REVIEW OF FACTORS AFFECTING GROUND-WATER LEVELS IN THE MOUNTAIN HOME PLATEAU AREA ELMORE AND ADA COUNTIES, IDAHO

by
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REVIEW OF FACTORS AFFECTING GROUND-WATER LEVELS IN THE MOUNTAIN HOME PLATEAU, ELMORE AND ADA COUNTIES, IDAHO

INTRODUCTION

In-depth hydrogeologic studies have been completed by several investigators in the Mountain Home area; chief among them being Norton, et al (1982), Young, H.W. (1977) and Ralston and Chapman (1968, 1970). These studies contain most of our knowledge of the aquifer units of the area and the effect of recharge and pumping for irrigation upon them. The Cinder Cone Butte Critical Ground-Water Area (CGWA) was so designated by the Idaho Department of Water Resources (IDWR) in 1981 in response to apparent over-development of ground water in the area and resultant rapid water-level declines. A study of ground-water and land-use practices by Norton, et al, in 1981-82 led to the designation of the Mountain Home Ground-Water Management Area (GWMA), also in response to citizen concerns and water-level declines. Figure 1 is a map showing the two areas involved.

Water-level data from selected observation wells in the area for recent years show a marked reduction in the rate of decline of water levels and, in some cases, even modest recovery of water levels. If water levels were truly recovering, IDWR wanted to be in the position to modify, if necessary, the GWMA designation and begin once again to issue permits. This review was initiated as a result of this interest in determining current ground-water conditions in the Mountain Home area.

In the case of the Mountain Home GWMA (and the Cinder Cone Butte CGWA within it), there are two types of data which are indicators of the changing hydrologic situation: 1) ground-water level trends and the effect of precipitation, discharge and recharge on them, and 2) changes in irrigated acreages. Each are discussed in turn below.

<u>Ground-water Level Trends</u>

The IDWR measures water levels in 19 observation wells in the area, the US Geological Survey, 11. IDWR collects water level data twice annually; about the last week of March, and the last week of October, to determine the highest point on the recharge curve before irrigation pumpage begins and to determine the water level in the fall which results mostly from pumpage for irrigation. The USGS collects data on a variety of schedules with their observation wells, but normally also make measurements in both the spring and fall corresponding to the IDWR schedule. Records for the 30 wells vary in completeness, but generally good data exist from the time of the Norton study in 1982 until the present. Therefore, for this report, trends have been reviewed primarily for the period 1982 - 1988, but also, where available, the review has included data back to 1976-77.

Ground-water level trends are shown on several USGS and IDWR hydrographs in Appendix A, which show a variety of trends, but most of them indicate at least a modest net decline for their periods of record. However, the declines have not been widespread or evenly applied throughout the area. Location of the observation wells within the GWMA is important to showing specific trends; those wells completed in the regional system show quite a different trend than those in the shallow, perched system. In general, water level declines in the regional system have moderated or even reversed in recent years, while declines in the shallow system have been more quickly impacted by the current drought, and therefore show larger net declines.

For this analysis, the focus is on changes taking place in the regional system, which is the one primarily developed for irrigation and municipal use. The shallow, perched system has shown widespread declines as a result of the drought, which in turn has affected the amount of recharge reaching the regional system. What happens in the regional system is more relevant to determining any change in GWMA status.

The water level change map for the regional aquifer (Figure 2), showing change in water levels from spring 1983 to spring 1988, indicates only two areas where long-term declines have taken place. The larger one is the Cinder Cone Butte area, in which declines have been well-documented in previous reports; the other, approximately centered on Mountain Home, probably reflects increased ground-water pumpage for municipal use the past two years of drought. The significant thing to note is the relatively small amount of net change, about 5 feet, over the past five years.

Shorter-term declines are also enlightening. As the water-level change maps for 1986-1988 and 1987-1988 show (Figures 3 & 4, respectively), very little additional decline took place, despite severe drought conditions. The reason for this anomaly appears to be strongly related to Federal government set-aside programs, which have encouraged farmers not to plant crops, and therefore to not irrigate, reducing the amount of ground water removed from storage. Land set aside from production has steadily increased since 1984, reversing a trend of increasing irrigated acreages (see "Changes in Irrigated Acreages", below).

Precipitation/Recharge Trends

Table 1 lists precipitation amounts and departures from long-term normals for the Boise and Mountain Home areas and the accompanying graph, Figure 5, shows that precipitation has been above normal for every year but 1985 and 1987. Recharge to the ground-water system should, therefore, also have been above normal.

Recharge to much of the Mountain Home area results from seepage losses from Canyon and Rattlesnake Creeks, both of which are fed primarily from snowmelt, and Canyon Creek, in part, is used as a conduit for water stored in Little Camas Reservoir. Seepage losses from these streams, as well as a multitude of canals, laterals, and ditches, to the shallow, perched system has been reduced by lack of available water in 1987-88. In addition, Fraser Reservoir was known to supply significant recharge water through seepage loss to the regional system in the area between Mountain Home and Cinder Cone Butte, until the dam was breached, allowing much of the water to now flow past the reservoir site to the Snake River. It is not known how much, if any, runoff water escapes down Canyon Creek to the Snake River without Fraser dam to impound it. In any event, 1986 water yield figures show Canyon Creek runoff to be about 50% of normal, with less than that likely for 1987 and 1988.

Changes in Irrigated Acreage

IDWR's Land and Water Use section compared satellite digital imagery from 1980 to that from 1984 (no more recent data was readily available) to develop an approximate irrigated acreage change map. Although the map was not suitable for publication, its results generally supported information supplied by Elmore County ASCS. Ron Maurer, Elmore County ASCS Director, recently estimated that, of about 28,500 acres involved in set-aside programs, between 40 and 50% of the acreage would be in western Elmore County, most within the GWMA. This amount of acreage (11,400 to 14,250 acres) represents an unknown but large amount of ground-water withdrawal not taking place this year (1988). Mr. Maurer also indicated that various set-asides in the area had increased greatly since about 1984. Satellite information indicates that between 1980 and 1984, irrigated cropland increased by about 4713 acres, as shown in the following table:

Table 2

Into Production		Out of Production	
Dry range to irr ag	4796 acres	Irr ag to dry range	65
Dry ag to irr ag	200	Irr ag to dry ag	218
	4996 acres		283

4996 - 283 = 4713 acres of new irrigated land

It is very apparent from the information supplied by Elmore ASCS and IDWR that significant reductions in the amount of land irrigated from ground water has had a very large impact on the amount of ground water withdrawn in the GWMA.

Water Rights

A computer search of water rights on file with the Department having priority dates later than November 9, 1982, the date of closure of the MHGWMA, failed to show a single right that had not existed prior to the closure of the area. This simply means that no authorized development has occurred in the MHGWMA since the date of closure. As a result, the conclusions in the Norton report need no modification, nor do conclusions in this report which are based on data from the Norton report.

Conclusions & Recommendations

Although some of the information reviewed is based on estimates, it is sufficient to draw certain conclusions. It seems apparent that water level declines are taking place at a reduced rate from those experienced prior to Norton's 1982 report and, in some cases, declines are actually reversing (water levels are recovering). Ground-water pumpage has decreased on about 11,400 to 14,250 acres as a probable result of Federal government agricultural set-aside programs. This could amount to a reduction of ground-water withdrawals of between 34,000 and 43,000 acre-ft per annum, assuming a consumptive use of about 3 acre-ft/acre.

Set-asides have increased dramatically since about 1984, reversing a previous trend of increasing amounts of land being brought into agricultural production. The length of time of some of the set-asides are for as long as ten years, ensuring that ground-water withdrawals may be below "normal" for years to come.

Long-term precipitation trends show that for the last several years we have experienced above-normal precipitation. This implies that future years may tend to be below-normal, further reducing the probable amount of water to be recharged to both the shallow and regional ground-water systems.

The net effect of reduced pumpage coupled with reduced recharge is unknown at this time, but, since the long-term changes are likely to be slow in developing, it is recommended that there be no change at this time to the status of the Mountain Home GWMA or to the handling of water right applications on file with IDWR. Monitoring and better defining of those parameters which went into producing this review should continue and some thought should be given to the ongoing purchase of satellite imagery with which changes in irrigated acreages from year to year can be documented. Finally, it is recommended that a review similar to this, in cooperation with other State and Federal agencies, be performed annually.

REFERENCES

1. Maurer, Ron; Director, Elmore County ASCS, personal communication, July 1988.

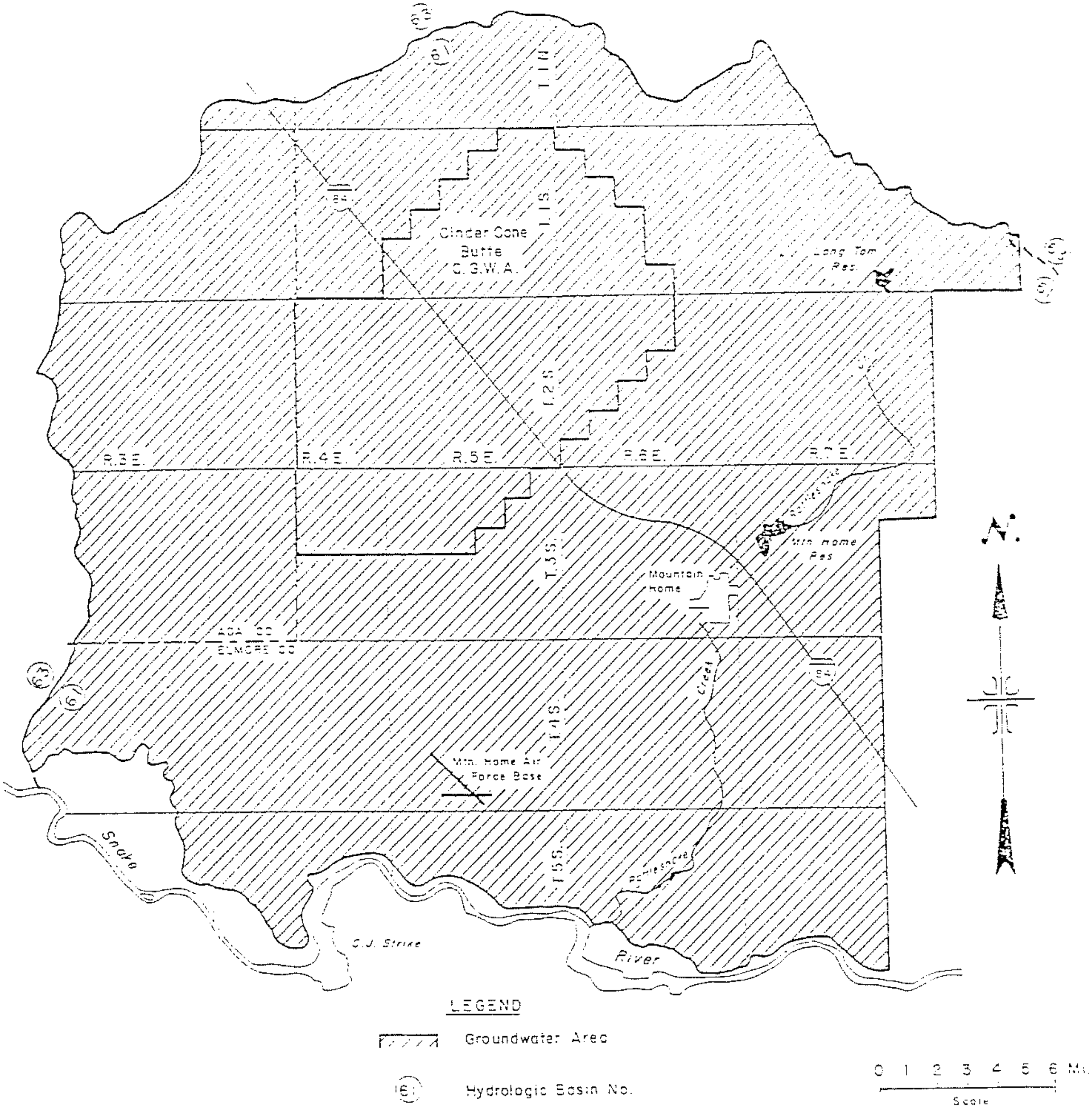
2. Norton, M.A., et al, 1982, Ground Water Investigation of the Mountain Home Plateau, Idaho; IDWR Open-file report, 62 p.

3. Ralston, D.R. and Chapman, S.L., 1968, Ground Water Resources in the Mountain Home Area, Elmore County, Idaho; IDWR Water Information Bulletin No. 4, 63 p.

4. Ralston, D.R. and Chapman, S.L., 1970, Ground Water Resources of Southern Ada County and Western Elmore County, Idaho; IDWR Water Information Bulletin No. 15, 52 p.

5. Young, H.W., 1977, Reconnaissance of Ground Water Resources in the Mountain Home Plateau Area, Southwest Idaho; U.S. Geological Survey Water Resources Investigations 77-108, Open-file report, 40 p.

