N003

The Hydraulic Impact of the Olin Production Wells
E. I. DuPont de Nemours & Co. Niagara Plant
Niagara Falls, New York

April 3, 1986

Woodward-Clyde Consultants

Consulting Engineers, Geologists and Environmental Scientists

5120 Butler Pike, Plymouth Meeting, Pennsylvania 19462

5120 Butler Pike
Plymouth Meeting
Pennsylvania 19462
215-825-3000
Telex 846-343

Woodward-Clyde Consultants

April 3, 1986
83C2236-8

E.I. duPont de Nemours & Co., Inc.
Buffalo Avenue & 26th Street
Niagara Falls, New York 14302

Attention: Mr. Steve Crawley

**THE HYDRAULIC IMPACT OF THE OLIN PRODUCTION WELLS
ON THE NIAGARA PLANT
NIAGARA FALLS, NEW YORK**

Gentlemen:

Woodward-Clyde Consultants (WCC) is pleased to submit this evaluation of the hydraulic impact of the Olin production wells at the Niagara Plant. This report was prepared in support of the ongoing discussions with the New York Department of Conservation regarding Niagara Plant bedrock remediation. This report contains our conclusions with respect to the hydraulic effects of the Olin production wells and is based on the groundwater contour maps, gradients, and plots of hydraulic head with time. We appreciate this opportunity to provide these services to you and DuPont on this project.

If you have any questions, please do not hesitate to call.

Very truly yours,

WOODWARD-CLYDE CONSULTANTS

Lynn Rubisch Penneman
for Kelly R. McIntosh
Hydrologist

Mark N. Gallagher
Mark N. Gallagher
Project Manager

KRM/MNG/vg/WM8A

cc: Richard Gentilucci
Frank S. Waller

THE HYDRAULIC IMPACT OF THE OLIN PRODUCTION WELLS ON THE NIAGARA PLANT

Prepared for:

E.I. DUPONT DE NEMOURS & CO., INC.

Niagara Falls, New York

Prepared by:

WOODWARD-CLYDE CONSULTANTS

Plymouth Meeting, Pennsylvania

EXECUTIVE SUMMARY

The bedrock groundwater remediation program currently operating at the Niagara Plant involves pumping the Olin Corporation's production wells at an average rate greater than 500 gpm. The actual daily pumping rate at the production wells varied from 435 to 952 gpm on the days when water levels were measured at DuPont monitoring wells. The response of the groundwater regime to variation in pumping rate was evaluated in this investigation.

Although the Olin production wells are pumped to remediate the bedrock zones, there is a limited impact on the overburden groundwater regime through induced leakage to the bedrock zones. The impacts of the production wells were difficult to quantify because of the dependence of the overburden groundwater regime on surface hydrology (precipitation and stage in Gill Creek) which tend to mask the impacts of the bedrock remediation.

The responses of the west plant bedrock water-bearing zones to increases in pumping rate at the Olin production wells were 1) an increase in relative hydraulic gradient toward the pumping wells, and 2) a general decrease in hydraulic head. Hydraulic head contour maps indicate that the cone of depression extends nearly to Gill Creek for all pumping rates studied during this investigation.

The bedrock groundwater regime responds as a confined aquifer; therefore, the effects of pump rate changes are transmitted as a pressure response rather than an actual dewatering of the media. Groundwater flow in the east plant area is in a northeasterly direction. The groundwater divide defining groundwater flow to the northeast and northwest to the Olin production wells is located near Gill Creek. The location of the groundwater divide is related to the magnitude of the influence of the Olin production wells and of the groundwater sink to the northeast. When the Olin production wells are pumped at a higher rate, the groundwater divide shifts to the east; when the pumping rate is reduced, the divide shifts to the west.

The relative hydraulic gradients (as defined in this report) between monitoring well clusters 1 (near Gill Creek) and 15 are consistently proportional to pumping rate in the west plant. In addition, hydraulic heads generally decrease

throughout the west plant as pumping rate increased. This supports a conclusion that the Olin production wells create a cone of depression encompassing the entire west plant area. WCC has recommended the installation of additional monitoring wells to confirm these results. These wells have recently been installed and will begin to generate data in the near future. The hydraulic control of the Olin production well in the east plant is minimal.

The packer installed to isolate the CD-zone from February through May 1985 resulted in decreased hydraulic gradients to the production well in the D- and F-zones. It also generally increased hydraulic head in the D- and F-zones. The apparently insignificant impacts of the packer on the CD-zone indicate that the primary source of production water is the CD-zone and that additional discharge resulting from the packer installation is not significant compared to the overall flow from the CD-zone.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PLATES

LIST OF PLATES (CONTINUED)

LIST OF APPENDICES

INTRODUCTION

The Olin Corporation's two production wells are used as part of the DuPont groundwater remediation program at the Niagara Plant. The pumping rates in these production wells during the time of the 1985 groundwater level measurements ranged from 435 to 950 gallons per minute (gpm). The response of the Niagara Plant groundwater flow regime to variations in the production well pumping rates is the subject of this report.

BACKGROUND

The Niagara Plant site is underlain by unconsolidated overburden deposits consisting of fill, glacial till, and glacial lake deposits. Beneath the overburden soils, the site is underlain by the fractured dolomite of the Lockport Formation. Beneath the Lockport Formation, and extending beyond the limit of this investigation, is the Rochester Shale.

Groundwater in the vicinity of the Niagara Plant site is encountered in both the unconsolidated overburden soils and the underlying rock. Fifty-two monitoring wells were installed for groundwater characterization. Groundwater elevation information collected from these wells was used to prepare groundwater contour maps for the five primary water-bearing zones (A-, B-, CD-, D-, and F-zones). The site hydrogeology is discussed and the primary water-bearing zones are established in WCC reports entitled "Geohydrologic Investigations" and "Supplemental Geohydrologic Investigations" dated December 23, 1983 and October 24, 1984, respectively.

The primary source of groundwater recharge for the overburden in the vicinity of the Niagara Plant site is from direct infiltration of precipitation. The primary sources of groundwater recharge in the underlying Lockport Formation includes induced infiltration of water from the Niagara River and, to a lesser extent, downward leakage from the overlying overburden groundwater flow regime. Groundwater flow in the overburden zone in the west plant (west of Gill Creek) discharges toward Gill Creek and the Niagara River. In the east plant (east of Gill Creek) overburden groundwater flow is toward the northeast. By contrast, flow in the underlying fractured rock is from the

Niagara River toward the PASNY conduits northeast of the site and toward the Olin production wells, northwest of the site.

The Olin production wells are located northwest of the Niagara Plant, near Adams Avenue and Chemical Road (Plate 1). Two wells separated by approximately 10 feet are present at this location; a north well and a south well. Both wells are 24 inches in diameter, cased from ground surface to below the B-zone, and open from the CD-through F- water-bearing zones. Production well-yield information for 1985 was supplied by the Olin Corporation. In addition, Olin Corporation reports that a packer was installed in the south well at a depth approximately 55 feet from the ground surface. The purpose of the packer is to isolate the CD-zone from the underlying water-bearing fractures. The south well is pumped from above the packer; therefore, the primary source of water in this well is the CD-zone. The packer was installed on January 29, 1985 and was removed on May 24, 1985.

Plate 1 also shows the locations of monitoring wells at the Niagara Plant, including eight wells installed in January and February 1986. These additional wells were located to provide data to improve our understanding of the hydrogeologic environment. Groundwater elevation and water quality data are not yet available for these wells. When obtained, these data will be examined for consistancy with the conclusions made in this report.

REVIEW OF THE OCTOBER 1984 PUMP TEST

During October 1984, pumping tests involving the Olin production wells were conducted by WCC for the Niagara Plant site. The results and conclusions drawn from these tests are presented in WCC's report entitled "Pump Test Results, October 1984" and dated June 19, 1985. The effects of different pumping rates on the bedrock groundwater elevations were monitored utilizing DuPont monitoring wells. The purposes of the pump test program were, 1) to determine the effects of the Olin production wells upon the groundwater flow regimes beneath the Niagara Plant site at various pumping rates, and 2) to estimate a minimum pumping rate which would control groundwater flow in the plant site area.

The results of the pump tests indicated that the Olin production wells influence groundwater flow in the B-, CD-, D-, and F- water-bearing zones in the west plant area. In most cases, the east plant area did not show a significant response to the pumping. When a response east of Gill Creek was observed, the response was not sufficient to reverse the northeasterly hydraulic gradient. The C- and E-zones are of limited areal extent in the plant site and, therefore, do not contribute significantly to the volume of groundwater flow.

The groundwater potentiometric surface in the west plant area is influenced by changes in the pumping rates of the Olin production wells. The bedrock groundwater responds as a confined aquifer; therefore, the effects of pump rate changes are transmitted as a pressure response rather than an actual dewatering of the media. Groundwater flow in the east plant area is in a northeasterly direction. The groundwater divide defining groundwater flow to the northeast and northwest to the Olin production wells is located near Gill Creek. The location of the groundwater divide is related to the magnitude of the influence of the Olin production wells and of the groundwater sink to the northeast. When the Olin production wells are pumped at a higher rate, the groundwater divide shifts to the east; when the pumping rate is reduced, the divide shifts to the west. Based on this investigation, WCC concluded that a minimum pump rate of 500 gpm should control groundwater flow in the west plant in the B- through F-zones.

HYDRAULIC IMPACT OF THE OLIN PRODUCTION WELLS

The following methods were used to evaluate the hydraulic impact of the Olin production wells on groundwater flow at the Niagara Plant. First, measured water levels in each monitoring well were plotted versus time (Appendix A). These plots were then evaluated to determine if changes in hydraulic head in monitoring wells correlated with monthly variation in the Olin well pumping rates. Second, groundwater elevation data were used to construct hydraulic head contour maps for the A-, B-, CD-, D-, and F-zones (Appendix B). These maps were used to qualitatively evaluate the impact of pumping rate changes on groundwater flow at the Niagara Plant. It should be noted that these evaluations are made without quantifying the impact of surface hydrology, i.e., precipitation, Niagara River flow, or Gill Creek flow. The absence of these data limits the accuracy with which the hydraulic response to pumping rate changes can be evaluated.

To quantitatively evaluate the impacts of the Olin production wells, the relative hydraulic head gradient between selected wells in the east and west plant were plotted versus Olin well pumping rate. Table 1 presents the 1985 monthly average flow rates for the Olin production wells. Since the bedrock system behaves as a confined aquifer, monitoring wells should respond quickly to changes in pumping rates at the Olin wells. Therefore, the pumping rates used in this study were calculated based on the total flow for each day water level measurements were obtained. In each case, the total daily flow rate was converted to gpm by dividing by 1440 minutes per day (see Table 2). Each well pair selected for this quantitative evaluation is located approximately along the expected flow path as indicated by the groundwater contour maps, and therefore each pair is expected to be indicative of the hydraulic gradient in that area. To evaluate the impact of the packer, the data set for each pair of wells was divided into two subsets, depending on whether the packer was installed in the pumping well at the time of the groundwater level measurements.

The parameter used to indicate hydraulic responses in this study will be referred to as the "relative hydraulic gradient," to distinguish it from "actual hydraulic gradient." Actual hydraulic gradients are determined from contour maps and are largely based on the interpretation of hydraulic head data by the hydrogeologist (particularly with fractured media). Since flow rates are not calculated in this investigation, the use of the relative hydraulic gradient is more appropriate.

In addition to the relative hydraulic gradient plots, hydraulic heads in west plant monitoring wells were plotted versus pumping rates for each water-bearing bedrock zone. These plots were used to determine the impact of pumping rate on hydraulic head throughout the west plant.

RESULTS

A-ZONE

Although the Olin production wells are pumped to remediate the bedrock zones, there is a limited impact on the overburden groundwater regime. WCC has reported in previous studies that the A-zone in the vicinity of the production wells is dewatered (Supplemental Geohydrologic Investigations Niagara Plant, October 24, 1984). This area also corresponds to the highest bedrock elevation in the west plant. WCC suggests two possible explanations for the dewatering in the vicinity of the Olin wells:

- o Leakage downward to bedrock zones resulting from the lowering of hydraulic heads in the water-bearing fracture zones near the production wells

- o Groundwater discharge to the Buffalo Avenue Sewer

Plots of groundwater elevation versus time for the A-zone monitoring wells are presented on Plates A-1 through A-24. Generally, A-zone water levels do not respond to the decreases in pumping. Wells 19A and 16A show small increases in groundwater elevation in the month following the October decrease in pumping rate. However, similar increases are seen in several east plant A-zone wells which the production wells do not impact. (Gill Creek appears to be a boundary in the A-Zone.) The water level increases during November are likely in response to the above-average rainfall during that period.

A-zone groundwater contour maps are presented on Plates B-1 through B-10. There appears to be little, if any, response to pumping rate changes. The lack of surface hydrology data is a particular limitation for analysis of the overburden groundwater regime, since it is most directly impacted by precipitation and the stage in Gill Creek.

West Plant - The general direction of overburden groundwater flow in the west plant is toward the Niagara River and Gill Creek, with probable downward leakage occurring near the production wells. The relative hydraulic gradients between monitoring wells 1A and 15A are plotted versus pumping rate on Plate 2. The hydraulic gradients are in the offsite direction, toward Gill Creek and the Niagara River (this is characteristic of the overburden only). If the Olin production wells are significantly impacting the west plant overburden groundwater flow, one would expect a decrease in the offsite relative hydraulic gradients as pumping rates increase. Plate 2 does not indicate such a trend.

East Plant - The overburden groundwater flow direction in the east plant is generally to the northeast. The relative hydraulic gradient between monitoring wells 10A and 23A are plotted on Plate 3 versus pumping rate. Since this gradient is offsite (away from the production wells) a reduction in gradient with increased pumping would indicate significant impact from the Olin wells. This relationship is not evident on Plate 3.

B-ZONE

Plates A-25 through A-34 present the plots of hydraulic head versus time for each B-zone monitoring well. Plates B-11 through B-20 present the hydraulic head contours throughout 1985 for the B-zone.

West Plant - The B-zone groundwater flow direction in the west plant is generally to the northwest. An increased yield of 925 gpm in August and then a slight decrease to 872 gpm in September lowered the groundwater level approximately 1 foot within 300 feet of the production wells (Plates B-16 and B-17). Water levels near the production wells recovered up to approximately 1 foot in response to the October decrease in pumping rate. The hydraulic head in the west plant B-zone monitoring wells are plotted versus pumping rate on Plate 4 for months without the packer installed and on Plate 5 for the three measurements with the packer installed. The corresponding measurements are listed on Tables 3 and 4. These plots show a general decrease in head with increases in pumping rate, with no significant impact due to the packer.

The relative hydraulic gradients between monitoring wells 1B and 19B, and between monitoring wells 5B and 19B, are plotted versus pumping rate on Plates 6 and 7, respectively. These relative hydraulic gradients are toward the production wells. Therefore an increasing hydraulic gradient with increasing pumping rate would be indicative of sensitivity to changes in the production well pumping rates. This trend is evident under conditions of no packer indicating an increasing gradient between the production wells and Gill Creek with increasing pumping rates. This trend is not evident with the packer installed. However, since the data set is limited to three points, no conclusions are warranted.

The Olin production wells are not open directly to the B-zone, consequently, head loss in the B-zone is due to downward leakage to the CD-zone. In the absence of a direct connection, a correlation between hydraulic gradient toward the well and monthly average pumping rate might be expected. Plates 8 and 9 show the relative hydraulic gradient for the above mentioned monitoring well pairs versus monthly average pumping rate. Hydraulic gradient does not appear to correlate with the monthly averages.

East Plant - The general direction of groundwater in the east plant is to the northeast. Monitoring well 23B, located near the northeast corner of the plant, appears to respond to changes in the Olin well pumping rate. This phenomenon was also observed in the October 1984 pump test, indicating that shifts in the groundwater divide between the east and west plant due to changes in pumping rate are reflected in monitoring well 23B. However, this response is not sufficient to reverse the offsite hydraulic gradient; the degree of hydraulic control on the east plant B-zone is minimal.

The relative hydraulic gradients between monitoring wells 12B and 23B are plotted versus pumping rate on Plate 10. No reduction in offsite gradient is evident as pumping rate increases, regardless of the presence of the packer in the production well.

CD-ZONE

Plates A-39 through A-49 present plots of CD-zone water levels versus time. Plates B-21 through B-30 present 1985 hydraulic head contour maps.

West Plant - Generally, the groundwater flow direction in the west plant is toward the Olin production wells, which appear to hydraulically control the entire west plant CD-zone. The water level plots indicate responses of 2 or more feet to pumping rate changes. The lower water levels occurred during the months of February, April and May corresponding both to high yield periods and months in which the packer was installed.

The hydraulic head in the west plant CD-zone monitoring wells are plotted versus pumping rate on Plate 11 for months without the packer and on Plate 12 for months with the packer. Tabulated measurements are included on Tables 5 and 6. Both plots indicate that hydraulic heads throughout the west plant are reduced at increased pumping rates. Recognizing the limitations of the smaller data set, the impact on head with the packer installed is approximately the same as with no packer.

Plates 13 and 14 show the relative hydraulic gradients versus pumping rate between monitoring wells 1C and 15CD and monitoring wells 5CD and 19CD. The relative hydraulic gradients between 1C and 15C increase as pumping rates increase. Monitoring wells 5CD and 19CD do not show this response, although again conclusions cannot be drawn from three data points. The packer appears to have little, if any, impact on the CD-zone hydraulic gradient, however, this data set is also limited to three measurements. The hydraulic head contour maps and the relative hydraulic gradient plot for monitoring wells 1C and 15CD provide evidence that the cone of depression from the Olin production wells extends to Gill Creek in the CD-zone. The apparently insignificant impacts of the packer indicate that the primary source of production water is the CD-zone without the packer installed. The proportional increase in CD-zone discharge resulting from the packer installation is not significant compared to the overall flow rate for the CD-zone.

East Plant - Groundwater flow is generally to the northeast with minimal response to changes in the Olin well pumping rate. Small responses in well 23C were noted in the October 1984 Pump Test Report; however, there was no reversal of hydraulic gradient in the east plant CD-zone. The relative hydraulic gradients between monitoring wells 18-C and 23-C are plotted versus pumping rate on Plate 15. No reduction in offsite hydraulic gradient is apparent at the higher pumping rates.

D-ZONE

Plates A-52 through A-58 show the water level plots versus time for D-zone wells. Plates B-31 through B-40 present 1985 hydraulic head contours for the D-zone.

West Plant - Generally, the groundwater flow in the west plant is toward the Olin production wells which appear to hydraulically control most of west plant D-zone. East of the groundwater divide occurring near Gill Creek, the hydraulic gradient is steep because of the consistently low hydraulic heads in monitoring well 10D. Slug test results from monitoring well 10D indicate an order-of-magnitude decline in permeability between the west and east plants. This decline in permeability would reduce the impact of the high hydraulic gradient on groundwater flow rates.

The hydraulic heads versus pumping rate for the west plant D-zone monitoring wells are plotted on Plate 16 (no packer) and Plate 17 (packer). Tables 7 and 8 present the measurements. The plots show a general decrease in hydraulic head throughout the west plant as the pumping rate is increased. Again, the impact of the packer cannot be adequately evaluated based on three data points, however, as expected, heads are generally higher in the D-zone when the packer is installed.

Plates 18 and 19 are plots of the relative hydraulic gradient versus pumping rate for monitoring wells 1D and 15D, and 5D and 19D, respectively. The relative hydraulic gradients toward the pumping well between monitoring wells 1D and 15D increase with increasing pumping rate with no packer. However, this trend is not exhibited with the packer installed. This indicates that the packer reduces the hydraulic impact of the Olin wells on D-zone groundwater flow in the area between monitoring well 1D and monitoring well 15D. The data for monitoring wells 5D and 19D are not sufficient to support a conclusion.

East Plant - The relative hydraulic gradient versus pumping rate between monitoring wells 10D and 23D are shown on Plate 20. This plot indicates that with no packer installed, a reduction in the offsite hydraulic gradient in the east plant occurs at higher pumping rates. The two data points with the packer installed do not exhibit this relationship.

F-ZONE

Plates A-61 through A-66 present plots of water level versus time for F-zone wells. Hydraulic head contour maps for 1985 are presented on Plates B-42 through B-51.

West Plant - The general direction of groundwater flow in the west plant is towards the northwest. Lower hydraulic heads generally occur around the Olin wells. The lowest elevations correspond to the highest pumping rates; the high elevation occurs near Gill Creek at monitoring well 1F.

Plates 21 and 22 present plots of hydraulic head versus pumping rate for west plant F-zone monitoring wells without and with the packer. The measured elevations are included on Tables 9 and 10. Increases in pumping rate at the Olin well appear to decrease hydraulic head throughout the west plant. The reduction is less evident than for other bedrock water-bearing zones. Hydraulic heads in the west plant are generally higher during months when the packer was installed, indicating that the F-zone is discharging to the Olin wells when the packer is absent.

Plates 23 and 24 present plots of relative hydraulic gradient versus pumping rate for monitoring wells 1F and 15F and monitoring wells 5F and 19F, respectively. The apparently anomolous point (557.1 feet) on Plate 23 is due to the July 1, 1985 water level measurement in monitoring well 15F. A water elevation of 558.39 feet was measured in this well on June 25, 1985, less than one week earlier. If this point is disregarded, a trend toward increasing relative hydraulic gradient with increasing pumping rate is evident.

East Plant - The general direction of groundwater flow in the east plant is to the northeast. The relative hydraulic gradient for monitoring wells 10F and 23F is plotted versus pumping rate on Plate 25. The east plant offsite hydraulic gradient appears to be relatively unaffected by changes in pumping rate at the production wells.

CONCLUSIONS

A-ZONE

Although the Olin production wells are pumped to remediate the bedrock zones, there is a limited impact on the overburden groundwater regime through induced leakage to the bedrock zones. The impacts of the production wells were difficult to quantify because of the dependence of the overburden groundwater regime on surface hydrology (precipitation and stage in Gill Creek) which tend to mask the impacts of the bedrock remediation.

WEST PLANT BEDROCK WATER-BEARING ZONES

The responses of the west plant bedrock water-bearing zones to increases in pumping rate at the Olin production wells were 1) an increase in relative hydraulic gradient toward the pumping wells, and 2) a general decrease in hydraulic head. Hydraulic head contour maps indicate that the cone of depression extends nearly to Gill Creek for all pumping rates studied during this investigation.

The relative hydraulic gradients between monitoring well clusters 1 (near Gill Creek) and 15 are consistently proportional to pumping rate in the west plant. In addition, hydraulic heads generally decrease throughout the west plant as pumping rate increased. This supports a conclusion that the Olin production wells create a cone of depression encompassing the entire west plant area. WCC has recommended the installation of additional monitoring wells to confirm this assertion (see Plate 1). These wells have recently been installed and will begin to generate data in the near future.

The packer installed from February through May 1985 isolated the CD-zone and resulted in decreased hydraulic gradients to the production well in the D- and F-zones. It also generally increased hydraulic head in the D- and F-zones. The apparently insignificant impacts of the packer on the CD-zone indicate that the primary source of production water is the CD-zone and that additional discharge resulting from the packer installation is not significant compared to the overall flow from the CD-zone.

EAST PLANT BEDROCK WATER-BEARING ZONES

Several wells in the east plant exhibited a response to pumping rate changes at the Olin production wells. However, this reponse is not sufficient to reverse the offsite hydraulic gradient. The results of this study indicate that the degree of hydraulic control in the east plant resulting from the Olin production wells is minimal.

LIMITATIONS

Any conclusions regarding the impact of the packer are preliminary since only three measurements were obtained during this period. Findings and conclusions presented in this report are based upon interpretations of available geologic subsurface and hydraulic head data. These findings and conclusions are subject to confirmation and/or revision as additional data become available.

Tables

TABLE 1
OLIN PRODUCTION WELL
1985 MONTHLY AVERAGE FLOW RATES

Month	Packer Installed	Flow Rate (gpm)
Jan	No	637
Feb	Yes	698
Mar	Yes	788
Apr	Yes	790
May	Yes	899
Jun	No	852
Jul	No	1084
Aug	No	1030
Sep	No	985
Oct	No	638
Nov	No	654
Dec	No	650

TABLE 2
1985 DAILY AVERAGE PUMPING RATES FOR THE OLIN PRODUCTION WELLS

Date	Packer	Average Flow (gpm)
February 5	Yes	760
April 22	Yes	692
May 10	Yes	952
June 25	No	750
July 1	No	577
August 7	No	925
September 16	No	872
October 14	No	435
November 13	No	573
December 12	No	623

TABLE 3
HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
B-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1B	3B	5B	16B	19B
435	Oct	561.36	561.68	NA	558.28	556.16
573	Nov	NA	559.67	NA	558.39	555.81
577	Jul	561.11	559.20	557.26	557.7	555.26
623	Dec	NA	558.69	NA	557.78	555.31
750	Jun	560.96	559.11	557.17	557.48	554.48
872	Sep	560.89	559.35	NA	557.64	554.85
925	Aug	560.87	558.68	556.57	557.0	554.41

TABLE 4
HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED
B-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1B	3B	5B	16B	19B
692	Apr	561.58	559.21	557.35	557.93	555.49
760	Feb	561.01	NA	557.82	557.94	555.81
952	May	560.81	558.56	556.70	557.12	555.76

TABLE 5
HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
CD-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1C	2C	4C	5CD	15CD	19CD
435	Oct	560.97	557.60	NA	NA	554.70	553.71
573	Nov	560.67	557.20	NA	NA	553.57	553.73
577	Jul	560.9	557.0	559.05	555.85	555.37	555.66
623	Dec	560.95	556.67	NA	NA	552.19	552.67
750	Jun	560.92	556.3	559.03	554.82	552.66	553.66
872	Sep	560.79	556.63	ND	NA	552.49	552.06
925	Aug	560.37	556.1	558.75	554.8	551.07	551.61

TABLE 6
HYDRAUALIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED CD-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1C	2C	4C	5CD	15CD	19CD
692	Apr	561.35	556.84	559.33	555.67	553.03	553.71
760	Feb	560.86	NA	NA	556.48	554.4	554.68
952	Mar	560.52	555.81	558.58	554.82	551.9	552.46

TABLE 7
HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
D-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1D	5D	15D	19D
435	Oct	557.32	NA	556.21	556.50
573	Nov	556.87	NA	556.48	556.46
577	Jul	556.70	557.51	555.70	555.78
623	Dec	556.54	NA	555.68	555.63
750	Jun	556.50	557.26	555.03	555.13
872	Sep	556.37	NA	555.17	555.33
925	Aug	555.90	556.30	554.69	555.19

TABLE 8
HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED
D-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1D	5D	15D	19D
692	Apr	557.50	557.56	555.66	555.61
760	Feb	557.26	558.07	556.49	556.28
952	Mar	555.49	556.75	554.82	554.81

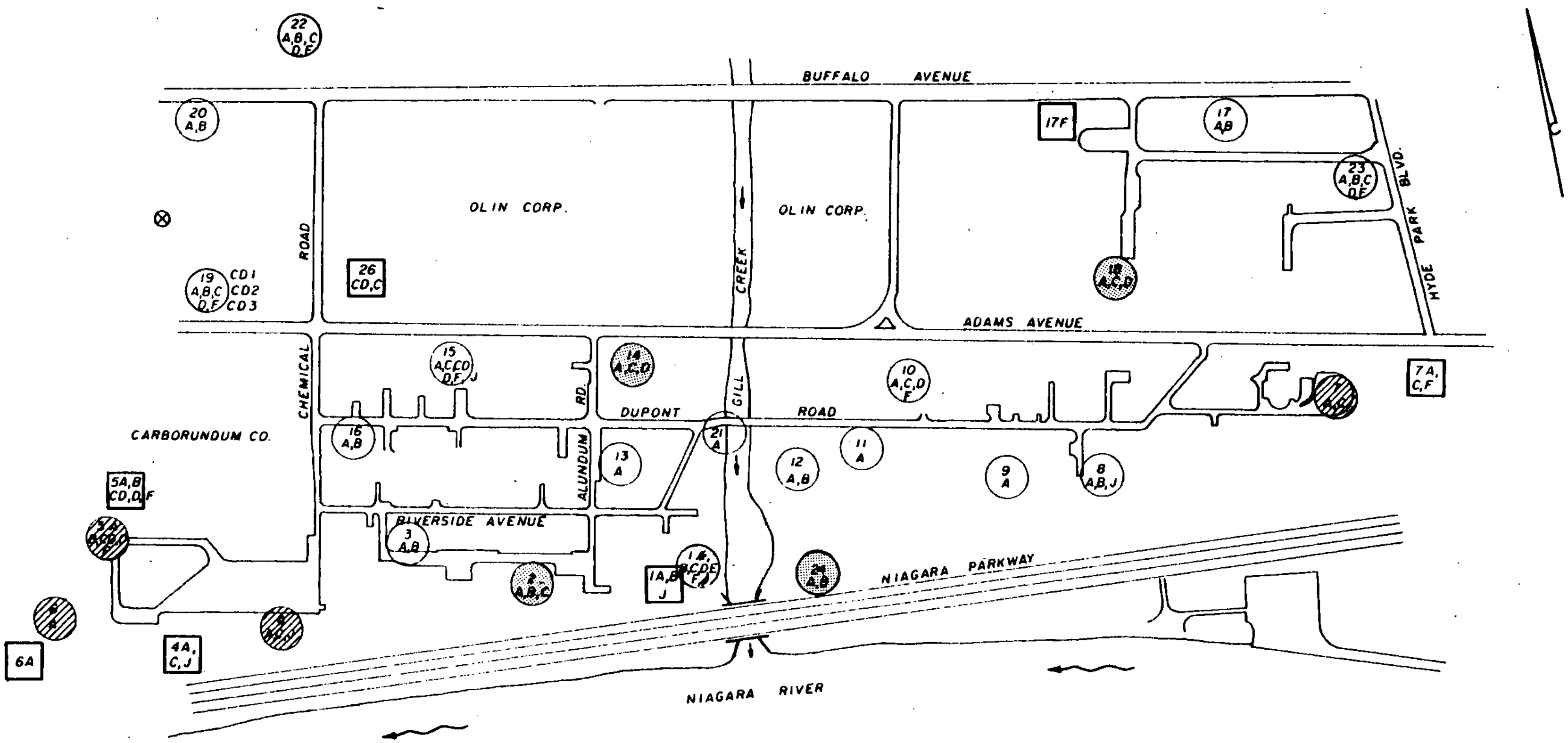
TABLE 9
HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
F-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1F	5F	15F	19F
435	Oct	559.86	NA	559.33	557.27
573	Nov	559.91	NA	559.49	554.03
577	Jul	559.53	556.88	557.1	556.28
623	Dec	559.34	NA	558.90	556.12
750	Jun	559.19	556.54	558.39	555.5
872	Sep	559.22	NA	558.64	555.68
925	Aug	559.06	554.36	558.08	555.38

TABLE 10
HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED F-ZONE WEST PLANT MONITORING WELLS

Pumping Rate	Month	1F	5F	15F	19F
692	Apr	559.42	556.85	558.92	555.92
760	Feb	559.91	557.55	559.4	556.86
952	Mar	556.06	556.15	558.45	555.05

Plates



LEGEND:

17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)

⊗ OLIN PRODUCTION WELL

[6A] NEW MONITORING WELL CLUSTER LOCATIONS

MONITORING WELLS REMOVED

MONITORING WELL CLUSTERS WITH NEW GROUNDWATER WELLS ADDED

MONITORING WELL LOCATION PLAN
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

PLATE 1

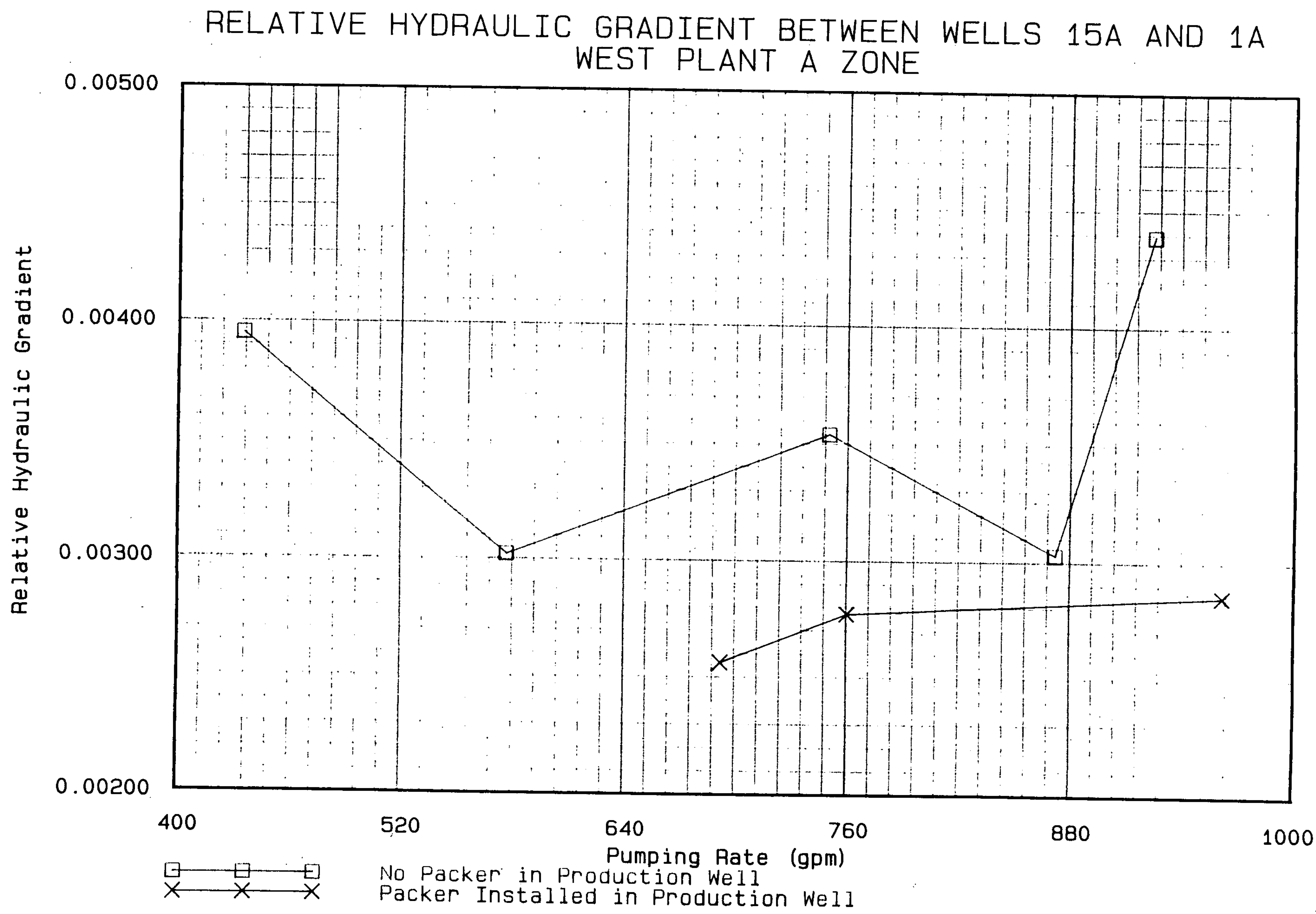
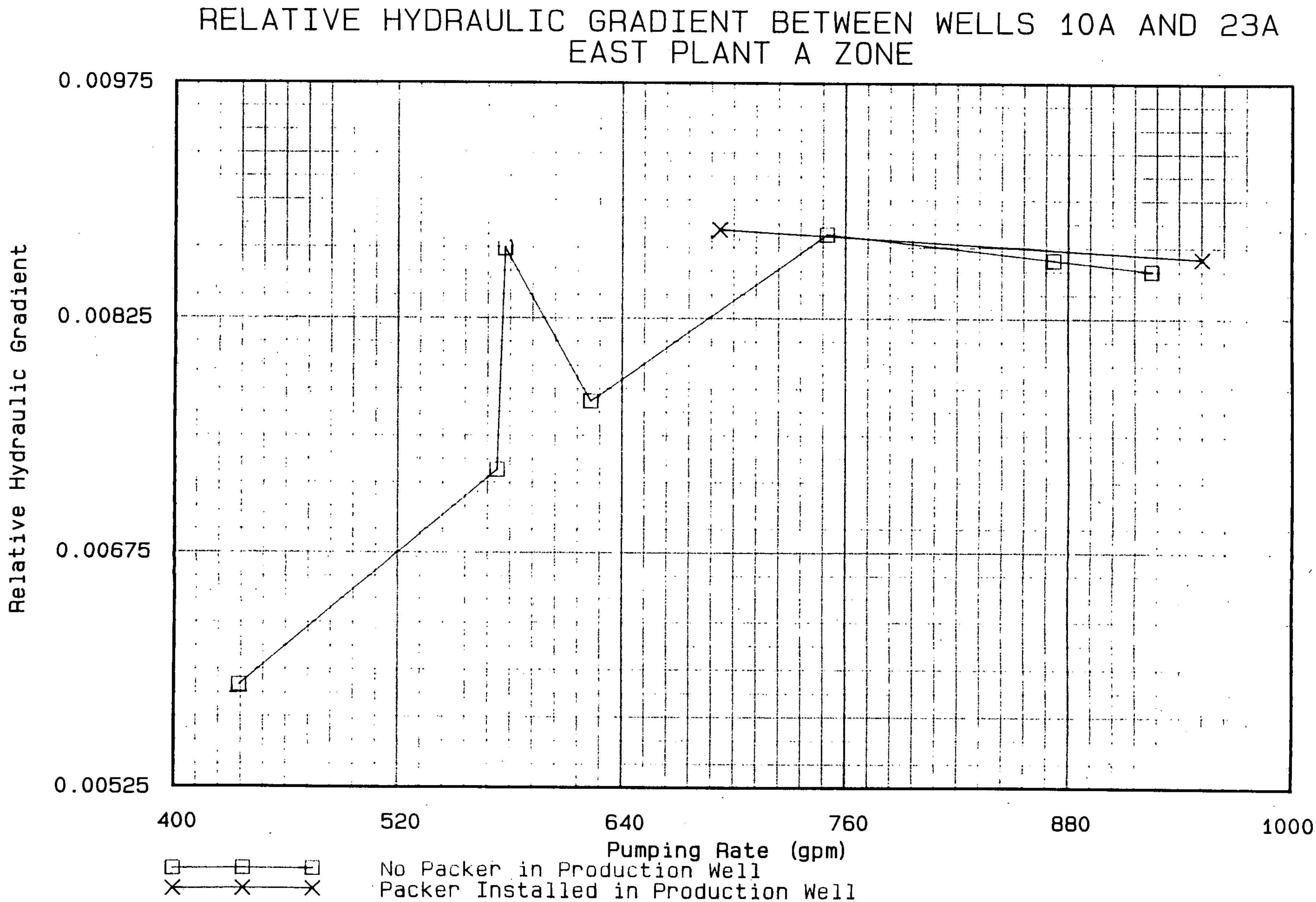

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 15A AND 1A
WEST PLANT A ZONE
0.00500
0.00400
0.00300
0.00200
Relative Hydraulic Gradient
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 2



RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 10A AND 23A
EAST PLANT A ZONE
Relative Hydraulic Gradient
0.00975
0.00825
0.00675
0.00525
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 3

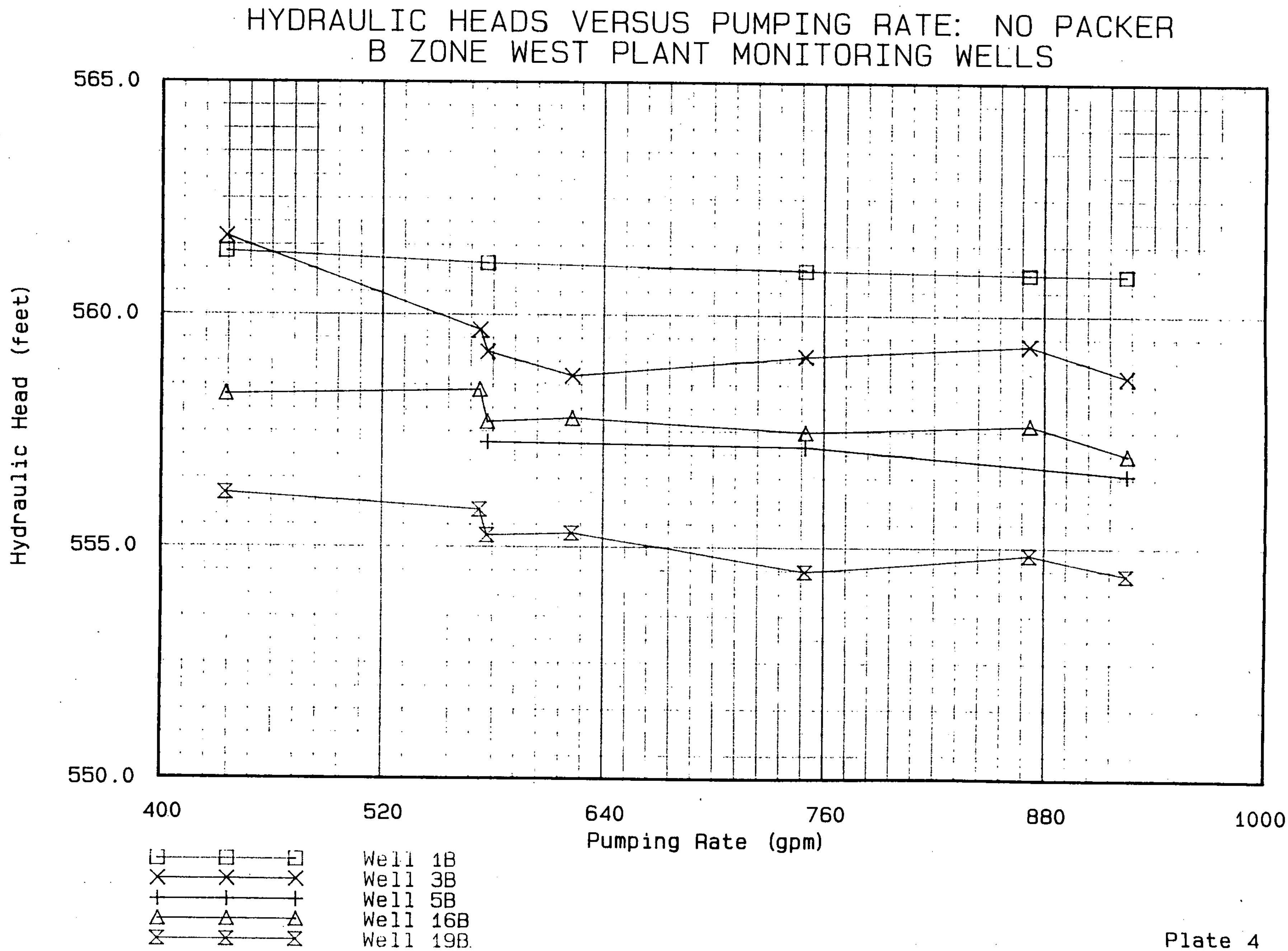

HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
B ZONE WEST PLANT MONITORING WELLS
565.0
560.0
555.0
550.0
Hydraulic Head (feet)
400
520
640
760
880
1000
Pumping Rate (gpm)
Well 1B
Well 3B
Well 5B
Well 16B
Well 19B

Plate 4

HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED
B ZONE WEST PLANT MONITORING WELLS

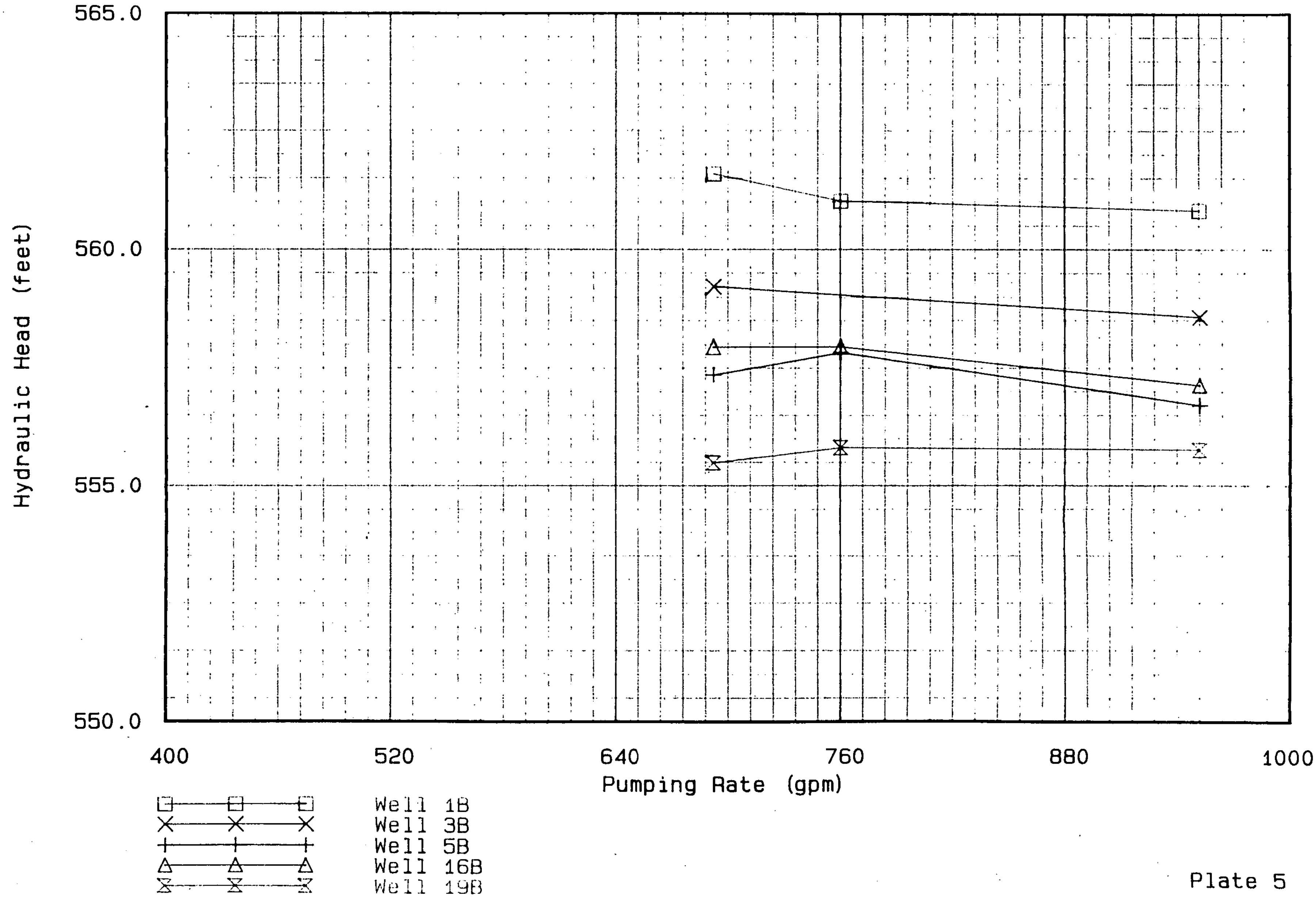


Plate 5

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 1B AND 19B
WEST PLANT B ZONE

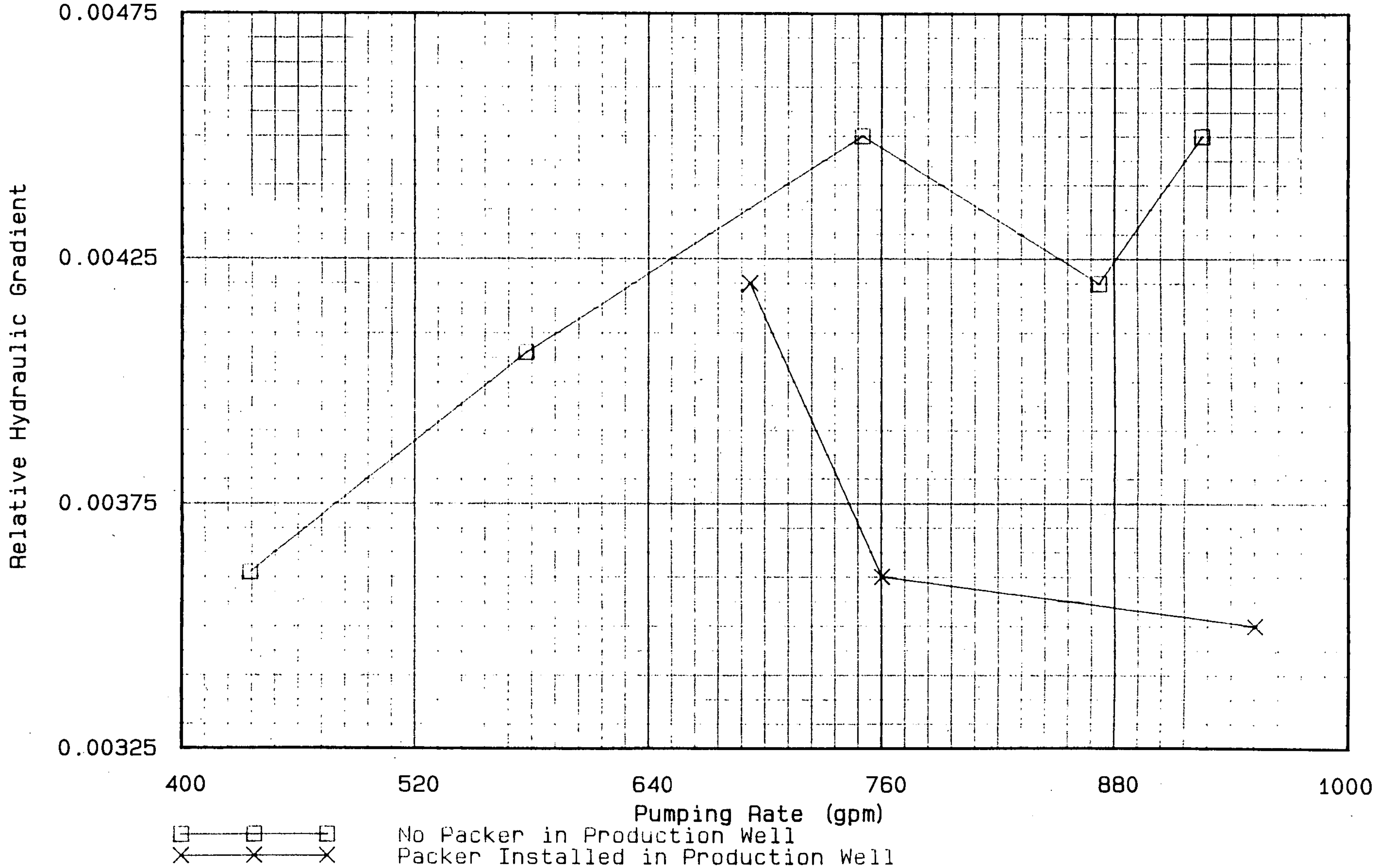


Plate 6

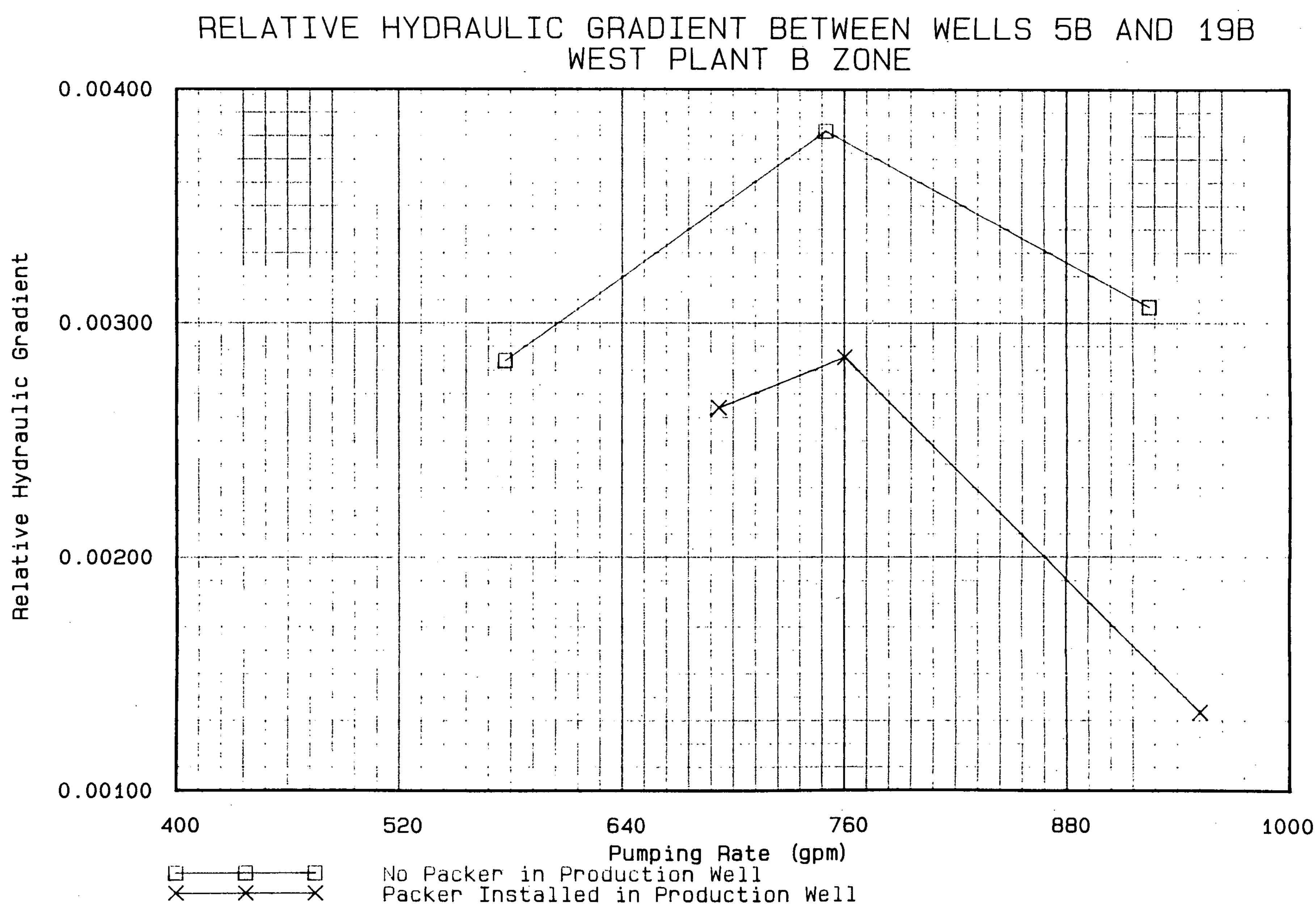

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 5B AND 19B
WEST PLANT B ZONE
Relative Hydraulic Gradient
0.00400
0.00300
0.00200
0.00100
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 7

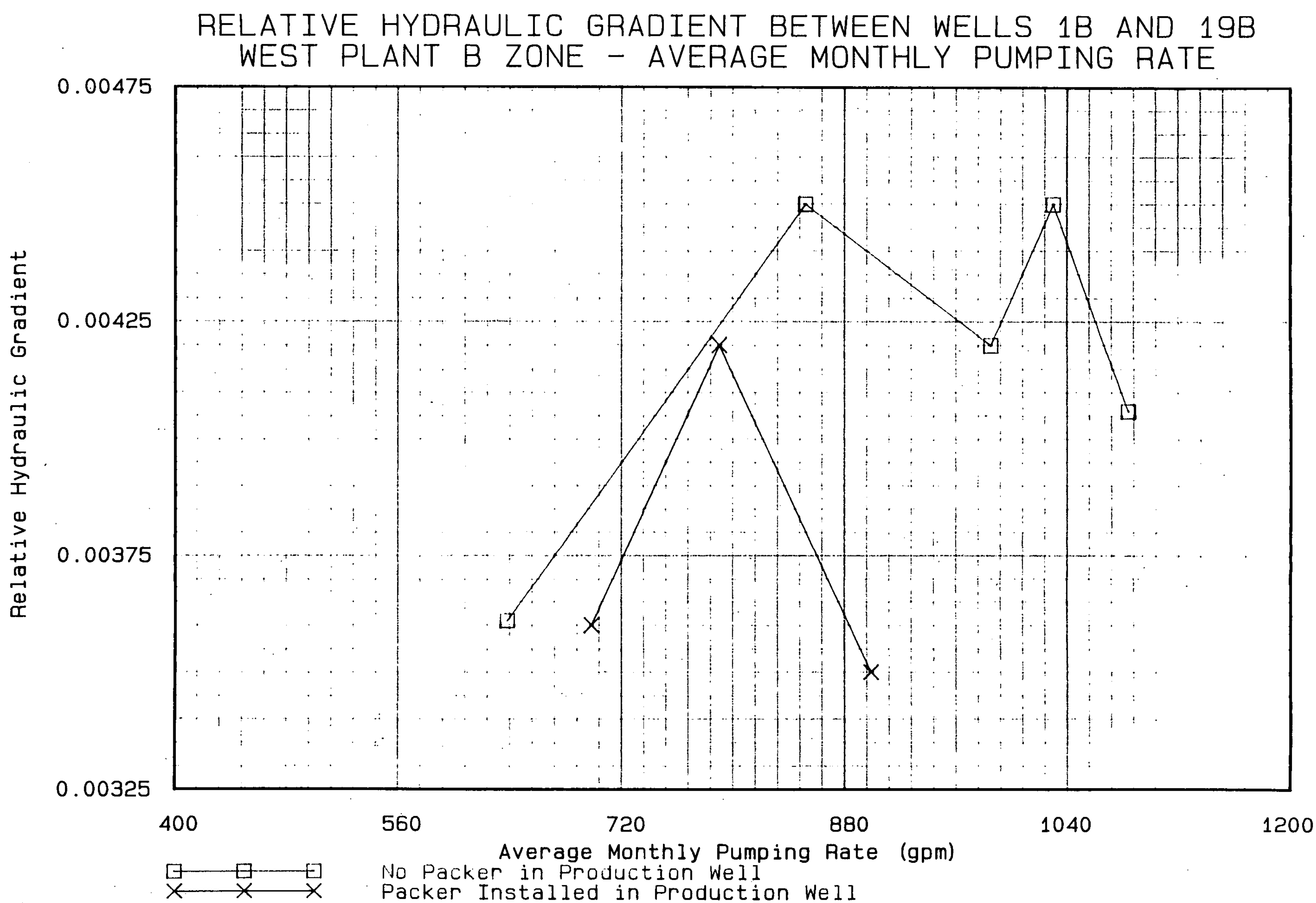

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 1B AND 19B
WEST PLANT B ZONE - AVERAGE MONTHLY PUMPING RATE
Relative Hydraulic Gradient
0.00475
0.00425
0.00375
0.00325
400
560
720
880
1040
1200
Average Monthly Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 8

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 5B AND 19B
WEST PLANT B ZONE - AVERAGE MONTHLY PUMPING RATE

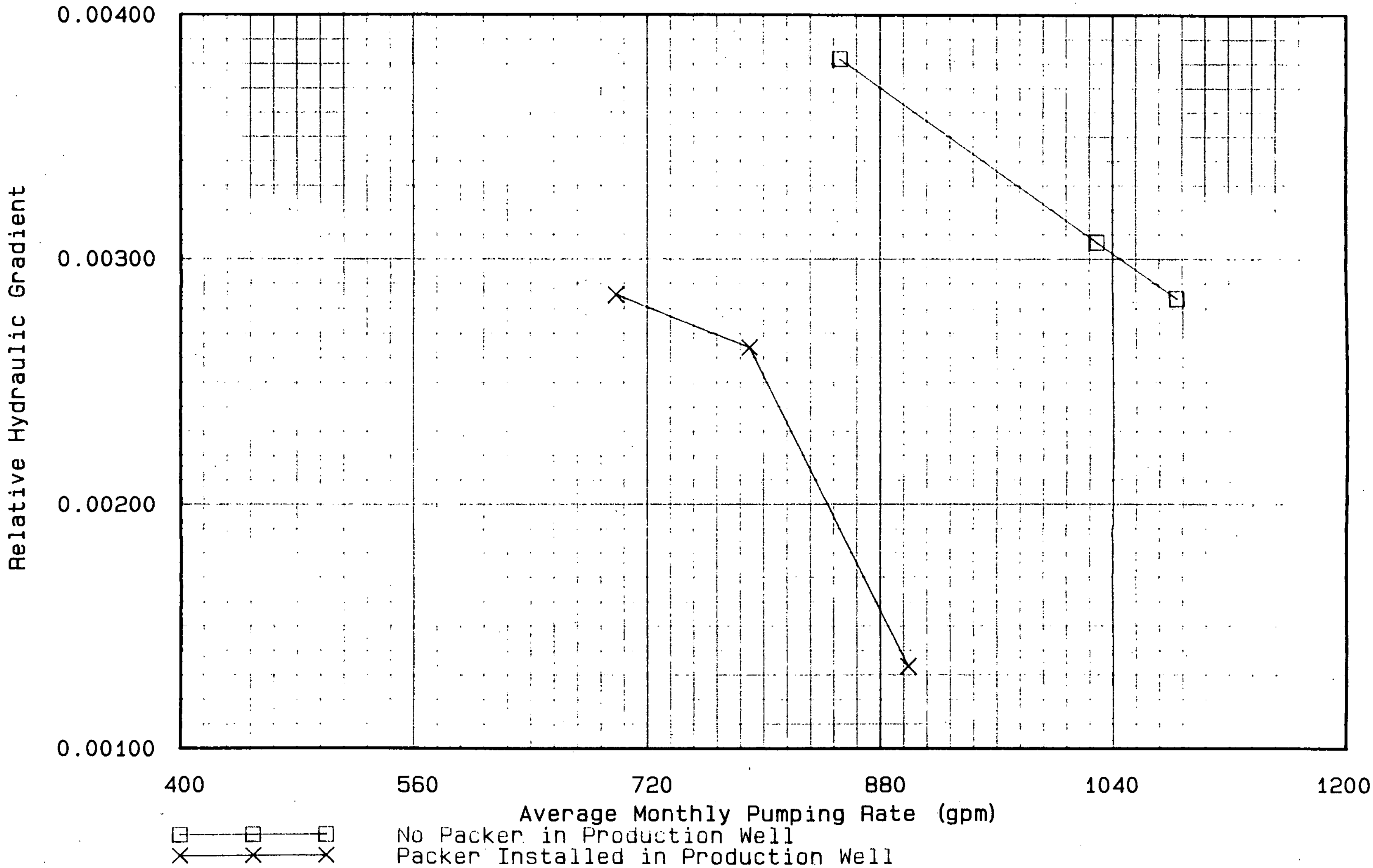


Plate 9

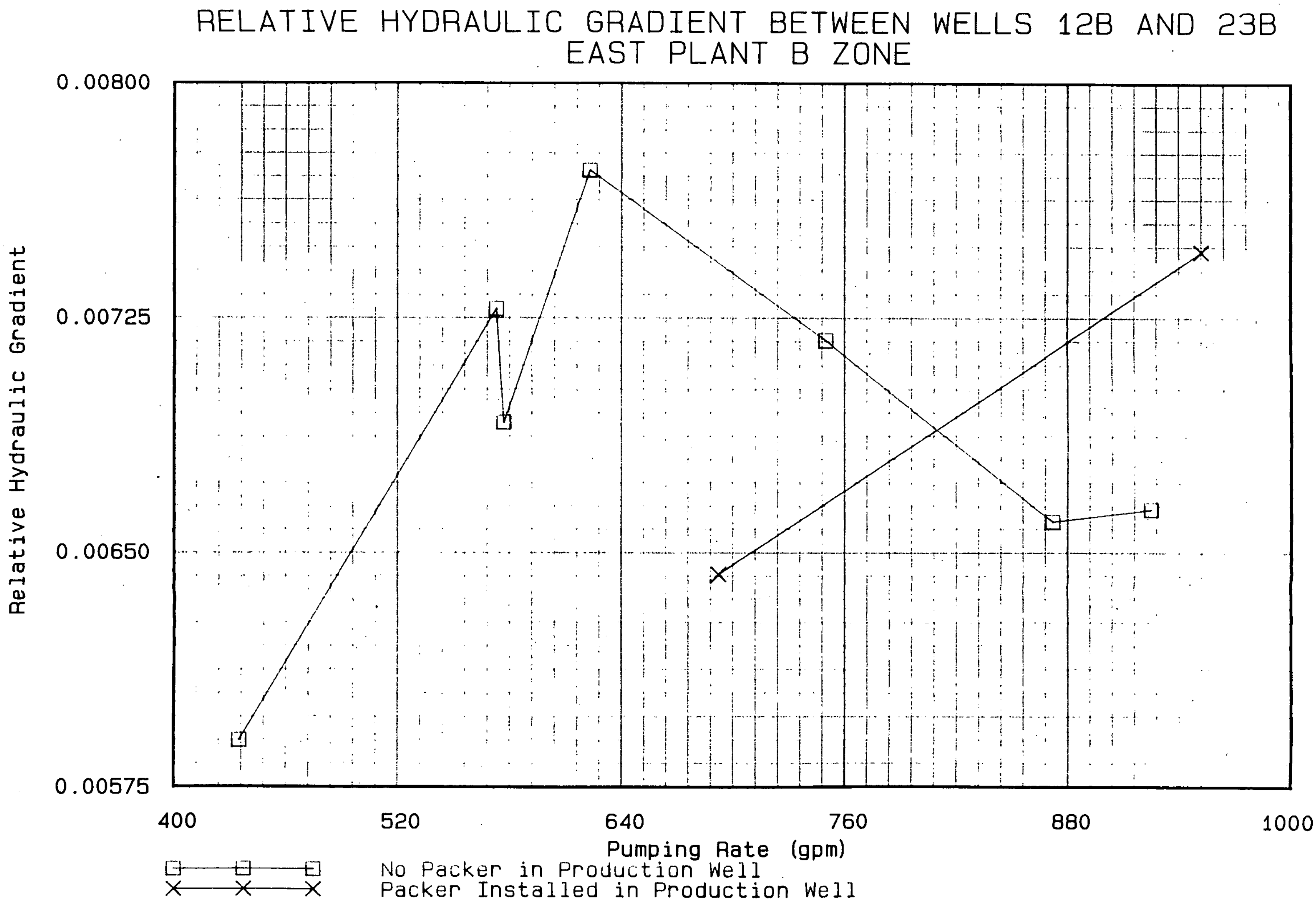

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 12B AND 23B
EAST PLANT B ZONE
0.00800
0.00725
0.00650
0.00575
Relative Hydraulic Gradient
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 10

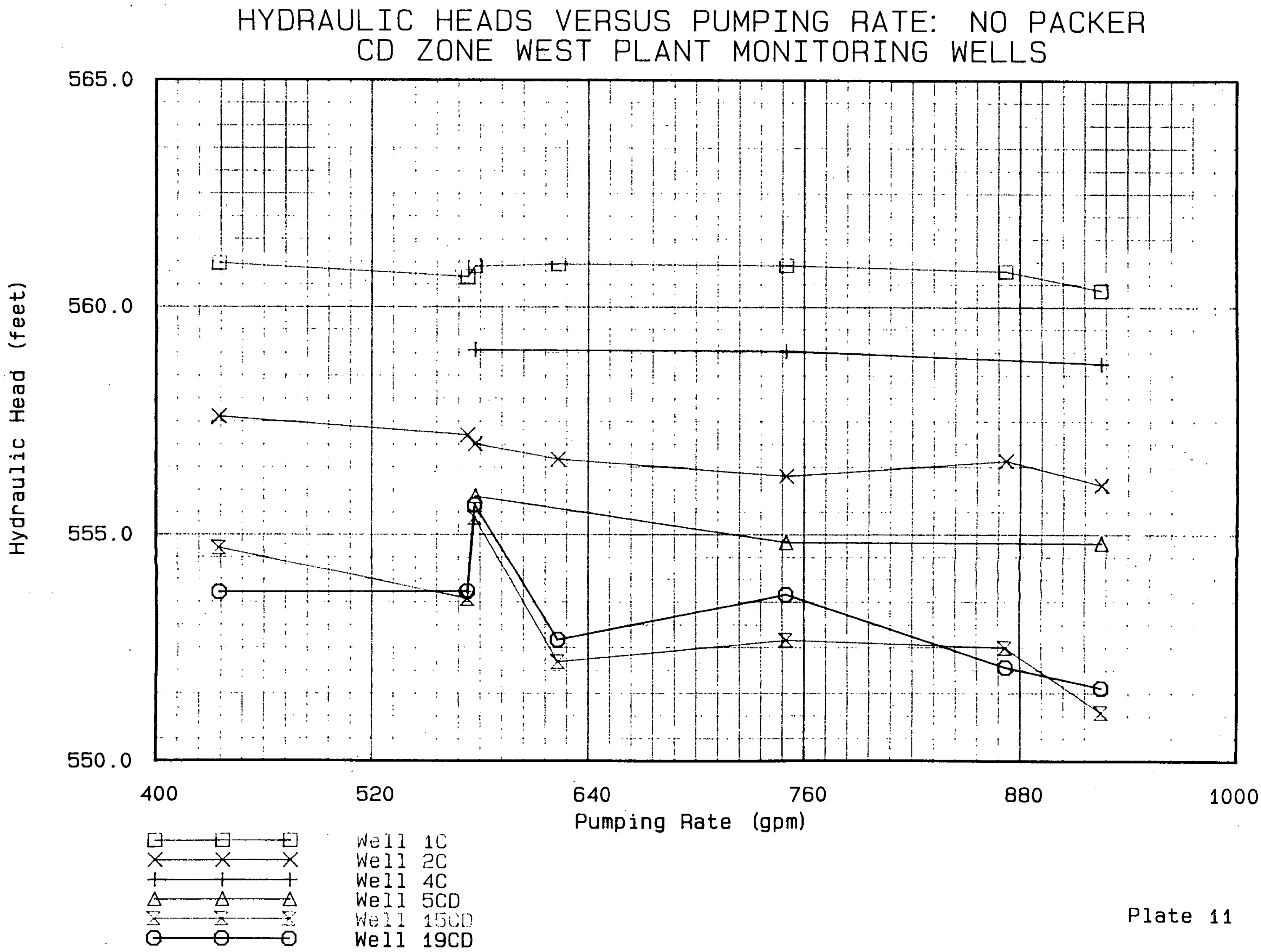

HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
CD ZONE WEST PLANT MONITORING WELLS
565.0
560.0
555.0
550.0
Hydraulic Head (feet)
400
520
640
760
880
1000
Pumping Rate (gpm)
Well 1C
Well 2C
Well 4C
Well 5CD
Well 15CD
Well 19CD

Plate 11

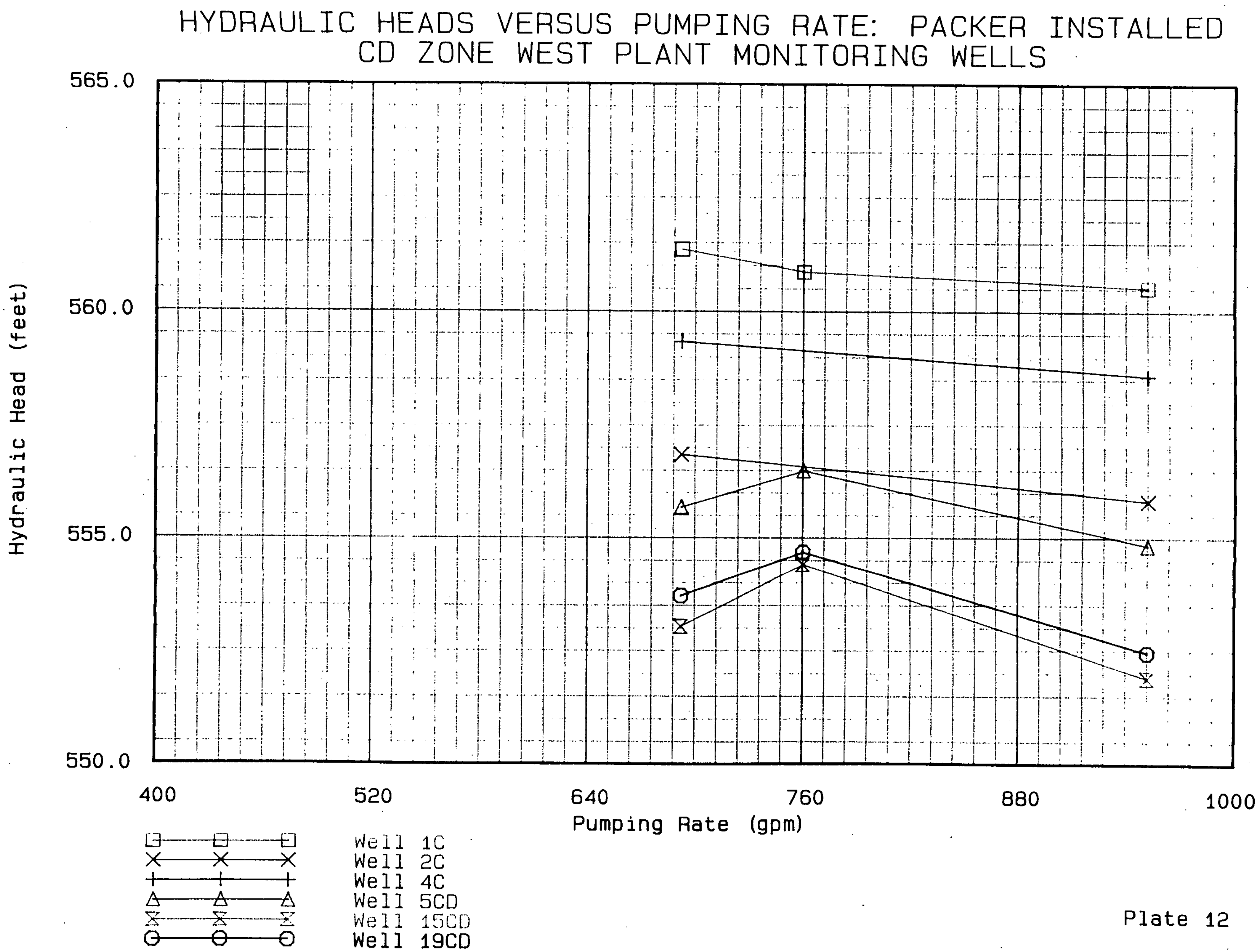

HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED
CD ZONE WEST PLANT MONITORING WELLS
Hydraulic Head (feet)
565.0
560.0
555.0
550.0
400
520
640
760
880
1000
Pumping Rate (gpm)
Well 1C
Well 2C
Well 4C
Well 5CD
Well 15CD
Well 19CD

Plate 12

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 1C AND 15CD
WEST PLANT CD ZONE

