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Woodward-Clyde Consultants

June 19, 1985
83C2236-8

E.I. duPont de Nemours & Co., Inc.
Niagara Plant
P.O. Box 787
Niagara Falls, New York 14302

Attention: Mr. Beverly W. Adams
Area Engineer

FINAL REPORT
PUMP TEST PROGRAM
OCTOBER 1984
NIAGARA PLANT SITE
NIAGARA FALLS, NEW YORK

Gentlemen:

We are pleased to submit our Final Report of the Pump Test Program for the pump tests conducted during October 1984 at the Niagara Plant site, Niagara Falls, New York. The purpose of the pump tests was to observe the response of the groundwater regime to various rates of withdrawal. These data were used to determine a minimum pump rate that would have an influence at the site boundaries.

Included in this report are the groundwater level data collected from monitoring wells during the pump tests performed using the Olin production wells. The data utilized during the preparation of this report are presented as tables, plates, and appendices. The results and conclusions drawn from these data are presented and discussed.

We sincerely appreciate the opportunity of providing these services to you on this project. If you have any questions, please do not hesitate to contact us.

Very truly yours,

WOODWARD-CLYDE CONSULTANTS

for Theodore W. Taylor
Senior Staff Geologist

Mark N. Gallagher
Project Hydrogeologist

TWT/MNG/mm

cc: Richard J. Gentilucci, DuPont
Steve Crawley, DuPont
Al Egler, DuPont
Ross Austin, DuPont
Jeffrey Evans, WCC
Frank S. Waller, WCC

FINAL REPORT
PUMP TEST RESULTS
OCTOBER 1984
NIAGARA PLANT SITE
NIAGARA FALLS, NEW YORK

Submitted to:

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

Niagara Falls, New York

Prepared by:

WOODWARD-CLYDE CONSULTANTS

Plymouth Meeting, Pennsylvania

TABLE OF CONTENTS

EXECUTIVE SUMMARY

During October 1984, pump tests involving the Olin production wells were conducted for the DuPont Niagara Plant site. The two Olin production wells, located adjacent to the northwest corner of the DuPont Niagara Plant site, were shutdown and restarted and pumped at various pump rates. The effects of the different pump rates on the bedrock groundwater elevations were monitored utilizing selected DuPont monitoring wells. The purposes of the pump test program were to determine the effects of the Olin production wells upon the groundwater flow regimes beneath the DuPont Plant site at various pump rates and to estimate a minimum pump rate which would control groundwater flow in the plant site area.

The results of the pump tests indicate that the Olin production wells influence groundwater flow in the B-, CD-, D-, and F- water-bearing zones in the DuPont Plant site area west of Gill Creek. The C- and E-zones are of limited areal extent in the plant site area and, therefore, do not contribute significantly to the volume of groundwater flow in the plant area. In most cases, areas of the plant site east of Gill Creek 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 easterly hydraulic gradient.

The groundwater potentiometric surface in the west plant area is influenced by changes in the pumping rate of the Olin production wells. The bedrock groundwater regime is confined; therefore, the effects of pump rate changes are transmitted as a pressure response. Groundwater flow in the east plant area is in a northeasterly direction. The groundwater divide defining groundwater flow to the northeast and to the Olin production wells is located in the vicinity of Gill Creek. The location of the groundwater divide is related to the magnitude of the influence of the groundwater sink to the northeast and of the Olin production wells. If the Olin production wells are pumped at a higher rate, the groundwater divide will shift to the east; if the pump rate is reduced, the divide will shift to the west. Based on this investigation, WCC concludes that a minimum pump rate of 500 gpm would likely control groundwater flow in the west plant site in the B- through F-zones.

INTRODUCTION

Woodward-Clyde Consultants (WCC), with assistance from E.I. duPont de Nemours and Co. (DuPont), conducted a pump test program in cooperation with the Olin Corporation (Olin). The pump test program was conducted at the DuPont Niagara Plant site, Niagara Falls, New York. The "Site Location Plan," presented as Plate 1, shows the location of monitoring wells at the DuPont Plant site and the pumping wells at the Olin site used during the pump tests. Olin continuously withdraws groundwater for industrial purposes from the two production wells which intersect the C- through F-water-bearing zones in the Lockport Formation. Due to the proximity of the two production wells to each other (approximately 10 feet), they are represented as one symbol on the "Site Location Plan" and are considered a single hydraulic sink. The pump test program was conducted during a scheduled Olin plant shutdown of the production wells.

Based upon our previous geohydrologic investigations, the production wells are the principal hydraulic control on groundwater flow in the bedrock in the west plant area. Pump tests were performed utilizing several pump rates, and groundwater levels were monitored in selected monitoring wells throughout the plant area. The pumping rate referred to in this report is the combined rate of pumping (in gallons per minute) from both production wells. Although pumping rates from each production well can be separately controlled, and each well may be pumping concurrently at different rates, only the combined pumping rate requires definition for the purposes of this pump test program.

The objective of these pump tests was to determine changes in groundwater level at selected well clusters as a result of the changing pump rates, and to use this information to estimate the minimum pump rate that would control bedrock groundwater flow throughout the entire plant area. The data was used to determine the approximate relative hydraulic connection between each water-bearing fracture zone and the fractures intersected by the production wells. These data were also used to examine the relationship between changes in hydraulic head as a function of changes in pumping rate.

WCC/DuPont personnel began monitoring the water levels in the selected monitoring wells at 4:00 a.m. on October 23, 1984. At this time, the pumping rate of the production wells was 1000 gallons per minute (gpm). The pumping rate was increased to 1800 gpm at 4:30 a.m. At 9:43 a.m. the pumps were turned off (pumping rate of 0 gpm) then rate of 600 gpm at 11:40 a.m. on October 24. The pumping rate was increased to 1000 gpm at 11:30 a.m. on October 25. Presented in Table 1 are the times, dates, and pumping rates of the production wells for the pump test program. The pumping rates and intervals were supplied to WCC by Olin.

Monitoring of the water levels at the DuPont Plant site continued through 6:40 p.m., October 25. The water-level data obtained during the test program are presented as Appendix A. The water levels presented in Appendix A and utilized for this study were not corrected for river stage changes. River-level fluctuation corrections were not considered necessary due to the dominating influence of the production wells upon the groundwater levels.

HYDRAULIC HEAD DISTRIBUTION

Shown on Plates 2 through 13 are groundwater elevation contour configurations for the B-, CD-, D-, and F- fracture zones at significant times during the pump test program. These plates are presented to illustrate the influence of the production well pumping rate upon the hydraulic head distribution within the water-bearing fracture zones.

A-ZONE

The overburden or A-zone is an unconfined water-bearing zone within unconsolidated materials. As such, the response of the A-zone due to changes in pumping rate cannot be adequately evaluated in short-term tests. As was noted in previous studies, the A-zone in the vicinity of the production wells is dewatered. This indicates that there is induced downward migration to the B-zone as a result of the Olin production well. The B-zone is then controlled by the Olin well. If the production wells were shut down for a significant period of time, the A-zone in this area may become saturated again.

B-ZONE WATER-BEARING FRACTURE

Presented on Plates 2, 3, and 4 are the groundwater elevation contours for the B-zone at 6:00 a.m. on October 23, 10:00 a.m. on October 24, and 2:00 p.m. on October 25, respectively. At 6:00 a.m., October 23, the production wells were pumped at approximately 1800 gpm for about 2 hours (before this time, the wells were pumped at a rate of 1000 gpm). At 10:00 a.m. on October 24, the pumps had been off for over 24 hours, and the groundwater potentiometric surface was equilibrating to a natural system without the pumping stress. At 2:00 p.m. on October 25, the pumping rate had been approximately 1000 gpm for 2 hours and approximately 500 gpm for 24 hours prior to this period.

Shown on Plate 2 is a distinct cone of depression centered around the production wells. This cone extends radially outward to influence the B-zone wells in Clusters 5, 3, and 22. The influence of the pumping appears to have diminished substantially in the B-zone as far out as Cluster 1; however, a small influence may still be present. Based upon this hydraulic distribution, groundwater in the vicinity of Well Cluster 1 is flowing toward the Olin production wells. It is evident that the production well has no significant influence in the B-zone east of Gill Creek.

Shown on Plate 3 is the hydraulic head distribution for the B-zone at 10:00 a.m. on October 24. As noted, the pumps at the production wells had been turned off for approximately 24 hours. As can be seen in Plate 3, the groundwater potentiometric surface has risen in the B-zone across the entire plant site west of Gill Creek. As expected, the water levels in the wells closest to the production wells rose more than those further away, producing a more gradual head differential in the cone of depression around the production wells. East of Gill Creek, the water levels in the B-zone have remained essentially the same, providing further evidence that pumping from the production wells does not influence groundwater flow in this portion of the plant site.

Shown on Plate 4 are the hydraulic head distributions in the B-zone at 2:00 p.m. on October 25. The production wells had been pumping at a rate of 600 gpm for 24 hours, which was then increased to 1000 gpm about 2 hours (12:00 noon) prior to these readings. Illustrated on Plate 4 is the cone of depression being redeveloped around the production wells. Again, the water levels in the area east of Gill Creek are unaffected by the production wells.

C-ZONE

The C-zone is absent at many locations on the plant site, precluding a detailed examination of hydraulic head distribution. The C-zone is expected to respond in a manner similar to the overlying B-zone and underlying CD-zone. The principal hydraulic influence of the production wells on the C-zone would be to increase the potential for vertical leakage by reducing the hydraulic head in the CD-zone.

CD-ZONE WATER-BEARING FRACTURE

Presented on Plates 5, 6, and 7 are the groundwater contour configurations for the CD-zone at 6:00 a.m., October 23; 10:00 a.m., October 24; and 2:00 p.m., October 25, respectively. From examination of interpretations presented on these plates, the influence of the production well pumping on the CD-zone is evident. The contour lines, however, do not exhibit the smooth, concentric pattern that they did in the B-zone. This is probably a result of the greater variation in permeabilities in the CD-zone versus the B-zone and/or the presence of a structural feature, reflecting a more complicated fracture system in the bedrock at this level.

In the CD-zone, the production wells have a strong influence in the direction of Monitoring Well Clusters 22, 15, and 2, with a lesser degree of influence to the south toward Monitoring Well Cluster 19. This results in an irregular pattern of contours as shown on Plates 5 through 7.

Overall, the CD- water-bearing zone and the B- water-bearing zone exhibit similar responses to changes in the pump rate. At 6:00 a.m. on October 23 (Plate 5), when the pumping rate was at its maximum, the hydraulic gradient towards the production well was the steepest and the water elevations the lowest. At 10:00 a.m. on October 24 (Plate 6). after the water levels had been recovering for the past 24 hours, the hydraulic gradient and the cone of depression around the production wells were less pronounced and the water levels had risen. Illustrated on Plate 7 are the groundwater elevations after the pumps had been restarted for approximately 26 hours and the cone of depression was regaining its initial configuration, as shown on Plate 5.

D-ZONE WATER-BEARING FRACTURE

Presented on Plates 8, 9, and 10 are the hydraulic head distributions for the D-zone at 6:00 a.m. on October 23, 10:00 a.m. on October 24, and 2:00 p.m. on October 25, respectively. The water-level gradient in the D-zone is less than that evidenced in the B- and CD-zones. The shallow gradient is found west of Gill Creek. East of Gill Creek there is a northeasterly groundwater flow component. The very shallow gradient in the west plant area and the rapid response to pumping changes suggests that the D-zone has a high permeability and a good hydraulic connection with the production wells. A structural change in the bedrock, which results in a low permeability zone, must be present in the area of Gill Creek in the D-zone. This structural change results in two distinct flow regimes, as defined by the different gradients. The shallow gradients in the west plant area make it difficult to construct representative contour maps. The contour maps for the D-zone are presented to depict general trends. As can be seen when pumping was at its greatest volume, the groundwater levels in the D-zone were at their lowest (Plate 8); and after the longest recovery period with the pumps off, the groundwater levels were their highest (Plate 9).

E-ZONE

The E-zone in the plant site area is of limited areal extent. The production wells will control the E-zone by vertical leakage to the F-zone. Where the E-zone is present it would be expected to respond to pumping in a manner similar to that of the D- and F-zones.

F-ZONE WATER-BEARING FRACTURE

The hydraulic head distributions for the F-zone, shown on Plates 11, 12, and 13, are somewhat different in their general pattern than those in the B-, CD-, and D-zones already discussed. F-zone groundwater flow is to the north in the direction of Well Cluster 22. To further investigate groundwater flow in the vicinity of the production well and Cluster 22, an estimation of the water level in the production well was derived using the data made available to us by Olin. According to Olin personnel, the elevation of the production well has not been surveyed. From U.S.G.S. topographic maps, the elevation is estimated to be 571 feet. The depth to water of approximately 30 feet for 6:00 a.m. on October 23 was provided by Olin. Therefore, the calculated water level in the production well is elevation 541 feet, or approximately 4 feet below that of the water level in Monitoring Well 22-F at the same time.

At 11:40 a.m., October 24, the depth to water was 21 feet, or approximately elevation 550. Simultaneously, the water level in Well 22-F was about elevation 555. No measurements for October 25 were reported. Utilizing the pumping well elevations, the interpretation of the hydraulic head distribution for the F-zone was developed, as shown on Plates 11, 12, and 13.

Based upon the hydraulic head distributions presented on Plates 11, 12, and 13 it appears that Monitoring Well 22-F has a good hydraulic connection with the production wells. This degree of communication is best represented by the amount of recovery that was recorded during the monitoring of the water levels in 22-F. Between the 9:43 a.m., October 23 shutdown of the pumps and the 11:40 a.m., October 24 restart, the groundwater level had recovered by over 10 feet. This was the largest change in head recorded in any of the monitoring wells during the pump test program. Monitoring Wells 19-F, 15-F, and 5F are affected by the pumping, but to a lesser degree than Well 22-F, resulting in the contour configurations shown on Plates 11, 12, and 13.

J-ZONE

The J-zone marks the contact between the Lockport and Rochester Formations. The lack of influence of the production wells within this zone is due to its very low permeability and that the production wells do not penetrate the J-zone.

ESTIMATE OF MINIMUM PUMP RATE

As previously discussed, the Olin production wells were pumped at various rates while the response of the bedrock groundwater regime was monitored. The responses of the various bedrock water-bearing zones to changes in pumping rate were used to estimate a minimum pumping rate that would be effective in controlling groundwater flow in the plant area.

In general, in the plant site area, groundwater flow in the bedrock is controlled by the Olin production wells and a groundwater sink to the northeast (possibly the PASNY conduits). Prior to pumping, the natural equilibrium groundwater flow direction was probably northward near the plant site. Without pumping, the hydraulic control on groundwater flow is the Niagara River below the falls. The PASNY conduits and the Falls Street tunnel represent local groundwater sinks to the northeast and north, respectively.

The natural groundwater flow pattern has been altered by the hydraulic influences of the Olin production wells and the PASNY conduits, so that groundwater flow is now in a northwesterly and northeasterly direction, respectively. These two groundwater flow directions are well developed, as shown on the groundwater elevation contours (Plates 2 through 13) developed for this study and previous studies. The two flow regimes are separated by a groundwater divide located in the area of Gill Creek. The groundwater divide defines a no-flow boundary where groundwater east of the divide flows to the northeast, and groundwater flow west of the divide flows to the northwest. The location of the groundwater divide varies slightly in each water-bearing fracture zone.

The location of the groundwater divide in each fracture zone is also dependent on the magnitude of the hydraulic influences of the PASNY conduits and the Olin production wells upon that fracture zone. The magnitude of the hydraulic influence is dependent principally on the pumping rate, permeability, and hydraulic continuity of each fracture zone. The hydraulic influence of the PASNY conduits can be considered to be "in equilibrium" since the hydraulic properties of the sink would not be expected to change significantly. Therefore, changes in the location of the groundwater divide would be expected to be sensitive to changes in the Olin production well pump rate. It would be expected that, if the Olin production well pumping rate decreased, the groundwater divide would shift westward, and if the pumping rate increased, the groundwater divide would shift eastward.

Groundwater elevation contour maps are used to define the direction of groundwater flow and were developed for selected time periods throughout the pump test program. The maps are then used to identify, in plan view, the groundwater flow direction. Groundwater flowing towards the Olin production wells is being contained; whereas, groundwater flowing to the PASNY conduits is not being contained.

For the Olin production wells to control groundwater flow in the area of the plant site, the cone of depression created by the production wells must extend to the plant site boundaries, and/or groundwater flow at the plant site boundaries must be in the direction of the cone of depression. Because the cone of depression is distorted (nonradial), due to anisotropic and heterogeneous flow conditions, the influence of the production wells is not equal at equal distances from the production wells. Therefore, a drawdown of approximately 0.3 to 0.5 feet at any given well was considered sufficient to conclude that the production wells were influencing the hydraulic head at that well. The location of the groundwater divide was used to define the limit of the area within the hydraulic barrier created by the production wells.