FIGURE 1



MOUNTAIN HOME GROUNDWATER MANAGEMENT AREA

FIGURE 2

MT. HOME W/L CHANGE, SPRING 83 – SPRING 88

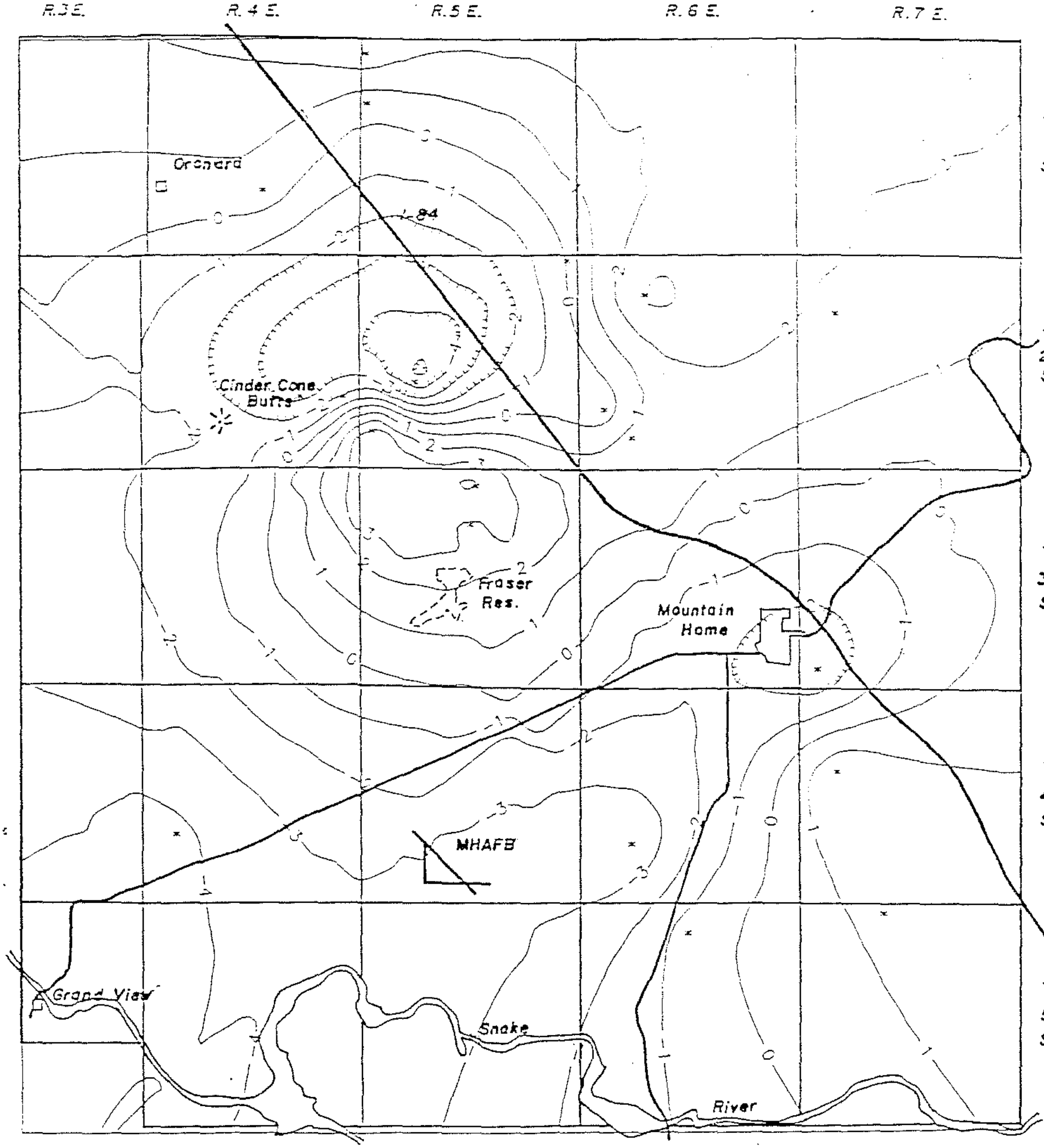


FIGURE 5

MT. HOME W L CHANGE, SPRING 86 – SPRING 88

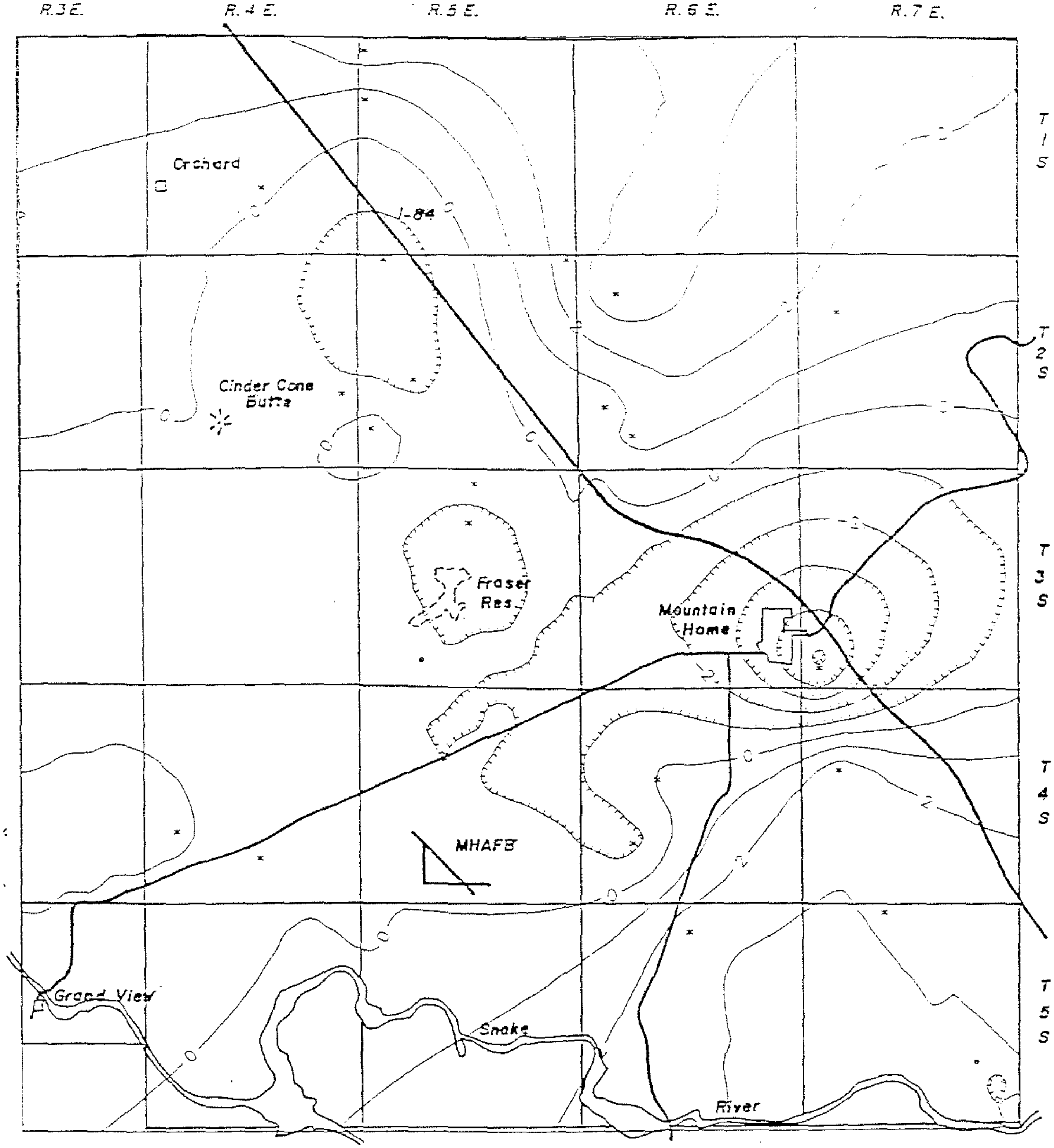


TABLE 1

BOISE & MT. HOME PRECIPITATION
AND DEPARTURES FROM NORMAL

YEAR	BOISE			MT. HOME		
	ANNUAL PRECIP	DEPARTURE	ACCUM DEPARTURE	ANNUAL PRECIP	DEPARTURE	ACCUM DEPARTURE
1974	9.46	-2.04	-2.04	11.24	1.64	1.64
1975	13.69	2.19	0.15	13.40	3.80	5.44
1976	12.20	0.70	0.85	12.91	3.31	8.75
1977	12.20	0.70	1.55	9.83	0.23	8.98
1978	11.83	0.33	1.88	12.24	2.64	11.62
1979	12.07	0.57	2.45	9.20	-0.40	11.22
1980	15.21	3.71	6.16	10.30	0.70	11.92
1981	15.28	3.78	9.94	12.03	2.43	14.35
1982	13.83	2.33	12.27	11.82	1.65	16.00
1983	18.77	7.06	19.33	18.40	8.23	24.23
1984	13.24	1.53	20.86	11.84	1.67	25.90
1985	11.14	-0.57	20.29	9.48	-0.69	25.21
1986	14.31	2.60	22.89	12.72	2.55	27.76
1987	8.49	-3.22	19.67	6.74	-3.43	24.33

FIGURE 4

MT. HOME W/L CHANGE, SPRING 87 – SPRING 88

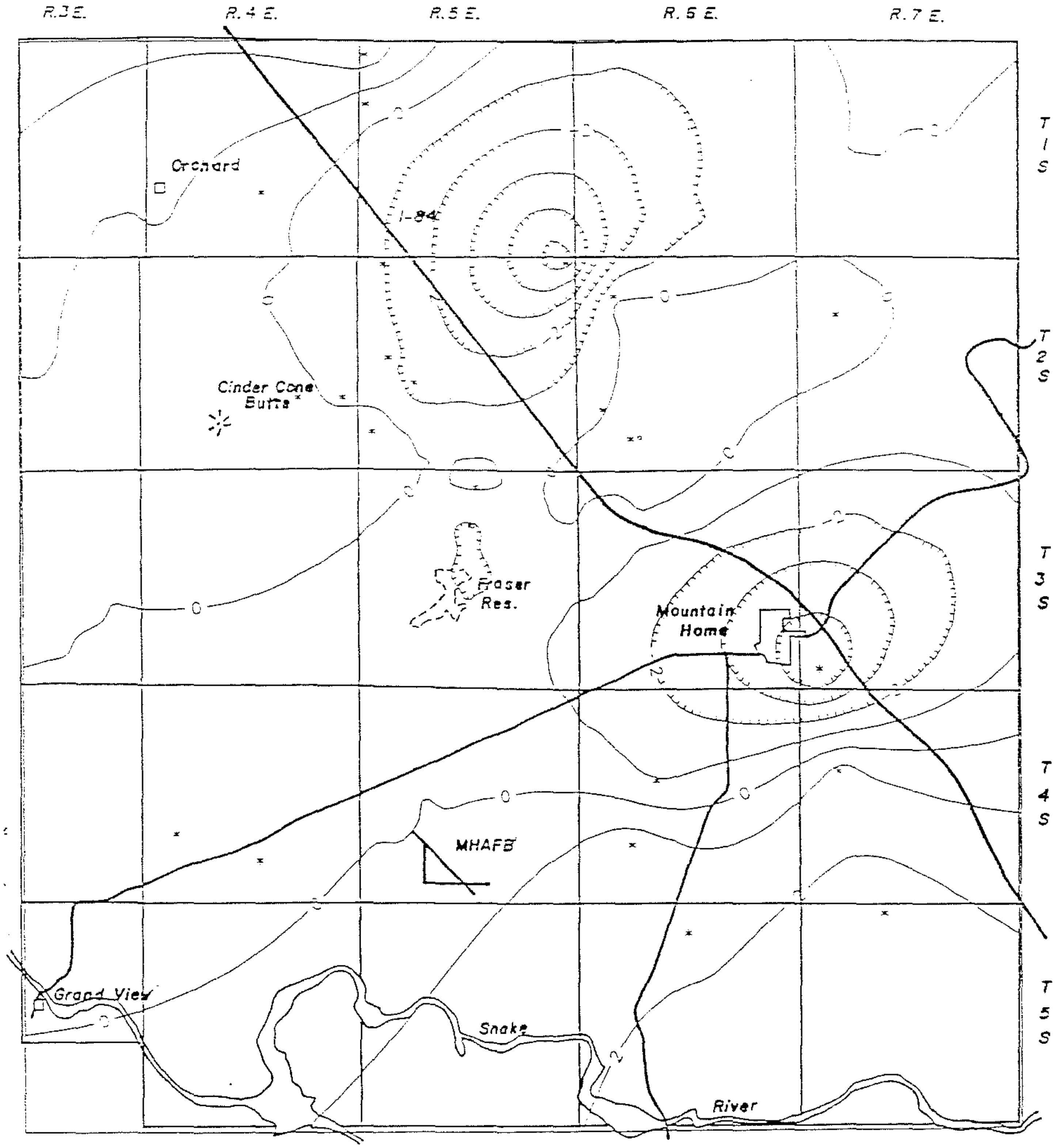
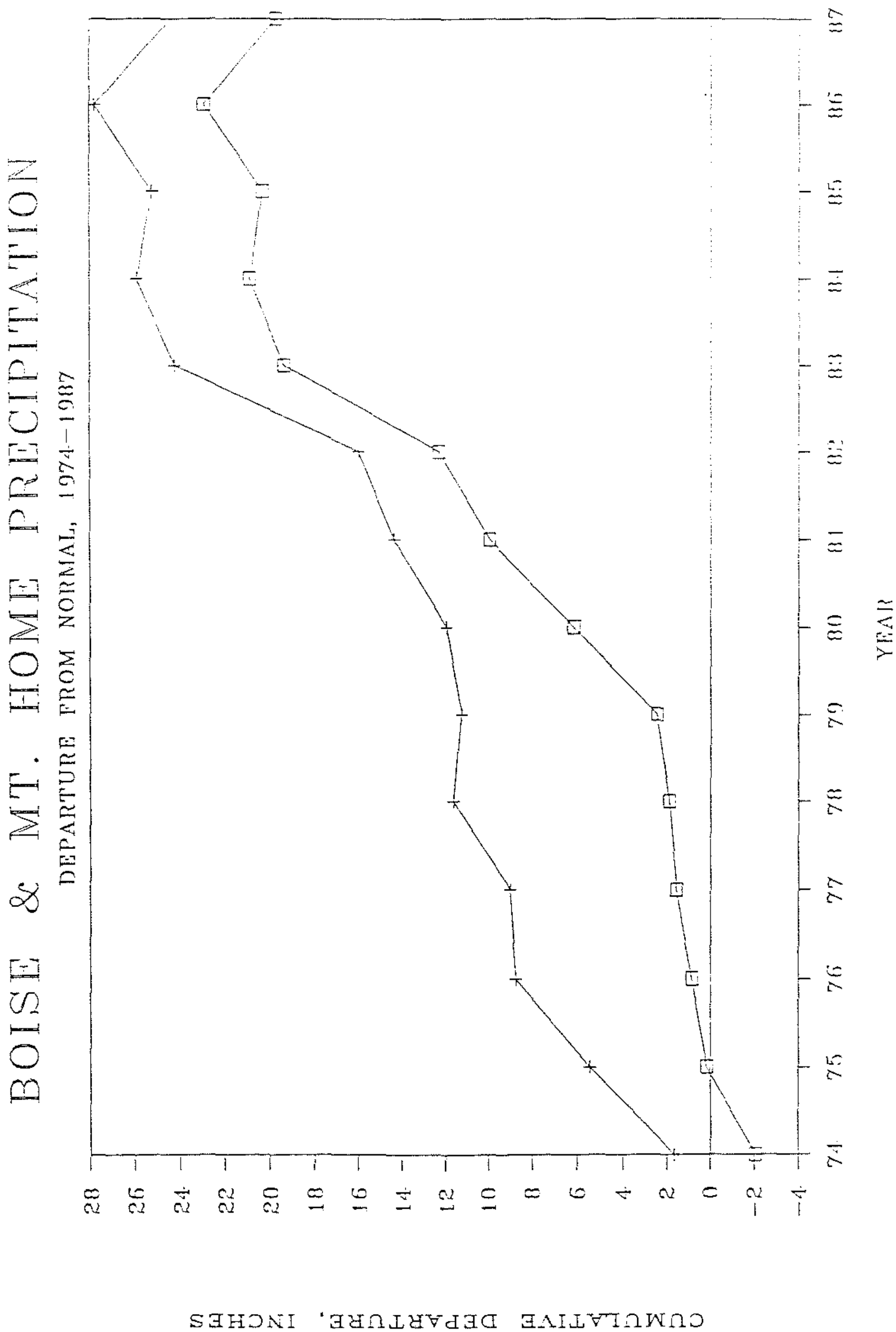


FIGURE 5



BOISE & MT. HOME PRECIPITATION
DEPARTURE FROM NORMAL, 1974–1987
CUMULATIVE DEPARTURE, INCHES
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
−2
−4
74
75
76
77
78
79
80
81
82
83
84
85
86
87
YEAR

APPENDIX A

OBSERVATION WELL HYDROGRAPHS

WELL-NUMBERING SYSTEM

The well-numbering system used by both the US Geological Survey and the Idaho Department of Water Resources in Idaho locates the wells within the official rectangular subdivisions of the public lands, with reference to the Boise base line and meridian. The first segment of a well number (example in Figure A-1) indicates the township, the second segment the range, and the third segment the section in which the well is situated. The letters following the section number indicate the well location within the section: the first letter denotes the 160-acre tract, the second the 40-acre tract, and the third the 10-acre tract. The letters are assigned in a counterclockwise direction, beginning in the northeast quarter of each progressively smaller subdivision. The last numeral is a serial number assigned when the well is inventoried. Thus, well 7S-17E-6ACA1 is in the NE1/4SW1/4NE1/4 of Section 6, Township 7 South, Range 17 East, and is the first well inventoried in that tract.