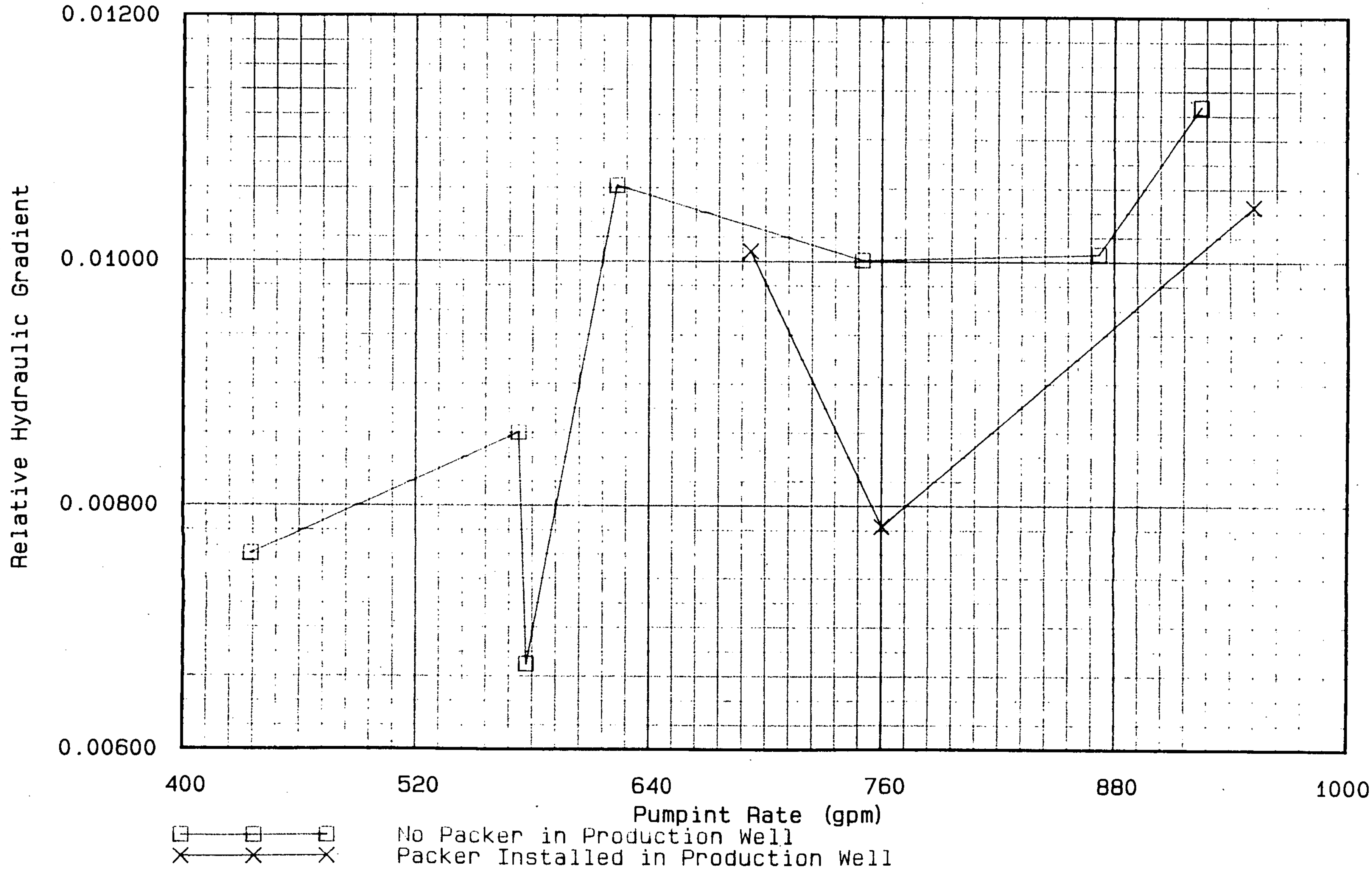


Plate 13

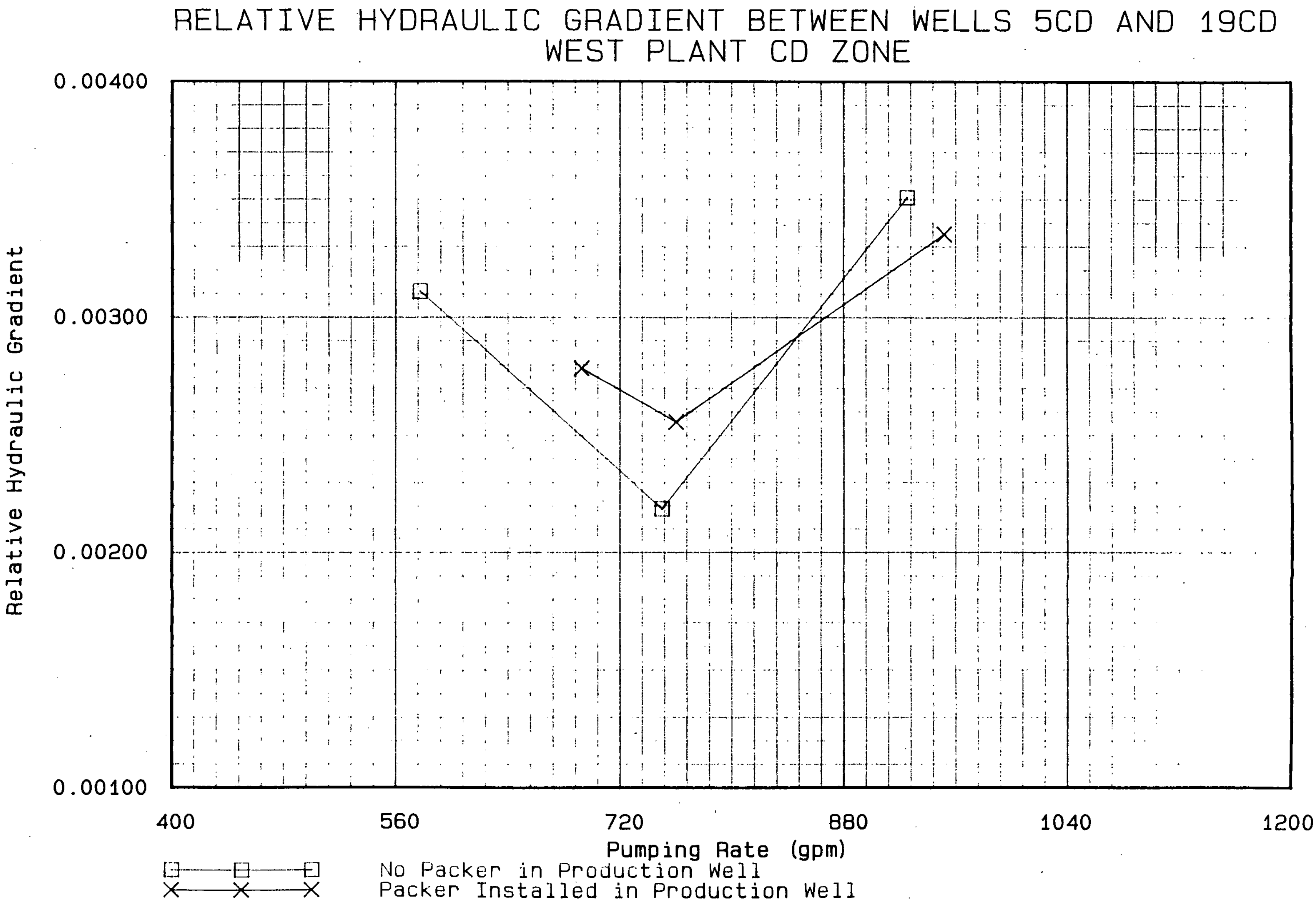

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 5CD AND 19CD
WEST PLANT CD ZONE
Relative Hydraulic Gradient
0.00400
0.00300
0.00200
0.00100
400
560
720
880
1040
1200
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 14

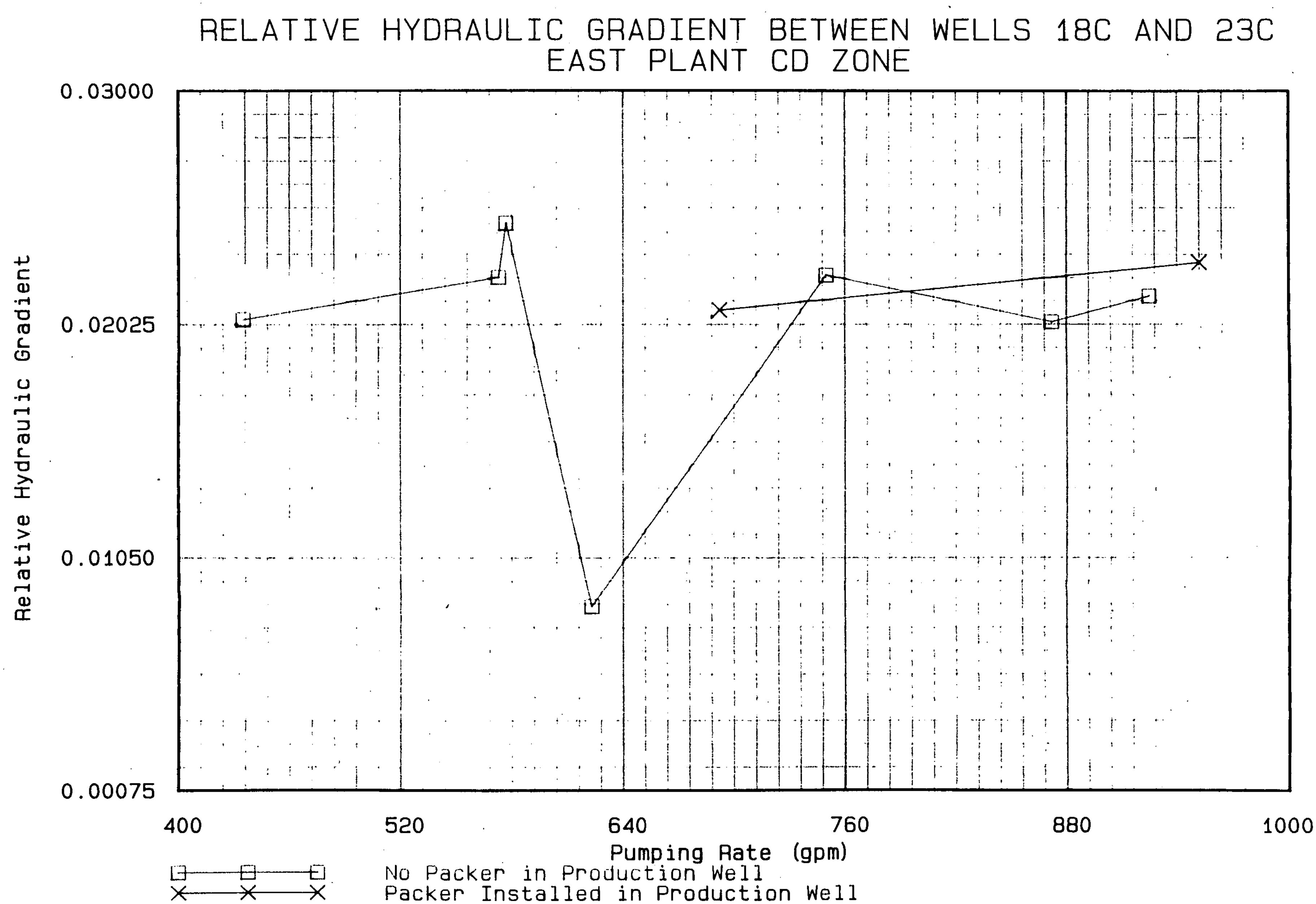

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 18C AND 23C
EAST PLANT CD ZONE
0.03000
0.02025
0.01050
0.00075
Relative Hydraulic Gradient
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 15

HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
D ZONE WEST PLANT MONITORING WELLS

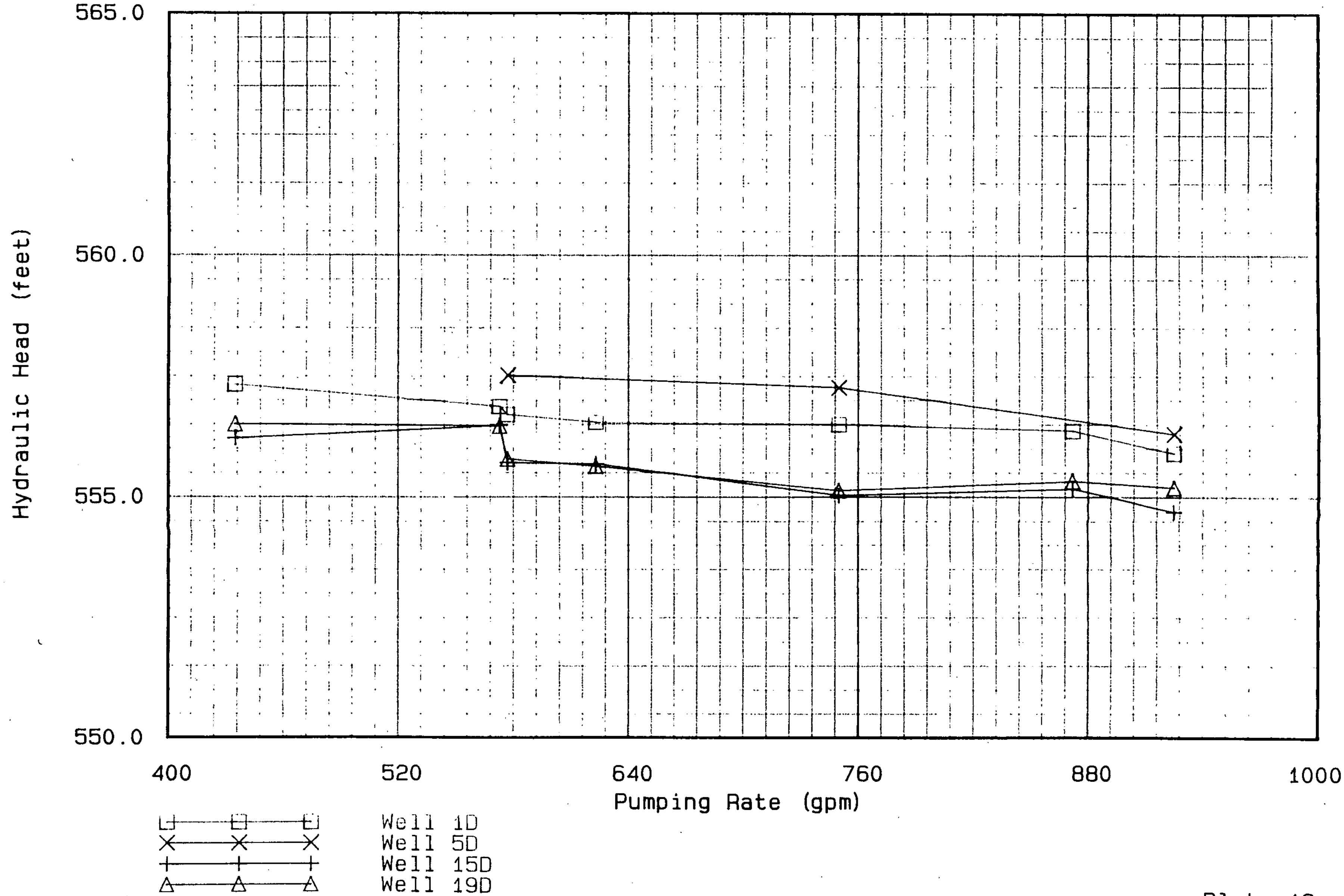


Plate 16

HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED D ZONE WEST PLANT MONITORING WELLS

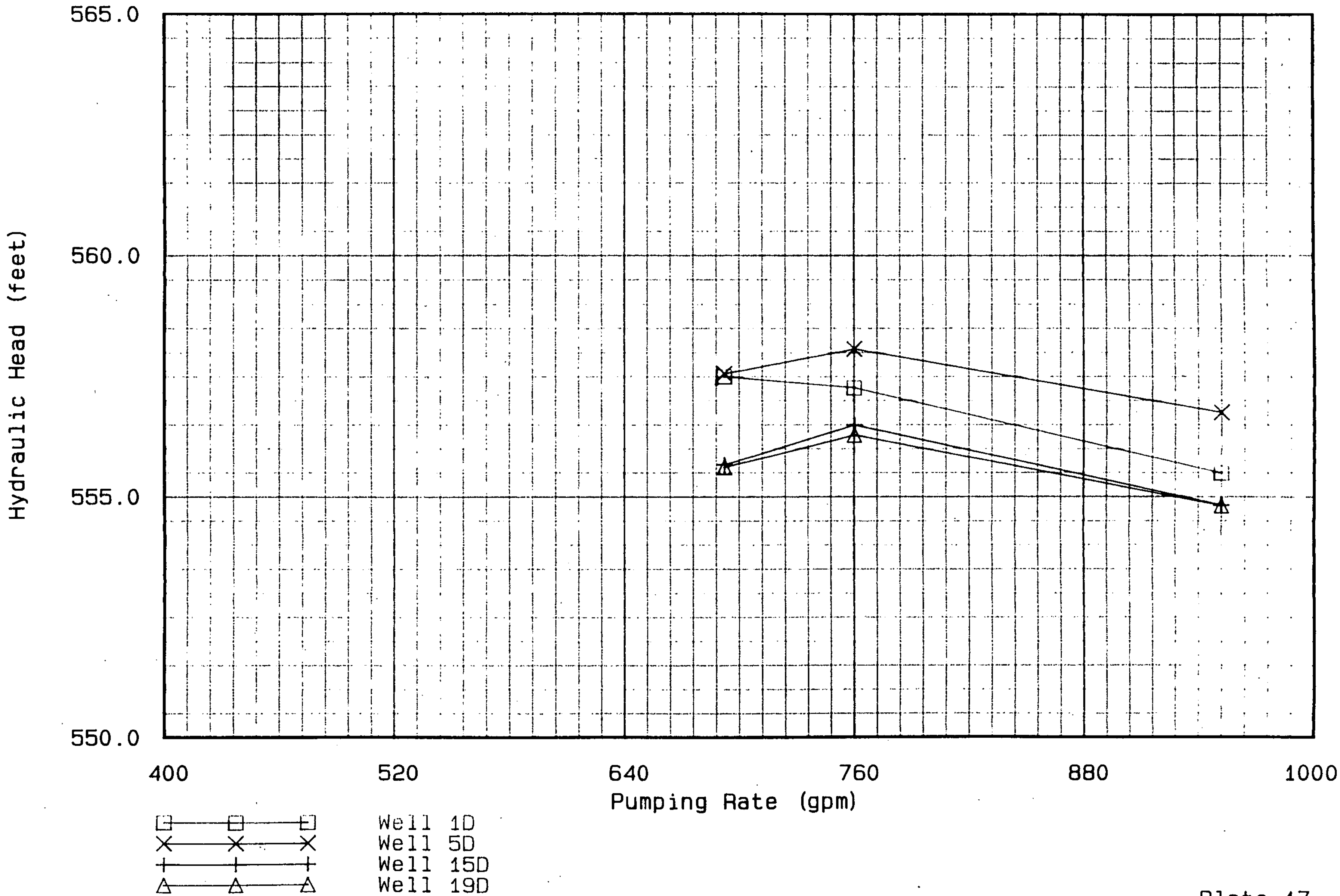


Plate 17

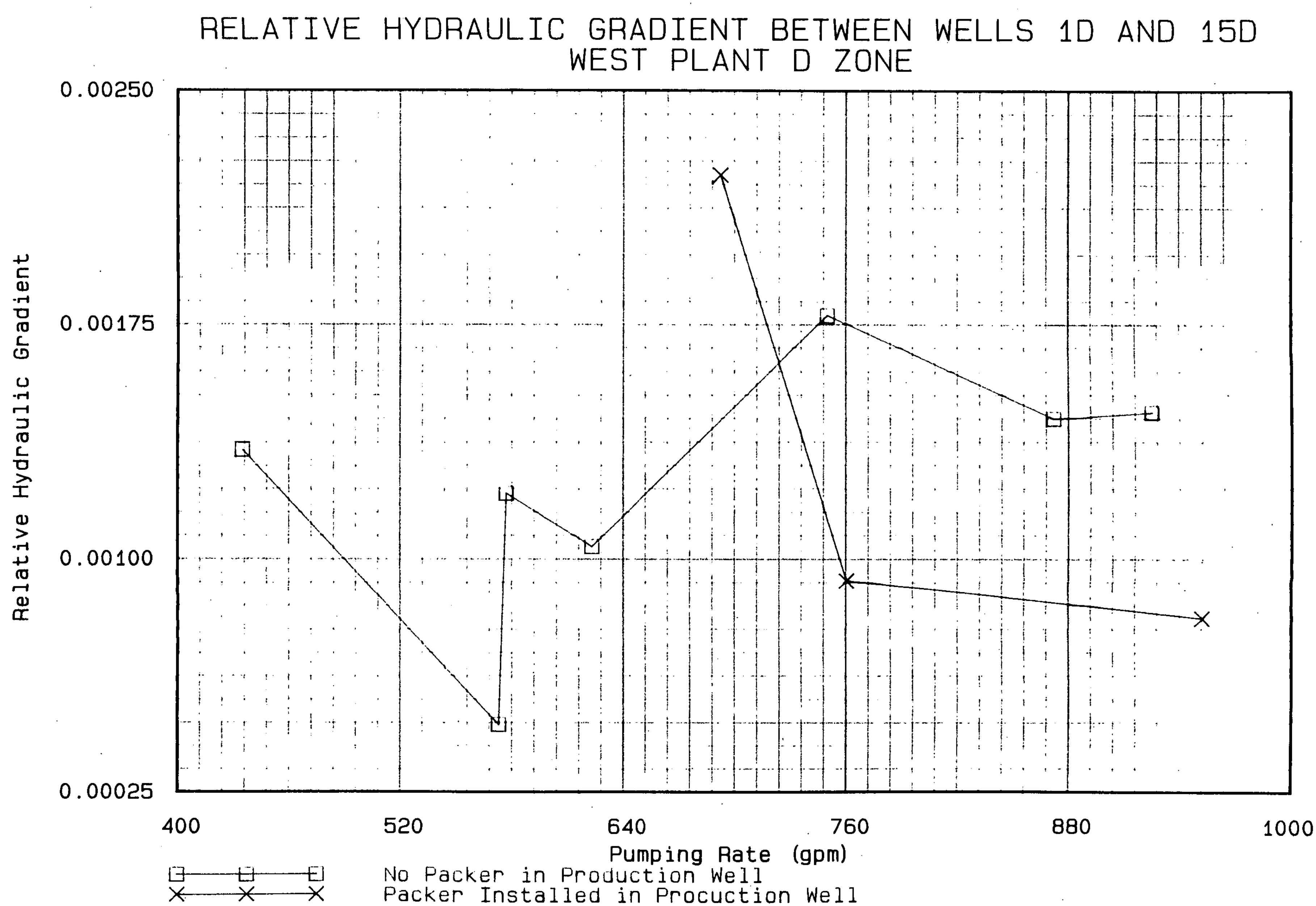

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 1D AND 15D
WEST PLANT D ZONE
Relative Hydraulic Gradient
0.00250
0.00175
0.00100
0.00025
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Procuction Well

Plate 18

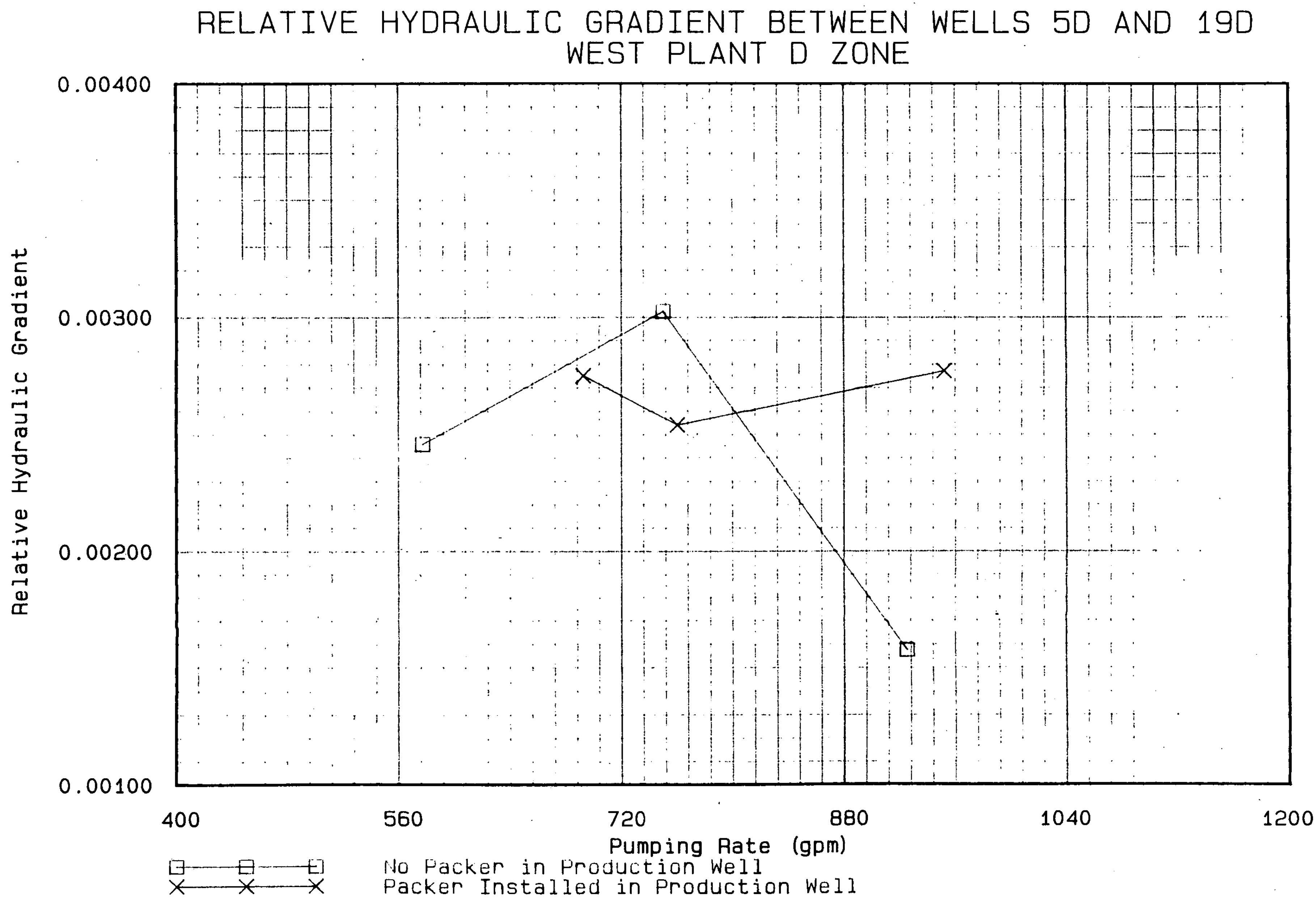

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 5D AND 19D
WEST PLANT D ZONE
Relative Hydraulic Gradient
0.00400
0.00300
0.00200
0.00100
400
560
720
880
1040
1200
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 19

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 10D AND 23D EAST PLANT D ZONE

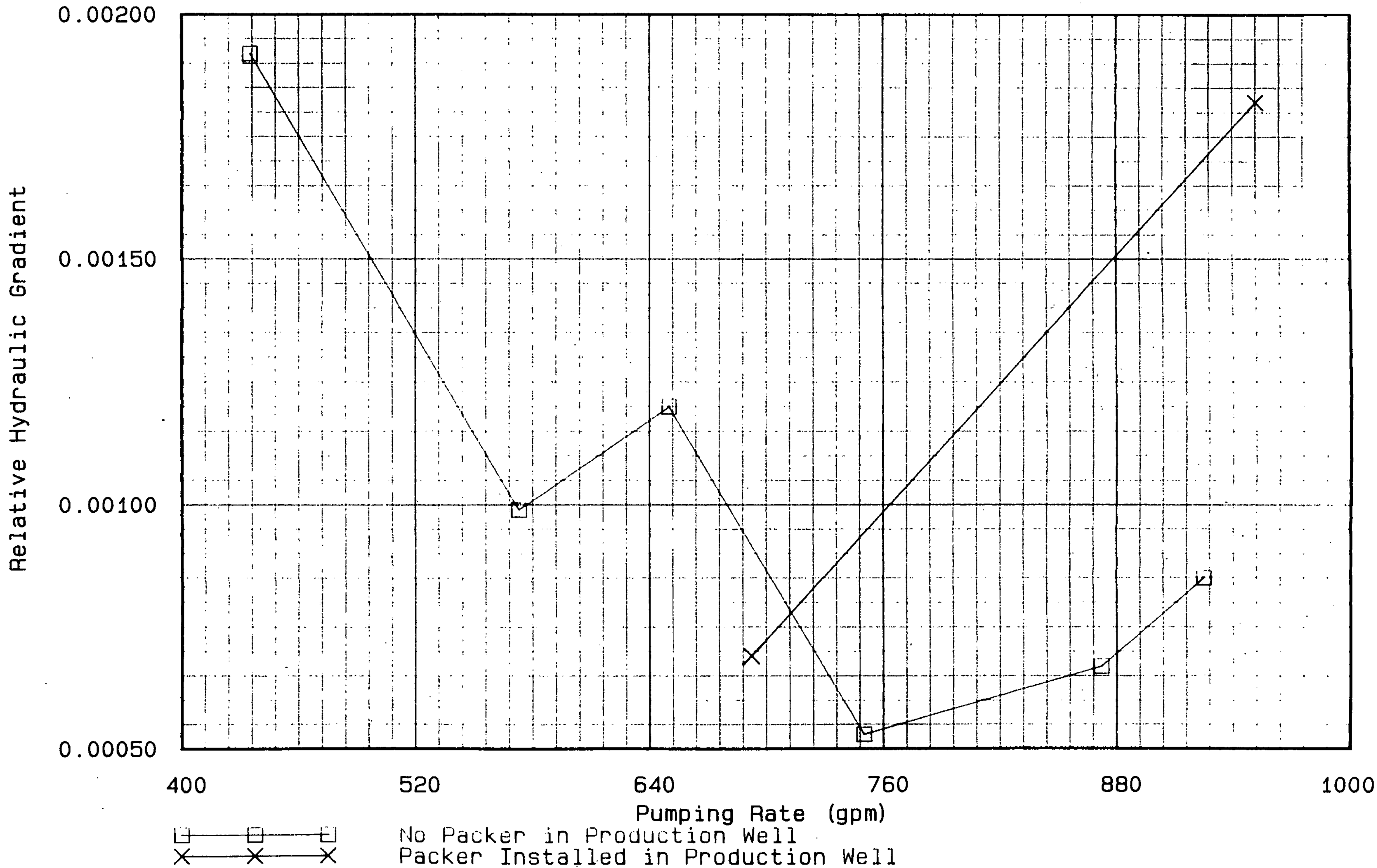


Plate 20

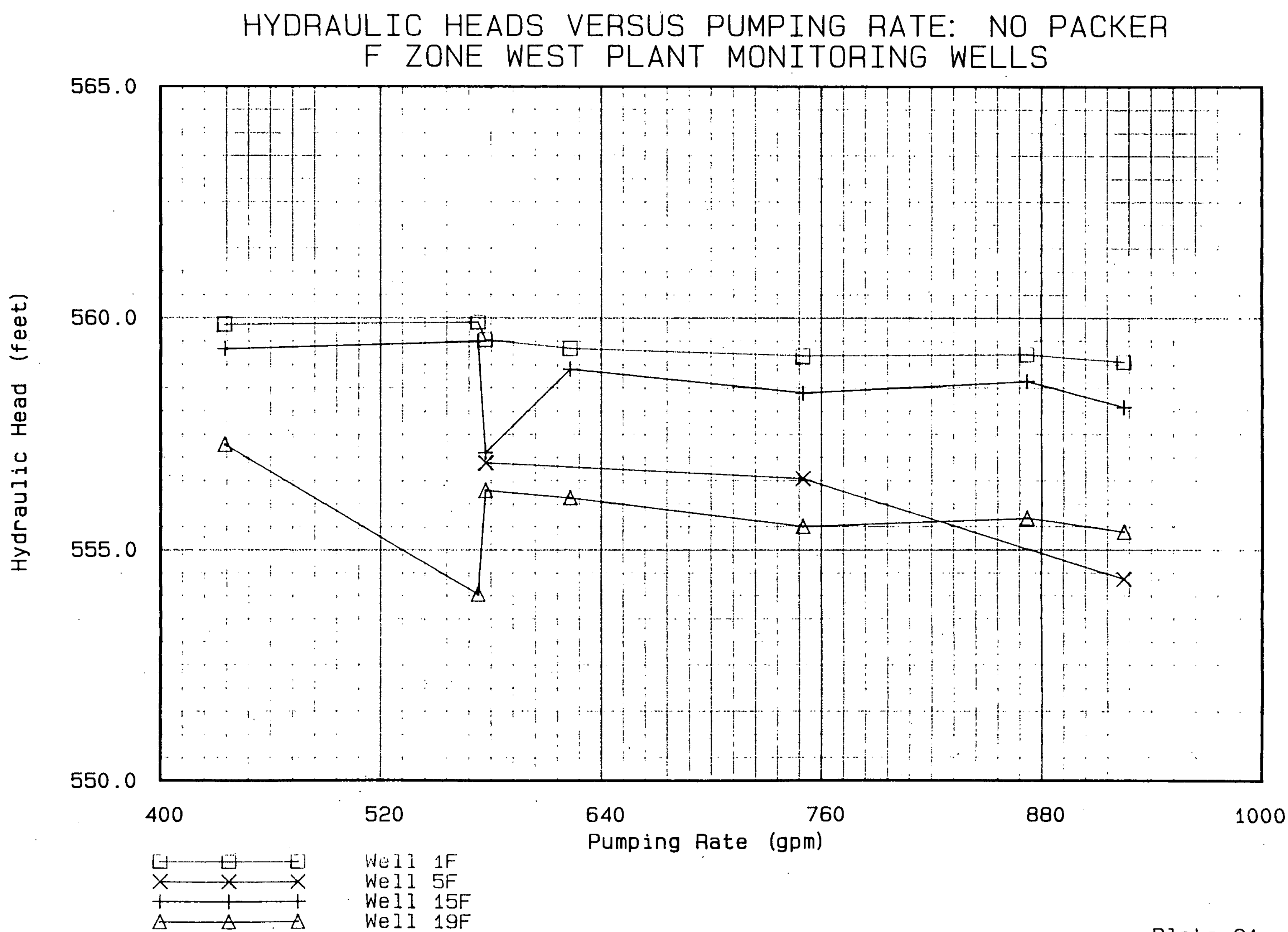

HYDRAULIC HEADS VERSUS PUMPING RATE: NO PACKER
F ZONE WEST PLANT MONITORING WELLS
Hydraulic Head (feet)
565.0
560.0
555.0
550.0
400
520
640
760
880
1000
Pumping Rate (gpm)
Well 1F
Well 5F
Well 15F
Well 19F

Plate 21

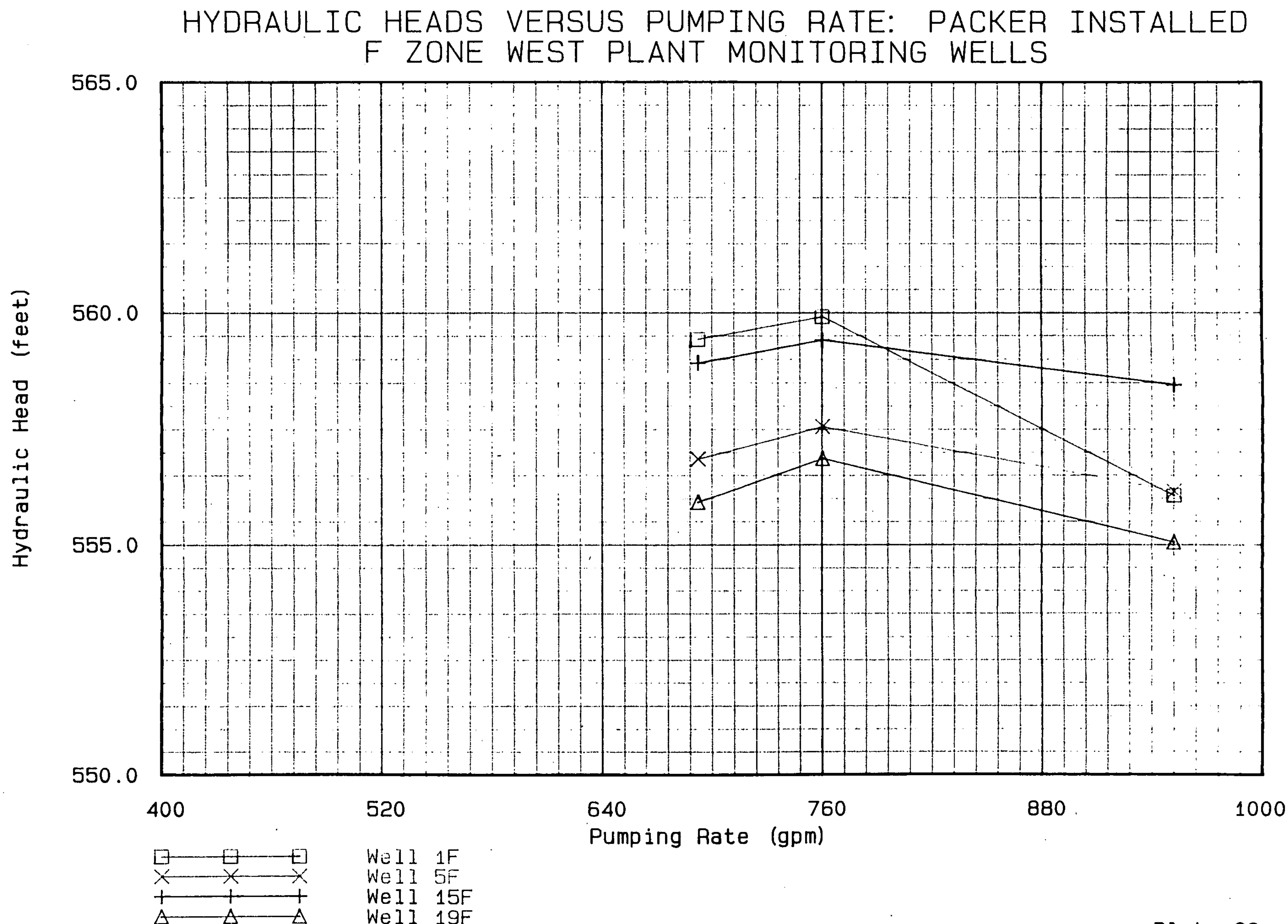

HYDRAULIC HEADS VERSUS PUMPING RATE: PACKER INSTALLED
F ZONE WEST PLANT MONITORING WELLS
565.0
560.0
555.0
550.0
Hydraulic Head (feet)
400
520
640
760
880
1000
Pumping Rate (gpm)
Well 1F
Well 5F
Well 15F
Well 19F

Plate 22

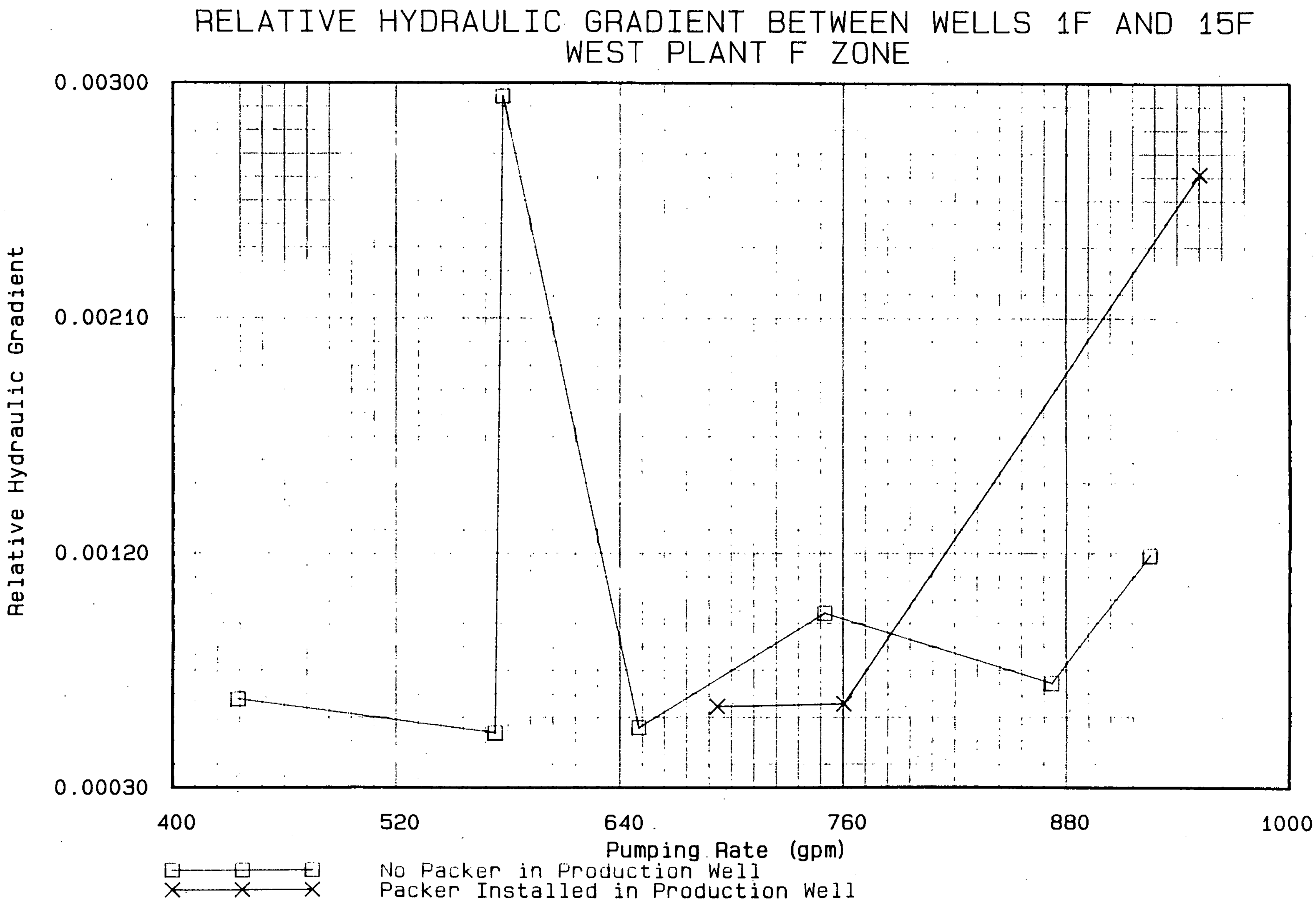

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 1F AND 15F
WEST PLANT F ZONE
Relative Hydraulic Gradient
0.00300
0.00210
0.00120
0.00030
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 23

RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 1F AND 15F
WEST PLANT F ZONE

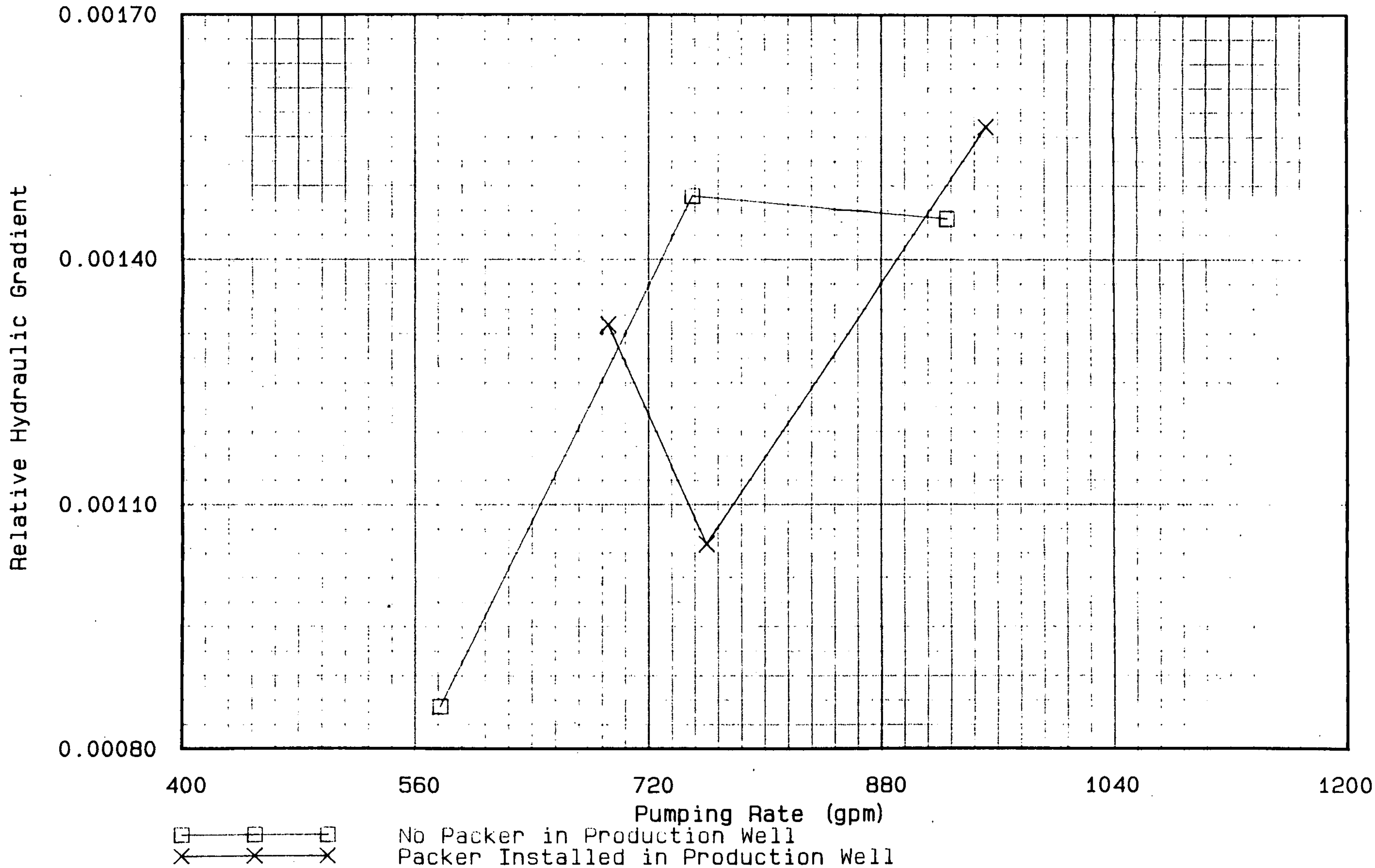
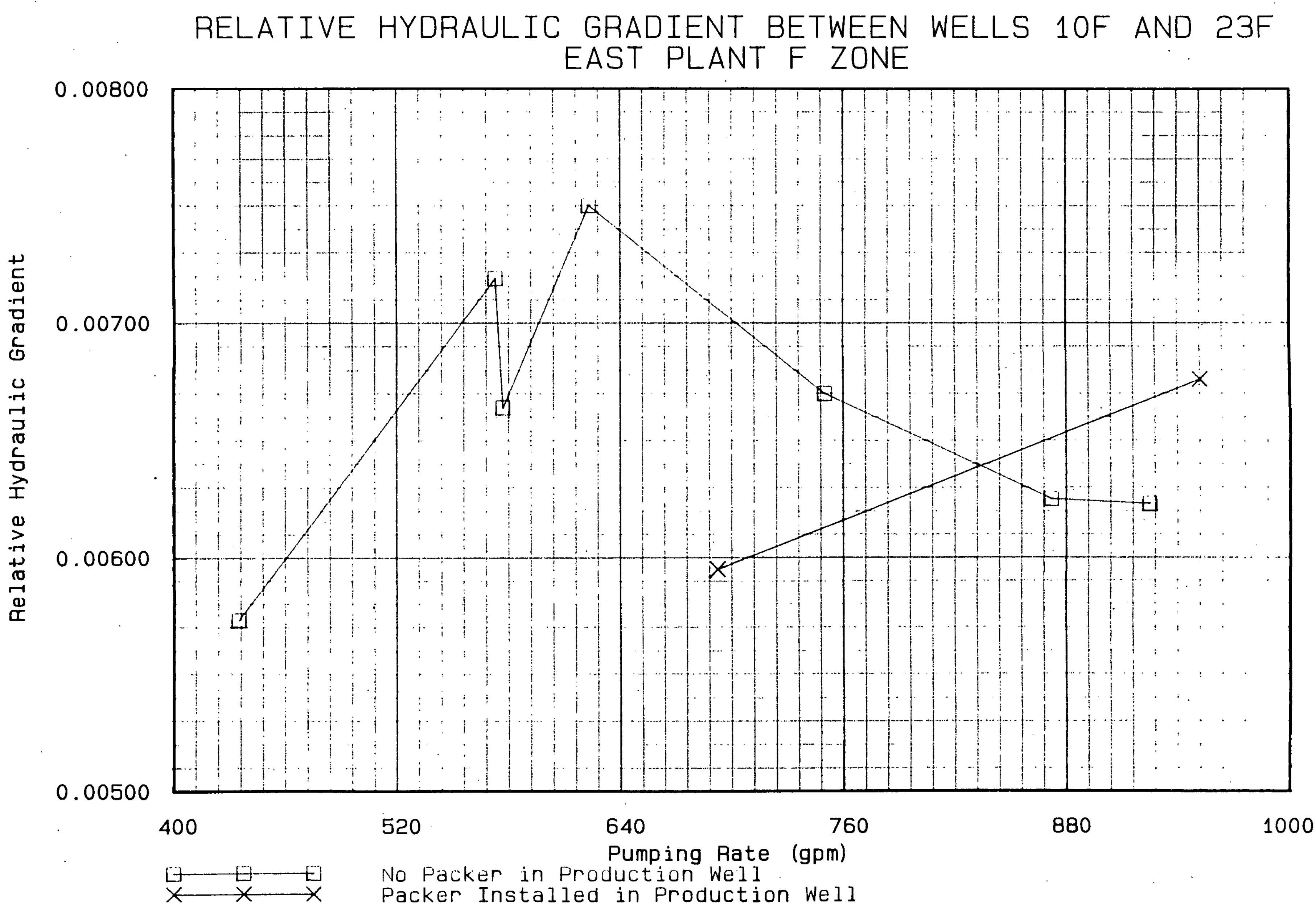


Plate 24



RELATIVE HYDRAULIC GRADIENT BETWEEN WELLS 10F AND 23F
EAST PLANT F ZONE
Relative Hydraulic Gradient
0.00800
0.00700
0.00600
0.00500
400
520
640
760
880
1000
Pumping Rate (gpm)
No Packer in Production Well
Packer Installed in Production Well

Plate 25

Appendix A
Plots of Hydraulic Head vs. Time from 1984-1986

GROUNDWATER ELEVATIONS
Well Number 1A

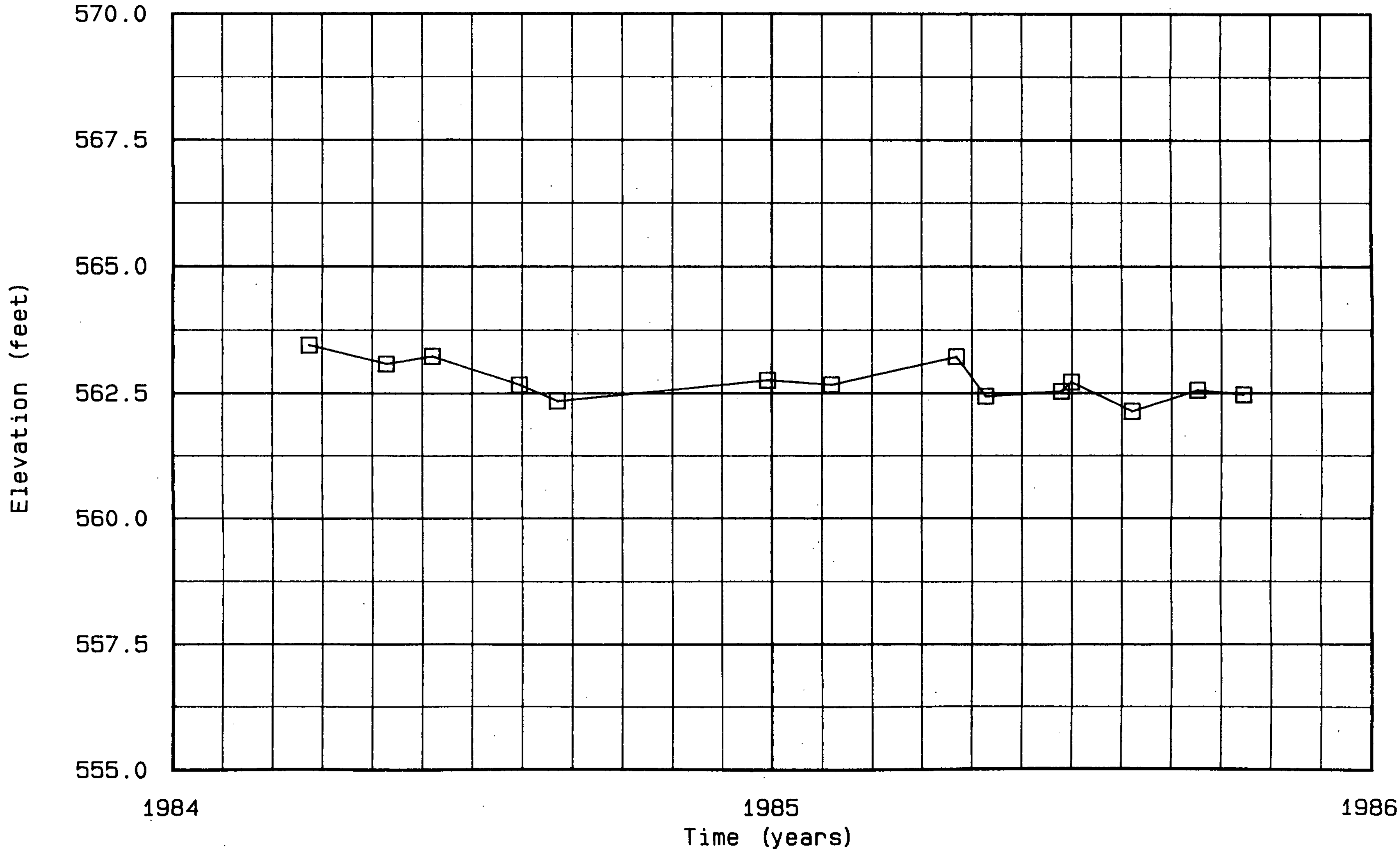


Plate A1

GROUNDWATER ELEVATIONS
Well Number 2A

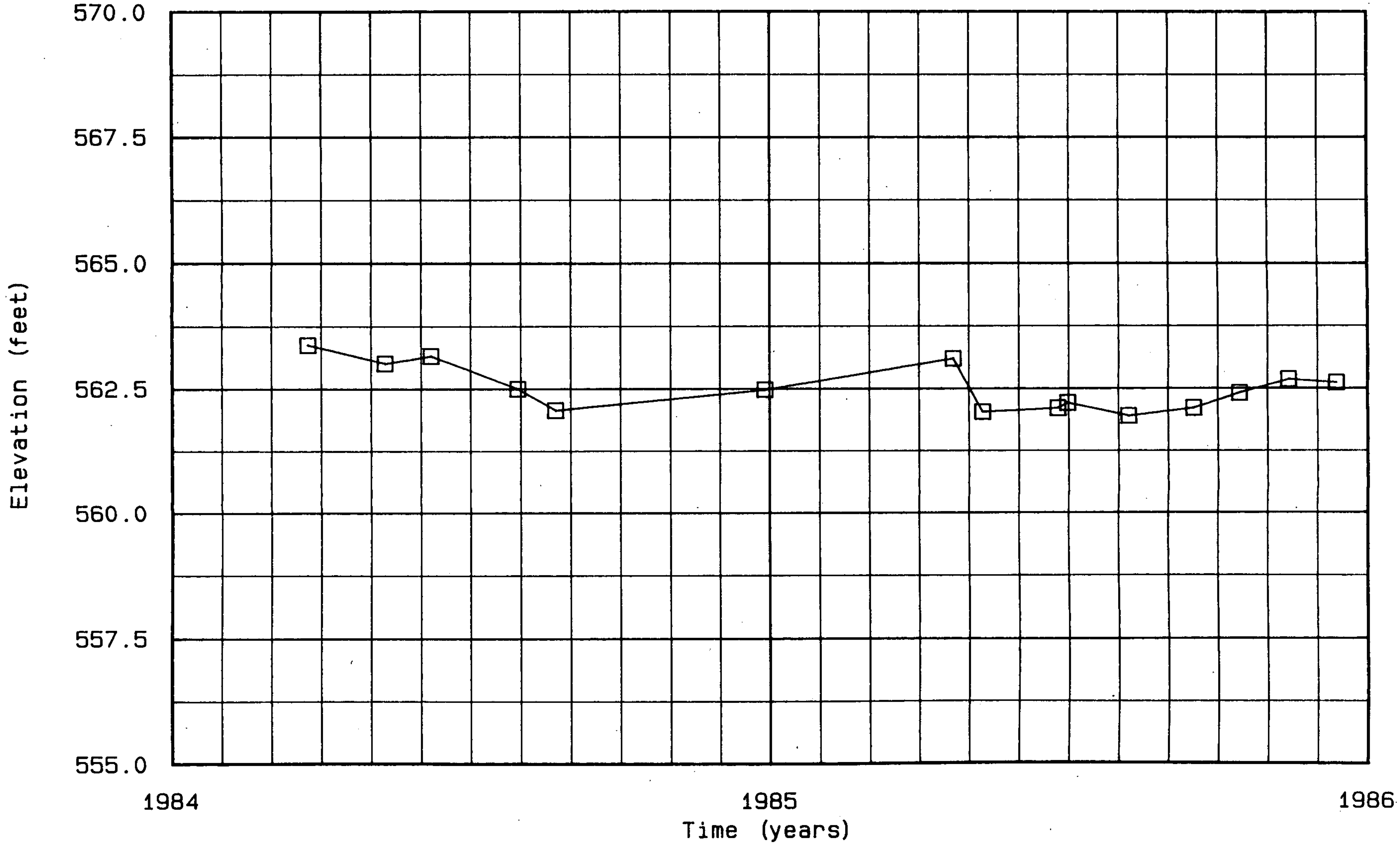


Plate A2

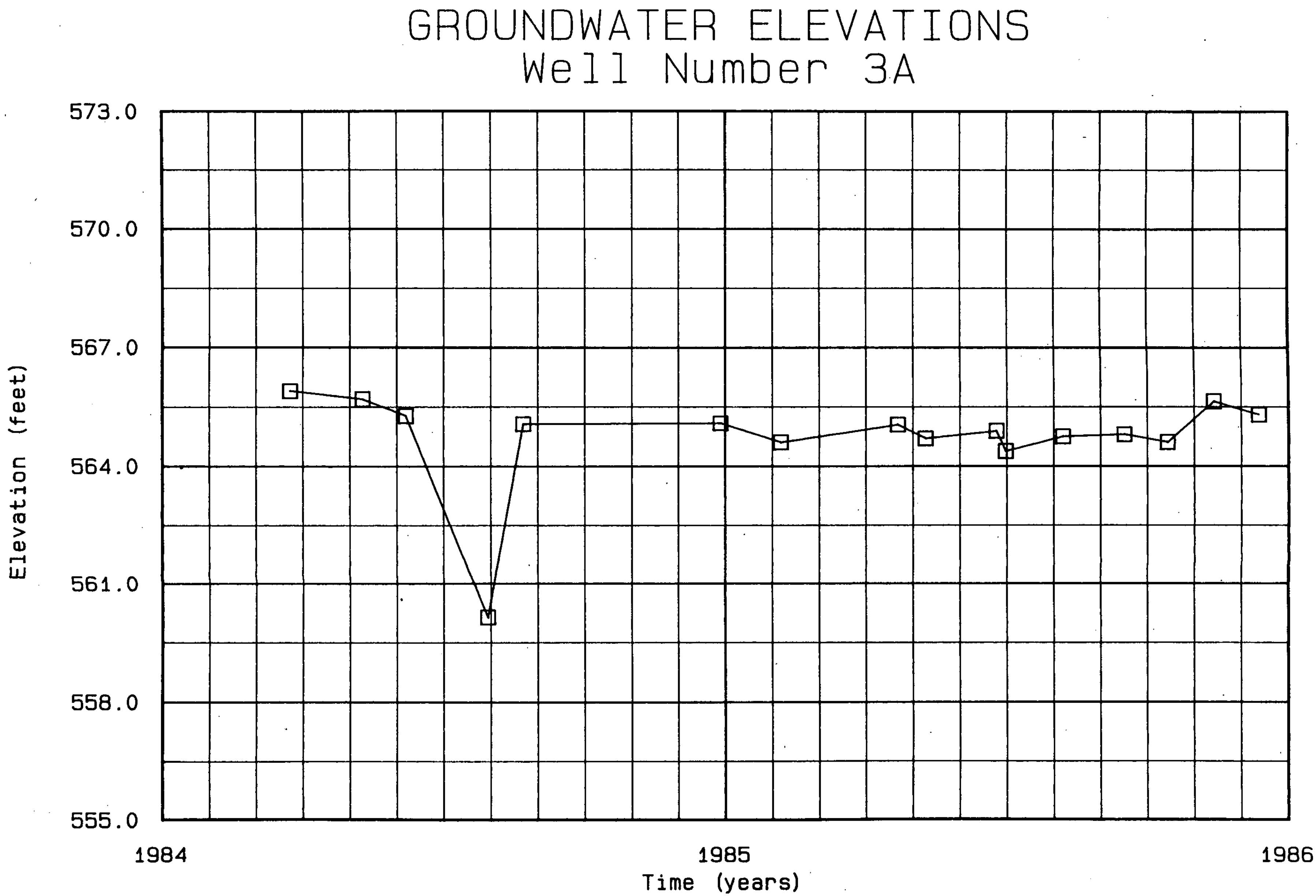

GROUNDWATER ELEVATIONS
Well Number 3A
573.0
570.0
567.0
564.0
561.0
558.0
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A3

GROUNDWATER ELEVATIONS
Well Number 4A

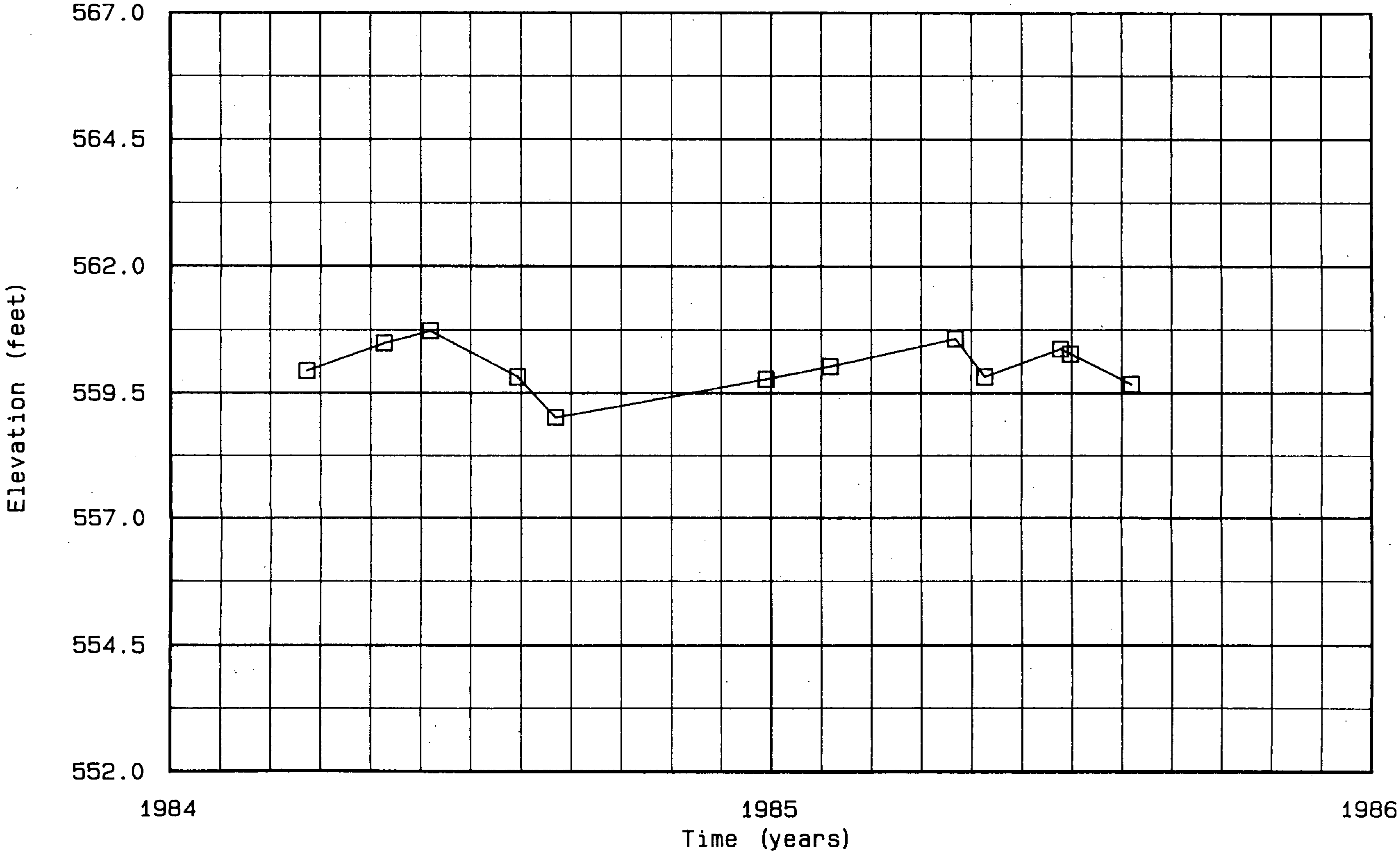


Plate A4

GROUNDWATER ELEVATIONS
Well Number 5A

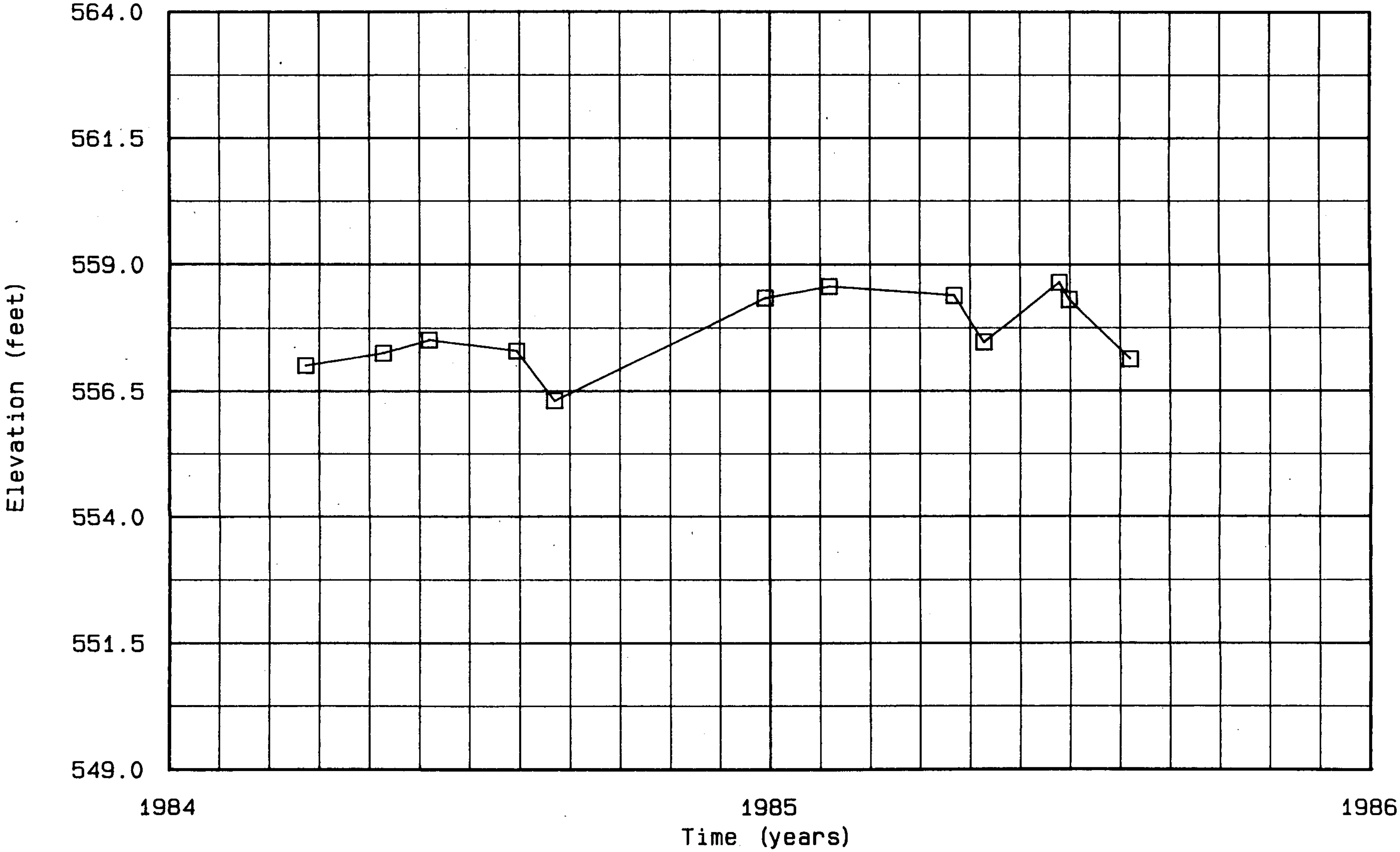


Plate A5

GROUNDWATER ELEVATIONS
Well Number 6A

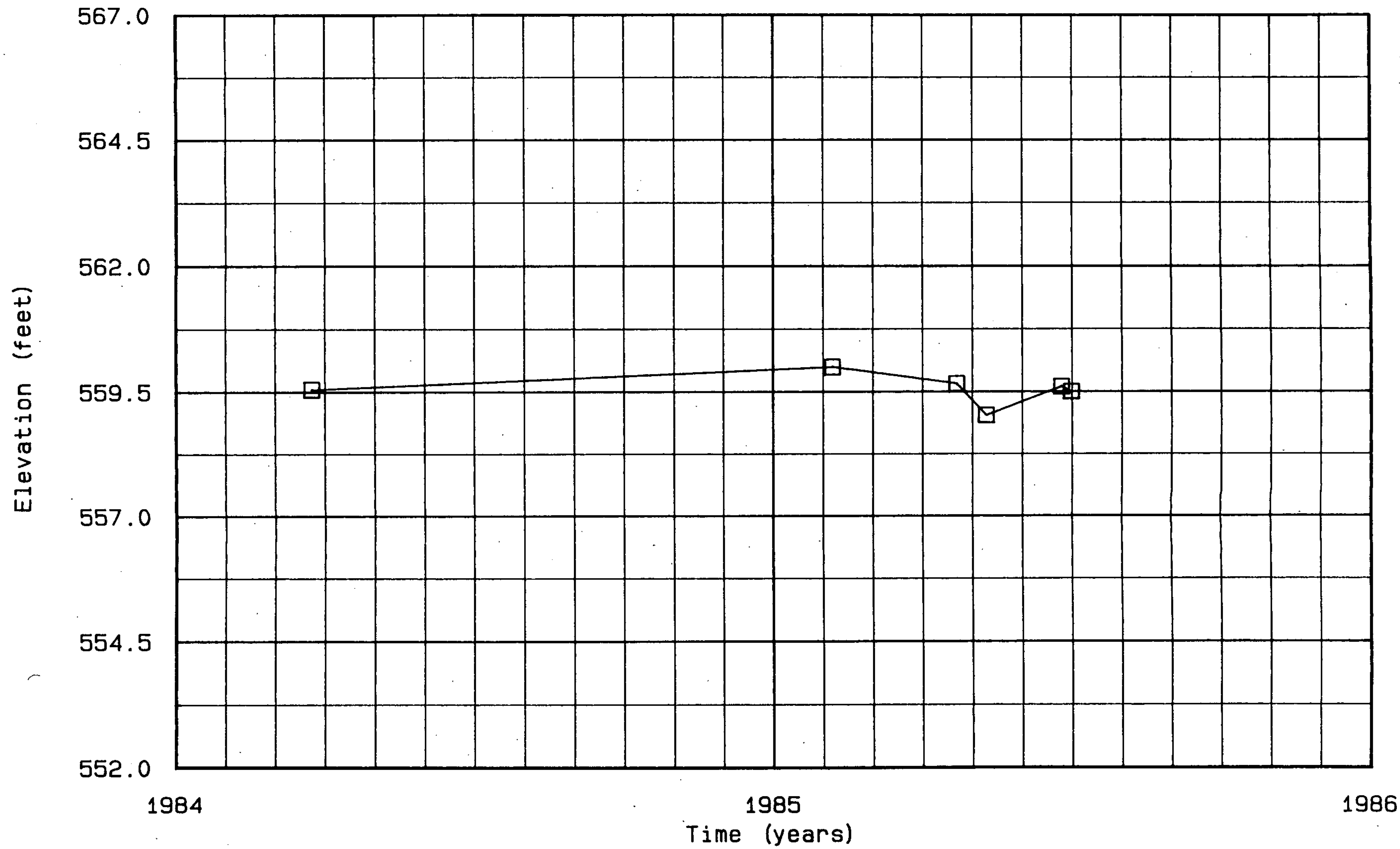


Plate A6

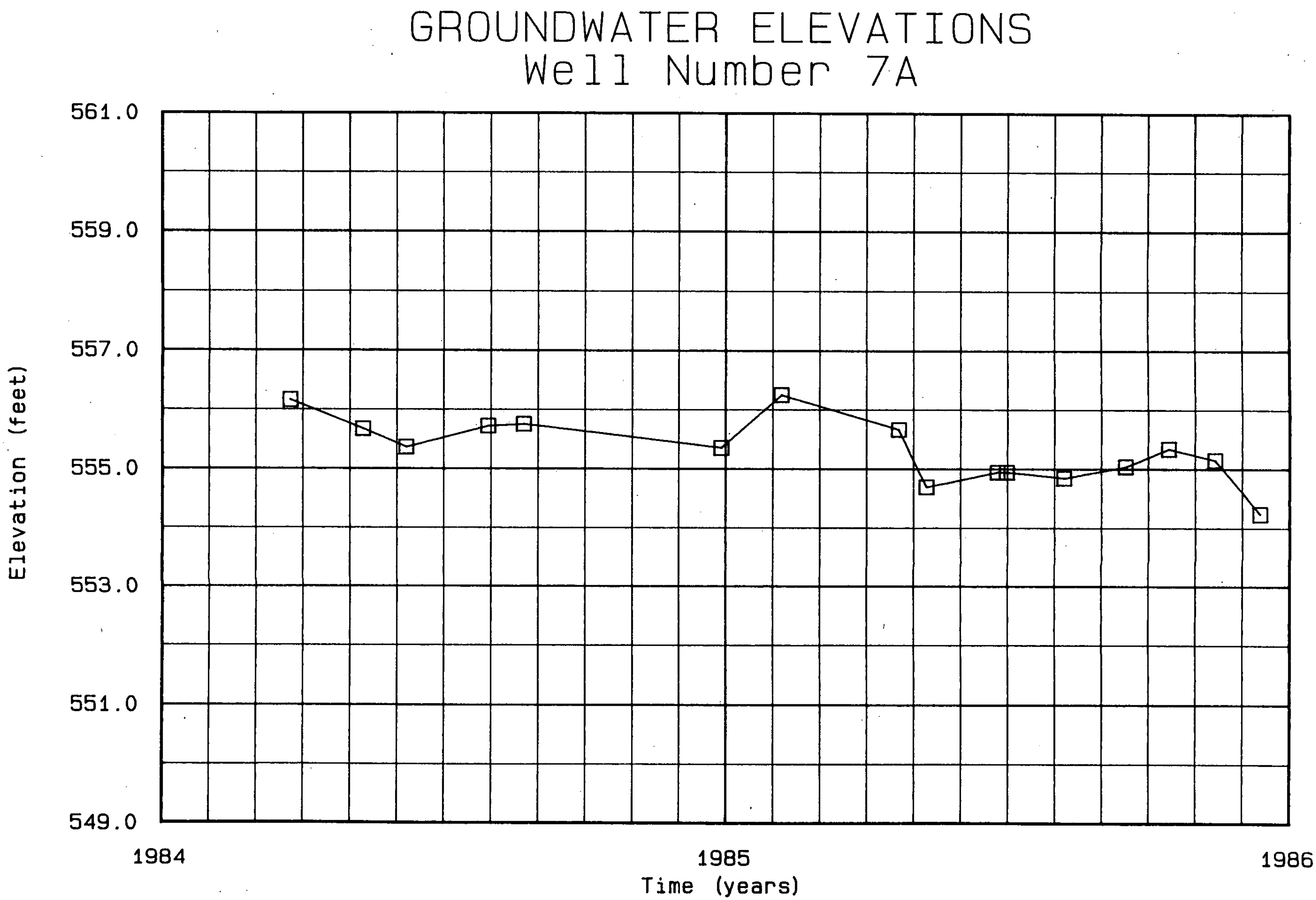

GROUNDWATER ELEVATIONS
Well Number 7A
561.0
559.0
557.0
555.0
553.0
551.0
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A7