The drawdown in selected monitoring wells due to changes in the Olin production well pump rate was measured. This data defines the effect of the production wells on the potentiometric surface of the water-bearing zone at known pump rates. To estimate the pump rate that would effect a drawdown of between 0.5 and 0.3 feet, change in pump rate versus change in head data plots were constructed. The changes in hydraulic head due to changes in pumping rates of 280, 400, 600, 800, and 1800 gpm were plotted. The maximum change in head during a pumping sequence was used. The changes in pumping rate were provided by Olin and are summarized in Table 1. Based upon the hydraulic principal that drawdown is proportional to pump rate, a straight line was drawn through the data plots. Although there was some scatter in the data, in most cases, the data plots described a linear relationship. The scatter in the data is due to the transient, short-term test periods.

B-ZONE

Within the B-zone, the change in head ranged from less than 0.3 feet to greater than 4 feet (Plates 14 and 15). As expected, the greater the pump rate, the larger the drawdown. In most cases, a drawdown of between 0.3 and 0.5 feet would be effected in the west plant area by pump rates ranging from less than 400 to greater than 1000 gpm. Using the drawdown for the known pump rates, the production wells are effective in containing groundwater flow in the B-zone beyond the west plant boundaries and to the east in the area of Gill Creek at pump rates of 600 to 1800 gpm. The estimated drawdown at a pump rate of 500 gpm is shown on Plate 16.

The production well influence in the area of Gill Creek is defined by the location of the groundwater divide. As shown on Plates 2 through 4, the shift of the groundwater divide due to pump rate changes was measured from a reference point located at the intersection of Gill Creek and DuPont Road. At pump rates of 1800, 1000, and 0 gpm, the groundwater divide was located approximately 360, 160, and 80 feet east of the reference point, respectively. As expected, the groundwater divide shifted westward as the pump rate was reduced.

Based on the direction of groundwater flow at known pump rates and the estimated pumping influence at 500 gpm, the B-zone in the west plant area would be contained at a pump rate of 500 gpm.

CD-ZONE

Drawdown in the CD-zone ranged from less than 1 foot to greater than 6 feet (Plates 17 through 19). In most cases, a drawdown of between 0.3 and 0.5 feet would be effected in the west plant area at pump rates ranging from less than 200 gpm to greater than 800 gpm. Using the drawdown from the known pump rates, the production wells are effective in containing groundwater flow beyond the west plant boundaries and to the area in the vicinity of Gill Creek at pumping rates of 600 to 1800 gpm, as shown on Plates 5 through 7. The predicted drawdown contours at a pumping rate of 500 gpm are shown on Plate 20.

The production well influence in the area of Gill Creek is defined by the location of the groundwater divide. The groundwater divide was located at the reference point at 1800 gpm, and shifted westward approximately 70 feet and 155 feet at pump rates of 1000 and 0 gpm, respectively.

Based on the direction of groundwater flow at the known pump rates and the estimated pumping influence at 500 gpm, the CD-zone in the west plant area would be contained at a pump rate of 500 gpm.

D-ZONE

Drawdown in the D-zone ranged from less than 0.3 feet to greater than 3 feet (Plates 2 and 22). In most cases, a drawdown of between 0.3 and 0.5 feet would be effected in the west plant area at pump rates ranging from less than 400 gpm to greater than 1000 gpm. Using the drawdown from the known pump rates, the production wells are effective in containing groundwater flow beyond the west plant site boundaries at pump rates of 600 to 1800 gpm and eastward to the area west of Gill Creek, as shown on Plates 8 through 10. The estimated drawdown at a pump rate of 500 gpm is shown on Plate 23.

The production well influence in the area west of Gill Creek is defined by the groundwater divide. The groundwater divide shifted eastward at pumping rates lower than 1800 gpm. This event probably occurred because the groundwater regime had not reacted in equilibrium with respect to pumping at the higher rate. Groundwater flow in the D-zone after the production wells were shut down was almost entirely offsite to the northeast.

Based on the direction of groundwater flow at the known pump rates and the estimated pumping influence at 500 gpm, the D-zone in the west plant area would be contained at a pump rate of 500 gpm.

F-ZONE

Drawdown in the F-zone ranged from less than 0.3 feet to greater than 10 feet (Plates 24 and 25). Using the drawdown from the known pump rates, the production wells are effective in containing groundwater flow beyond the west plant boundaries in the area west of Alundum Road at pump rates of 600 to 1800 gpm. In most cases, a drawdown of between 0.3 and 0.5 feet would be effected in the west plant area at pump rates ranging from less than 400 to greater than 800 gpm. The estimated drawdown at a pump rate of 500 gpm is shown on Plate 26.

The production well influence in the area of Alundum Road is defined by the groundwater divide. The groundwater divide was located approximately 400 feet west of the reference point at pump rates of 1600 to 1800 gpm, and 540 feet after the production wells were shut down.

Based on the direction of groundwater flow at the known pump rate and the estimated pumping influence at 500 gpm, the F-zone in the west plant area would be contained at a pump rate of 500 gpm.

CONCLUSIONS

The Olin production wells were used to conduct a pumping test program during October 1984. During these pumping tests, the production wells were pumped at various rates for various time periods, and selected bedrock monitoring wells were monitored to measure the effect the production wells have on the bedrock groundwater regime. The results of the pump tests were used to estimate an approximate pump rate that would control groundwater flow in the plant area.

In general, the results of the pump tests indicate that the production wells influence groundwater flow in the B-, CD-, D-, and F-zones in the plant site area west of Gill Creek. East of Gill Creek, the influence of pumping was not significant. The C- and E-zones are influenced by the production wells in the west plant area through leakage to the CD- and F-zones, respectively. The production wells have dewatered the A-zone in this immediate vicinity.

The degree of response of the bedrock groundwater regime to changes in pump rate was divided into four groups: (1) a rapid and large change in water level to changes in pumping rate, (2) a rapid change in water level, but of a lesser magnitude to changes in pumping rate, (3) a change in water level, measurable only after major changes in pumping rate, and (4) no measurable change in water level to changes in pumping rate.

The bedrock monitoring wells in Clusters 5, 15, 19, and 22 responded rapidly to changes in pump rate. The bedrock monitoring wells in Clusters 3, 4 (excluding 4-J), and 16 responded rapidly but with a lesser magnitude of change in water level. In general, the bedrock monitoring wells in Clusters 1, 2, 10 (excluding 10-C), and 20 responded with measurable changes in water level only during major changes in pumping rate. The remaining bedrock monitoring wells had no measurable responses to the changing pumping rates.

The results of the pump test were used to estimate at what rate the Olin production wells would have to be pumped in order to control groundwater flow in the plant site area. Included in the evaluation was the location of the production wells, the capacity of the production wells, the influence of the PASNY Conduits groundwater flow direction and the complex hydraulic flow regime associated with the fractured dolomite of the Lockport Formation.

The production wells are located west of the northwestern plant site boundary and wells have a greater influence in the northwest corner than in other areas of the plant site. The capacity of the production wells is a function of the transmissivity of the Lockport Formation, the type of pumps used, the GAC system used and the diameter of the well. The capacity of the production wells is on the order of 3000 gpm. Groundwater flow in fractured rock is a combination of radial and linear flow. Groundwater flow is from minor to major fracture zones. At the site boundaries the influence of the production wells will be greater in the major fractures.

The PASNY Conduits have a significant hydraulic influence in the plant area. The hydraulic influence of the PASNY conduits is defined by a groundwater divide. East of this divide, groundwater flow is to the PASNY Conduits and west of the divide groundwater flow is to the Olin production wells. The area of influence of the PASNY Conduits is primarily in the east plant area. If the PASNY Conduits did not exist the Olin production wells would have a greater influence in the east plant area. The hydraulic influence of the Olin production wells is primarily in the west plant area. Therefore this study focused on the calculation of a minimum pumps rate which would control groundwater flow west of Gill Creek. The minimum pump rate would not be expected to effect equal drawdowns at equal radial distances from the production wells. It would be expected that drawdown would be greater along major fracture zones then along minor fracture zones.

Based on the graphical plots of the change in water level versus change in pump rate, the pump rate required to cause a 0.3- to 0.5-foot drawdown along the west plant site boundary ranged from 100 to 600 gpm. Based on these results, coupled with the location of the groundwater divide and groundwater flow directions for each case, it is concluded that a minimum pump rate of 500 gpm would control groundwater flow in the west plant area in the B- through F-zones.

The production wells are open to the C- through F-zones; therefore, they do not have a direct influence in the B-zone. The influence of the production wells in the B-zone is a result of vertical leakage to the C-zone. As a result of this indirect hydraulic influence, the B-zone requires a longer period of time to respond to pumping. Therefore, the influence of the production wells in the B-zone is not adequately defined by the short-term test performed during this investigation.

The influence of the production wells in the B-zone is shown by the groundwater elevation contour configurations (Plates 2, 3, and 4). As can be seen, there is a depression in the B-zone groundwater surface centered at the production wells. Thus, groundwater flow in the B-zone in the west plant area is toward the production wells. It is expected that the production wells will influence the B-zone at a pump rate of 500 gpm, and groundwater flow in the west plant site in the B-zone will be toward the production wells.

As discussed in the "Supplemental Geohydrologic Investigations Report" (WCC, October 24, 1984) for the Niagara Plant, the effect of the Buffalo Avenue sewer on groundwater flow in the A- and B-zones is not easily assessed with the existing data. It appears from the existing data that any effects of the sewer on the flow of groundwater in the area of the production wells may be insignificant compared to the effects of the Olin production wells.

ADDITIONAL STUDY

The Olin production wells have been pumping at a combined rate of 500 gpm since the fall of 1984. Water level elevation measurements obtained in April, 1985 generally support WCC's conclusion that a groundwater withdrawal rate of 500 gpm is the minimum to affect hydraulic control on groundwater west of Gill Creek. Briefly, the cone of depression within the B-, C-, CD-, and D-zones appears to extend to Gill Creek. The location of the groundwater divide in the F-zone is apparently located 300 to 500 feet west of Gill Creek. WCC will prepare a letter report addressing these new data.

LIMITATIONS

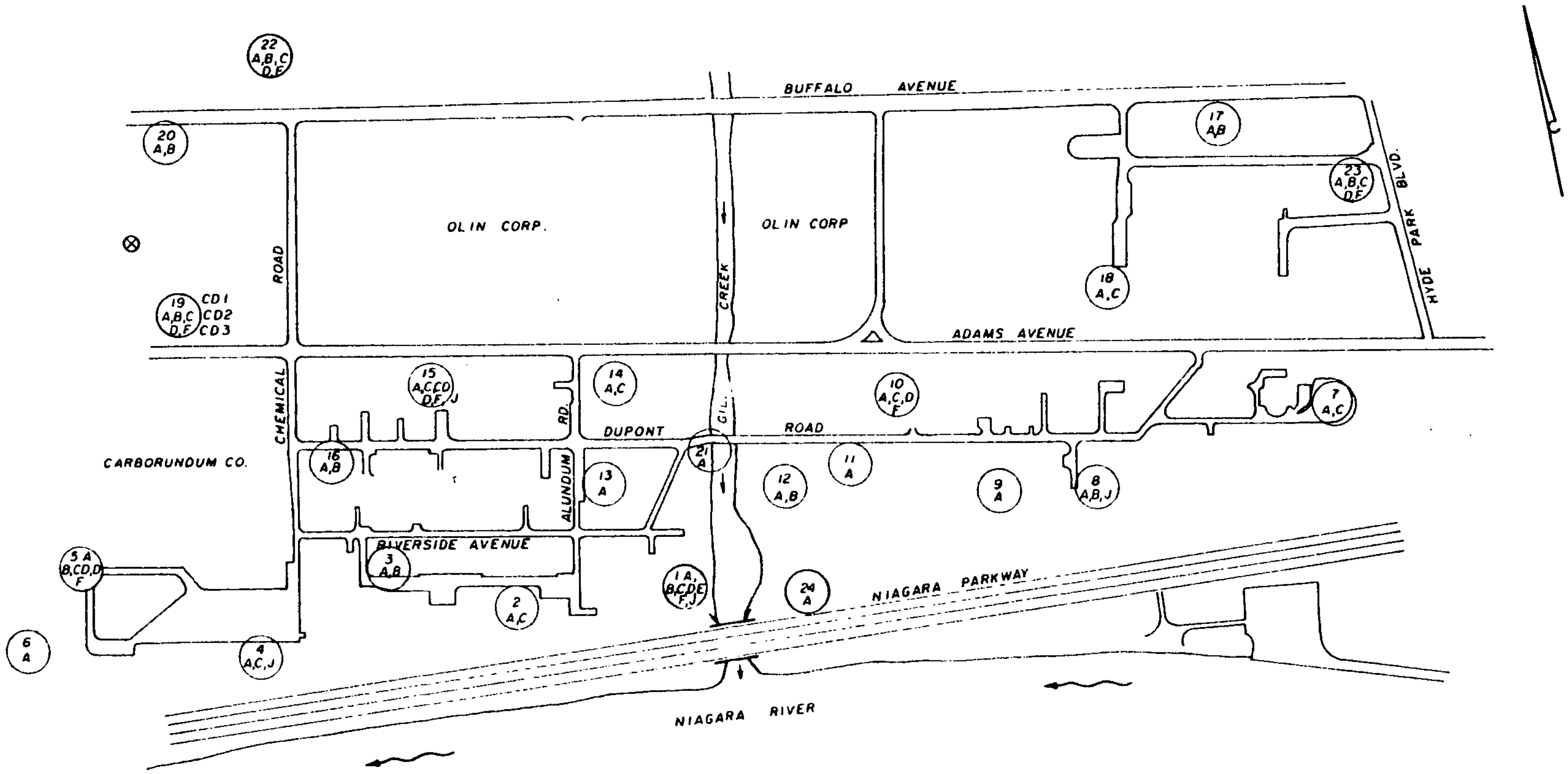
The results and conclusions presented in this report are based upon the interpretations developed from the available geologic, subsurface, and hydrologic data. These results and conclusions are subject to confirmation and/or revision as additional information becomes available.

Tables

TABLE 1
PUMP TEST
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Day-Date	Time	Pumps	Approximate Pumping Rate (gpm)	Change in Pumping Rate (gpm)
Tuesday-10/23/84	4:30 a.m.	1 pump on	1000	—
	4:30 a.m.	2 pumps on	1800	+800
	6:15 a.m.	2 pumps on	1520	-280
	7:10 a.m.	2 pumps on	1800	+280
	9:43 a.m.	0 pumps on	0	-1800
Wednesday-10/24/84	11:40 a.m.	1 pump on	600	+600
Thursday-10/25/84	11:30 a.m.	1 pump on	1000	+400

Plates

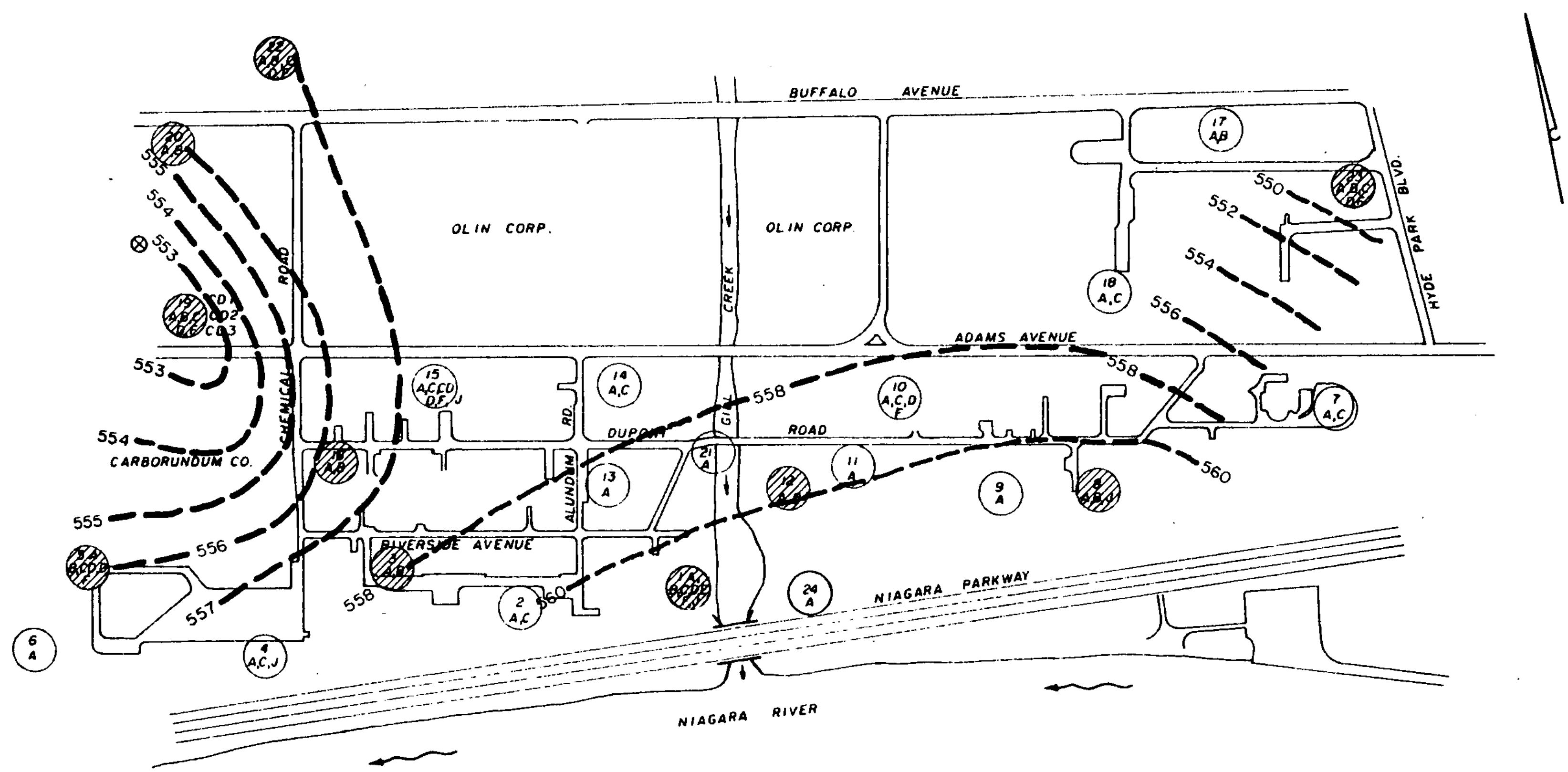


LEGEND:

- (17 / A,B) — WELL CLUSTER NUMBER (NO.)
- WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELLS

SITE 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: 5/16/85
CHECKED : J.C.E.		JOB : 83C2236

PLATE I



LEGEND:

- 17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELLS
- WELLS USED TO GENERATE CONTOURS
- — — — GROUNDWATER CONTOUR
- .... PROJECTED GROUNDWATER CONTOUR

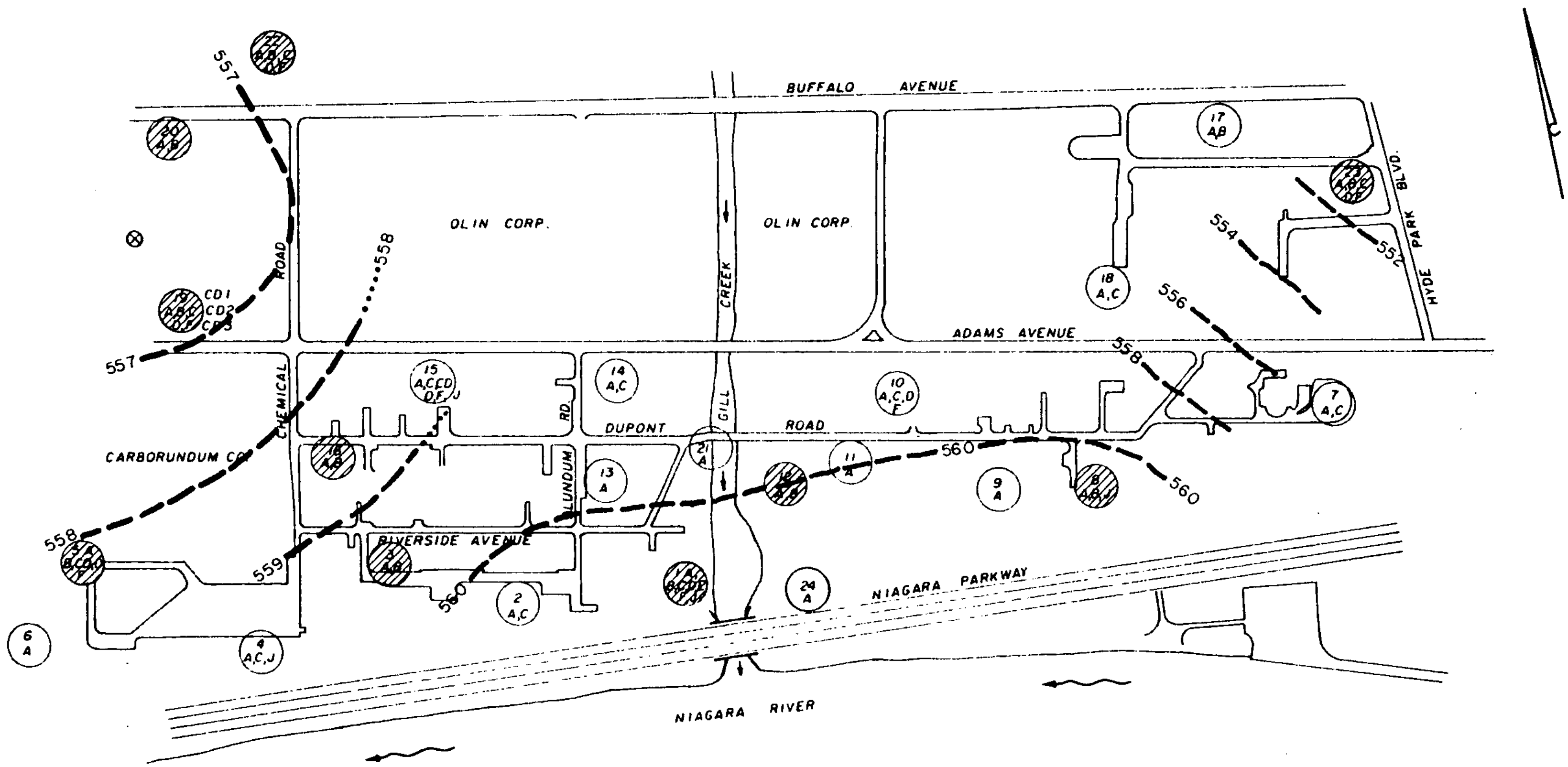
NOTE: PUMPING RATE = 1800 GPM

GROUNDWATER ELEVATION CONTOURS, B-ZONE
6:00 a.m., OCTOBER 23, 1984
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: 10/18/84	
CHECKED: J.C.E.		JOB: 83C2236	

PLATE 2



LEGEND:

- 17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELLS
- WELLS USED TO GENERATE CONTOURS
- — — GROUNDWATER CONTOUR
- ········ PROJECTED GROUNDWATER CONTOUR

NOTE: PUMPING RATE = 0 GPM

GROUNDWATER ELEVATION CONTOURS, B-ZONE
10:00 a.m., OCTOBER 24, 1984
NIAGARA PLANT

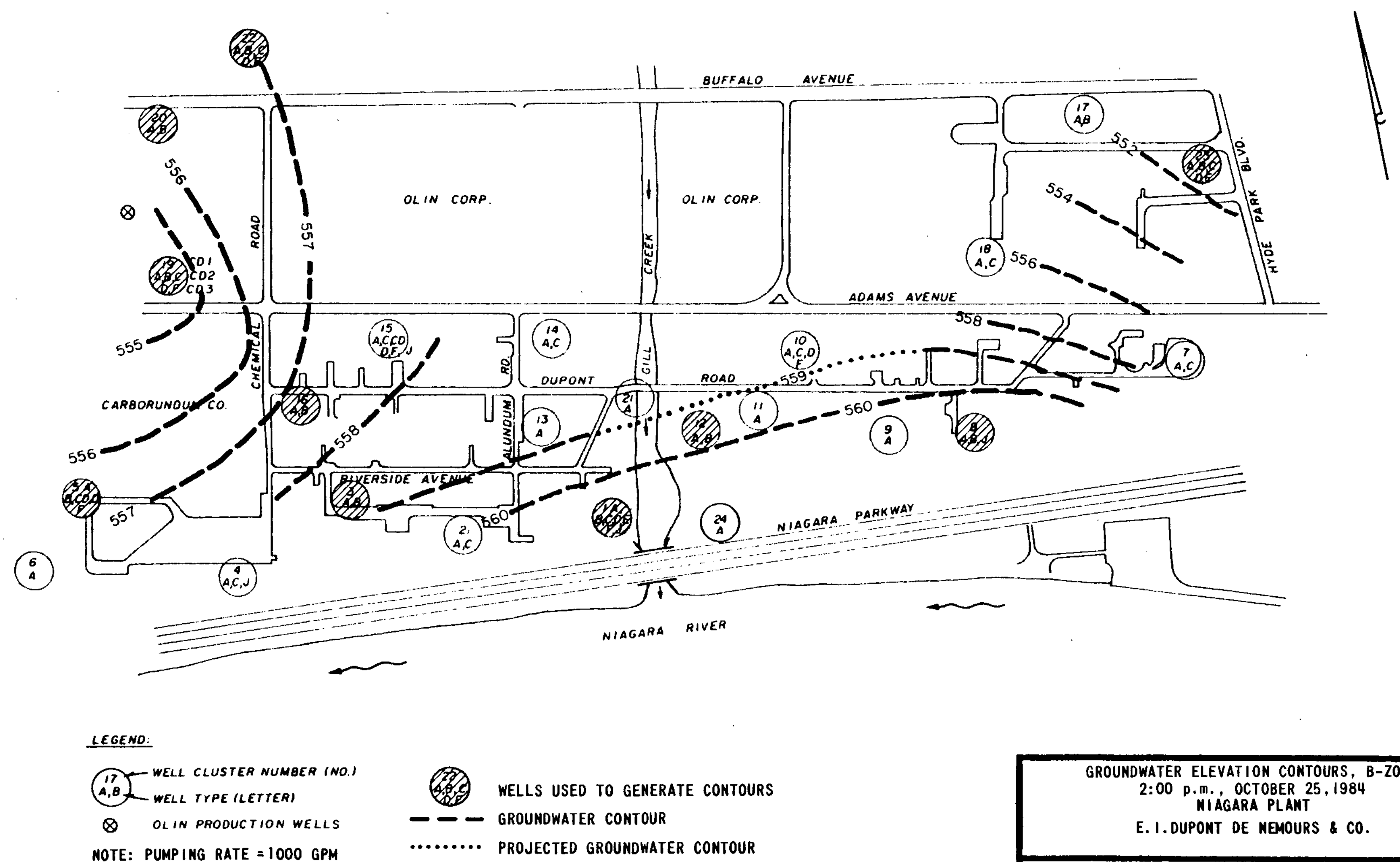
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 3



GROUNDWATER ELEVATION CONTOURS, B-ZONE
2:00 p.m., OCTOBER 25, 1984
NIAGARA PLANT

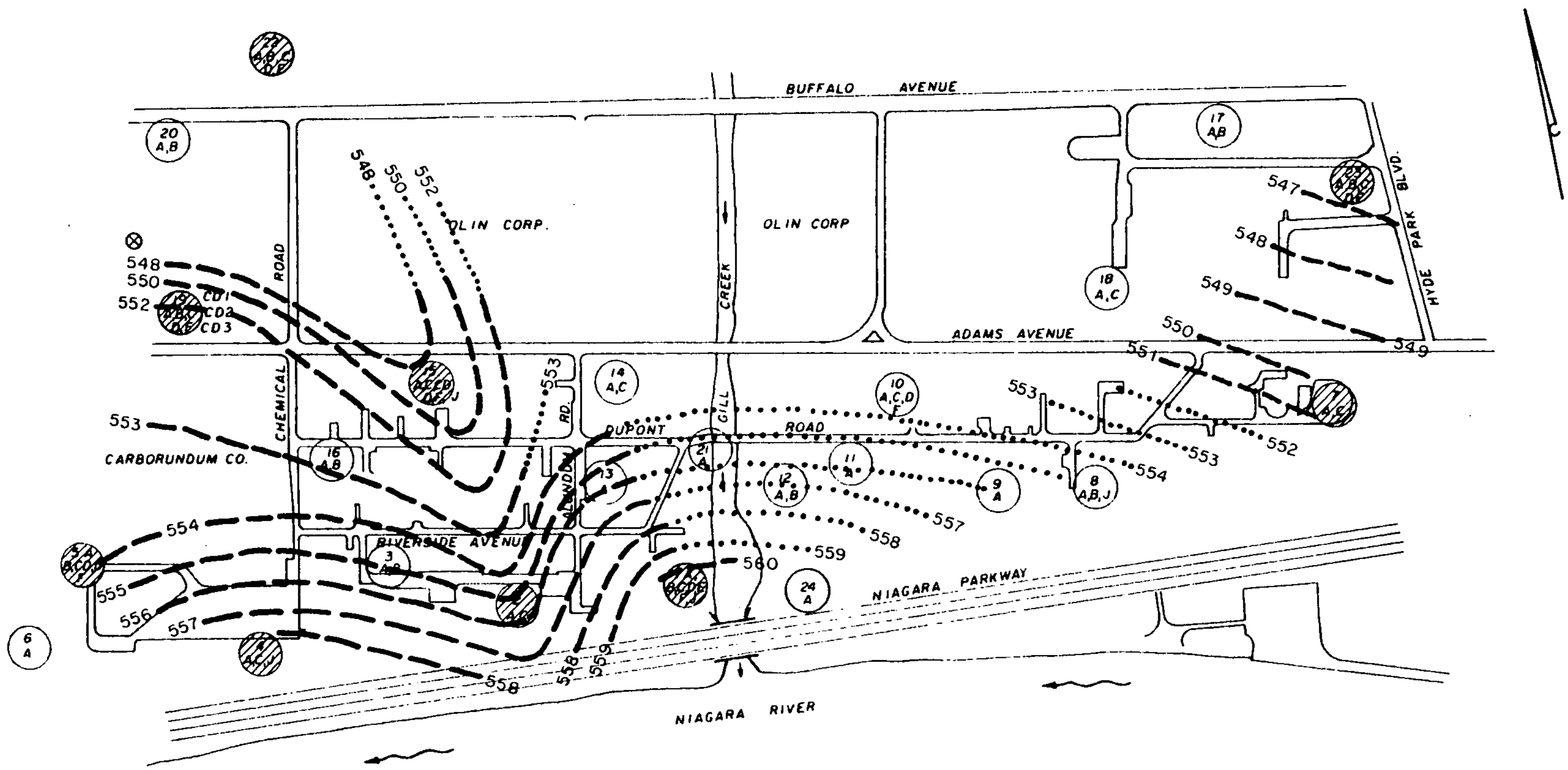
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 5/16/85
CHECKED: J.C.E.	0 — 300	JOB: 83C2236

PLATE 4



LEGEND:

WELL CLUSTER NUMBER (NO.)
WELL TYPE (LETTER)
⊗ OLIN PRODUCTION WELLS

NOTE: PUMPING RATE = 1800 GPM

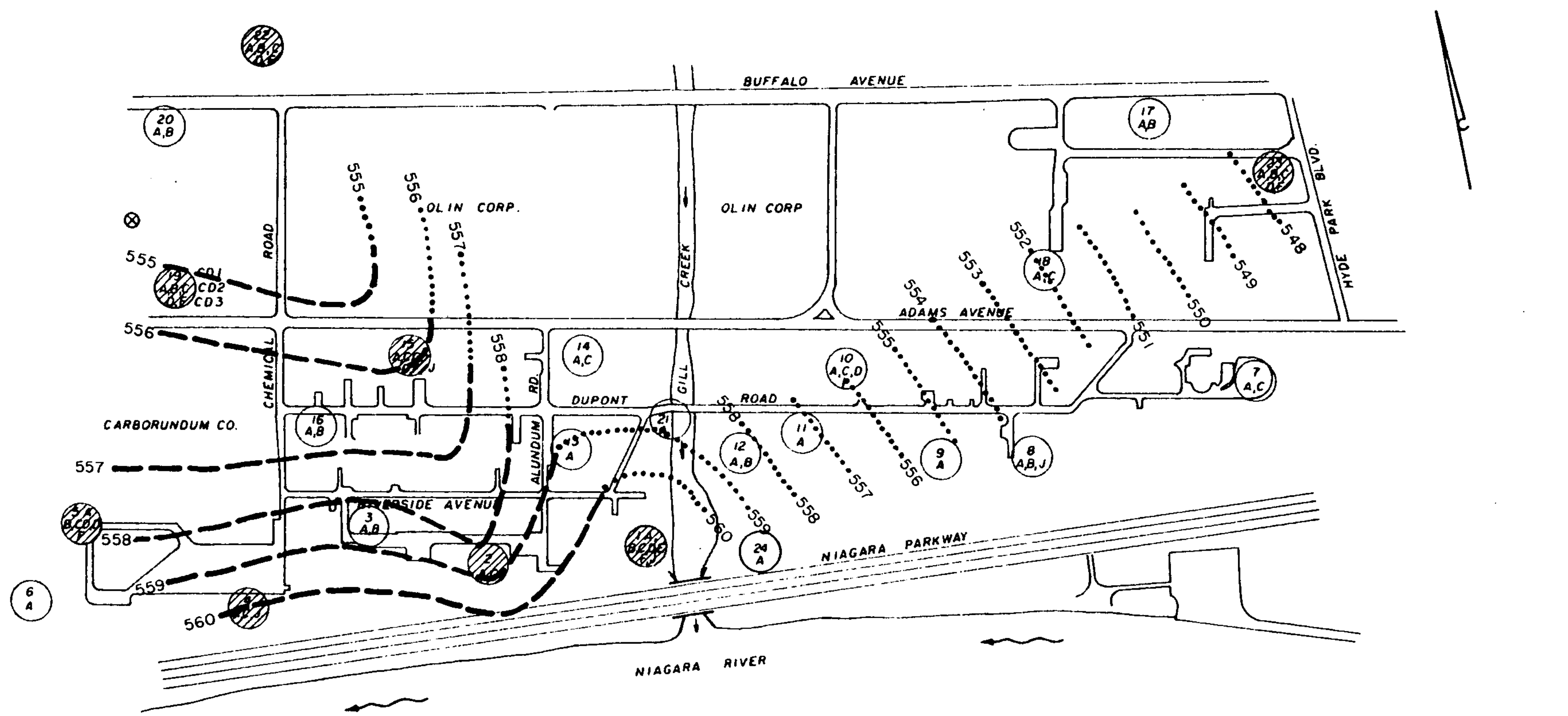
WELLS USED TO GENERATE CONTOURS
— — — GROUNDWATER CONTOUR
········ PROJECTED GROUNDWATER CONTOUR