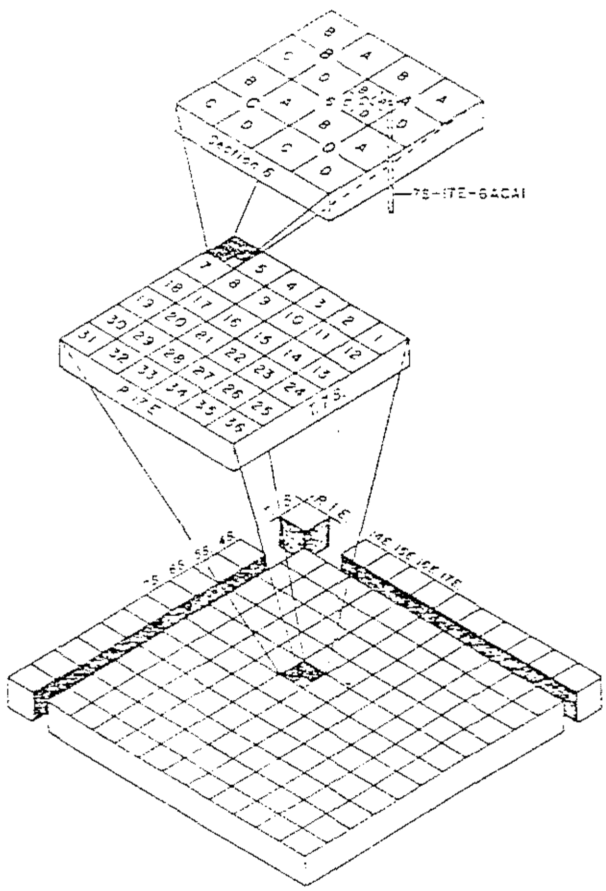
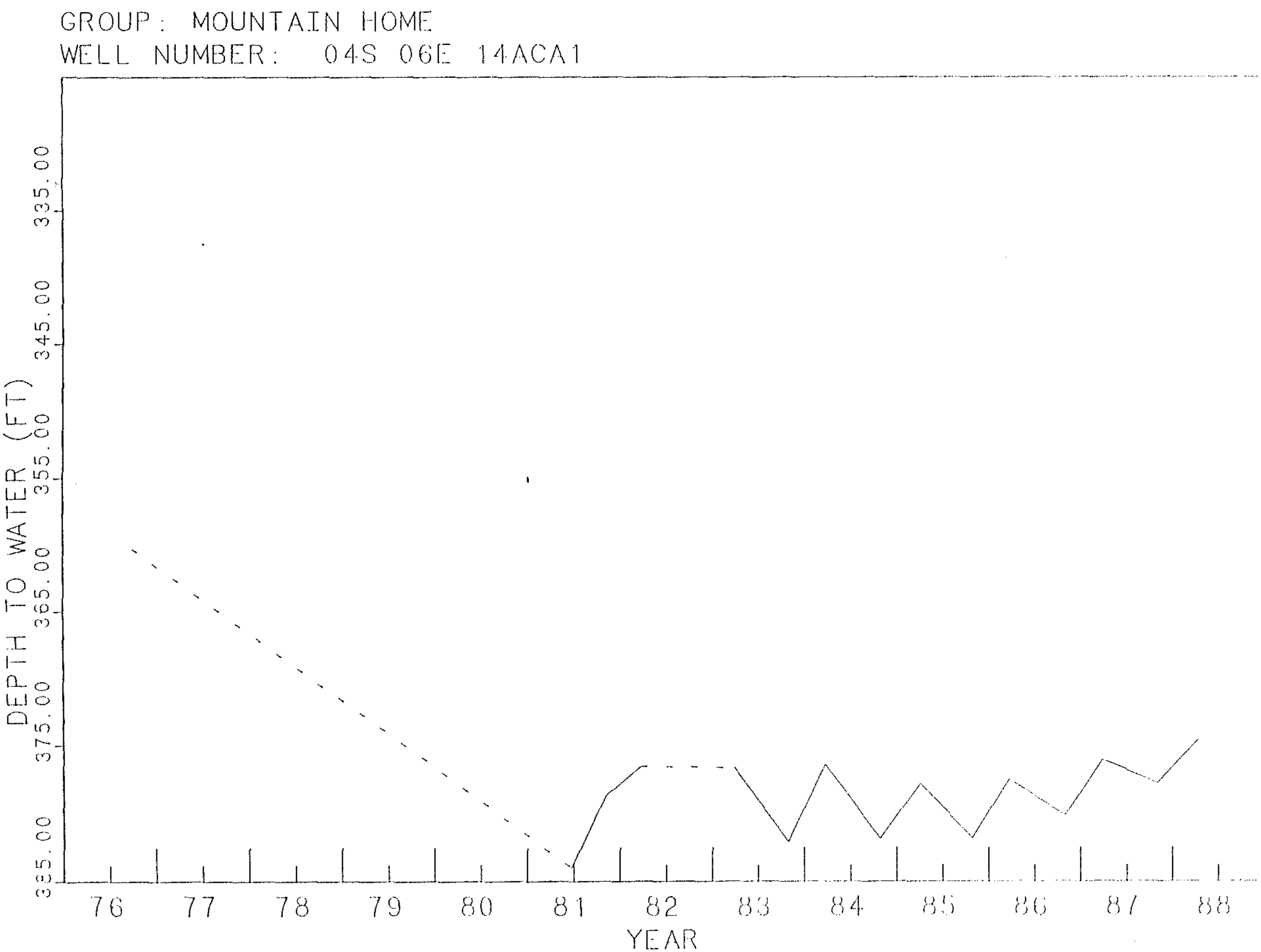
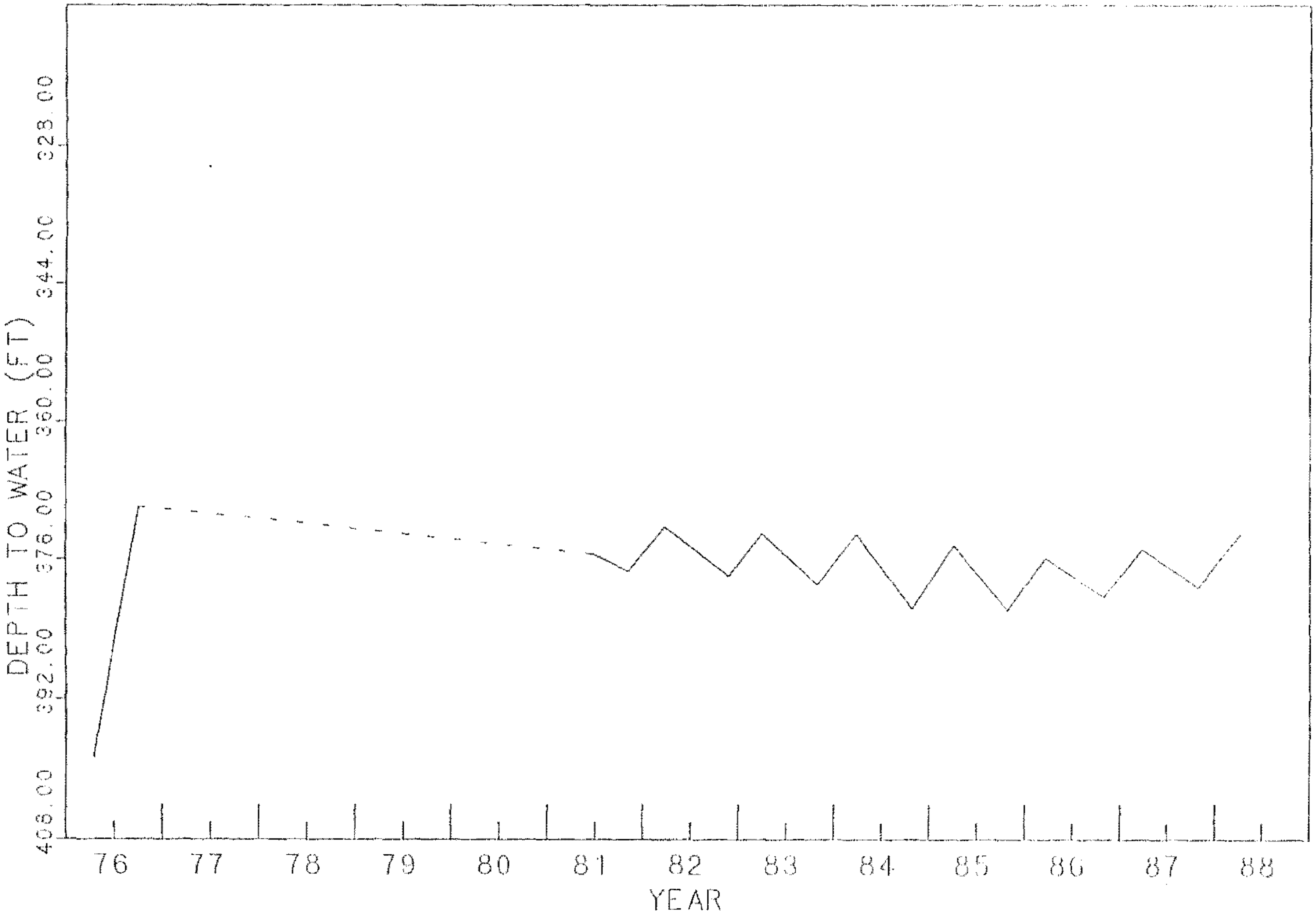


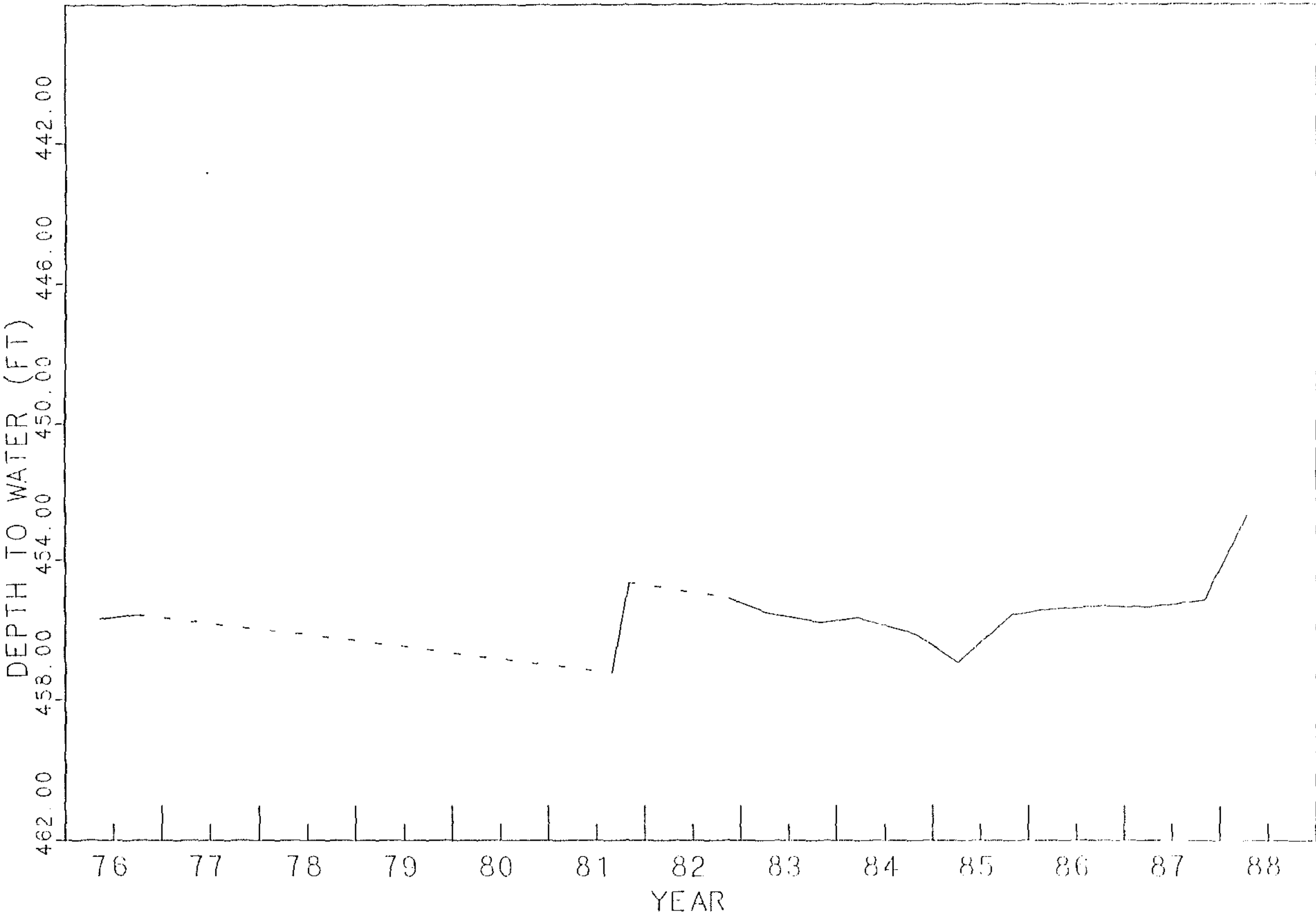
Figure A-1. Diagram showing well-numbering system


GROUP: MOUNTAIN HOME
WELL NUMBER: 04S 06E 14ACA1
DEPTH TO WATER (FT)
335.00
345.00
355.00
365.00
375.00
385.00
76
77
78
79
80
81
82
83
84
85
86
87
88
YEAR

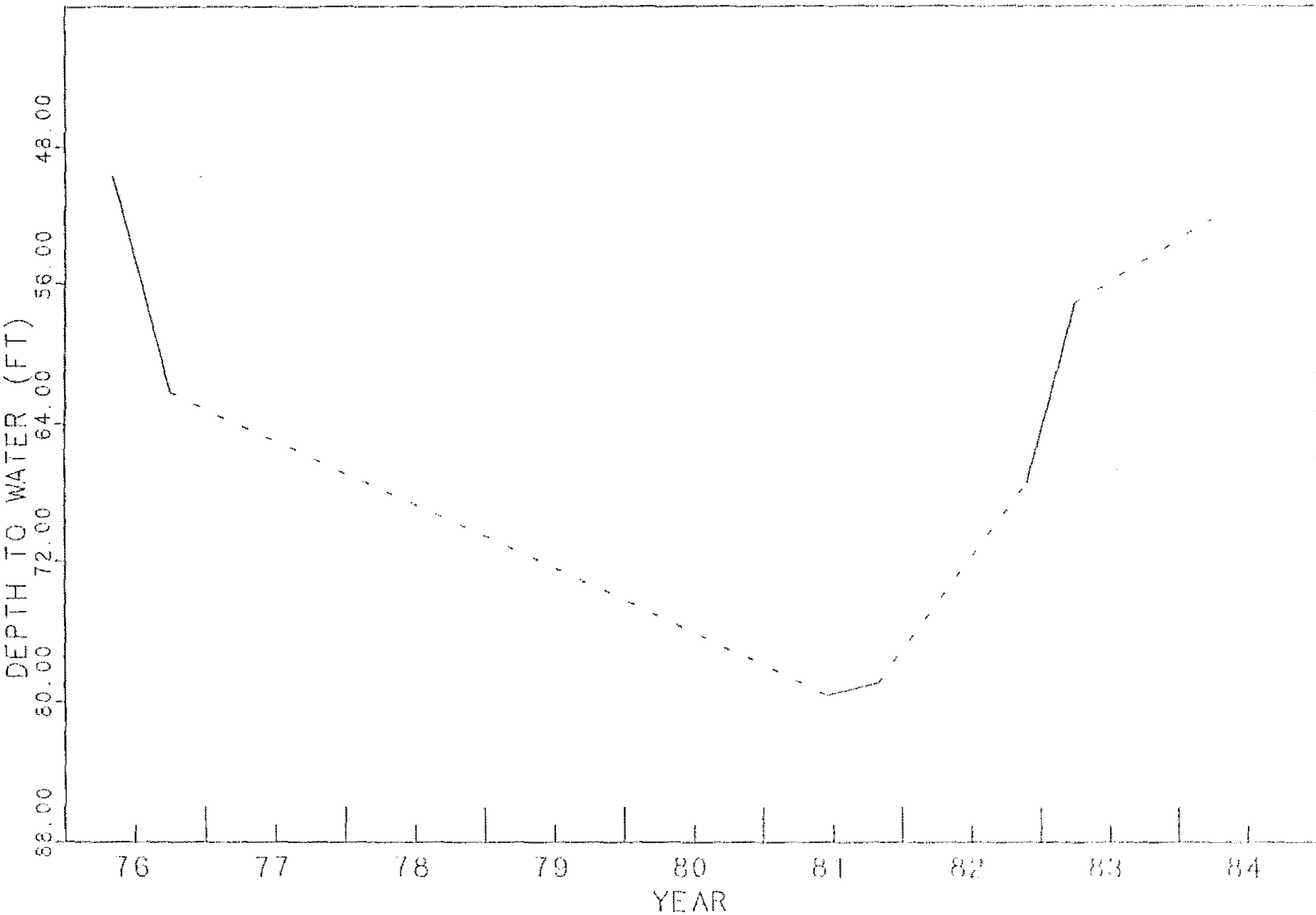
GROUP: MOUNTAIN HOME
WELL NUMBER: 05S 06E 06CAA1



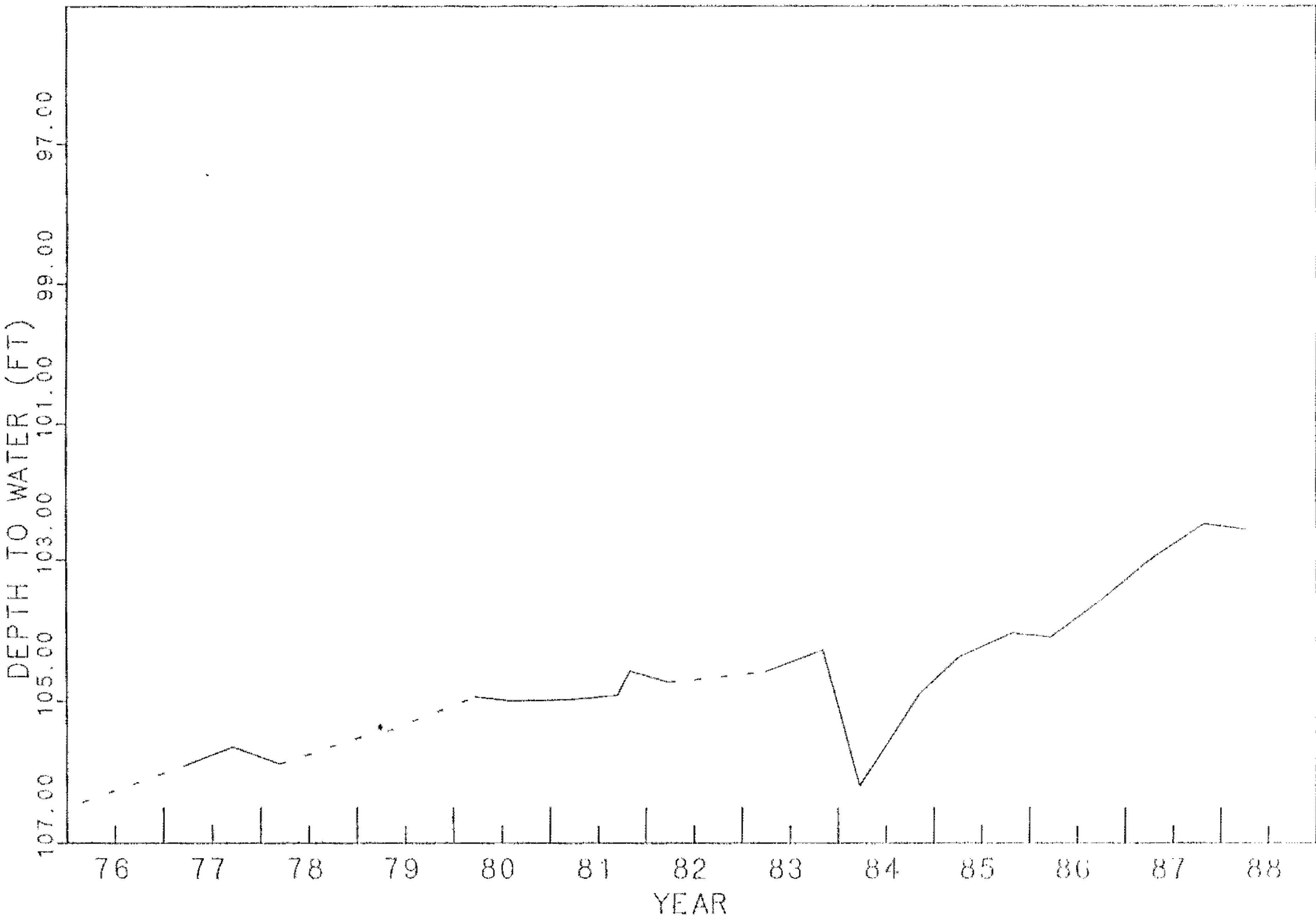
GROUP: MOUNTAIN HOME
WELL NUMBER: 01S 04E 03ADB1