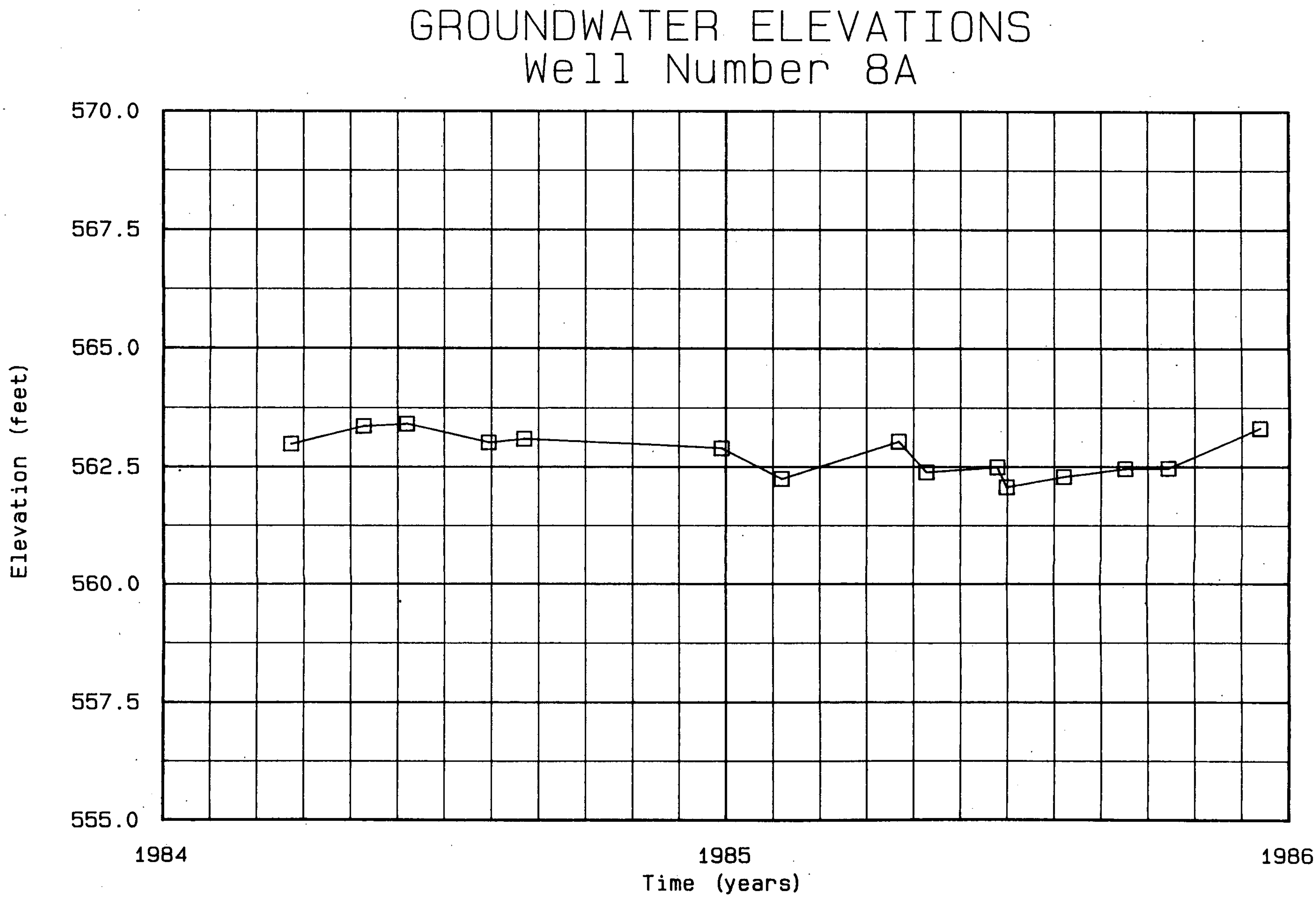

GROUNDWATER ELEVATIONS
Well Number 8A
570.0
567.5
565.0
562.5
560.0
557.5
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A8

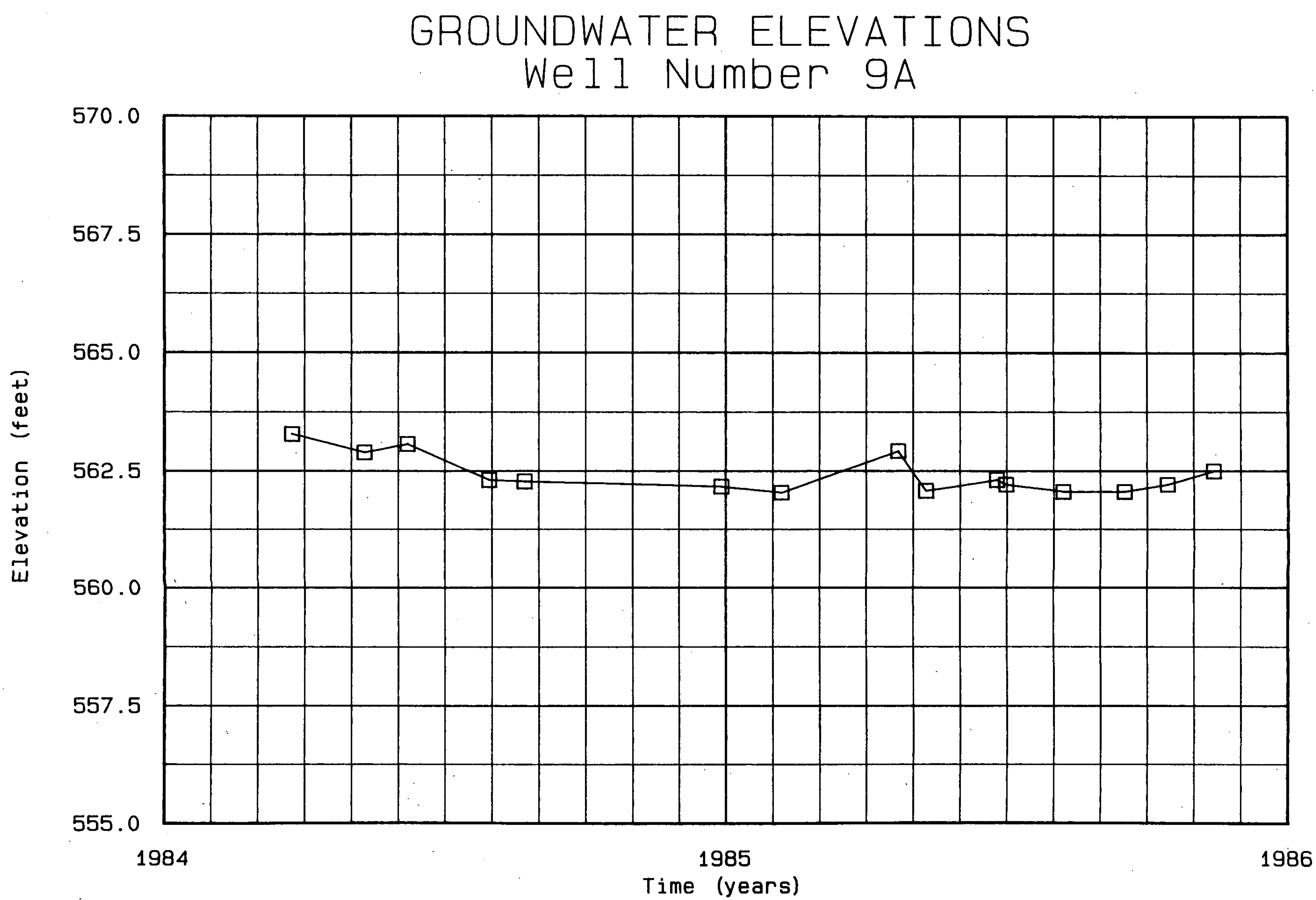

GROUNDWATER ELEVATIONS
Well Number 9A
570.0
567.5
565.0
562.5
560.0
557.5
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A9

GROUNDWATER ELEVATIONS
Well Number 10A

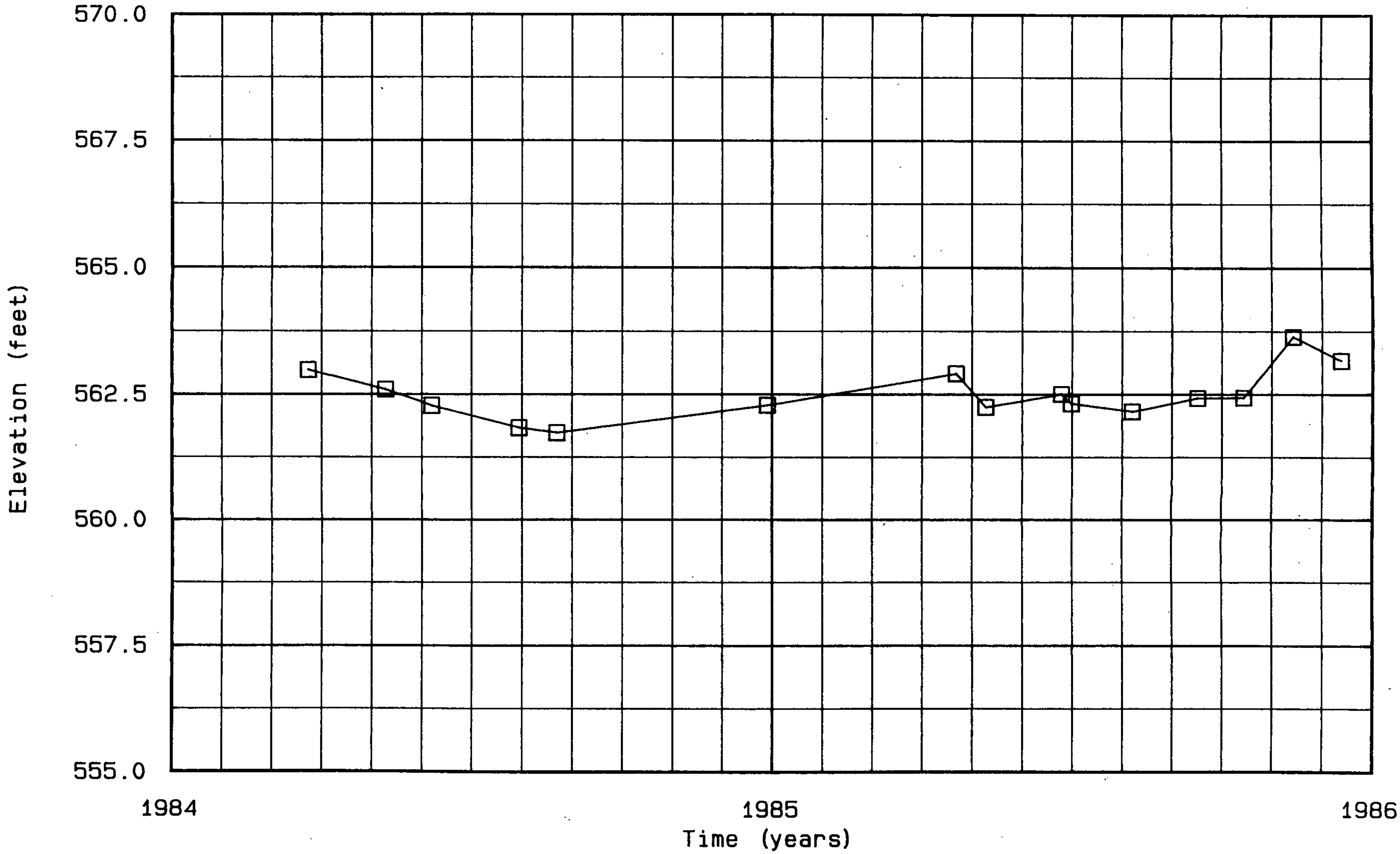


Plate A10

GROUNDWATER ELEVATIONS
Well Number 11A

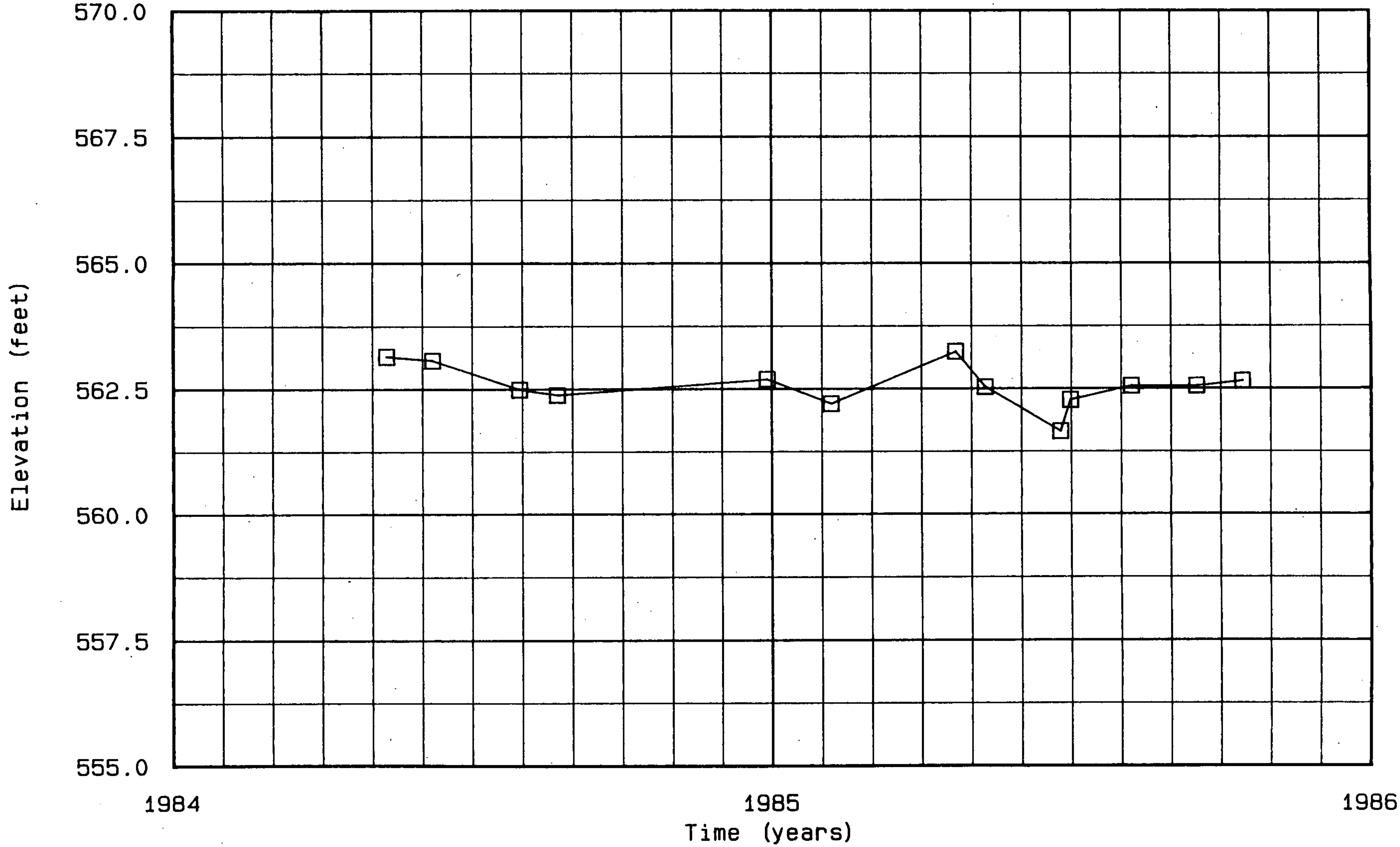


Plate A11

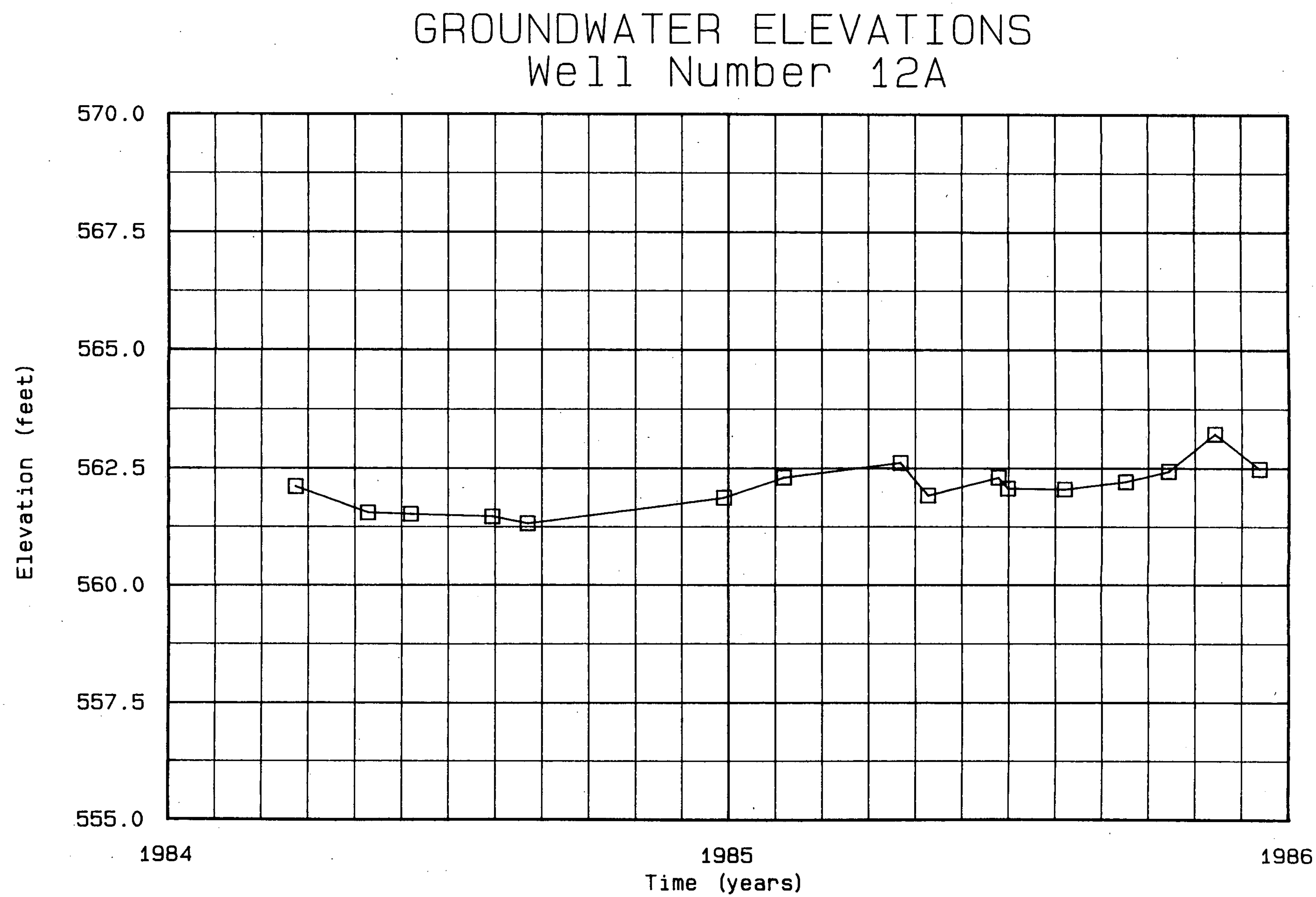
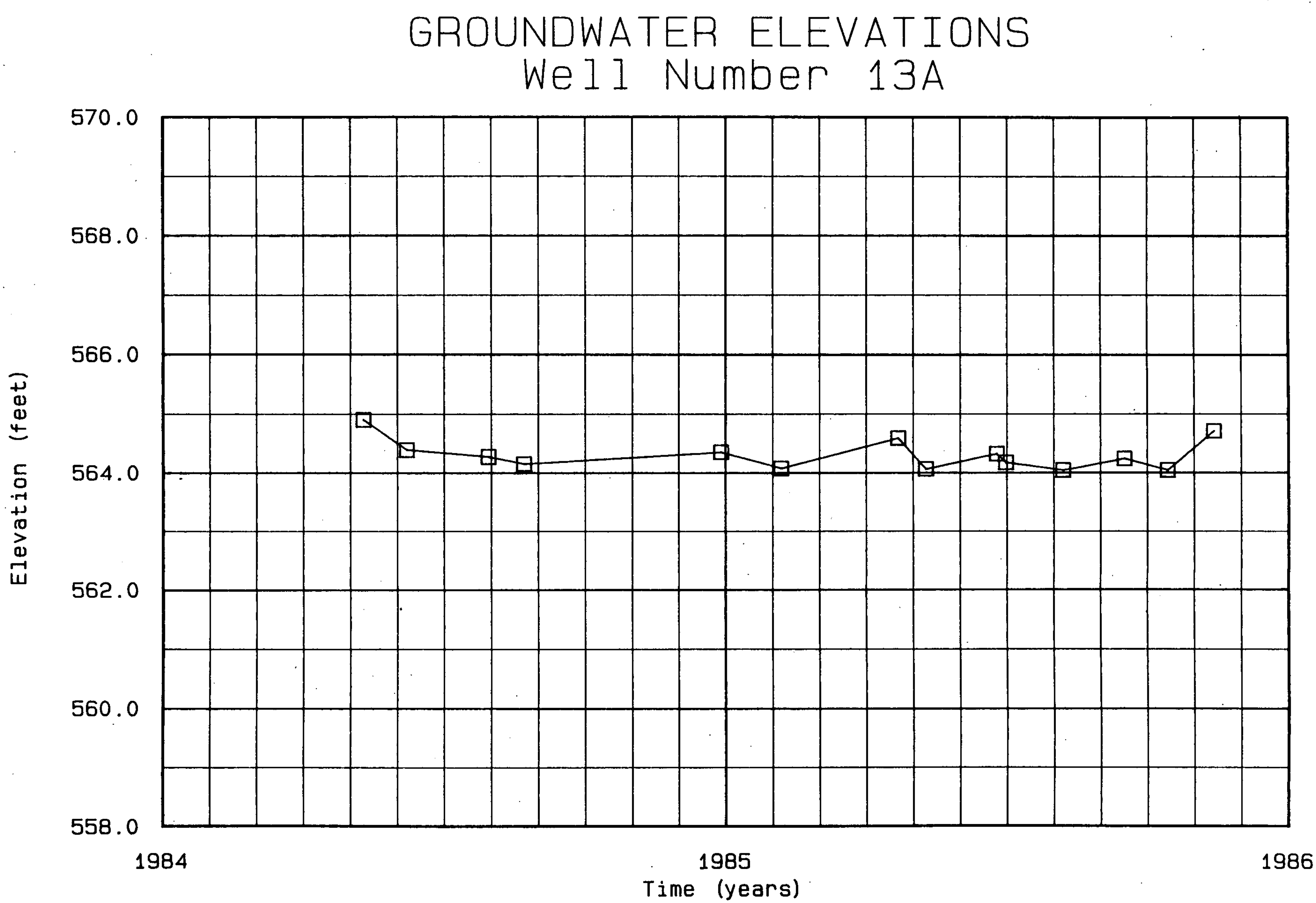

GROUNDWATER ELEVATIONS
Well Number 12A
570.0
567.5
565.0
562.5
560.0
557.5
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A12



GROUNDWATER ELEVATIONS
Well Number 13A
570.0
568.0
566.0
564.0
562.0
560.0
558.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A13

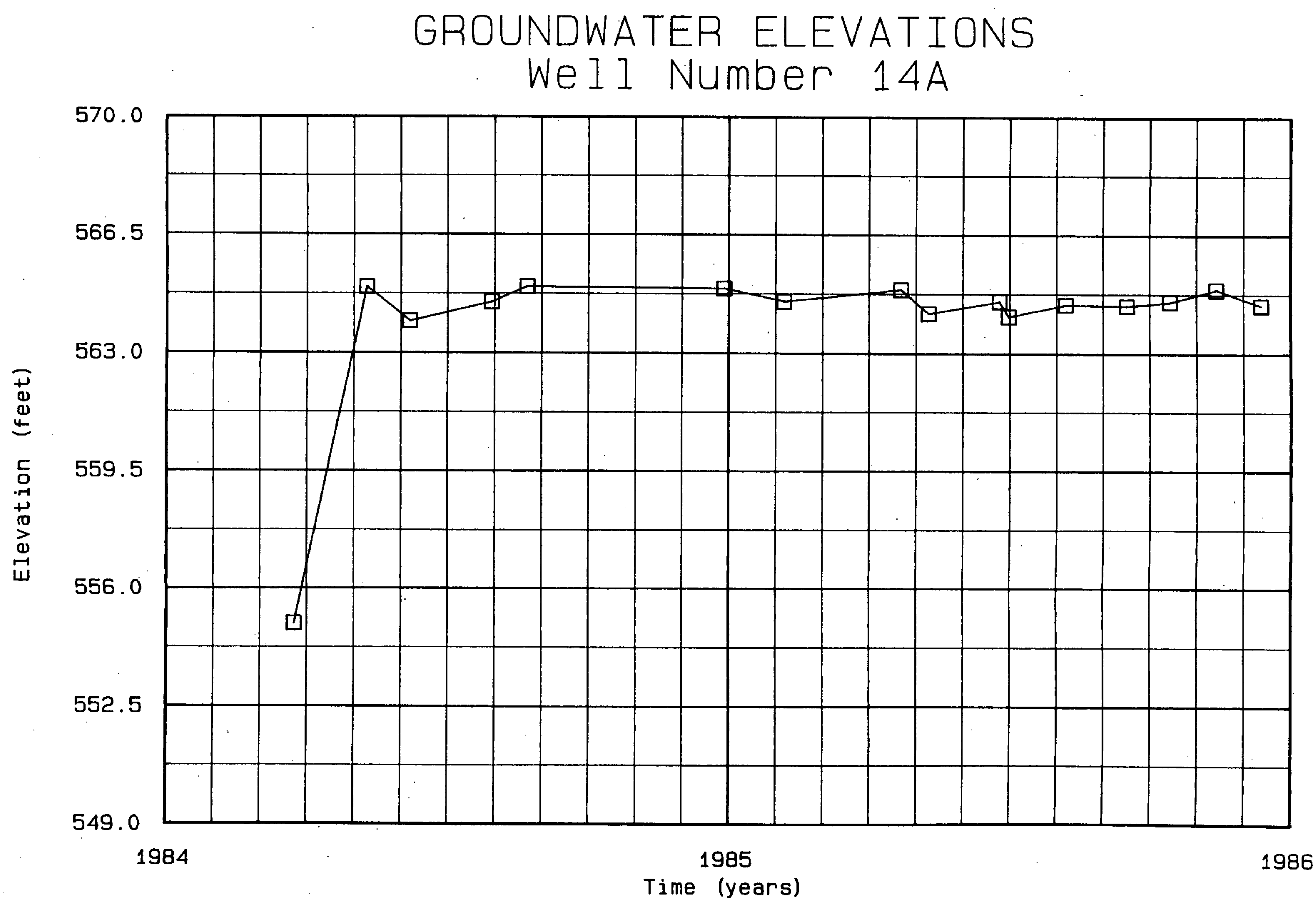
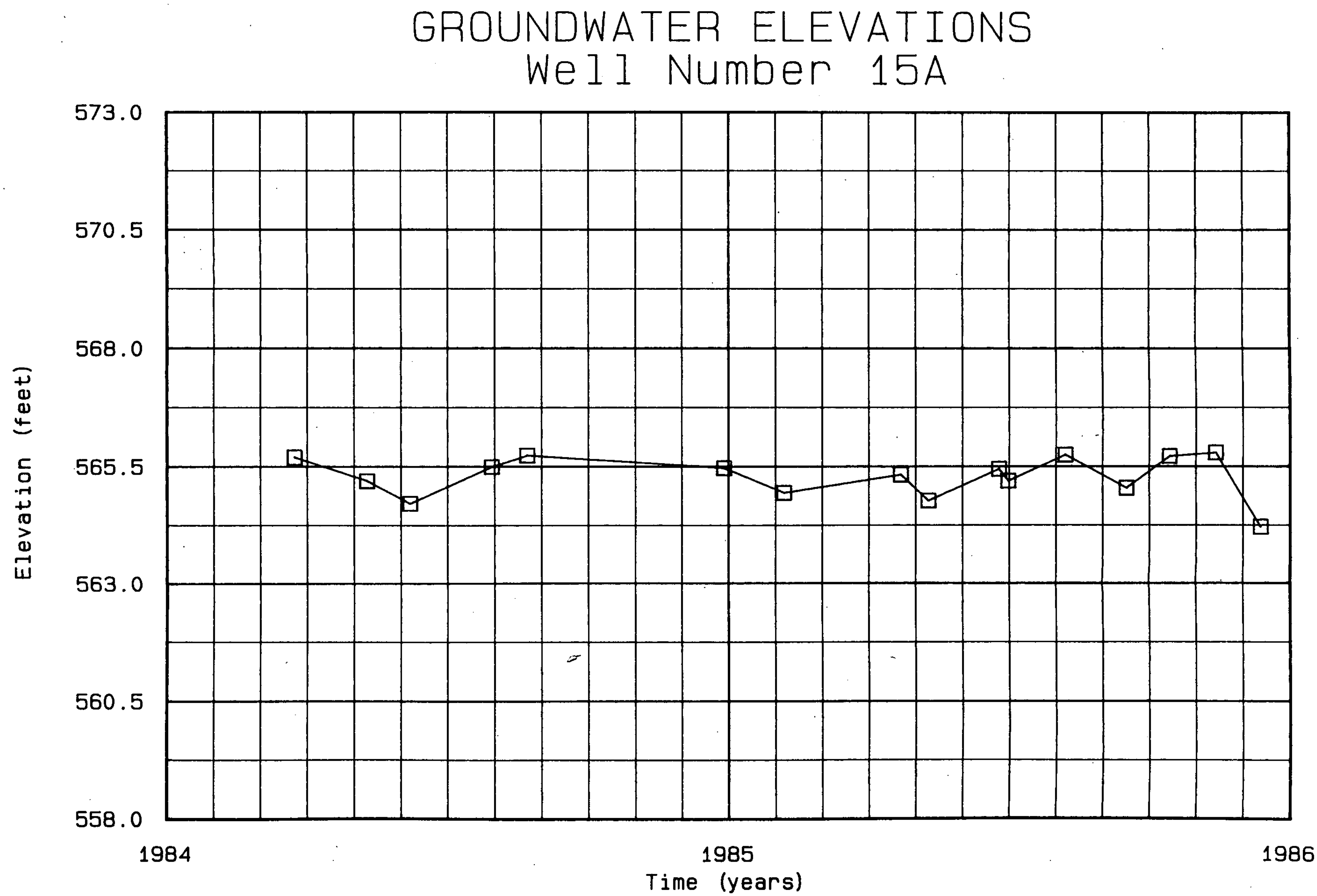

GROUNDWATER ELEVATIONS
Well Number 14A
570.0
566.5
563.0
559.5
556.0
552.5
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A14



GROUNDWATER ELEVATIONS
Well Number 15A
573.0
570.5
568.0
565.5
563.0
560.5
558.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A15

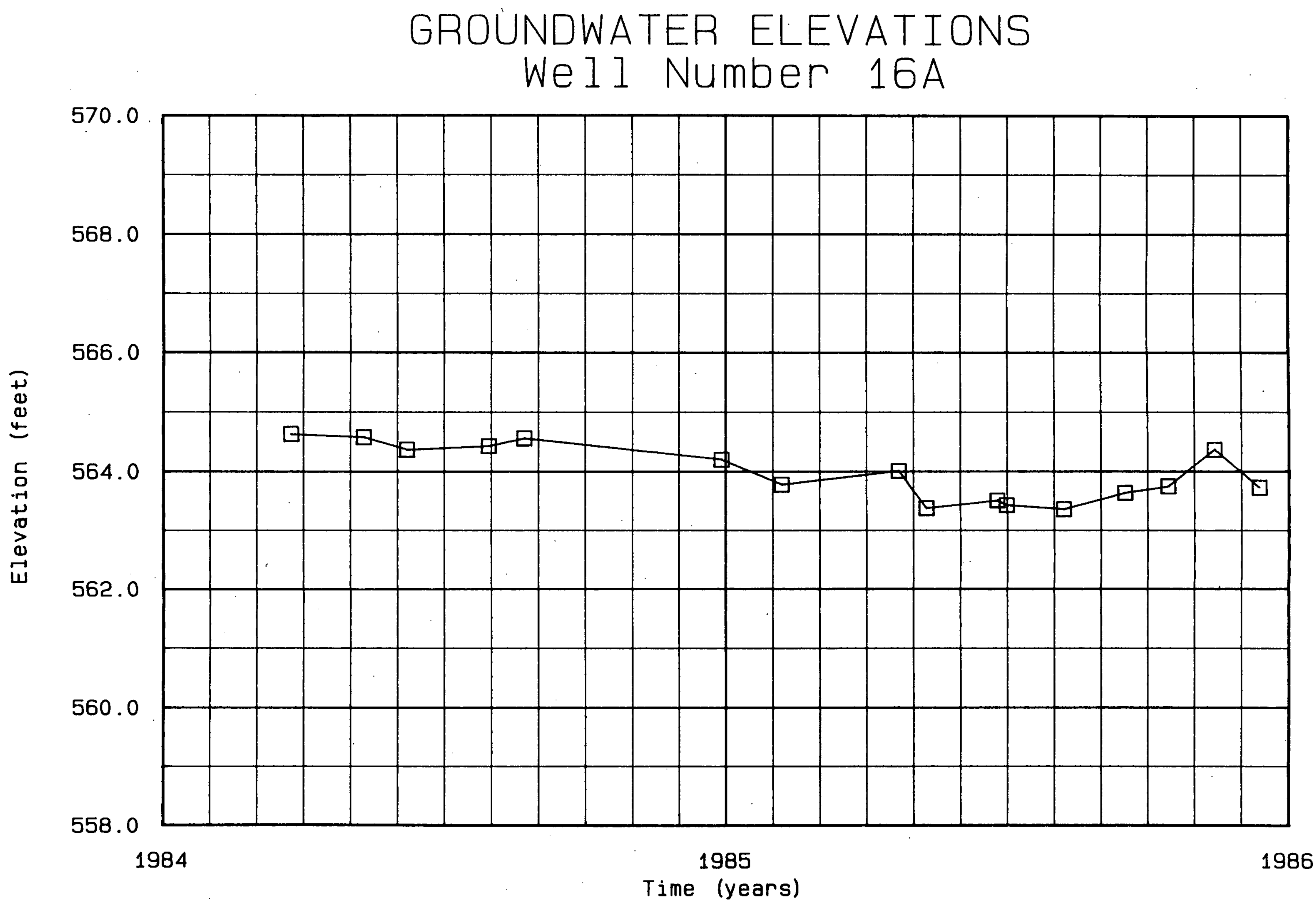

GROUNDWATER ELEVATIONS
Well Number 16A
570.0
568.0
566.0
564.0
562.0
560.0
558.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A16

GROUNDWATER ELEVATIONS
Well Number 17A

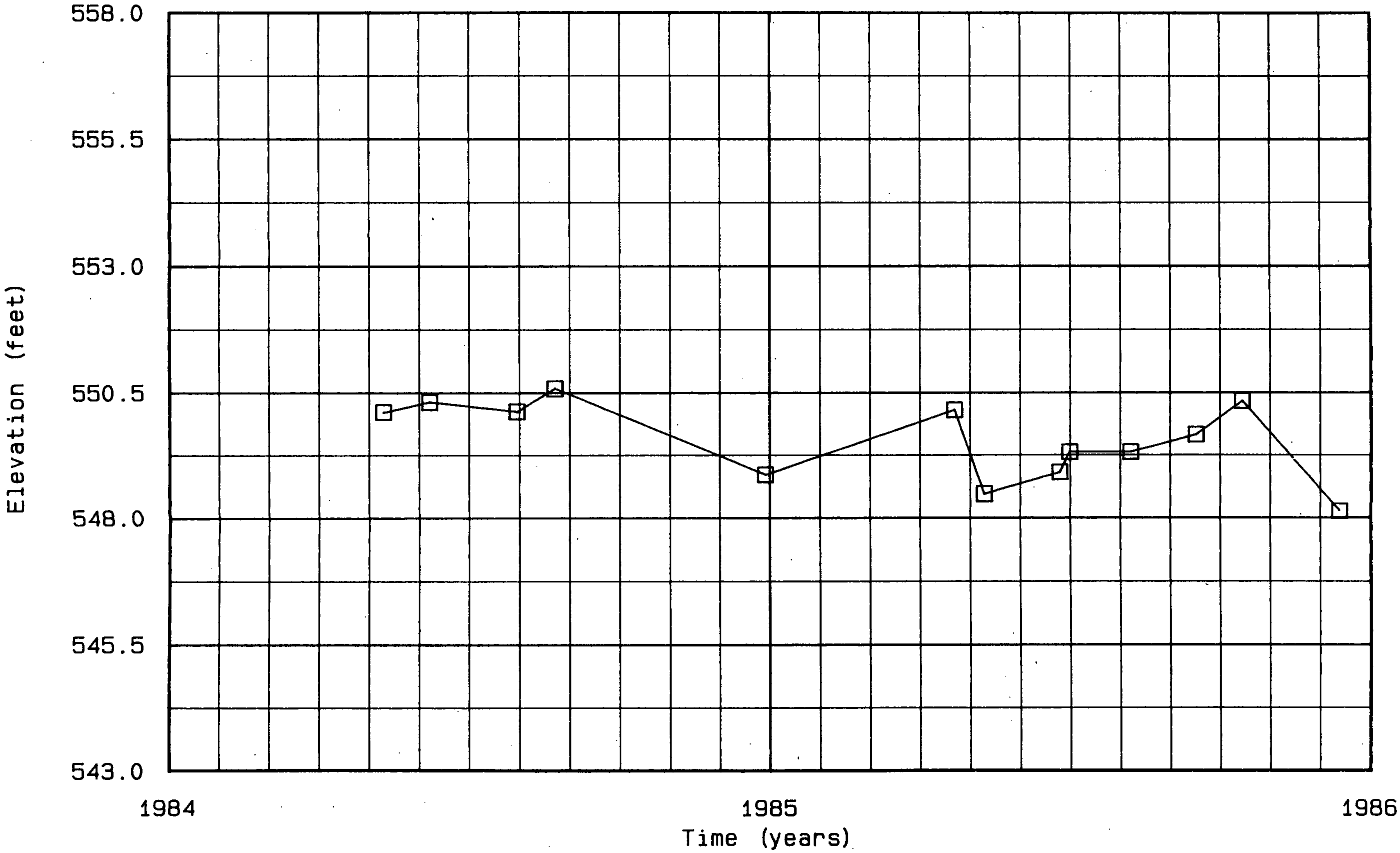
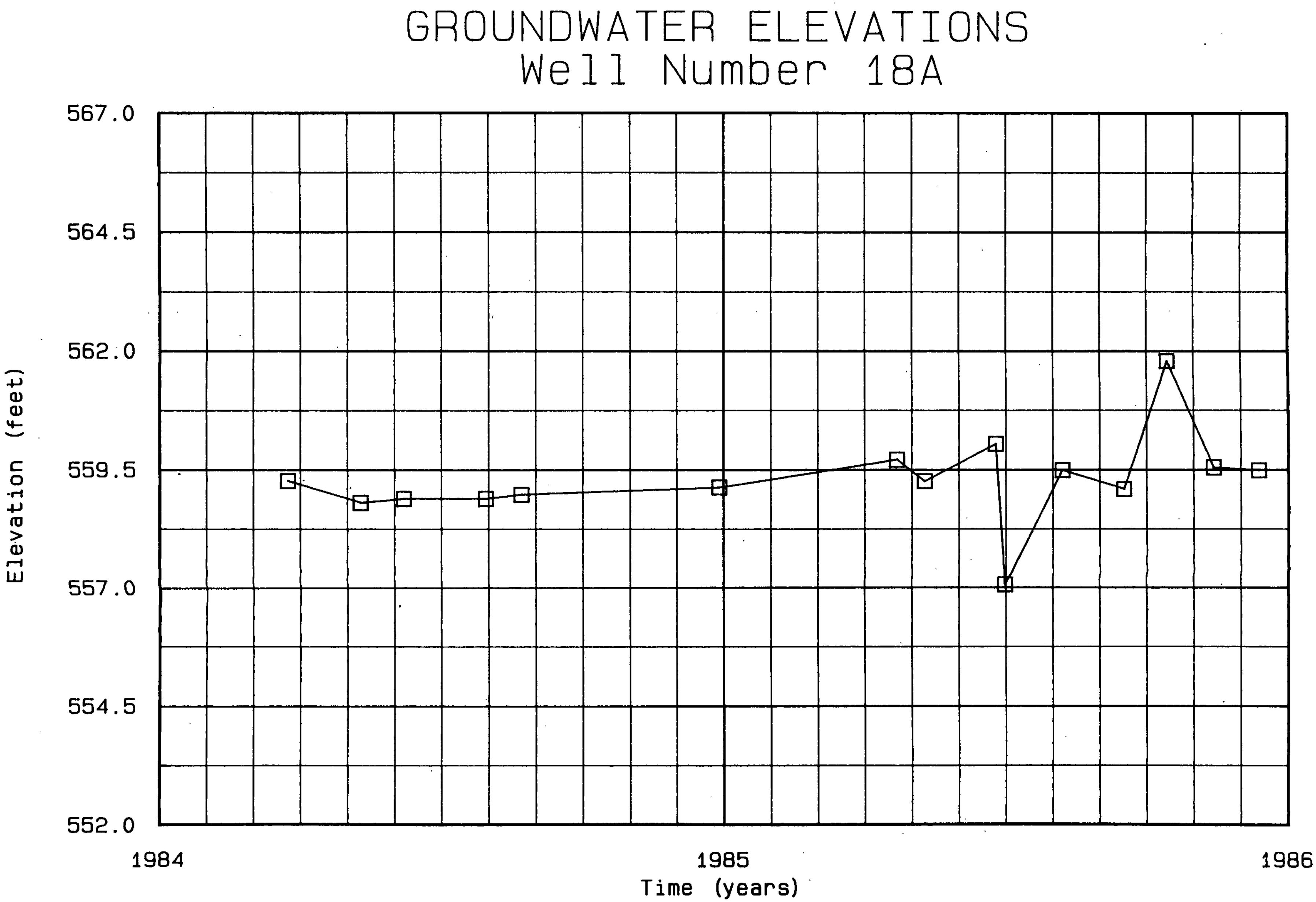


Plate A17



GROUNDWATER ELEVATIONS
Well Number 18A
567.0
564.5
562.0
559.5
557.0
554.5
552.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A18

GROUNDWATER ELEVATIONS
Well Number 19A

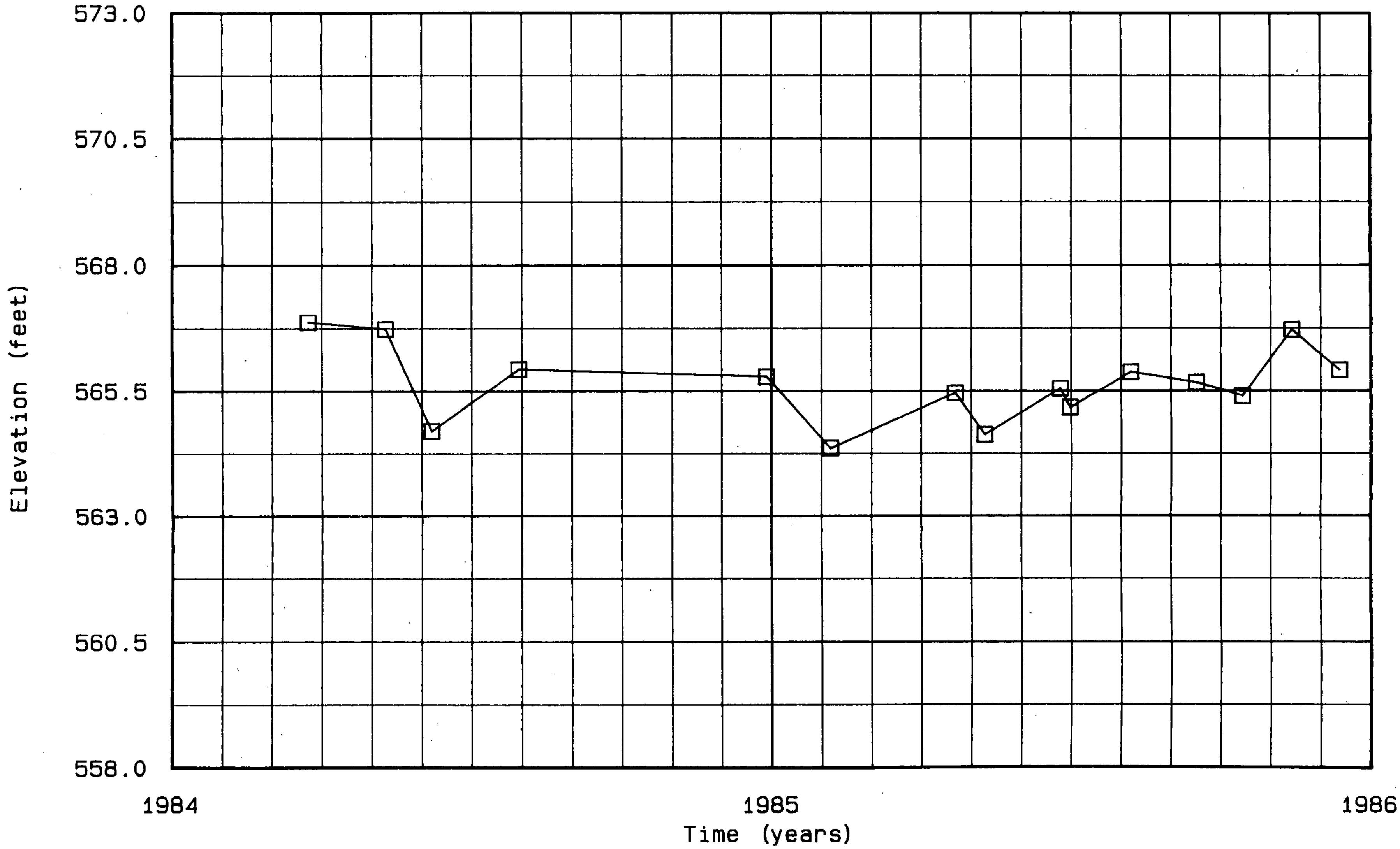


Plate A19

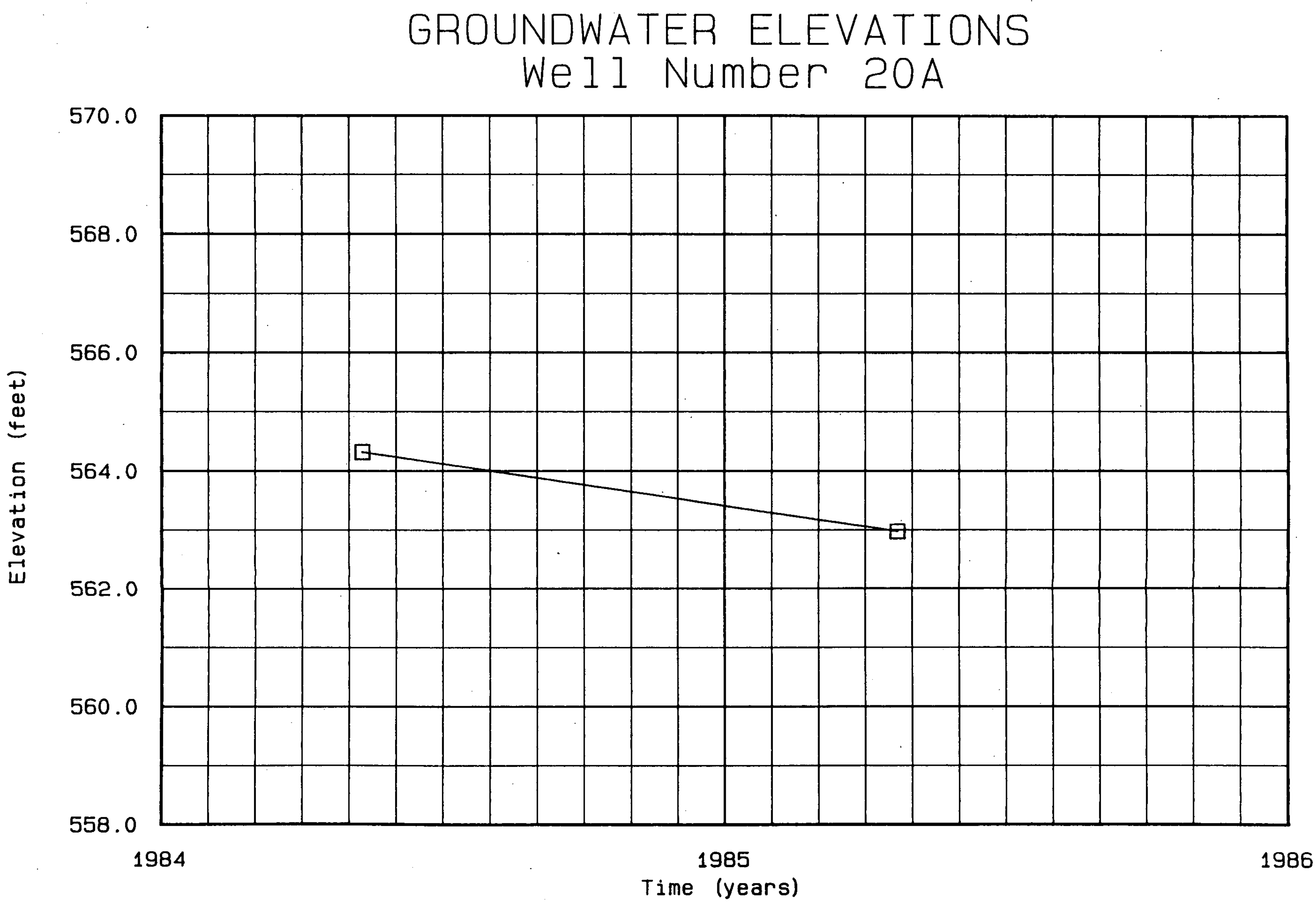

GROUNDWATER ELEVATIONS
Well Number 20A
570.0
568.0
566.0
564.0
562.0
560.0
558.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A20

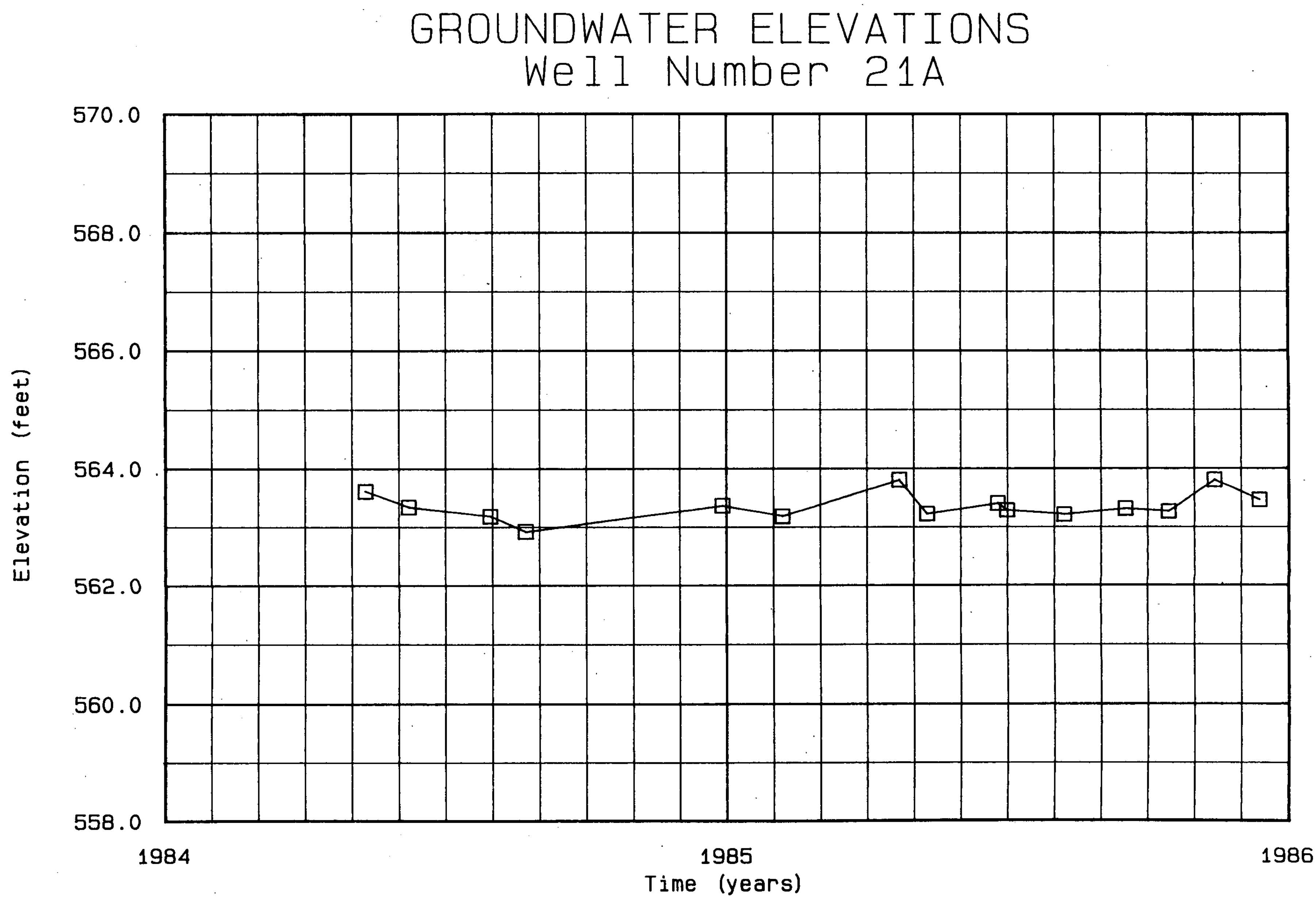

GROUNDWATER ELEVATIONS
Well Number 21A
570.0
568.0
566.0
564.0
562.0
560.0
558.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A21

GROUNDWATER ELEVATIONS
Well Number 22A

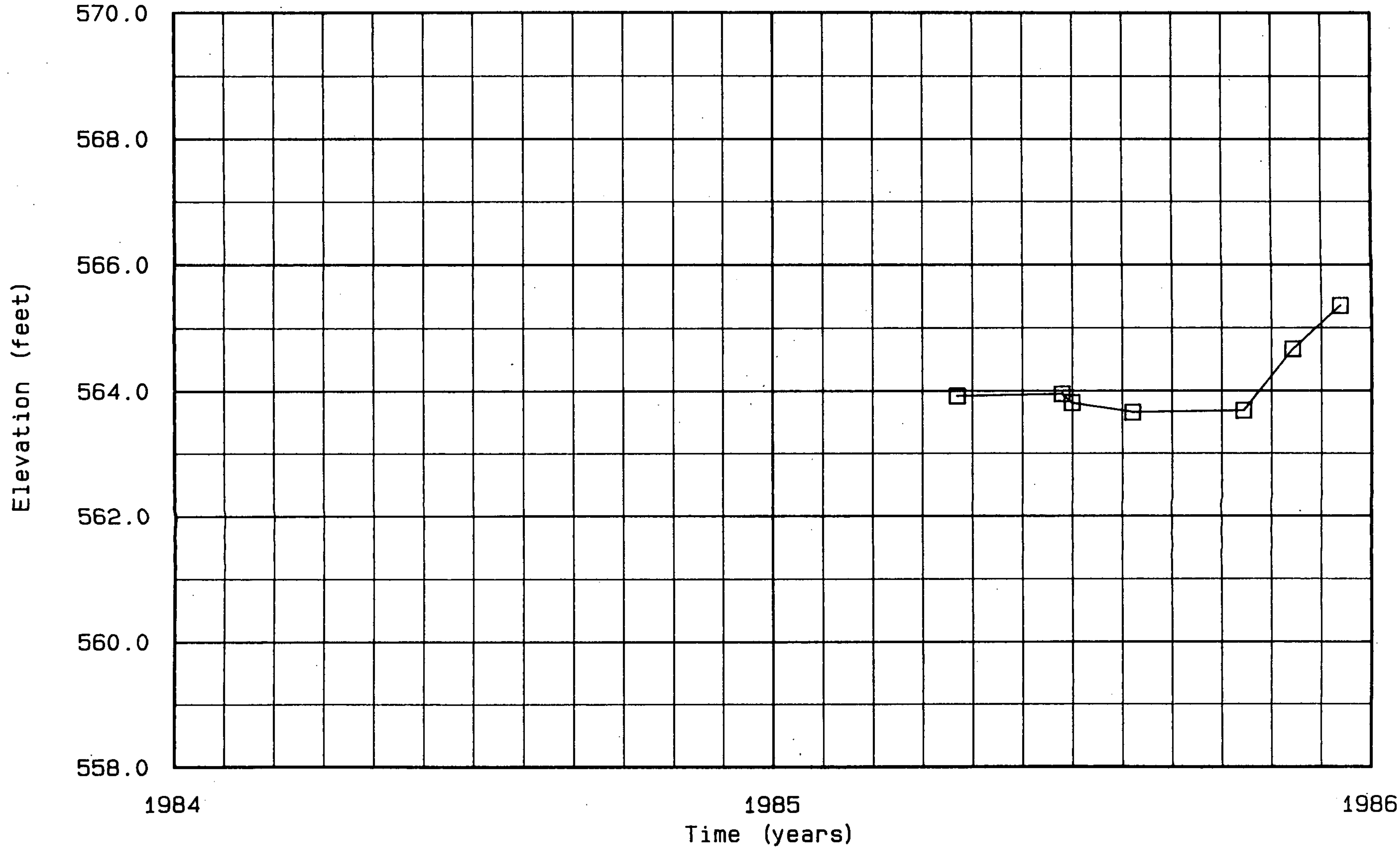


Plate A22

GROUNDWATER ELEVATIONS
Well Number 23A

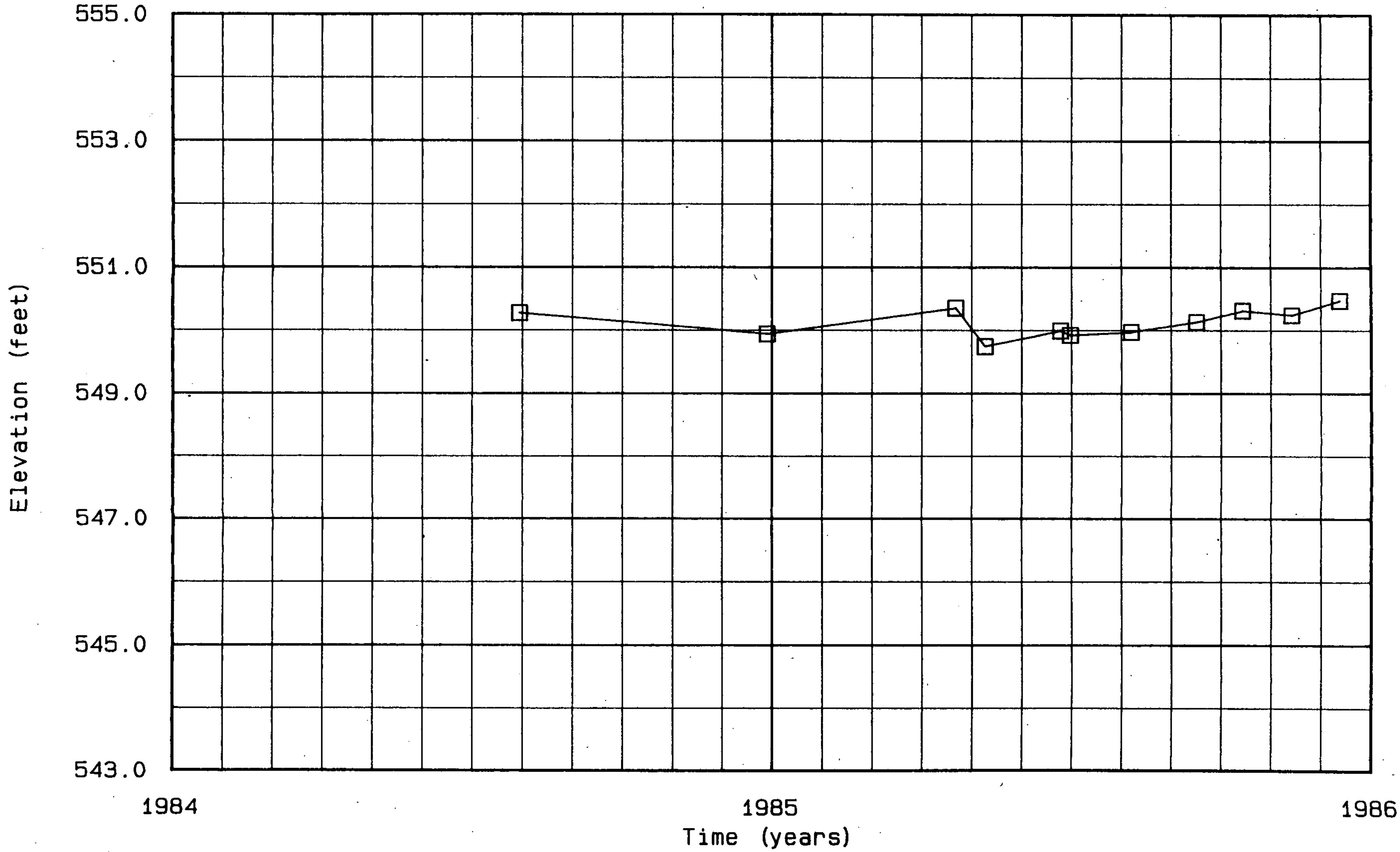


Plate A23

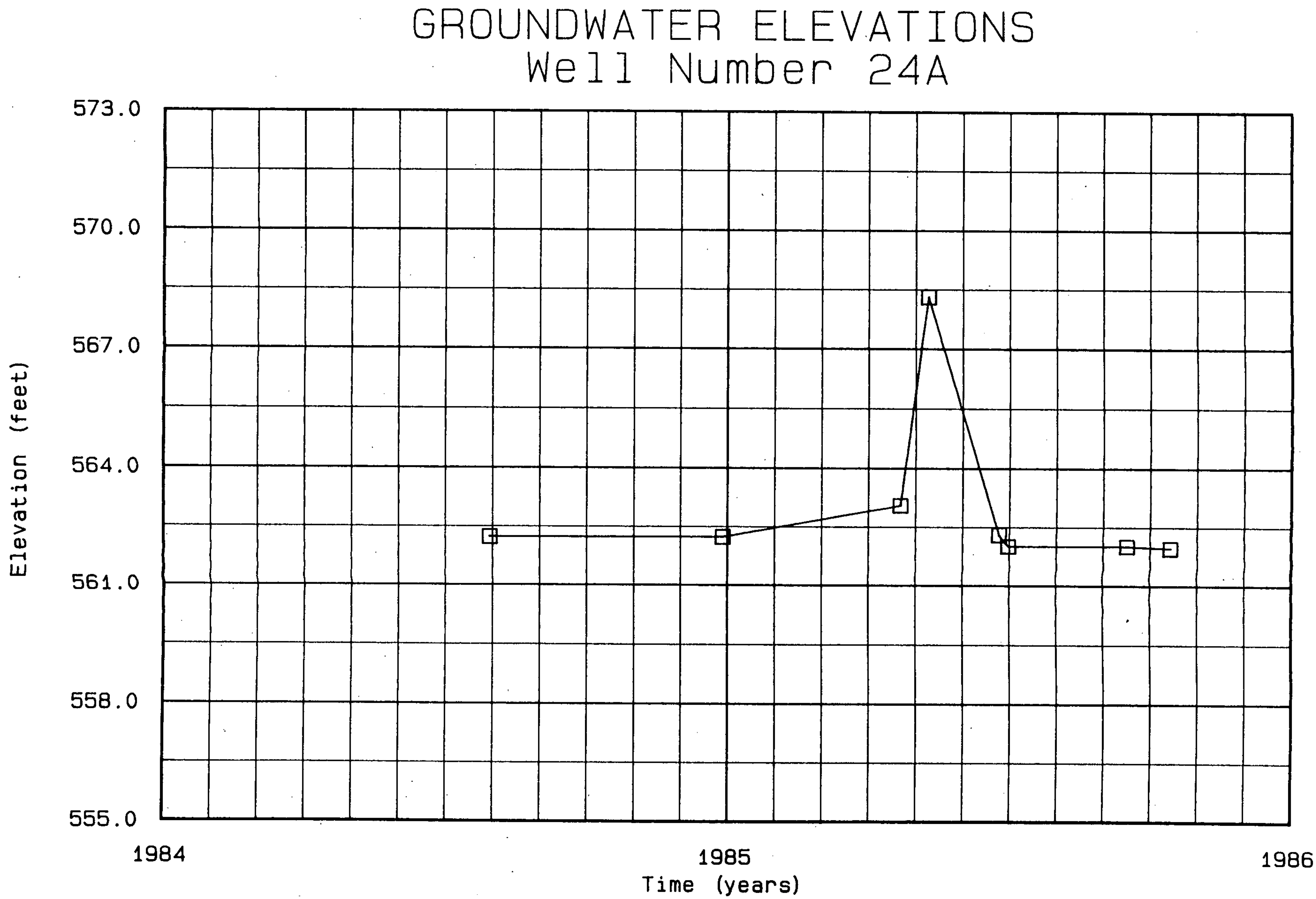

GROUNDWATER ELEVATIONS
Well Number 24A
573.0
570.0
567.0
564.0
561.0
558.0
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A24

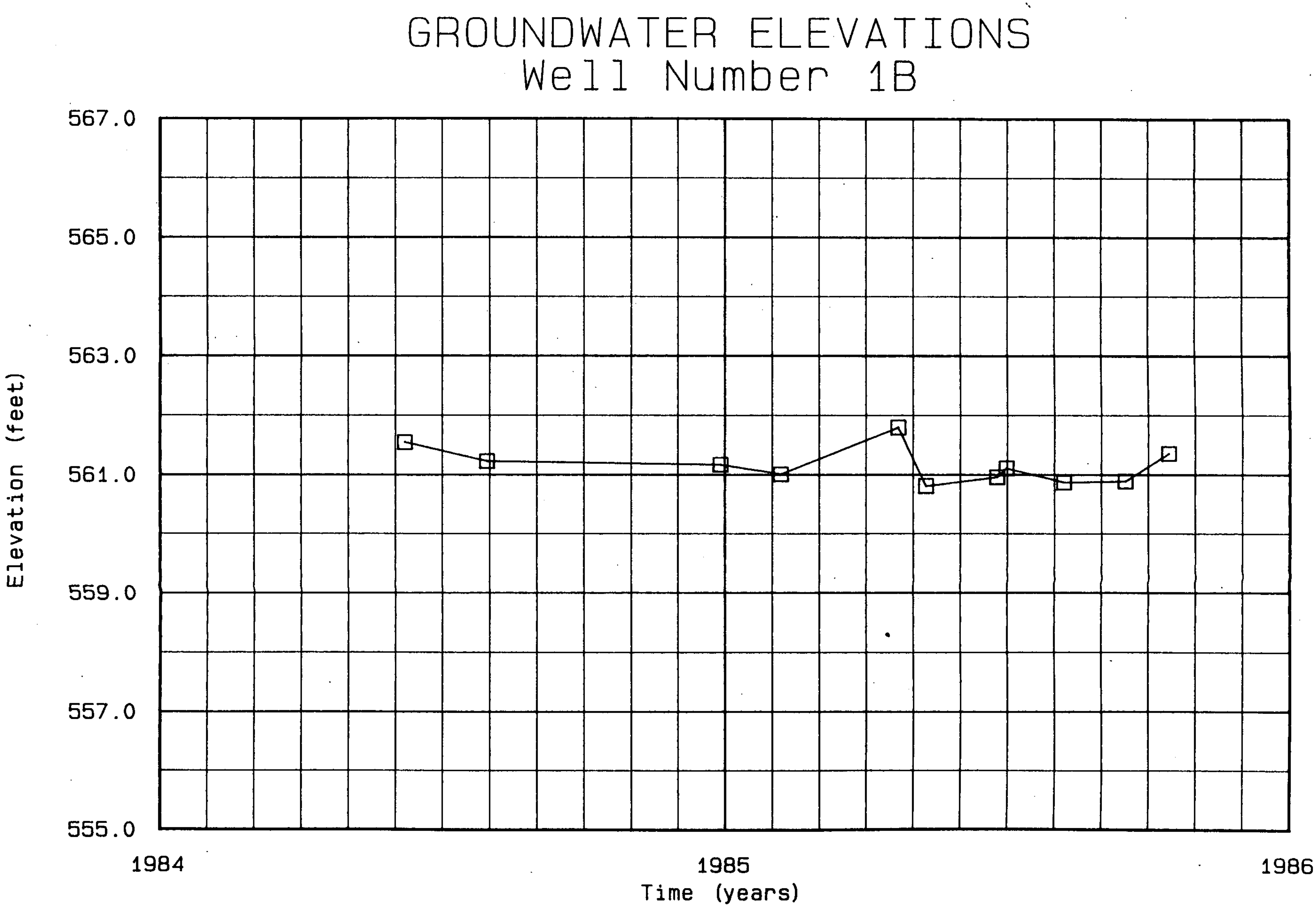

GROUNDWATER ELEVATIONS
Well Number 1B
567.0
565.0
563.0
561.0
559.0
557.0
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A25