GROUNDWATER ELEVATION CONTOURS, CD-ZONE
6:00 a.m., OCTOBER 23, 1984
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: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 5



LEGEND:

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

⊗ OLIN PRODUCTION WELLS

NOTE: PUMPING RATE = 0 GPM

WELLS USED TO GENERATE CONTOURS

— — — GROUNDWATER CONTOUR

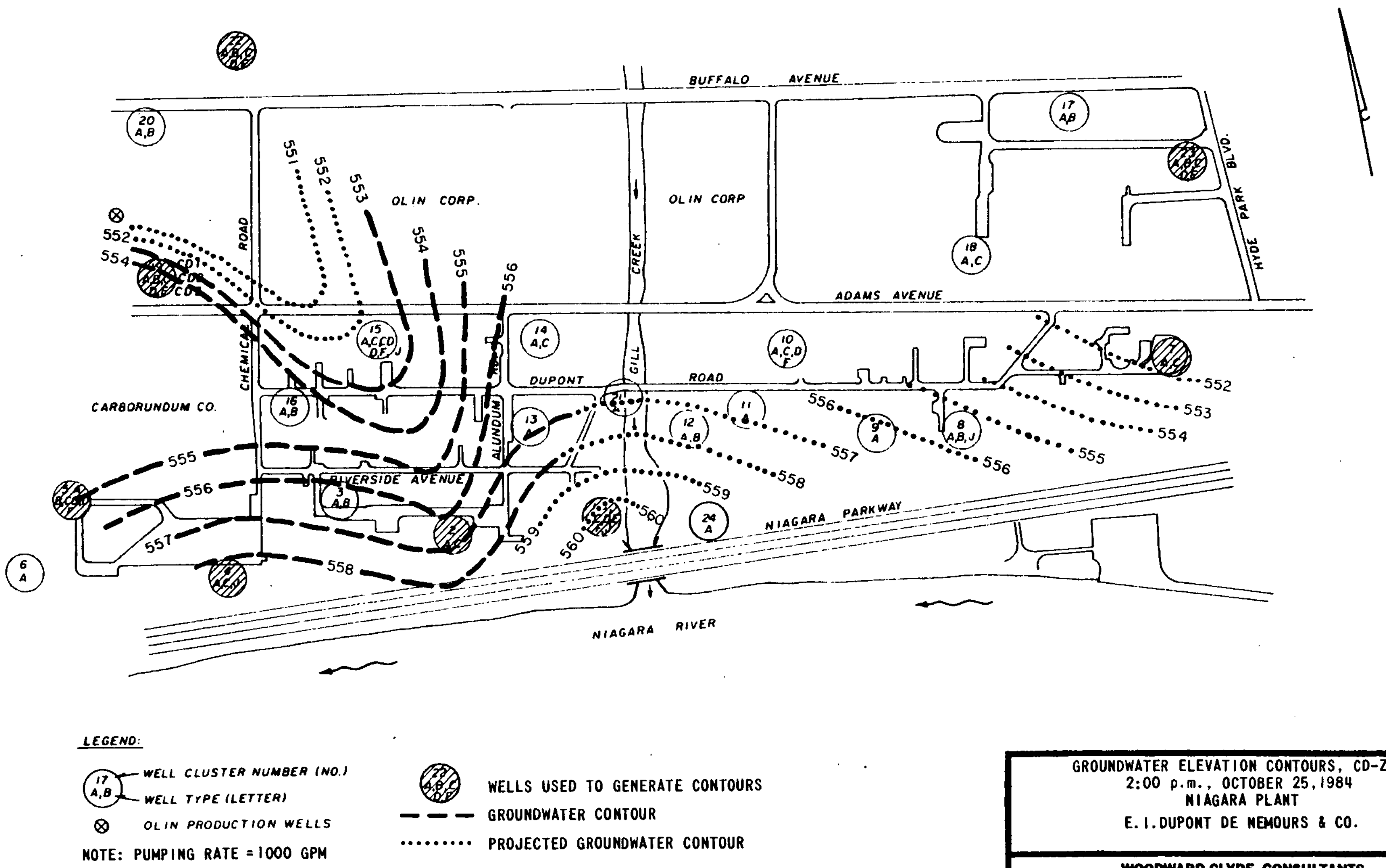
········ PROJECTED GROUNDWATER CONTOUR

GROUNDWATER ELEVATION CONTOURS, CD-ZONE
10:00 a.m., OCTOBER 24, 1984
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: 5/16/85	
CHECKED: J.C.E.	0 300	JOB: 83C2236	

PLATE 6

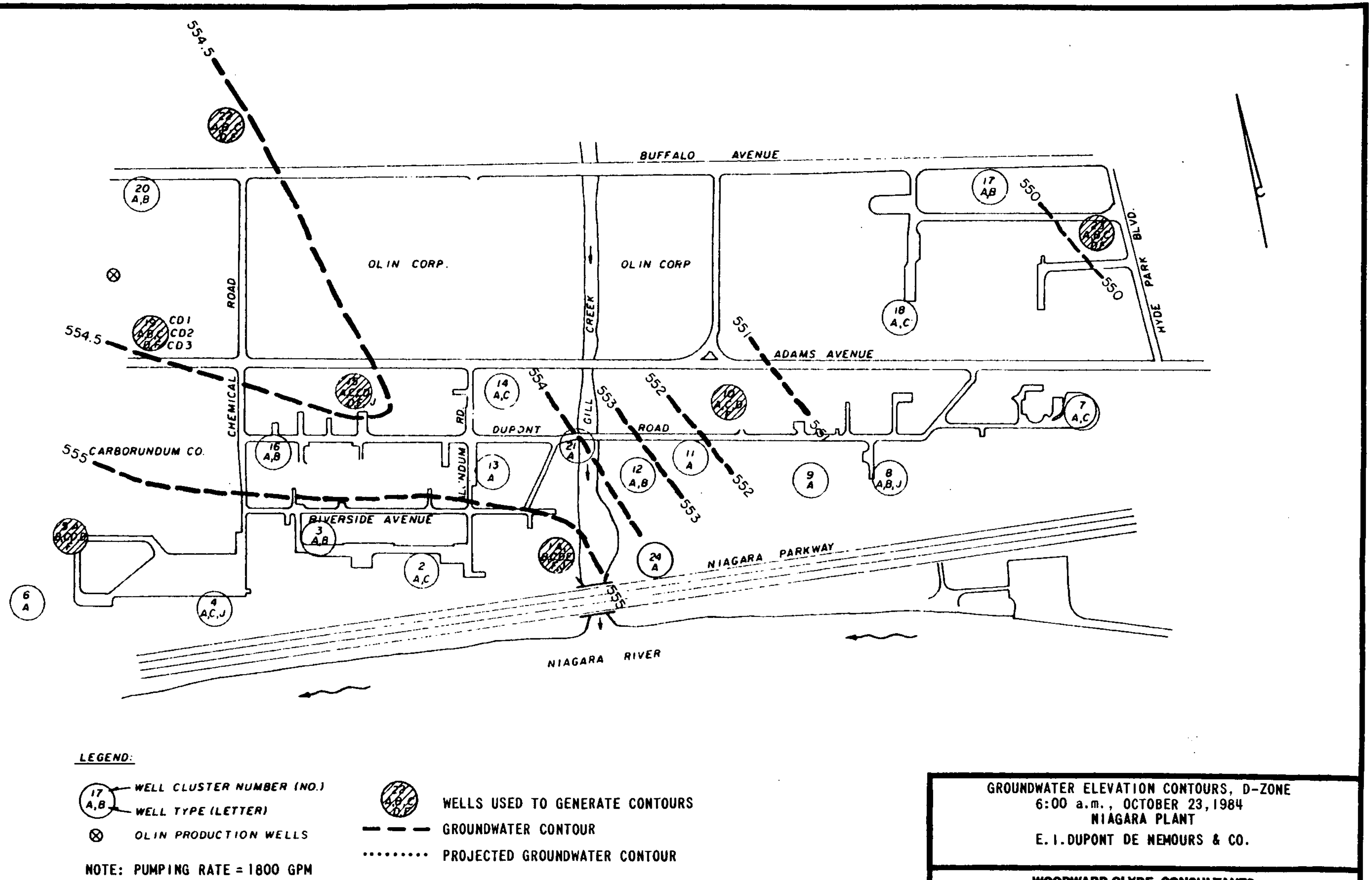


GROUNDWATER ELEVATION CONTOURS, CD-ZONE
2:00 p.m., OCTOBER 25, 1984
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE In FEET 0 300	DATE: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 7

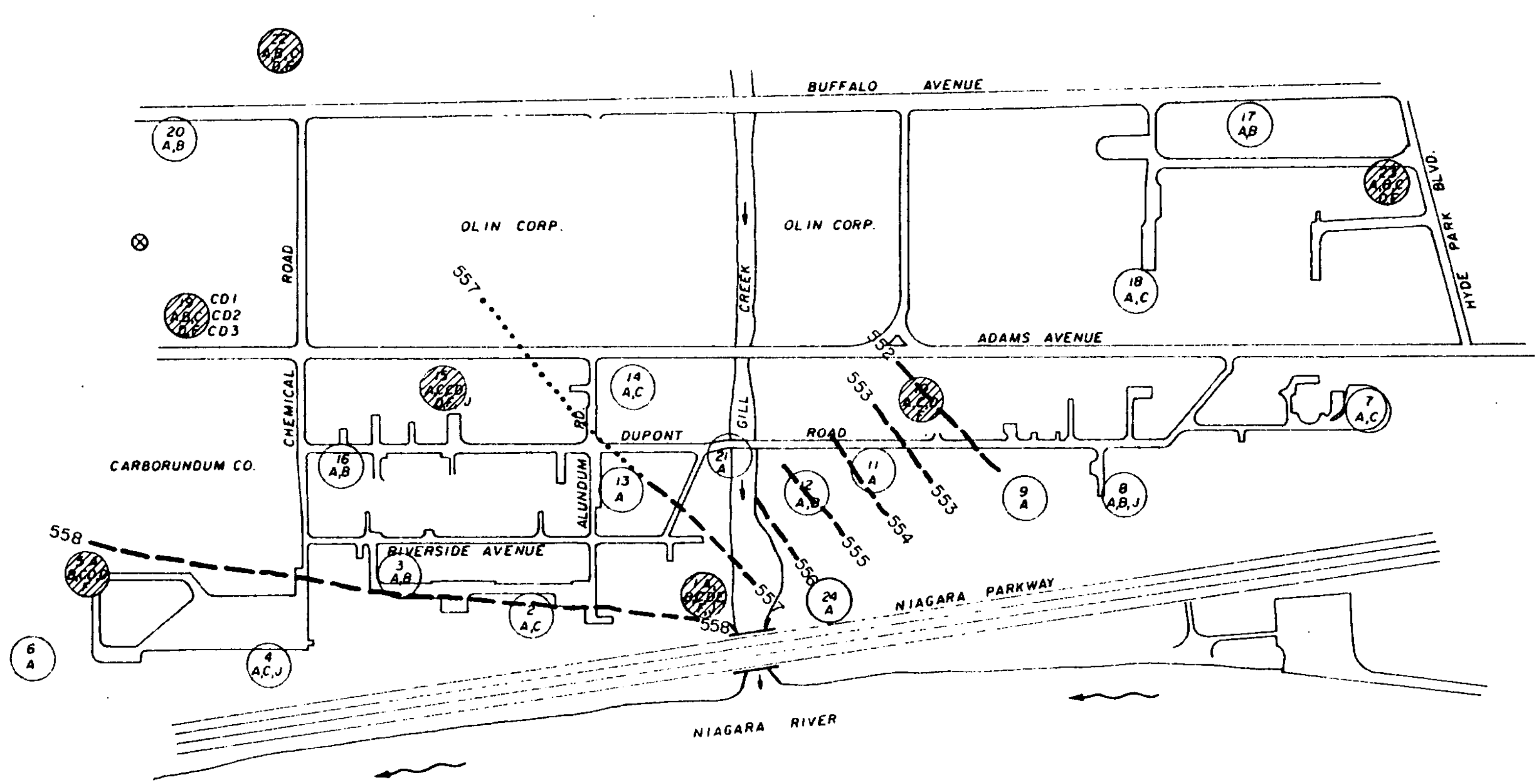


GROUNDWATER ELEVATION CONTOURS, D-ZONE
6:00 a.m., OCTOBER 23, 1984
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET	DATE: 5/16/85	
CHECKED: J.C.E.	0 — 300	JOB: 83C2236	

PLATE 8



LEGEND:

- 17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELLS
- WELLS USED TO GENERATE CONTOURS
- — — — GROUNDWATER CONTOUR
- ········ PROJECTED GROUNDWATER CONTOUR

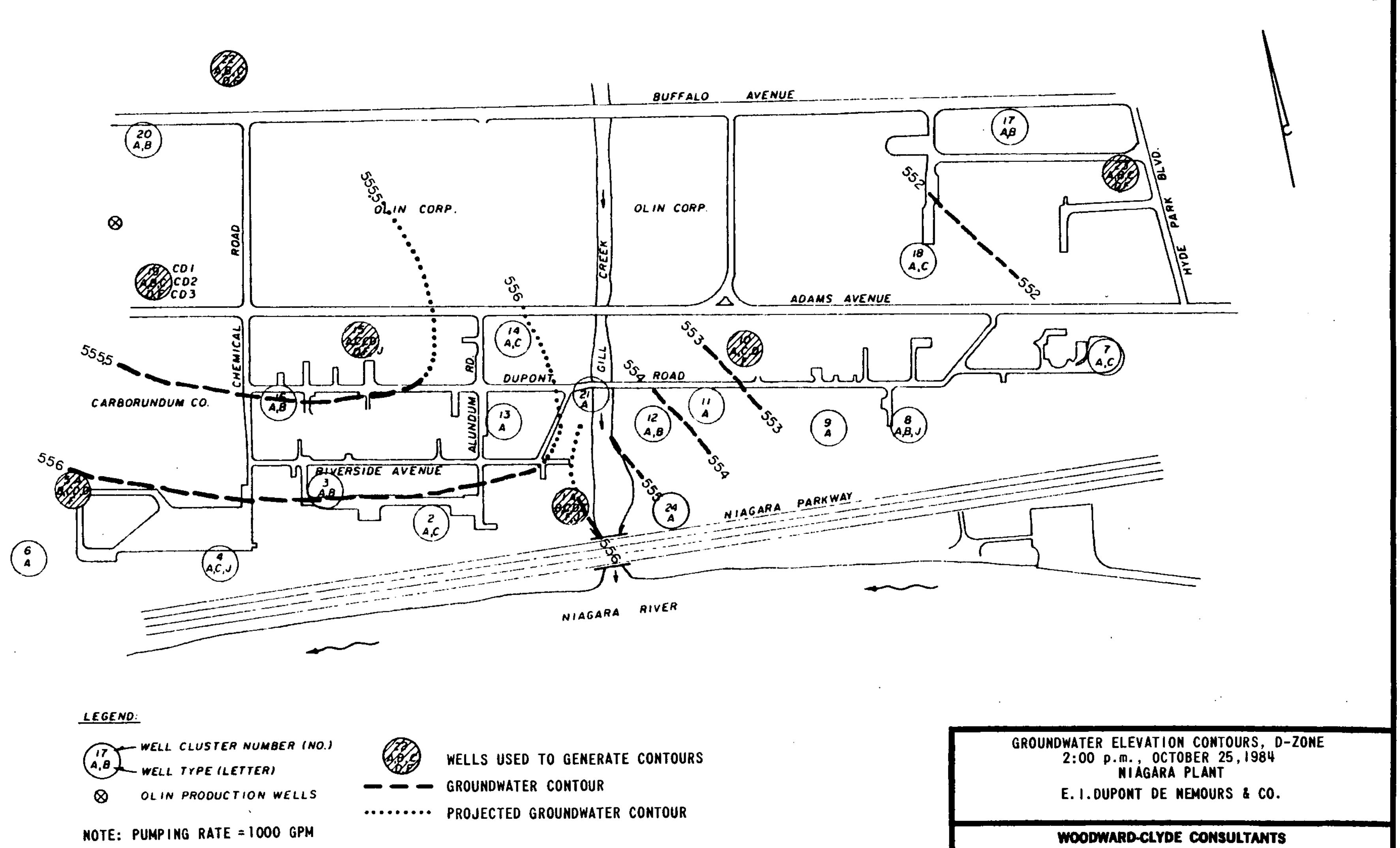
NOTE: PUMPING RATE = 0 GPM

GROUNDWATER ELEVATION CONTOURS, D-ZONE
10:00 a.m., OCTOBER 24, 1984
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: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 9