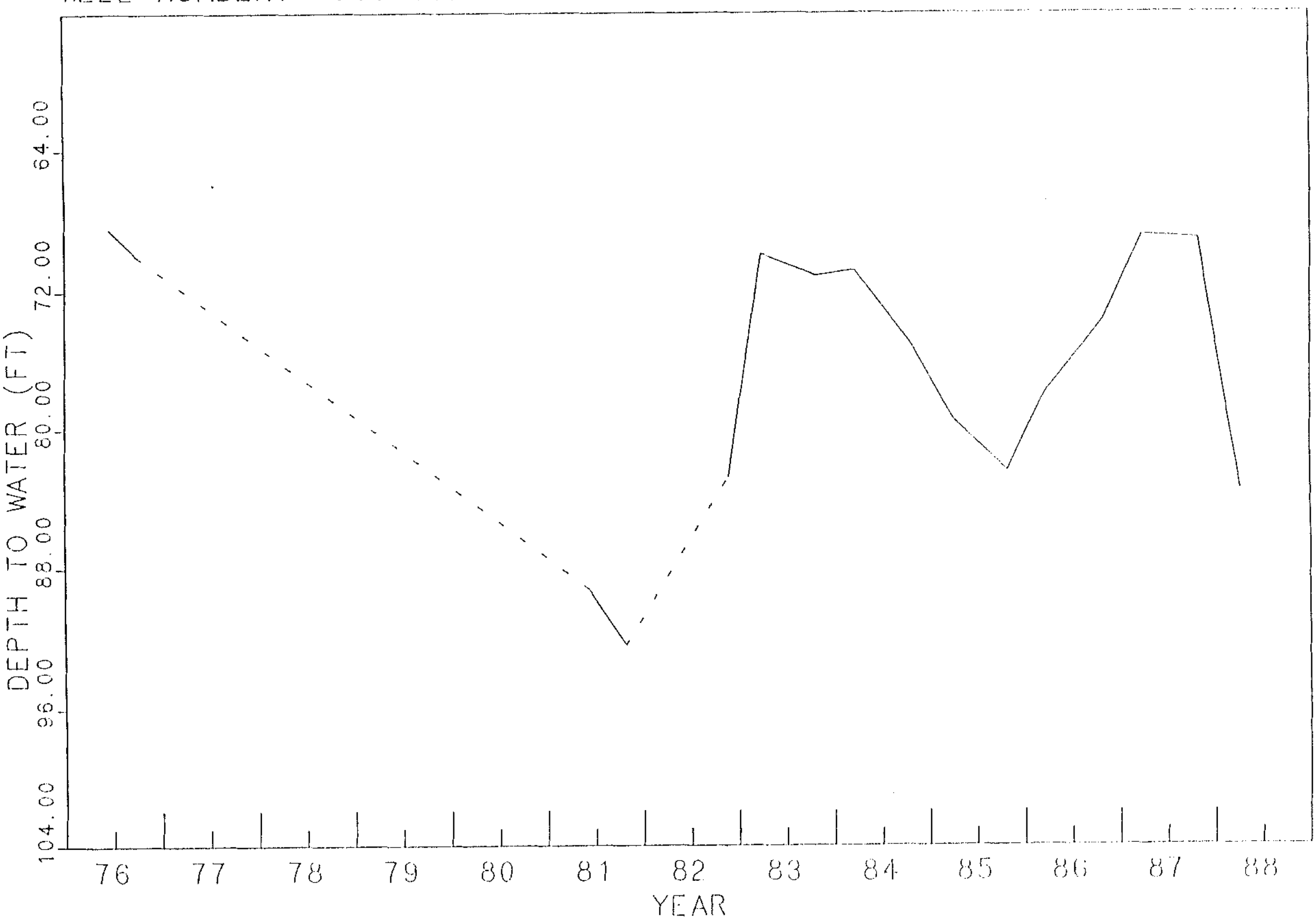
GROUP: MOUNTAIN HOME
WELL NUMBER: 03S 06E 02ACA1



GROUP: MOUNTAIN HOME
WELL NUMBER: 02S 06E 11DAC1

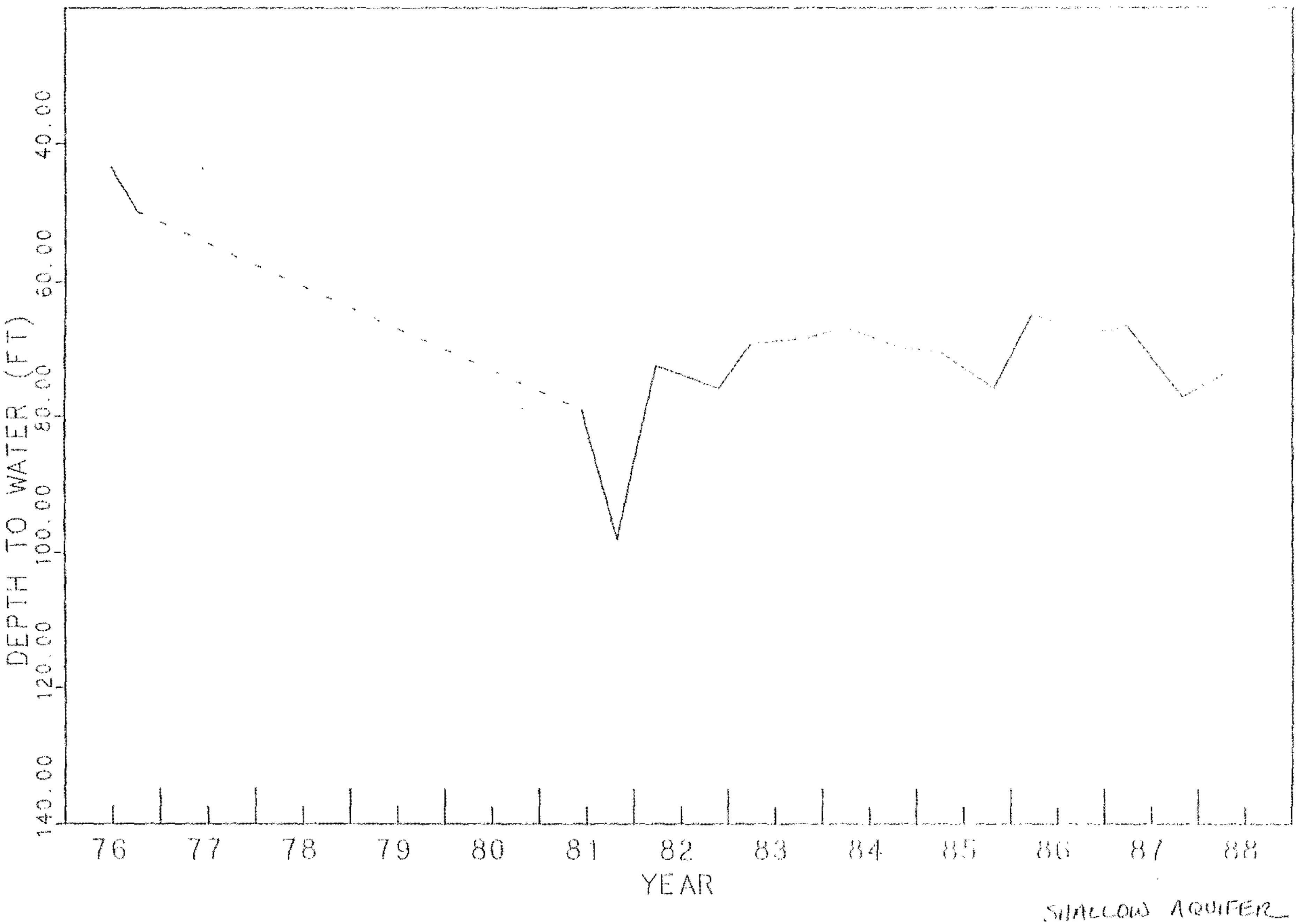


GROUP: MOUNTAIN HOME
WELL NUMBER: 03S 07E 08DBB1

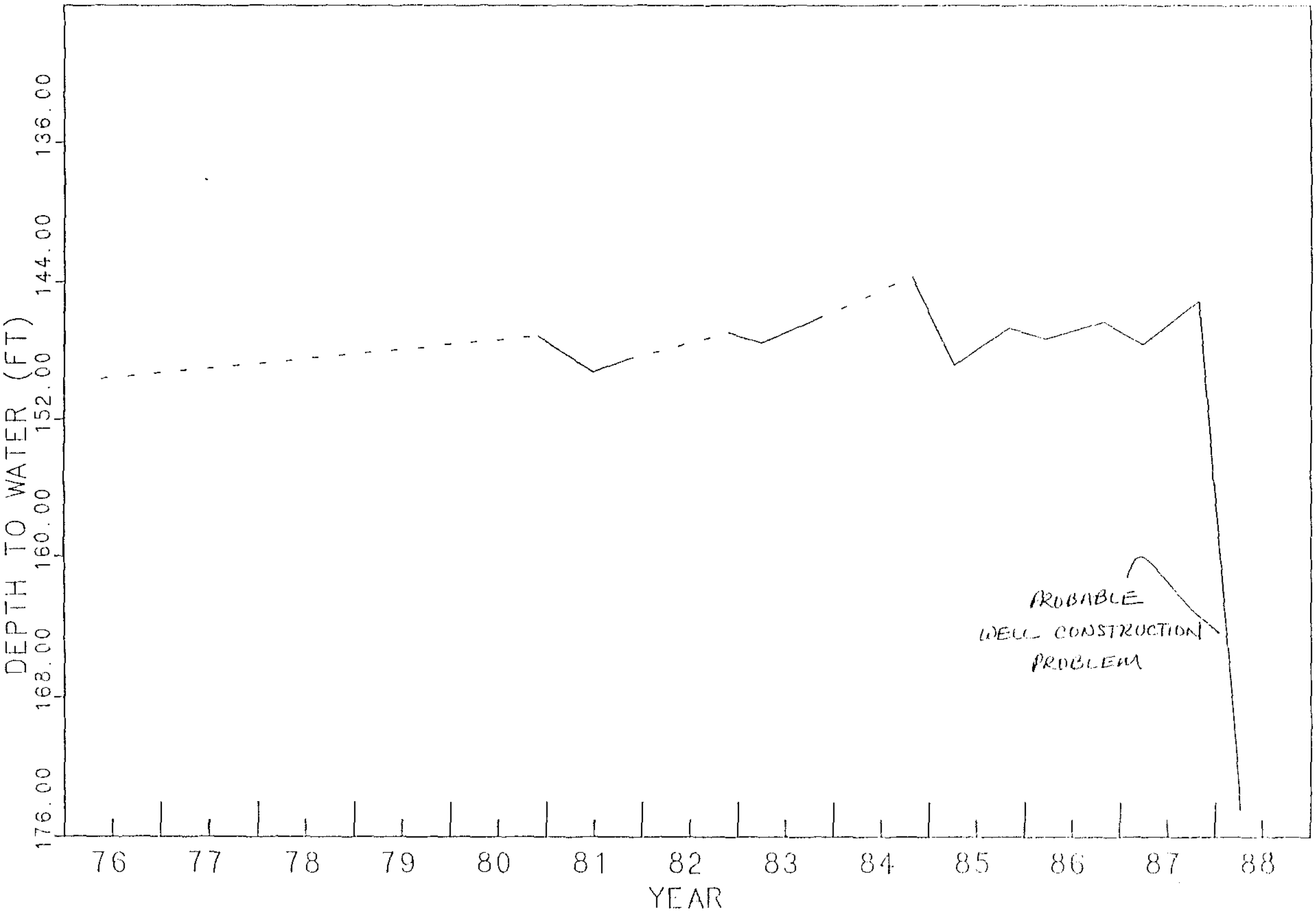


SHALLOW AQUIFER

GROUP: MOUNTAIN HOME
WELL NUMBER: 03S 07E 18CAA1



GROUP: MOUNTAIN HOME
WELL NUMBER: 03S 06E 34DDD1



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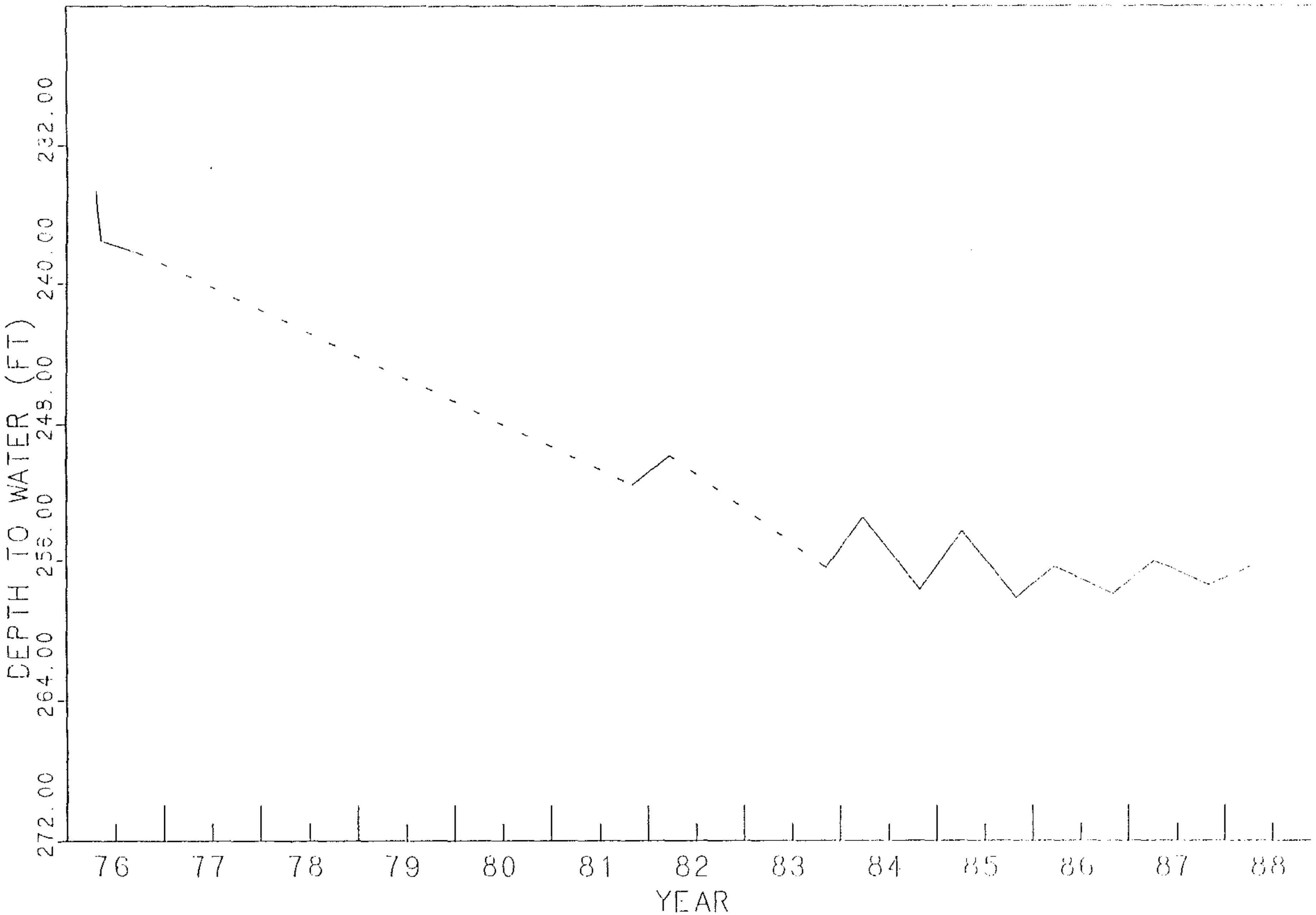
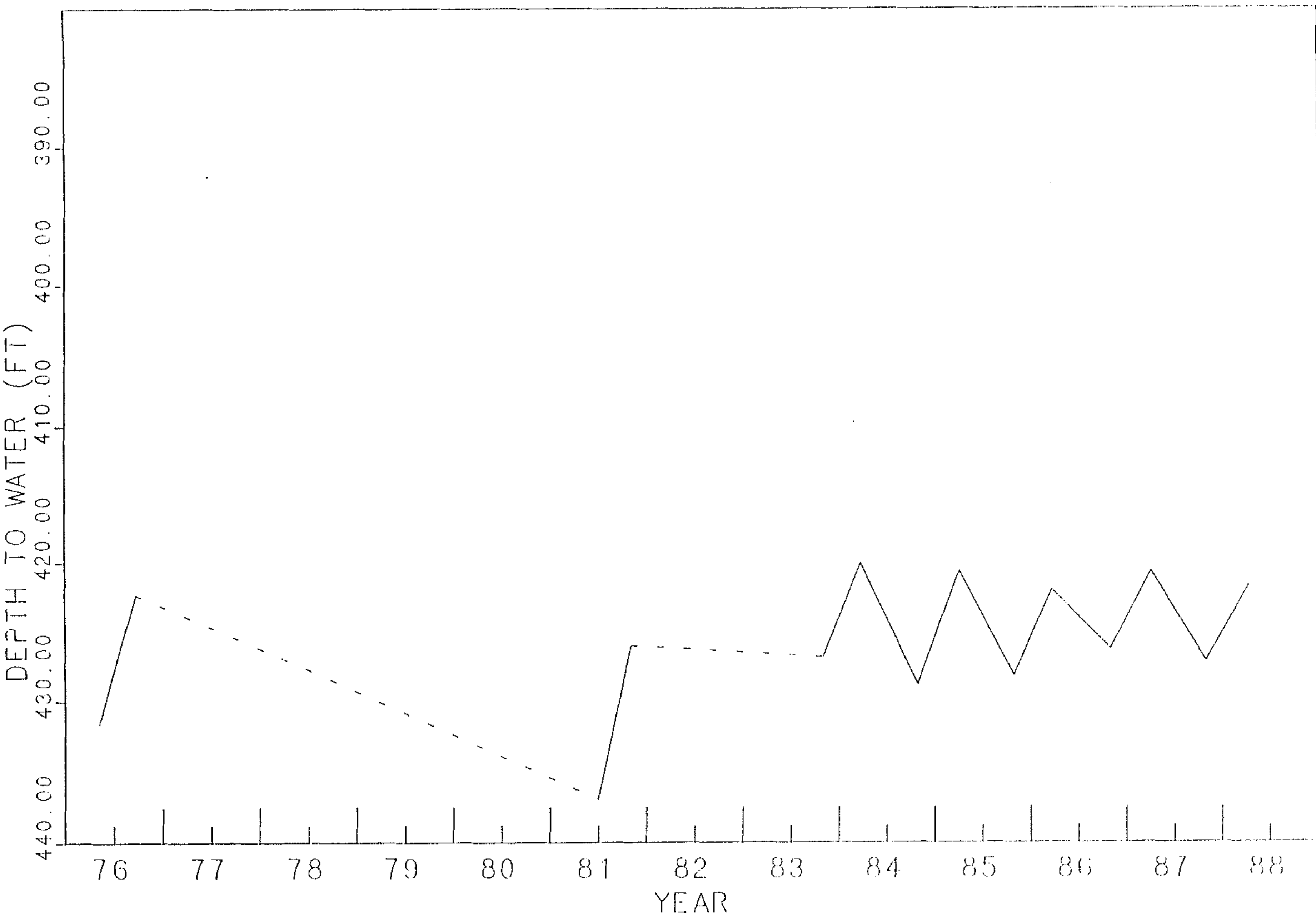