GROUNDWATER ELEVATIONS
Well Number 3B

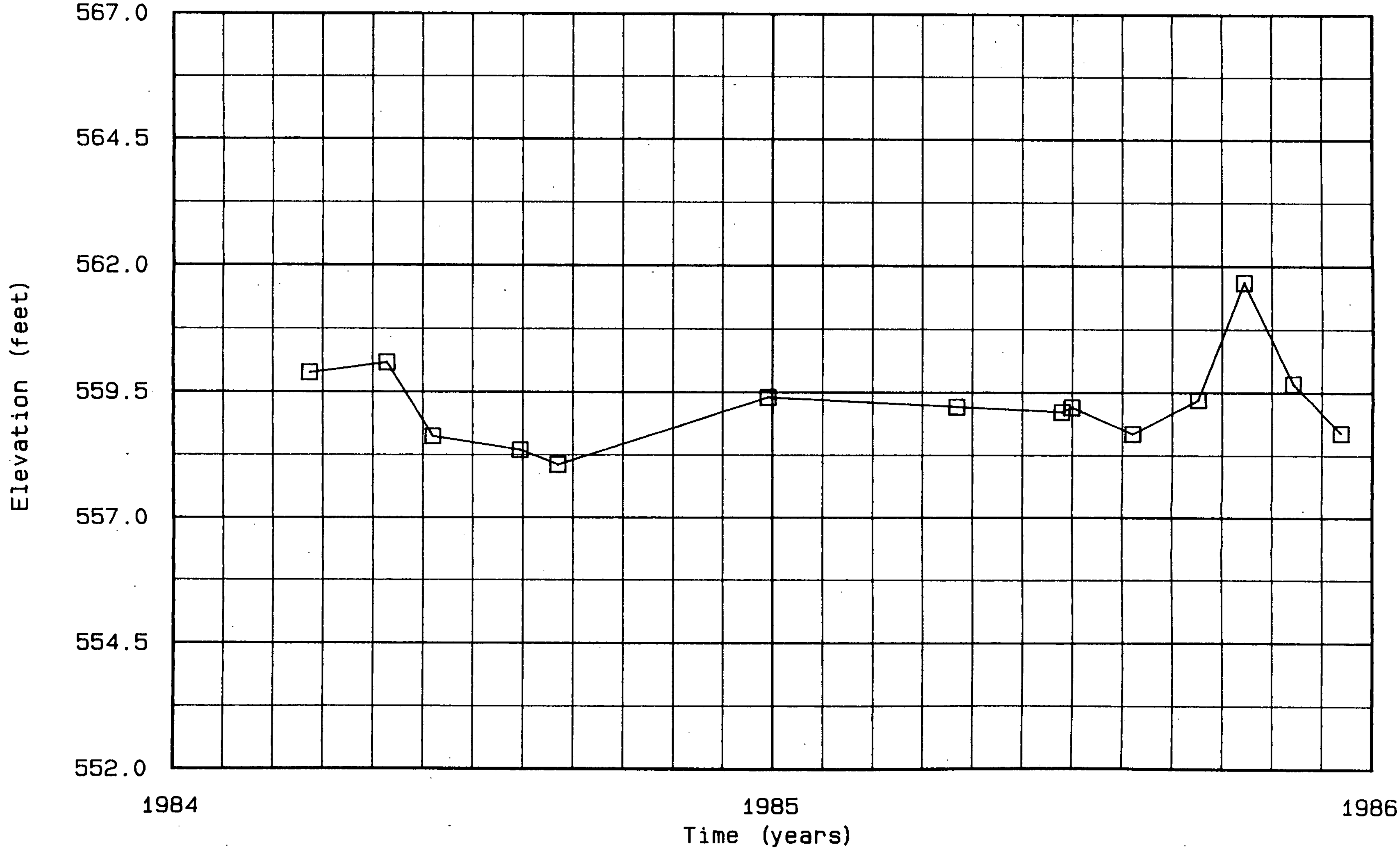


Plate A26

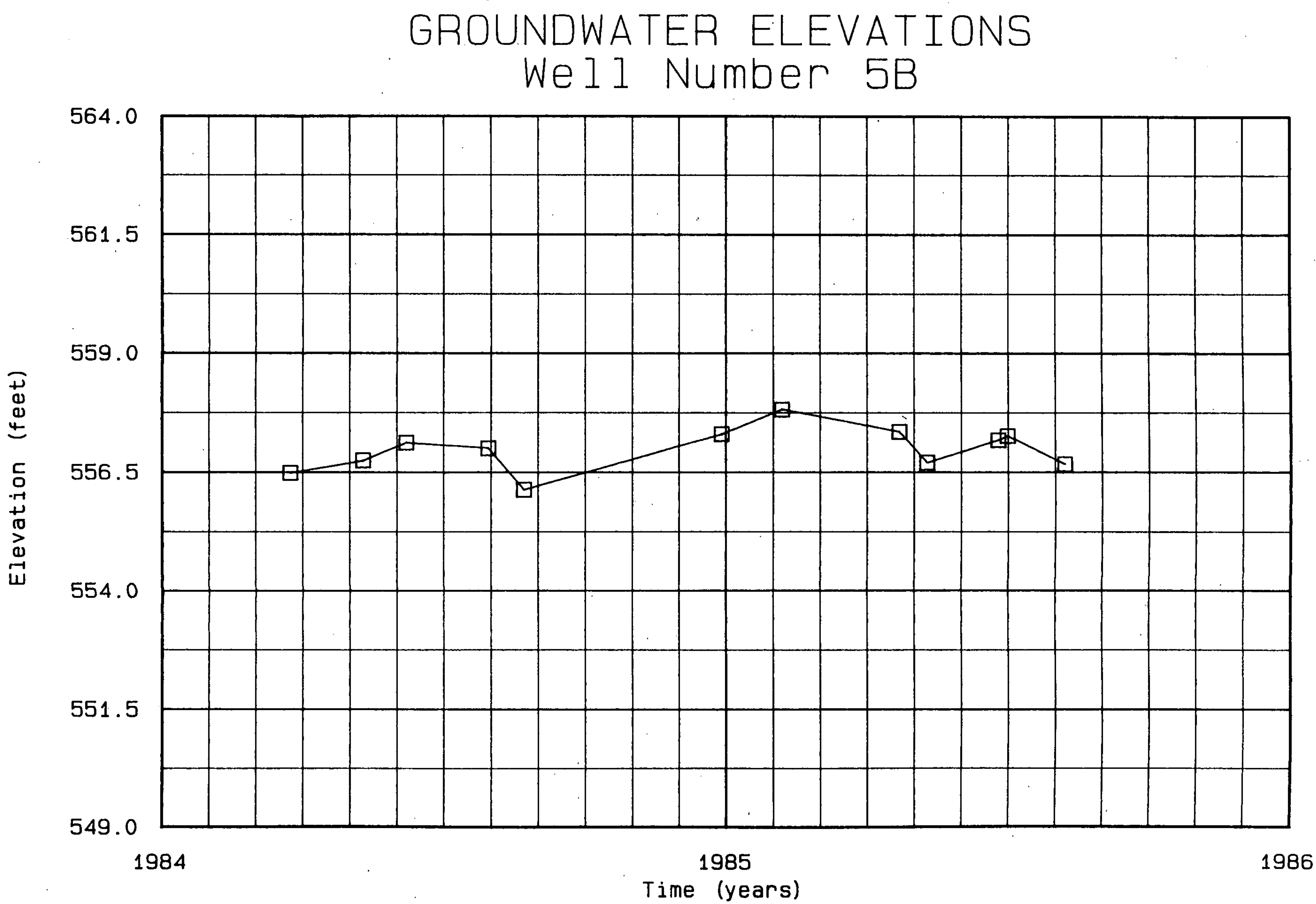

GROUNDWATER ELEVATIONS
Well Number 5B
564.0
561.5
559.0
556.5
554.0
551.5
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A27

GROUNDWATER ELEVATIONS
Well Number 8B

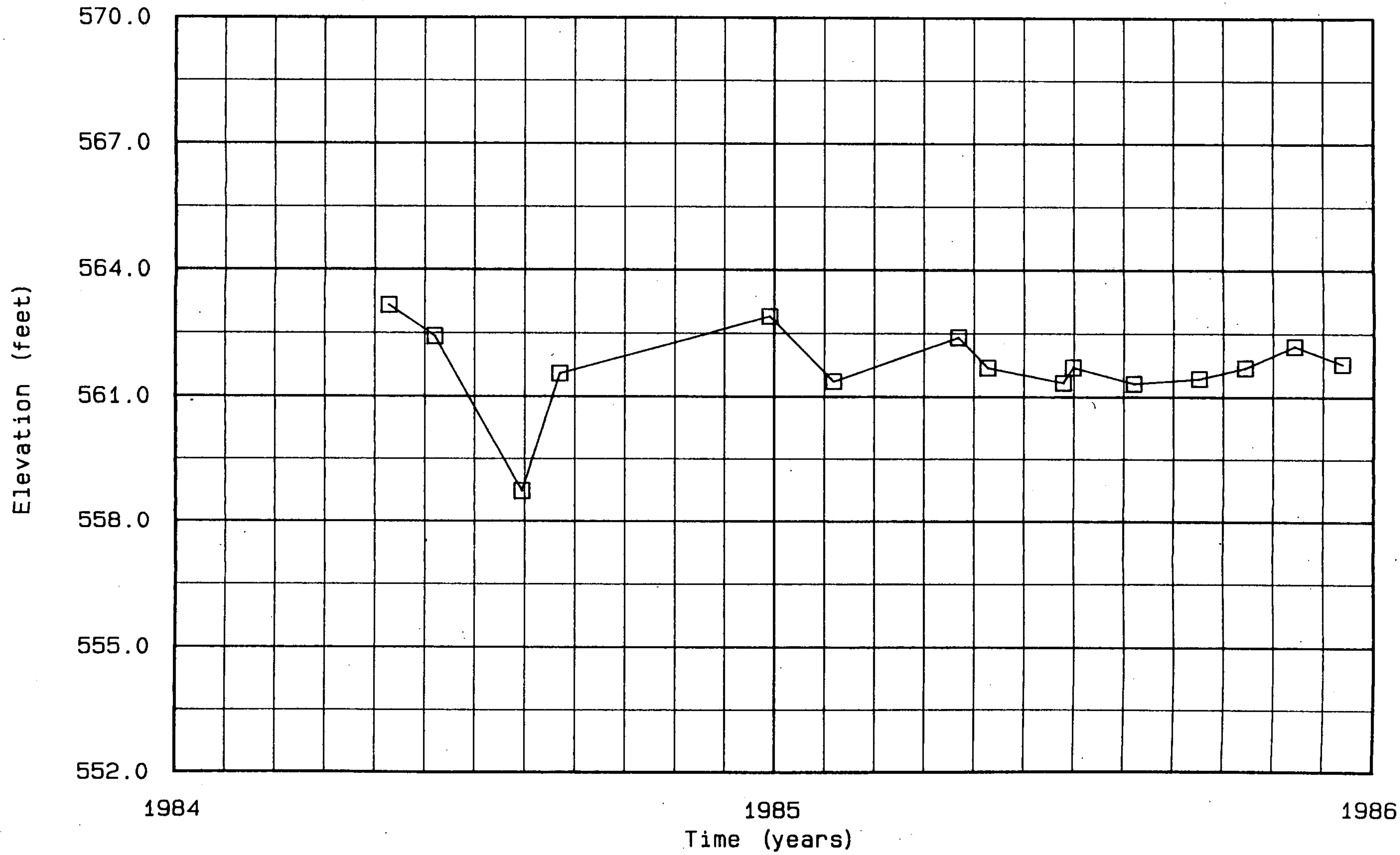


Plate A28

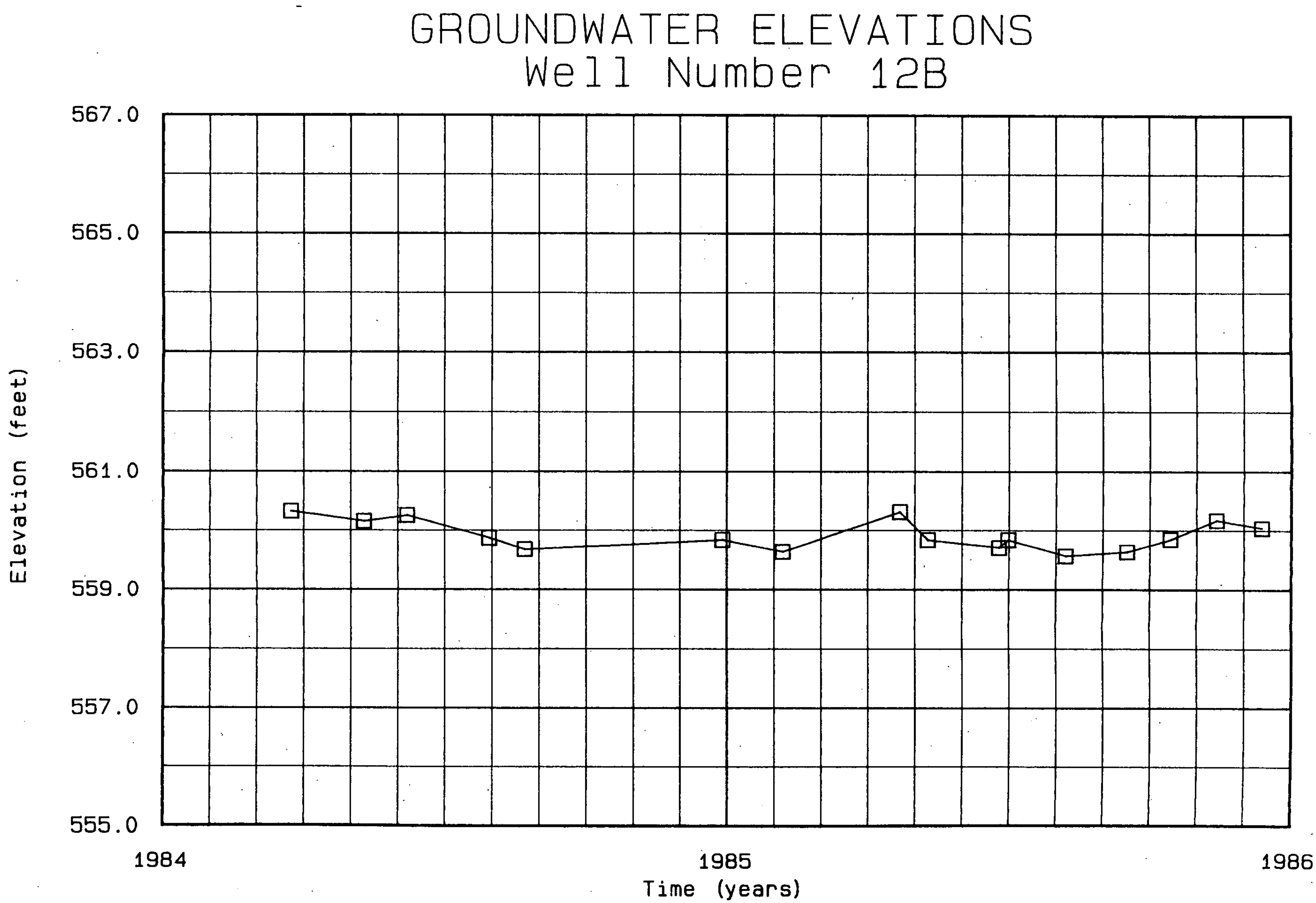

GROUNDWATER ELEVATIONS
Well Number 12B
567.0
565.0
563.0
561.0
559.0
557.0
555.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A29

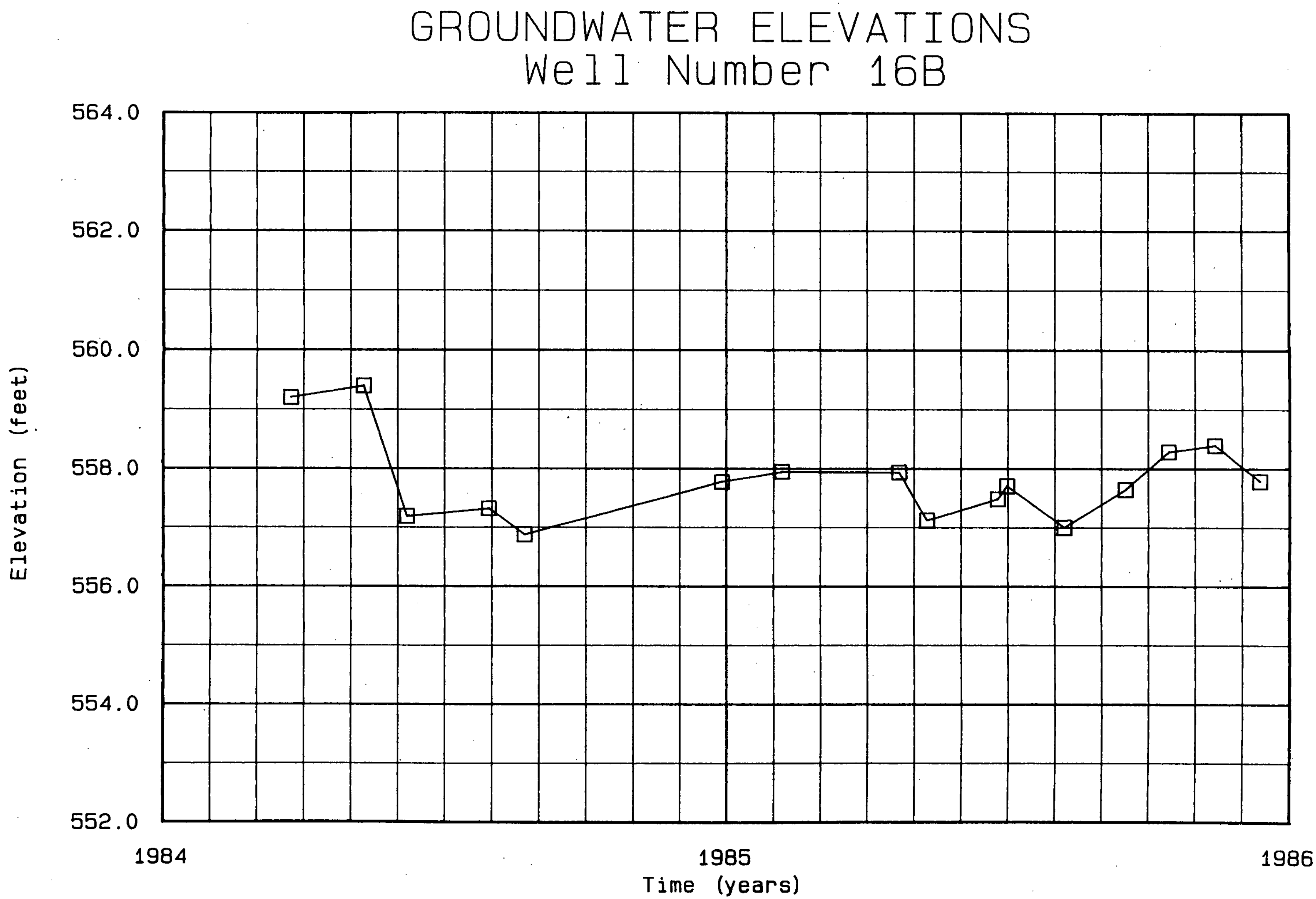

GROUNDWATER ELEVATIONS
Well Number 16B
564.0
562.0
560.0
558.0
556.0
554.0
552.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A30

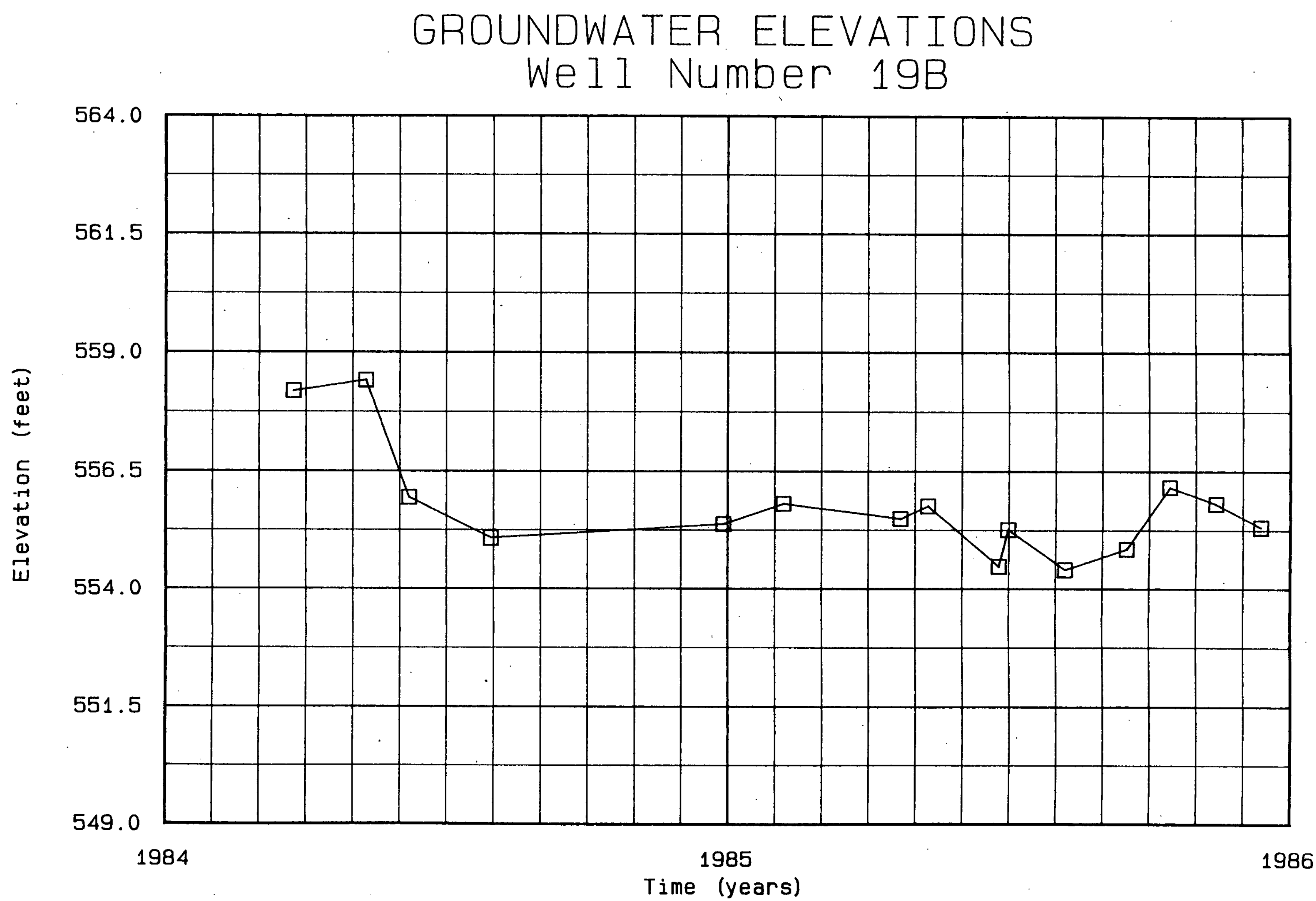

GROUNDWATER ELEVATIONS
Well Number 19B
564.0
561.5
559.0
556.5
554.0
551.5
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A31

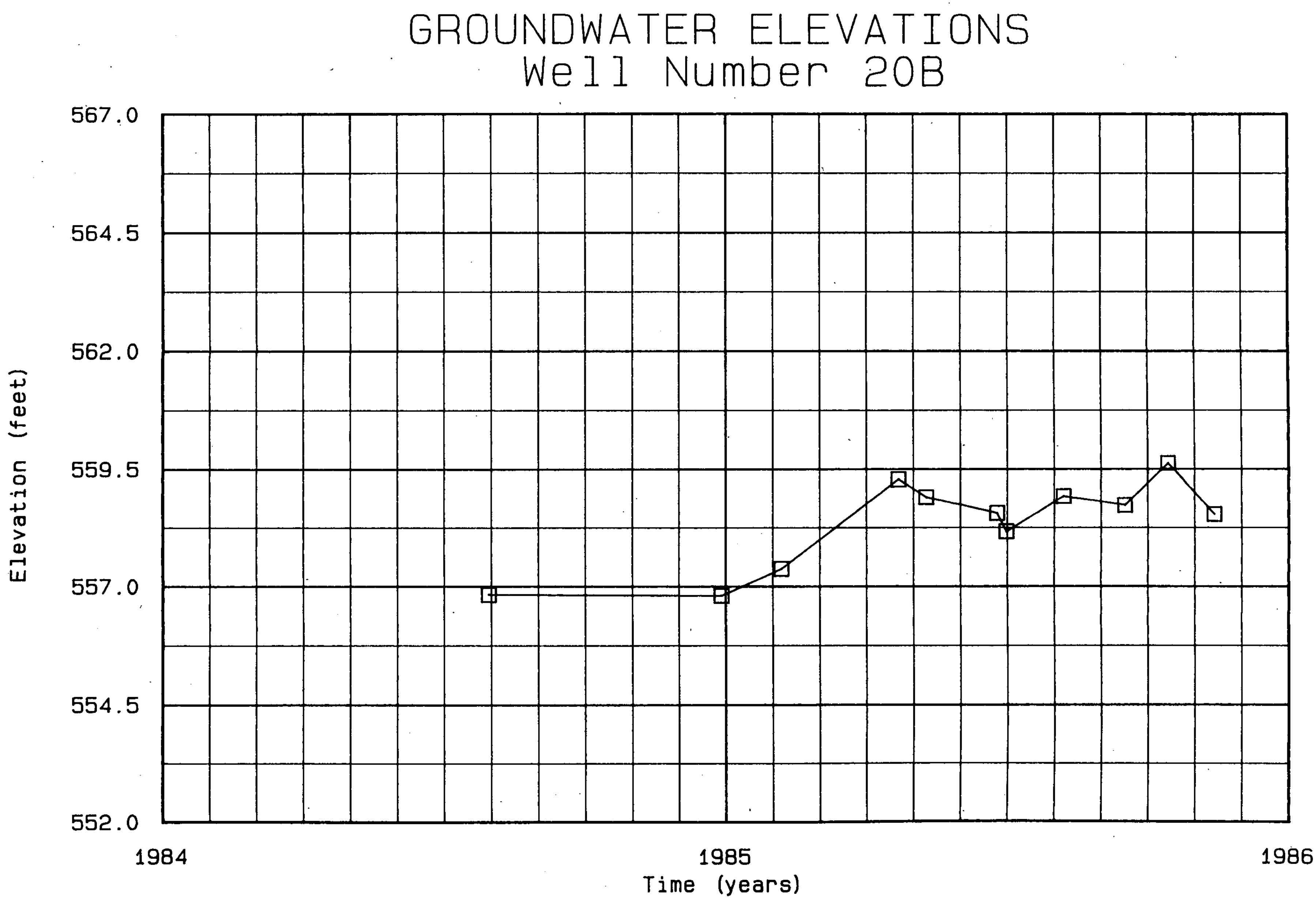

GROUNDWATER ELEVATIONS
Well Number 20B
Elevation (feet)
567.0
564.5
562.0
559.5
557.0
554.5
552.0
1984
1985
1986
Time (years)

Plate A32

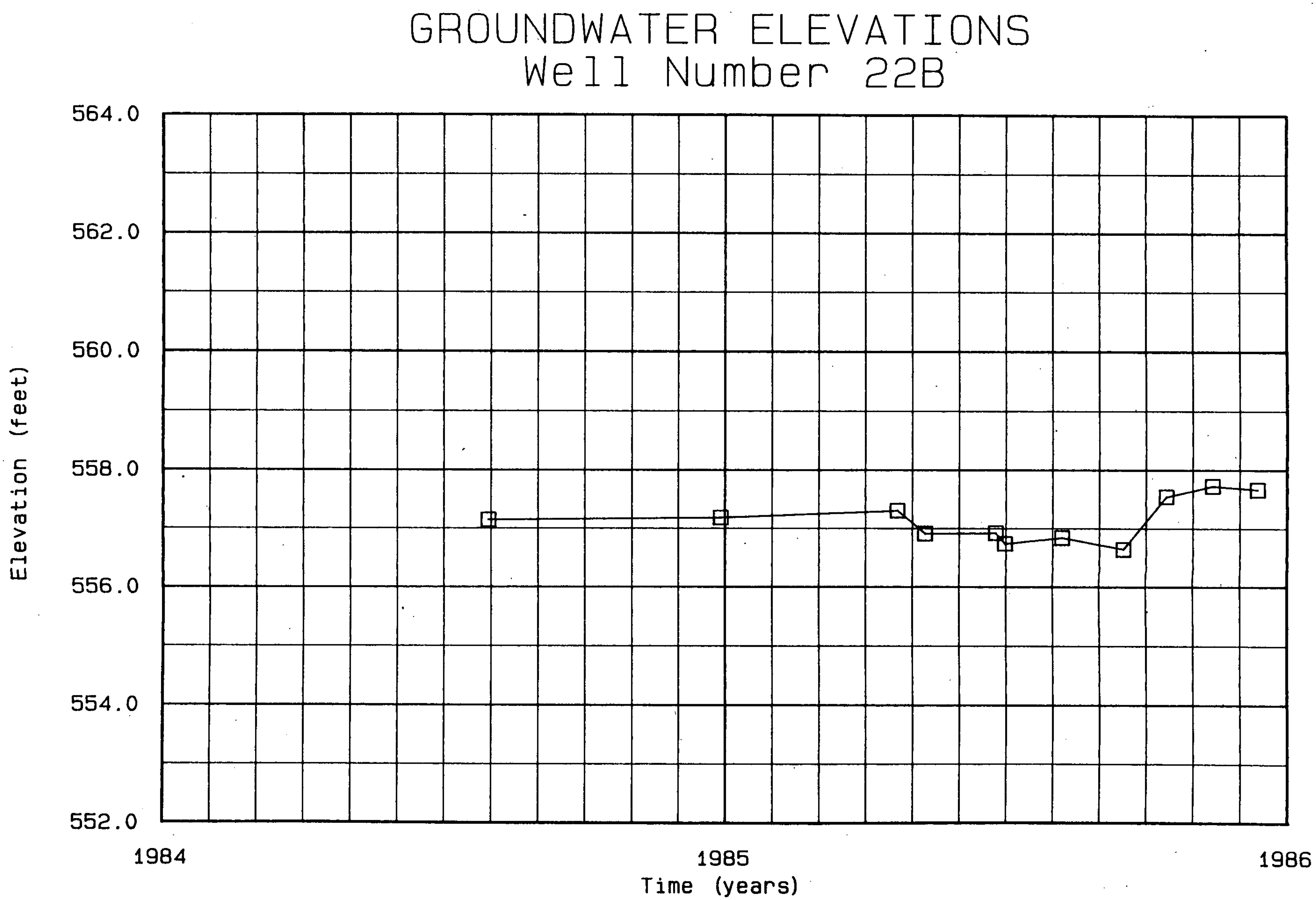

GROUNDWATER ELEVATIONS
Well Number 22B
564.0
562.0
560.0
558.0
556.0
554.0
552.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A33

GROUNDWATER ELEVATIONS
Well Number 23B

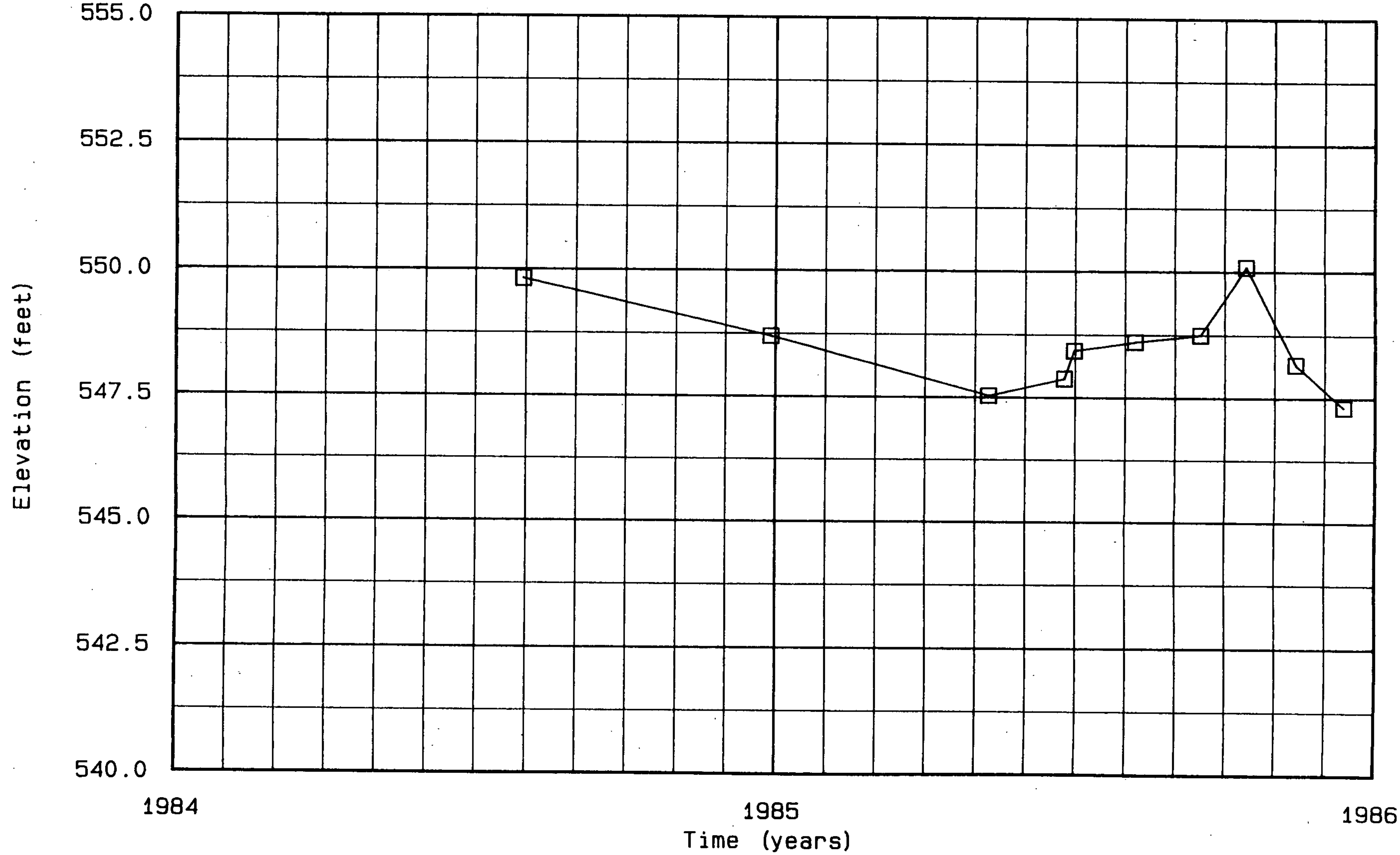


Plate A34

GROUNDWATER ELEVATIONS
Well Number 10C

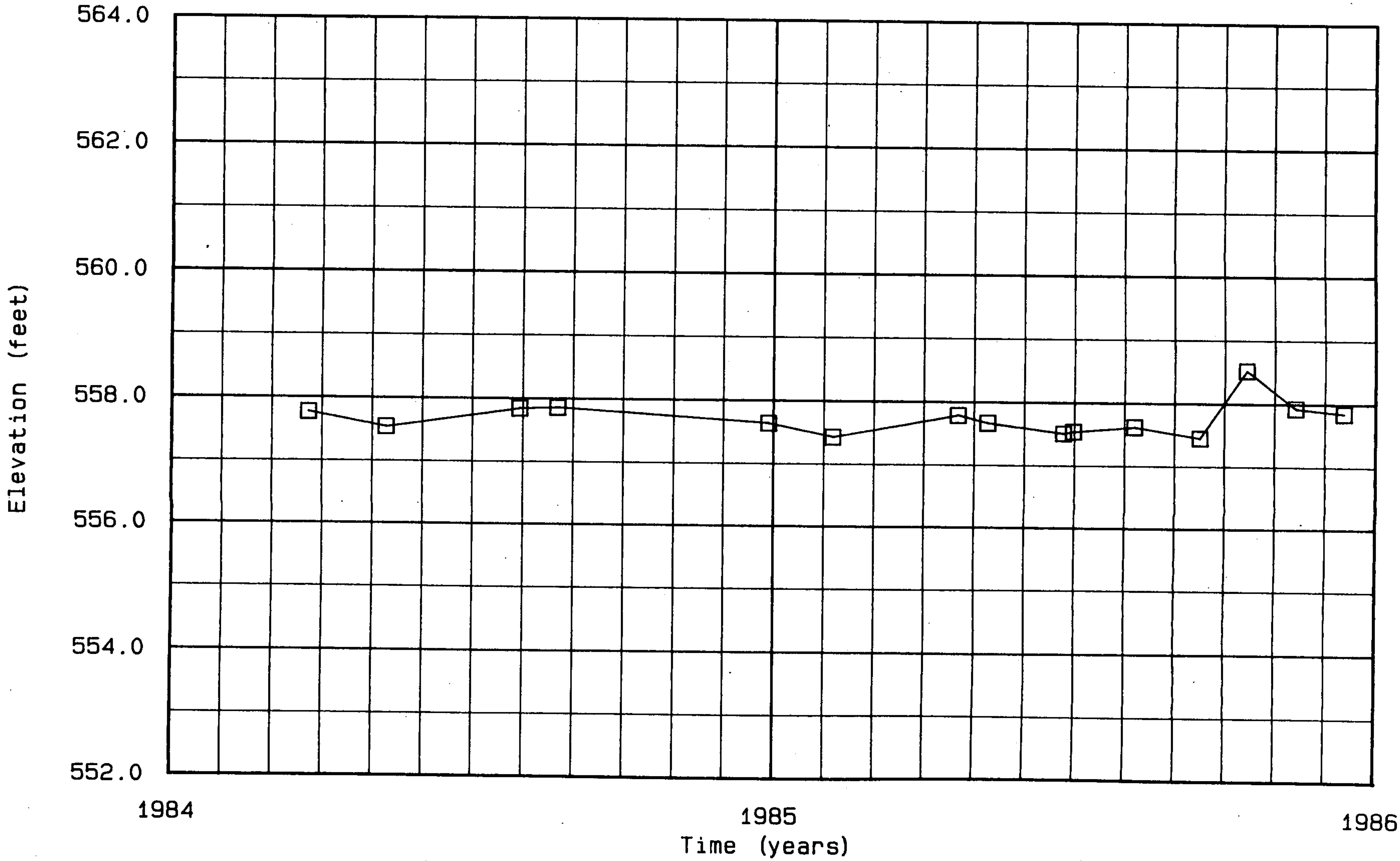


Plate A35

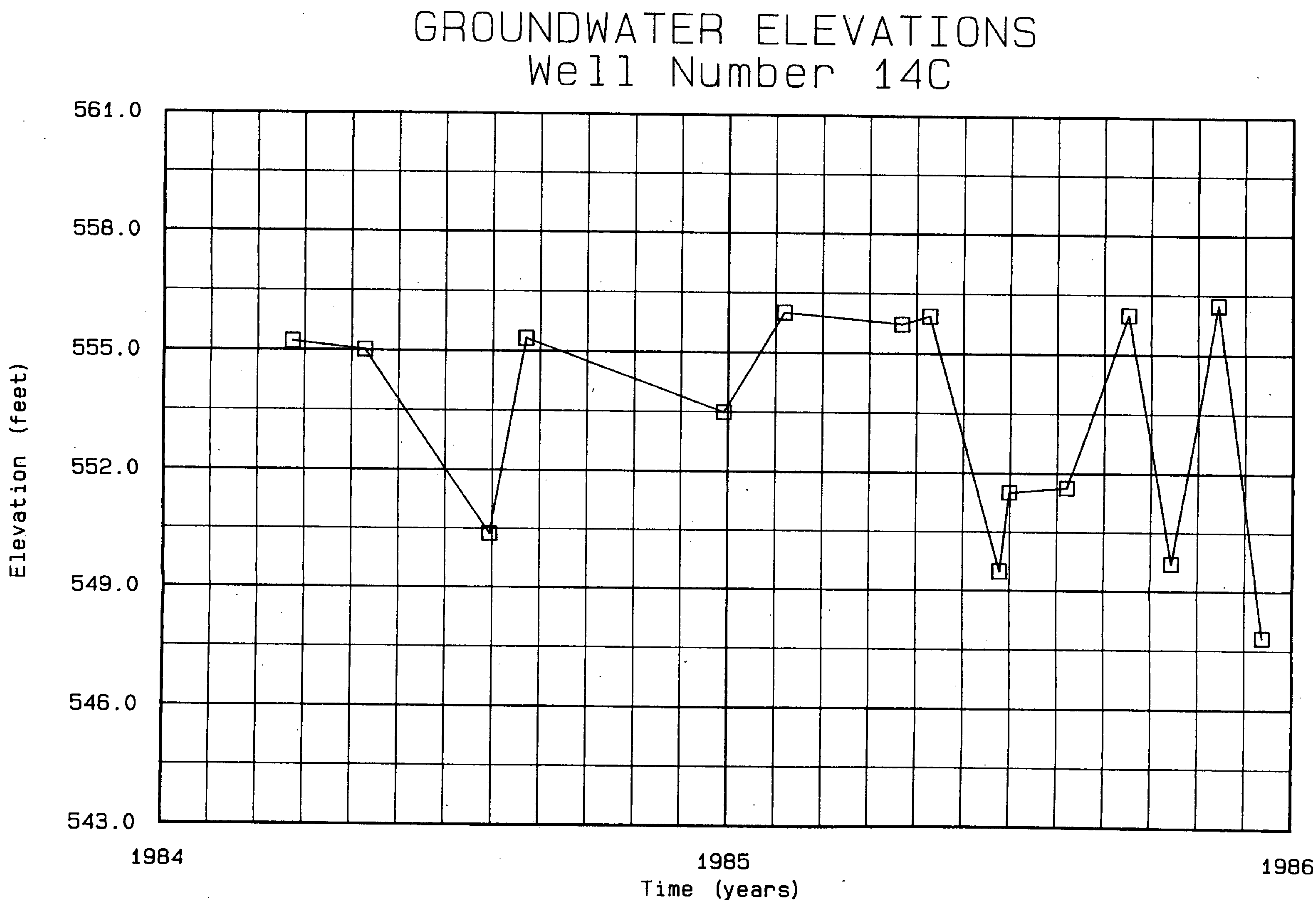

GROUNDWATER ELEVATIONS
Well Number 14C
561.0
558.0
555.0
552.0
549.0
546.0
543.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A36

GROUNDWATER ELEVATIONS
Well Number 15C

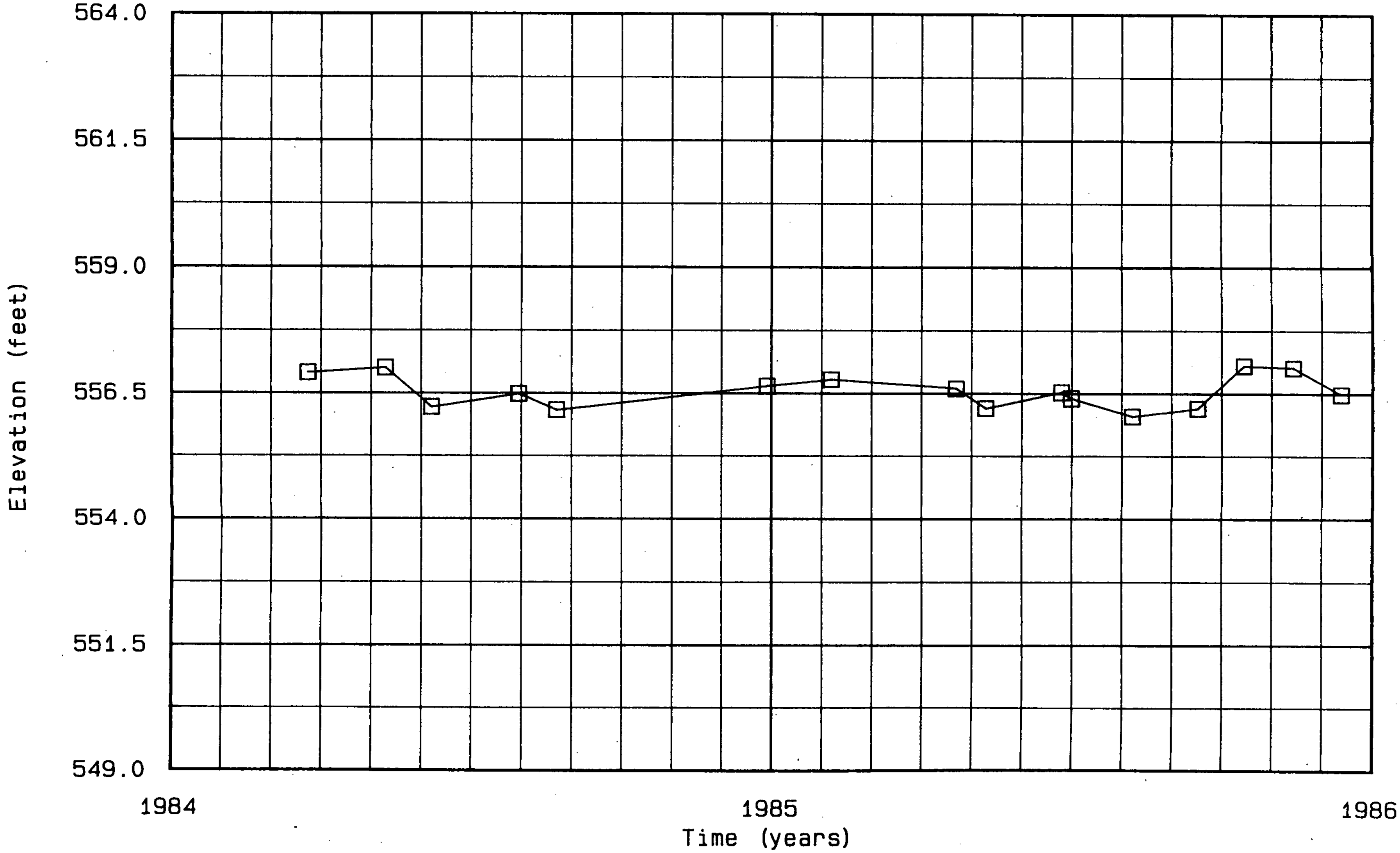


Plate A37

GROUNDWATER ELEVATIONS
Well Number 19C

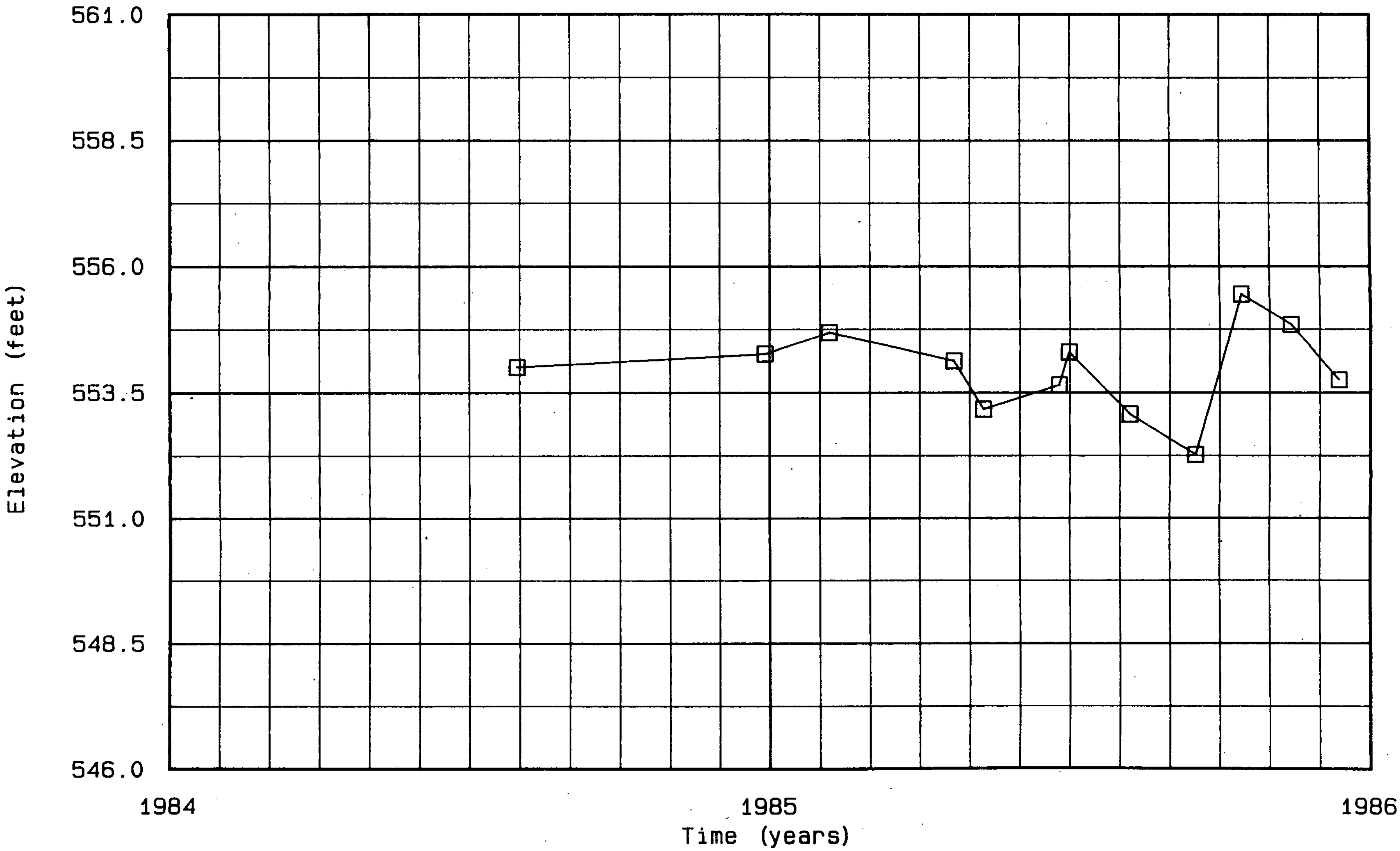


Plate A38

GROUNDWATER ELEVATIONS
Well Number 1C

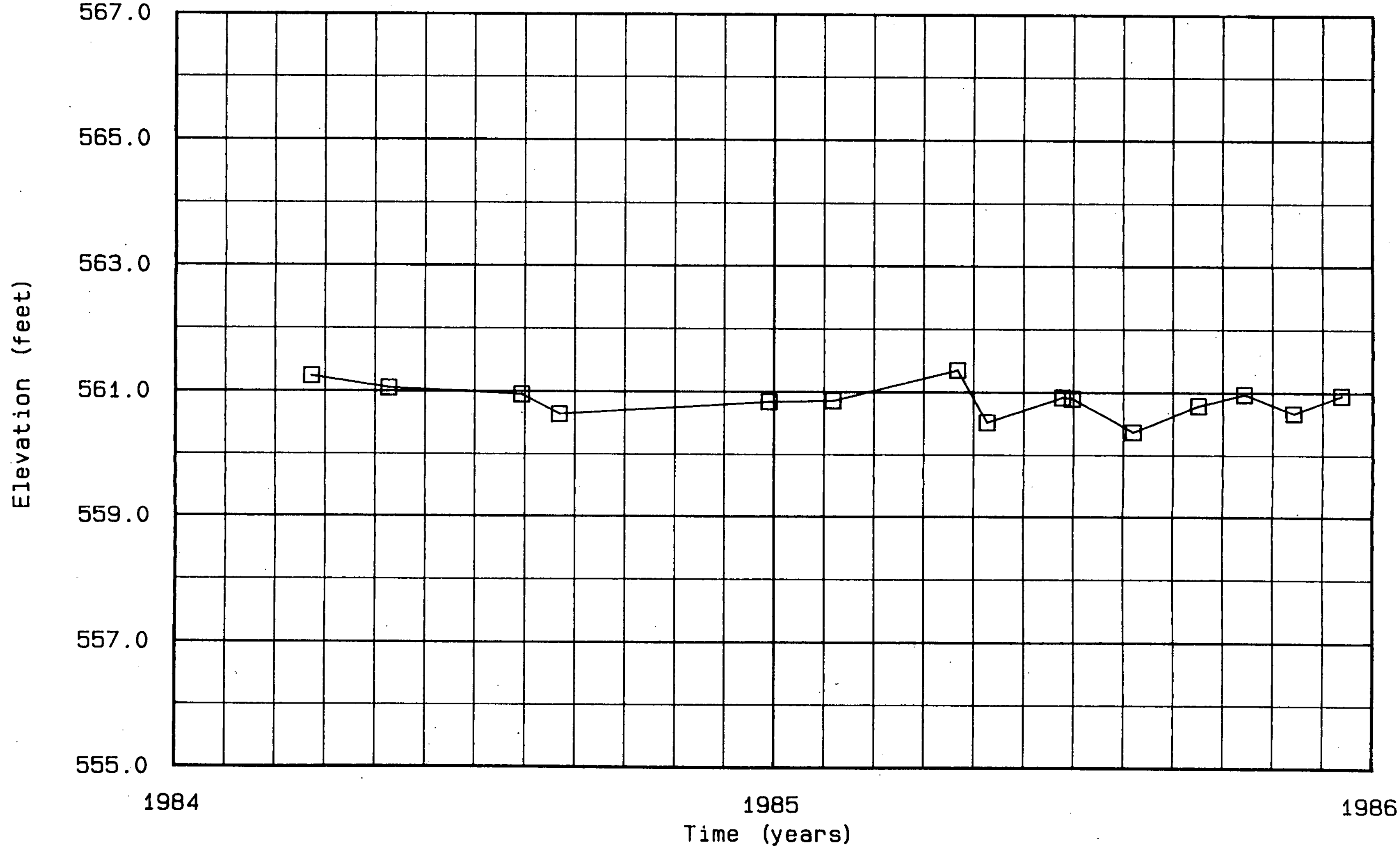


Plate A39

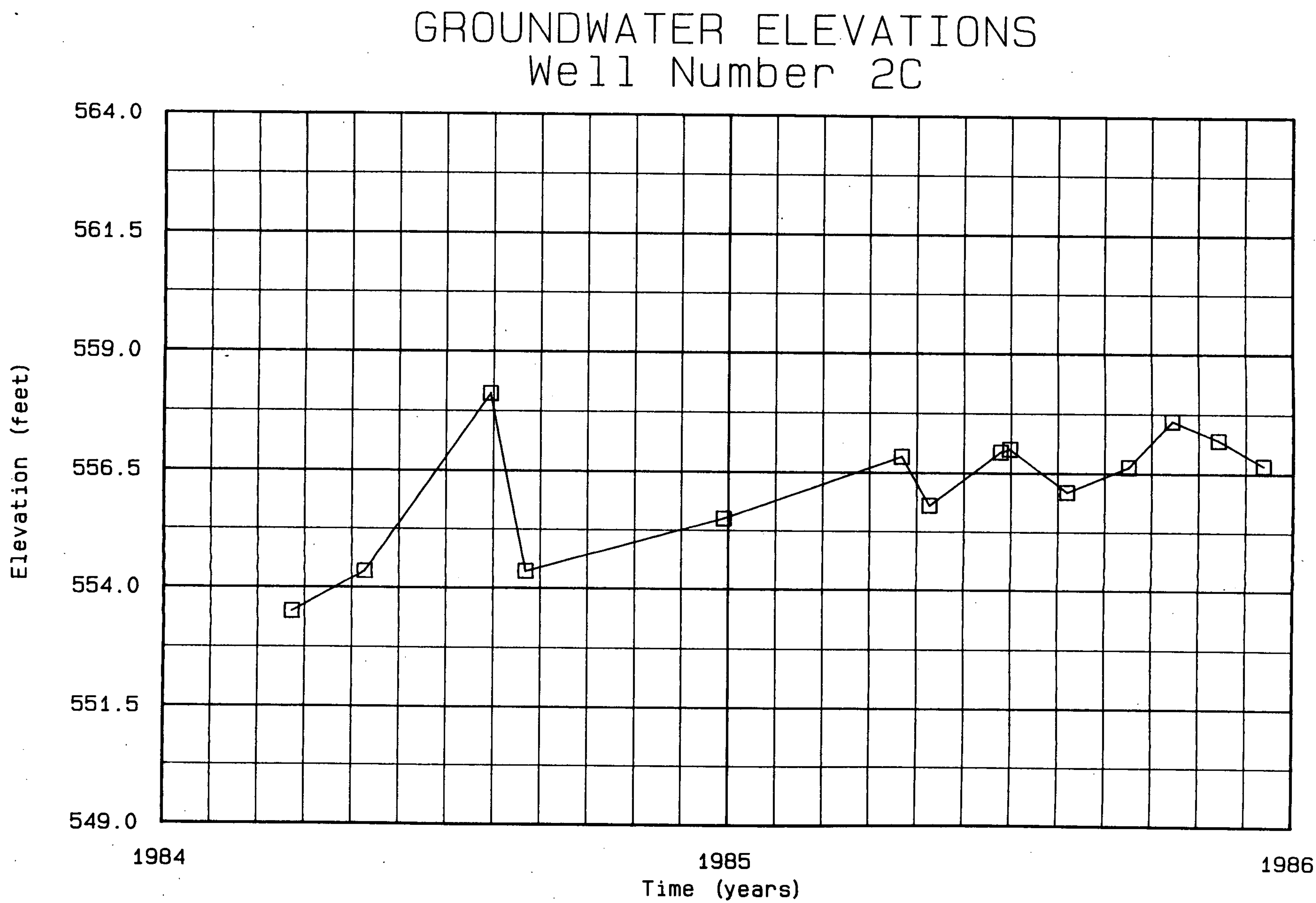

GROUNDWATER ELEVATIONS
Well Number 2C
564.0
561.5
559.0
556.5
554.0
551.5
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A40

GROUNDWATER ELEVATIONS
Well Number 4CD

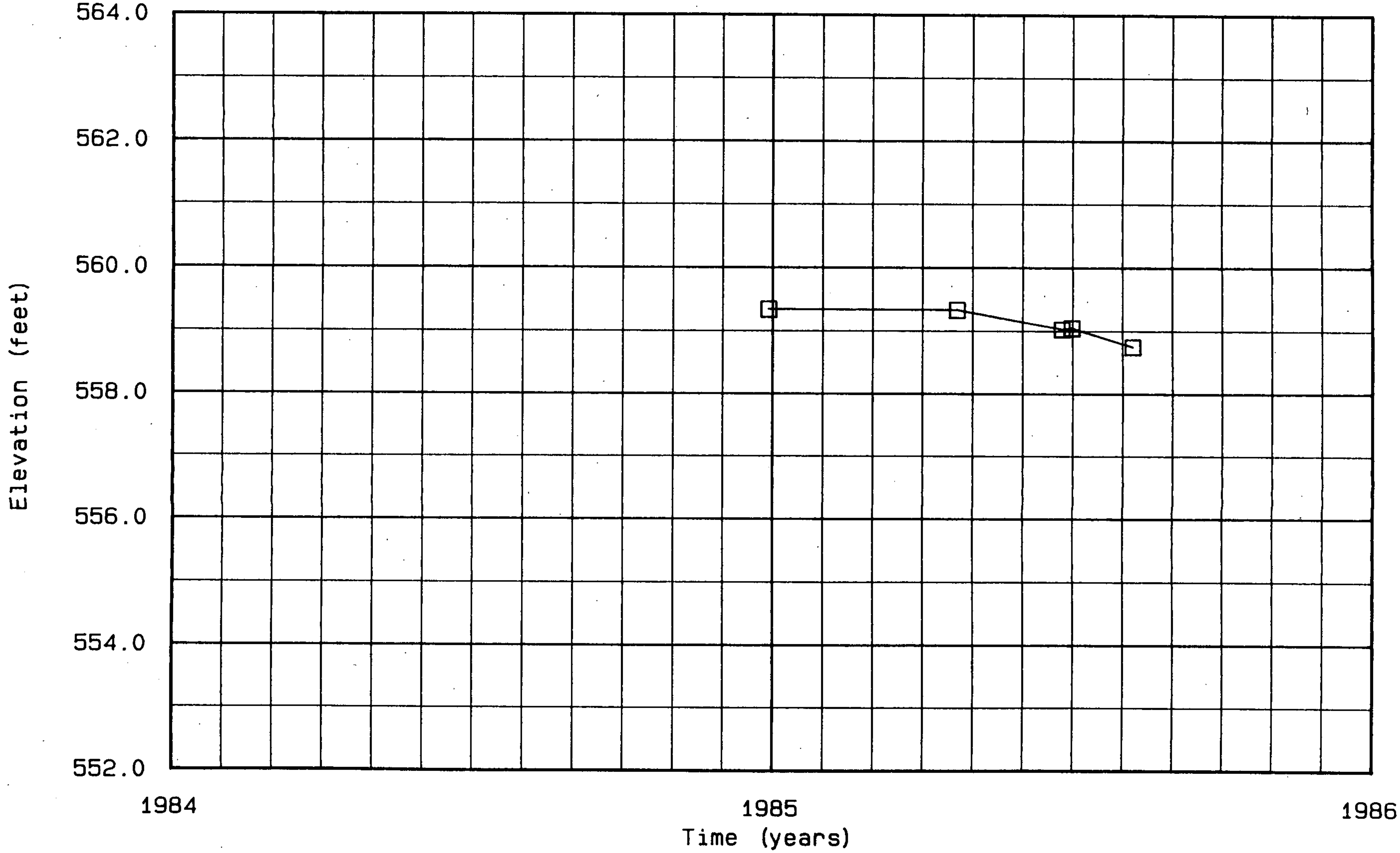


Plate A41

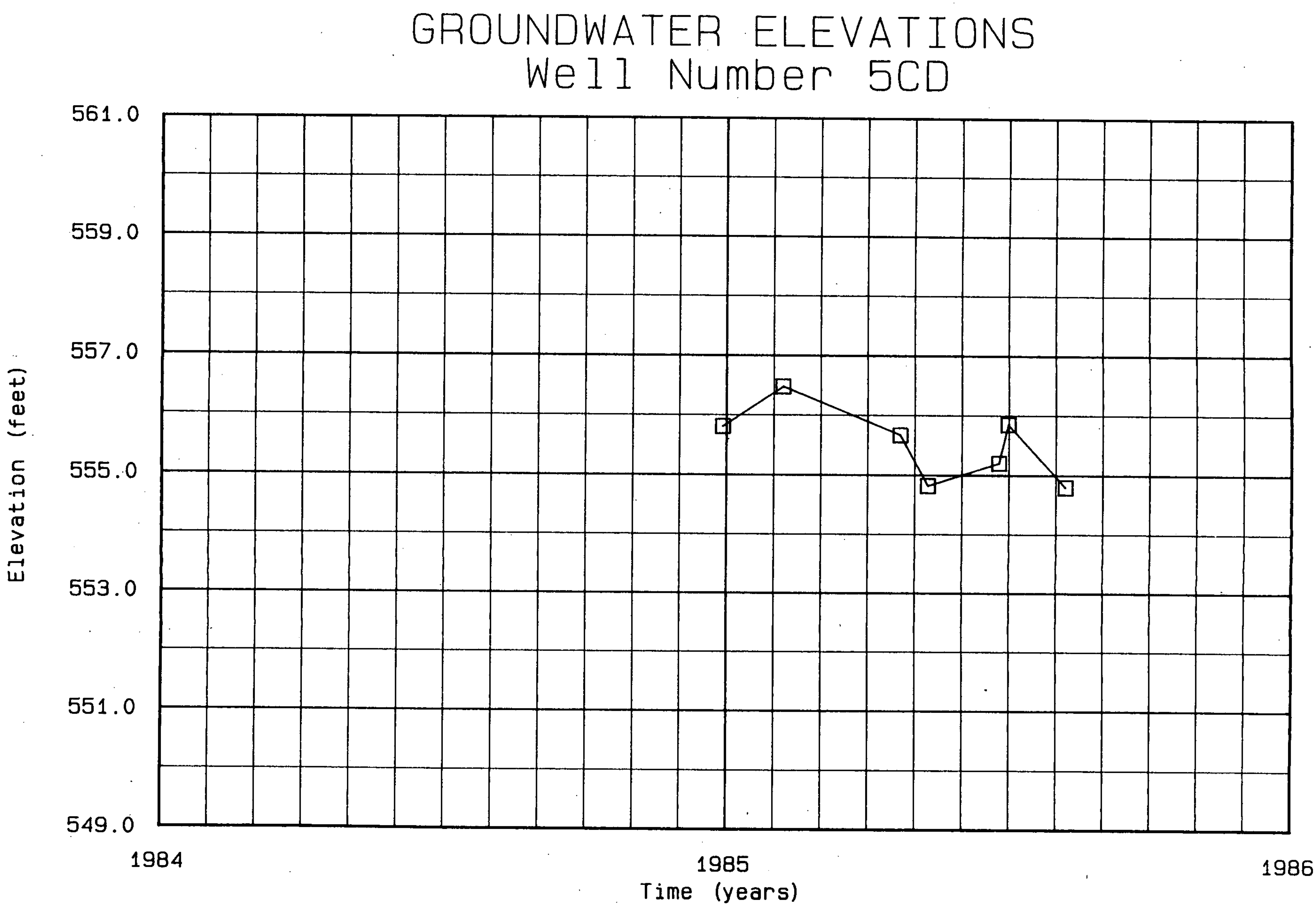

GROUNDWATER ELEVATIONS
Well Number 5CD
Elevation (feet)
561.0
559.0
557.0
555.0
553.0
551.0
549.0
1984
1985
1986
Time (years)

Plate A42

GROUNDWATER ELEVATIONS
Well Number 7C

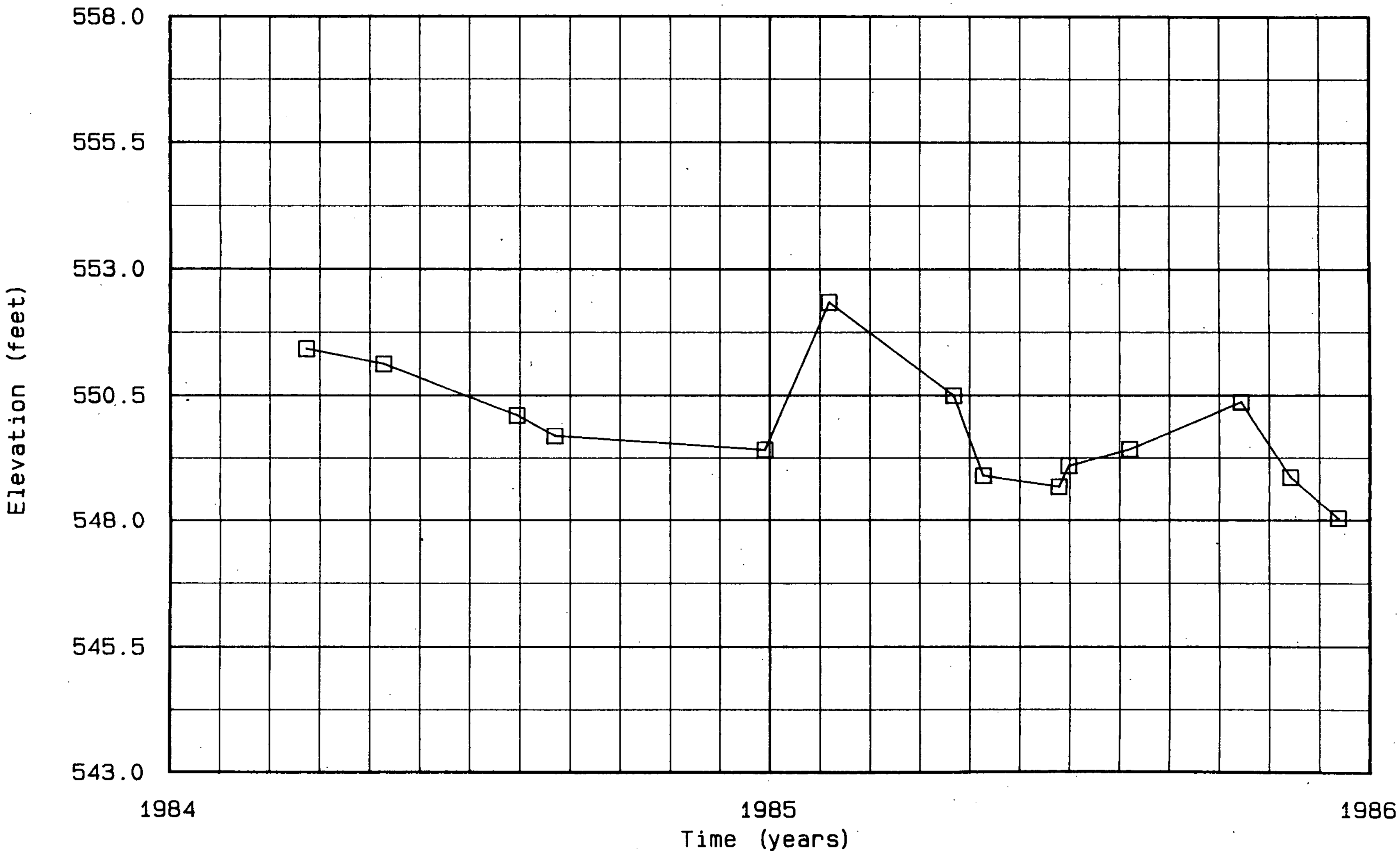


Plate A43

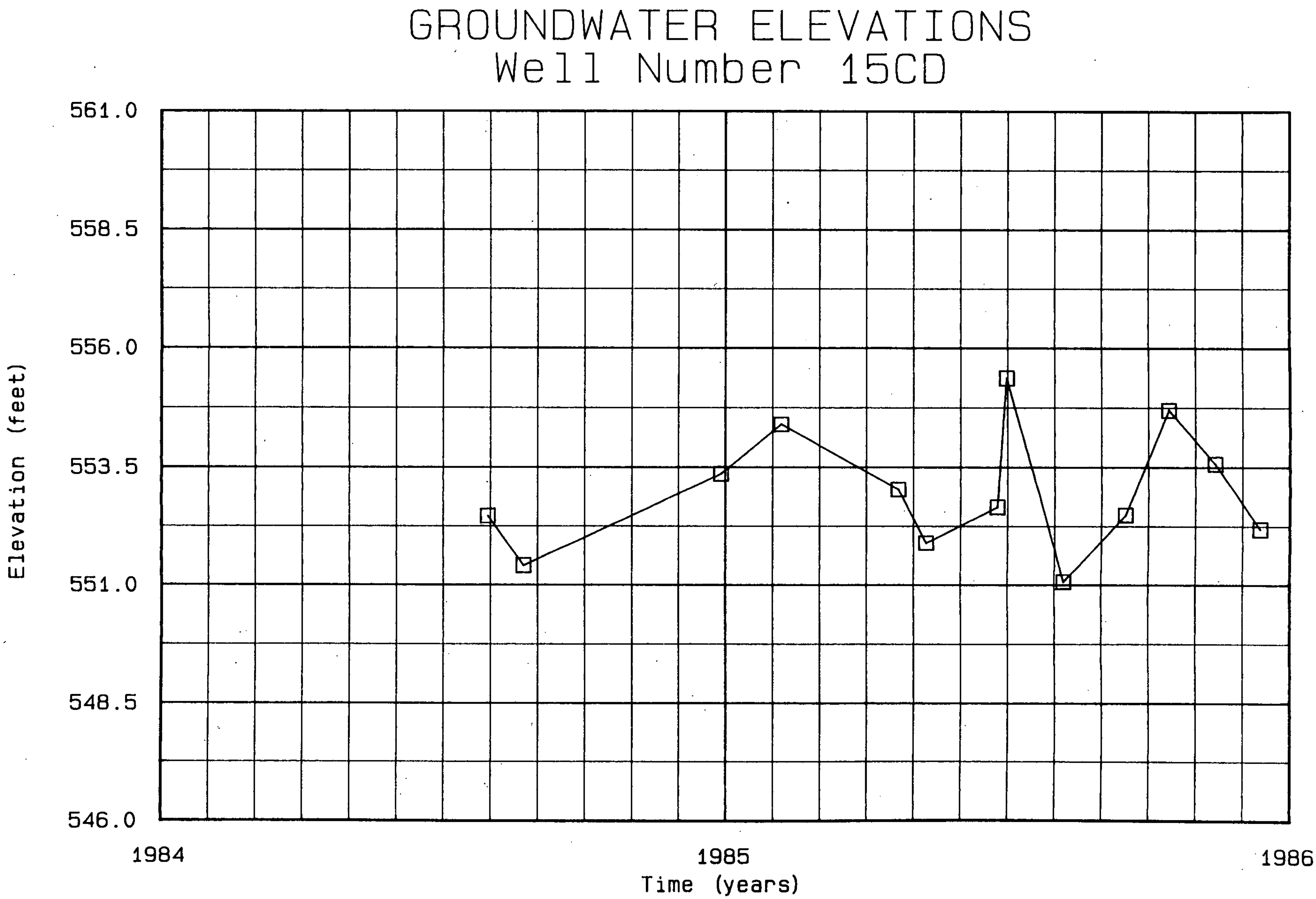

GROUNDWATER ELEVATIONS
Well Number 15CD
Elevation (feet)
561.0
558.5
556.0
553.5
551.0
548.5
546.0
1984
1985
1986
Time (years)

Plate A44

GROUNDWATER ELEVATIONS
Well Number 17B

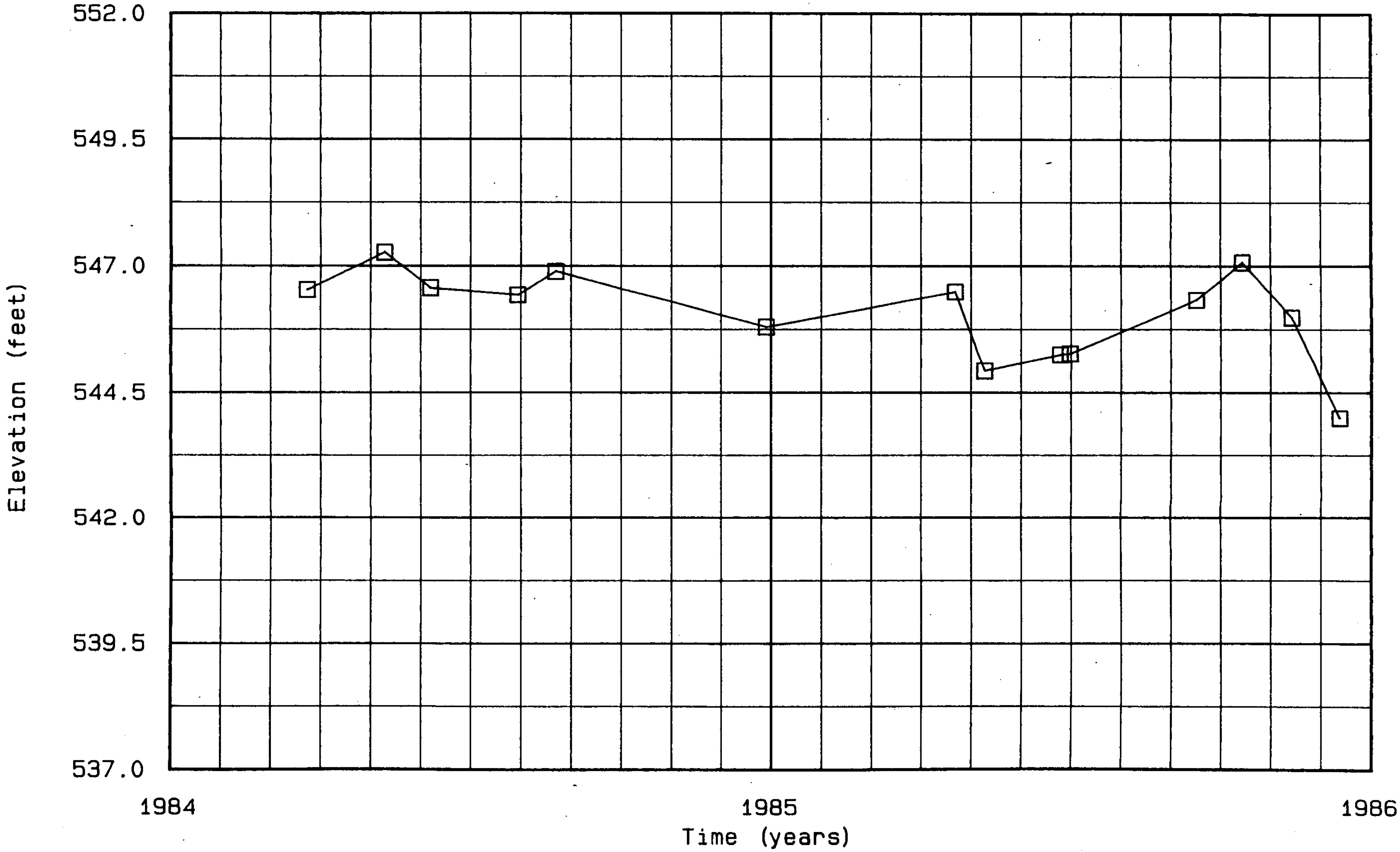


Plate A45

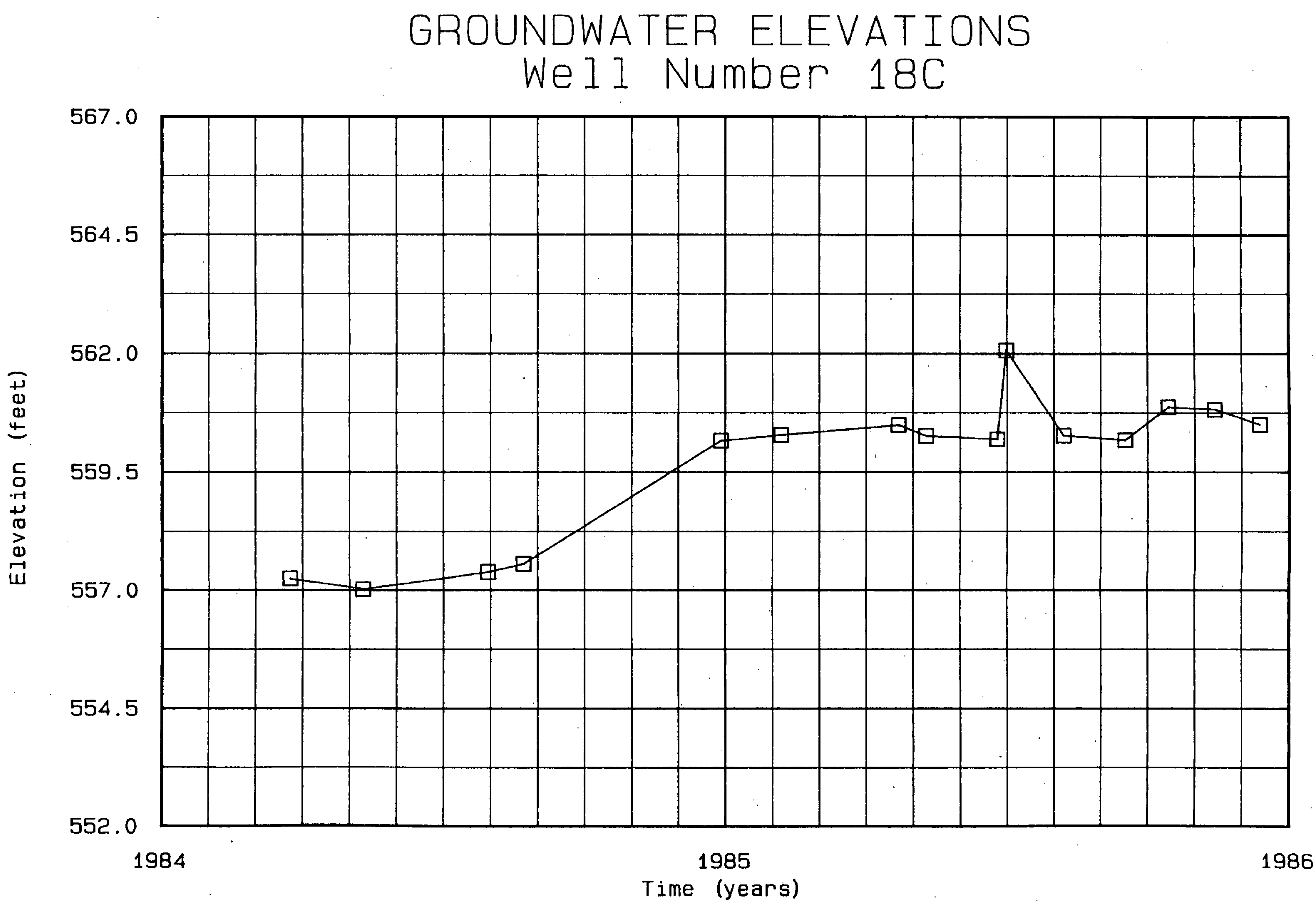

GROUNDWATER ELEVATIONS
Well Number 18C
567.0
564.5
562.0
559.5
557.0
554.5
552.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A46