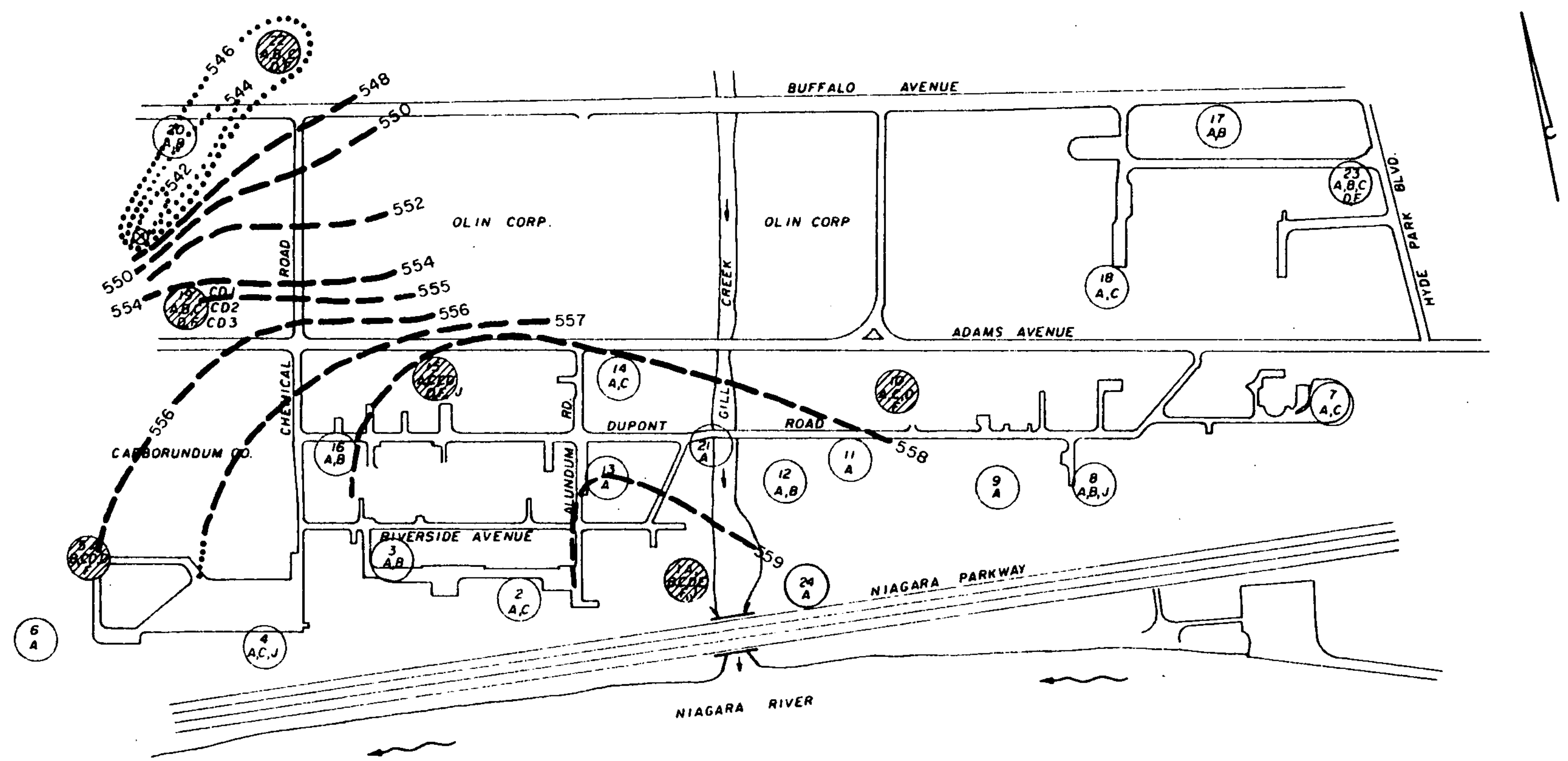


GROUNDWATER ELEVATION CONTOURS, D-ZONE
2:00 p.m., OCTOBER 25, 1984
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 5/16/85	
CHECKED: J.C.E.		JOB: 83C2236	

PLATE 10



LEGEND:

- (17 A,B) — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELLS
- WELLS USED TO GENERATE CONTOURS
- — — GROUNDWATER CONTOUR
- ········ PROJECTED GROUNDWATER CONTOUR

NOTE: PUMPING RATE = 1800 GPM

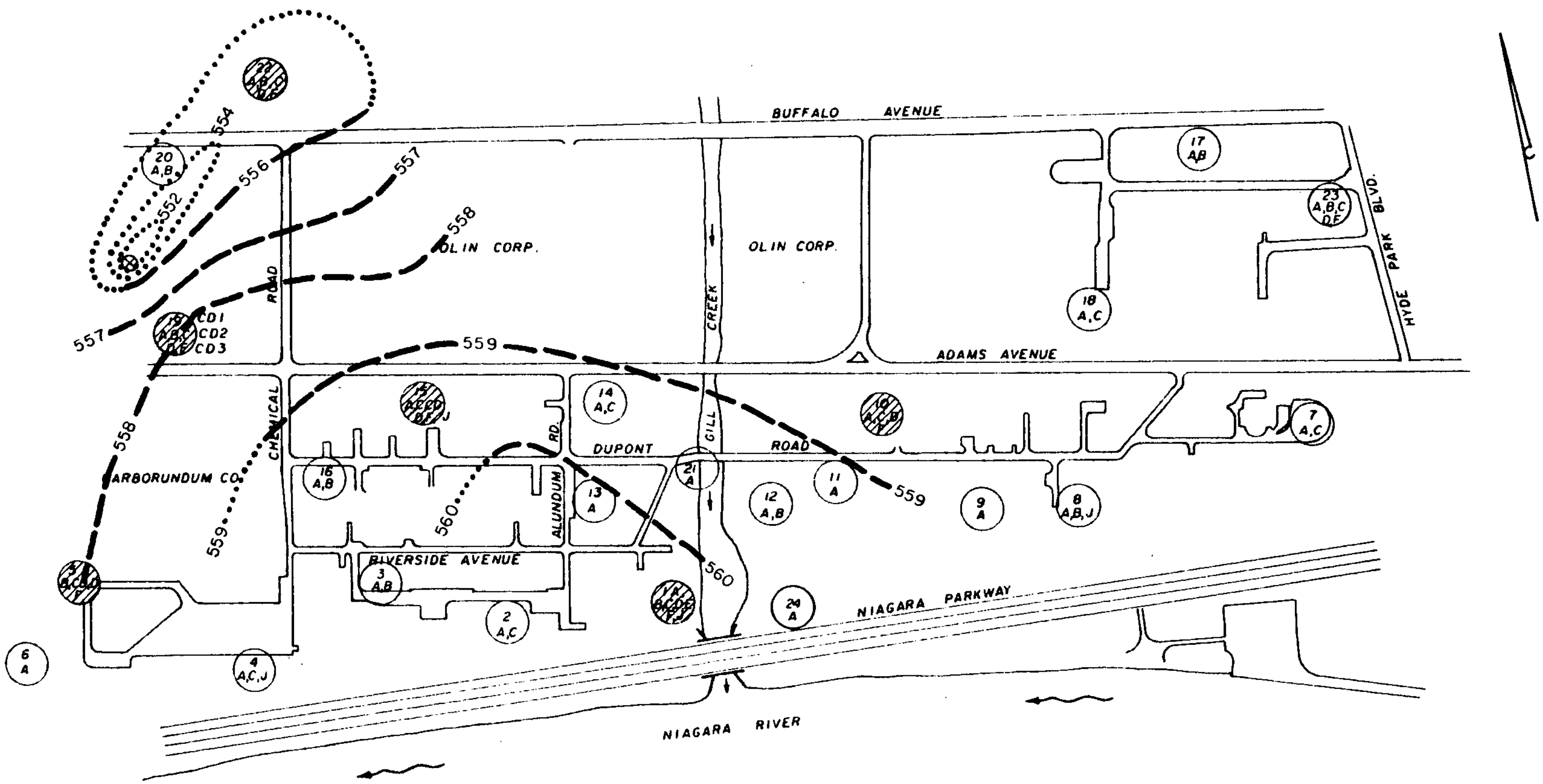
GROUNDWATER ELEVATION CONTOURS, F-ZONE
6:00 a.m., OCTOBER 23, 1984
NIAGARA PLANT

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: 5/16/85
CHECKED: J.C.E.			JOB: 83C2236

PLATE 11



LEGEND:

- 17 A,B — WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELLS
- WELLS USED TO GENERATE CONTOURS
- — — — GROUNDWATER CONTOUR
- .... PROJECTED GROUNDWATER CONTOUR

NOTE: PUMPING RATE = 0 GPM

GROUNDWATER ELEVATION CONTOURS, F-ZONE
10:00 a.m., OCTOBER 24, 1984
NIAGARA PLANT

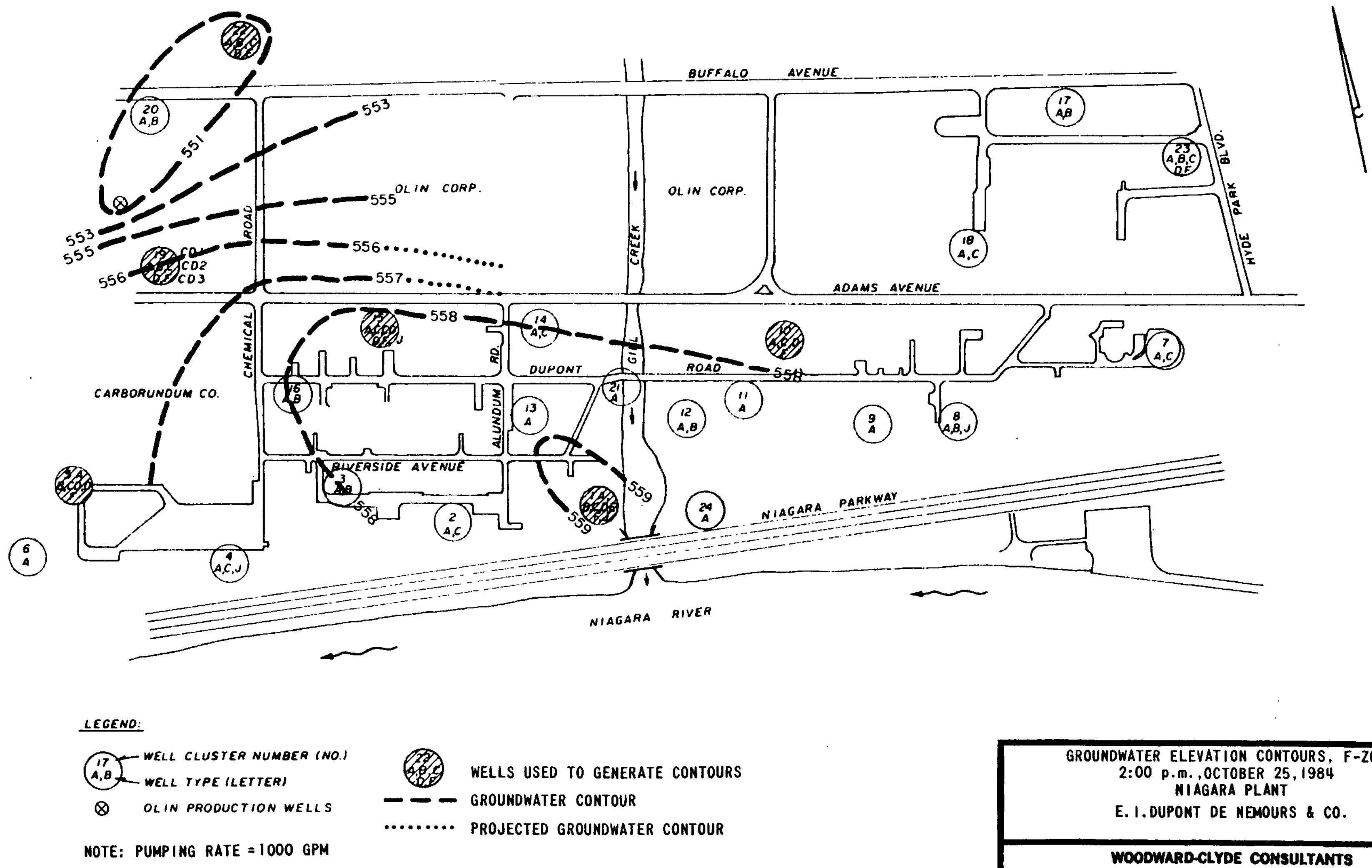
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 12

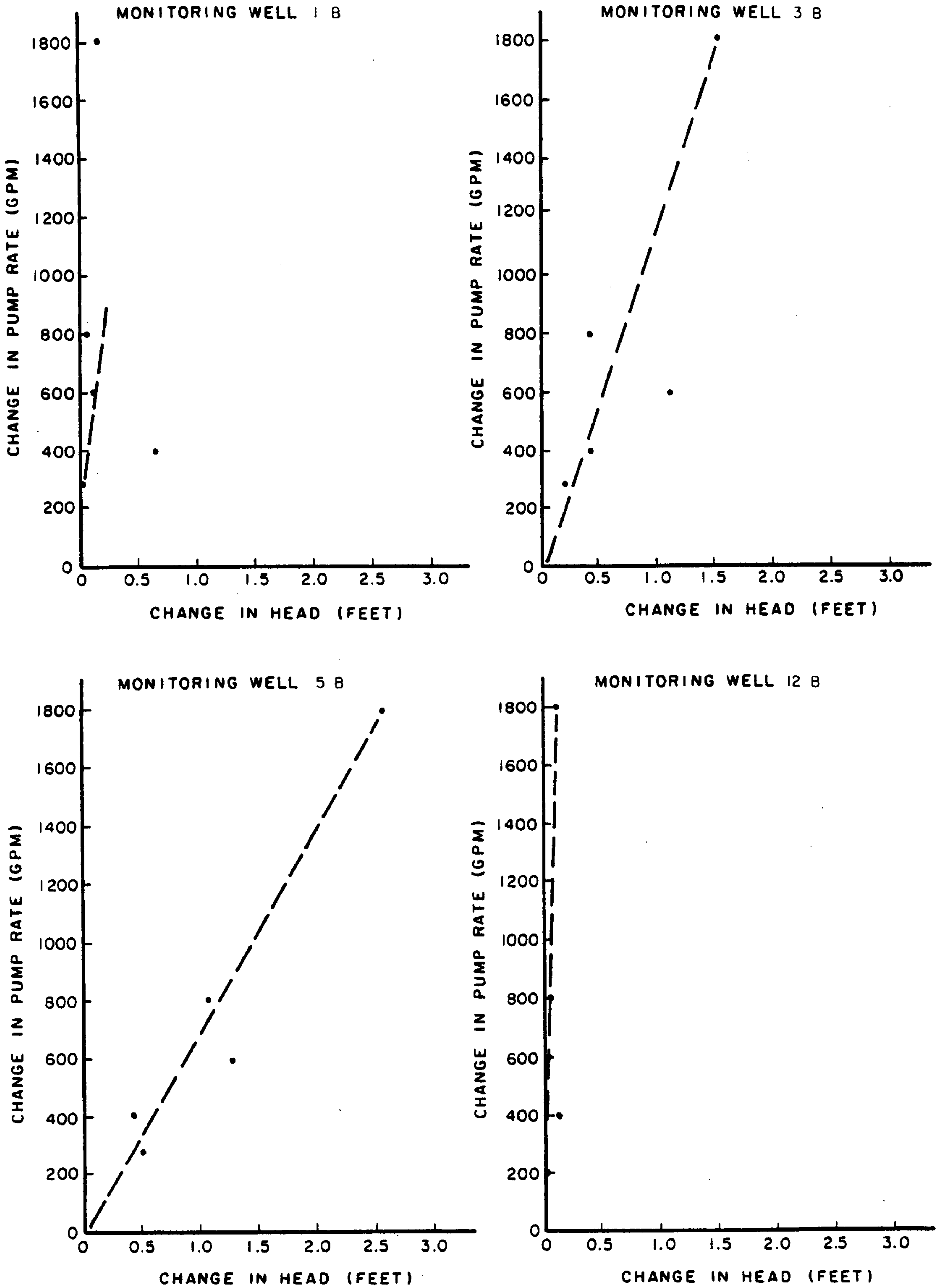


GROUNDWATER ELEVATION CONTOURS, F-ZONE
2:00 p.m., OCTOBER 25, 1984
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