GROUP: MOUNTAIN HOME
WELL NUMBER: 04S 05E 13DAB1



GROUP: MOUNTAIN HOME
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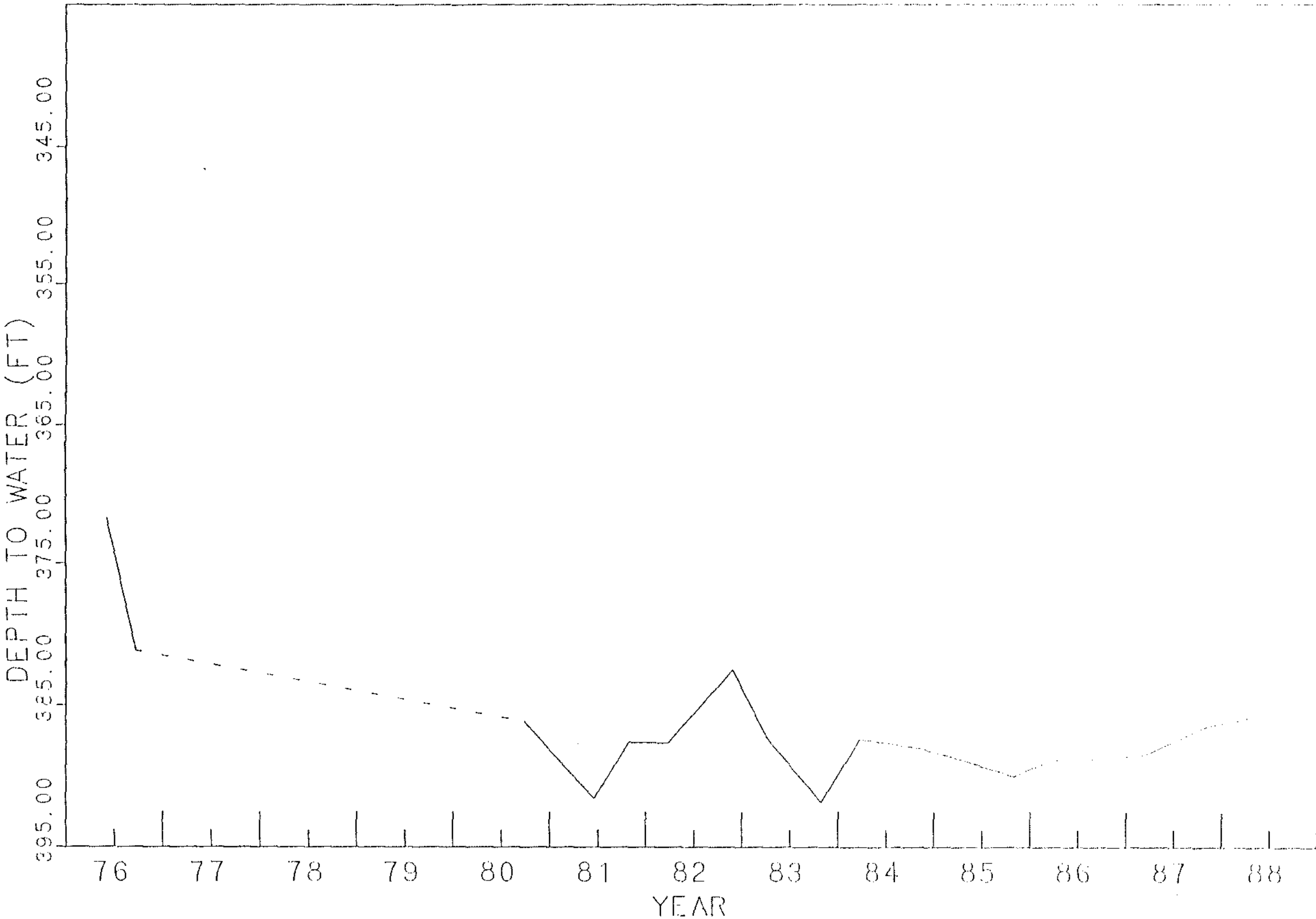
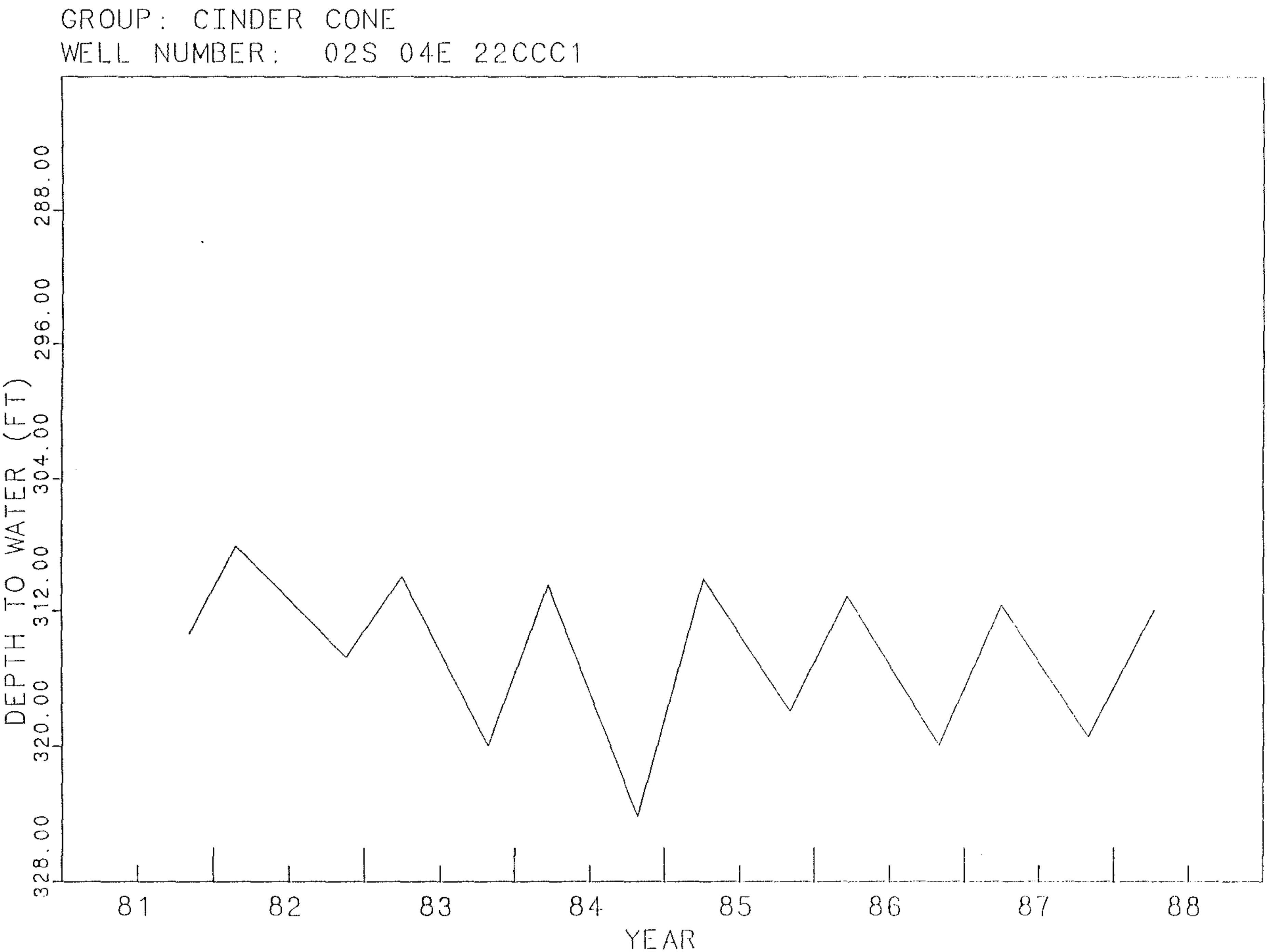
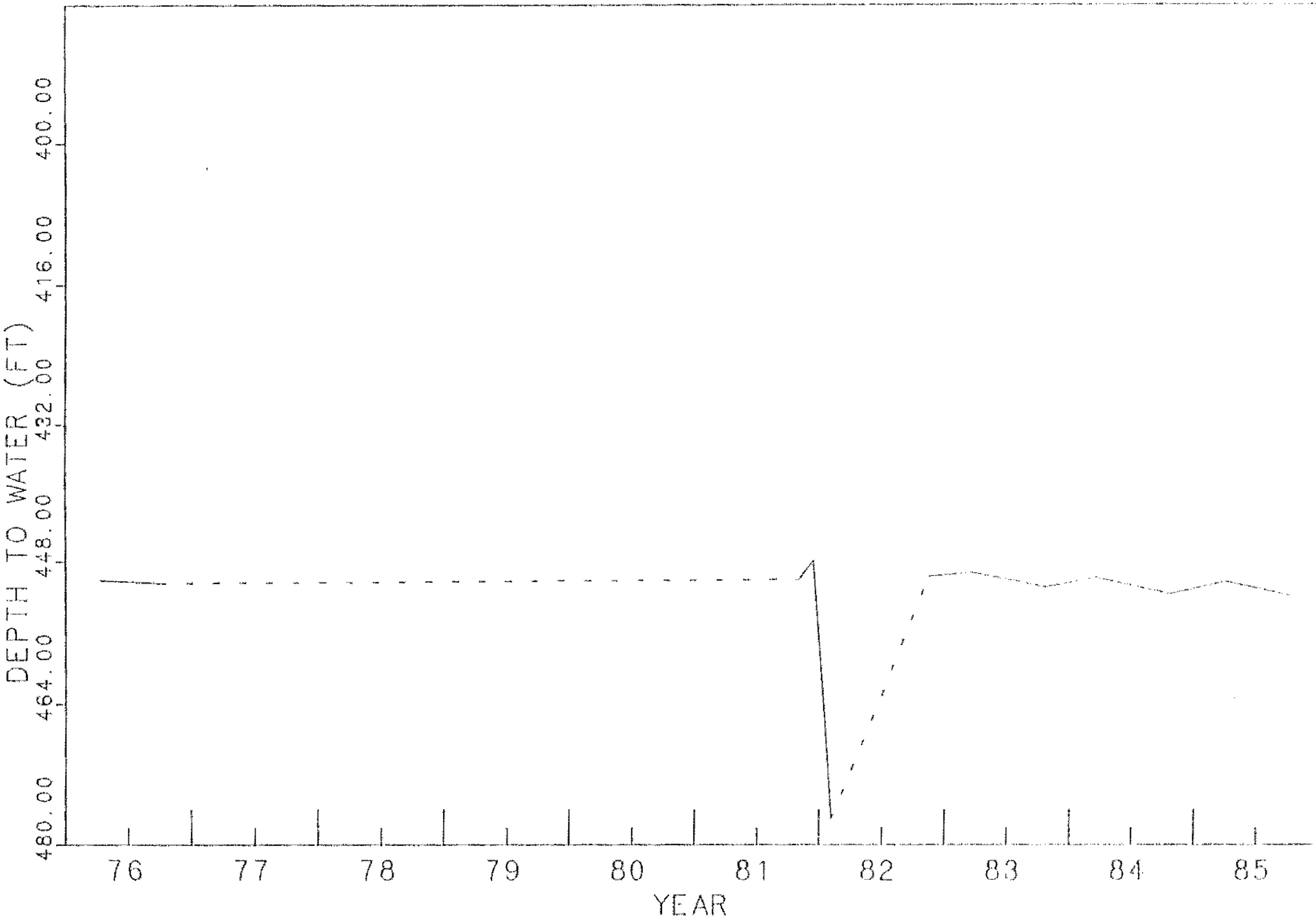



GROUP: CINDER CONE
WELL NUMBER: 02S 04E 22CCC1
DEPTH TO WATER (FT)
288.00
296.00
304.00
312.00
320.00
328.00
81
82
83
84
85
86
87
88
YEAR

GROUP: CINDER CONE
WELL NUMBER: 02S 04E 11BCD1



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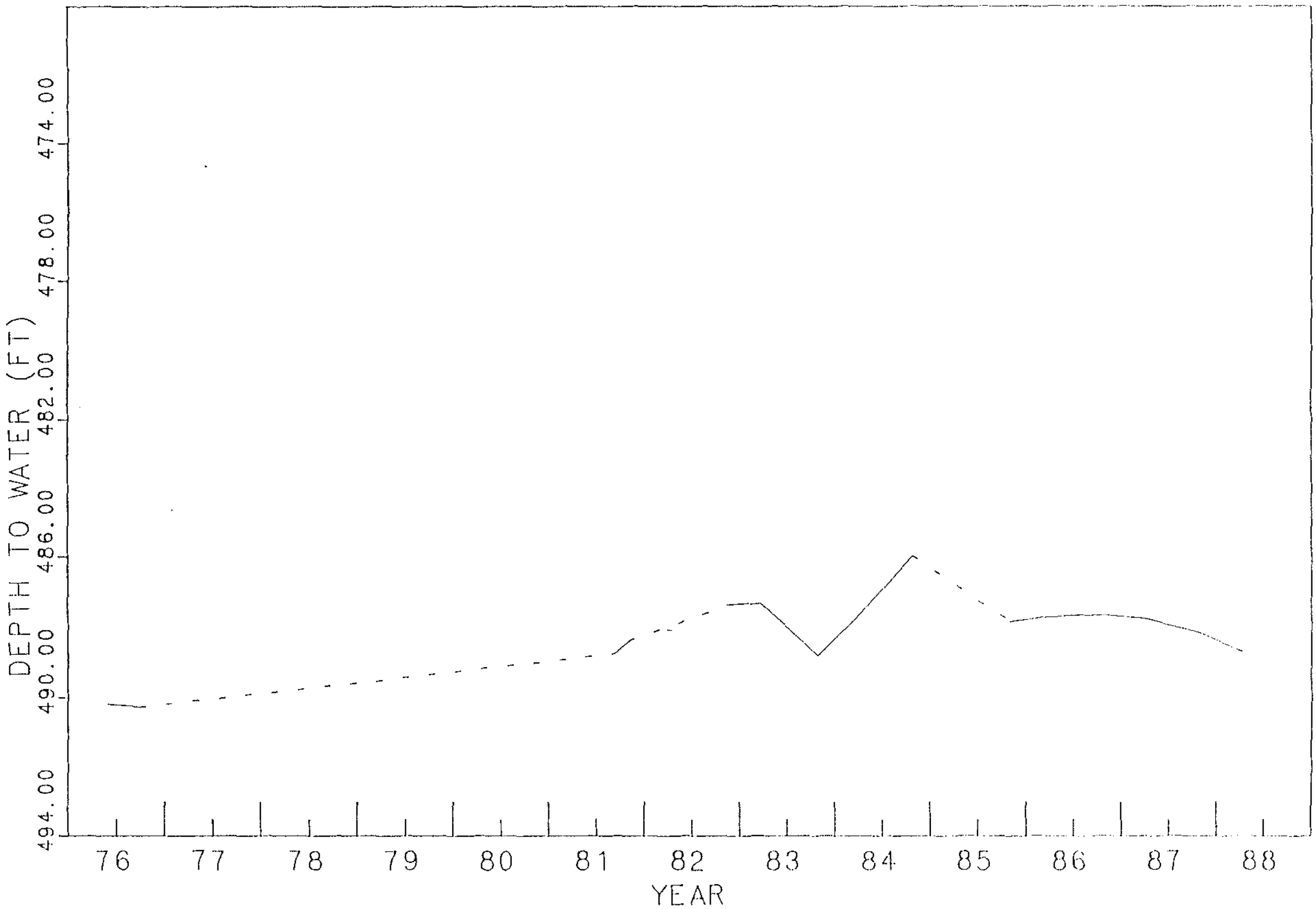

