00	51.9
7-Jul	12:00	43.3
7-Jul	18:00	51.8
8-Jul	0:00	51.5
8-Jul	6:00	52.2
8-Jul	12:00	52.0
8-Jul	18:00	51.1
9-Jul	0:00	51.1
9-Jul	6:00	43.0
9-Jul	12:00	51.7
9-Jul	18:00	51.3
10-Jul	0:00	51.5
10-Jul	6:00	51.9
10-Jul	12:00	51.8
10-Jul	18:00	51.6
11-Jul	0:00	51.9
11-Jul	6:00	52.2
11-Jul	12:00	52.3
11-Jul	18:00	52.3
12-Jul	0:00	52.2
12-Jul	6:00	52.6
12-Jul	12:00	53.1
12-Jul	18:00	53.0
13-Jul	0:00	53.2
13-Jul	6:00	53.4
13-Jul	12:00	53.6
13-Jul	18:00	53.4
14-Jul	0:00	53.8
14-Jul	6:00	54.1
14-Jul	12:00	45.1
14-Jul	18:00	53.7
15-Jul	0:00	53.6

valentine springs 1996

15-Jul	6:00	54.1
15-Jul	12:00	54.4
15-Jul	18:00	54.1
16-Jul	0:00	54.4
16-Jul	6:00	54.5
16-Jul	12:00	54.7
16-Jul	18:00	54.4
17-Jul	0:00	54.4
17-Jul	6:00	54.8
17-Jul	12:00	55.0
17-Jul	18:00	54.7
18-Jul	0:00	45.8
18-Jul	6:00	55.2
18-Jul	12:00	55.1
18-Jul	18:00	54.7
19-Jul	0:00	55.6
19-Jul	6:00	55.9
19-Jul	12:00	55.5
19-Jul	18:00	55.3
20-Jul	0:00	55.6
20-Jul	6:00	55.9
20-Jul	12:00	56.2
20-Jul	18:00	55.6
21-Jul	0:00	55.5
21-Jul	6:00	55.8
21-Jul	12:00	55.9
21-Jul	18:00	55.6
22-Jul	0:00	56.2
22-Jul	6:00	47.4
22-Jul	12:00	56.9
22-Jul	18:00	56.4
23-Jul	0:00	47.1
23-Jul	6:00	57.0
23-Jul	12:00	57.3
23-Jul	18:00	57.0
24-Jul	0:00	57.0
24-Jul	6:00	57.4
24-Jul	12:00	57.6
24-Jul	18:00	57.2
25-Jul	0:00	47.7
25-Jul	6:00	57.8
25-Jul	12:00	57.6
25-Jul	18:00	57.4
26-Jul	0:00	57.7
26-Jul	6:00	57.7
26-Jul	12:00	57.9
26-Jul	18:00	57.4
27-Jul	0:00	57.6
27-Jul	6:00	48.4
27-Jul	12:00	58.2
27-Jul	18:00	58.0

valentine springs 1996

28-Jul	0:00	58.0
28-Jul	6:00	58.4
28-Jul	12:00	58.8
28-Jul	18:00	58.1
29-Jul	0:00	58.3
29-Jul	6:00	58.6
29-Jul	12:00	58.7
29-Jul	18:00	58.3
30-Jul	0:00	58.4
30-Jul	6:00	58.9
30-Jul	12:00	58.8
30-Jul	18:00	58.5
31-Jul	0:00	58.5
31-Jul	6:00	49.1
31-Jul	12:00	59.1
31-Jul	18:00	58.6
1-Aug	0:00	58.9
1-Aug	6:00	59.1
1-Aug	12:00	58.8
1-Aug	18:00	58.6
2-Aug	0:00	58.8
2-Aug	6:00	59.2
3-Aug	6:00	59.2
3-Aug	12:00	59.3
3-Aug	18:00	58.9
3-Aug	0:00	59.2
4-Aug	6:00	59.6
4-Aug	12:00	49.9
4-Aug	18:00	59.3
4-Aug	0:00	59.5
5-Aug	6:00	59.8
5-Aug	12:00	59.7
5-Aug	18:00	59.2
5-Aug	0:00	49.4
6-Aug	6:00	49.6
6-Aug	12:00	59.8
6-Aug	18:00	59.1
6-Aug	0:00	59.0
7-Aug	6:00	59.5
7-Aug	12:00	59.7
7-Aug	18:00	59.3
7-Aug	0:00	59.1
8-Aug	6:00	60.3
8-Aug	12:00	59.6
8-Aug	18:00	59.1
8-Aug	0:00	59.1
9-Aug	6:00	59.6
9-Aug	12:00	59.4
9-Aug	18:00	58.4
9-Aug	0:00	58.6
10-Aug	6:00	59.1