GROUNDWATER ELEVATIONS
Well Number 19CD1

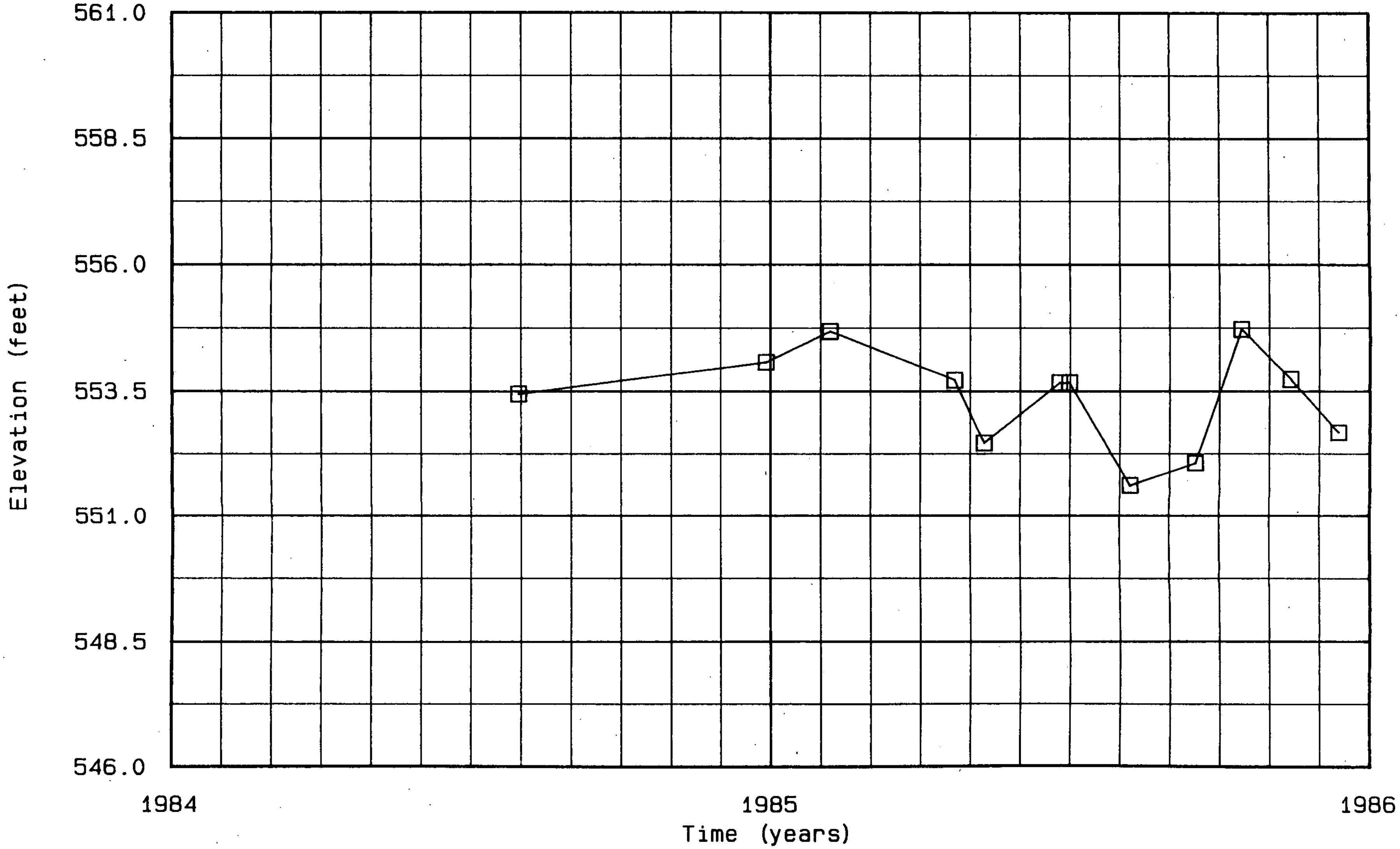


Plate A47

GROUNDWATER ELEVATIONS
Well Number 22C

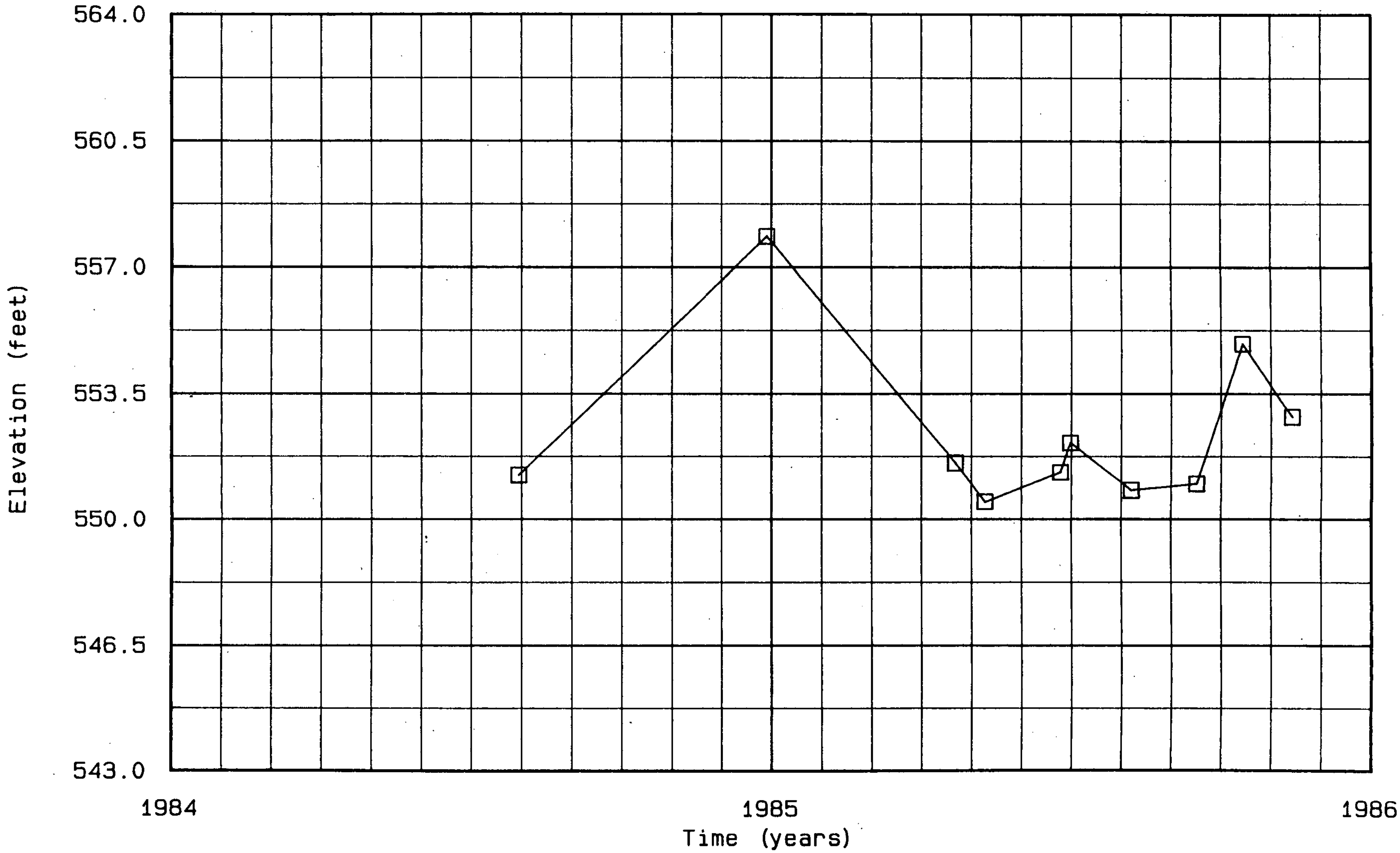


Plate A48

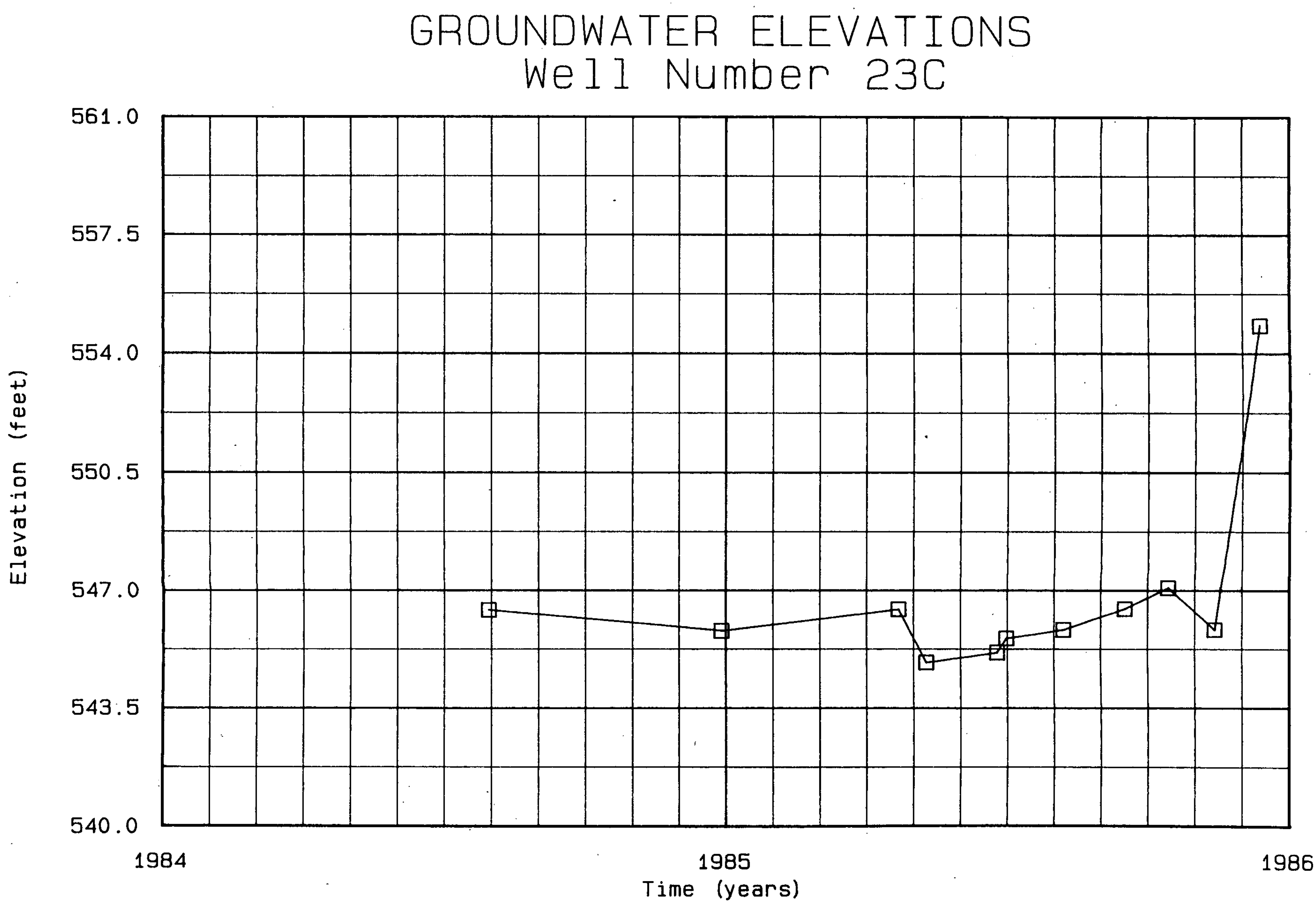

GROUNDWATER ELEVATIONS
Well Number 23C
561.0
557.5
554.0
550.5
547.0
543.5
540.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A49

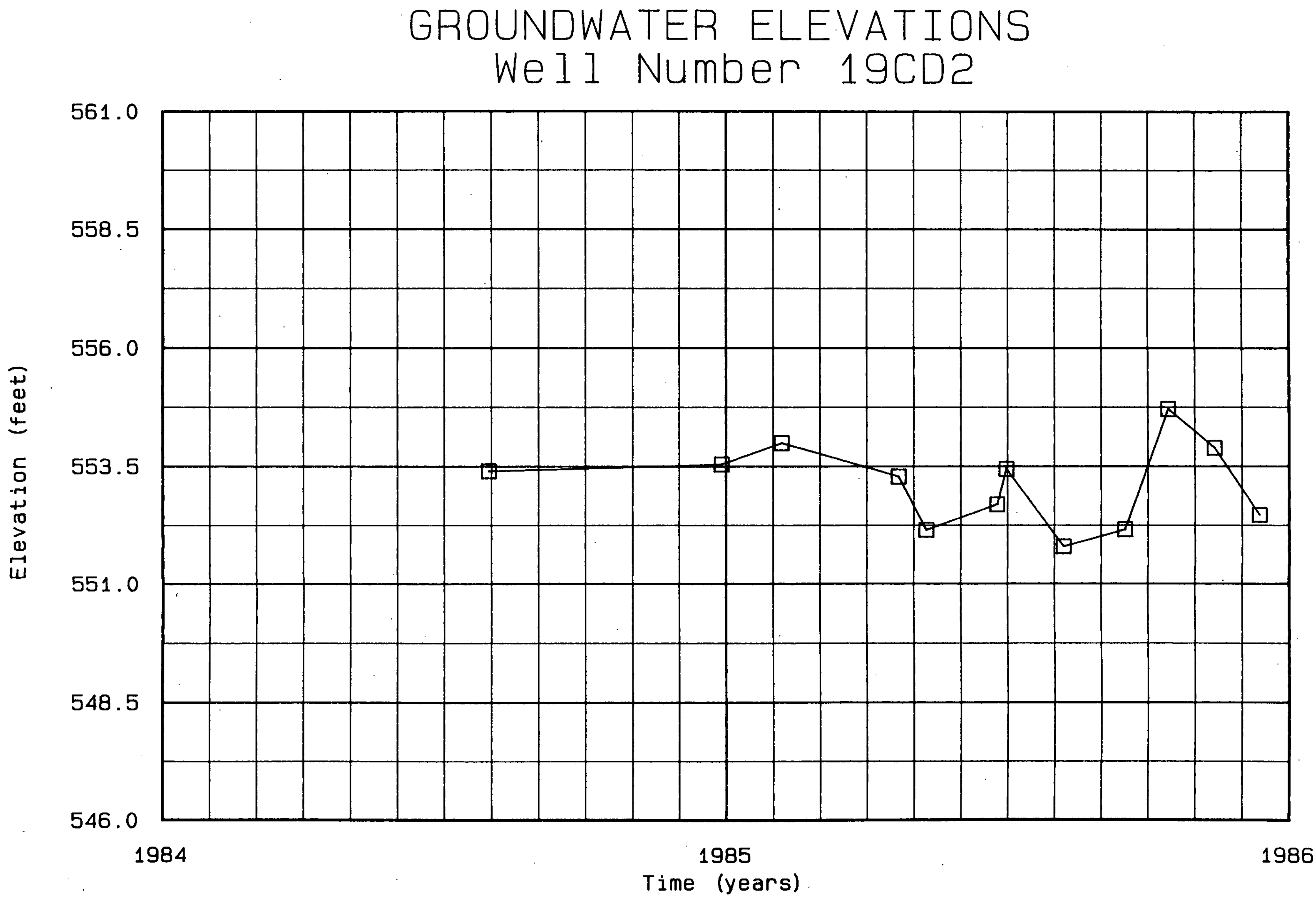

GROUNDWATER ELEVATIONS
Well Number 19CD2
561.0
558.5
556.0
553.5
551.0
548.5
546.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A50

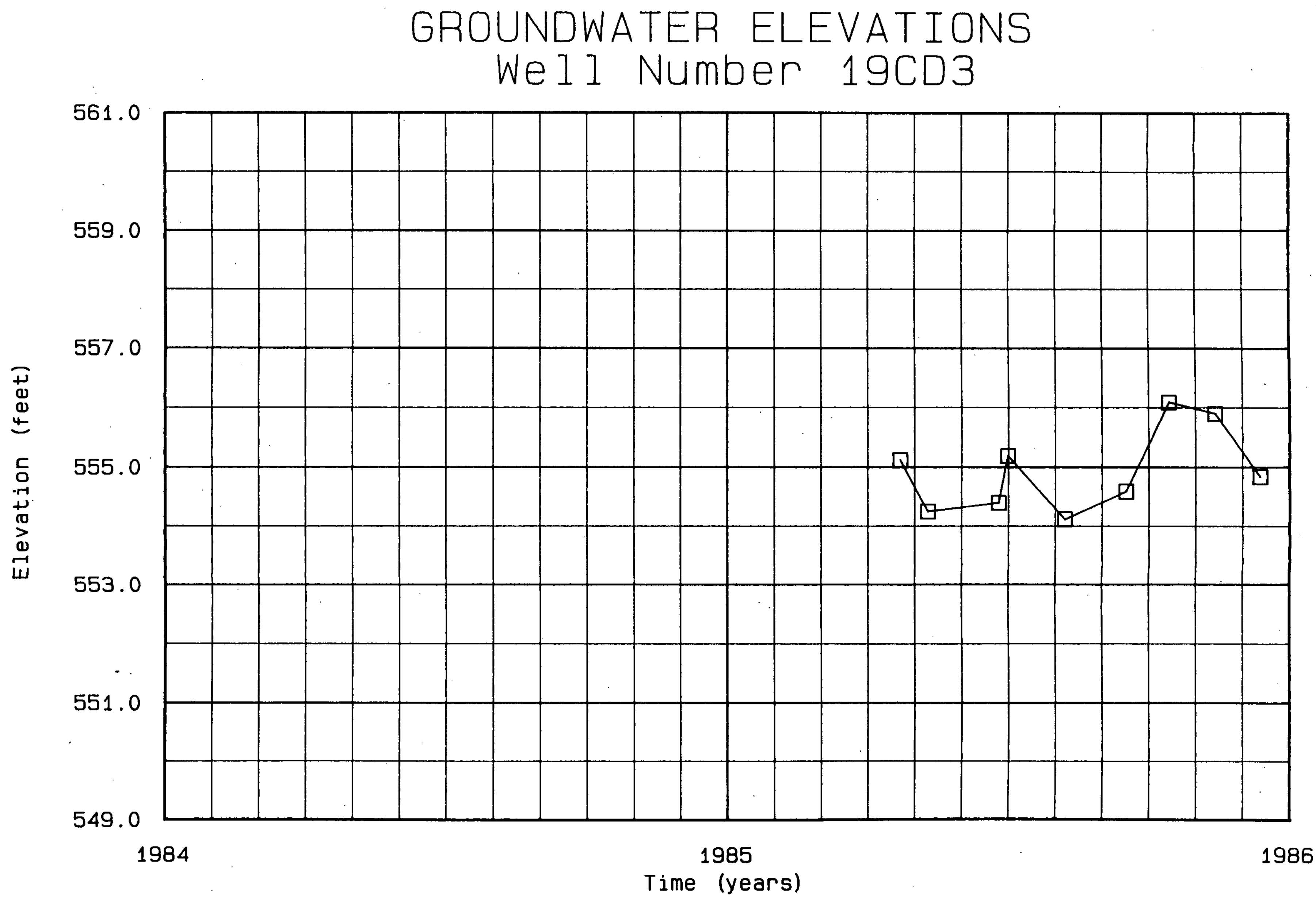

GROUNDWATER ELEVATIONS
Well Number 19CD3
561.0
559.0
557.0
555.0
553.0
551.0
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A51

GROUNDWATER ELEVATIONS
Well Number 1D

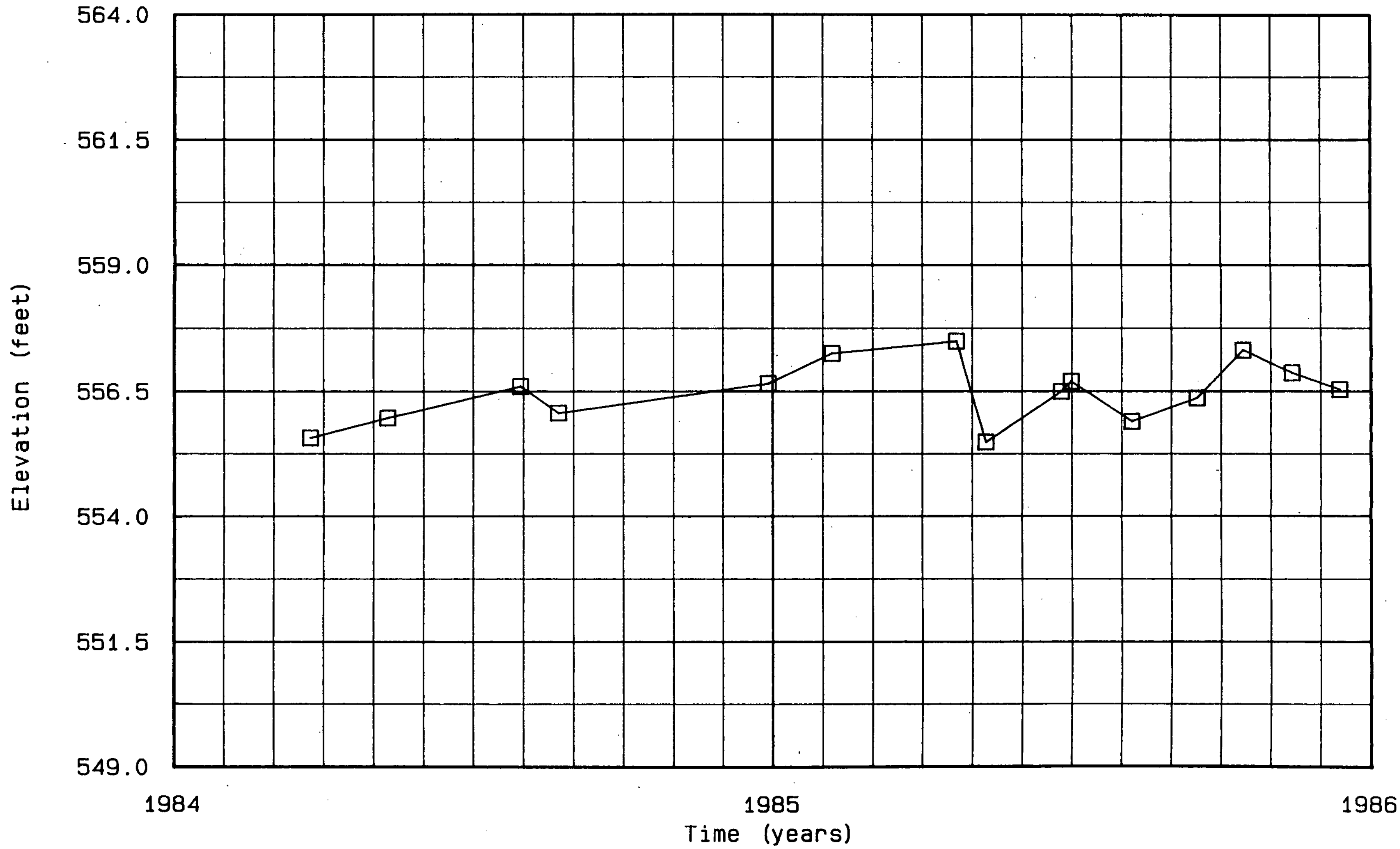


Plate A52

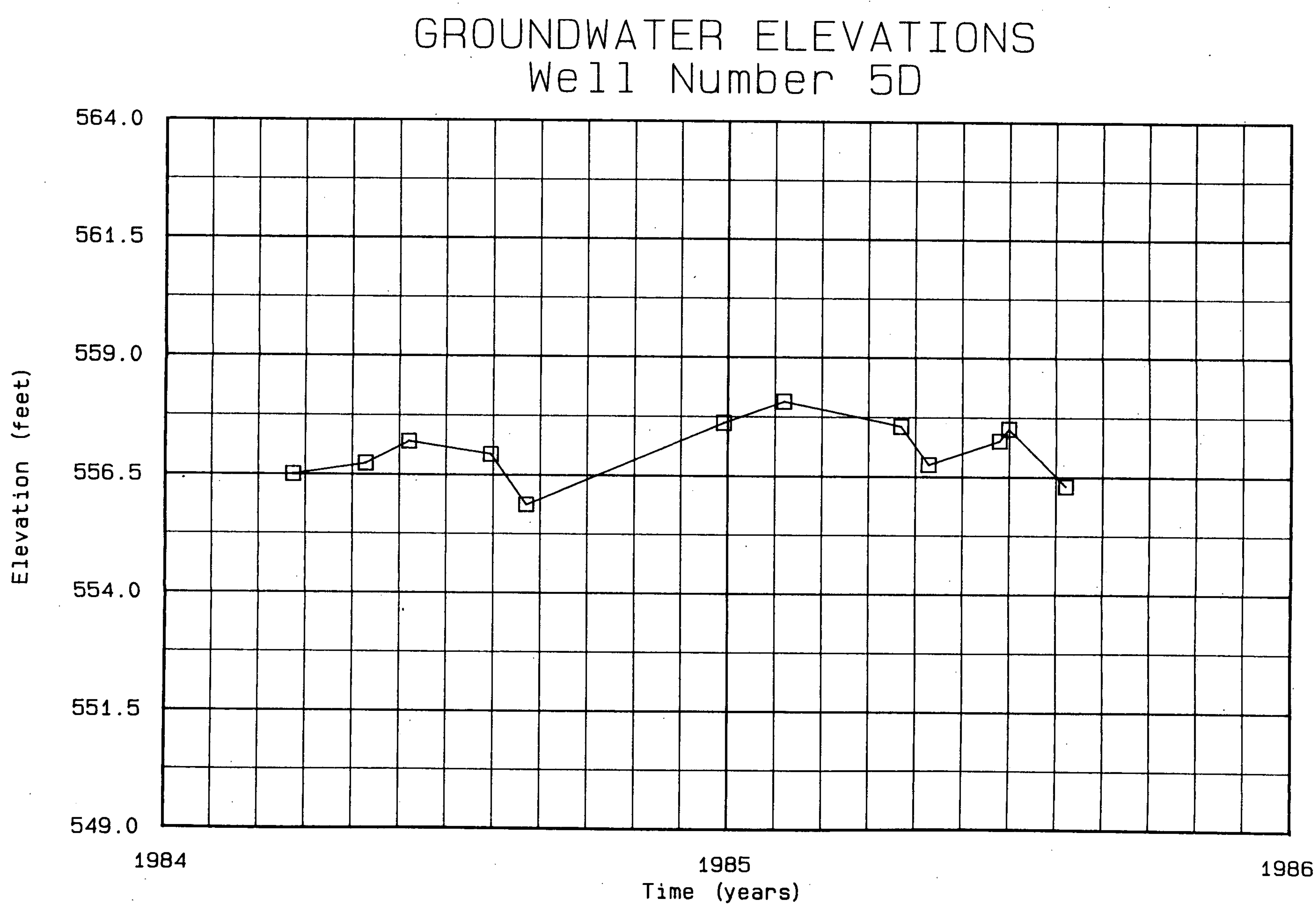

GROUNDWATER ELEVATIONS
Well Number 5D
564.0
561.5
559.0
556.5
554.0
551.5
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A53

GROUNDWATER ELEVATIONS
Well Number 10D

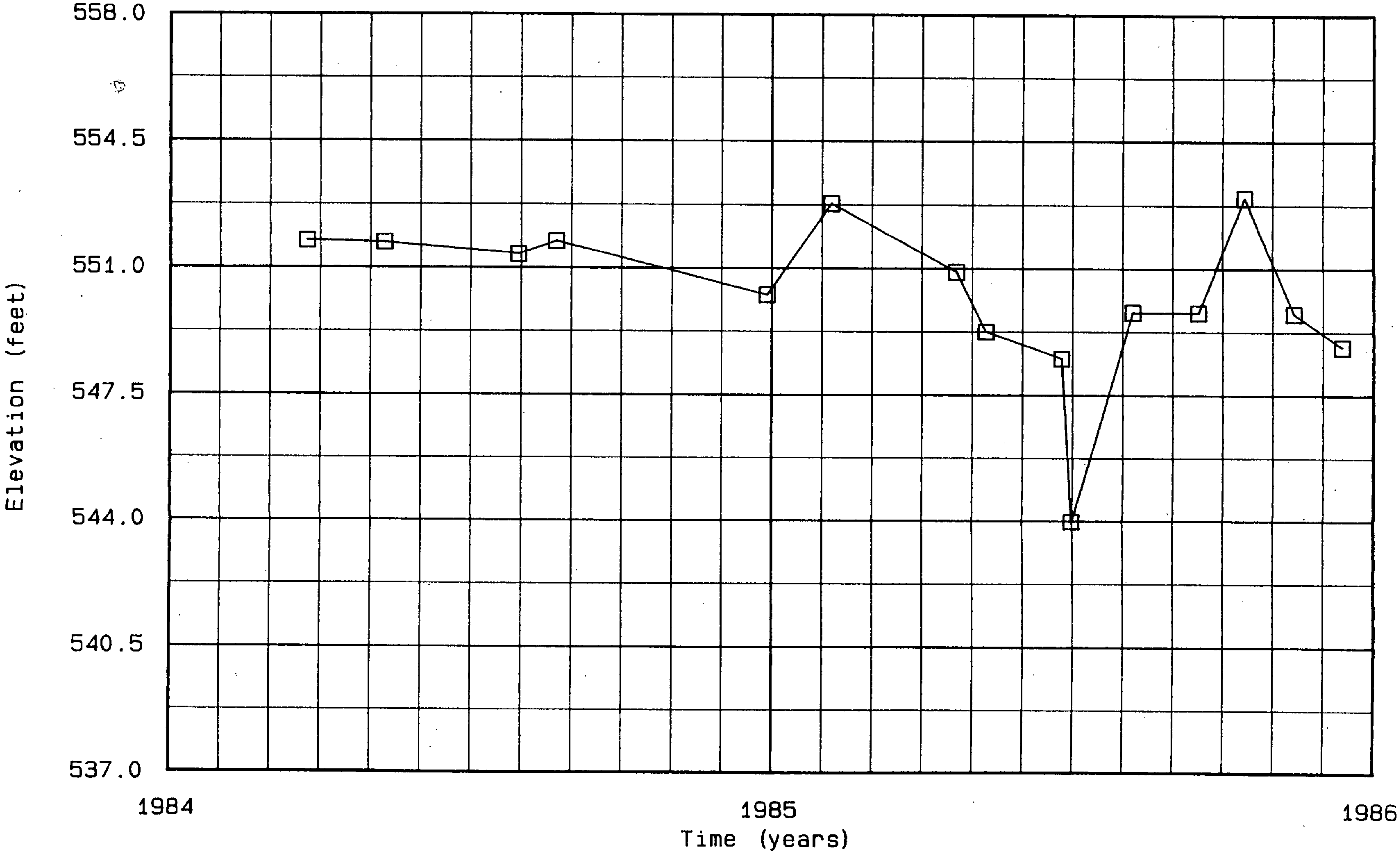


Plate A54

GROUNDWATER ELEVATIONS
Well Number 15D

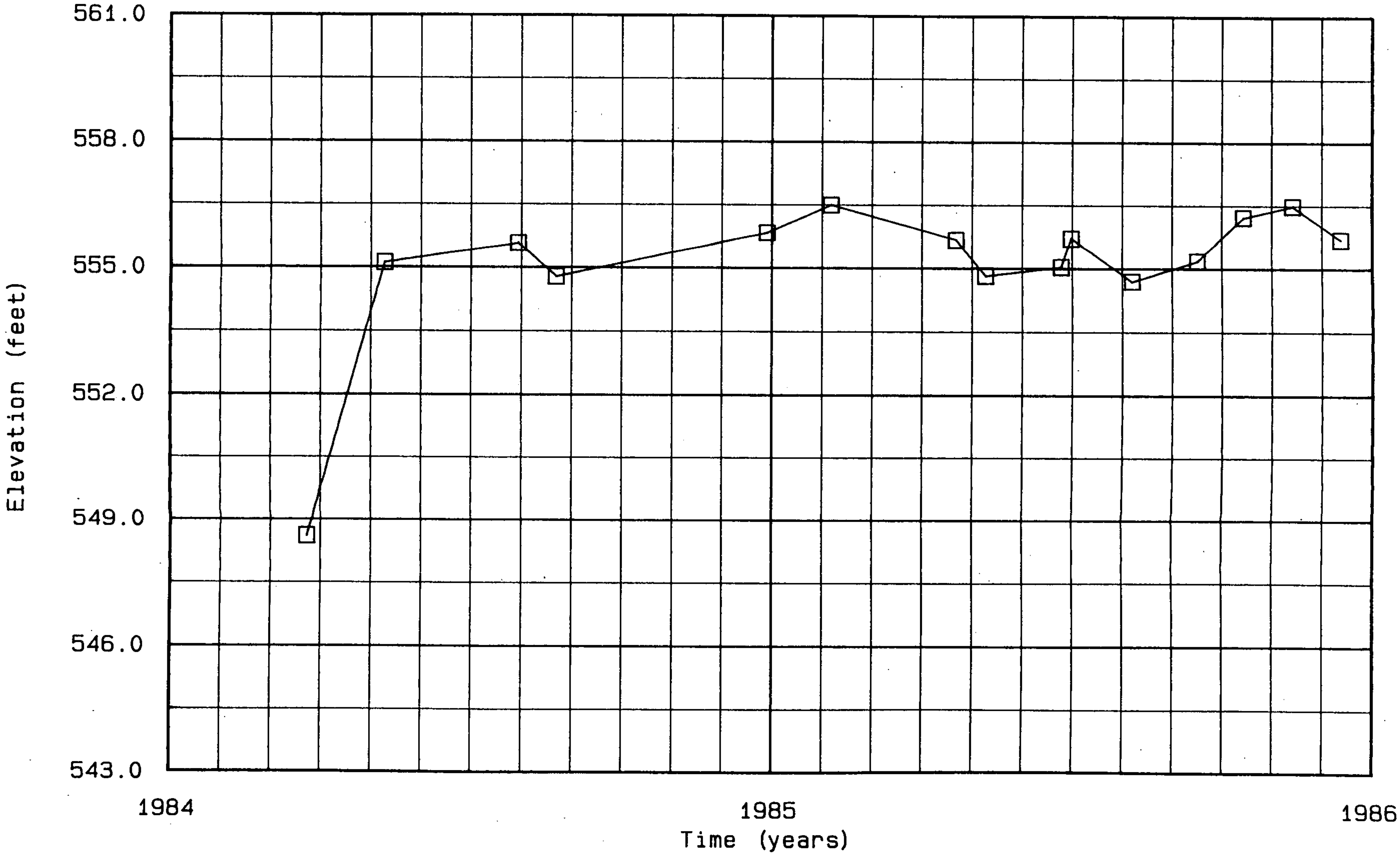


Plate A55

GROUNDWATER ELEVATIONS
Well Number 19D

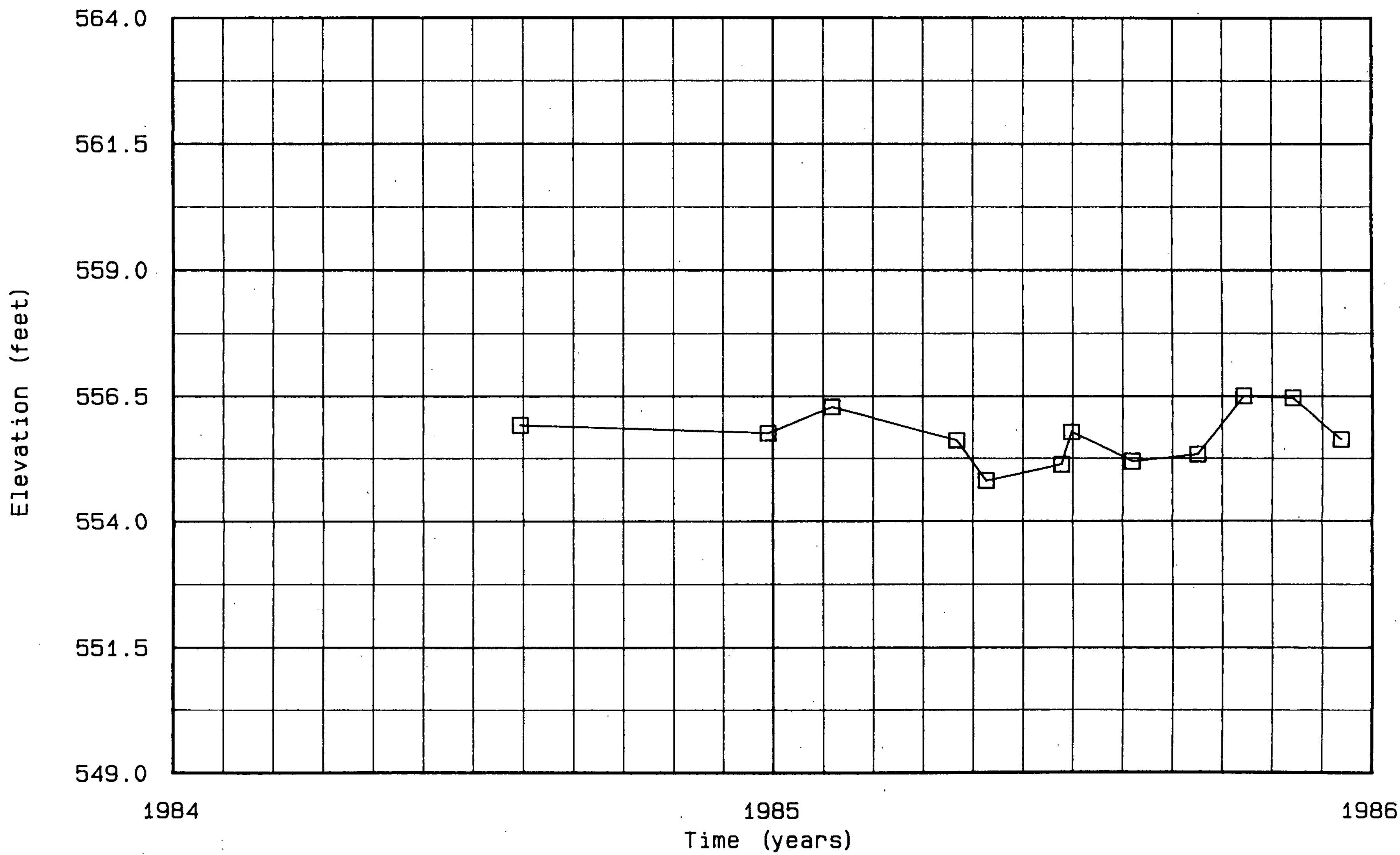


Plate A56

GROUNDWATER ELEVATIONS
Well Number 22D

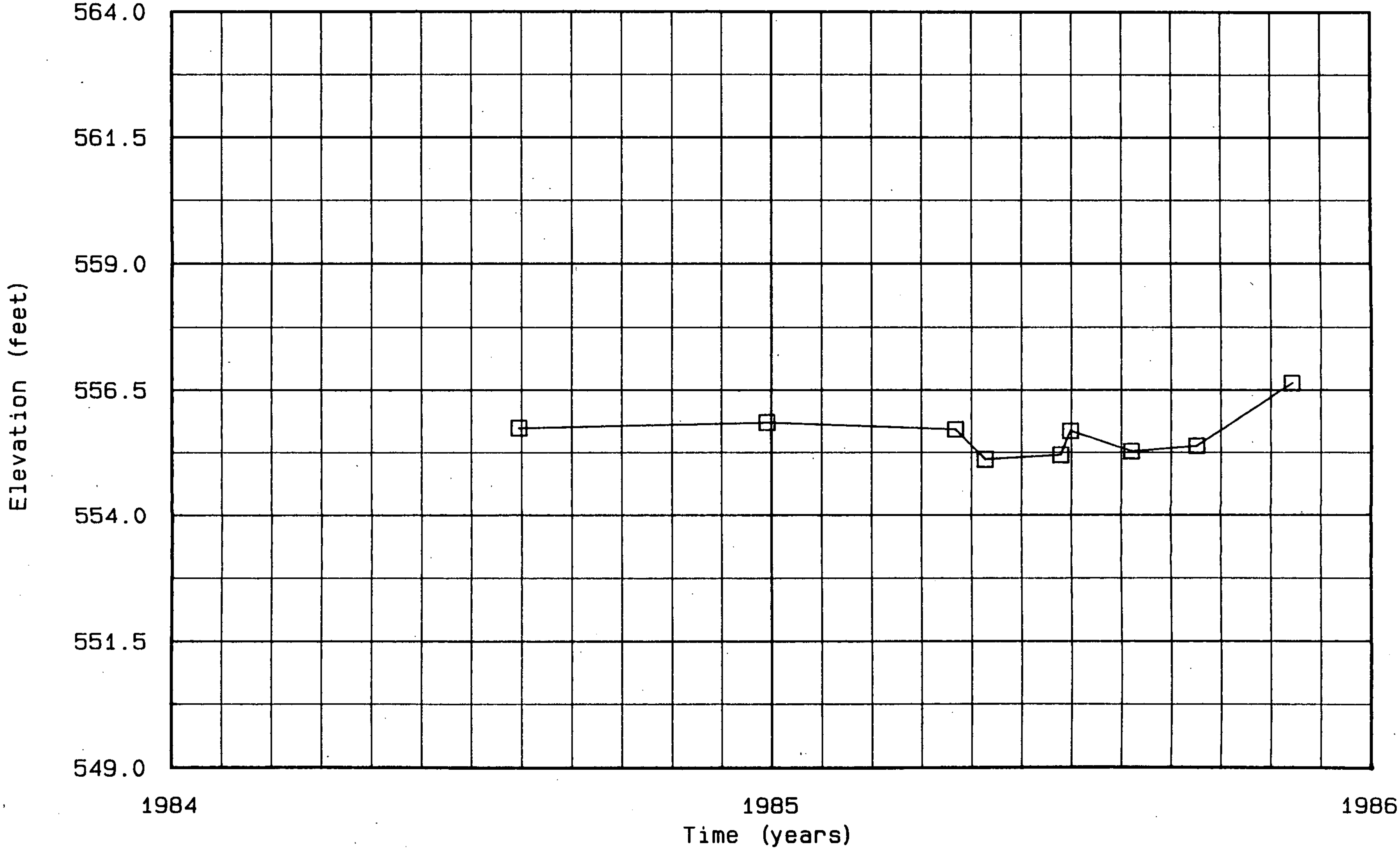


Plate A57

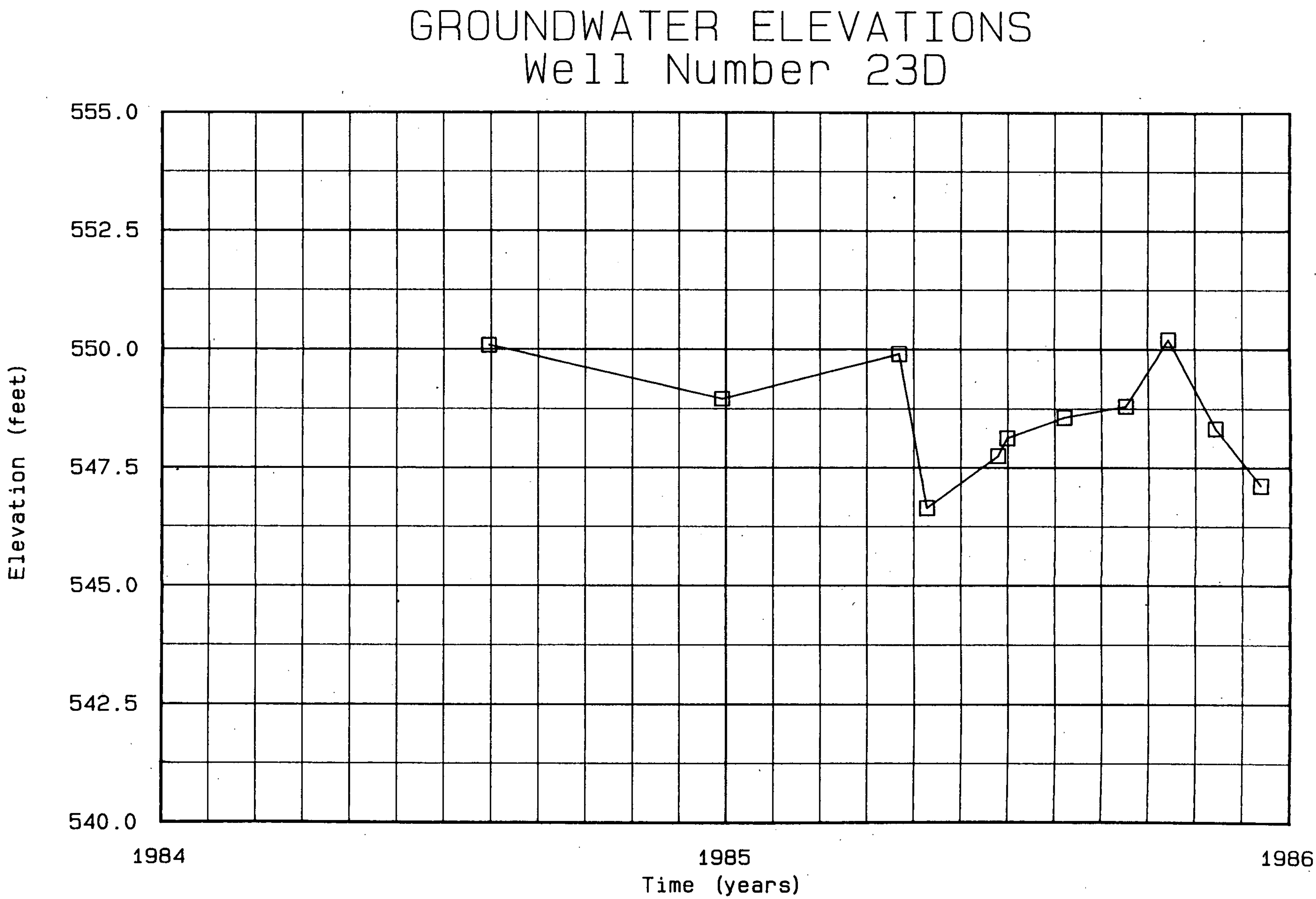

GROUNDWATER ELEVATIONS
Well Number 23D
555.0
552.5
550.0
547.5
545.0
542.5
540.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A58

GROUNDWATER ELEVATIONS
Well Number 1E

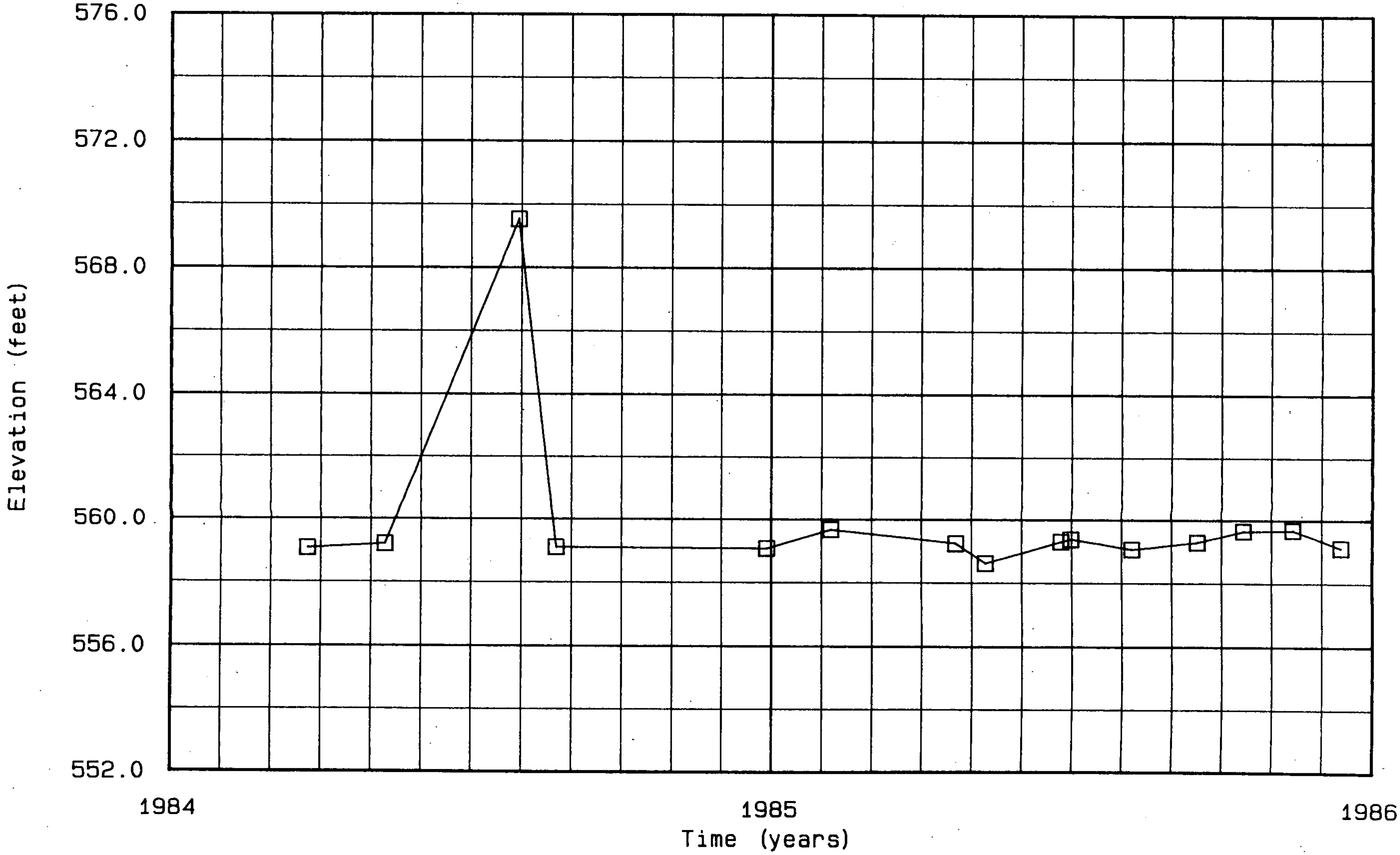


Plate A59

GROUNDWATER ELEVATIONS
Well Number 19F

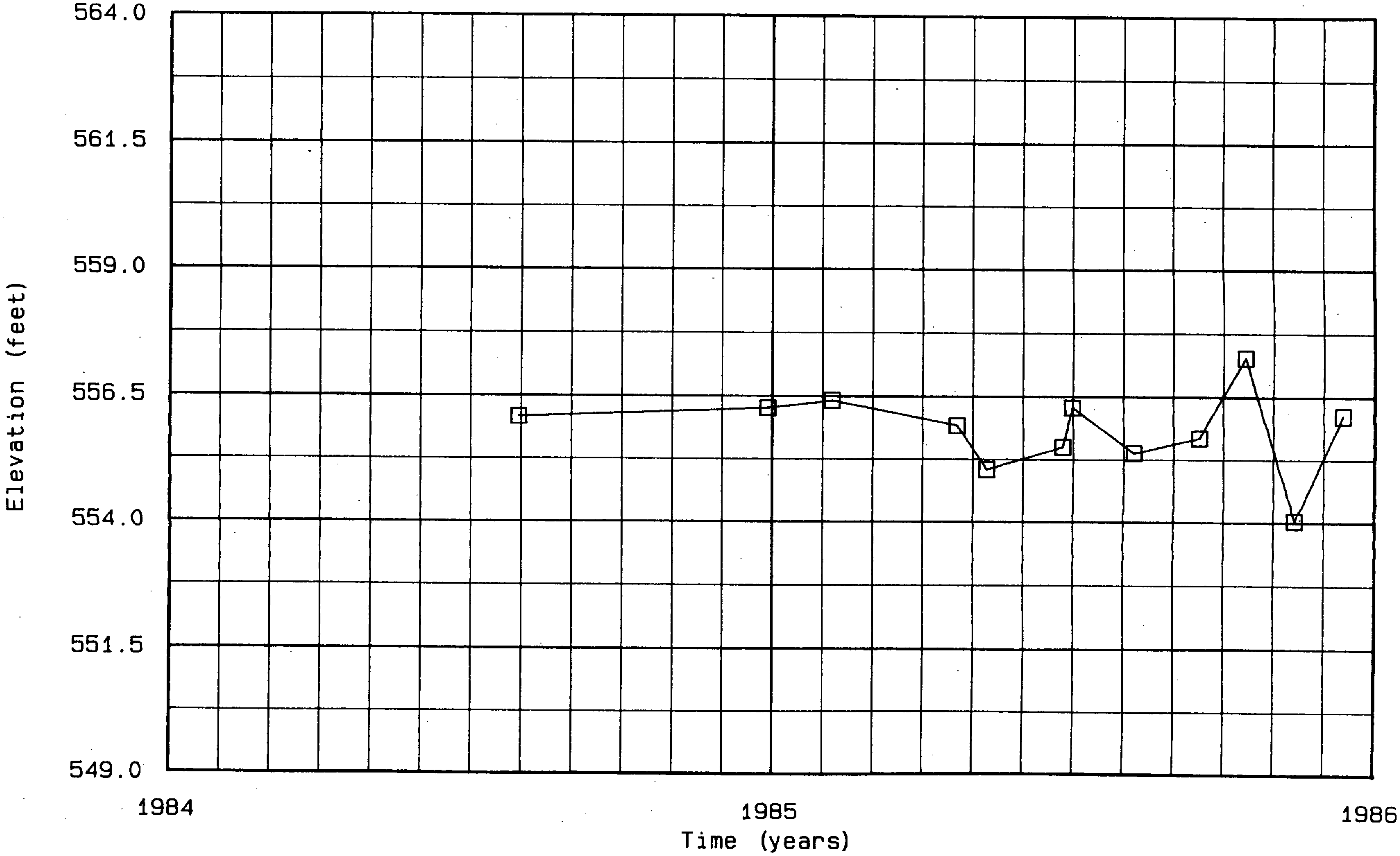


Plate A60

GROUNDWATER ELEVATIONS
Well Number 1F

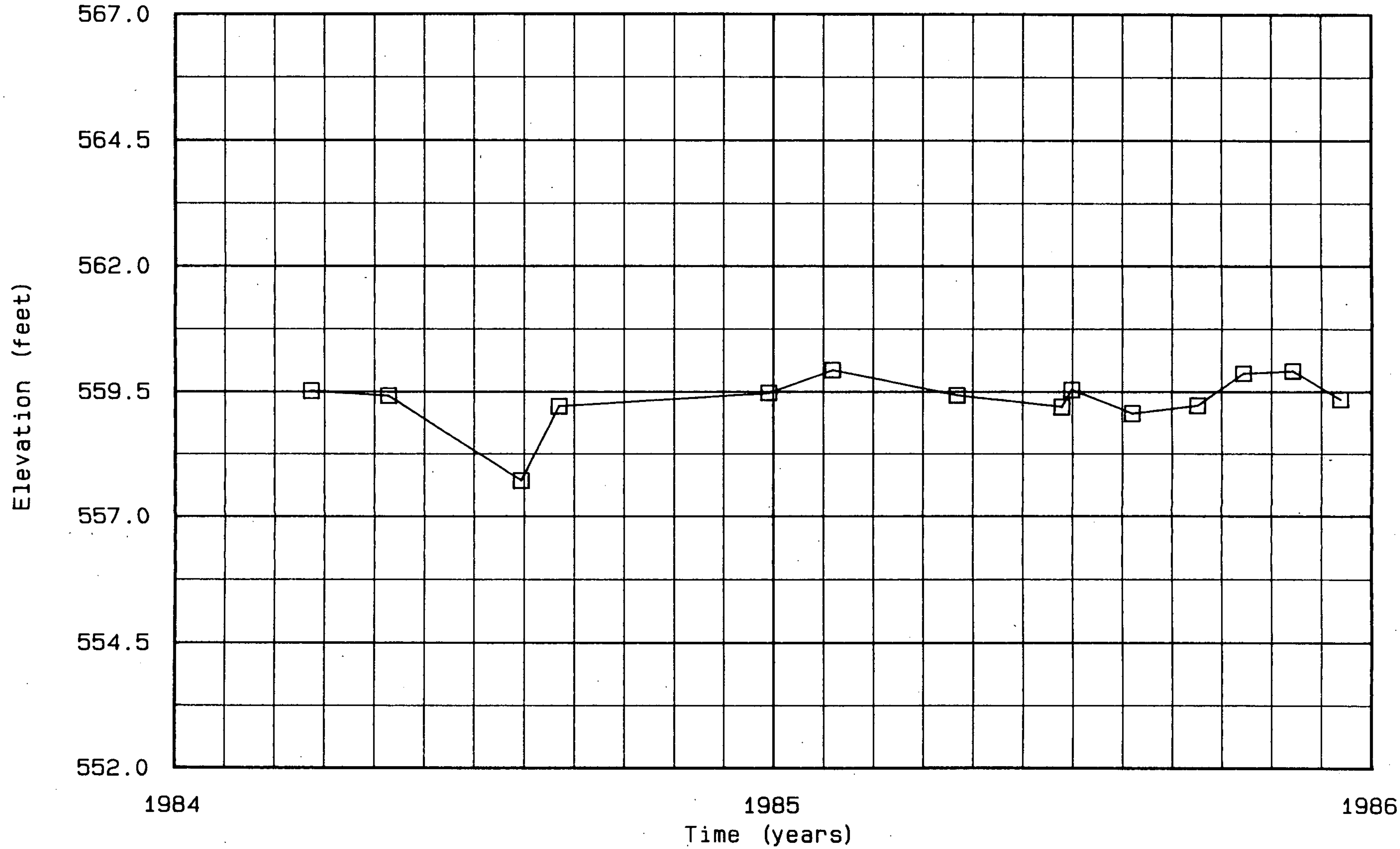


Plate A61

GROUNDWATER ELEVATIONS
Well Number 5F

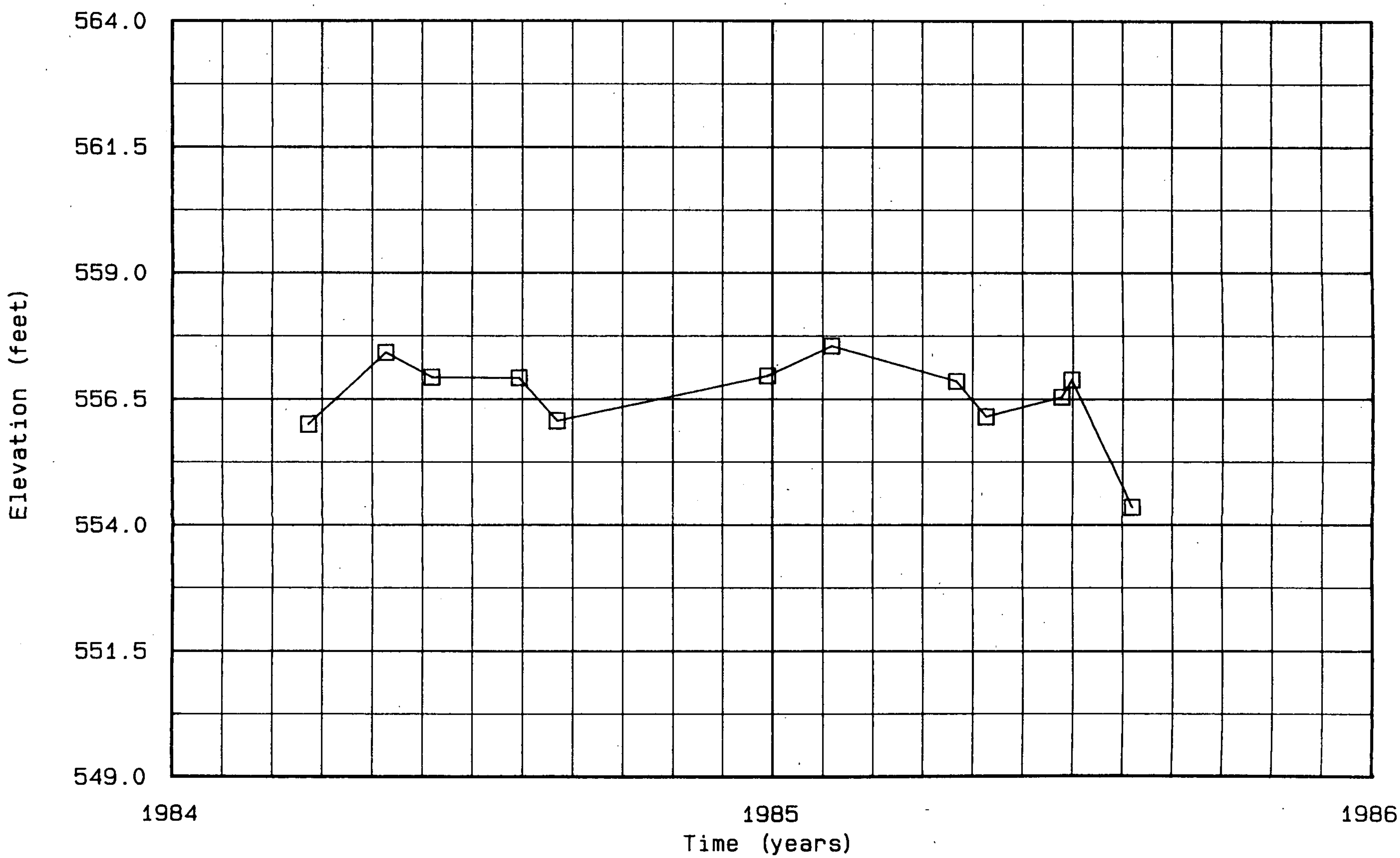
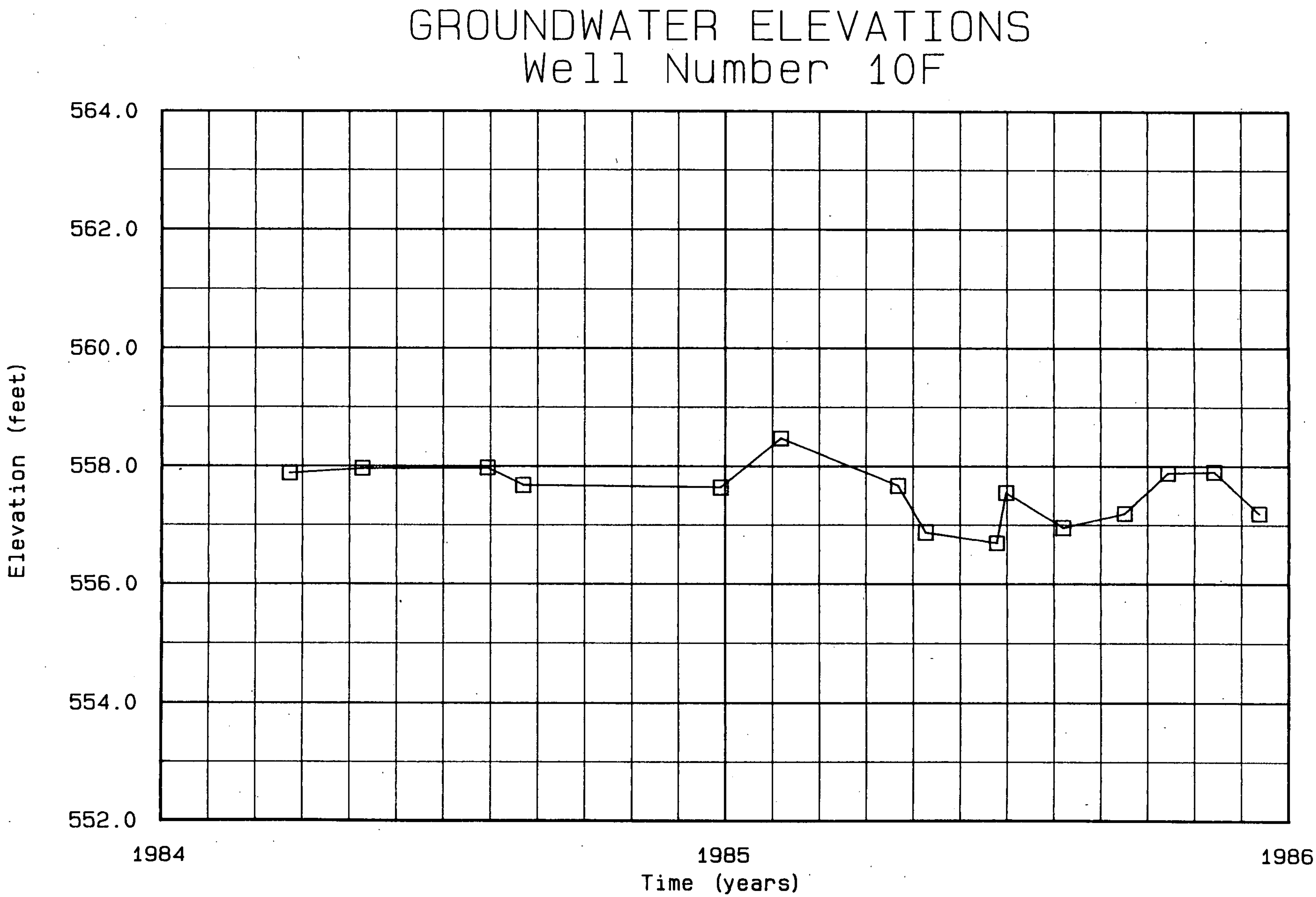
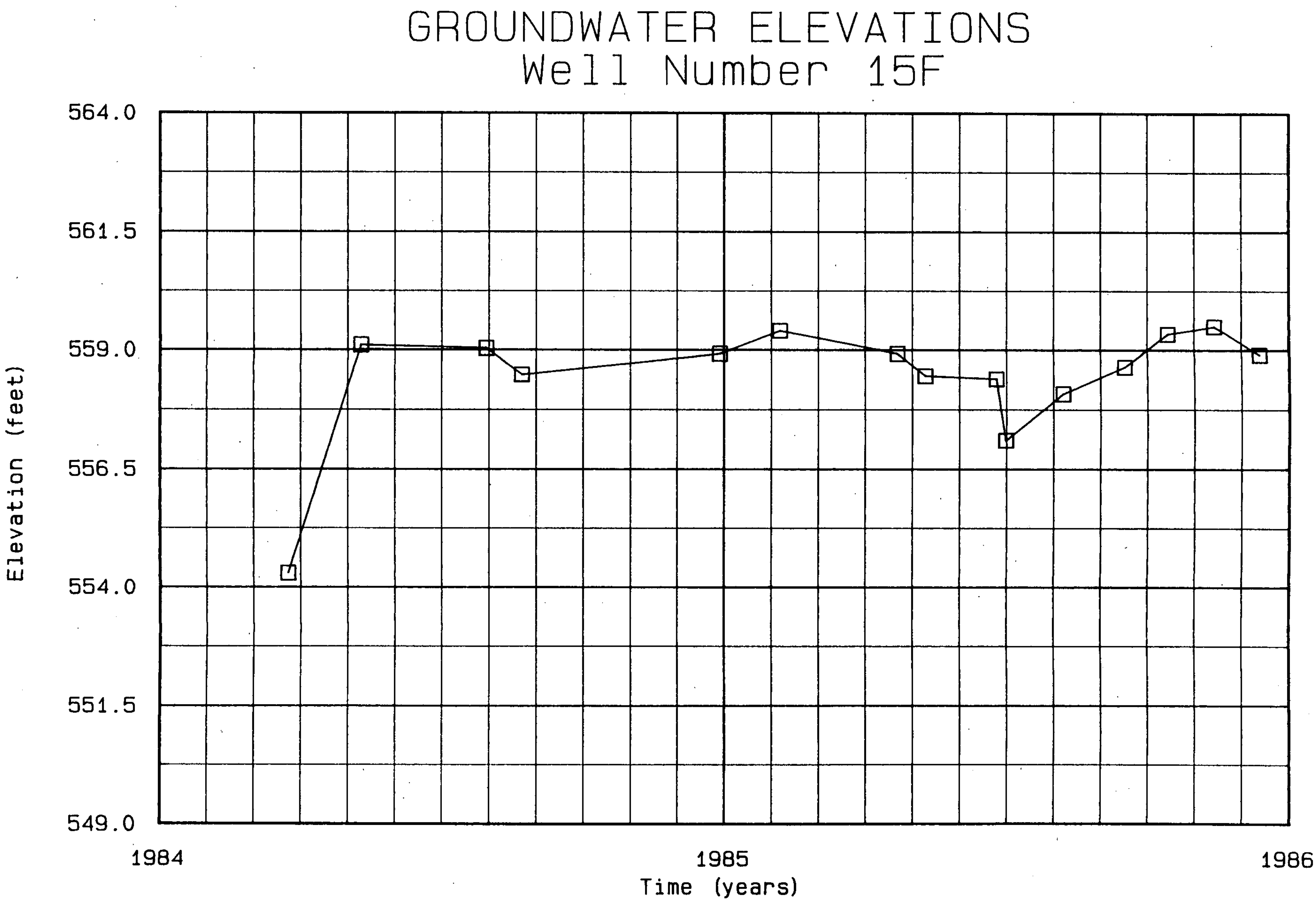


Plate A62



GROUNDWATER ELEVATIONS
Well Number 10F
564.0
562.0
560.0
558.0
556.0
554.0
552.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A63



GROUNDWATER ELEVATIONS
Well Number 15F
564.0
561.5
559.0
556.5
554.0
551.5
549.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A64