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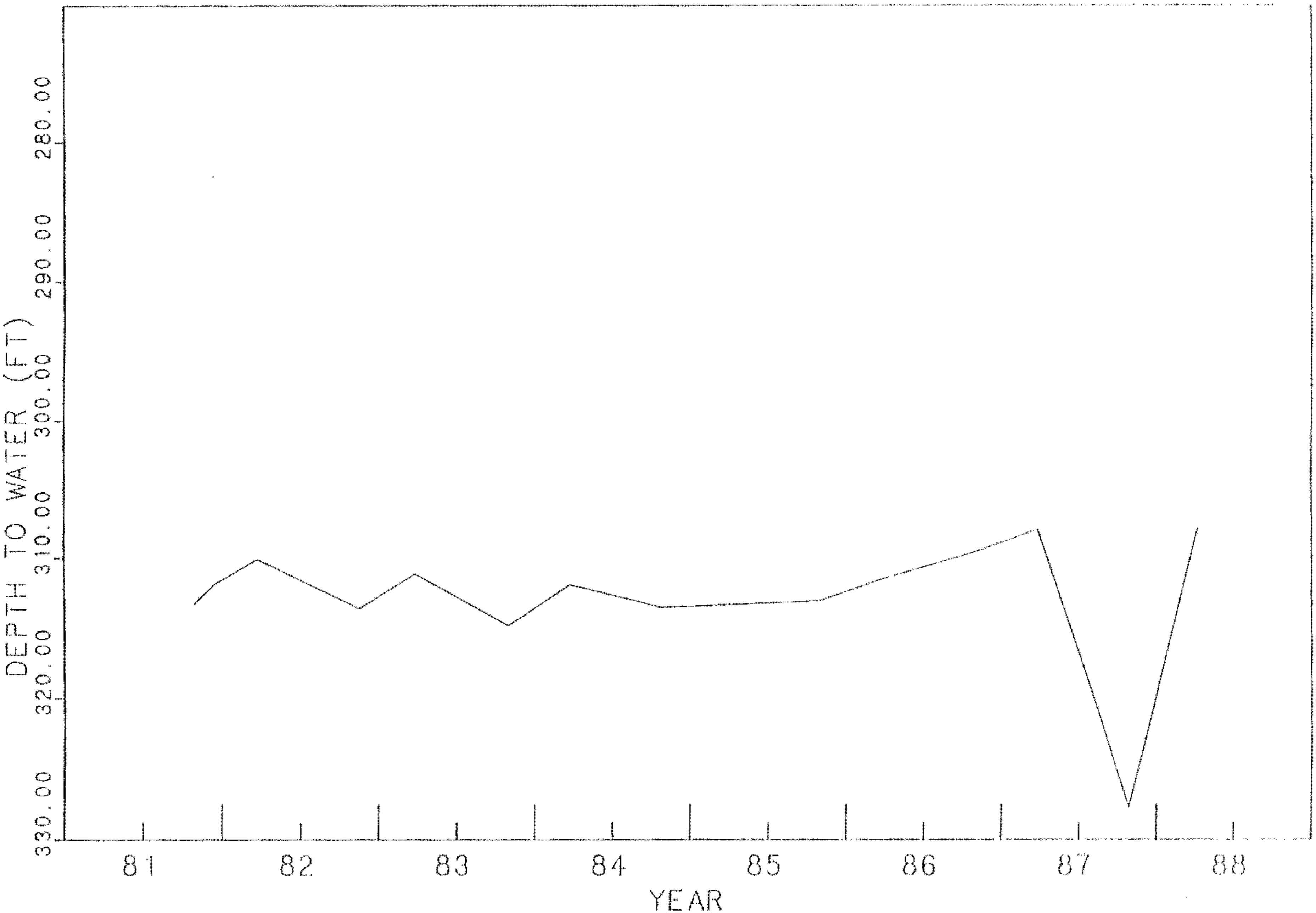
WELL NUMBER: 02S 05E 11AAB1



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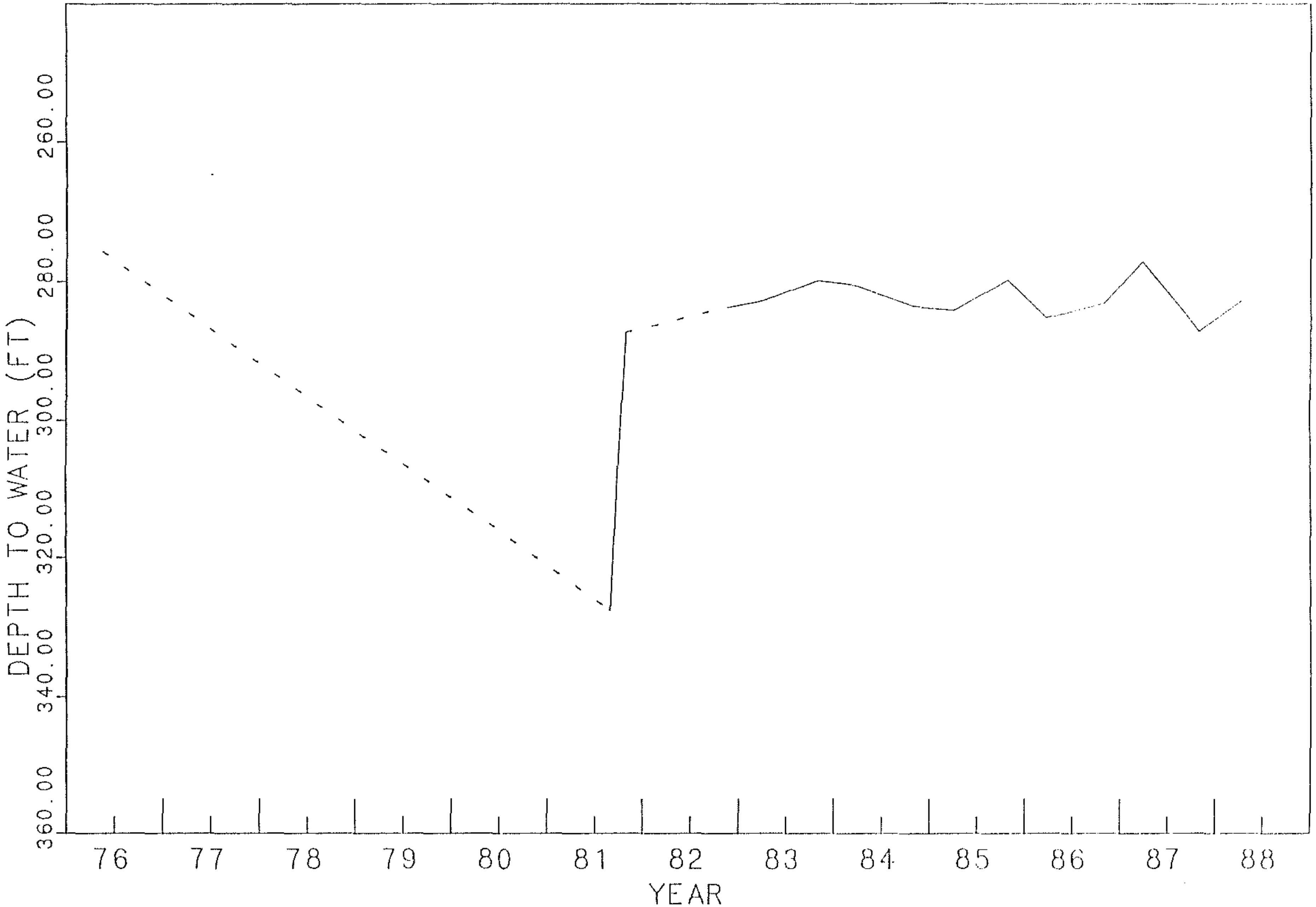
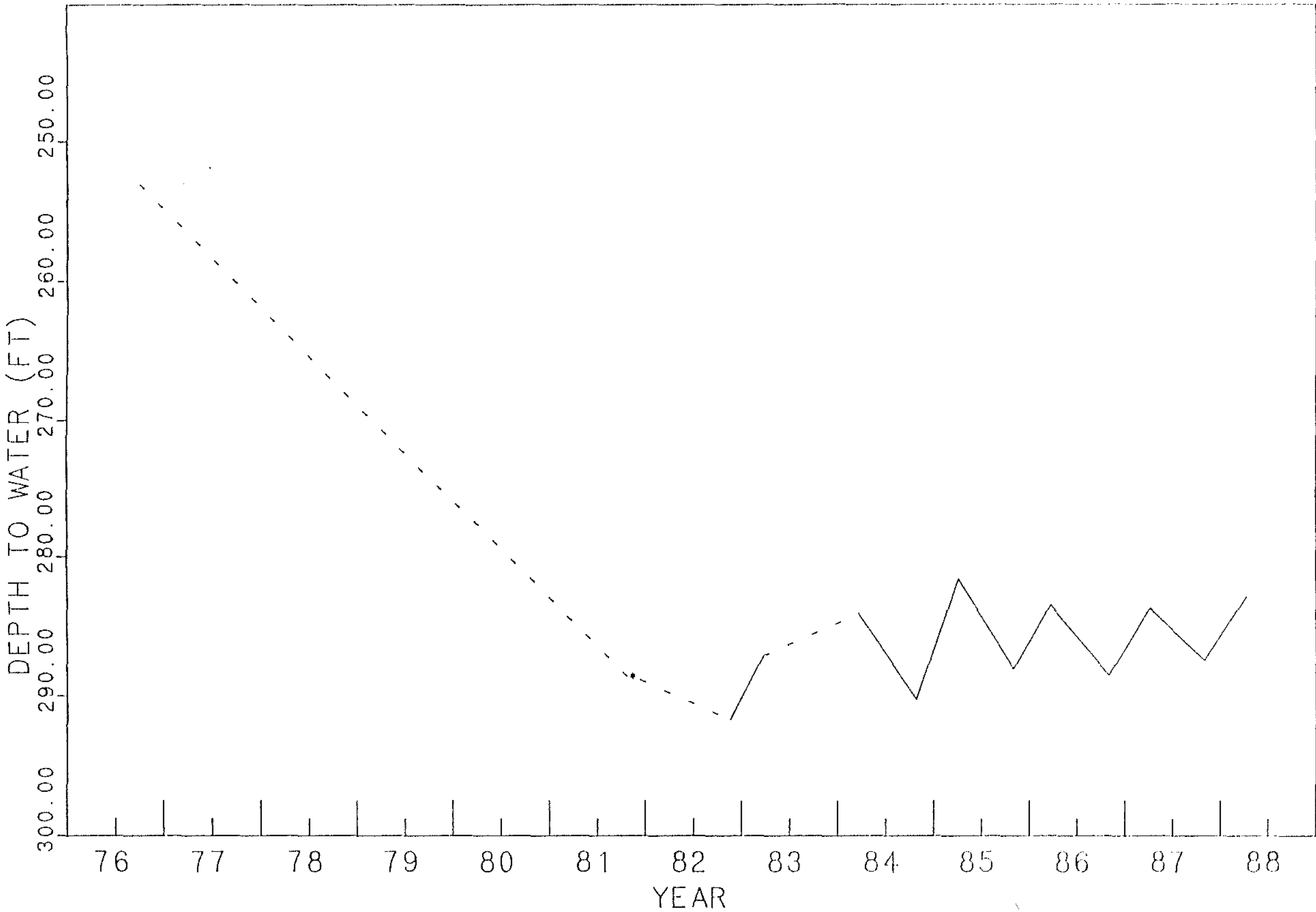
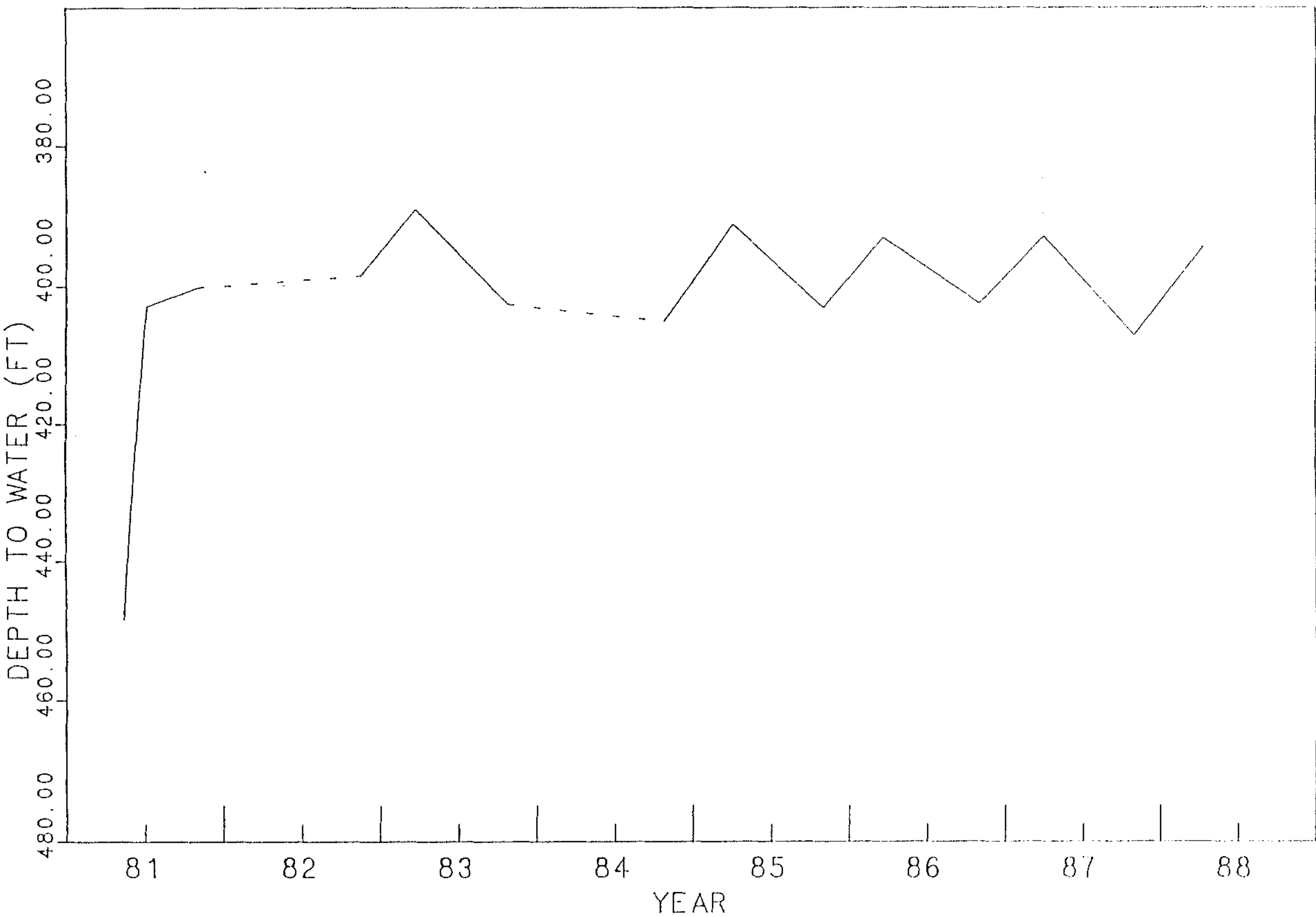


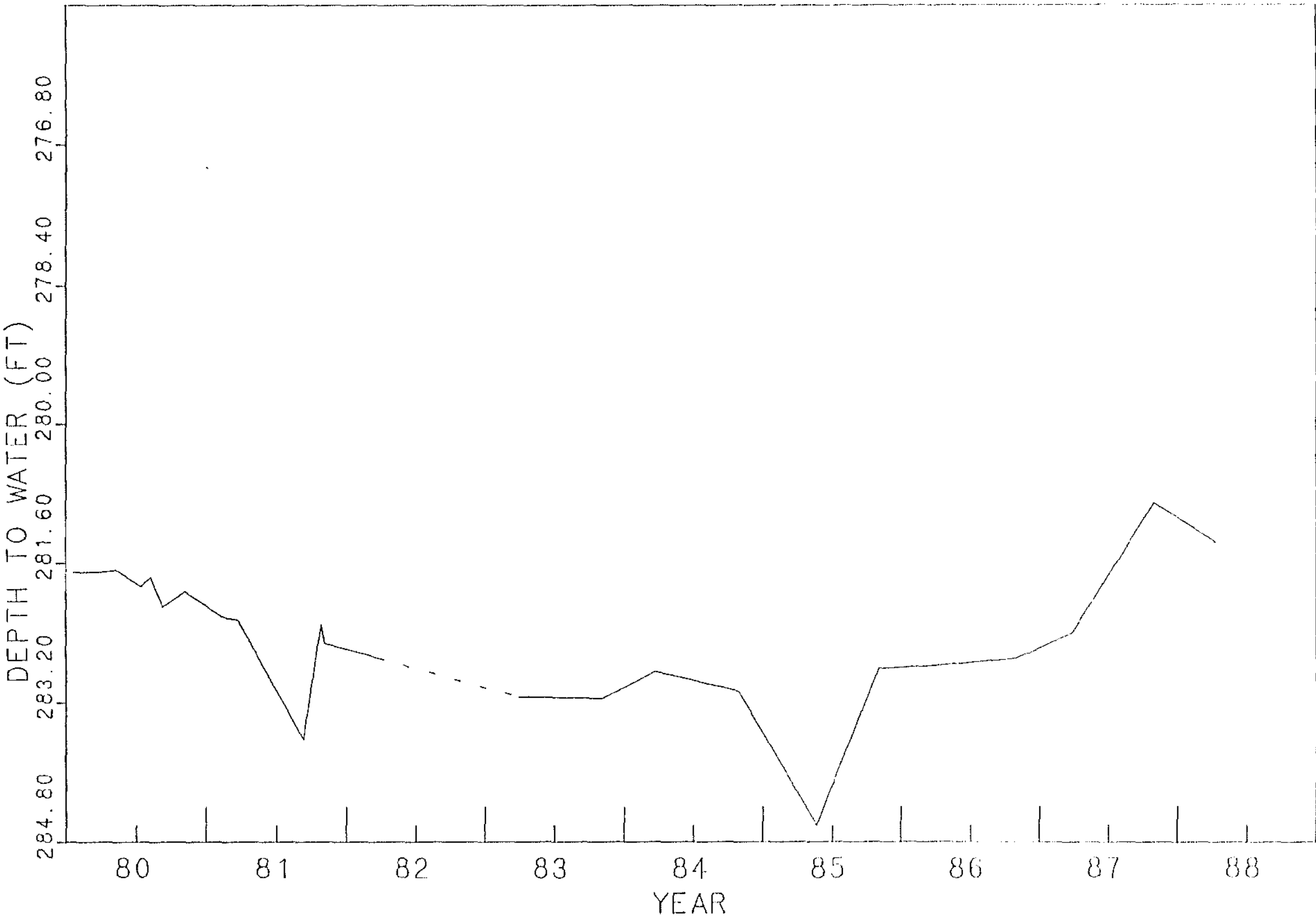
GROUP: CINDER CONE
WELL NUMBER: 02S 04E 27DDD1