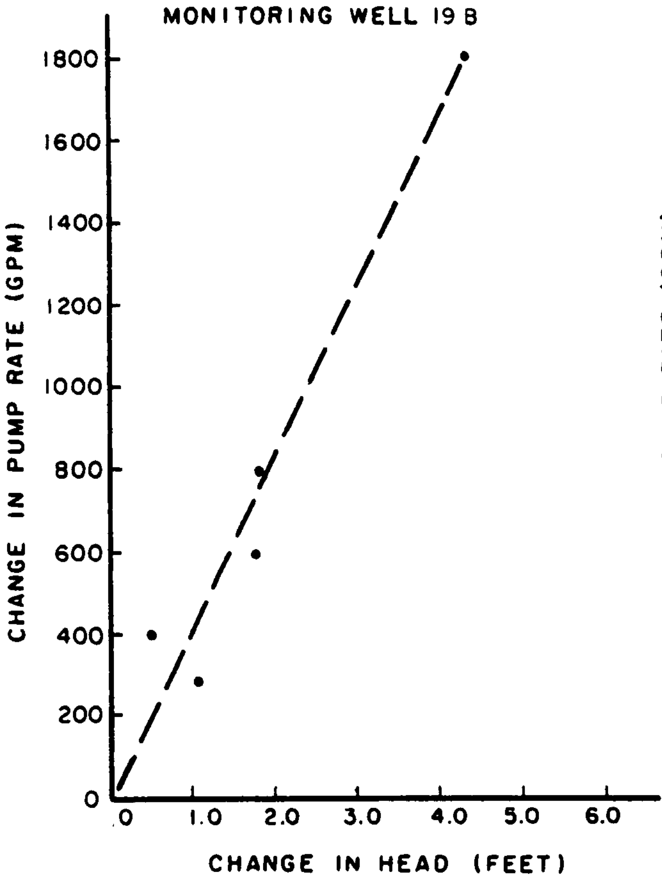
DRAWN BY: T.P.	SCALE in FEET	DATE: 5/16/85	
CHECKED: J.C.E.	0 — 300	JOB: 83C2236	

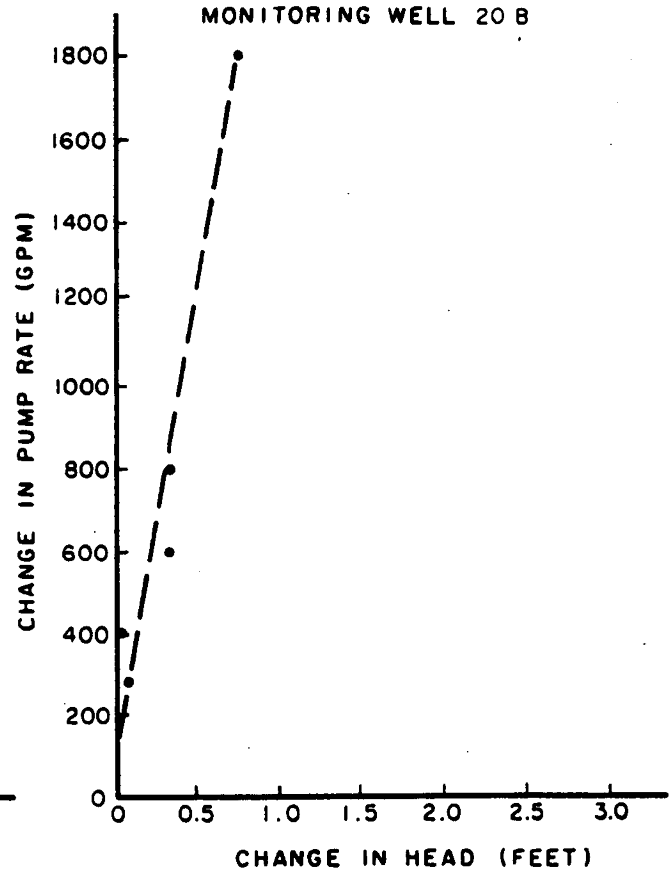
PLATE 13

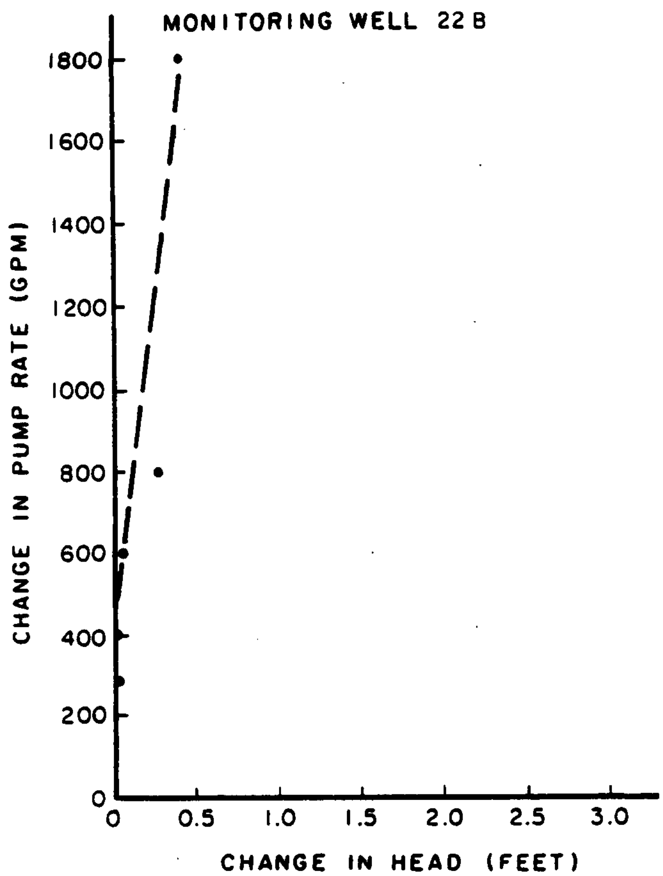


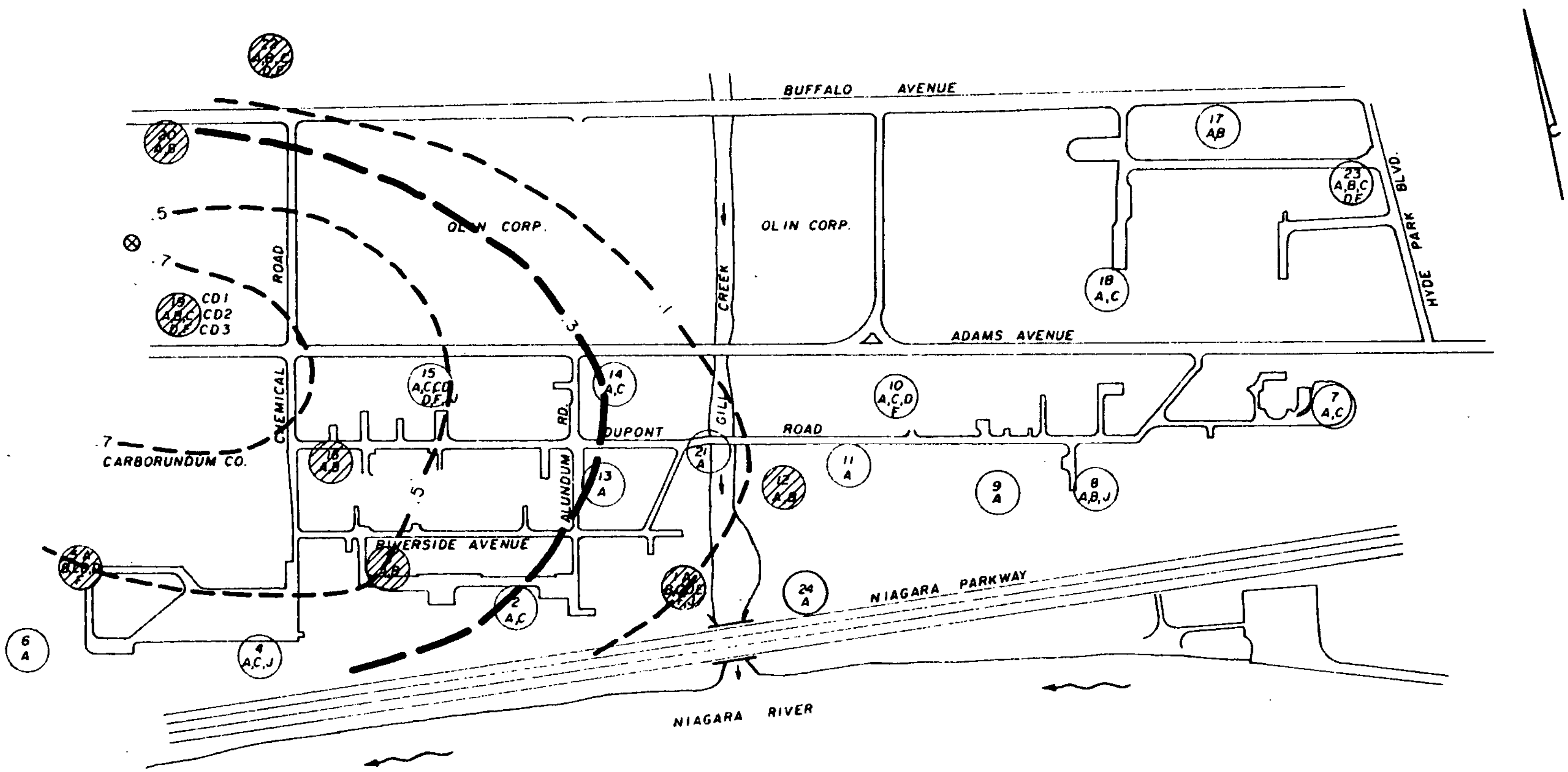
MONITORING WELL 1 B
MONITORING WELL 3 B
MONITORING WELL 5 B
MONITORING WELL 12 B
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
0.5
1.0
1.5
2.0
2.5
3.0

PLATE 14


MONITORING WELL 19 B
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
1.0
2.0
3.0
4.0
5.0
6.0
CHANGE IN HEAD (FEET)


MONITORING WELL 20 B
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)


MONITORING WELL 22 B
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)



LEGEND:

- (17 A,B) WELL CLUSTER NUMBER (NO.) / WELL TYPE (LETTER)
- ⊗ OLIN PRODUCTION WELL
- (hatched circle) WELLS USED TO GENERATE CONTOURS
- — — — DRAWDOWN CONTOUR (FEET)

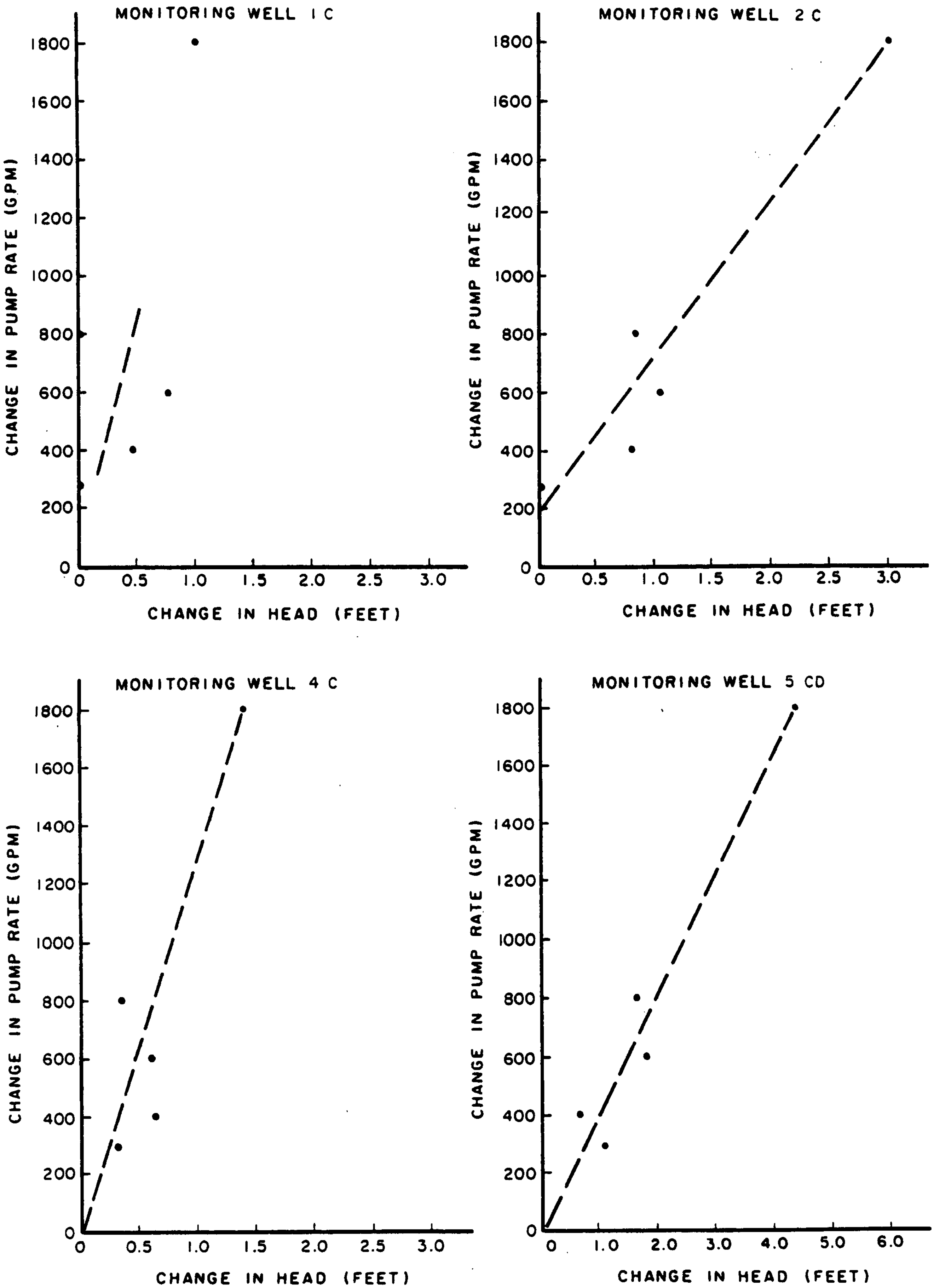
NOTE: PUMPING RATE = 500 GPM

PREDICTED DRAWDOWN CONTOURS: B-ZONE
NIAGARA PLANT
E.I. DUPONT DE NEMOURS & CO.