GROUNDWATER ELEVATIONS
Well Number 22F

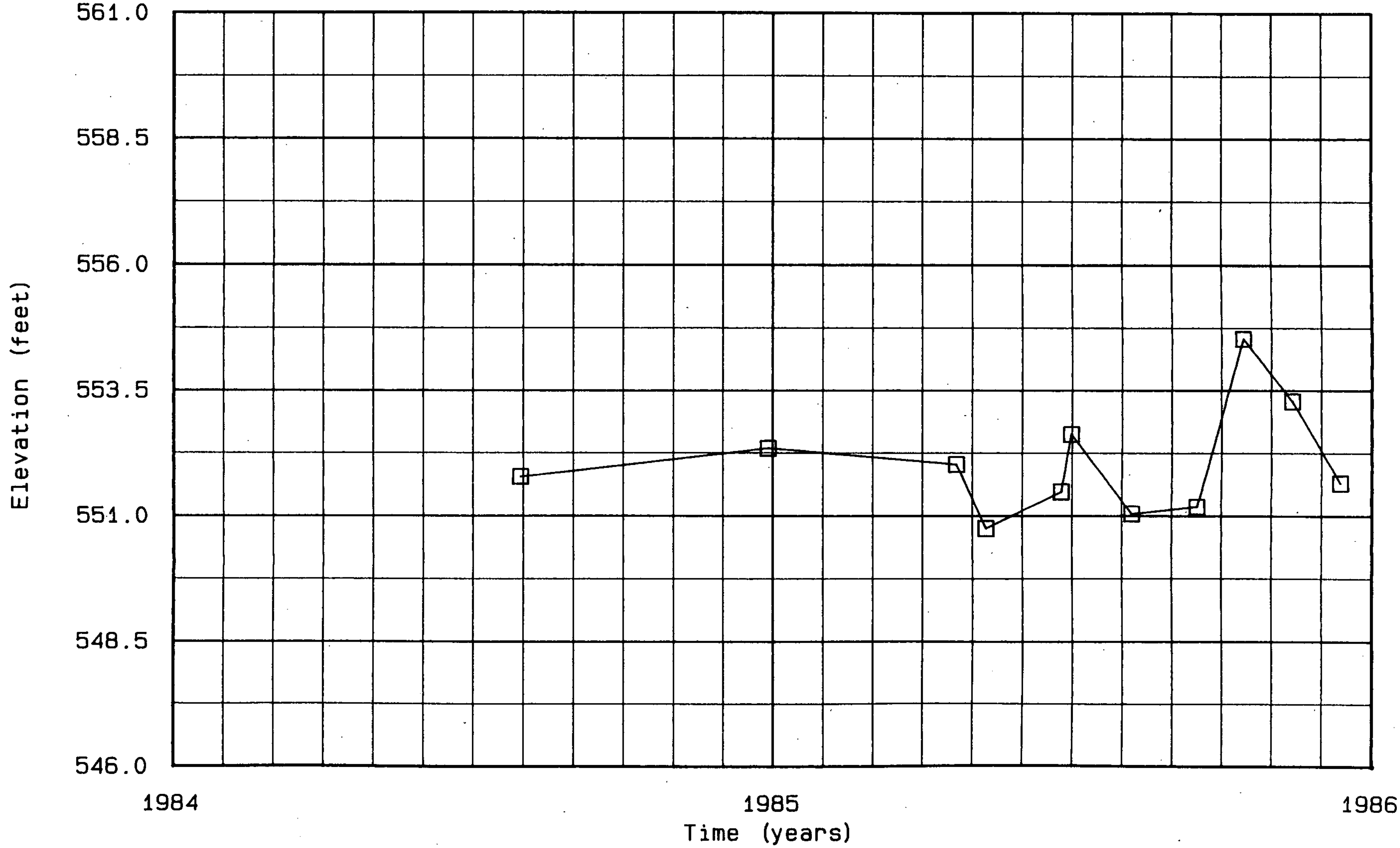


Plate A65

GROUNDWATER ELEVATIONS
Well Number 23F

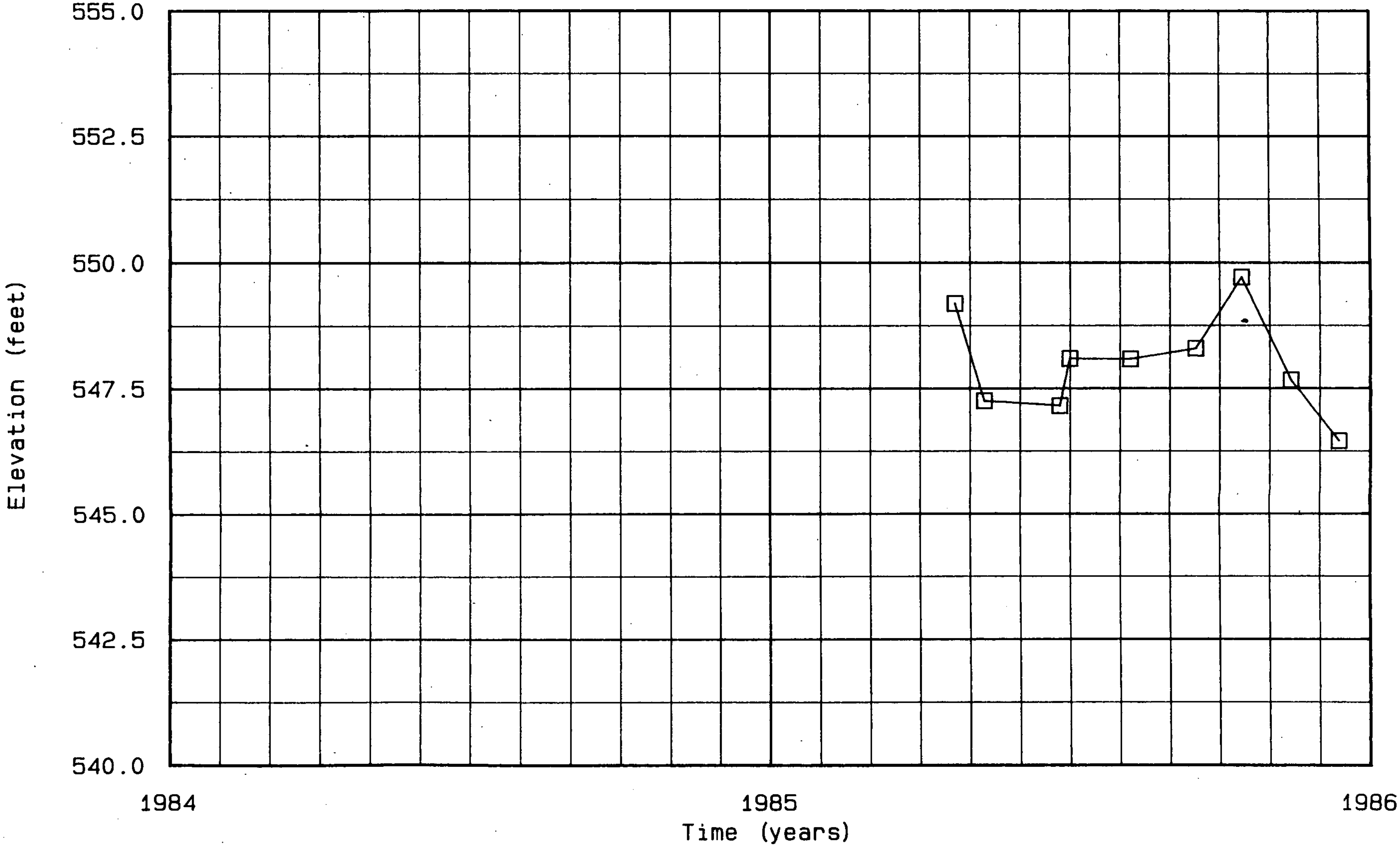


Plate A66

GROUNDWATER ELEVATIONS
Well Number 1J

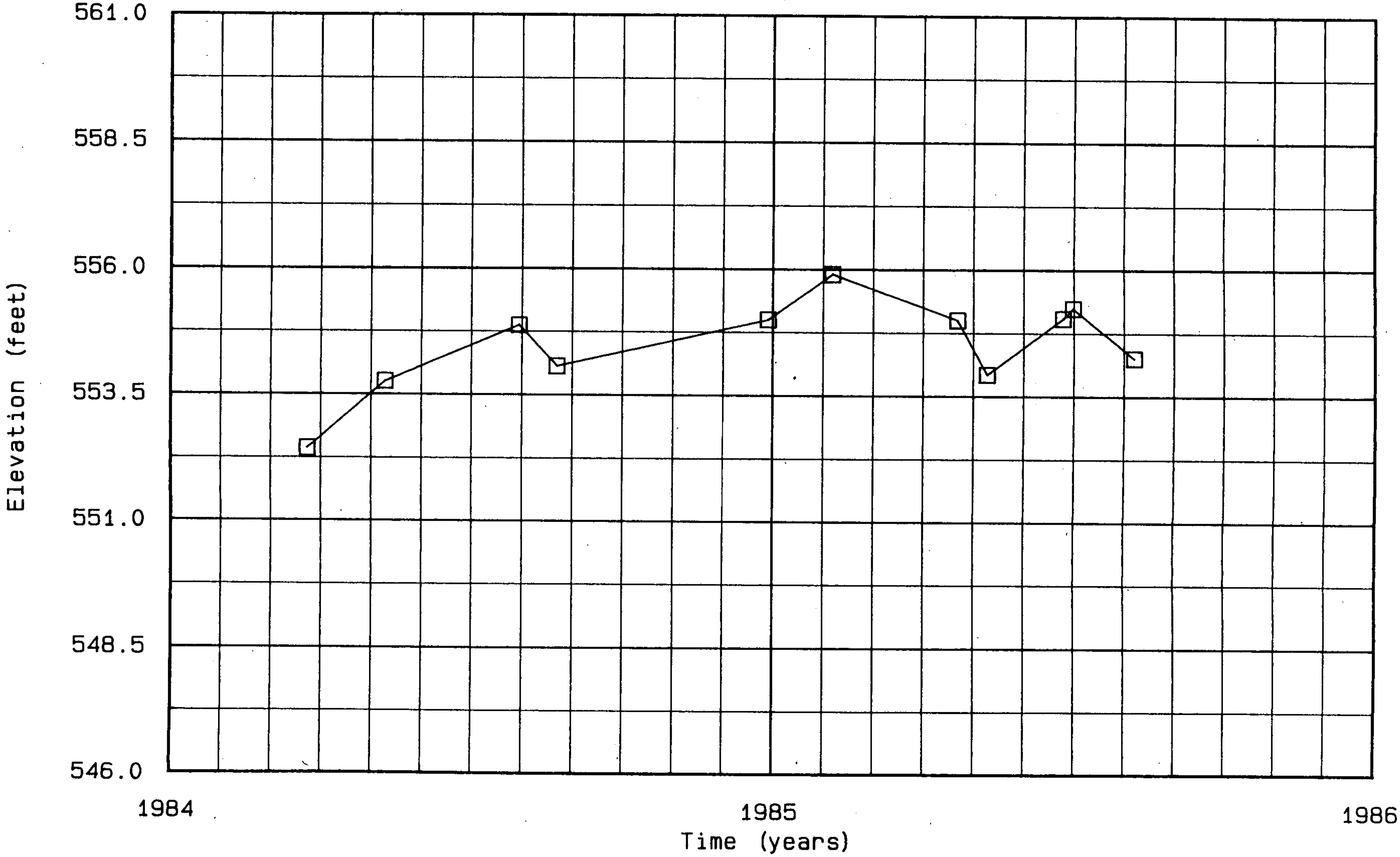


Plate A67

GROUNDWATER ELEVATIONS
Well Number 4J

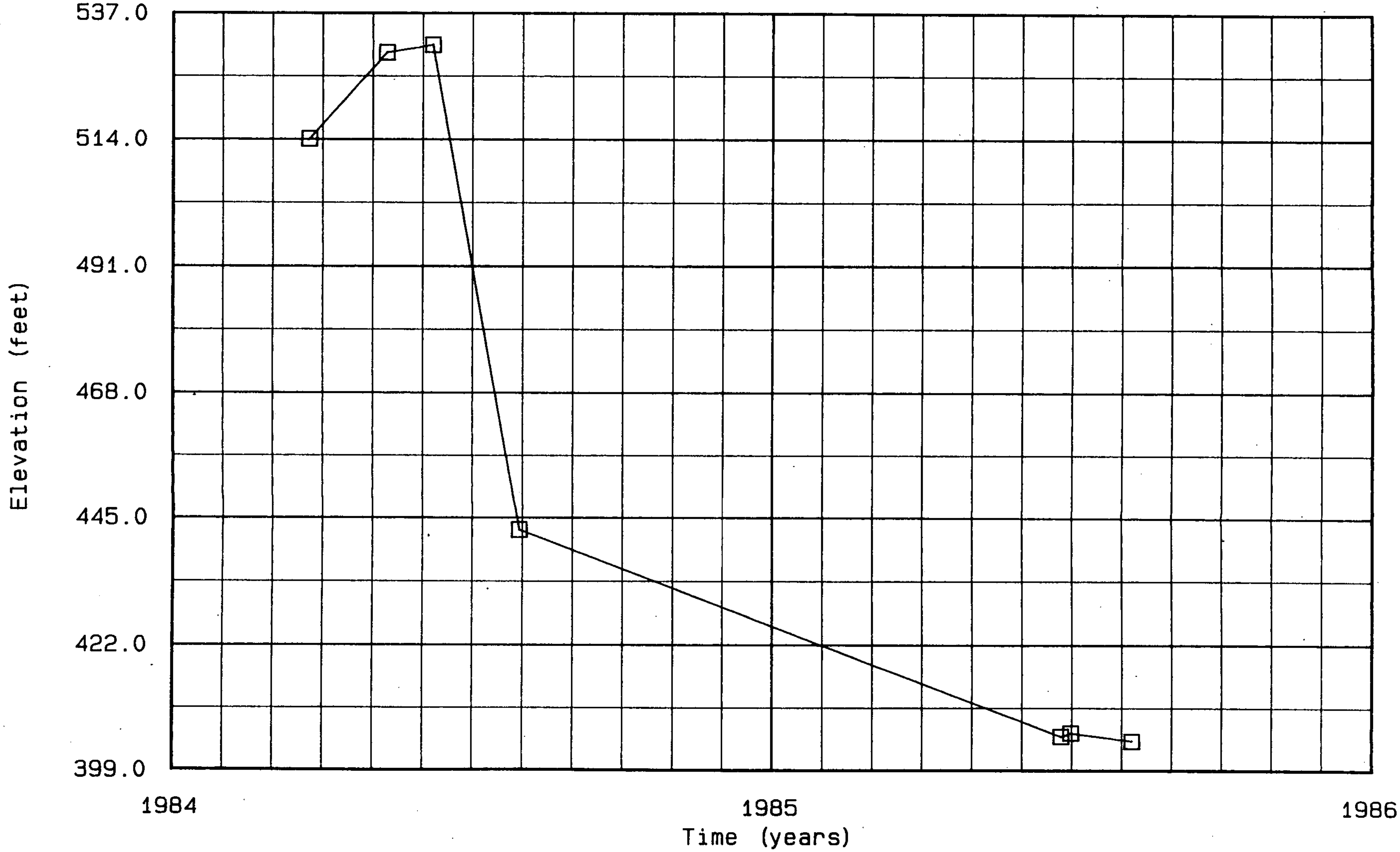


Plate A68

GROUNDWATER ELEVATIONS
Well Number 8J

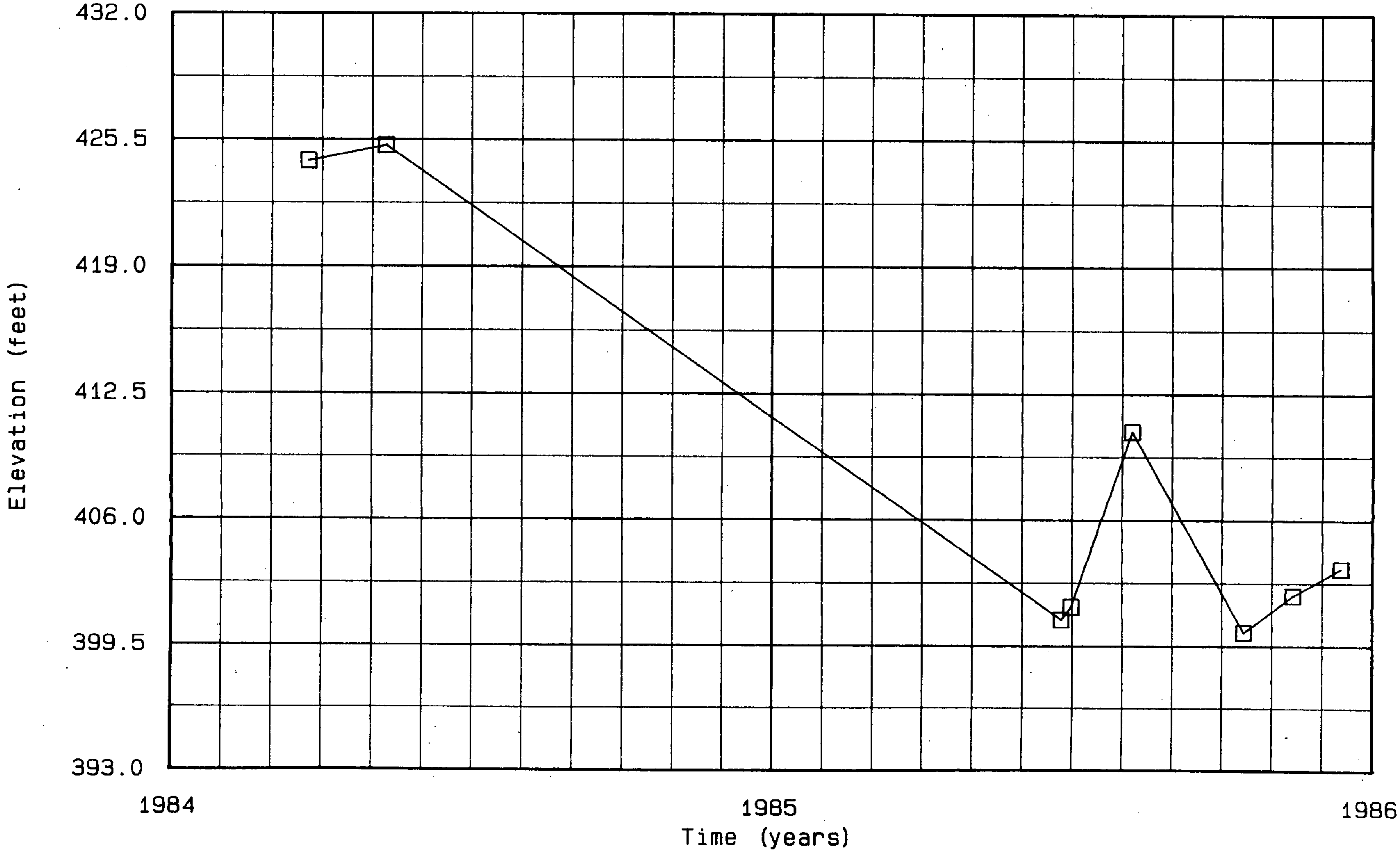


Plate A69

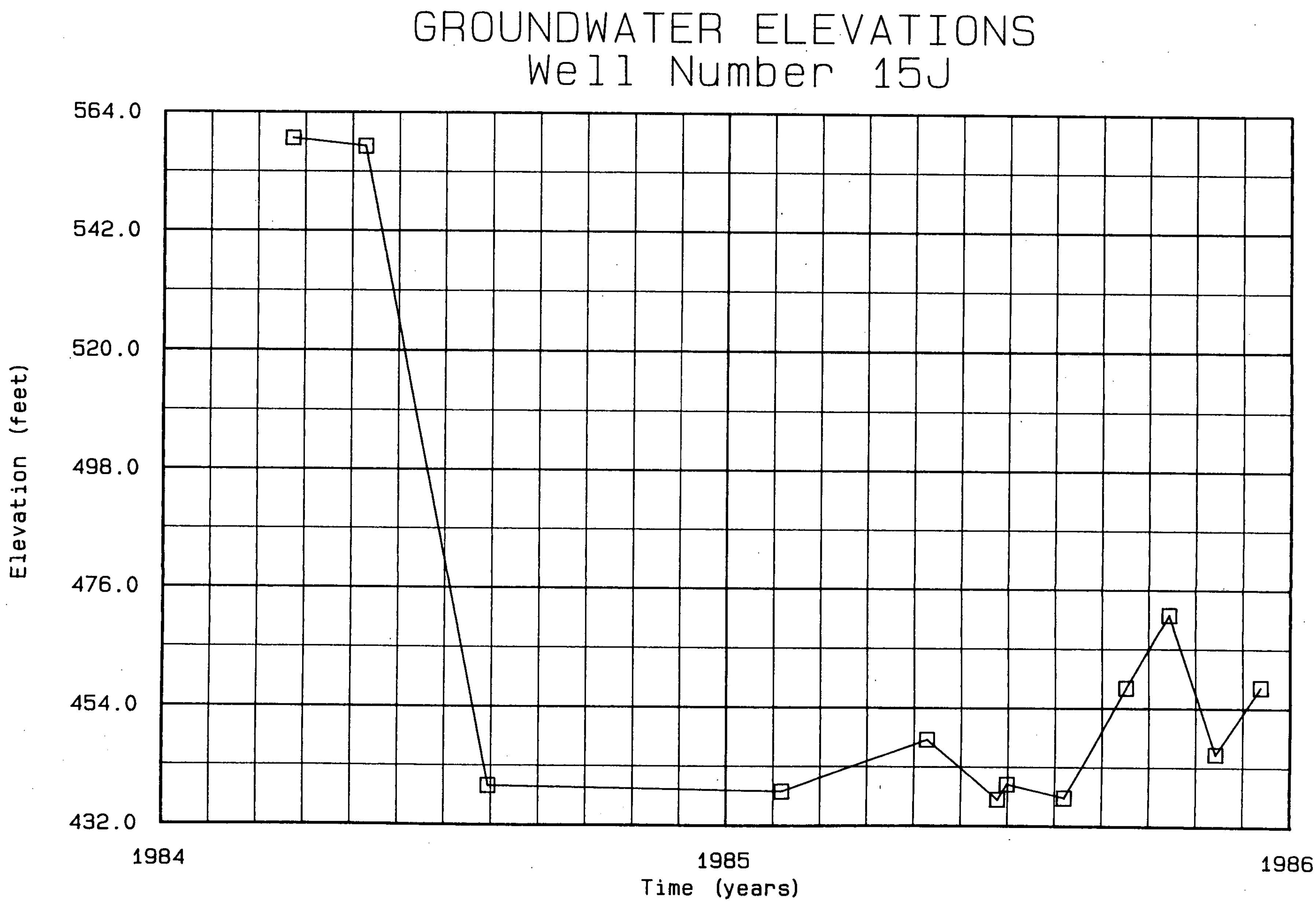
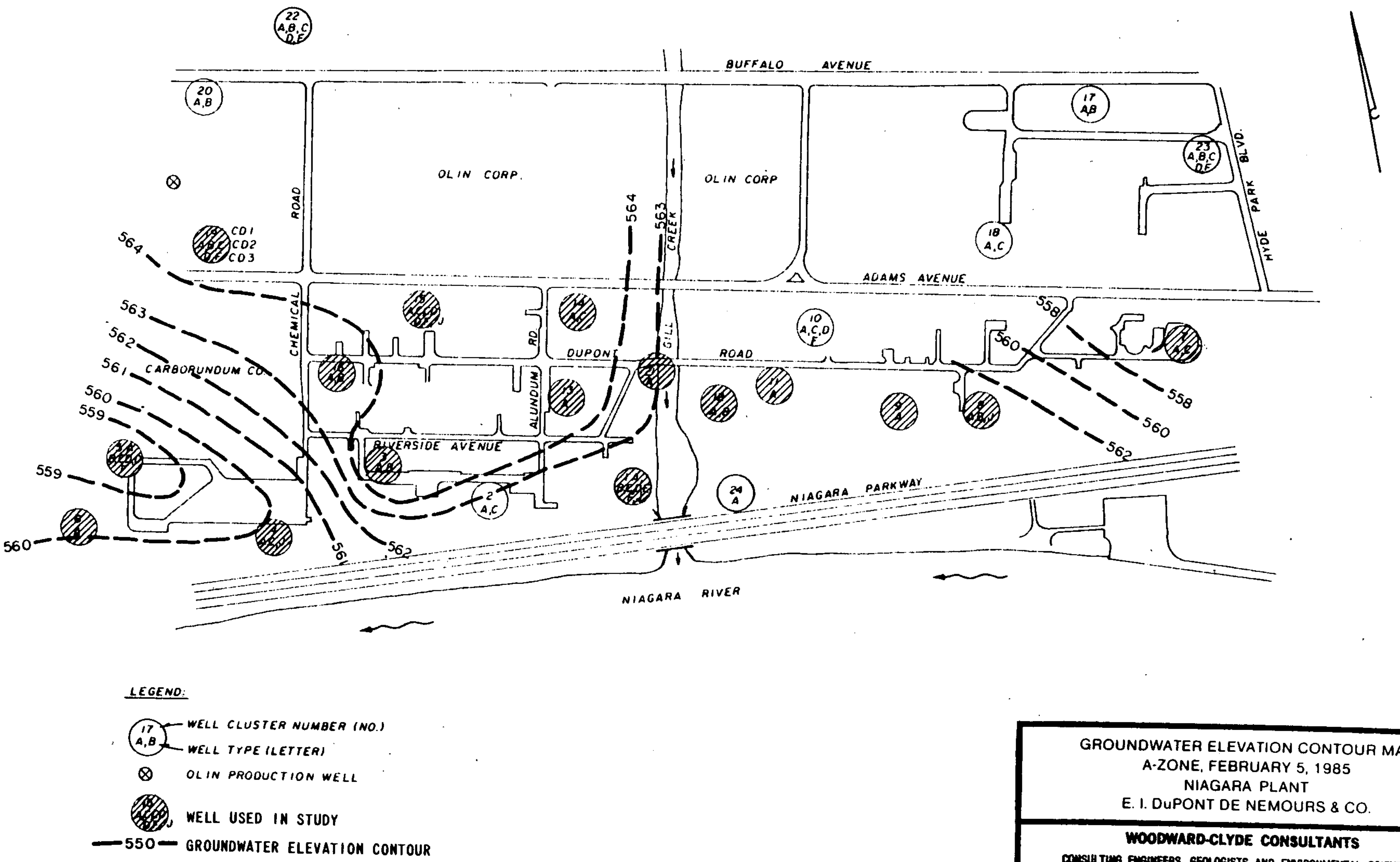

GROUNDWATER ELEVATIONS
Well Number 15J
564.0
542.0
520.0
498.0
476.0
454.0
432.0
Elevation (feet)
1984
1985
1986
Time (years)

Plate A70

Appendix B
Groundwater Contour Maps

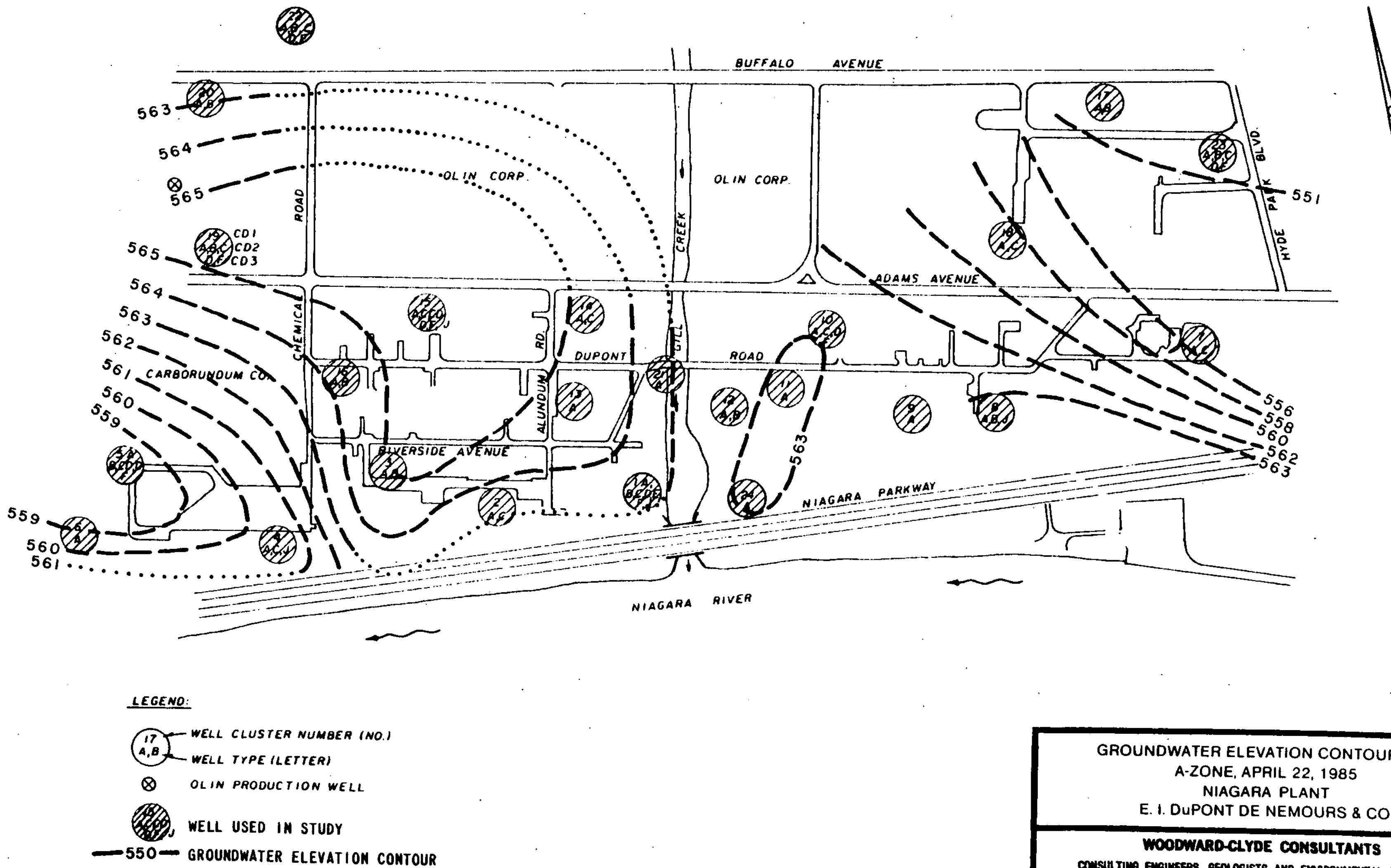


GROUNDWATER ELEVATION CONTOUR MAP
A-ZONE, FEBRUARY 5, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86	
CHECKED: K.R.M.		JOB: 83C2236-8	

FIGURE B-1

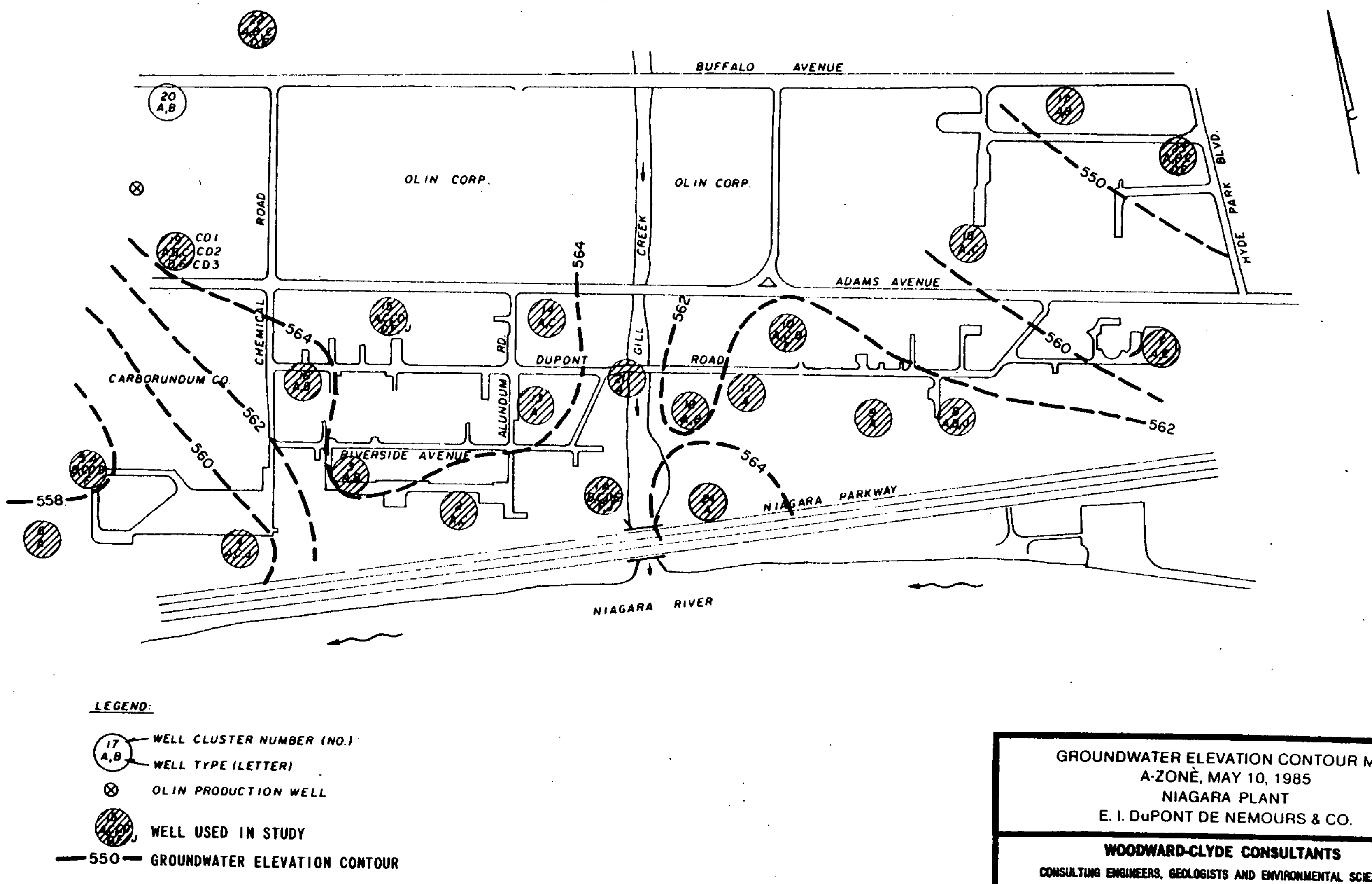


GROUNDWATER ELEVATION CONTOUR MAP
A-ZONE, APRIL 22, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY:	T.P.	SCALE in FEET 0 300	DATE:	3/21/86
CHECKED:	K.R.M.		JOB:	83C2236-8

FIGURE B-2



GROUNDWATER ELEVATION CONTOUR MAP
A-ZONE, MAY 10, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T. P.	SCALE in FEET 0 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-3

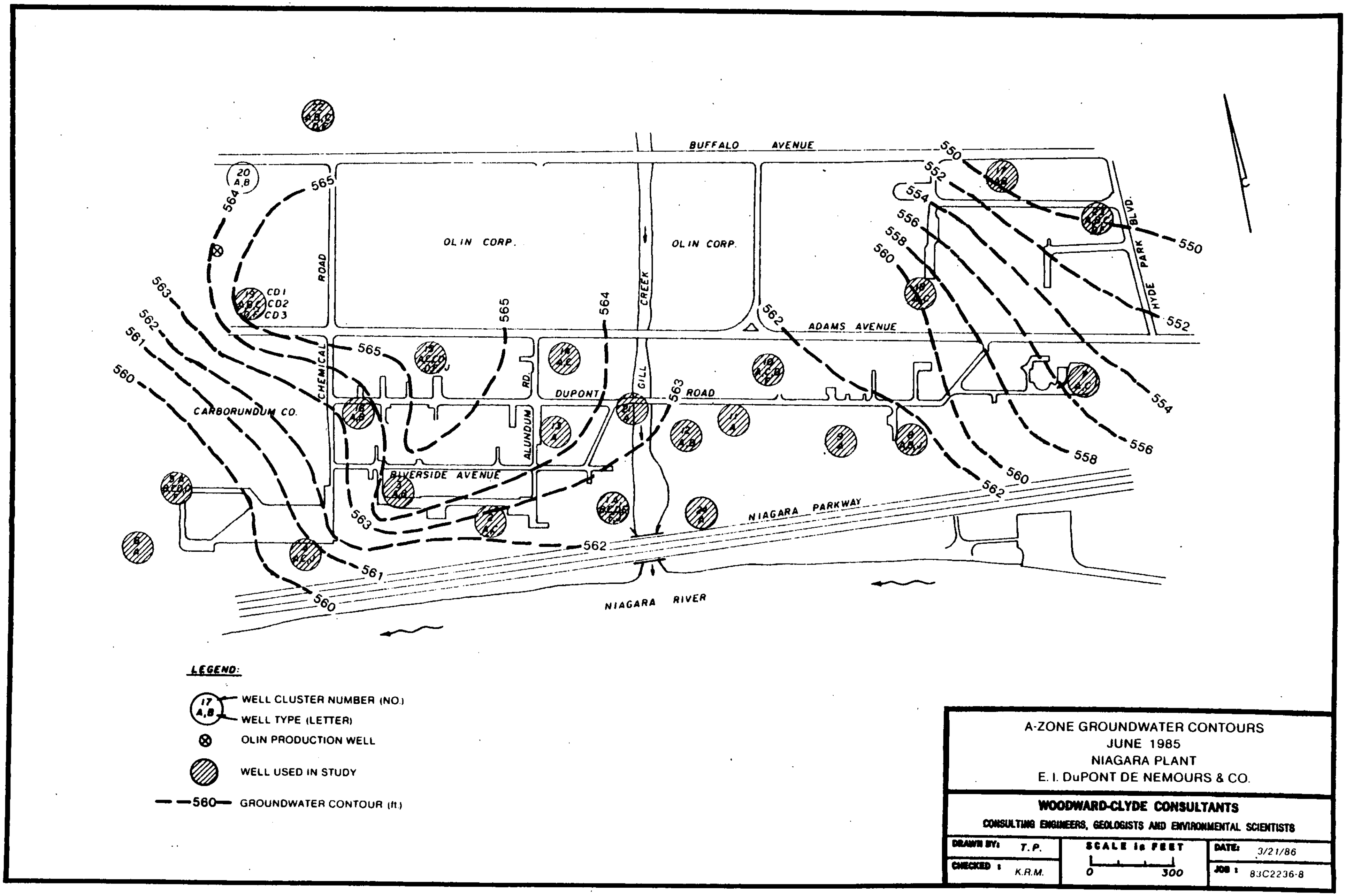
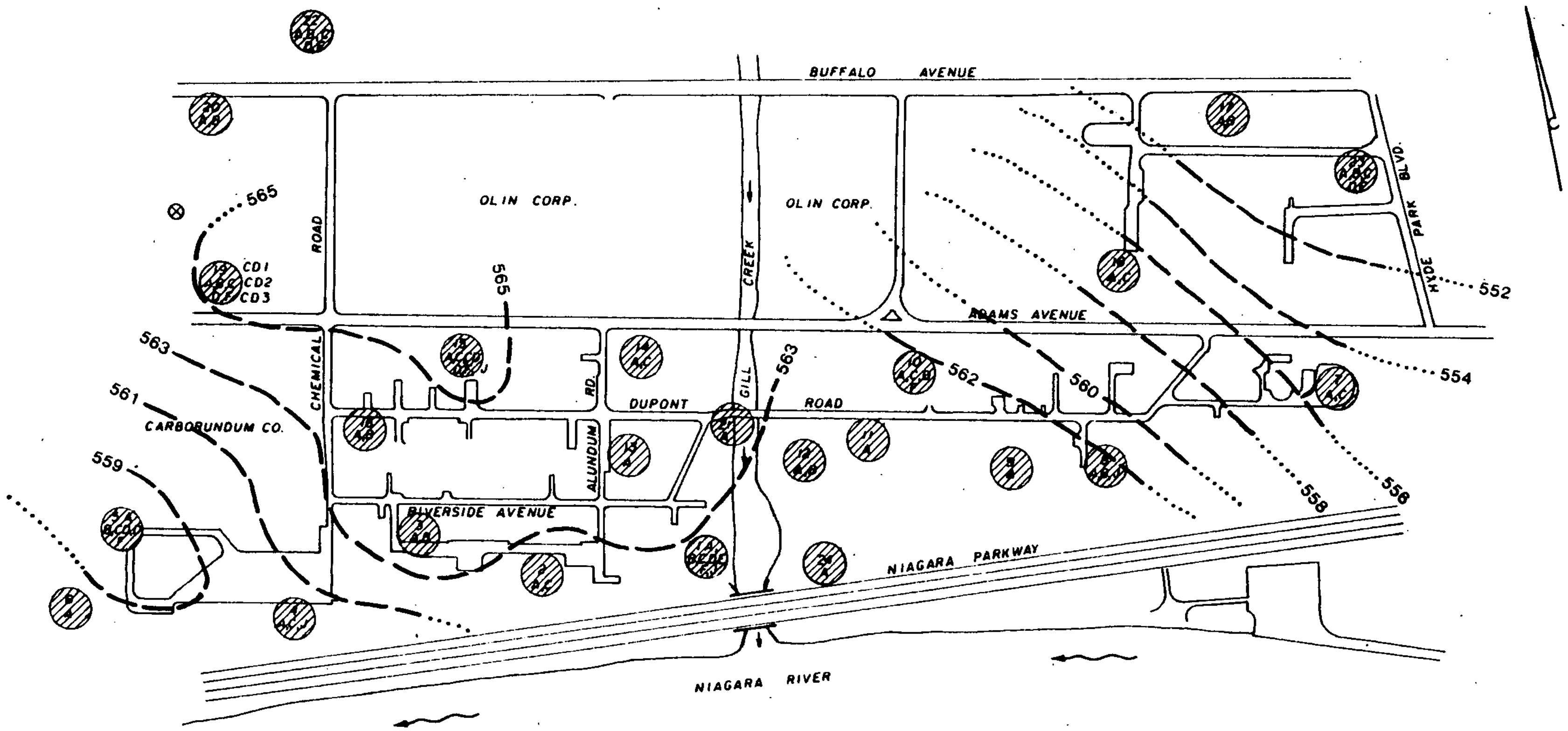

BUFFALO AVENUE
ADAMS AVENUE
HYDE PARK BLVD.
OLIN CORP.
OLIN CORP.
ROAD
CHEMICAL
CREEK
GILL
DUPONT ROAD
ALUNDUM RD.
RIVERSIDE AVENUE
CARBORUNDUM CO.
NIAGARA PARKWAY
NIAGARA RIVER
550
552
554
556
558
560
561
562
563
564
565
CD1
CD2
CD3
20 A,B
LEGEND:
WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft.)
A-ZONE GROUNDWATER CONTOURS
JUNE 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE in FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-4



LEGEND:

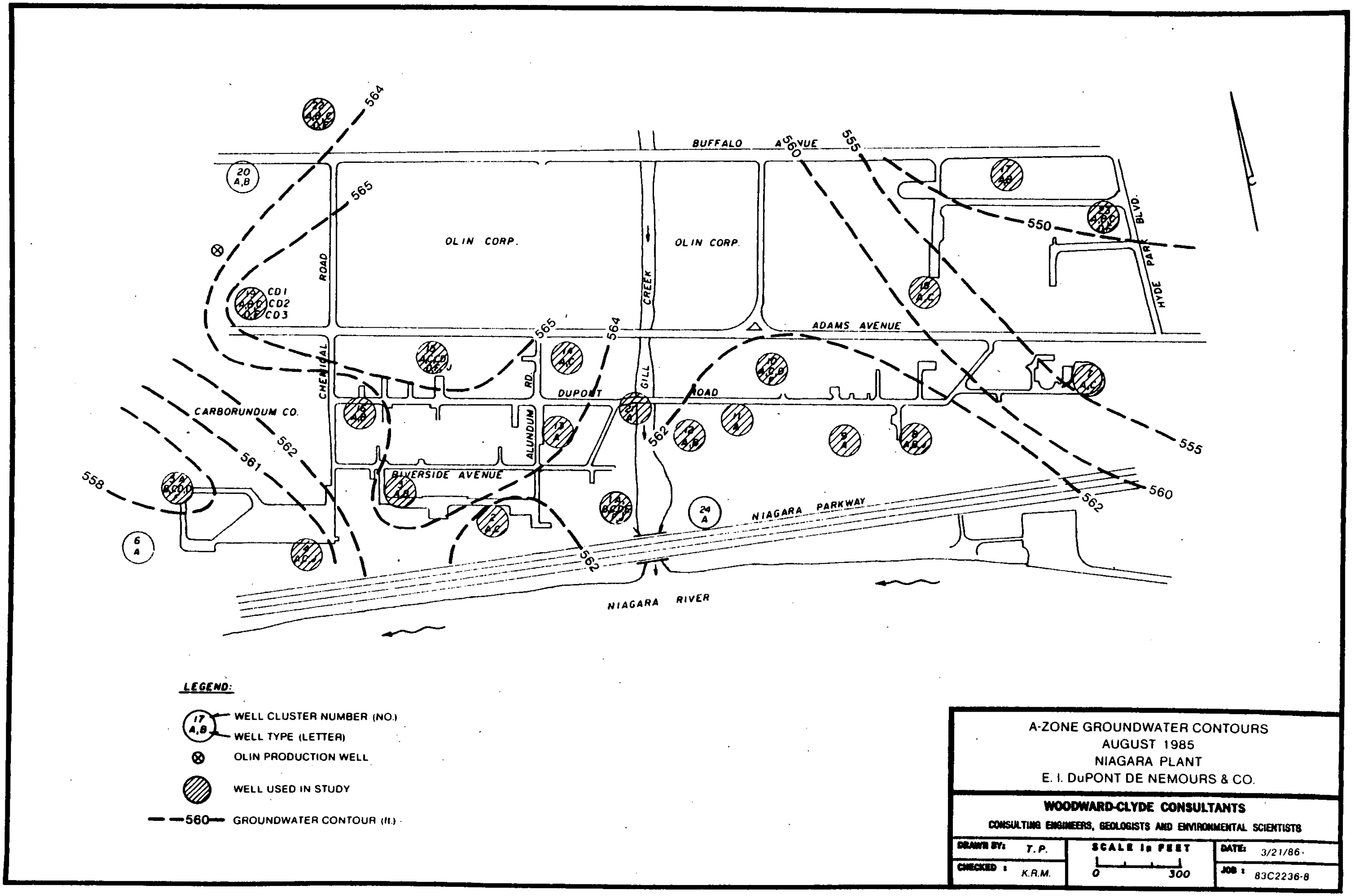
- 17 / A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- WELL USED IN STUDY
- ···—560— GROUNDWATER CONTOUR (ft.)

A-ZONE GROUNDWATER CONTOURS
JULY 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

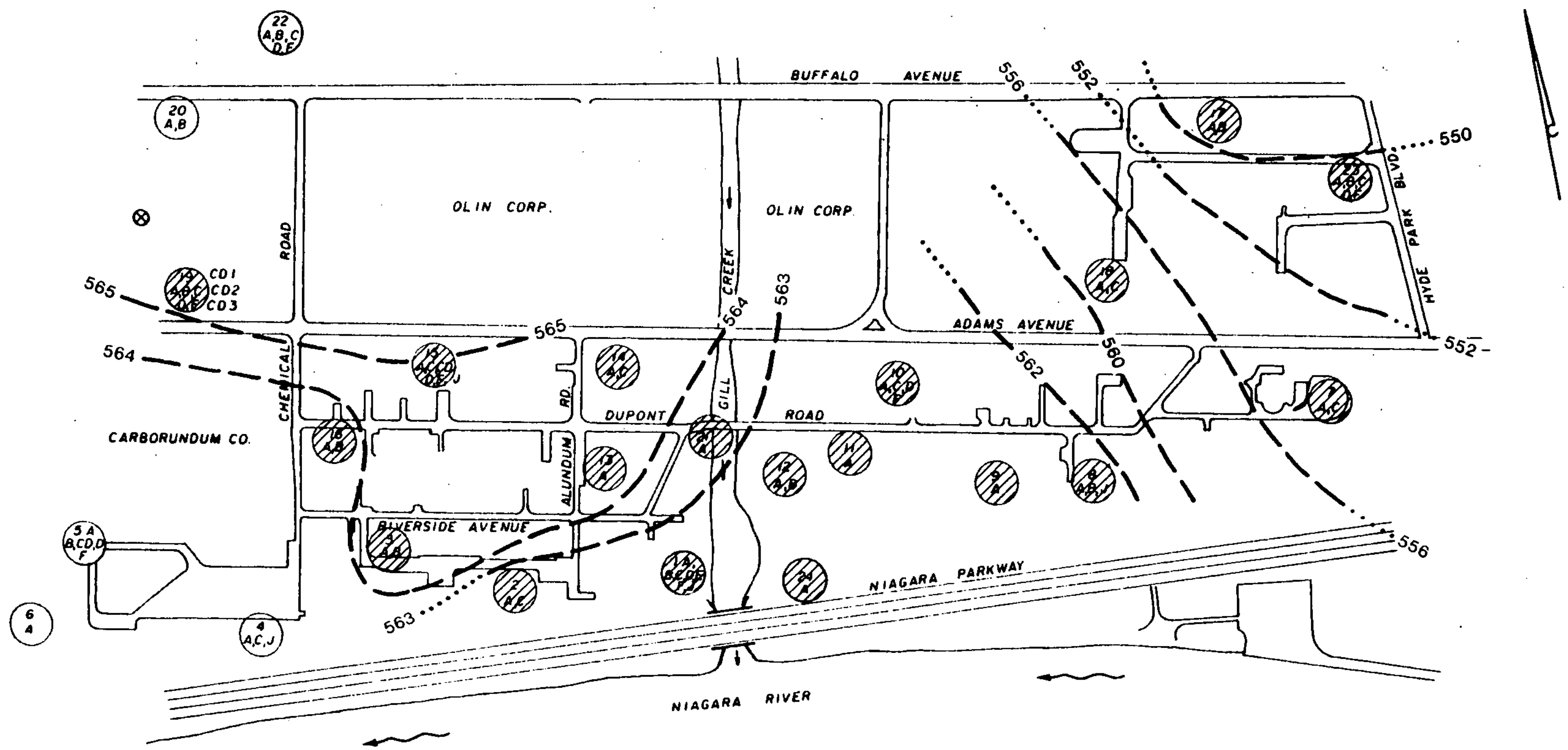
DRAWN BY: T.P.	SCALE in FEET		DATE: 3/21/86
CHECKED: K.R.M.	0 300		JOB: 83 C 2236-8

FIGURE B-5



BUFFALO AVENUE
ADAMS AVENUE
HYDE PARK BLVD.
OLIN CORP.
OLIN CORP.
GILL CREEK
DUPONT ROAD
CHEMICAL ROAD
ALUNDUM RD.
RIVERSIDE AVENUE
CARBORUNDUM CO.
NIAGARA PARKWAY
NIAGARA RIVER
CD1
CD2
CD3
550
555
560
562
564
565
561
558
LEGEND:
WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft.)
A-ZONE GROUNDWATER CONTOURS
AUGUST 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T. P.
CHECKED: K.R.M.
SCALE in FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-6



LEGEND:

- WELL CLUSTER NUMBER (NO.)
- WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- WELL USED IN STUDY
- ···—560— GROUNDWATER CONTOUR (ft.)

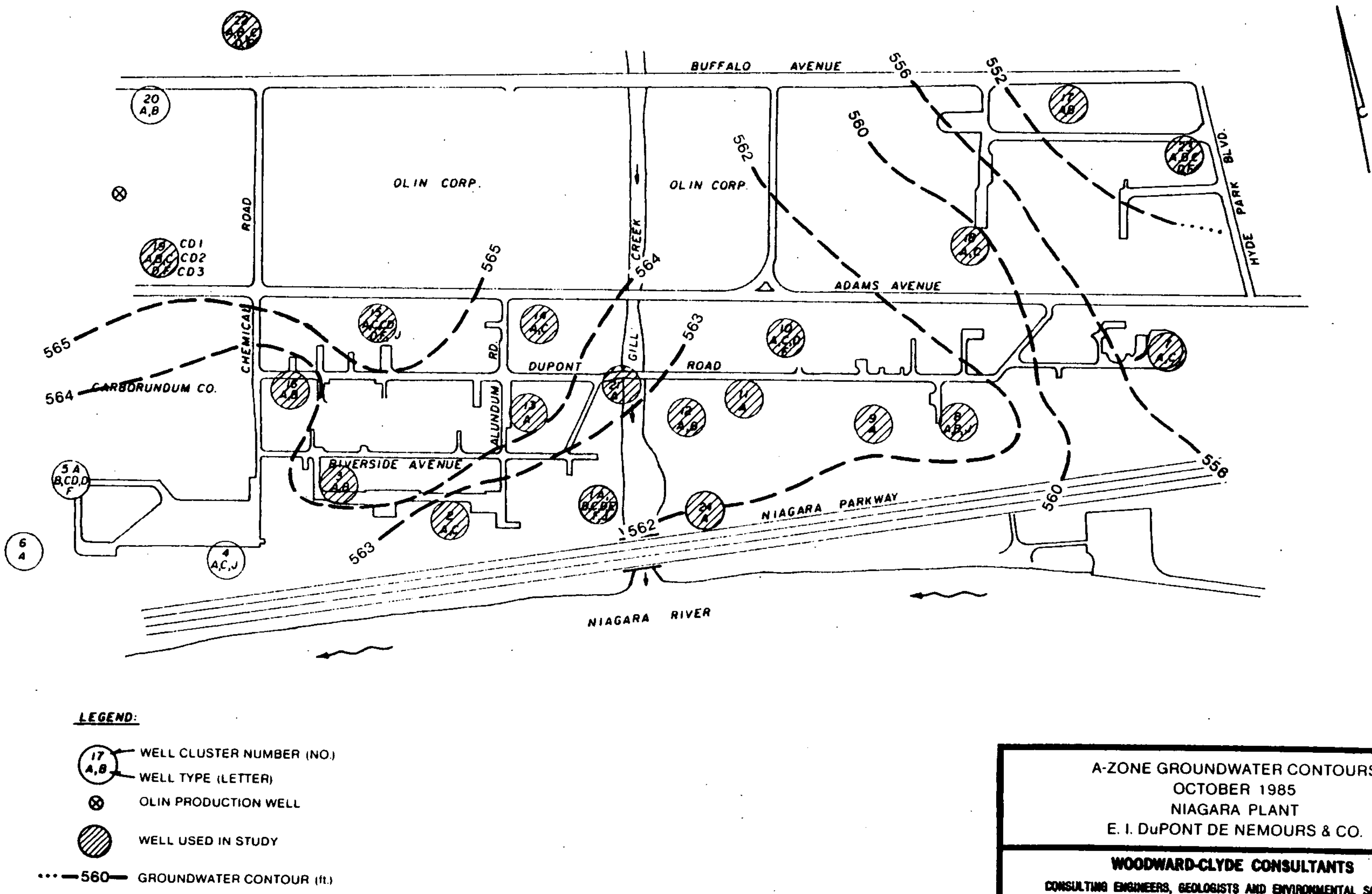
A-ZONE GROUNDWATER CONTOURS
SEPTEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

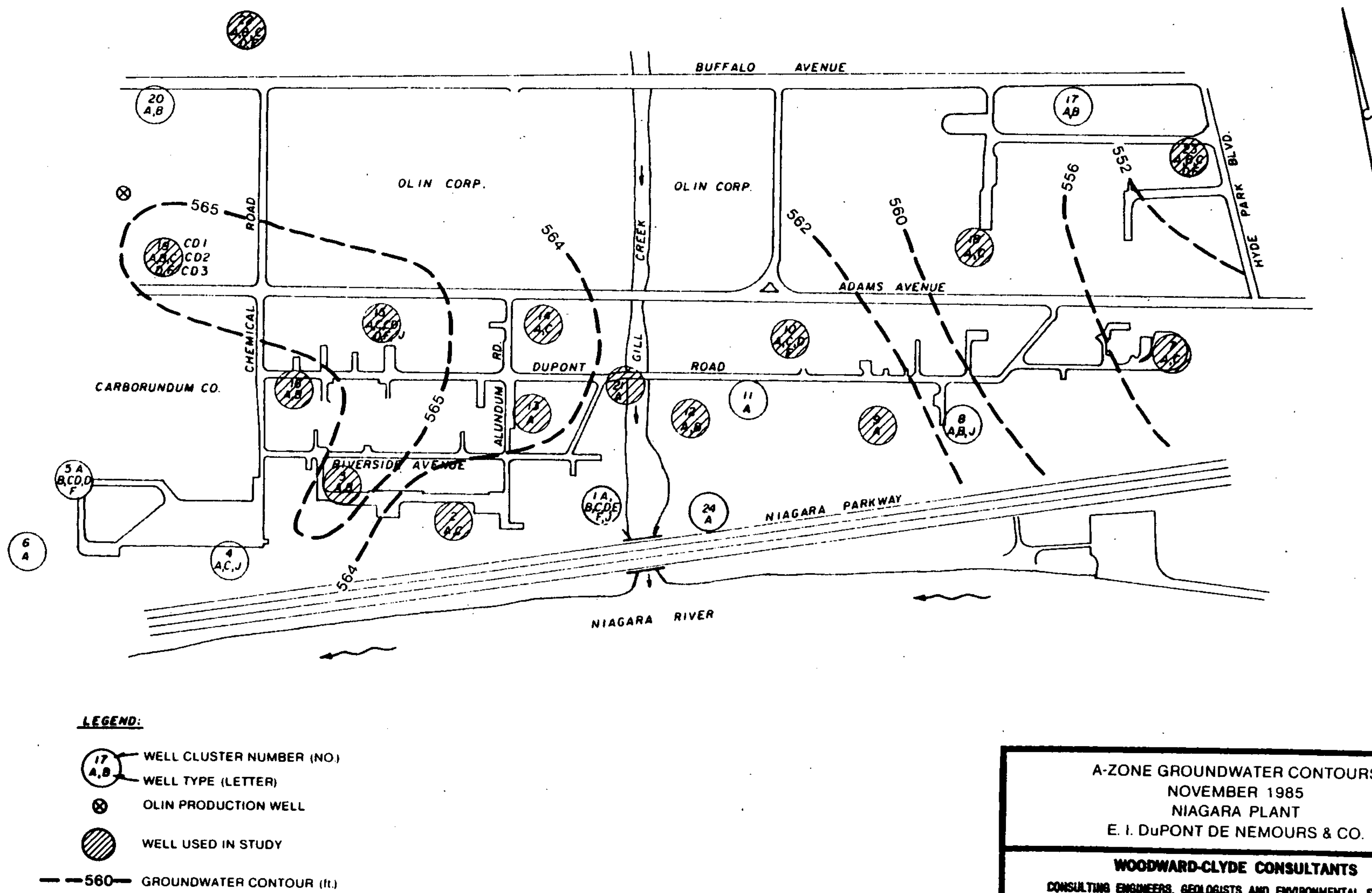
DRAWN BY: T.P.	SCALE in FEET	DATE: 3/21/86
CHECKED: K.R.M.	0 — 300	JOB: 83C2236-8

FIGURE B-7



A-ZONE GROUNDWATER CONTOURS OCTOBER 1985 NIAGARA PLANT E. I. DuPONT DE NEMOURS & CO.			
WOODWARD-CLYDE CONSULTANTS CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS			
DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86	
CHECKED: K.R.M.		JOB: 83C2236-8	

FIGURE B-8

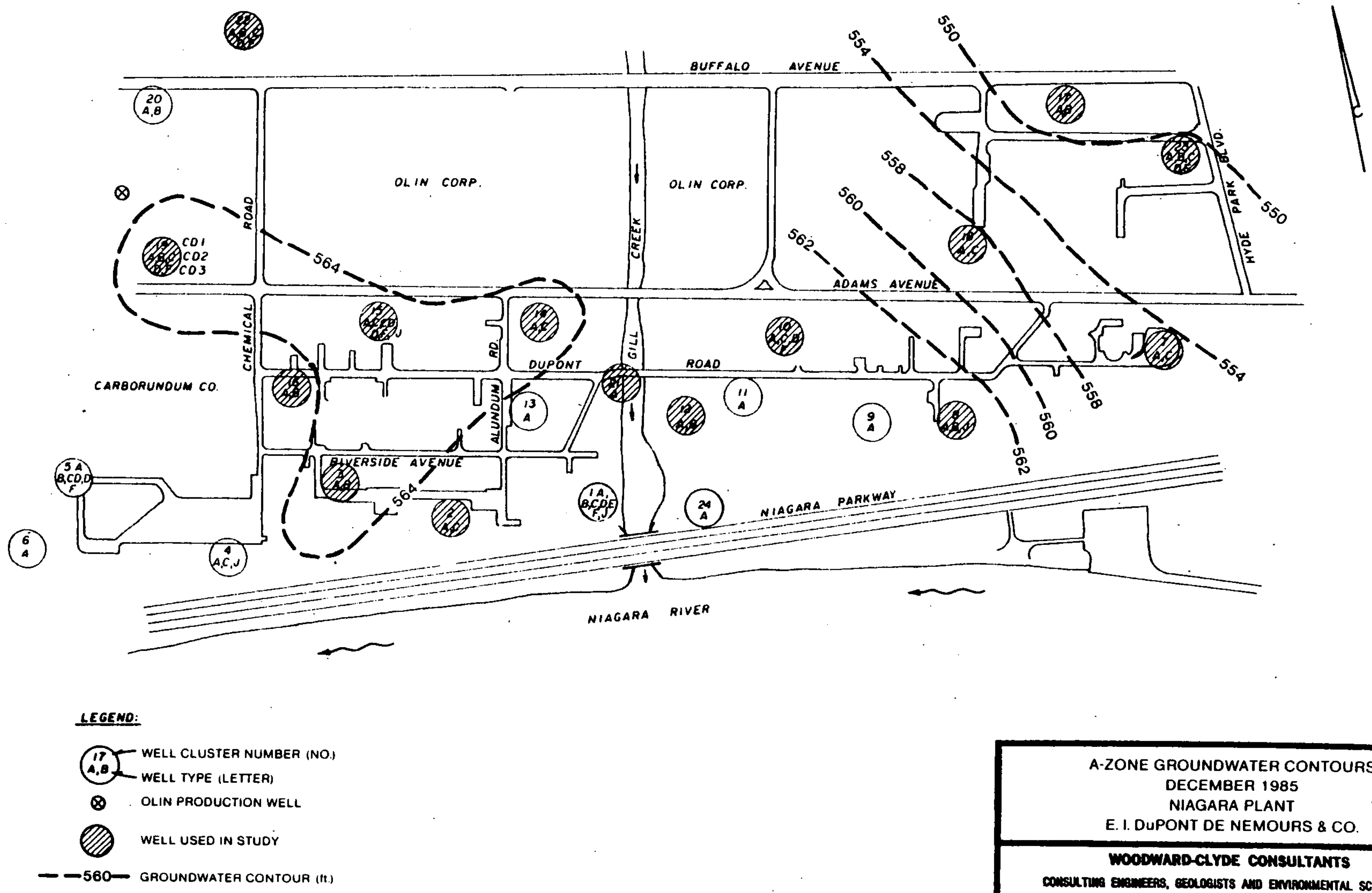


A-ZONE GROUNDWATER CONTOURS
NOVEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-9

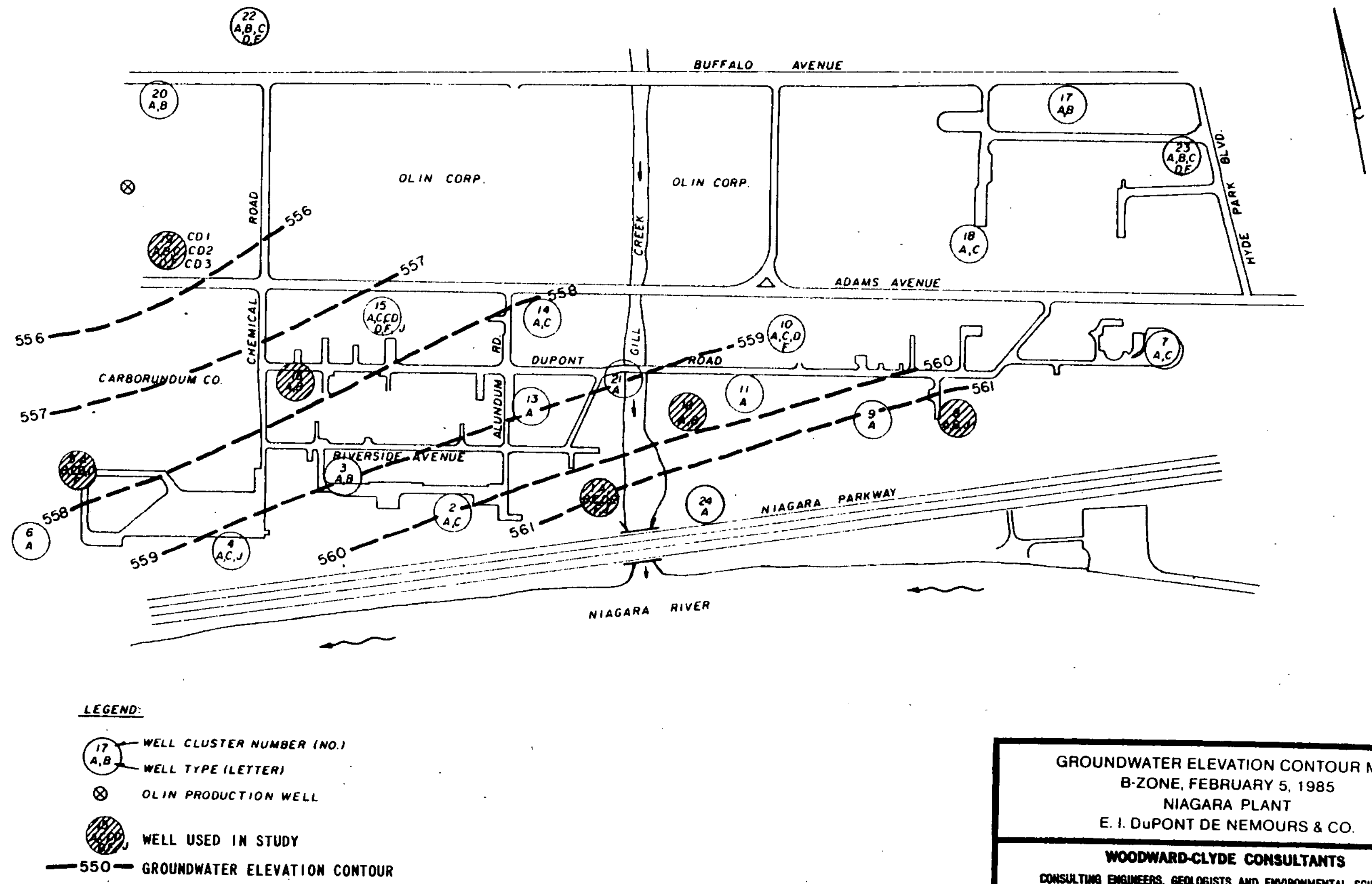


A-ZONE GROUNDWATER CONTOURS
DECEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-10

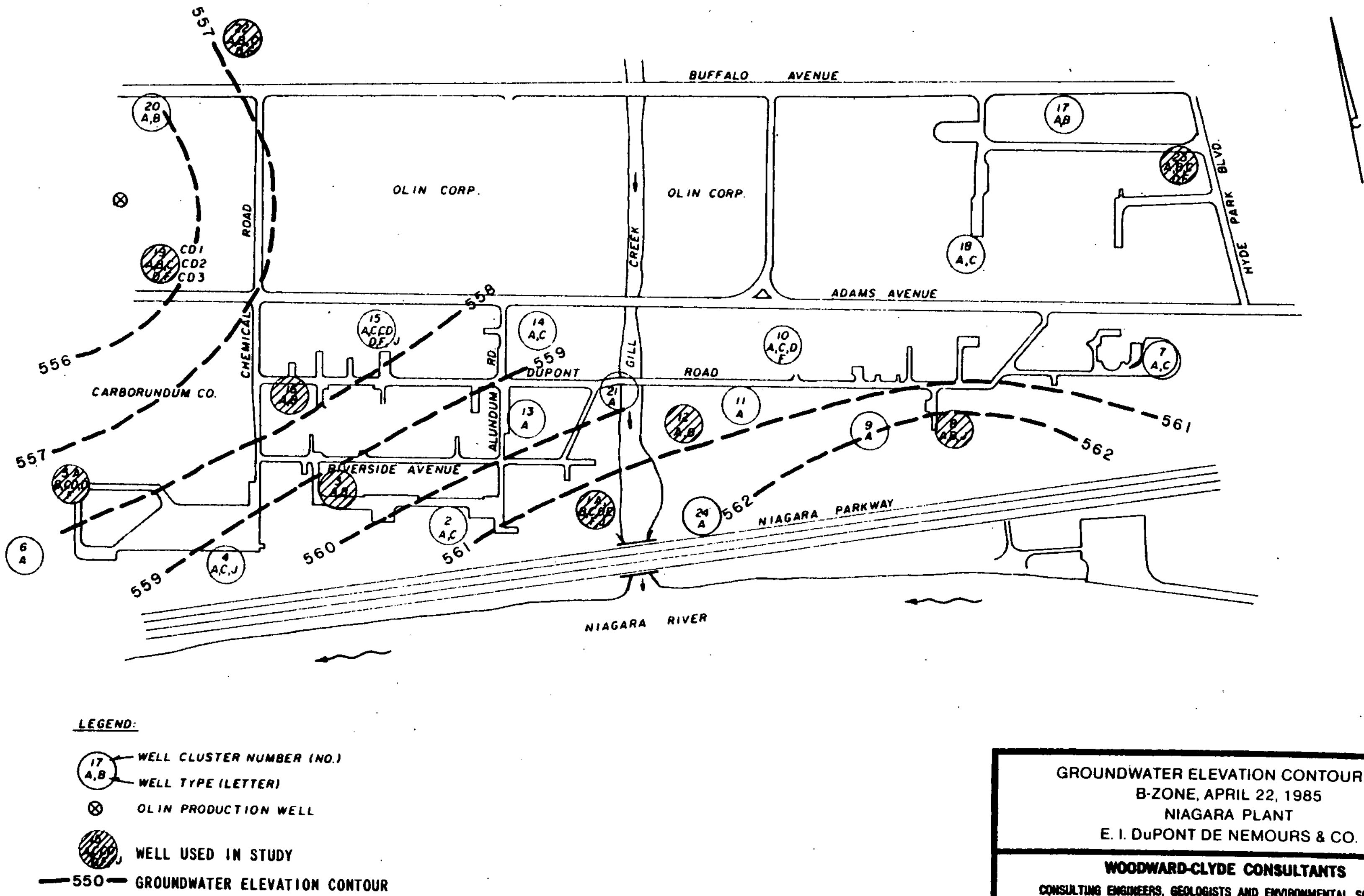


GROUNDWATER ELEVATION CONTOUR MAP
B-ZONE, FEBRUARY 5, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	0 — 300	DATE: 3/21/86
CHECKED: K.R.M.			JOB: 83C2236-8

FIGURE B-11

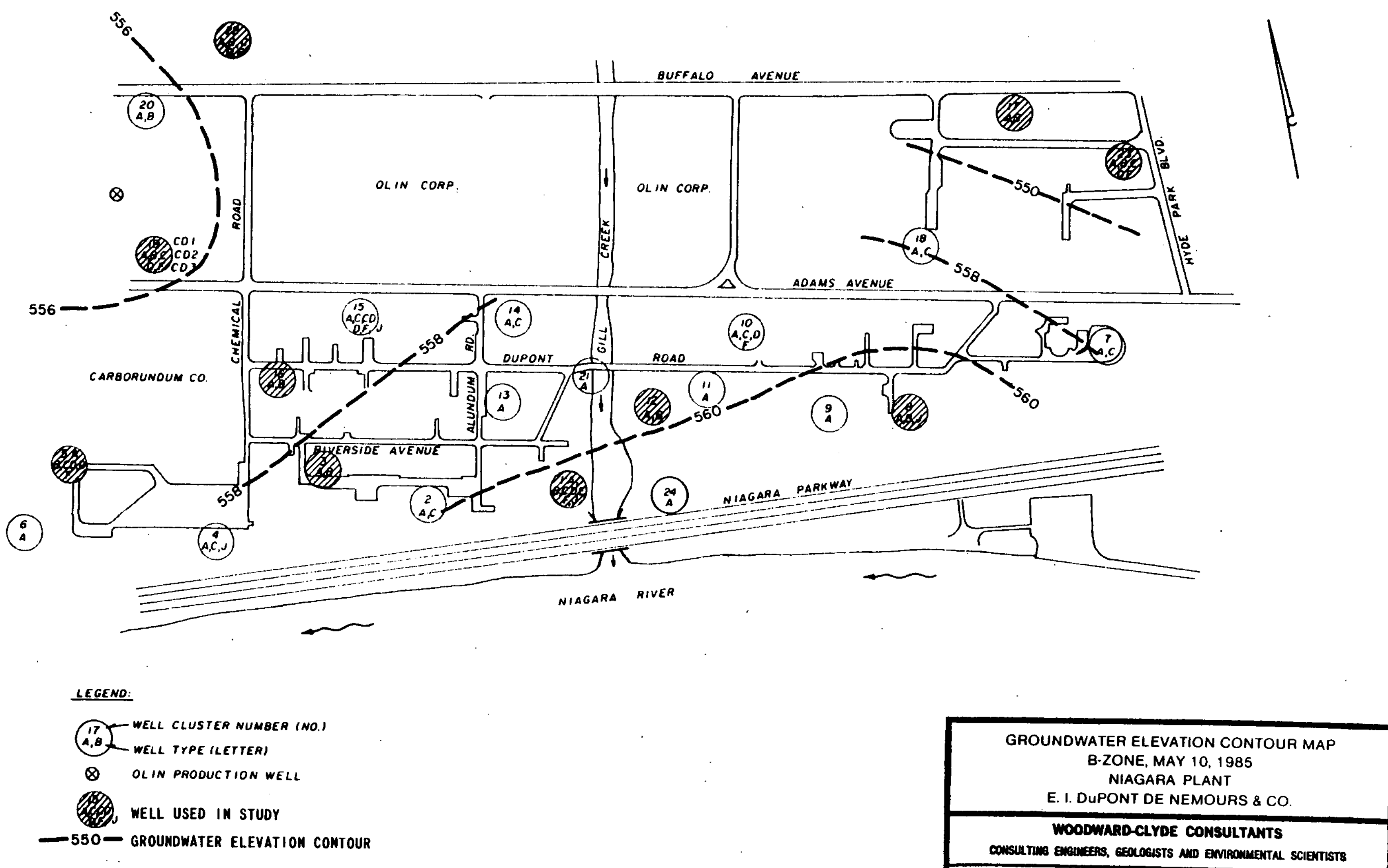


GROUNDWATER ELEVATION CONTOUR MAP
B-ZONE, APRIL 22, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-12

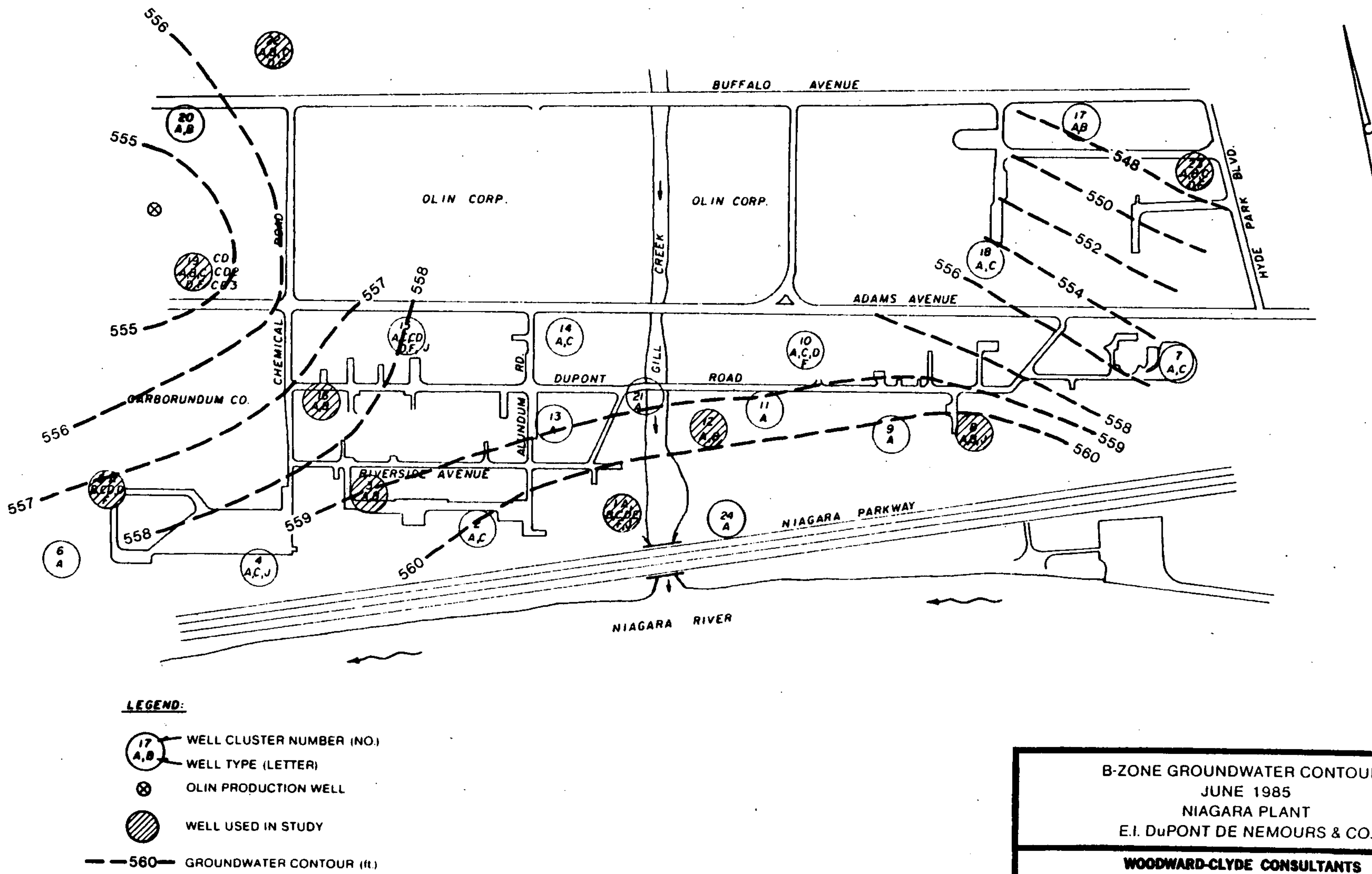


GROUNDWATER ELEVATION CONTOUR MAP
B-ZONE, MAY 10, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY:	T.P.	SCALE in FEET		DATE:	3/21/86
CHECKED:	K.R.M.	0	300	JOB:	83C2236-8