valentine springs 1996

10-Aug	12:00	59.1
10-Aug	18:00	58.6
10-Aug	0:00	58.6
11-Aug	6:00	59.2
11-Aug	12:00	59.2
11-Aug	18:00	58.6
11-Aug	0:00	59.0
12-Aug	6:00	59.3
12-Aug	12:00	59.4
12-Aug	18:00	59.0
12-Aug	0:00	59.1
13-Aug	6:00	49.8
13-Aug	12:00	49.5
13-Aug	18:00	59.0
13-Aug	0:00	58.8
14-Aug	6:00	59.4
14-Aug	12:00	59.3
14-Aug	18:00	59.0
14-Aug	0:00	59.0
15-Aug	6:00	59.1
15-Aug	12:00	59.2
15-Aug	18:00	58.8
15-Aug	0:00	58.9
16-Aug	6:00	59.2
16-Aug	12:00	59.3
16-Aug	18:00	58.7
16-Aug	0:00	58.9
17-Aug	6:00	59.2
17-Aug	12:00	59.1
17-Aug	18:00	59.1
17-Aug	0:00	58.9
18-Aug	6:00	59.2
18-Aug	12:00	58.9
18-Aug	18:00	58.3
18-Aug	0:00	58.5
19-Aug	6:00	49.0
19-Aug	12:00	59.1
19-Aug	18:00	58.4
19-Aug	0:00	58.3
20-Aug	6:00	58.7
20-Aug	12:00	58.3
20-Aug	18:00	58.2
20-Aug	0:00	58.3
21-Aug	6:00	58.8
21-Aug	12:00	58.8
21-Aug	18:00	58.6
21-Aug	0:00	58.7
22-Aug	6:00	59.2
22-Aug	12:00	59.2
22-Aug	18:00	58.7
22-Aug	0:00	58.8

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23-Aug	6:00	59.0
23-Aug	12:00	59.0
23-Aug	18:00	58.3
23-Aug	0:00	58.4
24-Aug	6:00	49.1
24-Aug	12:00	58.8
24-Aug	18:00	58.1
24-Aug	0:00	58.2
25-Aug	6:00	58.7
25-Aug	12:00	58.7
25-Aug	18:00	58.4
25-Aug	0:00	58.3
26-Aug	6:00	58.4
26-Aug	12:00	58.7
26-Aug	18:00	58.2
26-Aug	0:00	58.2
27-Aug	6:00	58.5
27-Aug	12:00	58.5
27-Aug	18:00	58.0
27-Aug	0:00	58.0
28-Aug	6:00	58.1
28-Aug	12:00	39.1
28-Aug	18:00	57.9
28-Aug	0:00	57.7
29-Aug	6:00	58.2
29-Aug	12:00	58.0
29-Aug	18:00	57.4
29-Aug	0:00	57.3
30-Aug	6:00	57.8
30-Aug	12:00	57.7
30-Aug	18:00	57.1
30-Aug	0:00	57.4
31-Aug	6:00	57.8
31-Aug	12:00	57.6
31-Aug	18:00	57.2
31-Aug	0:00	57.3
1-Sep	6:00	48.1
1-Sep	12:00	57.6
1-Sep	18:00	57.0
1-Sep	0:00	57.0
2-Sep	6:00	48.0
2-Sep	12:00	57.4
2-Sep	18:00	56.9
2-Sep	0:00	56.8
3-Sep	6:00	57.4
3-Sep	12:00	47.7
3-Sep	18:00	56.6
3-Sep	12:00:00 AM	56.8
4-Sep	6:00	47.8
4-Sep	12:00	57.4
4-Sep	18:00	47.7