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

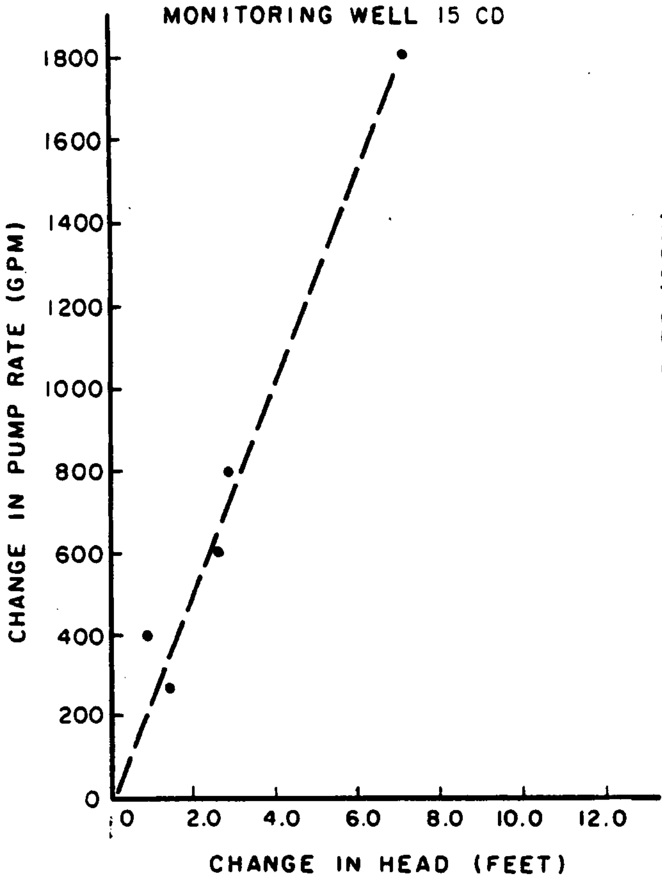
DRAWN BY: T.P.	SCALE in FEET 0 — 300	DATE: 5/16/85
CHECKED : J.C.E.		JOB : 83C2236

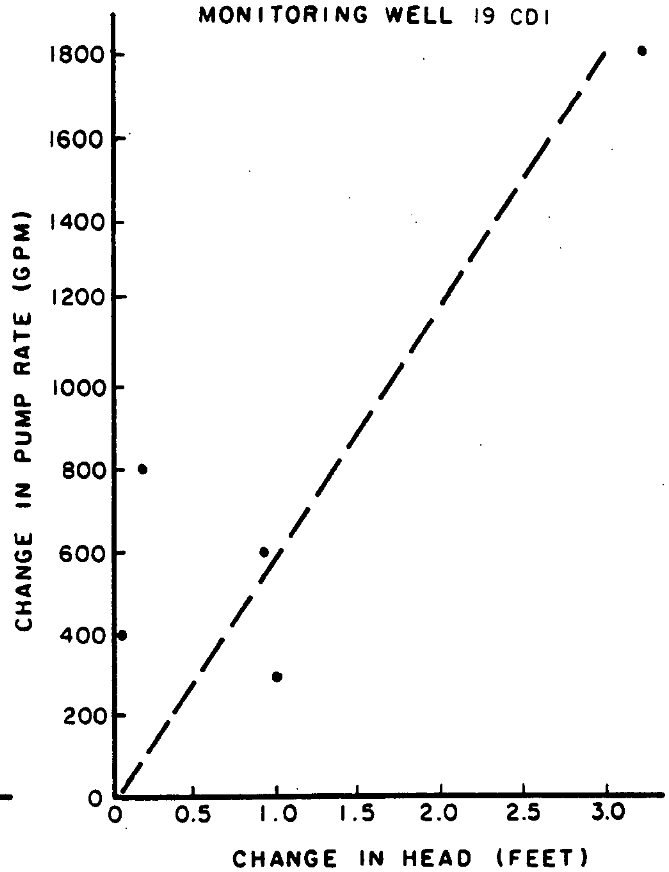
PLATE 16

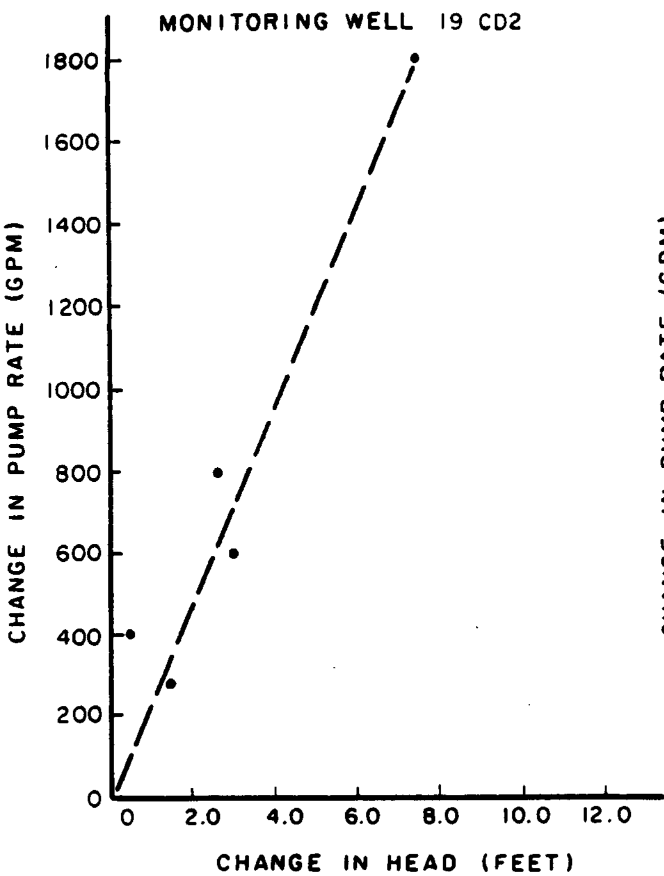


MONITORING WELL 1C
MONITORING WELL 2C
MONITORING WELL 4C
MONITORING WELL 5CD
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
0.5
1.0
1.5
2.0
2.5
3.0
4.0
5.0
6.0

PLATE 17


MONITORING WELL 15 CD
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
2.0
4.0
6.0
8.0
10.0
12.0


MONITORING WELL 19 CD1
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
0.5
1.0
1.5
2.0
2.5
3.0


MONITORING WELL 19 CD2
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
2.0
4.0
6.0
8.0
10.0
12.0

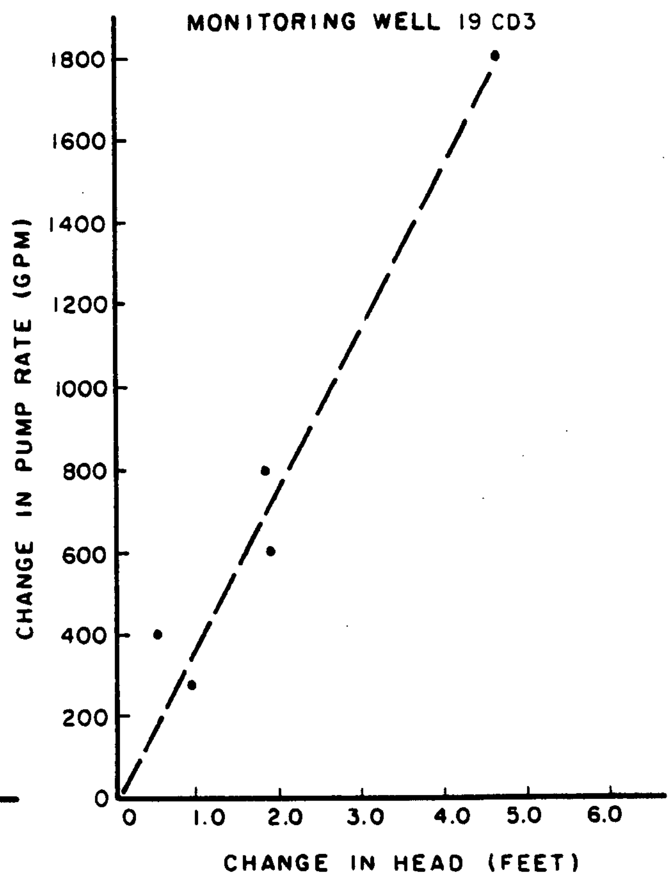
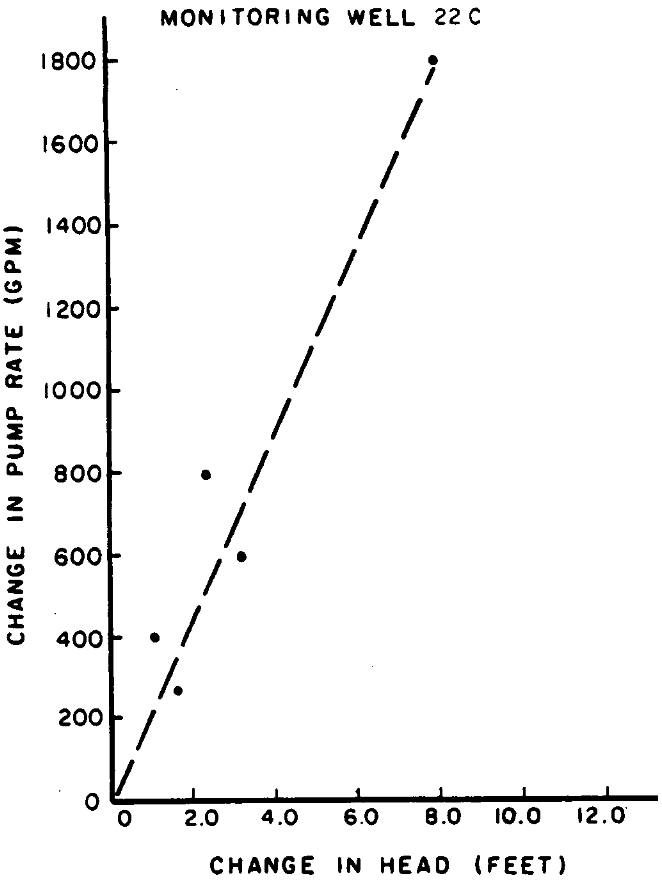
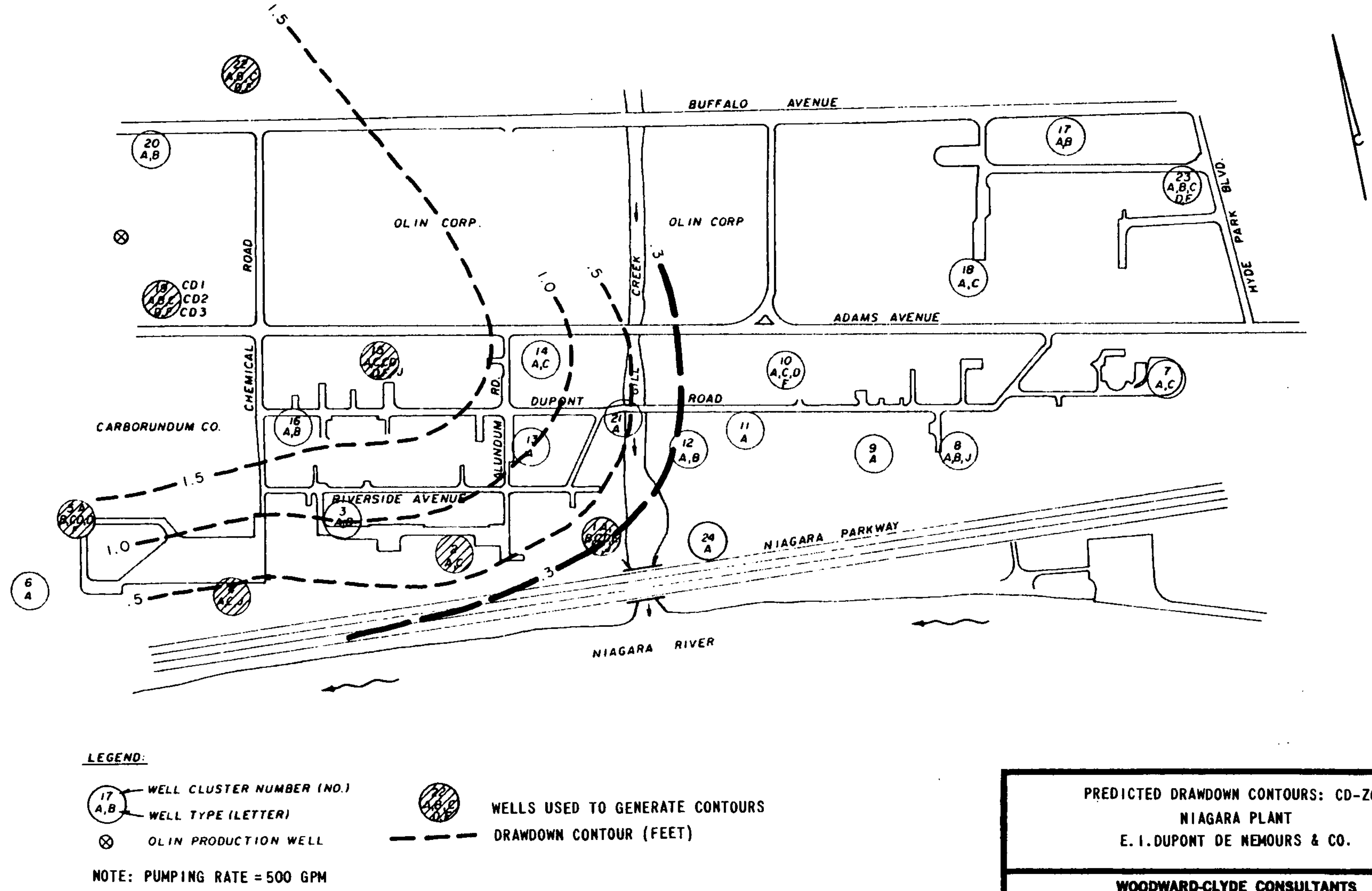

MONITORING WELL 19 CD3
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
1.0
2.0
3.0
4.0
5.0
6.0

PLATE 18



MONITORING WELL 22C
CHANGE IN PUMP RATE (GPM)
1800
1600
1400
1200
1000
800
600
400
200
0
0
2.0
4.0
6.0
8.0
10.0
12.0
CHANGE IN HEAD (FEET)

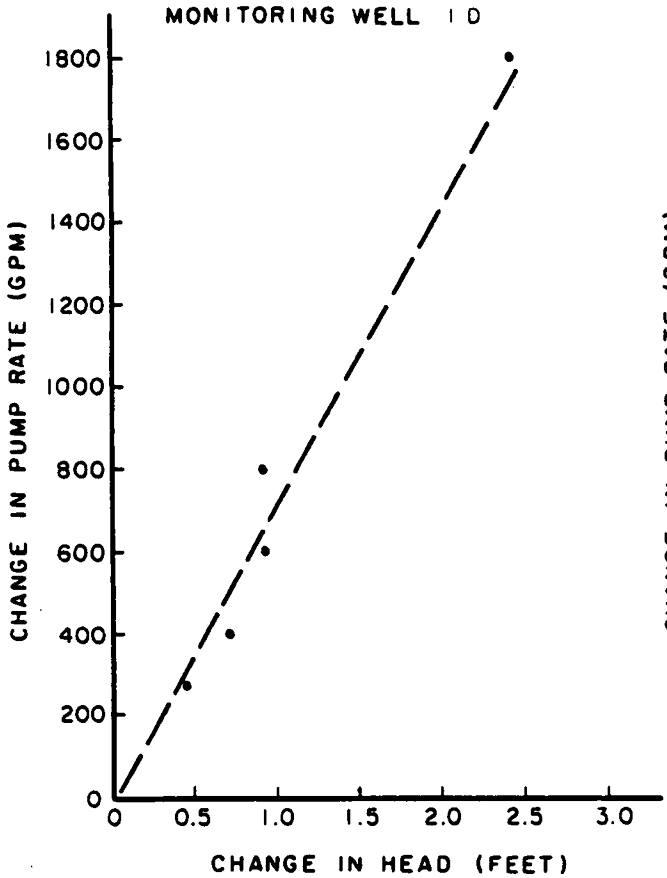


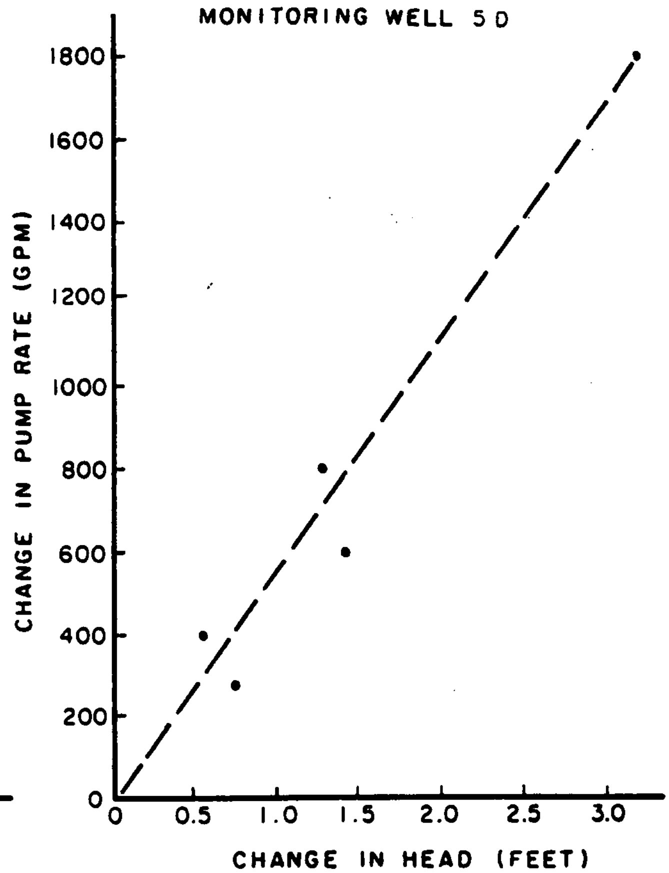
PREDICTED DRAWDOWN CONTOURS: CD-ZONE
NIAGARA PLANT
E. I. DUPONT DE NEMOURS & CO.