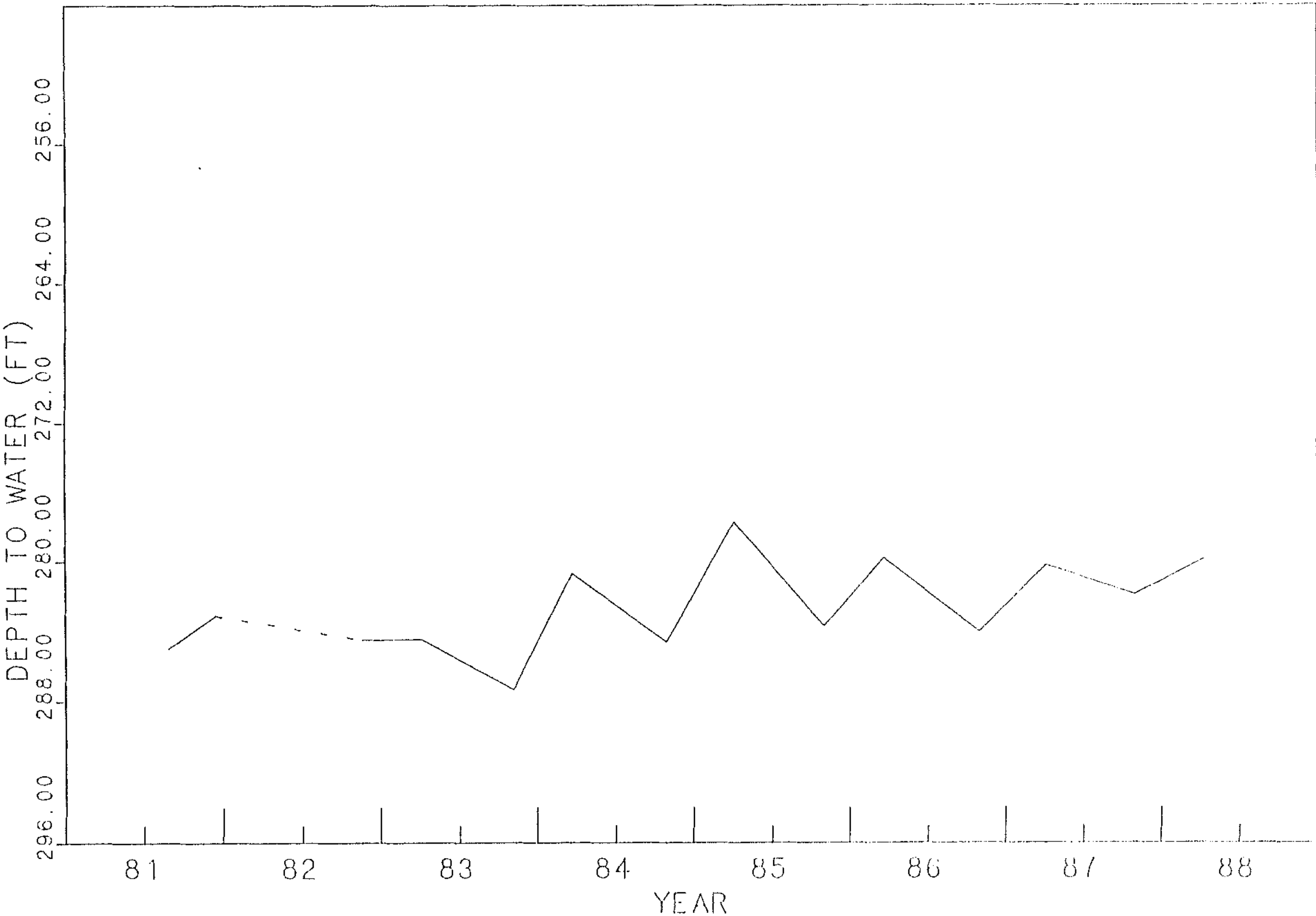
GROUP: CINDER CONE
WELL NUMBER: 02S 04E 24DBB1

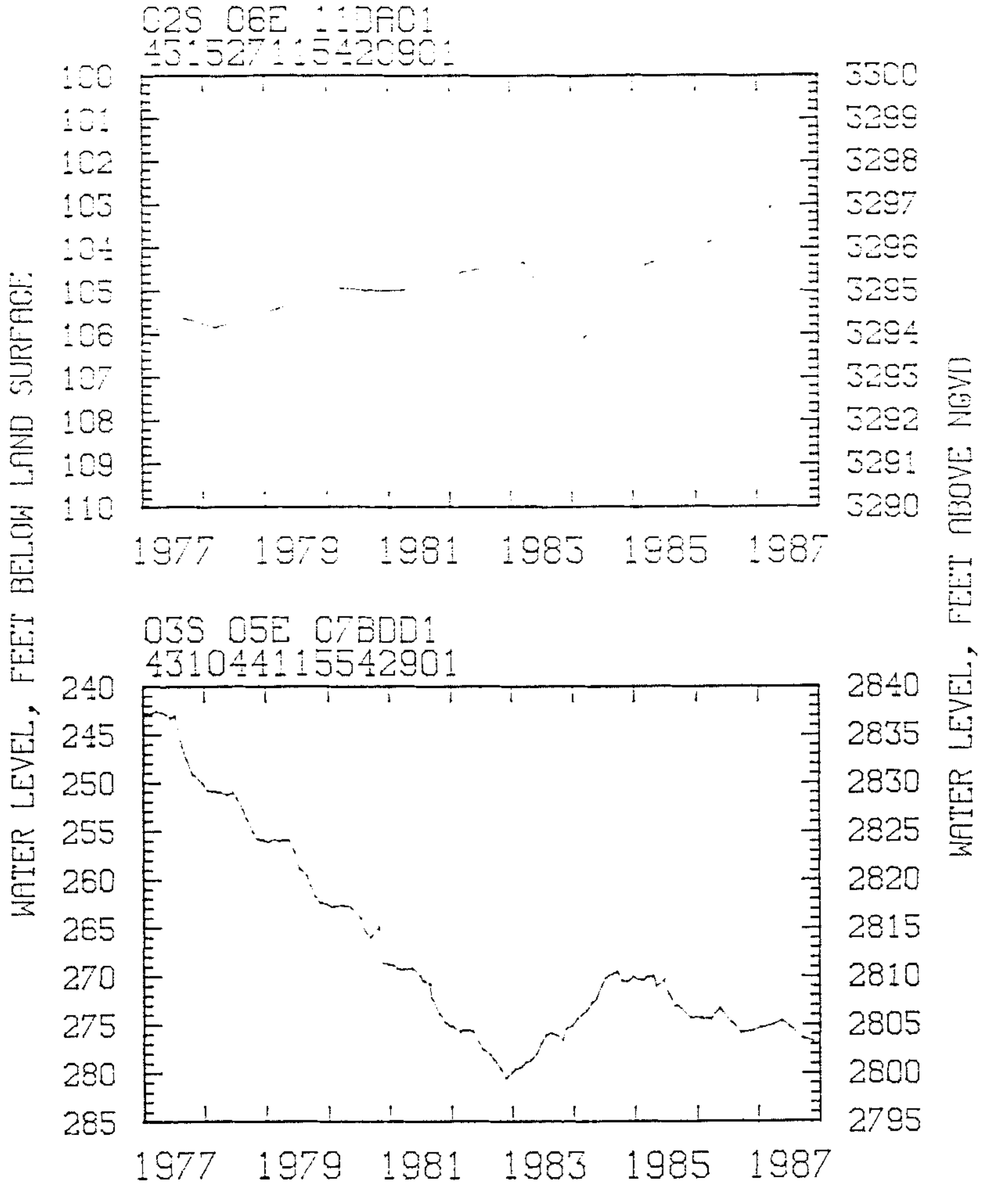


GROUP: CINDER CONE
WELL NUMBER: 02S 05E 36BBB1

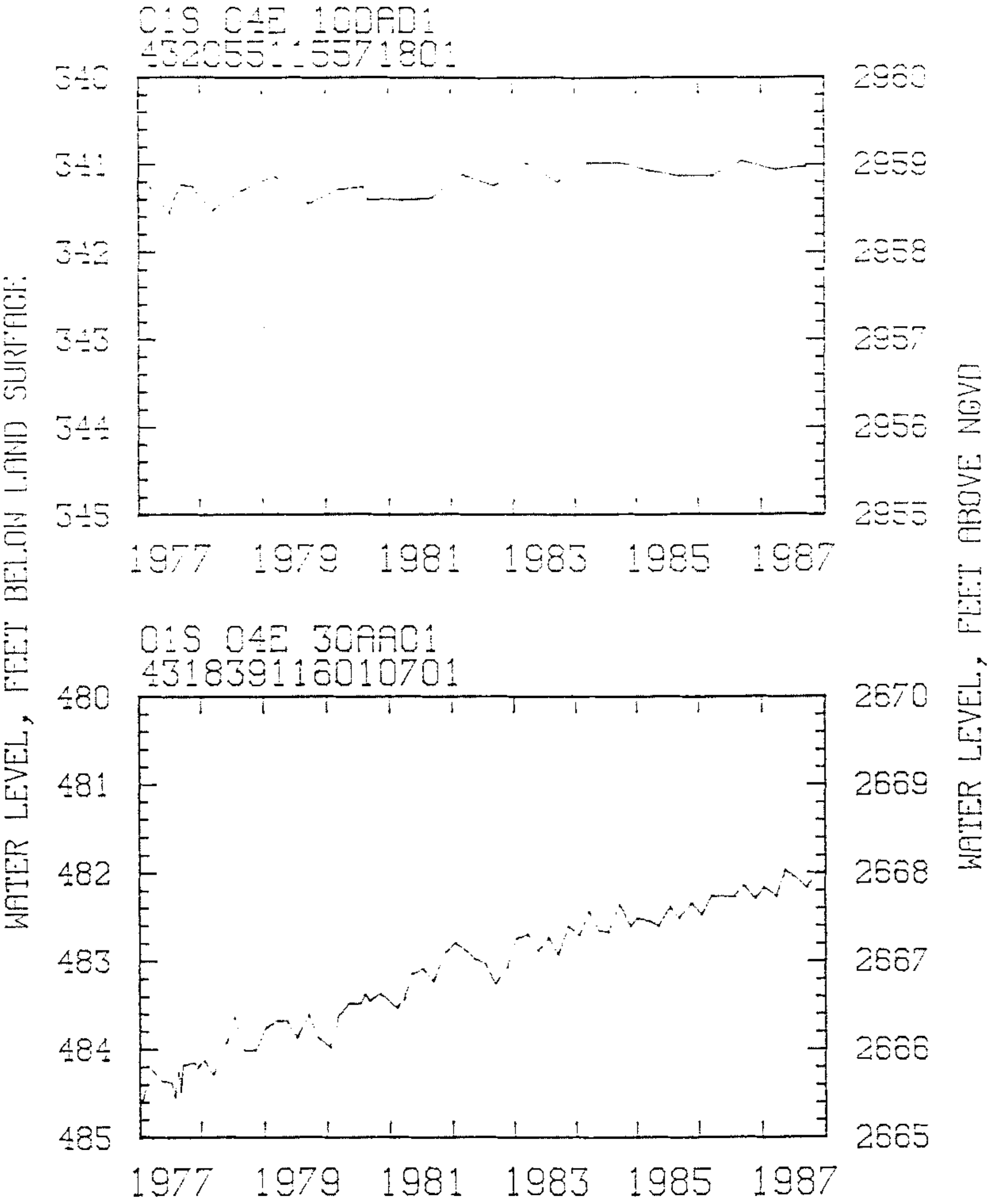


GROUP: CINDER CONE
WELL NUMBER: 03S 05E 06ACC1



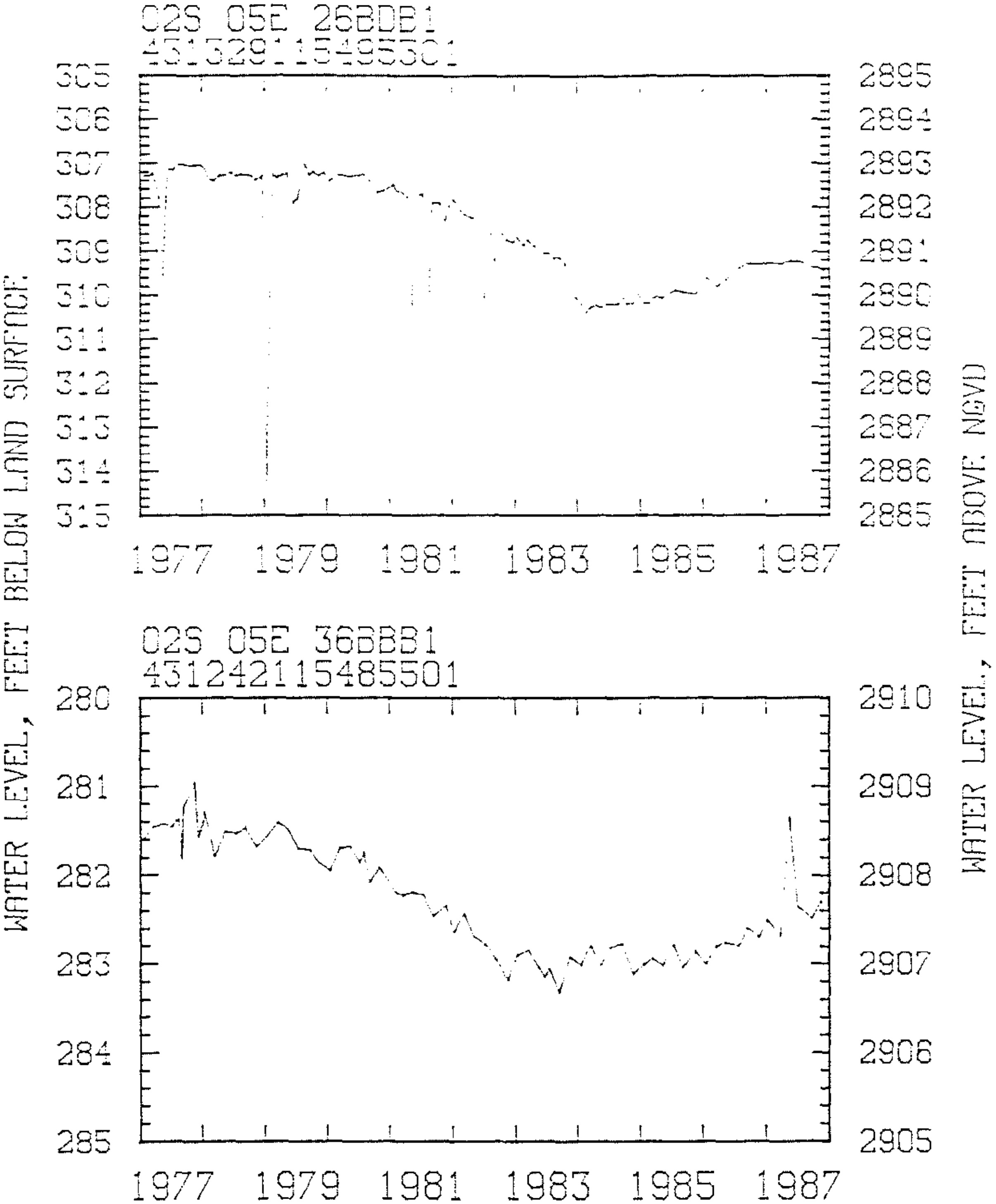

02S 06E 11DAC1
431527115420901
100
101
102
103
104
105
106
107
108
109
110
3300
3299
3298
3297
3296
3295
3294
3293
3292
3291
3290
1977
1979
1981
1983
1985
1987
03S 05E 07BDD1
431044115542901
240
245
250
255
260
265
270
275
280
285
2840
2835
2830
2825
2820
2815
2810
2805
2800
2795
1977
1979
1981
1983
1985
1987
WATER LEVEL, FEET BELOW LAND SURFACE
WATER LEVEL, FEET ABOVE NGVD

SOURCE: USGS



01S 04E 10DAD1
432055115571801
340
341
342
343
344
345
2960
2959
2958
2957
2956
2955
1977
1979
1981
1983
1985
1987
01S 04E 30AAC1
431839116010701
480
481
482
483
484
485
2670
2669
2668
2667
2666
2665
1977
1979
1981
1983
1985
1987
WATER LEVEL, FEET BELOW LAND SURFACE
WATER LEVEL, FEET ABOVE NGVD