FIGURE B-13

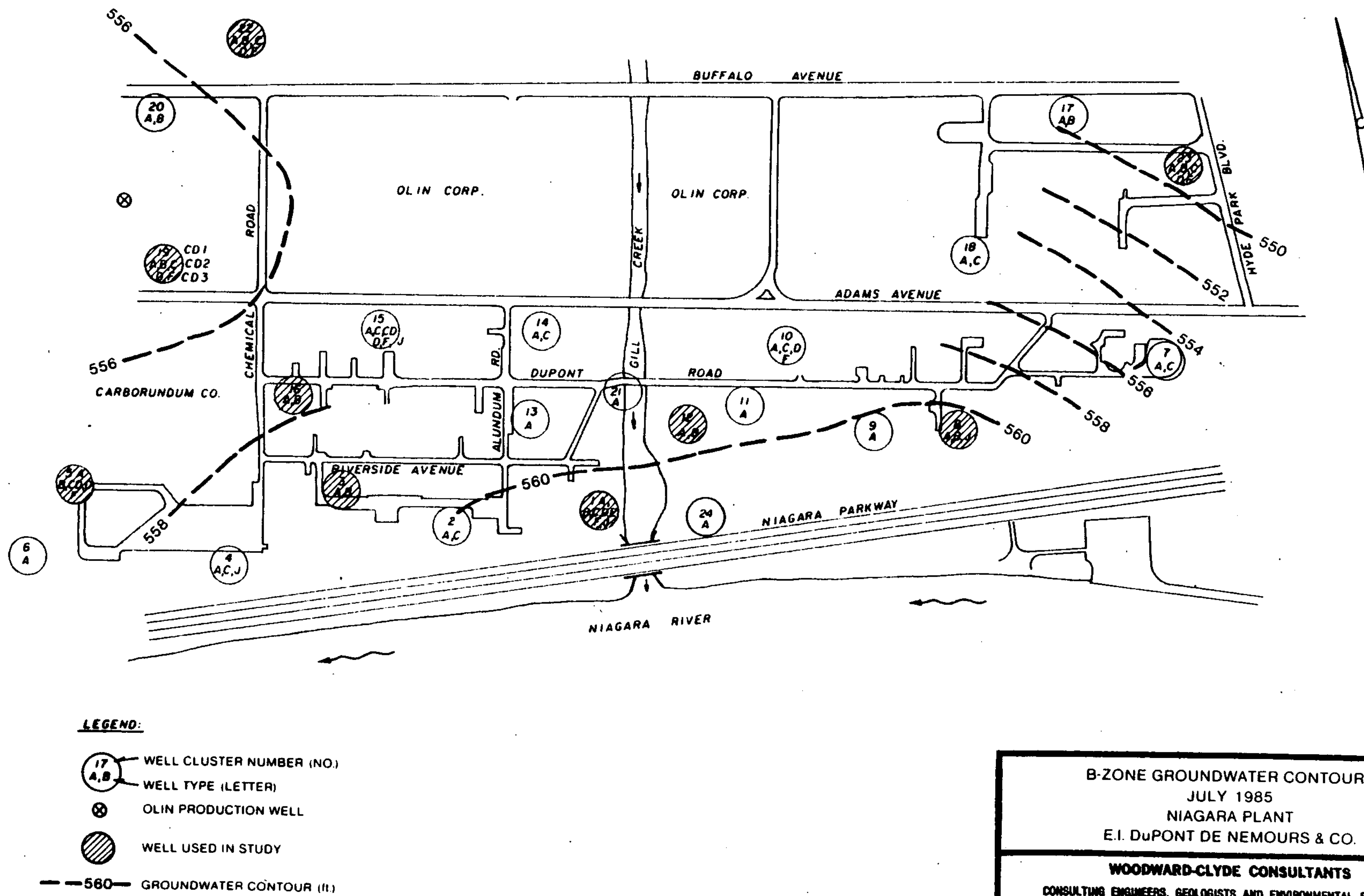


B-ZONE GROUNDWATER CONTOURS
JUNE 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 3/21/86	
CHECKED: K.R.M.	0 300	JOB: 83C2236-8	

FIGURE B-14

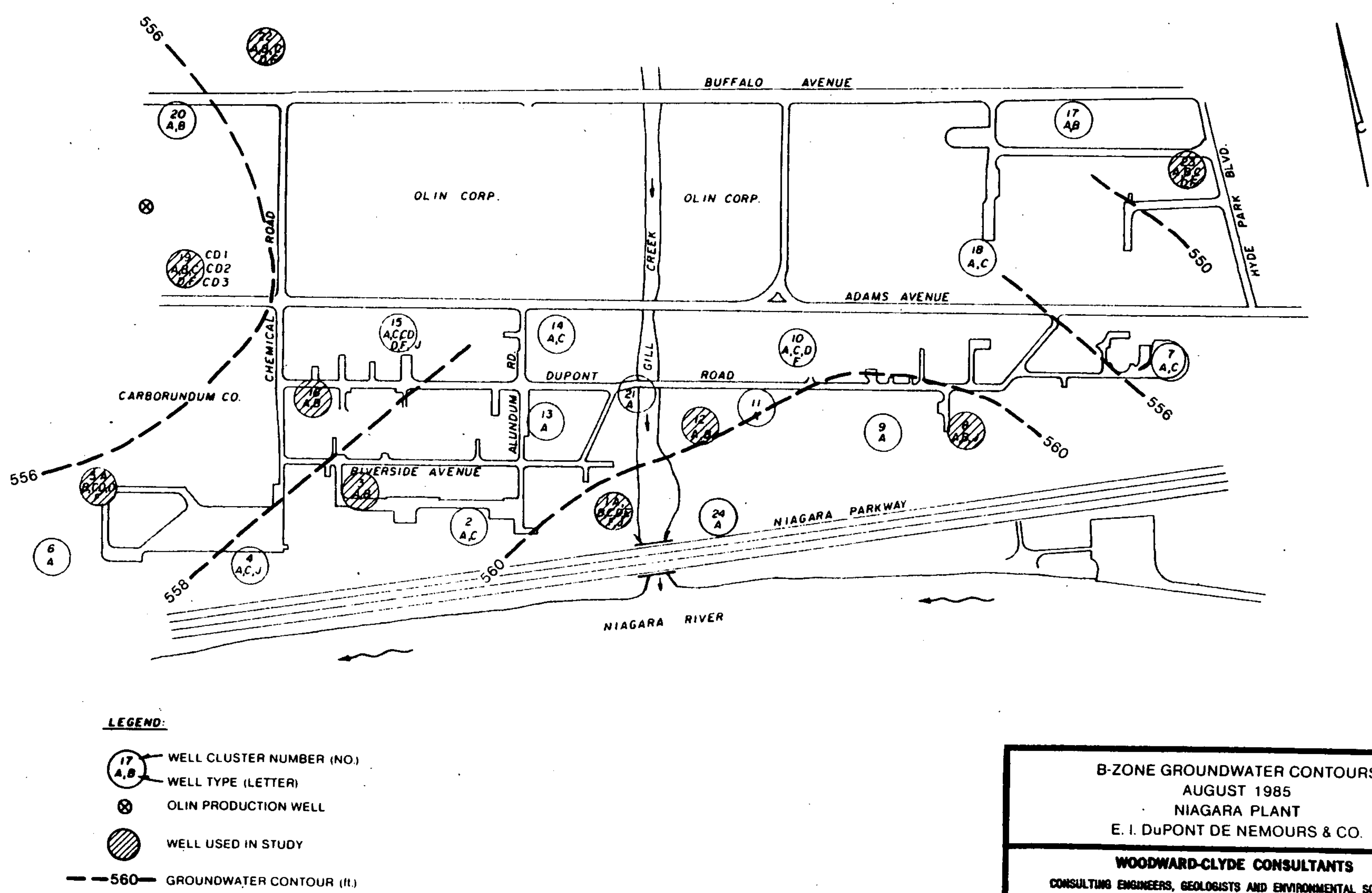


B-ZONE GROUNDWATER CONTOURS
JULY 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-15

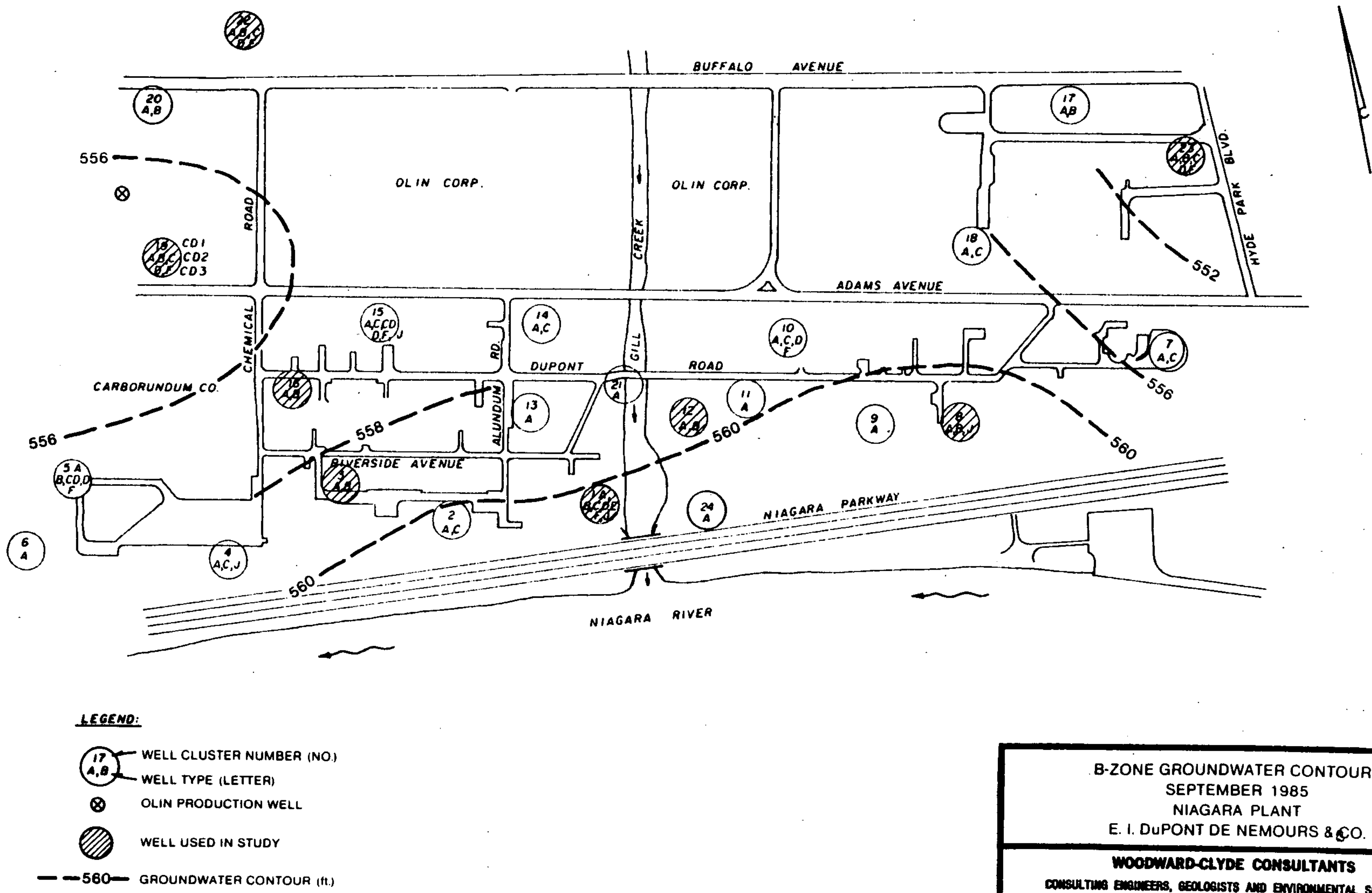


B-ZONE GROUNDWATER CONTOURS
AUGUST 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE IN FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-16

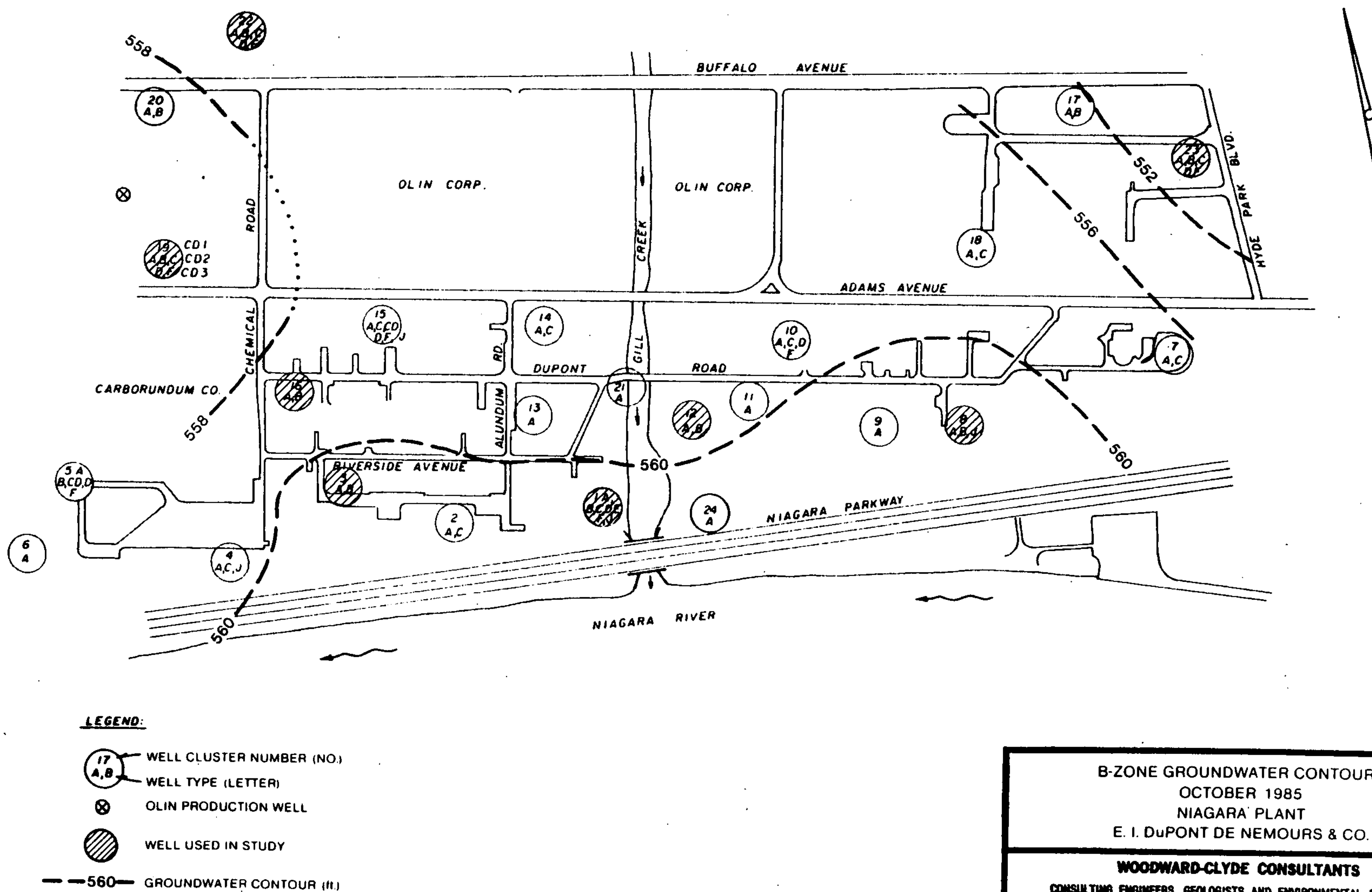


B-ZONE GROUNDWATER CONTOURS
SEPTEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86	
CHECKED: K.R.M.		JOB: 83C2236-8	

FIGURE B-17

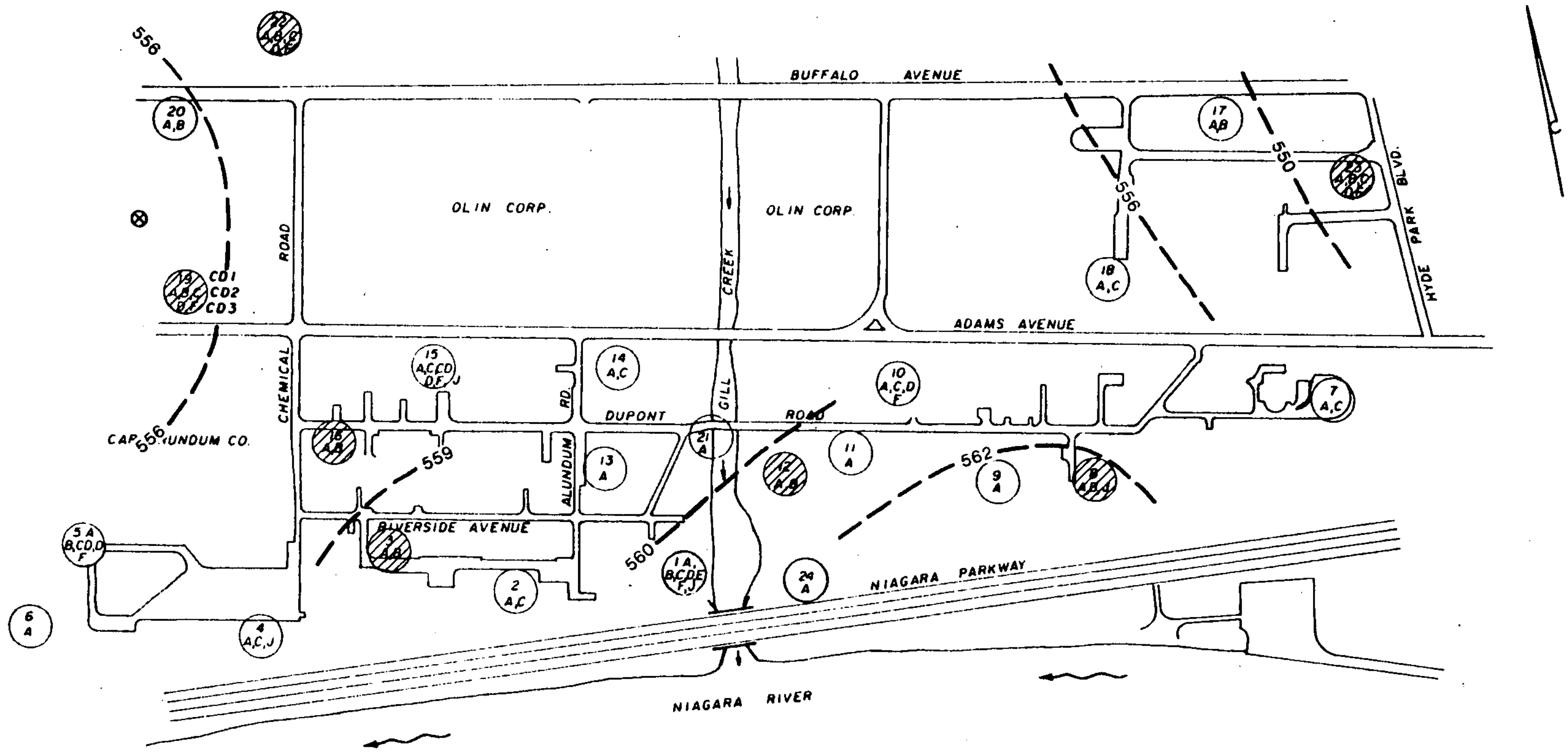


B-ZONE GROUNDWATER CONTOURS
OCTOBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-18



LEGEND:

17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)

⊗ OLIN PRODUCTION WELL

WELL USED IN STUDY

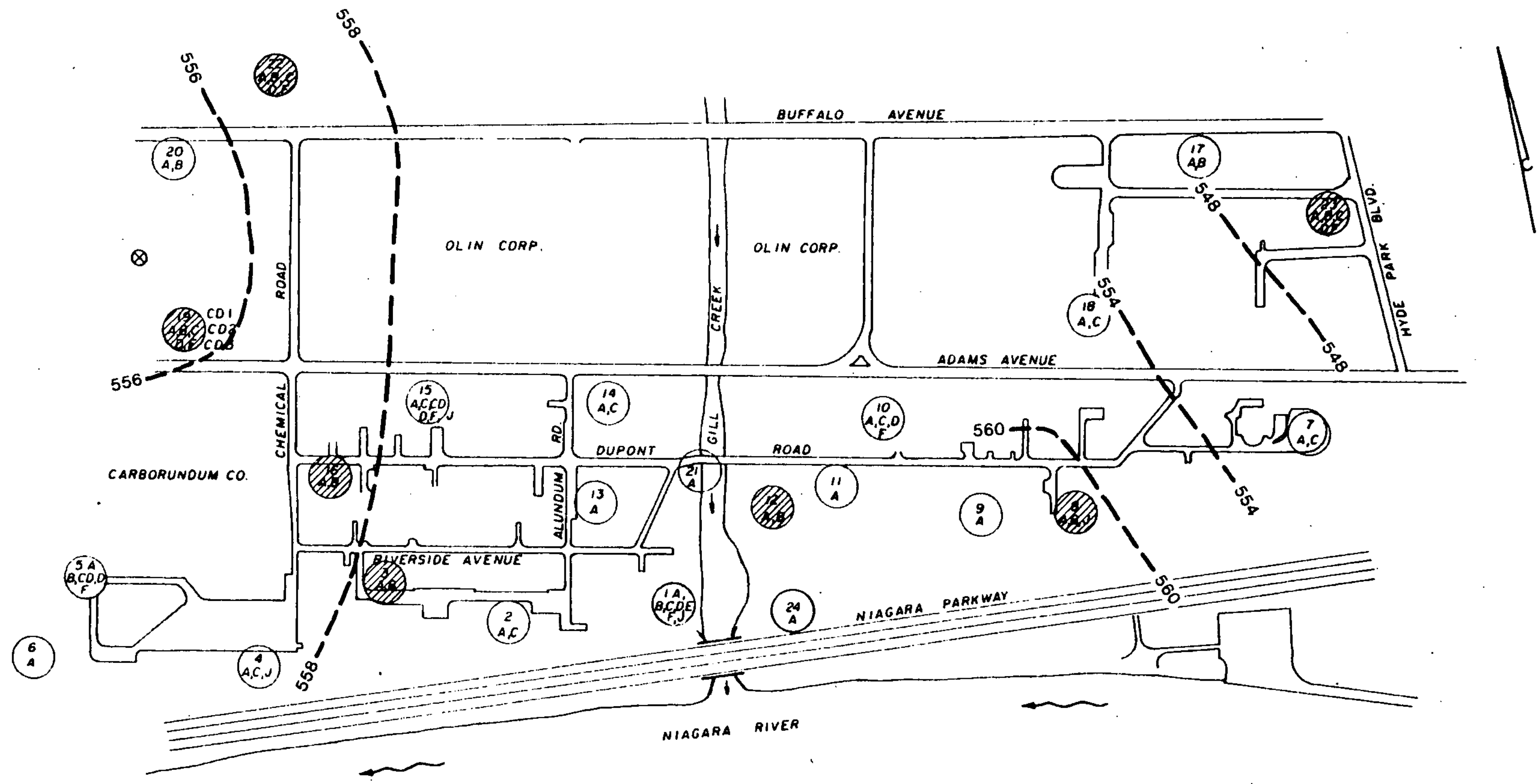
— —560— GROUNDWATER CONTOUR (ft.)

B-ZONE GROUNDWATER CONTOURS
NOVEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE IN FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-19



LEGEND:

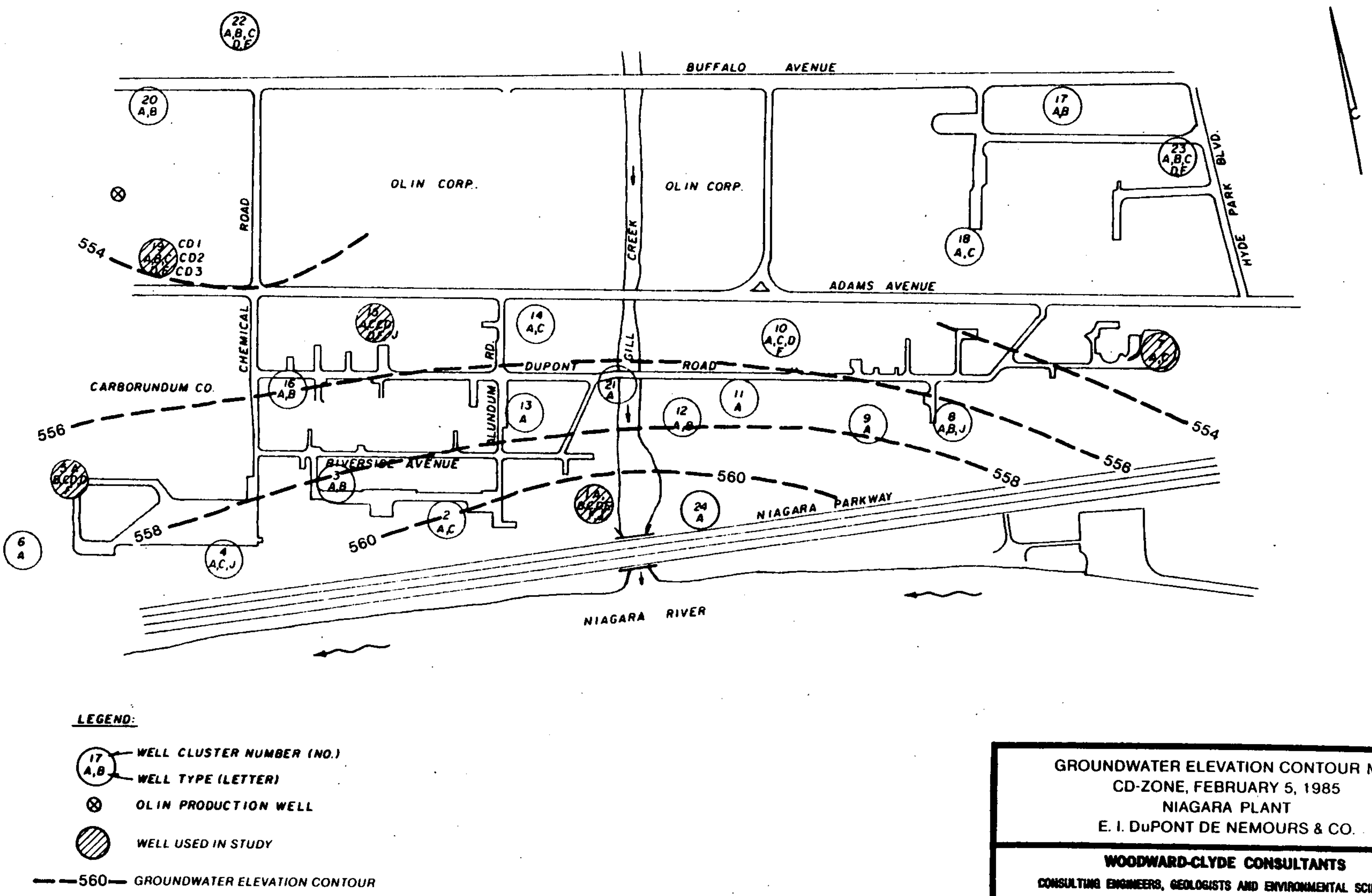
- (17 A,B) WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- (hatched circle) WELL USED IN STUDY
- — —560— GROUNDWATER CONTOUR (ft.)

B-ZONE GROUNDWATER CONTOURS
DECEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 3/21/86
CHECKED: K.R.M.	0 — 300	JOB: 83C2236-8

FIGURE B-20



GROUNDWATER ELEVATION CONTOUR MAP
CD-ZONE, FEBRUARY 5, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86
CHECKED : K.R.M.		JOB : 83C2236-8

FIGURE B-21

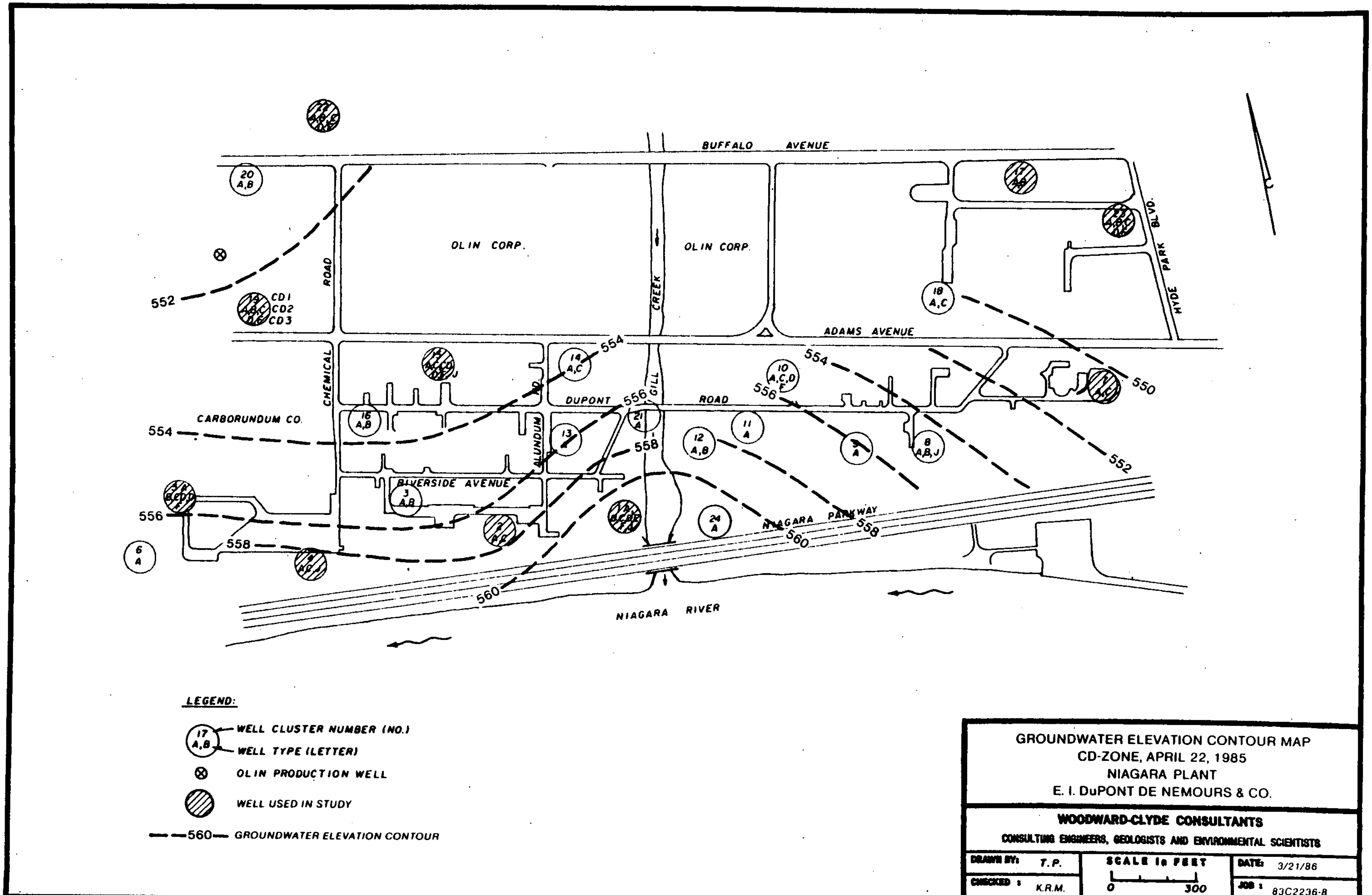
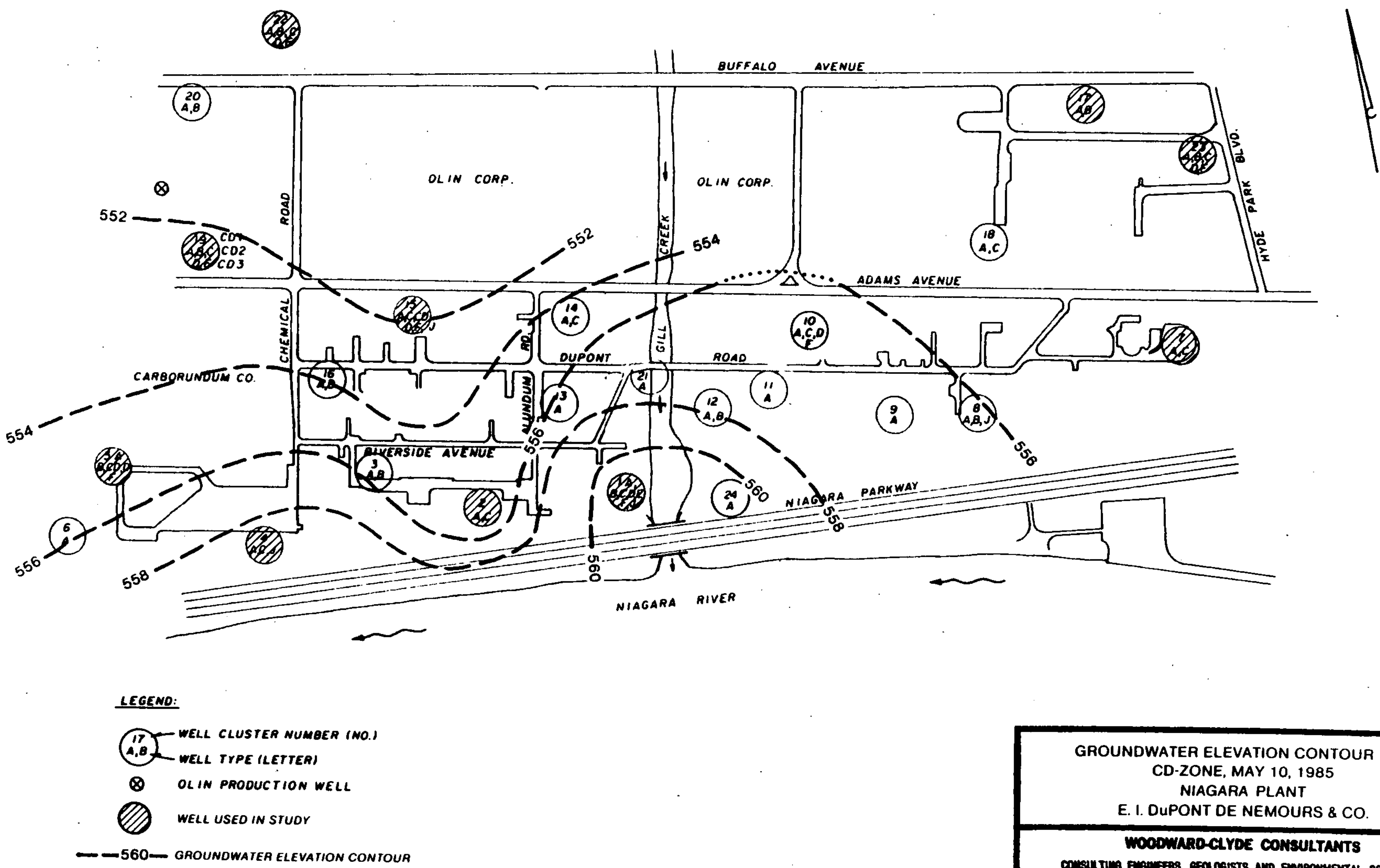

BUFFALO AVENUE
ADAMS AVENUE
DUPONT ROAD
CHEMICAL ROAD
ALUNDUM RD.
RIVERSIDE AVENUE
HYDE PARK BLVD.
GILL CREEK
NIAGARA PARKWAY
NIAGARA RIVER
OLIN CORP.
OLIN CORP.
CARBORUNDUM CO.
CD1
CD2
CD3
20 A,B
18 A,C
14 A,C
10 A,C,D F
16 A,B
21 A
11 A
12 A,B
13
8 A,B,J
3 A,B
24 A
6 A
552
554
556
558
560
550
LEGEND:
WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER ELEVATION CONTOUR
GROUNDWATER ELEVATION CONTOUR MAP
CD-ZONE, APRIL 22, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE in FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-22

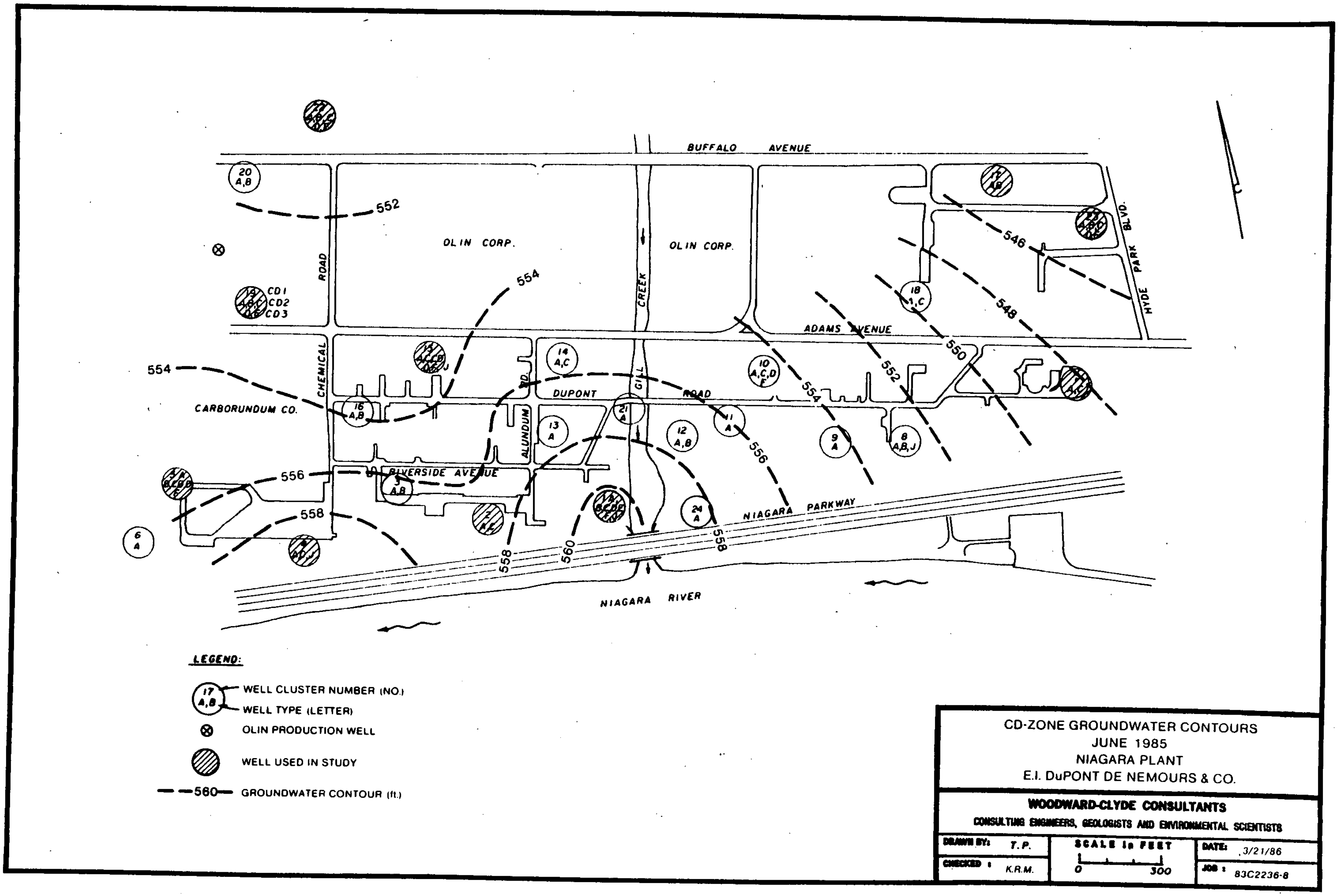


GROUNDWATER ELEVATION CONTOUR MAP
CD-ZONE, MAY 10, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

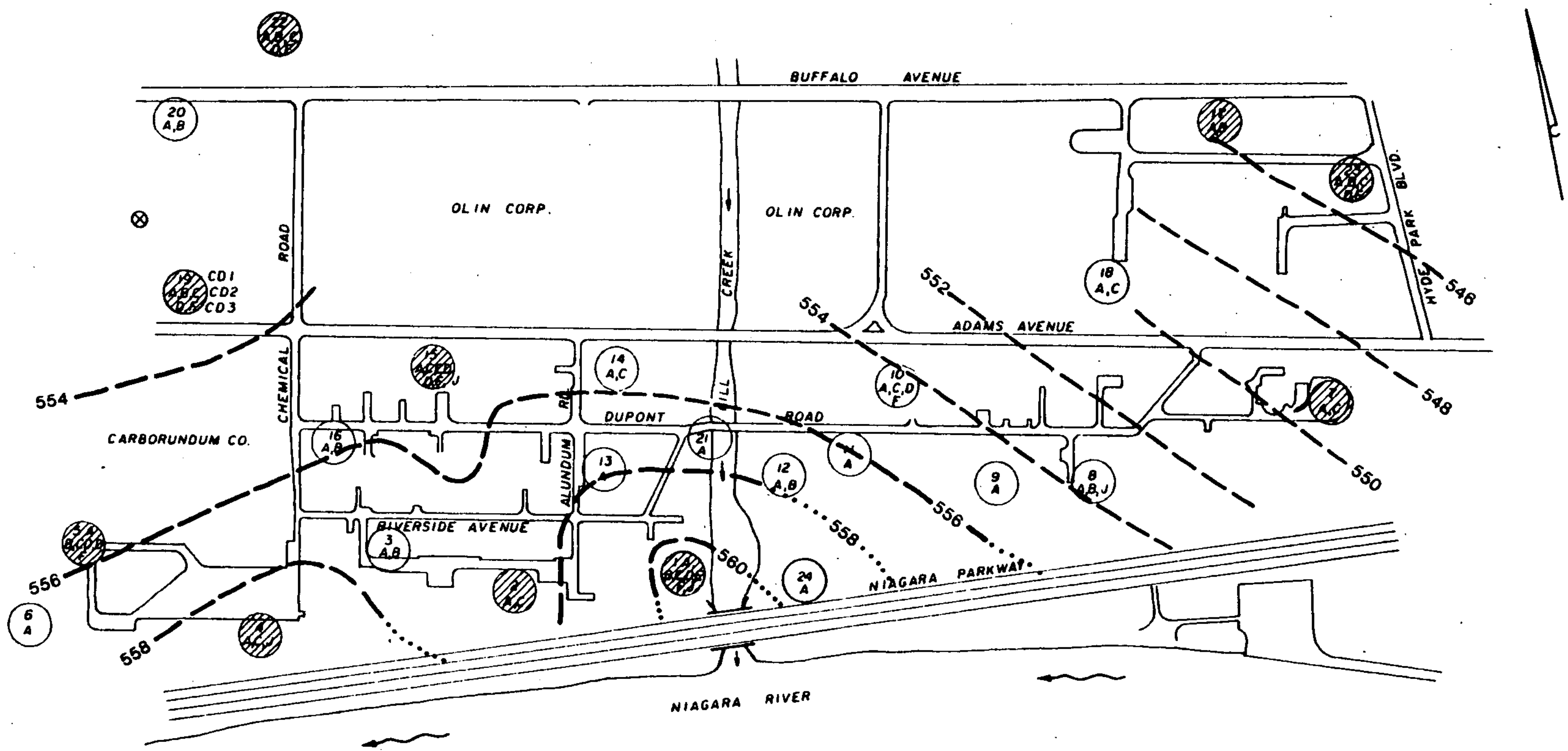
DRAWN BY:	T.P.	SCALE in FEET 0 — 300	DATE:	3/21/86
CHECKED:	K.R.M.		JOB:	83C2236-8

FIGURE B-23



BUFFALO AVENUE
OLIN CORP.
OLIN CORP.
ROAD
CHEMICAL
CREEK
GILL
ADAMS AVENUE
HYDE PARK BLVD.
DUPONT ROAD
ALUNDUM RD.
RIVERSIDE AVENUE
CARBORUNDUM CO.
NIAGARA PARKWAY
NIAGARA RIVER
546
548
550
552
554
556
558
560
20 A,B
CD1
CD2
CD3
14 A,C
10 A,C,D F
18 1,C
13 A
12 A,B
9 A
8 A,B,J
24 A
15 A,B
3 A,B
6 A
LEGEND:
17 A,B
WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft.)
CD-ZONE GROUNDWATER CONTOURS
JUNE 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE in FEET
0
300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-24



LEGEND:

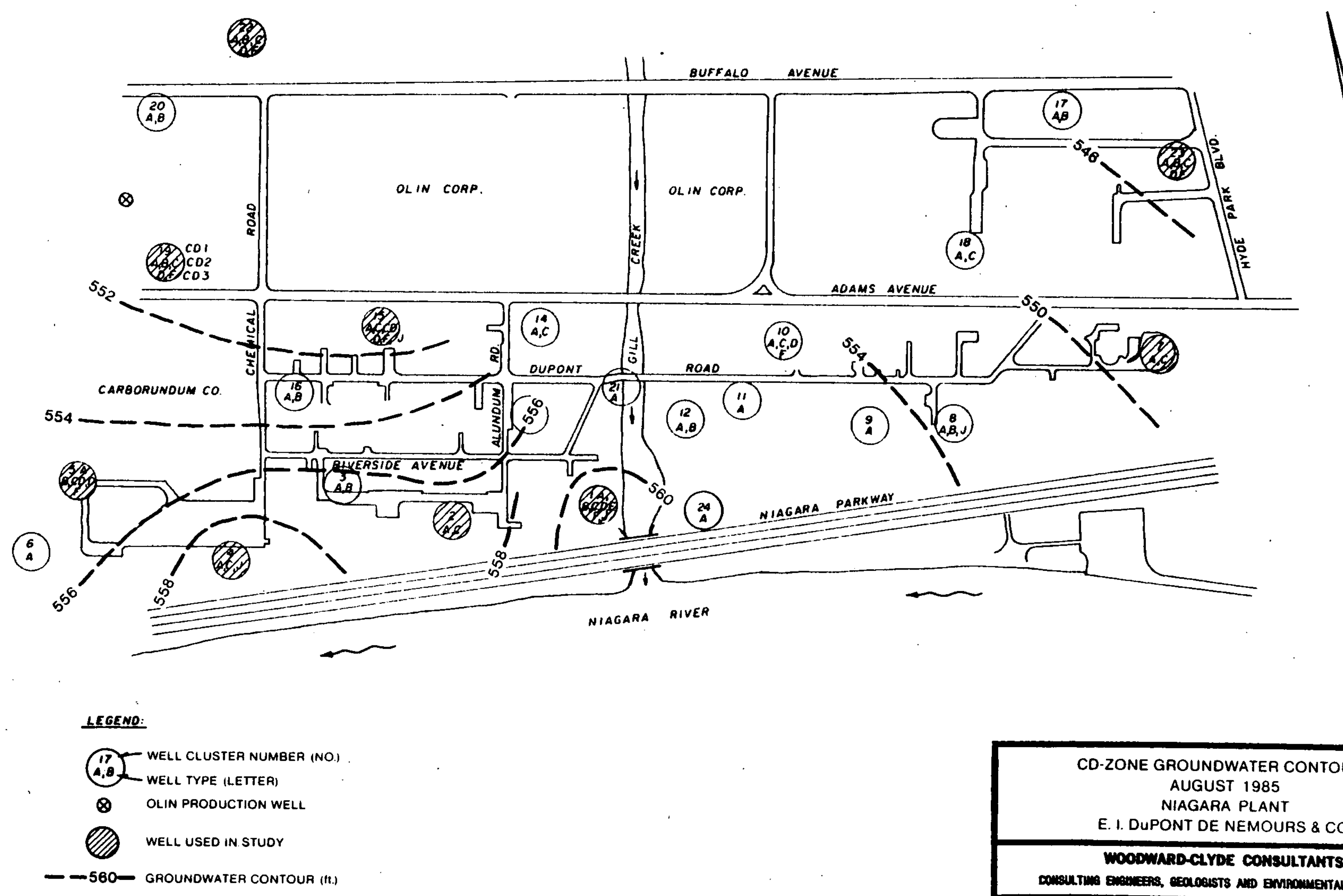
- WELL CLUSTER NUMBER (NO.)
- WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- WELL USED IN STUDY
- ···—560— GROUNDWATER CONTOUR (ft.)

CD-ZONE GROUNDWATER CONTOURS
JULY 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-25

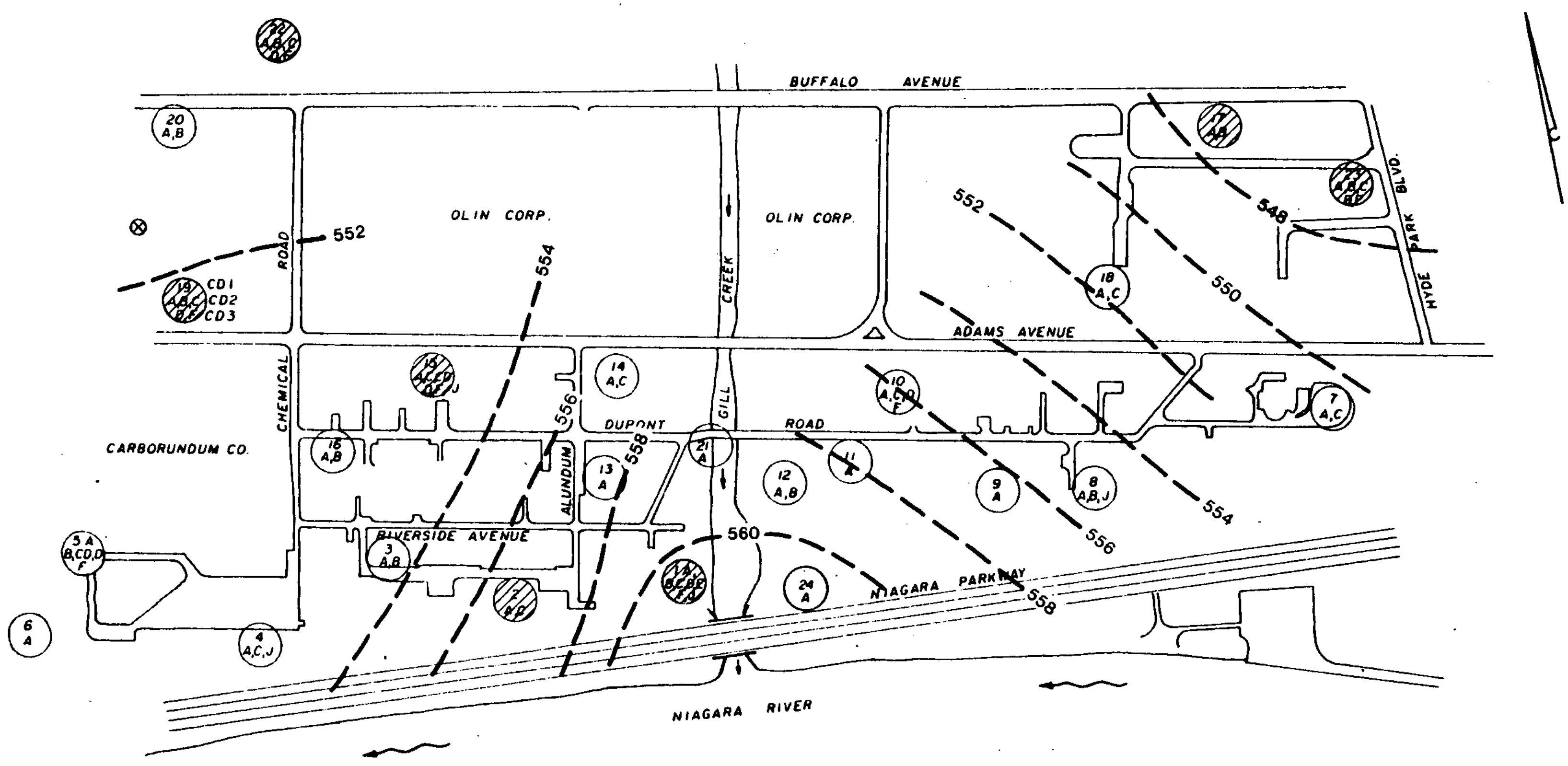


CD-ZONE GROUNDWATER CONTOURS
AUGUST 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 3/21/86
CHECKED: K.R.M.	0 300	JOB #: 83C2236-8

FIGURE B-26



LEGEND:

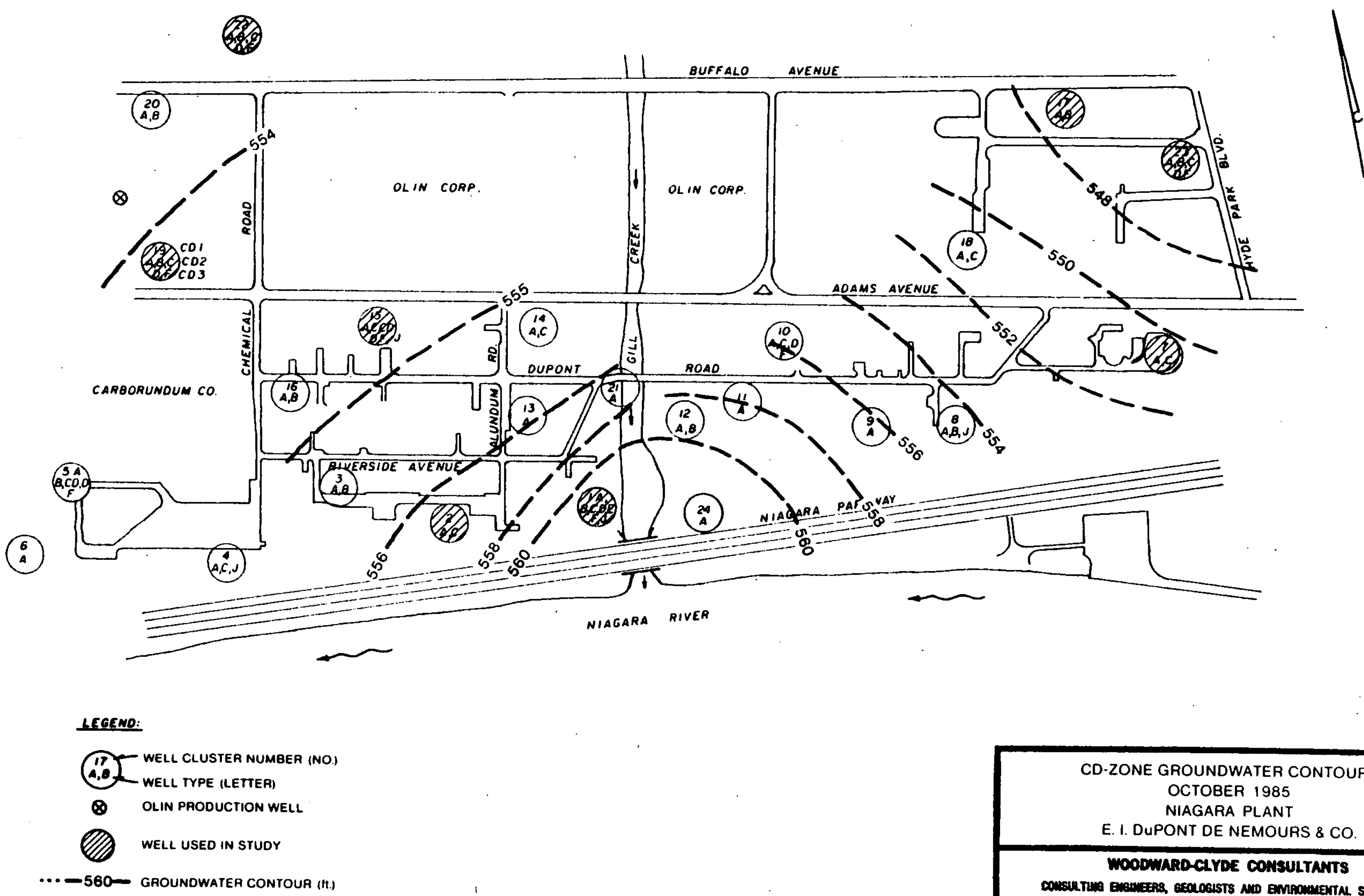
- WELL CLUSTER NUMBER (NO.)
- WELL TYPE (LETTER)
- OLIN PRODUCTION WELL
- WELL USED IN STUDY
- 560 GROUNDWATER CONTOUR (ft.)

CD-ZONE GROUNDWATER CONTOURS
SEPTEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-27

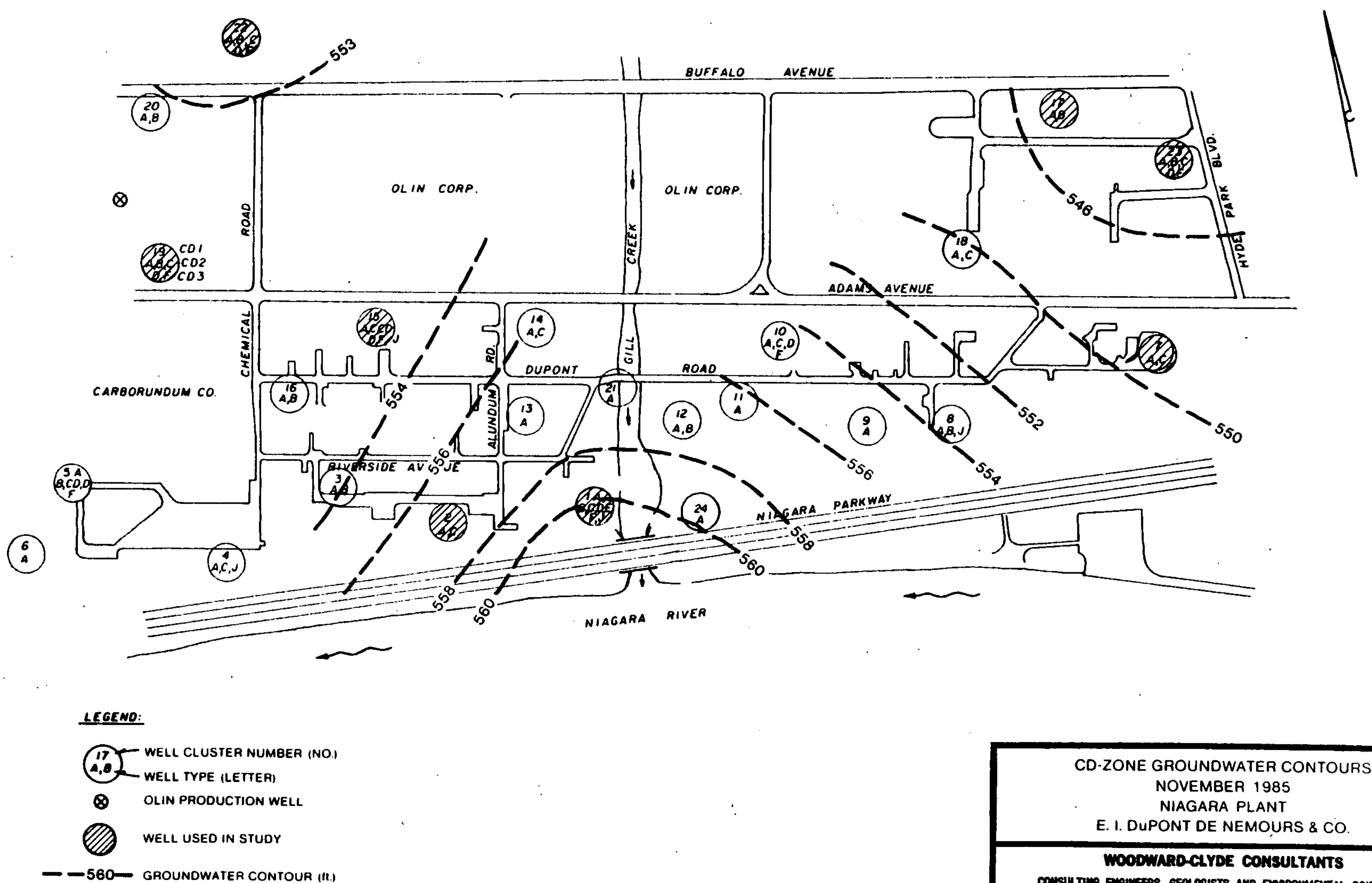


CD-ZONE GROUNDWATER CONTOURS
OCTOBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-28

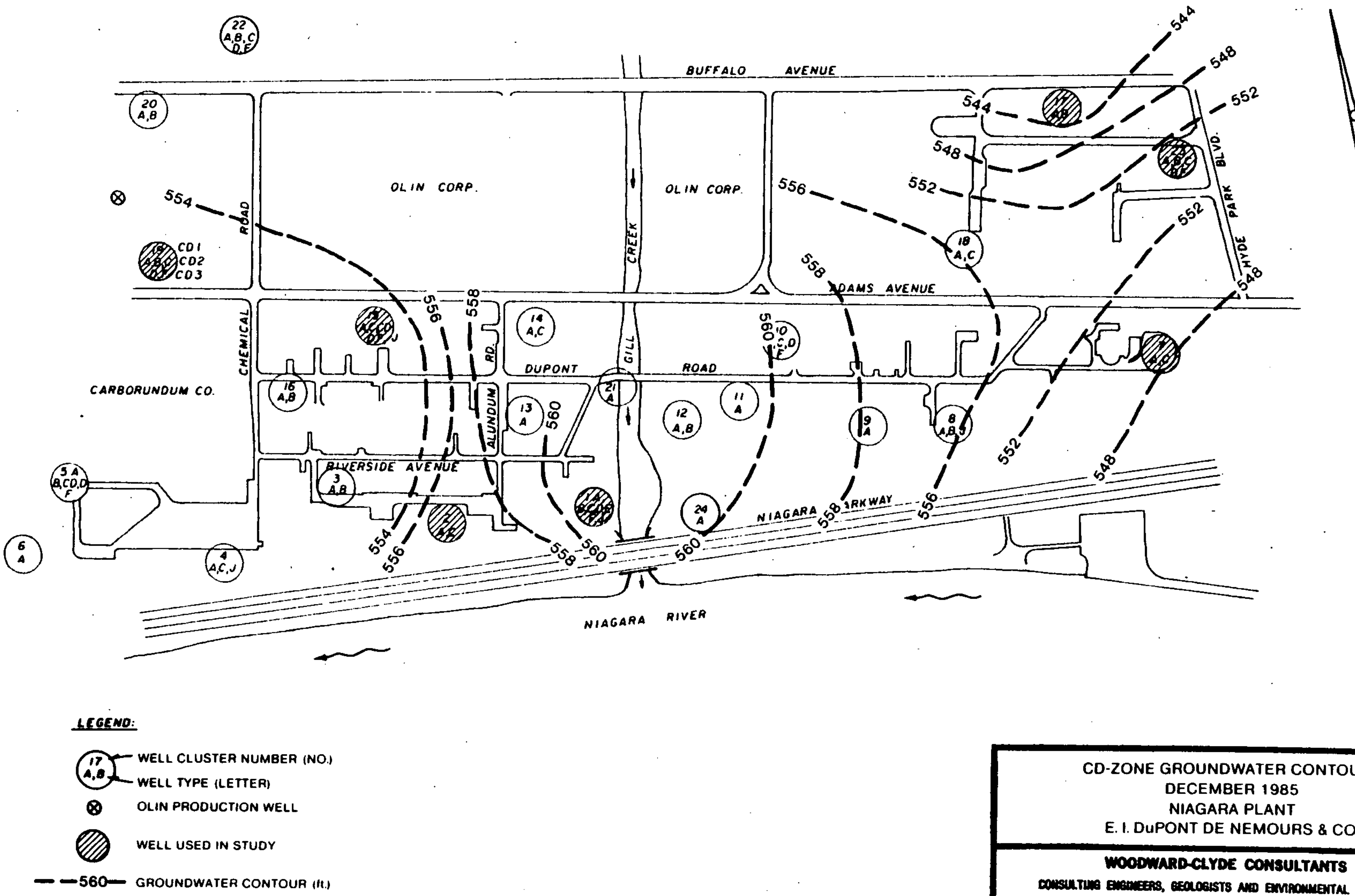


CD-ZONE GROUNDWATER CONTOURS
NOVEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 3/21/86	
CHECKED: K.R.M.	0 300	JOB: 83C2236-8	

FIGURE B-29

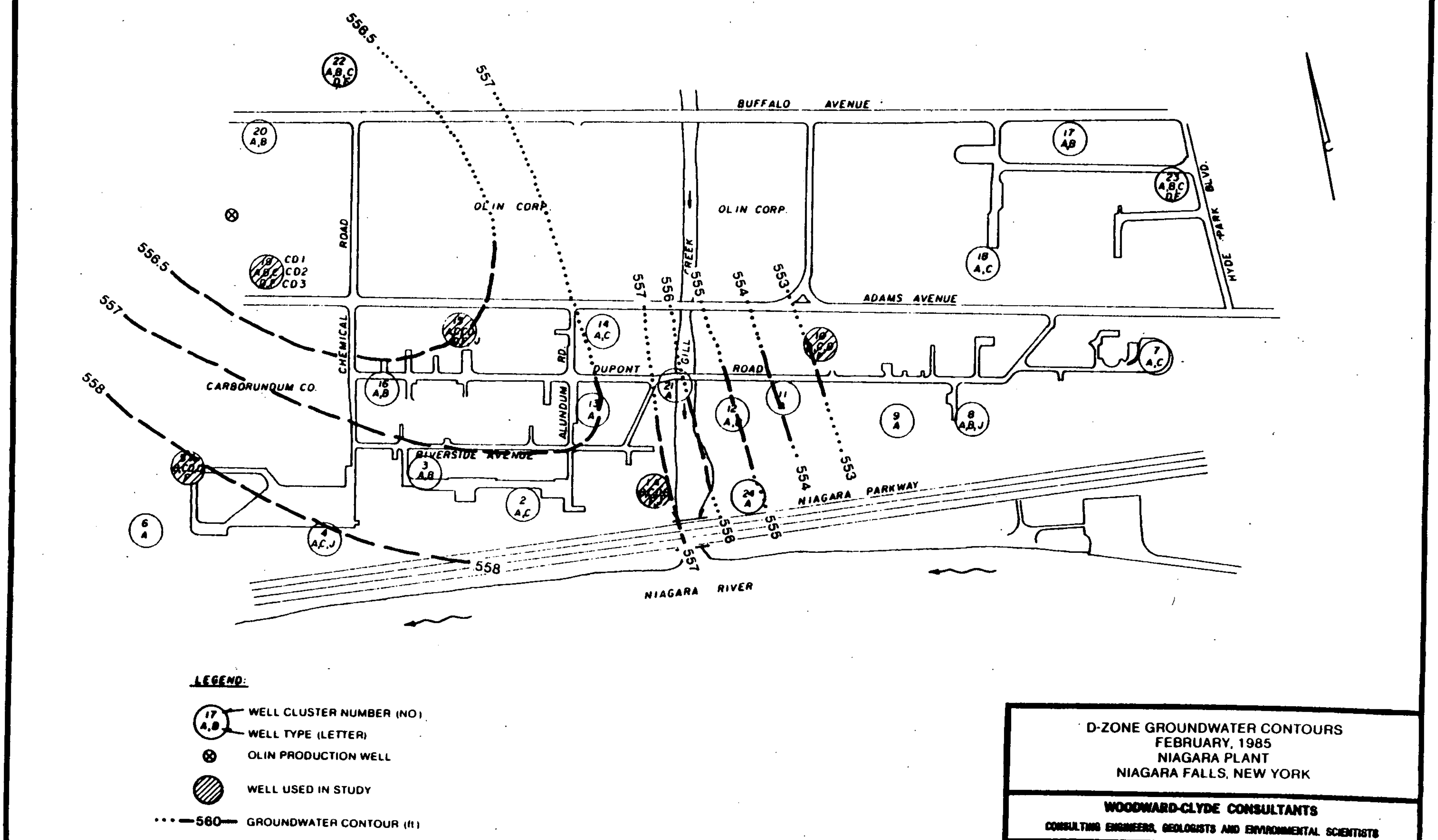


CD-ZONE GROUNDWATER CONTOURS
DECEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	0 — 300	DATE: 3/21/86
CHECKED: K.R.M.			JOB: 83C2236-8

FIGURE B-30



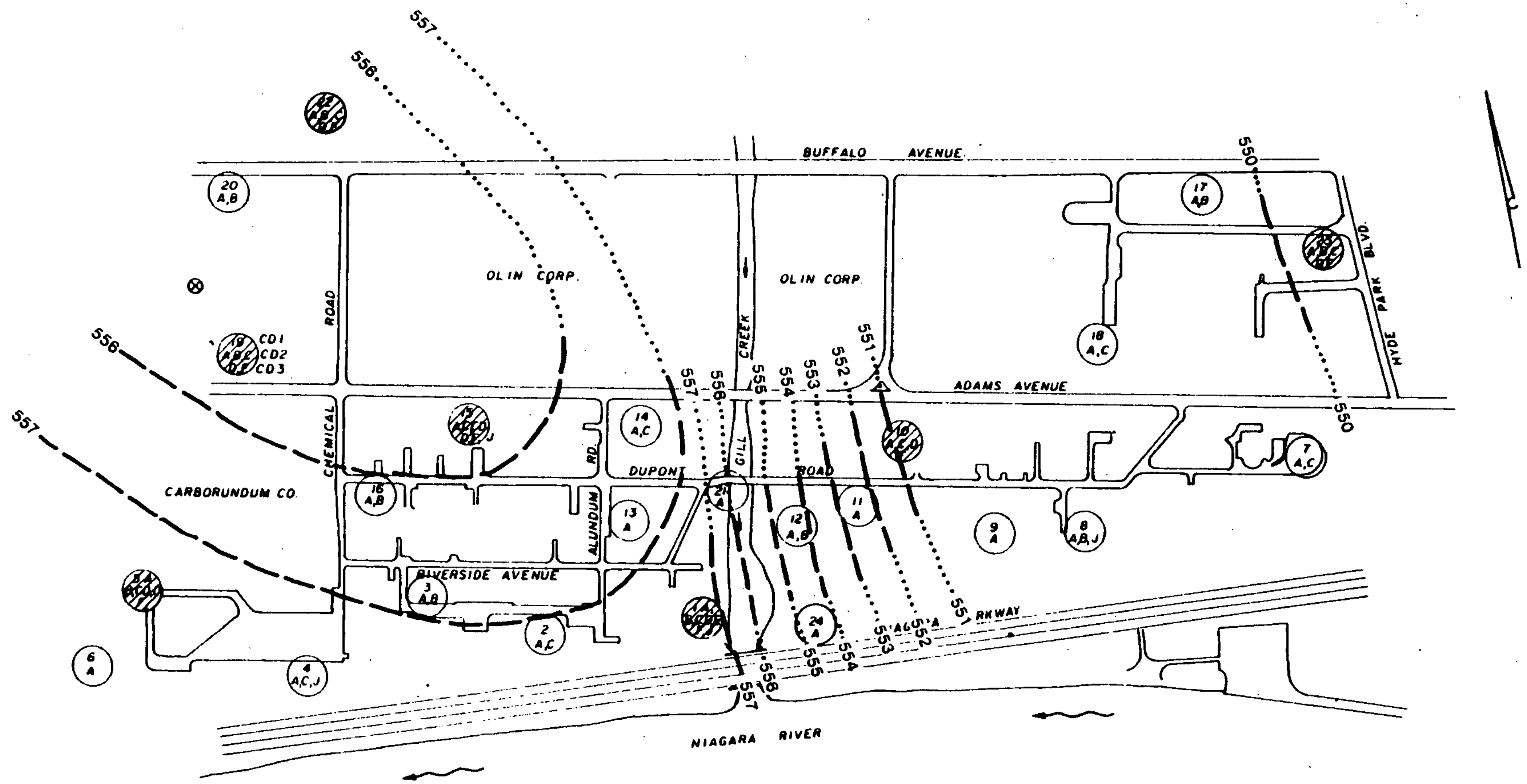
D-ZONE GROUNDWATER CONTOURS
FEBRUARY, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY:	T.P.	SCALE in FEET 0 — 300	DATE:	3/21/86
CHECKED:	KRM		JOB:	83C2236-8

FIGURE B-31



LEGEND:

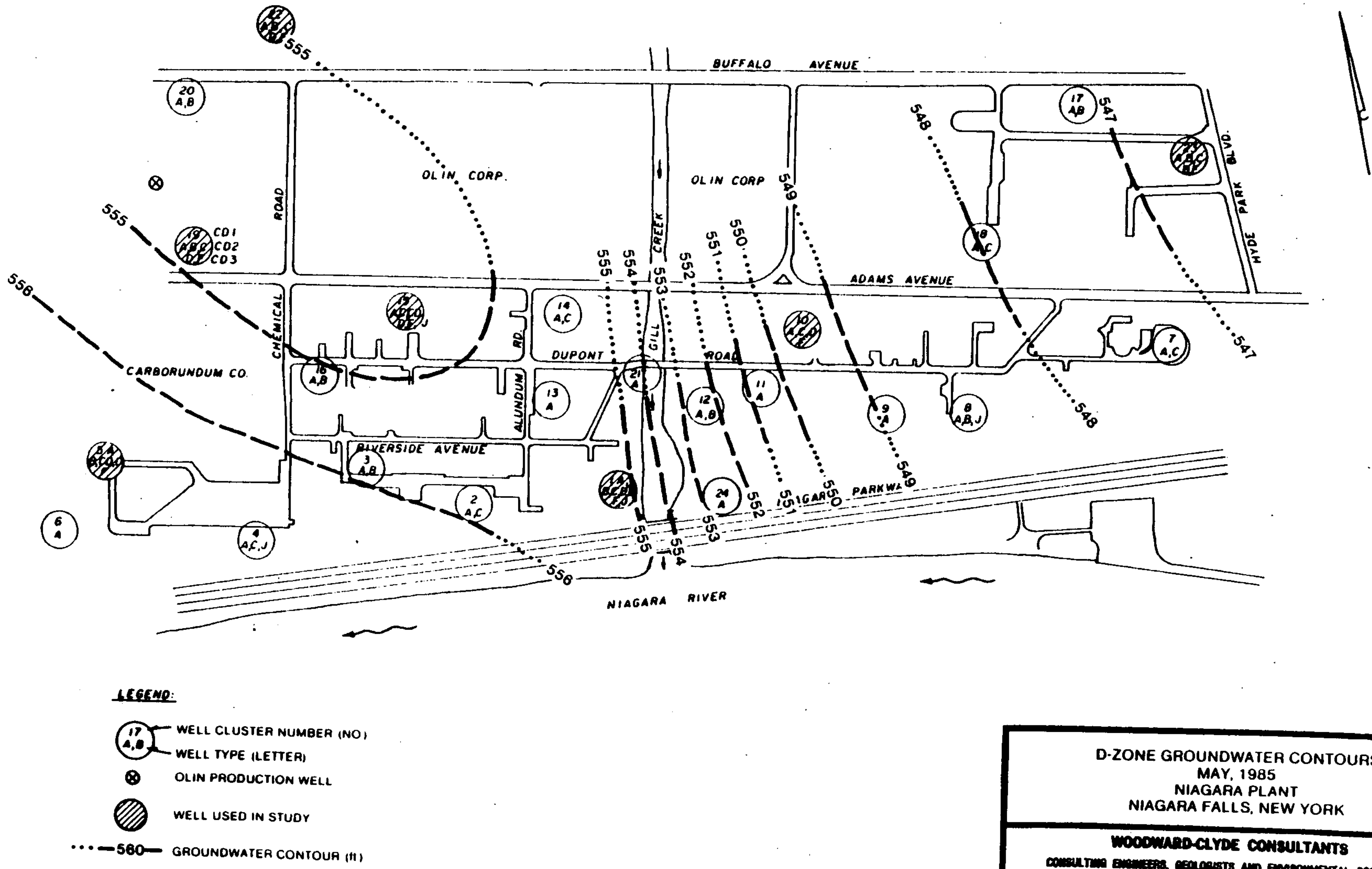
- WELL CLUSTER NUMBER (NO)
- WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- WELL USED IN STUDY
- ···—560— GROUNDWATER CONTOUR (ft)

D-ZONE GROUNDWATER CONTOURS
APRIL, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86	
CHECKED: K.R.M		JOB: 83C2236-8	

FIGURE B-32



D-ZONE GROUNDWATER CONTOURS
MAY, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	0 — 300	DATE: 3/21/86
CHECKED: K.R.M.			JOB: 83C2236-8

FIGURE B-33

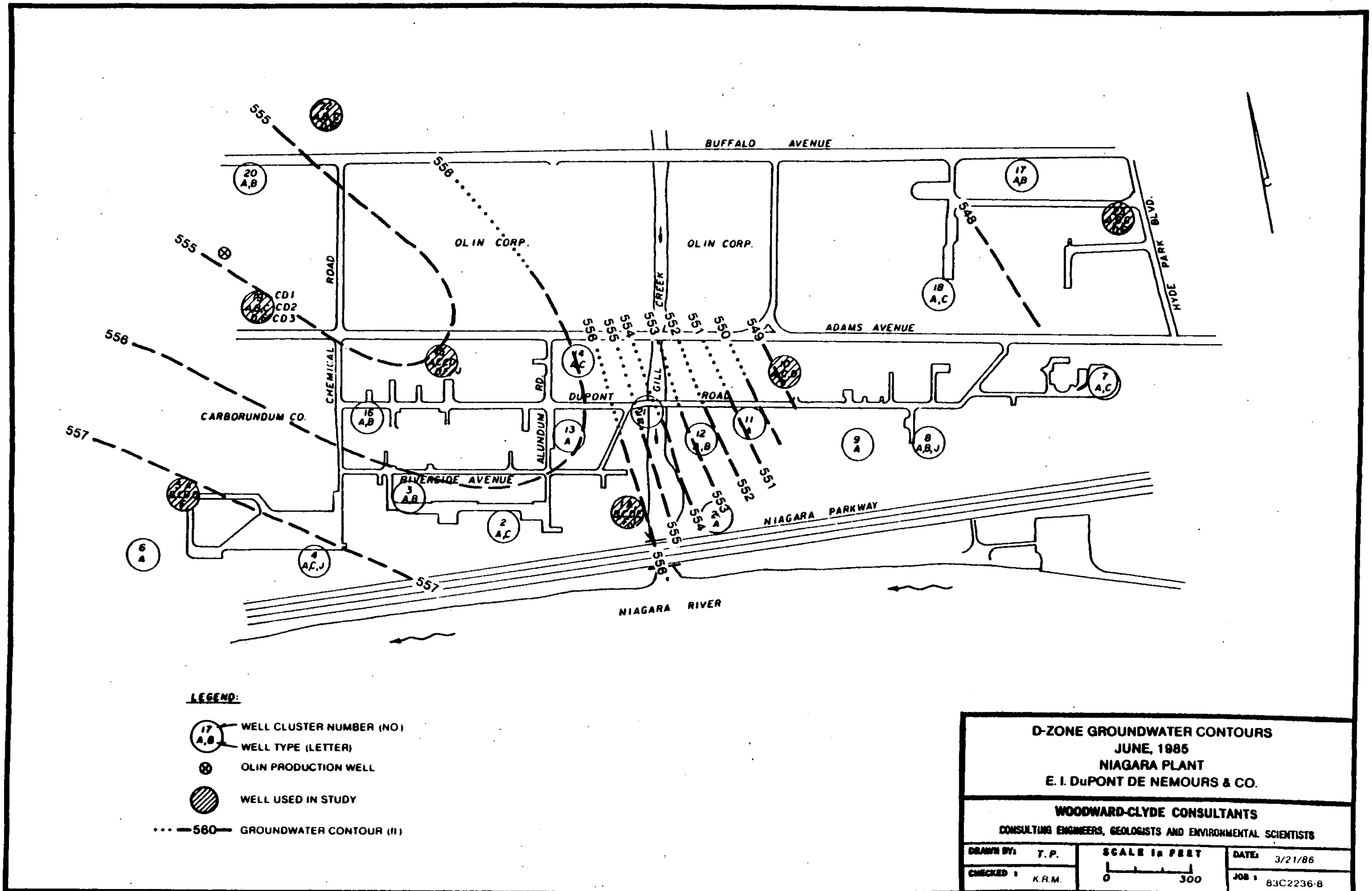
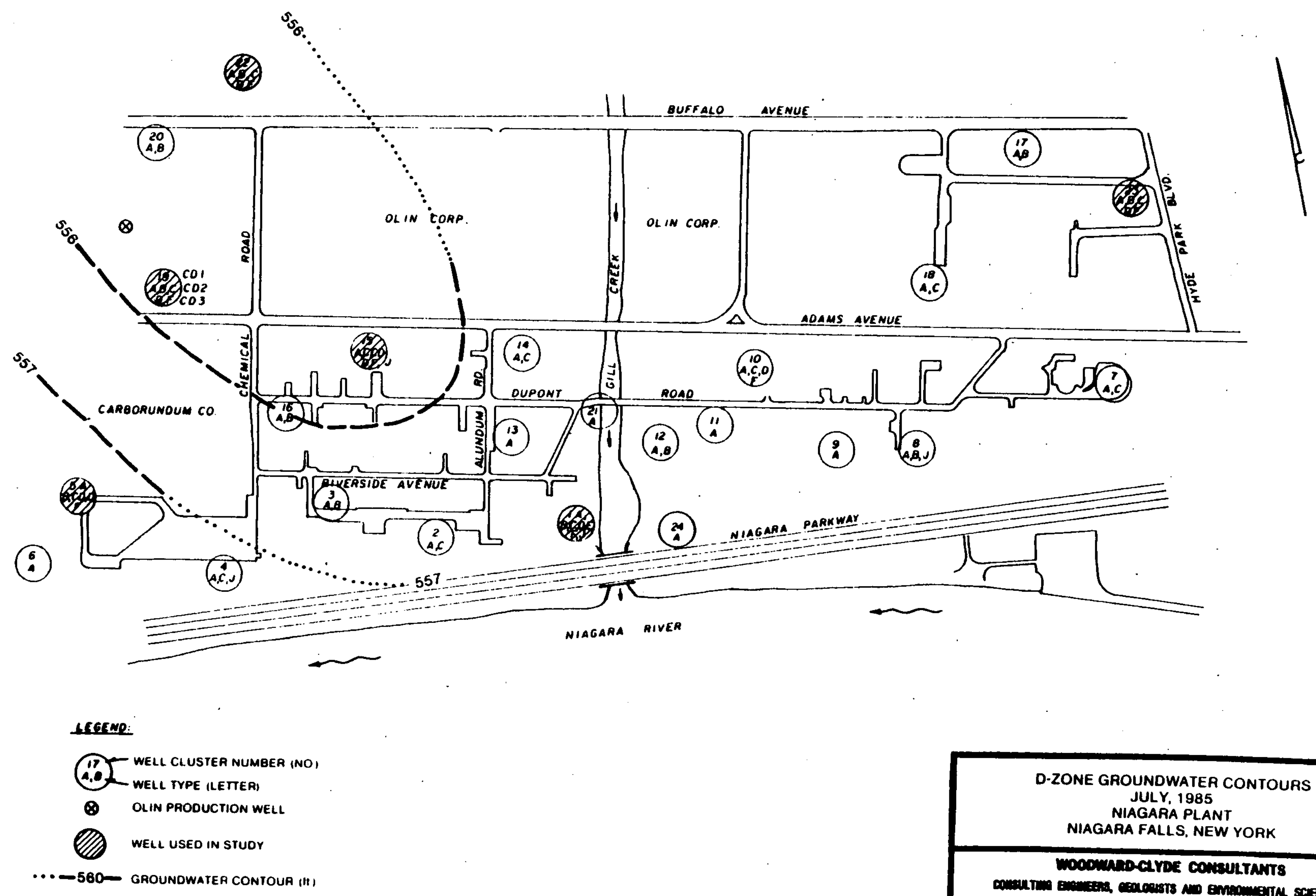

BUFFALO AVENUE
ADAMS AVENUE
HYDE PARK BLVD.
OLIN CORP.
OLIN CORP.
CREEK
GILL
DUPONT ROAD
ALUNDUM RD.
CHEMICAL ROAD
RIVERSIDE AVENUE
CARBORUNDUM CO.
NIAGARA PARKWAY
NIAGARA RIVER
CD1
CD2
CD3
20 A,B
17 A,B
18 A,C
7 A,C
14 A,C
16 A,B
13 A
11
12
9 A
8 A,B,J
3 A,B
2 A,C
4 A,C,J
6 A
548
549
550
551
552
553
554
555
556
557
LEGEND:
WELL CLUSTER NUMBER (NO)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft)
D-ZONE GROUNDWATER CONTOURS
JUNE, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE IN FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-34

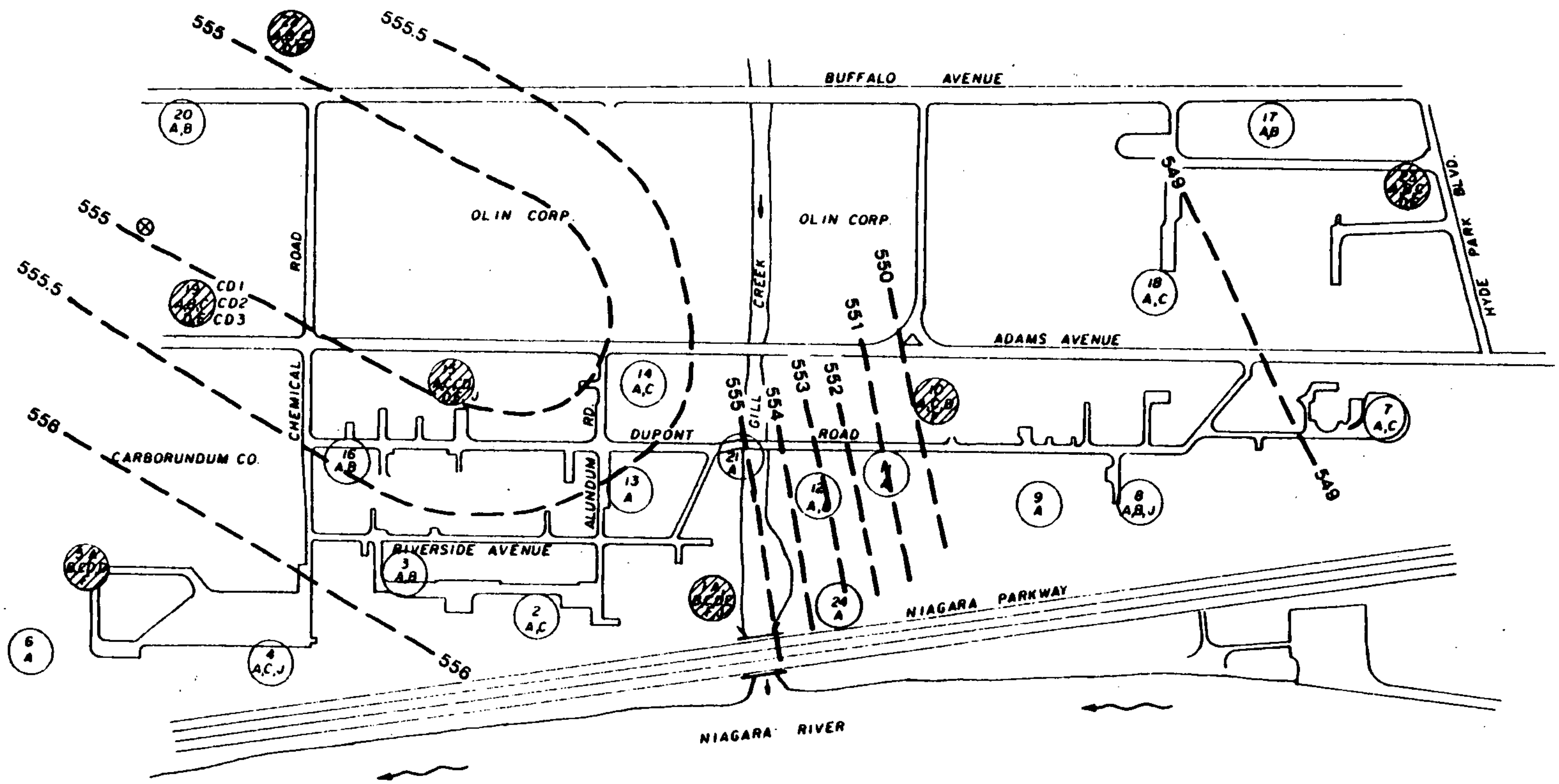


D-ZONE GROUNDWATER CONTOURS
JULY, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86	
CHECKED: K.R.M.		JOB: 83C2236-8	

FIGURE B-35



LEGEND:

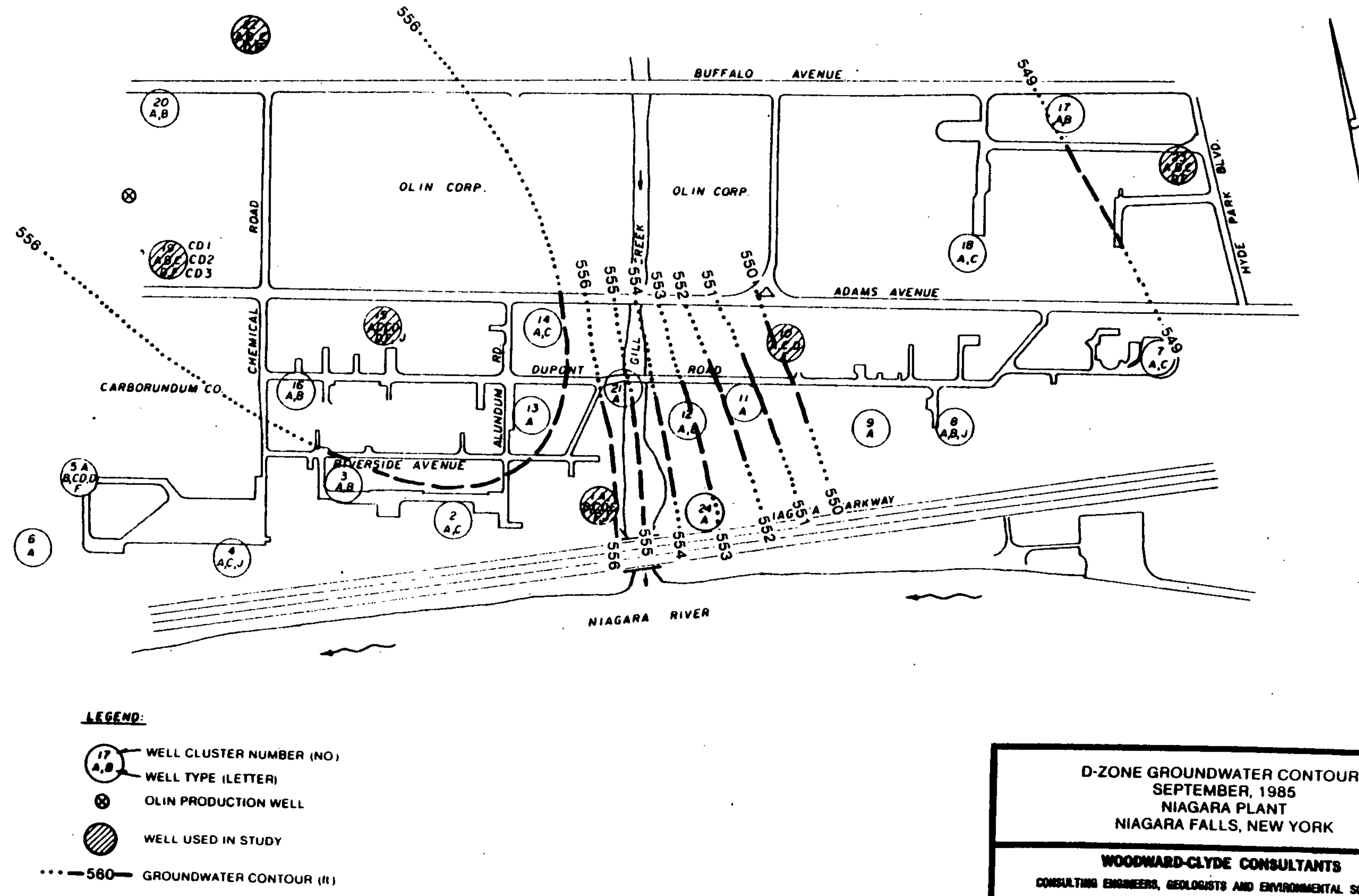
- 17 A,B — WELL CLUSTER NUMBER (NO) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- (hatched circle) WELL USED IN STUDY
- — —560— GROUNDWATER CONTOUR (ft)

D-ZONE GROUNDWATER CONTOURS
AUGUST 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-36



D-ZONE GROUNDWATER CONTOURS
SEPTEMBER, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY:	T.P.	SCALE in FEET 0 300	DATE:	3/21/86
CHECKED:	K.R.M.		JOB:	83C2236-8

FIGURE B-37

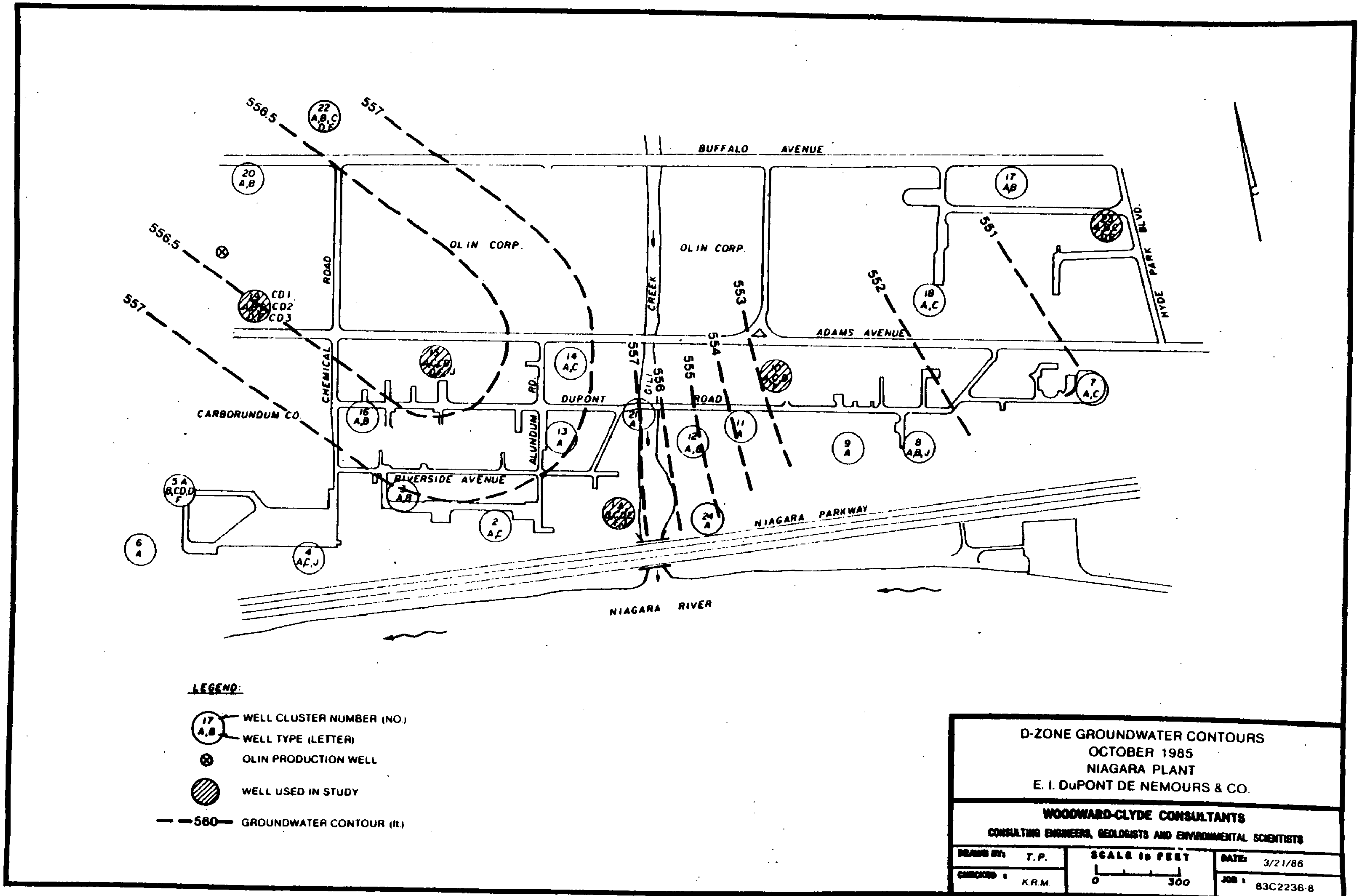

D-ZONE GROUNDWATER CONTOURS
OCTOBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE in FEET
0
300
DATE: 3/21/86
JOB: 83C2236-8
LEGEND:
WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft.)
BUFFALO AVENUE
ADAMS AVENUE
HYDE PARK BLVD.
DUPONT ROAD
CHEMICAL ROAD
ALUNDUM RD
RIVERSIDE AVENUE
NIAGARA PARKWAY
NIAGARA RIVER
GILL CREEK
OLIN CORP.
OLIN CORP.
CARBORUNDUM CO.
551
552
553
554
555
556
557
556.5
557
556.5
557
CD1
CD2
CD3

FIGURE B-38

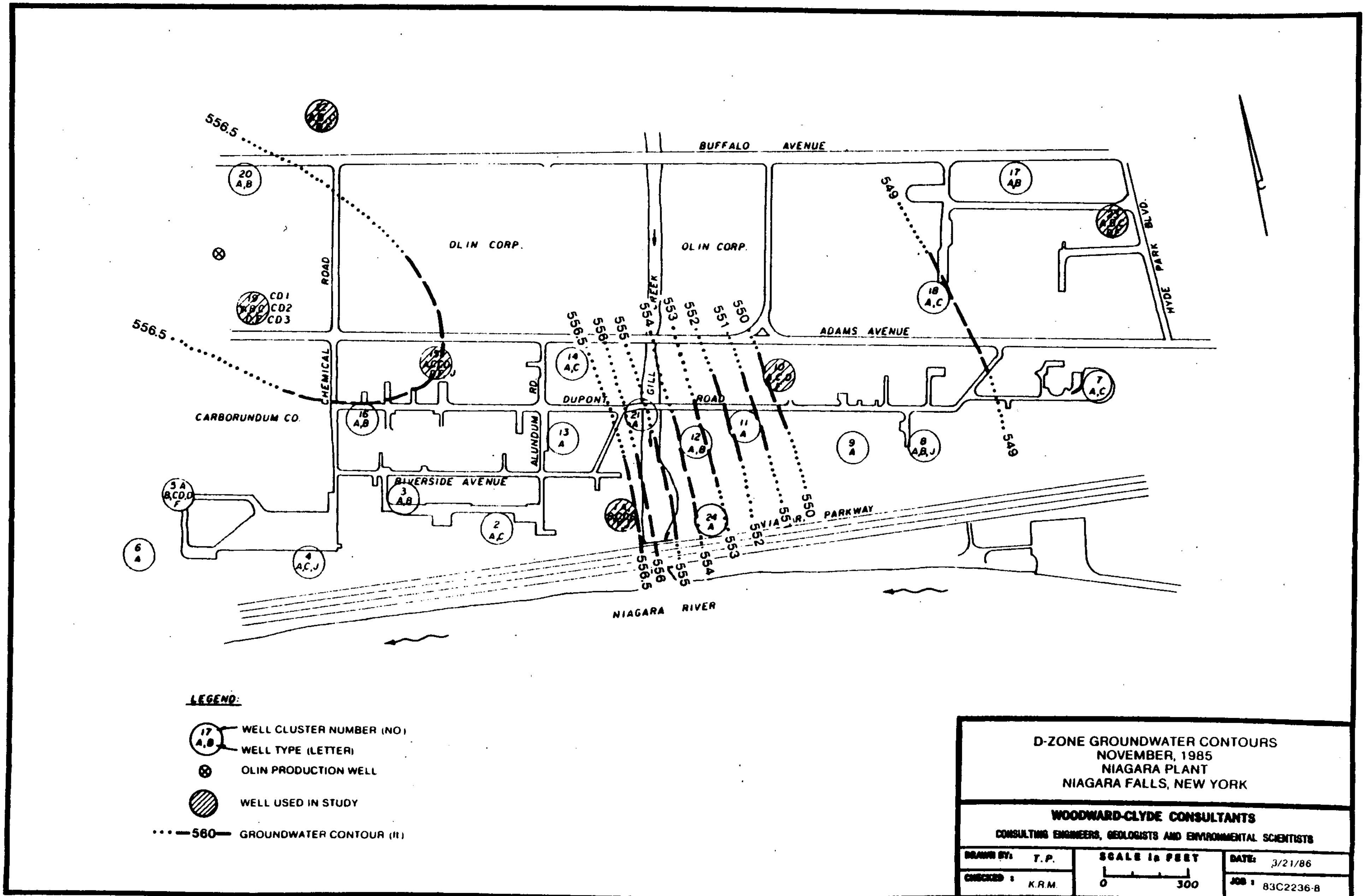

BUFFALO AVENUE
OLIN CORP.
OLIN CORP.
ADAMS AVENUE
HYDE PARK BLVD.
CHEMICAL ROAD
DUPONT ROAD
GILL CREEK
ALUNDUM RD
RIVERSIDE AVENUE
CARBORUNDUM CO.
PARKWAY
NIAGARA RIVER
549
550
551
552
553
554
555
556
556.5
CD1
CD2
CD3
LEGEND:
WELL CLUSTER NUMBER (NO)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft)
D-ZONE GROUNDWATER CONTOURS
NOVEMBER, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE in FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-39

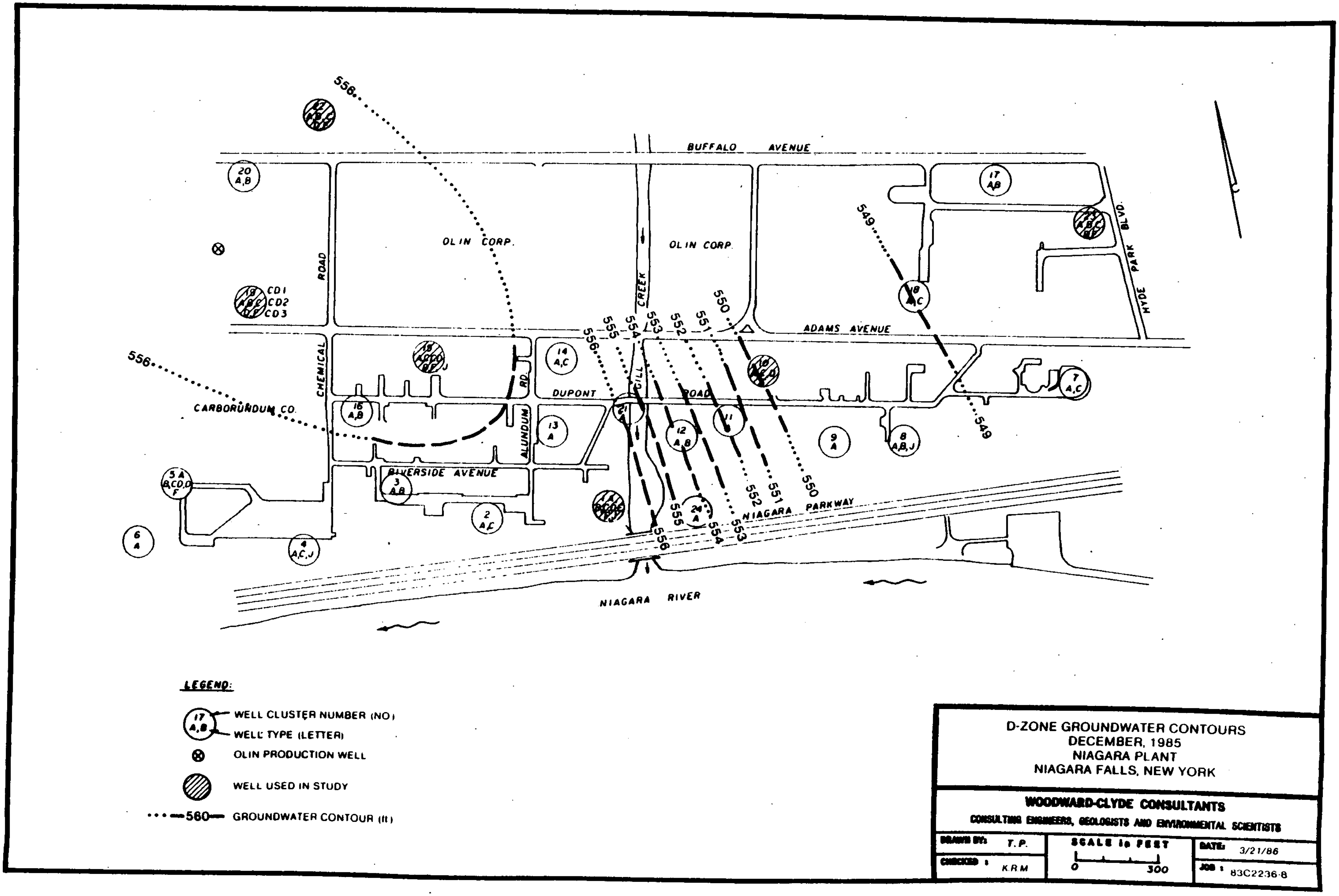
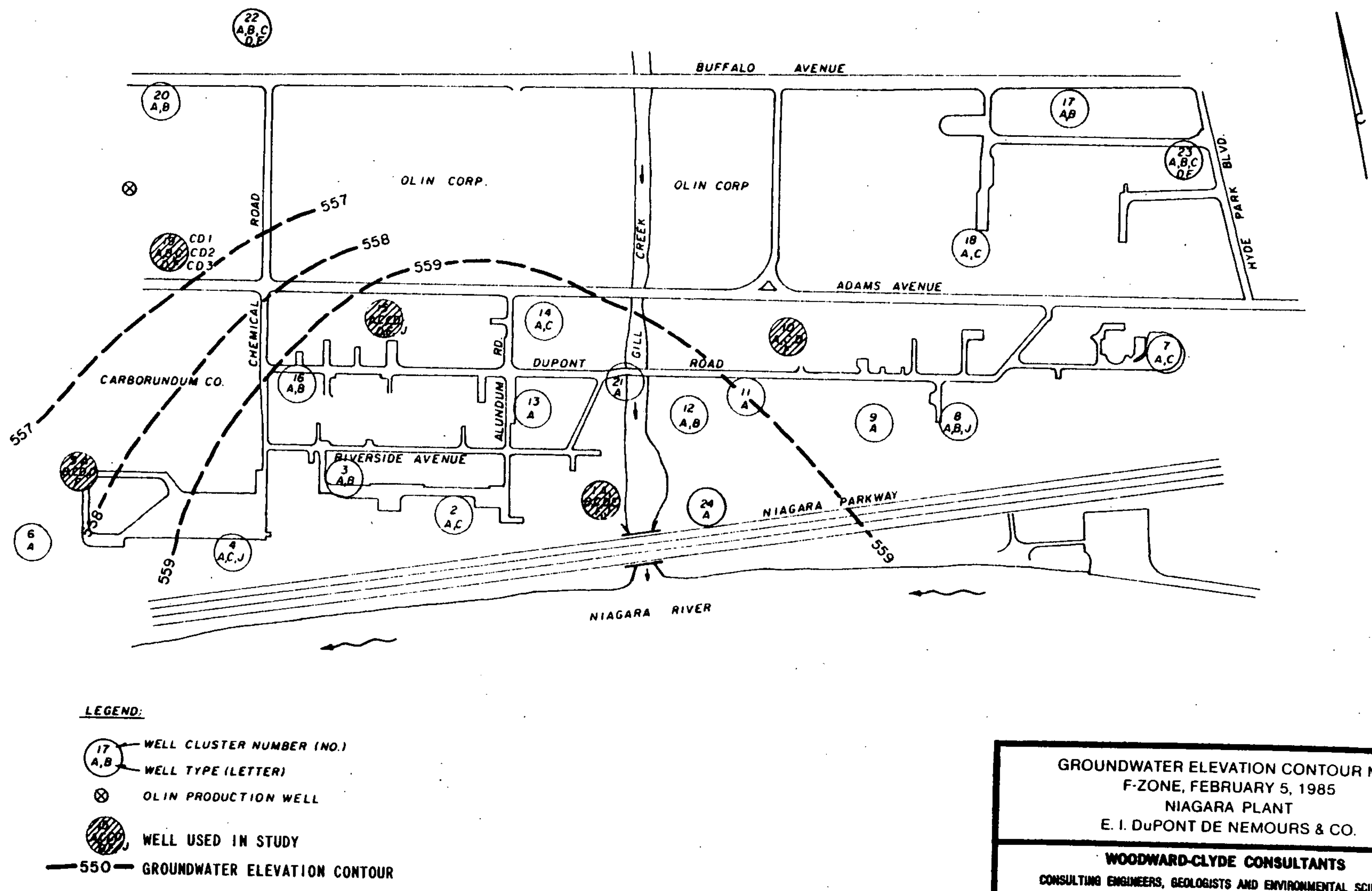

BUFFALO AVENUE
OLIN CORP.
OLIN CORP.
ADAMS AVENUE
HYDE PARK BLVD.
CHEMICAL ROAD
DUPONT ROAD
GILL CREEK
ALUNDUM RD
RIVERSIDE AVENUE
CARBORUNDUM CO.
NIAGARA PARKWAY
NIAGARA RIVER
549
550
551
552
553
554
555
556
CD1
CD2
CD3
LEGEND:
WELL CLUSTER NUMBER (NO)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft)
D-ZONE GROUNDWATER CONTOURS
DECEMBER, 1985
NIAGARA PLANT
NIAGARA FALLS, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: KRM
SCALE in FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-40

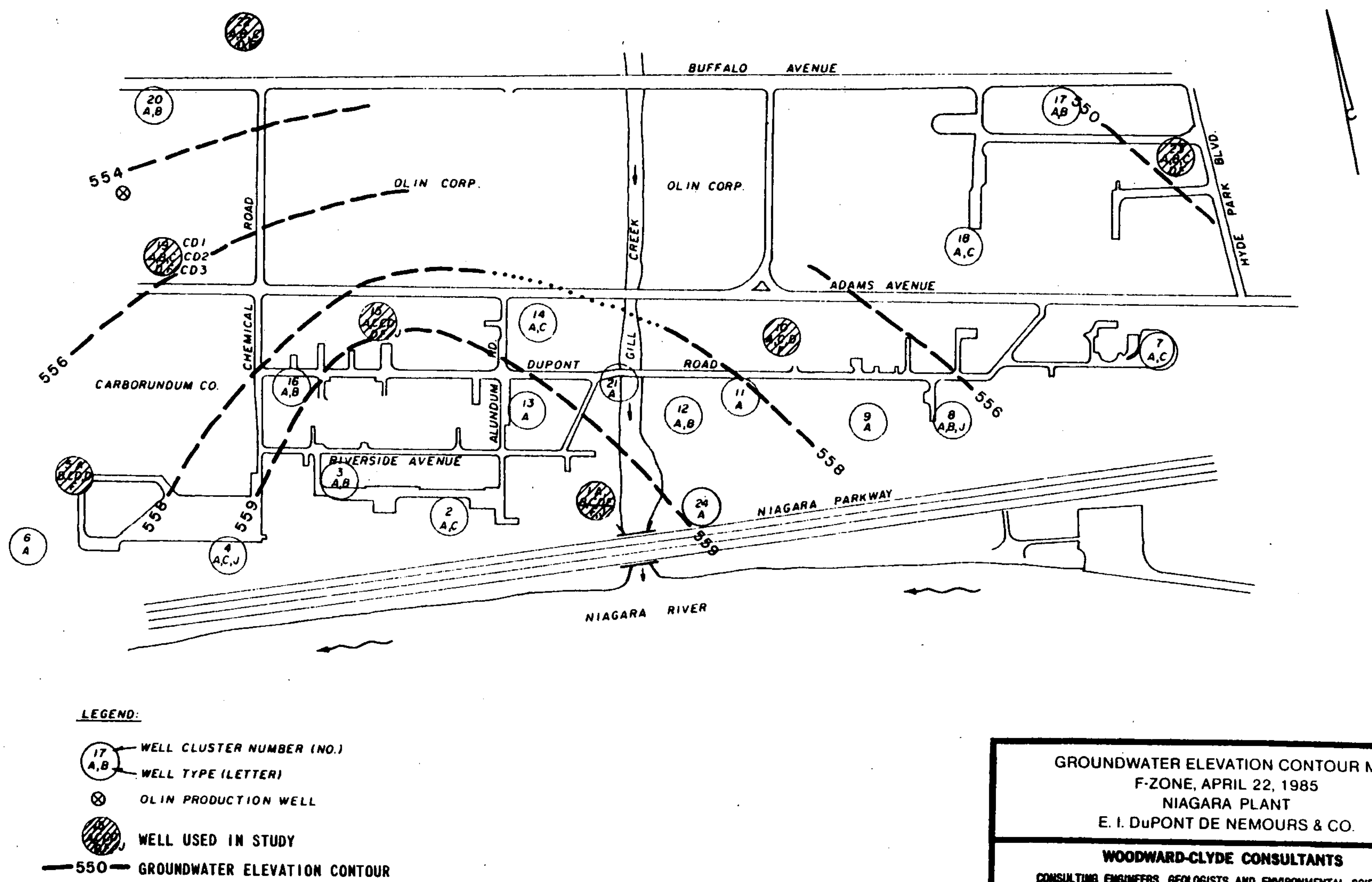


GROUNDWATER ELEVATION CONTOUR MAP
F-ZONE, FEBRUARY 5, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 3/21/86
CHECKED: K.R.M.	0 300	JOB: 83C2236-8

FIGURE B-41

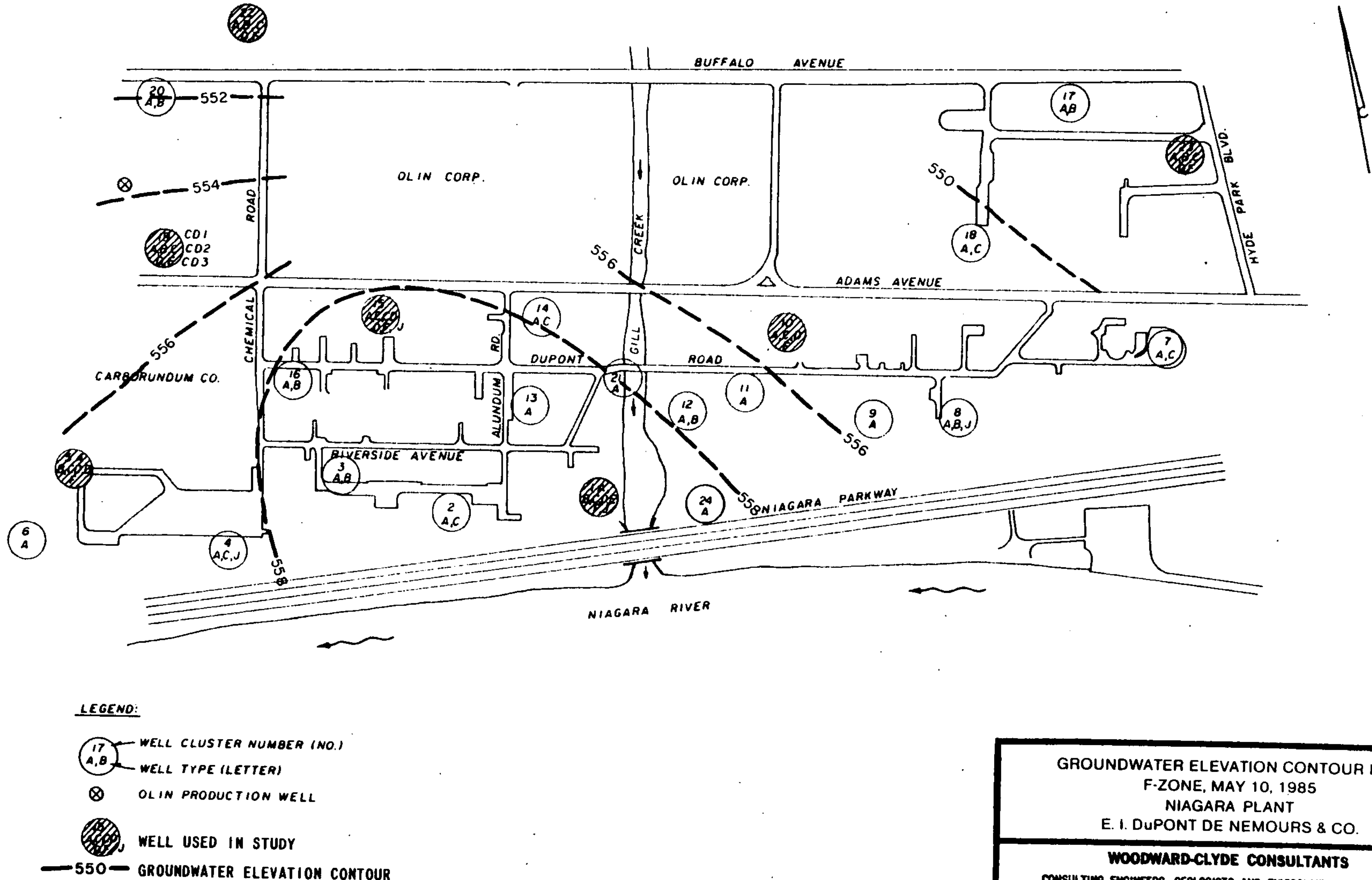


GROUNDWATER ELEVATION CONTOUR MAP
F-ZONE, APRIL 22, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T. P.	SCALE in FEET 0 300	DATE: 3/21/86
CHECKED : K.R.M.		JOB : 83C2236-8

FIGURE B-42

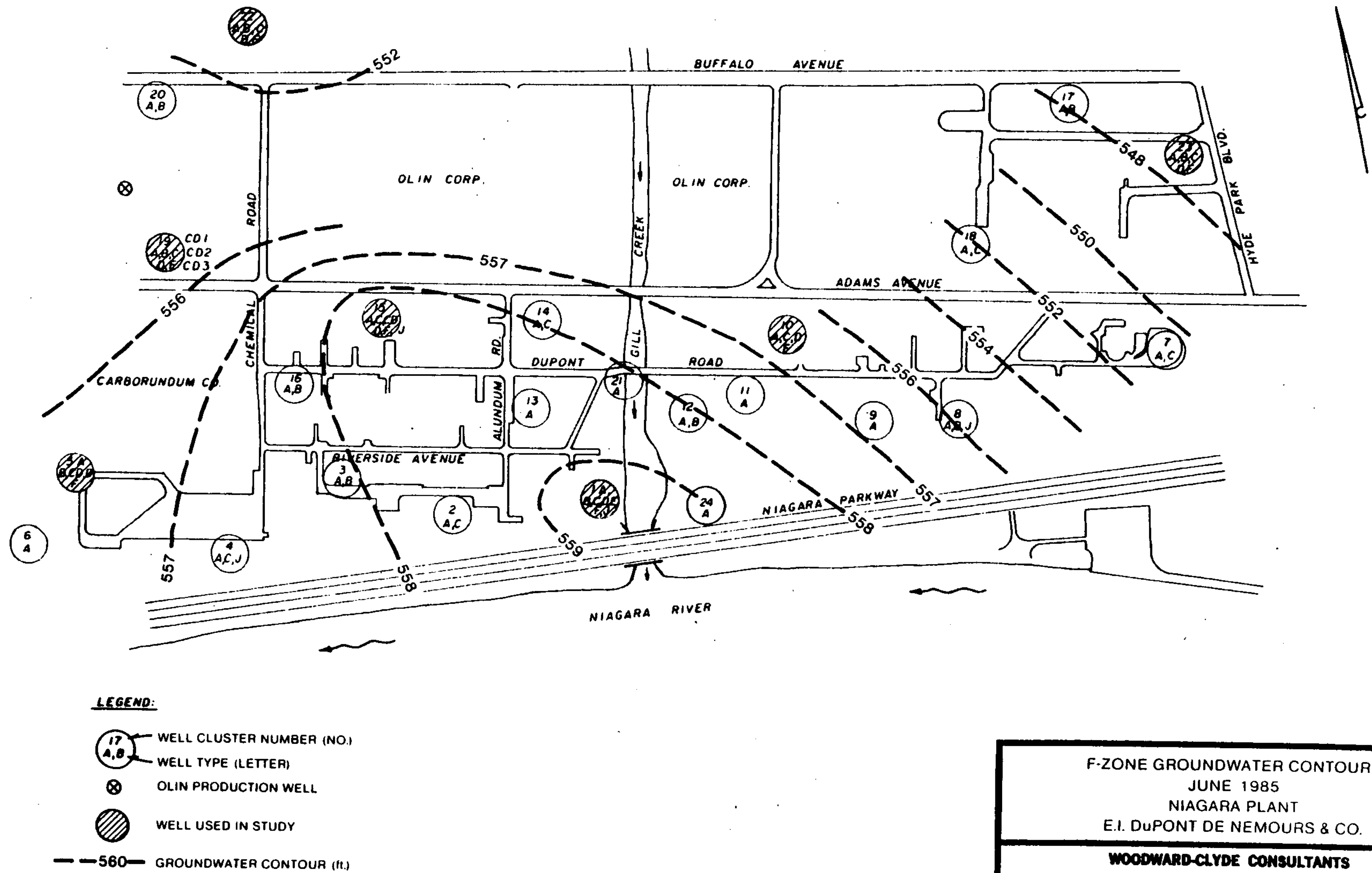


GROUNDWATER ELEVATION CONTOUR MAP
F-ZONE, MAY 10, 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET		DATE: 3/21/86
CHECKED: K.R.M.	0 300		JOB: 83C2236-8

FIGURE B-43

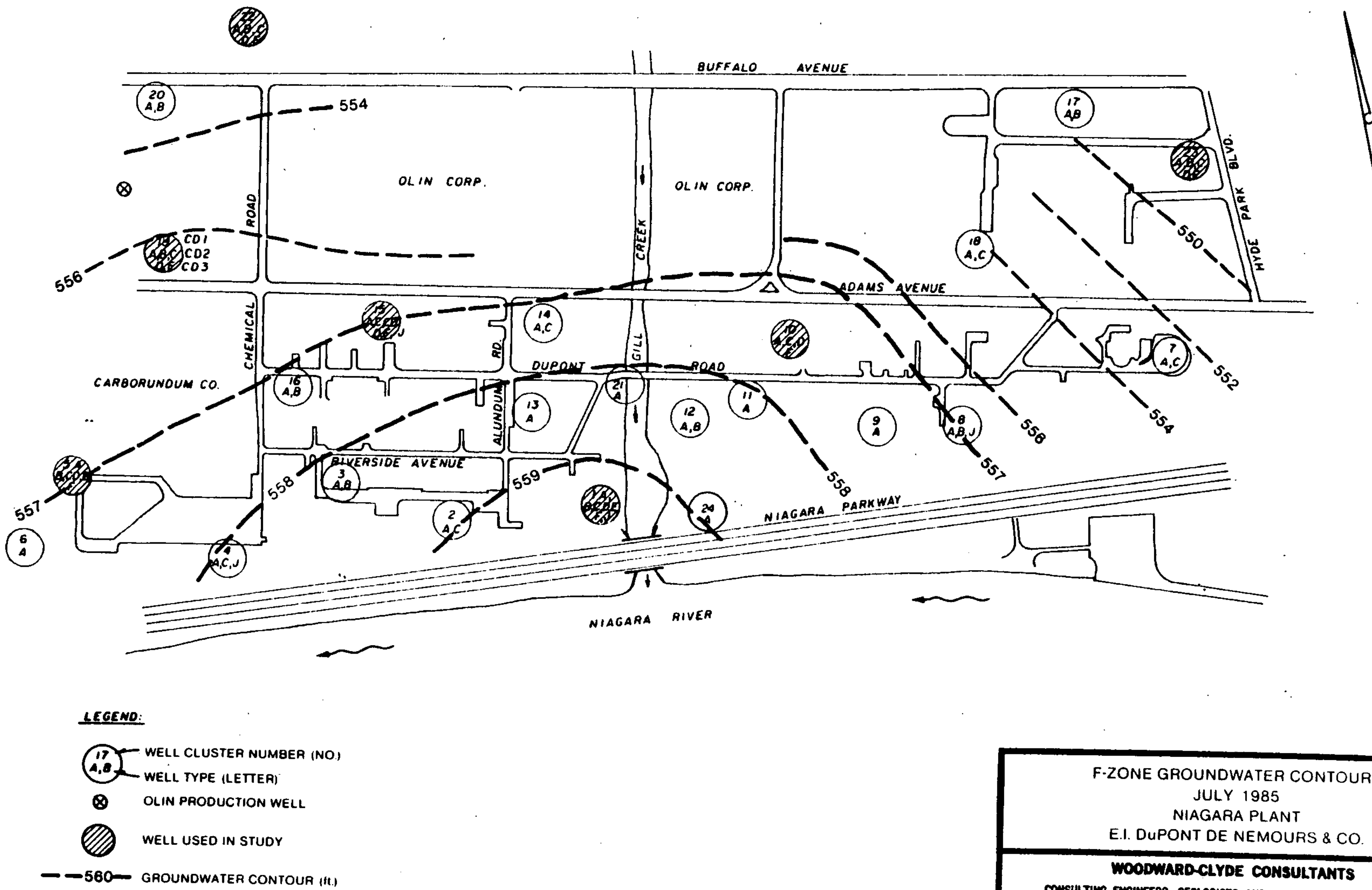


F-ZONE GROUNDWATER CONTOURS
JUNE 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY:	T.P.	SCALE in FEET	DATE:	3/21/86
CHECKED:	K.R.M.	0 — 300	JOB:	83C2236-8

FIGURE B-44



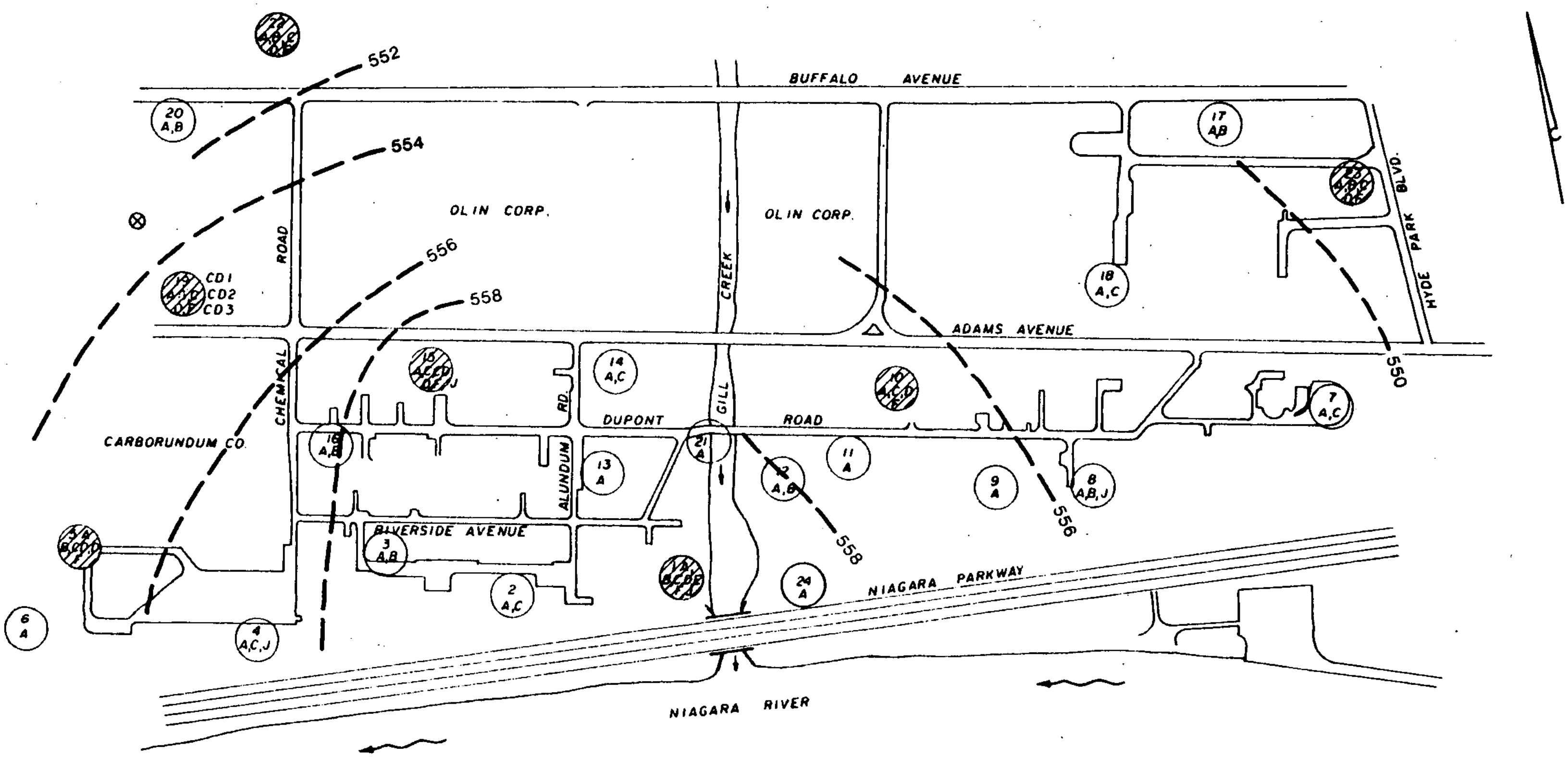
F-ZONE GROUNDWATER CONTOURS
JULY 1985
NIAGARA PLANT
E.I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET		DATE: 3/21/86
CHECKED: K.R.M.	0	300	JOB: 83C2236-8

FIGURE B-45



LEGEND:

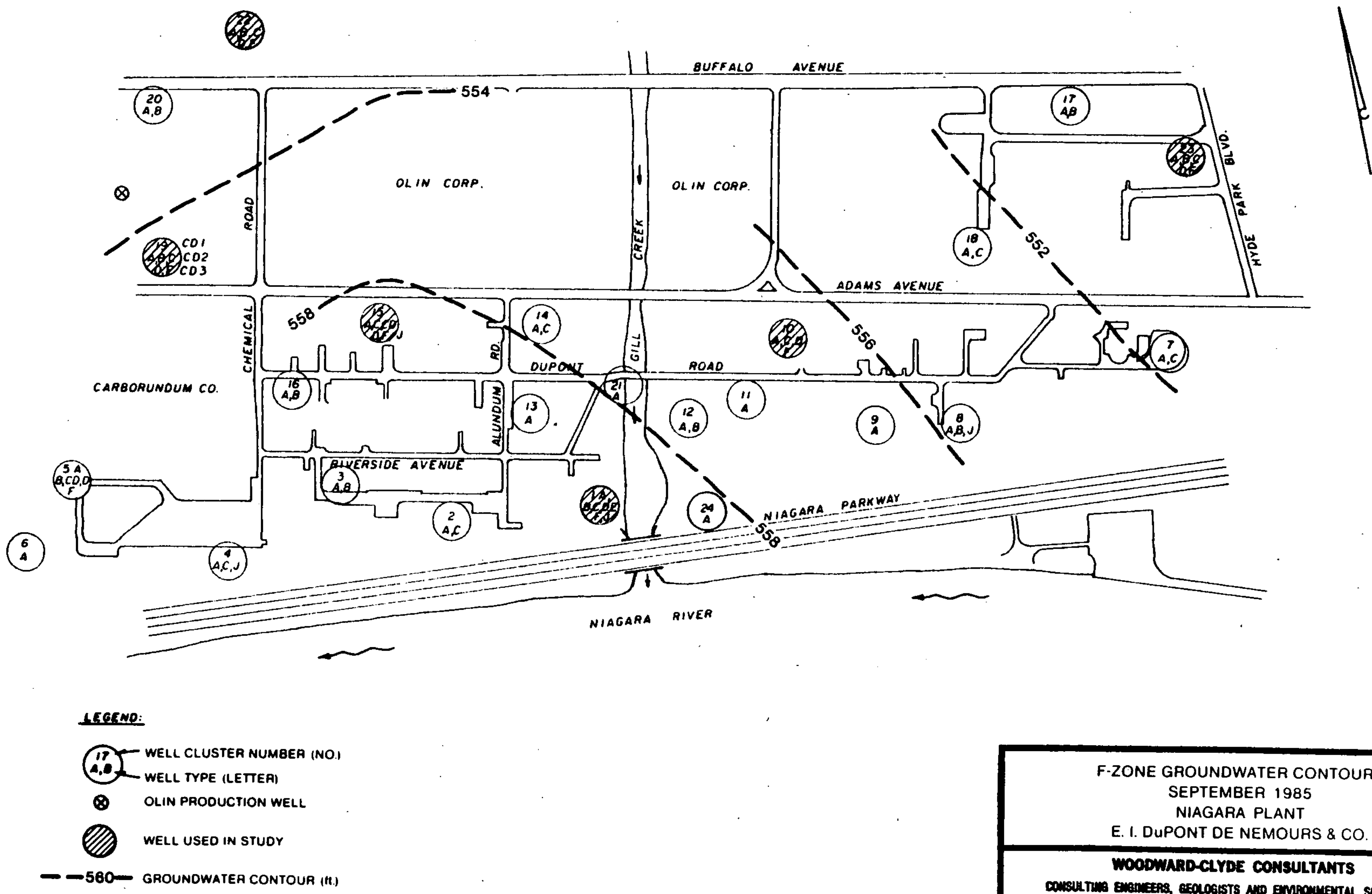
- (17 A,B) WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- (hatched circle) WELL USED IN STUDY
- — —560— GROUNDWATER CONTOUR (ft)

F-ZONE GROUNDWATER CONTOURS
AUGUST 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-46

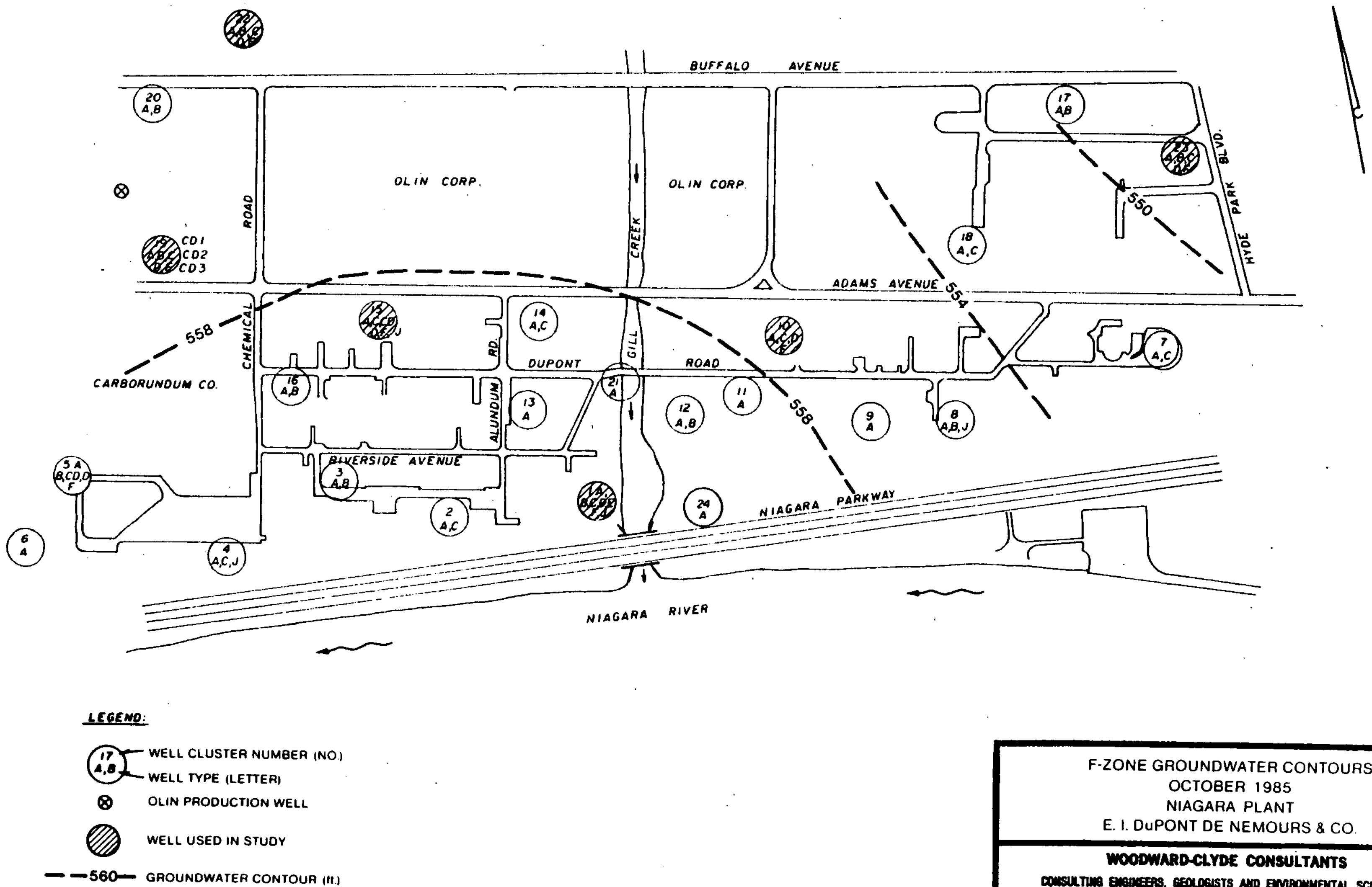


F-ZONE GROUNDWATER CONTOURS
SEPTEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T. P.	SCALE in FEET 0 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-47

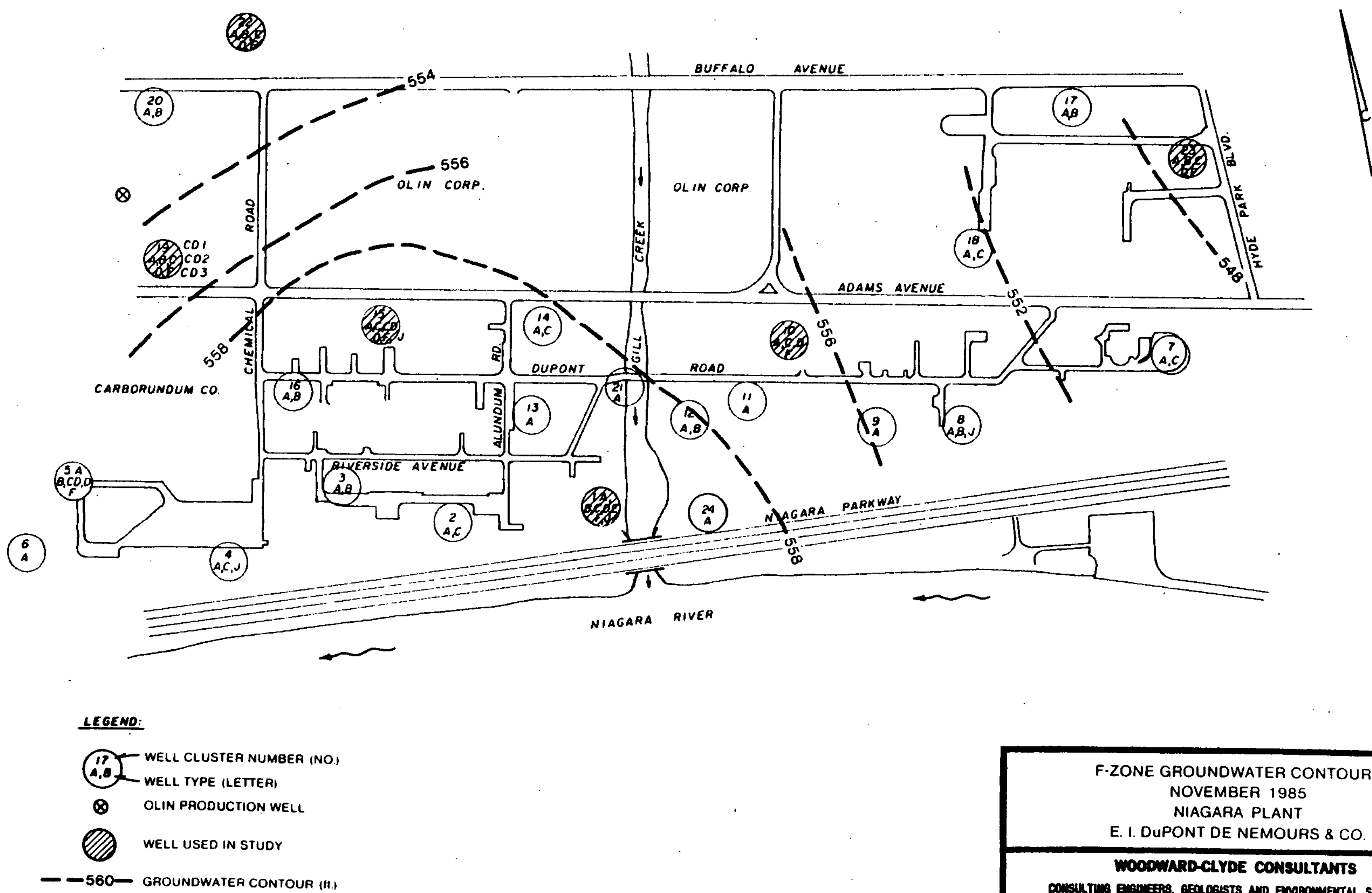


F-ZONE GROUNDWATER CONTOURS
OCTOBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 300	DATE: 3/21/86
CHECKED: K.R.M.		JOB: 83C2236-8

FIGURE B-48



F-ZONE GROUNDWATER CONTOURS
NOVEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.		SCALE in FEET 0 300	DATE:	3/21/86
CHECKED: K.R.M.			JOB:	83C2236-8

FIGURE B-49

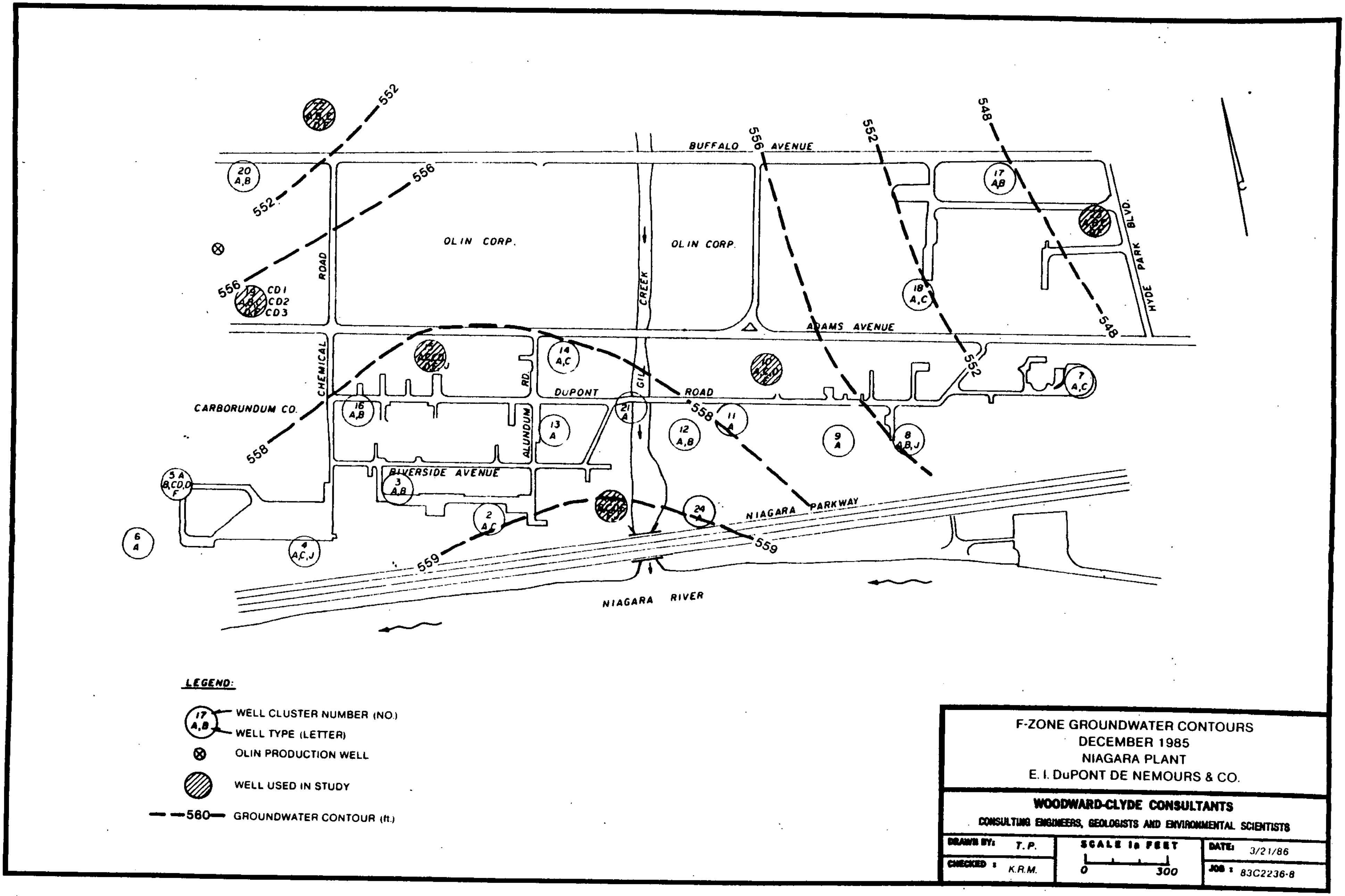

BUFFALO AVENUE
ADAMS AVENUE
HYDE PARK BLVD.
OLIN CORP.
OLIN CORP.
CHEMICAL ROAD
GILL CREEK
DUPONT ROAD
ALUNDUM RD.
RIVERSIDE AVENUE
CARBORUNDUM CO.
NIAGARA PARKWAY
NIAGARA RIVER
548
552
556
558
559
20 A,B
CD1
CD2
CD3
14 A,C
16 A,B
3 A,B
2 A,C
4 A,C,J
5 A B,C,D,D F
6 A
13 A
21 A
12 A,B
11 A
24
9 A
8 A,B,J
18 A,C
17 A,B
7 A,C
LEGEND:
WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
OLIN PRODUCTION WELL
WELL USED IN STUDY
560 GROUNDWATER CONTOUR (ft.)
F-ZONE GROUNDWATER CONTOURS
DECEMBER 1985
NIAGARA PLANT
E. I. DuPONT DE NEMOURS & CO.
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
DRAWN BY: T.P.
CHECKED: K.R.M.
SCALE in FEET
0 300
DATE: 3/21/86
JOB: 83C2236-8

FIGURE B-50

BX #68