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4-Sep	0:00	57.3
5-Sep	6:00	57.7
5-Sep	12:00	57.8
5-Sep	18:00	57.7
5-Sep	0:00	47.8
6-Sep	6:00	58.0
6-Sep	12:00	58.1
6-Sep	18:00	57.5
6-Sep	0:00	57.5
7-Sep	6:00	57.8
7-Sep	12:00	48.1
7-Sep	18:00	57.3
7-Sep	0:00	57.2
8-Sep	6:00	57.8
8-Sep	12:00	57.8
8-Sep	18:00	56.9
8-Sep	0:00	57.3
9-Sep	6:00	57.5
9-Sep	12:00	57.5
9-Sep	18:00	56.7
9-Sep	0:00	47.6
10-Sep	6:00	47.7
10-Sep	12:00	47.9
10-Sep	18:00	56.8
10-Sep	0:00	56.9
11-Sep	6:00	57.1
11-Sep	12:00	57.0
11-Sep	18:00	56.7
11-Sep	0:00	56.8
12-Sep	6:00	57.2
12-Sep	12:00	57.2
12-Sep	18:00	56.9
12-Sep	0:00	56.8
13-Sep	6:00	57.2
13-Sep	12:00	57.3
13-Sep	18:00	57.5
13-Sep	0:00	57.6
14-Sep	6:00	57.9
14-Sep	12:00	58.0
14-Sep	18:00	57.4
14-Sep	0:00	47.9
15-Sep	6:00	48.2
15-Sep	12:00	57.8
15-Sep	18:00	57.3
15-Sep	0:00	57.8
16-Sep	6:00	58.1
16-Sep	12:00	58.4
16-Sep	18:00	60.3
16-Sep	0:00	57.4
17-Sep	5:59	57.8
17-Sep	12:00	57.8

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17-Sep	18:00	57.5
17-Sep	0:00	57.7
18-Sep	6:00	57.8
18-Sep	12:00	57.8
18-Sep	18:00	57.5
18-Sep	0:00	47.9
19-Sep	6:00	57.7
19-Sep	12:00	58.0
19-Sep	18:00	57.3
19-Sep	0:00	57.2
20-Sep	6:00	57.1
20-Sep	12:00	57.2
20-Sep	18:00	56.7
20-Sep	0:00	56.4
21-Sep	6:00	56.6
21-Sep	12:00	56.6
21-Sep	18:00	56.3
21-Sep	0:00	56.2
22-Sep	6:00	47.1
22-Sep	12:00	57.0
22-Sep	18:00	56.4
22-Sep	0:00	56.3
23-Sep	6:00	56.7
23-Sep	12:00	56.6
23-Sep	18:00	56.1
23-Sep	0:00	56.2
24-Sep	6:00	56.5
24-Sep	12:00	56.6
24-Sep	18:00	56.1
24-Sep	0:00	56.3
25-Sep	6:00	56.3
25-Sep	12:00	56.4
25-Sep	18:00	55.9
25-Sep	0:00	56.0
26-Sep	6:00	47.0
26-Sep	12:00	56.3
26-Sep	18:00	56.1
26-Sep	0:00	55.9
27-Sep	6:00	55.7
27-Sep	12:00	46.6
27-Sep	18:00	55.9
27-Sep	0:00	55.6
28-Sep	6:00	56.0
28-Sep	12:00	55.9
28-Sep	18:00	37.2
28-Sep	0:00	55.5
29-Sep	6:00	55.7
29-Sep	12:00	55.7
29-Sep	18:00	55.3
29-Sep	0:00	55.0
30-Sep	6:00	55.4
30-Sep	12:00	55.3
30-Sep	18:00	55.3
30-Sep	0:00	55.7