SOURCE: USGS


02S 05E 26BDB1
431329115495501
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306
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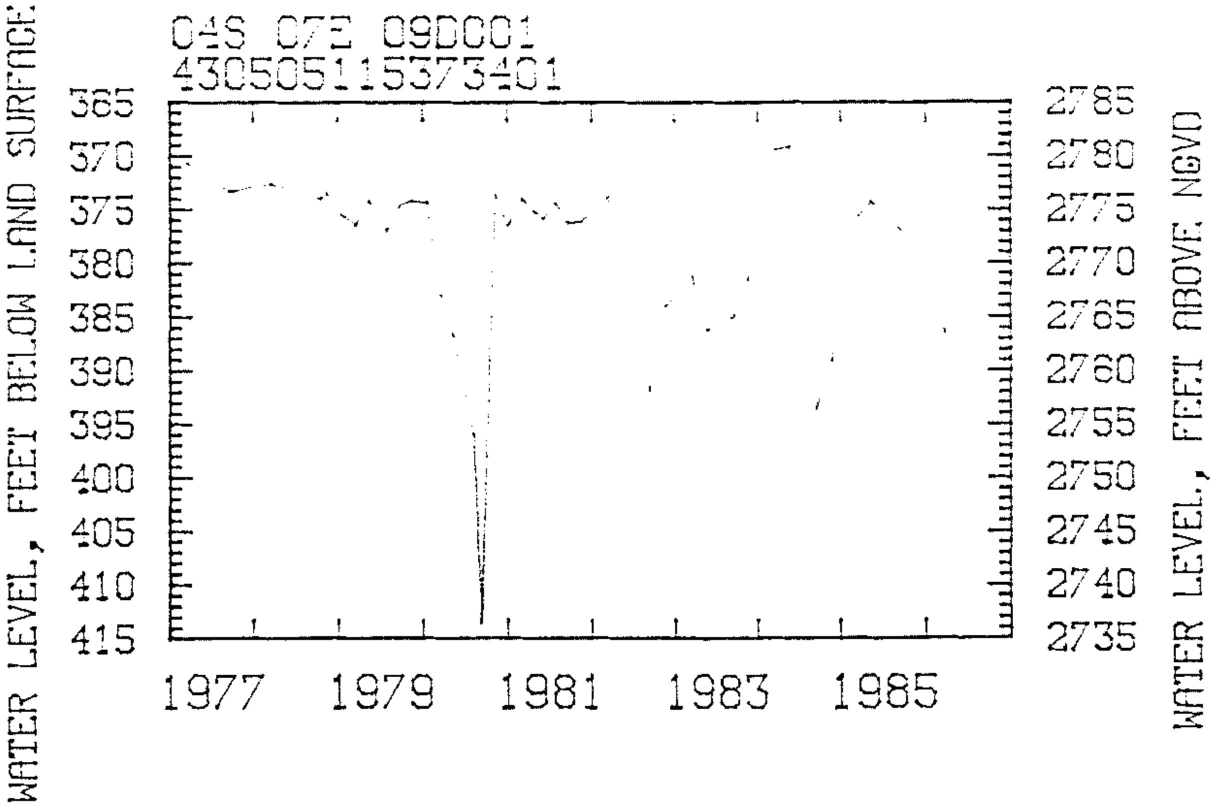
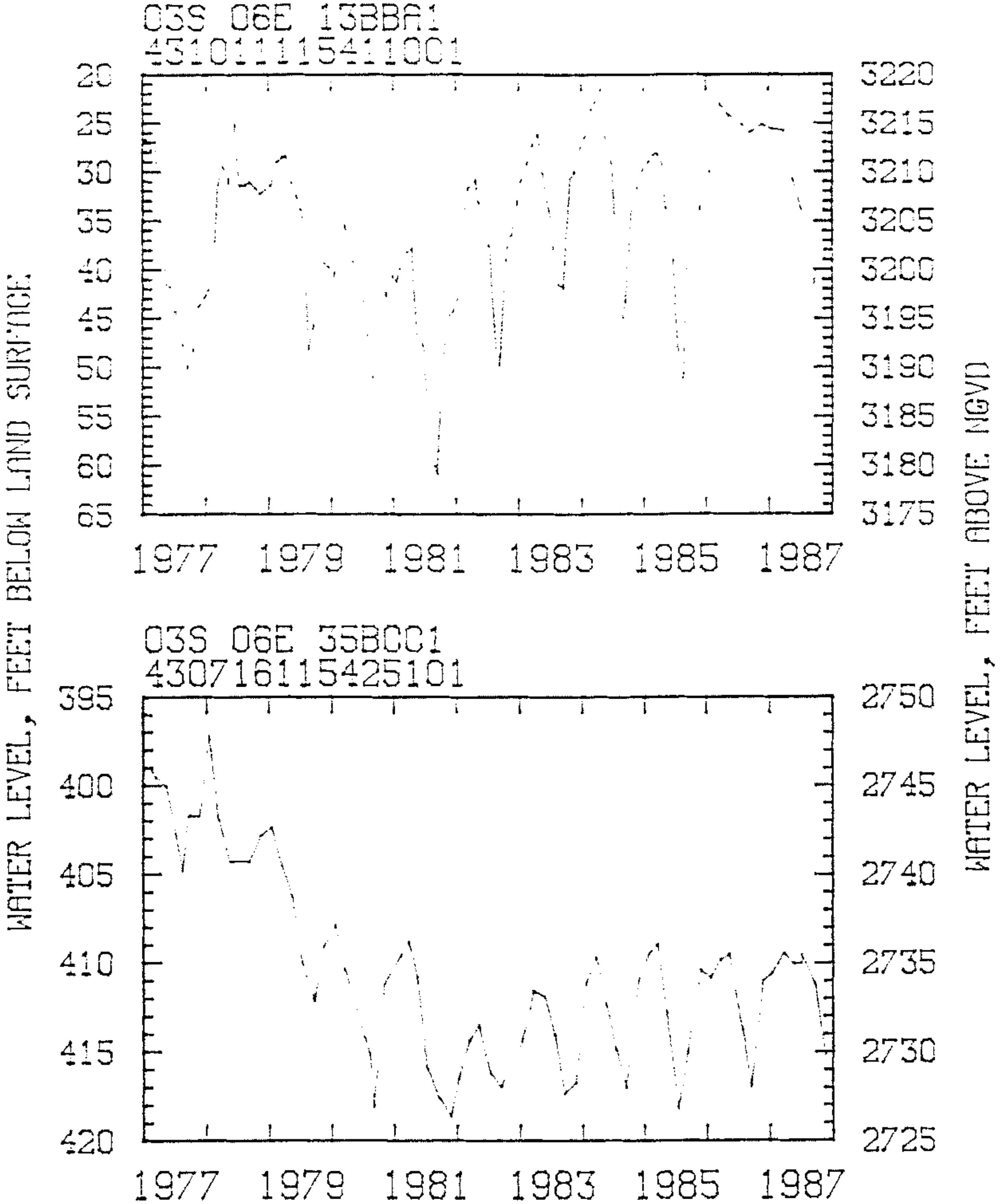
2892
2891
2890
2889
2888
2887
2886
2885
1977
1979
1981
1983
1985
1987
02S 05E 36BBB1
431242115485501
280
281
282
283
284
285
2910
2909
2908
2907
2906
2905
1977
1979
1981
1983
1985
1987
WATER LEVEL, FEET BELOW LAND SURFACE
WATER LEVEL, FEET ABOVE NGVD

SOURCE: USGS



04S 07E 09D001
430505115373401
WATER LEVEL, FEET BELOW LAND SURFACE
365
370
375
380
385
390
395
400
405
410
415
2785
2780
2775
2770
2765
2760
2755
2750
2745
2740
2735
WATER LEVEL, FEET ABOVE NGVD
1977
1979
1981
1983
1985

SOURCE: USGS


03S 06E 13BBA1
431011115411001
WATER LEVEL, FEET BELOW LAND SURFACE
WATER LEVEL, FEET ABOVE NGVD
20
25
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1977
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03S 06E 35BCC1
430716115425101
395
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1977
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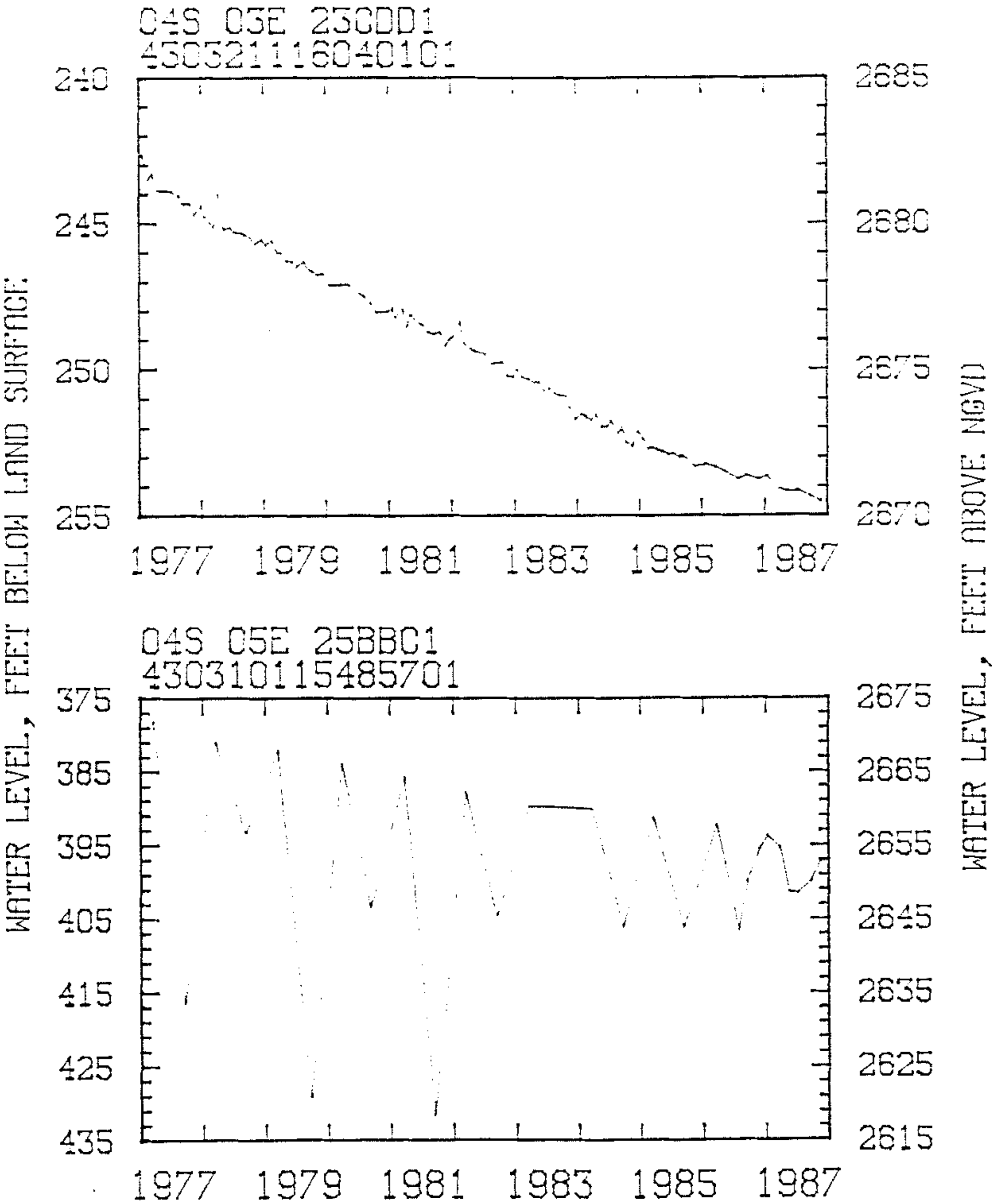
SOURCE: USGS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04S 05E 25BBC1
430310115485701
375
385
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1977
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WATER LEVEL, FEET BELOW LAND SURFACE
WATER LEVEL, FEET ABOVE NGVD

SOURCE: USGS

APPENDIX B

WATER-LEVEL AND WELL DATA

WATER LEVEL DATA, MOUNTAIN HOME GWMA & CINDER CONE BUTTE, 1982-1988

CGWA/ GWMA	WELL NUMBER	LOCATION X	LOCATION Y	ELEV (LSD)	SPRING 1982	SPRING 1985	SPRING 1986	SPRING 1987	SPRING 1988	CHANGE 82-86	CHANGE 85-86	CHANGE 82-87	CHANGE 85-87	CHANGE 86-87	CHANGE 82-88	CHANGE 85-88	CHANGE 86-88	CHANGE 87-88
MH	01S 04E 03ADB1	2.40	7.50	3375		456.95	455.41	455.35	452.70		1.54		1.6	0.06		4.25	2.71	2.65
MH	01S 04E 10DAD1	2.41	7.15	3300	341.12	341.07	341.14	341.07	340.73	-0.02	-0.07	0.05	0	0.07	0.39	0.34	0.41	0.34
MH	01S 04E 30AAC1	1.68	6.54	3150	482.88	482.55	482.26	482.27	482.02	0.62	0.29	0.61	0.28	-0.01	0.86	0.53	0.24	0.25
CC	02S 04E 02BBD1	2.53	6.04	3170			104.09	487.76	488.69									-0.93
CC	02S 04E 14CDD1	2.56	5.38	3123	407.31	413.75	414.41	415.68	416.27	-7.10	-0.66	-8.37	-1.93	-1.27	-8.96	-2.52	-1.86	-0.59
MH	02S 04E 20DDD2	1.93	5.10	3077	313.79	319.14	320.51	321.00	320.69	-6.72	-1.37	-7.21	-1.86	-0.49	-6.9	-1.55	-0.18	0.31
CC	02S 04E 22CCC1	2.24	5.10	3085	308.05	310.05	311.09	311.60	311.92	-3.04	-1.04	-3.55	-1.55	-0.51	-3.87	-1.87	-0.83	-0.32
CC	02S 04E 24DBB1	2.74	5.20	3130		391.07	392.96	392.80	394.38		-1.89		-1.73	0.16		-3.31	-1.42	-1.58
CC	02S 04E 27DDD1	2.44	4.86	3080		281.46	283.33	283.55	282.74		-1.87		-2.09	-0.22		-1.28	0.59	0.81
CC	02S 05E 03BAB1	3.83	6.04	3290		284.12	285.25	277.15	282.86		-1.13		6.97	8.1		1.26	2.39	-5.71
CC	02S 05E 11AAB1	4.37	5.80	3323	310.05	313.32	311.53	307.85	307.74	-1.48	1.79	2.20	5.47	3.68	2.31	5.58	3.79	0.11
CC	02S 05E 26BDB1	4.09	5.00	3025	308.18	310.08	309.81	309.31	309.52	-1.63	0.27	-1.13	0.77	0.5	-1.34	0.56	0.29	-0.21
CC	02S 05E 36BBB1	4.28	4.80	3190	282.68	284.61	282.77	282.39	281.36	-0.09	1.84	0.29	2.22	0.38	1.32	3.25	1.41	1.03
MH	02S 06E 11DAC1	5.70	5.67	3400	104.74	104.38	104.09	103.00	102.55	0.65	0.29	1.74	1.38	1.09	2.19	1.83	1.54	0.45
CC	03S 05E 06ACC1	3.17	4.47	3085		277.73	279.79	280.21	279.90		-2.06		-2.48	-0.42		-2.17	-0.11	0.31
CC	03S 05E 07BDD1	3.13	4.20	3074	275.56	270.09	274.45	275.00	276.28	1.11	-4.36	0.56	-4.91	-0.55	-0.72	-6.19	-1.83	-1.28
MH	03S 06E 13BBA1	5.83	4.03	3240	31.72	28.04	23.07	25.83	32.15	8.65	4.97	5.89	2.21	-2.76	-0.43	-4.11	-9.08	-6.32
MH	03S 06E 34DDD1	5.50	3.08	3135		148.79	147.26	147.60	174.44		1.53		1.19	-0.34		-25.65	-27.18	-26.84
MH	03S 06E 35ABB1	5.68	3.27	3135	4.07	3.45	2.50	--DISC--		1.57	0.95							
MH	03S 06E 35BCC1	5.58	3.19	3145	414.39	408.95	409.17	409.48	414.64	5.22	-0.22	4.91	-0.53	-0.31	-0.25	-5.69	-5.47	-5.16
MH	03S 07E 08DBB1	6.64	4.08	3330		79.45	77.85	68.85	83.55		1.60		10.6	9		-4.1	-5.70	-14.70
MH	03S 07E 18CAA1	6.17	3.90	3270	72.33	70.39	64.71	66.46	73.63	7.62	5.68	5.87	3.93	-1.75	-1.3	-3.24	-8.92	-7.17
MH	04S 03E 23CDD1	1.08	2.06	2917	249.15	252.68	253.35	254.10	254.60	-4.20	-0.67	-4.95	-1.42	-0.75	-5.45	-1.92	-1.25	-0.50
MH	04S 04E 30DDB1	1.66	1.88	2902	249.83	254.21	256.27	255.95	256.30	-6.44	-2.06	-6.12	-1.74	0.32	-6.47	-2.09	-0.03	-0.35
MH	04S 05E 13DAB1	4.45	2.42	3100		420.51	421.90	420.55	421.67		-1.39		-0.04	1.35		-1.16	0.23	-1.12
MH	04S 05E 25BBC1	4.28	1.98	3048	387.81	391.23	392.21	395.40	393.70	-4.40	-0.98	-7.59	-4.17	-3.19	-5.89	-2.47	-1.49	1.70
MH	04S 06E 14ACA1	5.71	2.48	3084	376.52	377.79	377.48	376.06	374.65	-0.96	0.31	0.46	1.73	1.42	1.87	3.14	2.83	1.41
MH	04S 07E 09DCC1	6.69	2.58	3152	373.85	375.70	386.50	--DISC--		-12.65	-10.80							
MH	05S 06E 01AAA1	6.03	1.50	3065	387.58	388.70	388.82	388.33	385.92	-1.24	-0.12	-0.75	0.37	0.49	1.66	2.78	2.90	2.41
MH	05S 06E 06CAA1	4.67	1.37	3030	372.25	374.30	375.76	374.75	373.03	-3.51	-1.46	-2.50	-0.45	1.01	-0.78	1.27	2.73	1.72

Note: Origin for X-Y pairs is SW corner of T5S R3E.