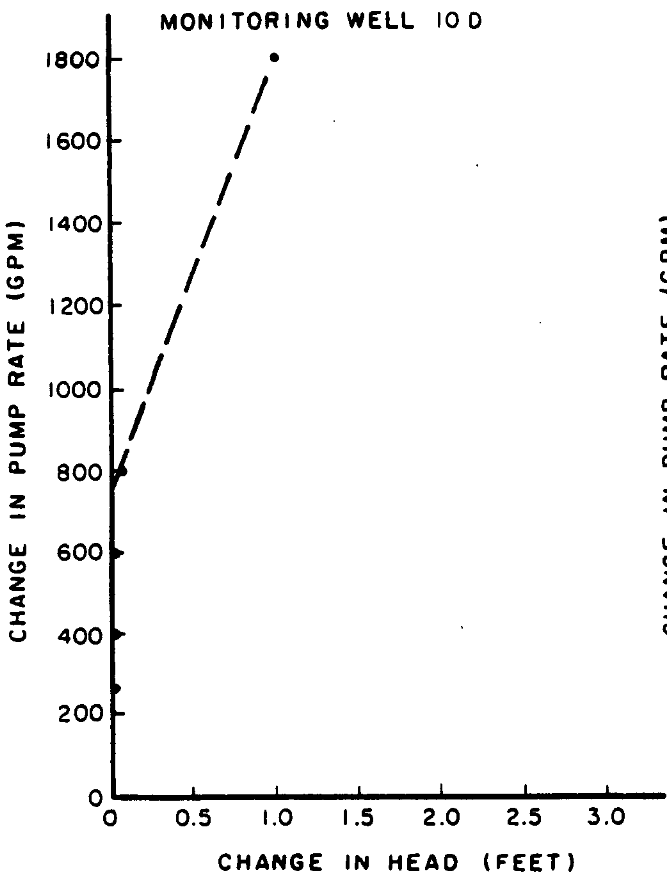
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

DRAWN BY: T.P.	SCALE in FEET		DATE: 5/16/85
CHECKED: J.C.E.	0 300		JOB: 83C2236

PLATE 20


MONITORING WELL 1 D
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)


MONITORING WELL 5 D
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)


MONITORING WELL 10 D
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)

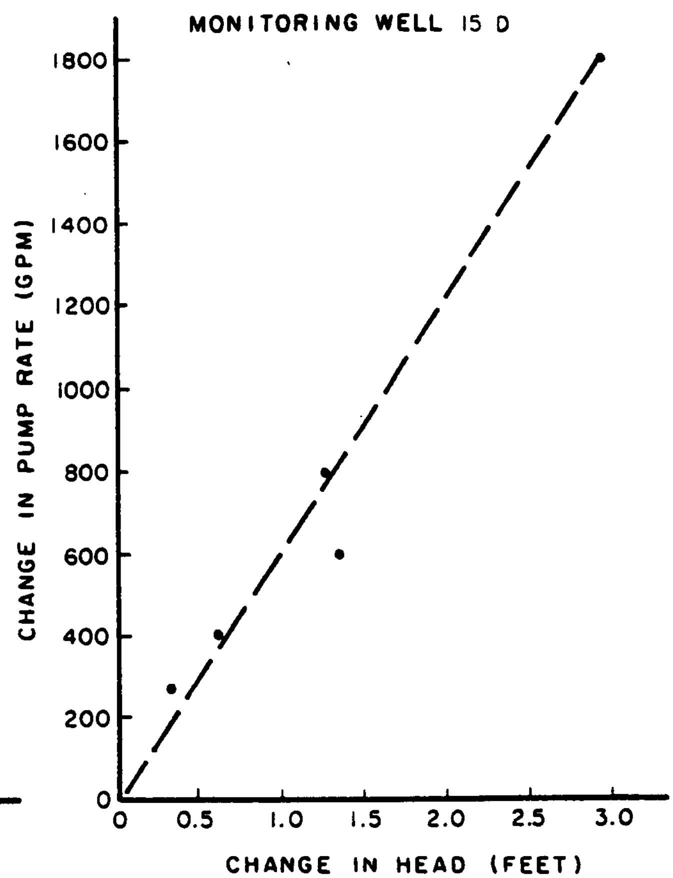

MONITORING WELL 15 D
CHANGE IN PUMP RATE (GPM)
0
200
400
600
800
1000
1200
1400
1600
1800
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)

PLATE 21

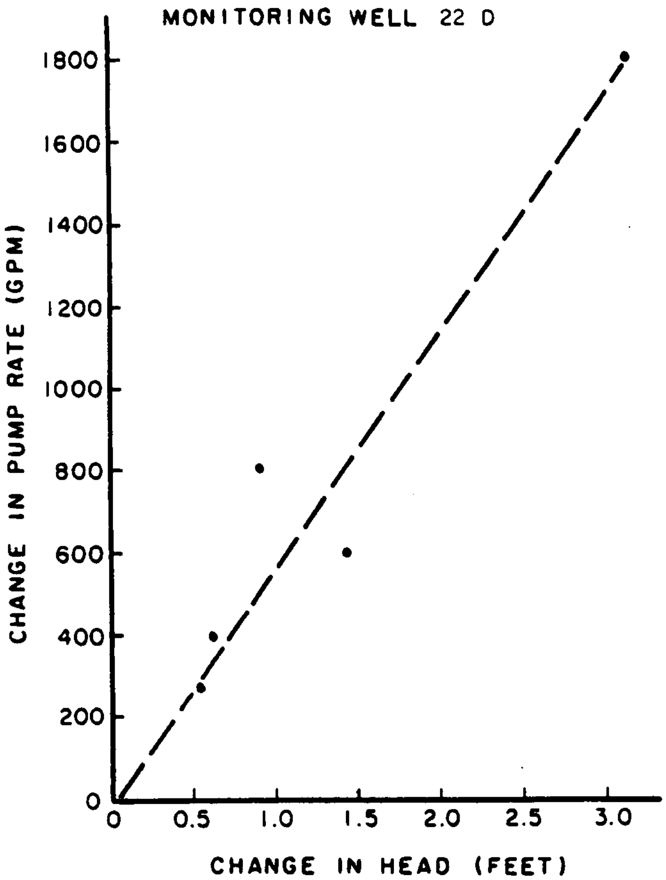
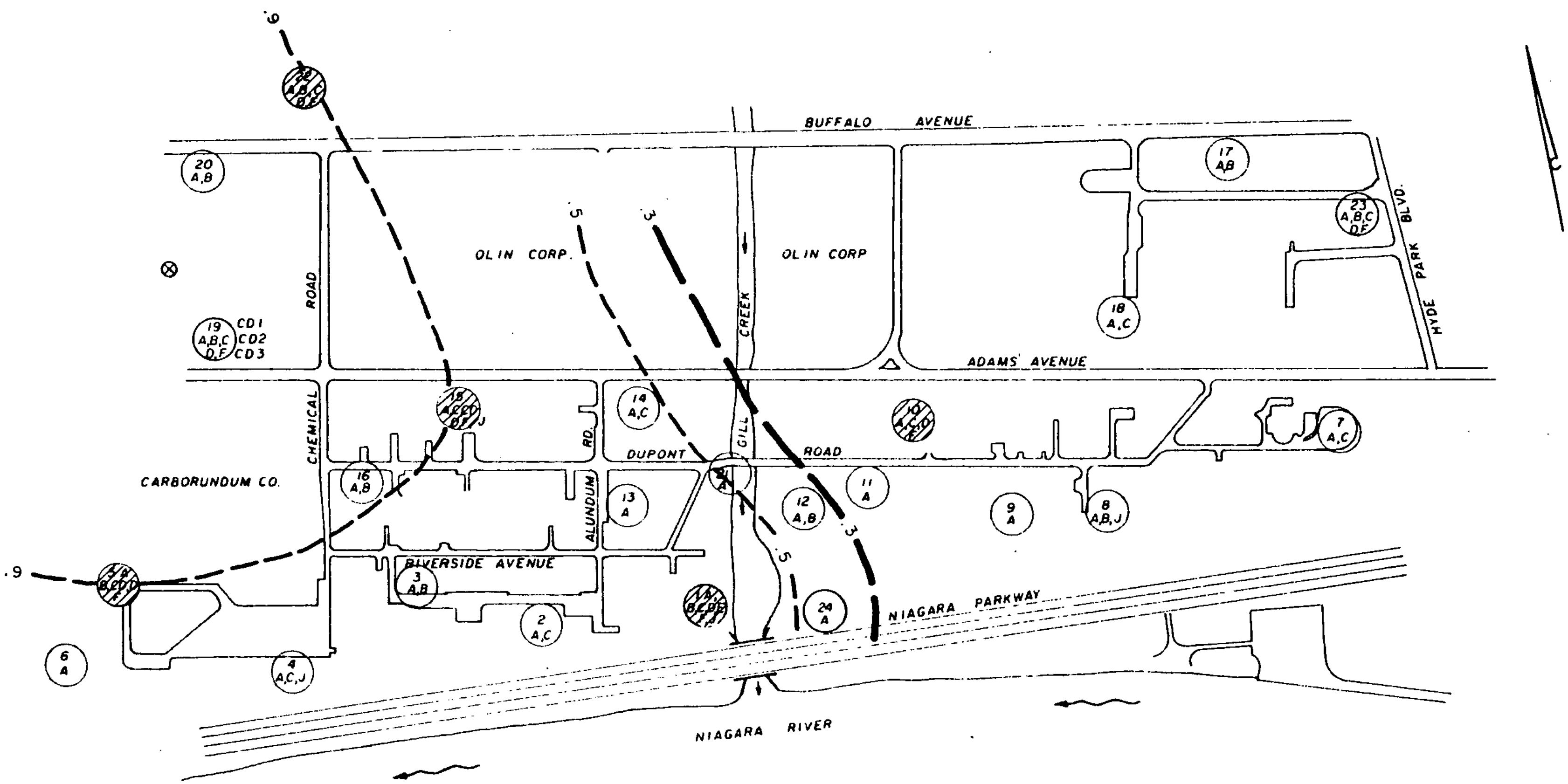

MONITORING WELL 22 D
CHANGE IN PUMP RATE (GPM)
1800
1600
1400
1200
1000
800
600
400
200
0
0
0.5
1.0
1.5
2.0
2.5
3.0
CHANGE IN HEAD (FEET)

PLATE 22



LEGEND:

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

⊗ OLIN PRODUCTION WELL

WELLS USED TO GENERATE CONTOURS

DRAWDOWN CONTOUR (FEET)

NOTE: PUMPING RATE = 500 GPM

PREDICTED DRAWDOWN CONTOURS: D-ZONE
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: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 23

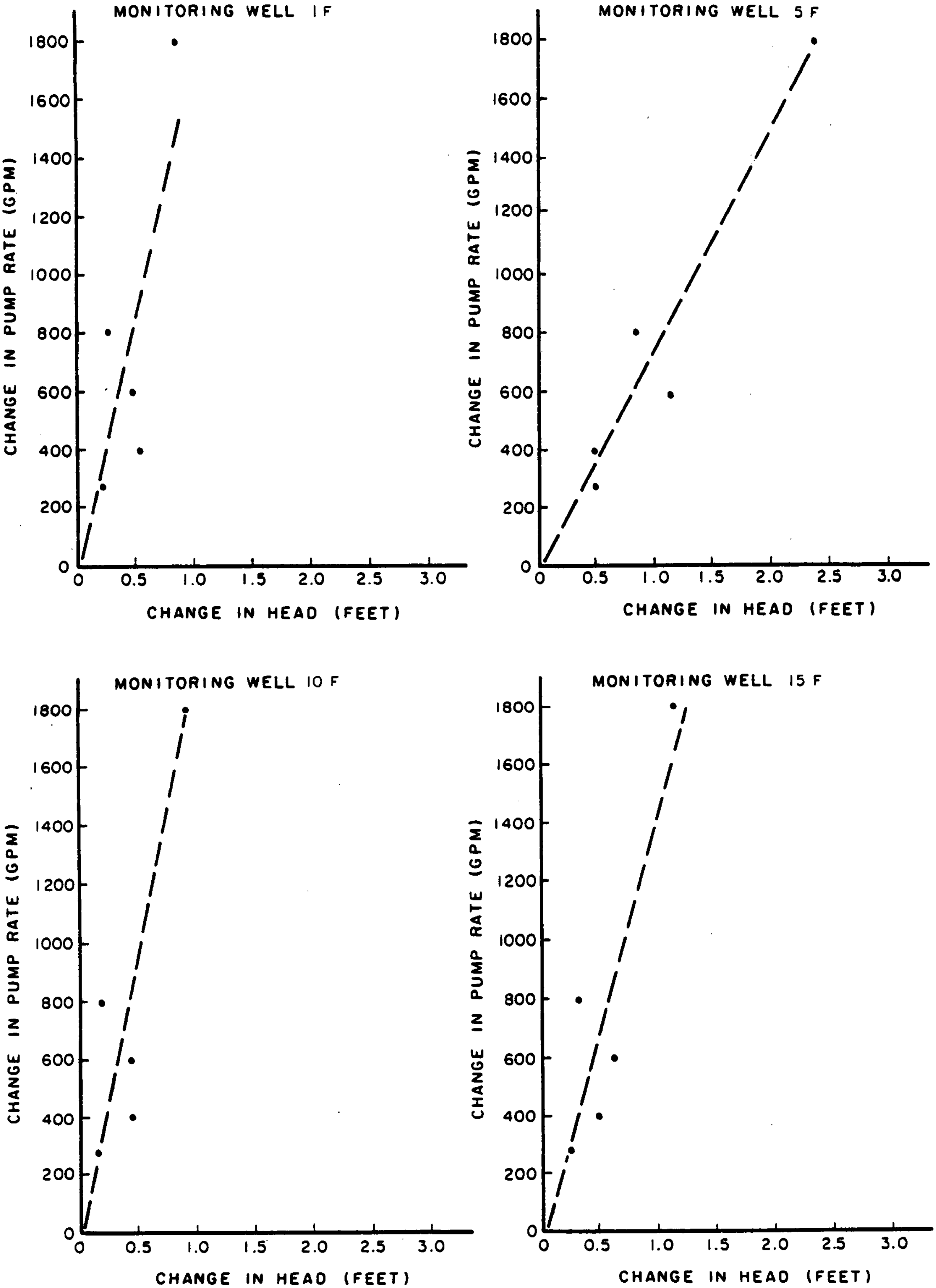
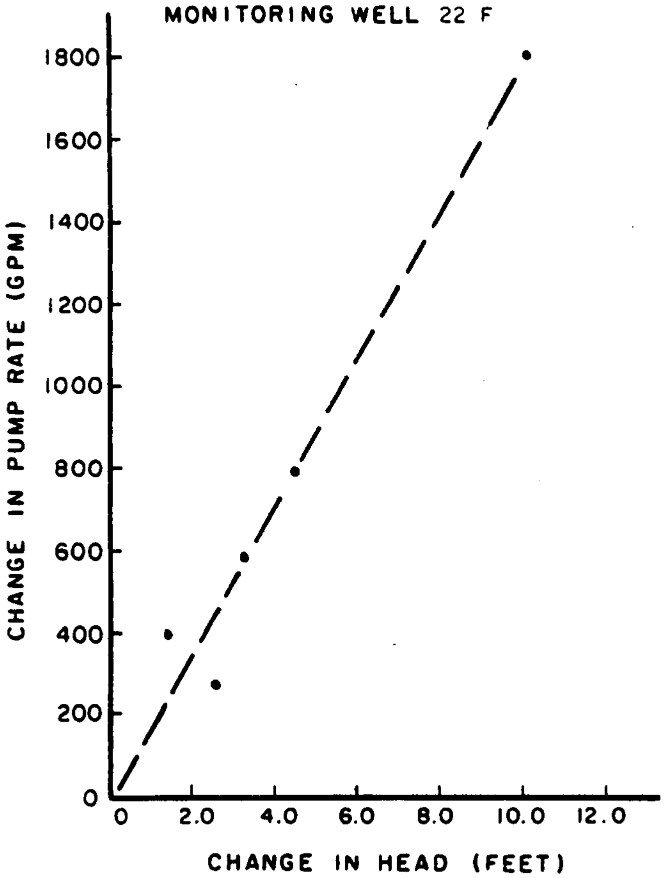
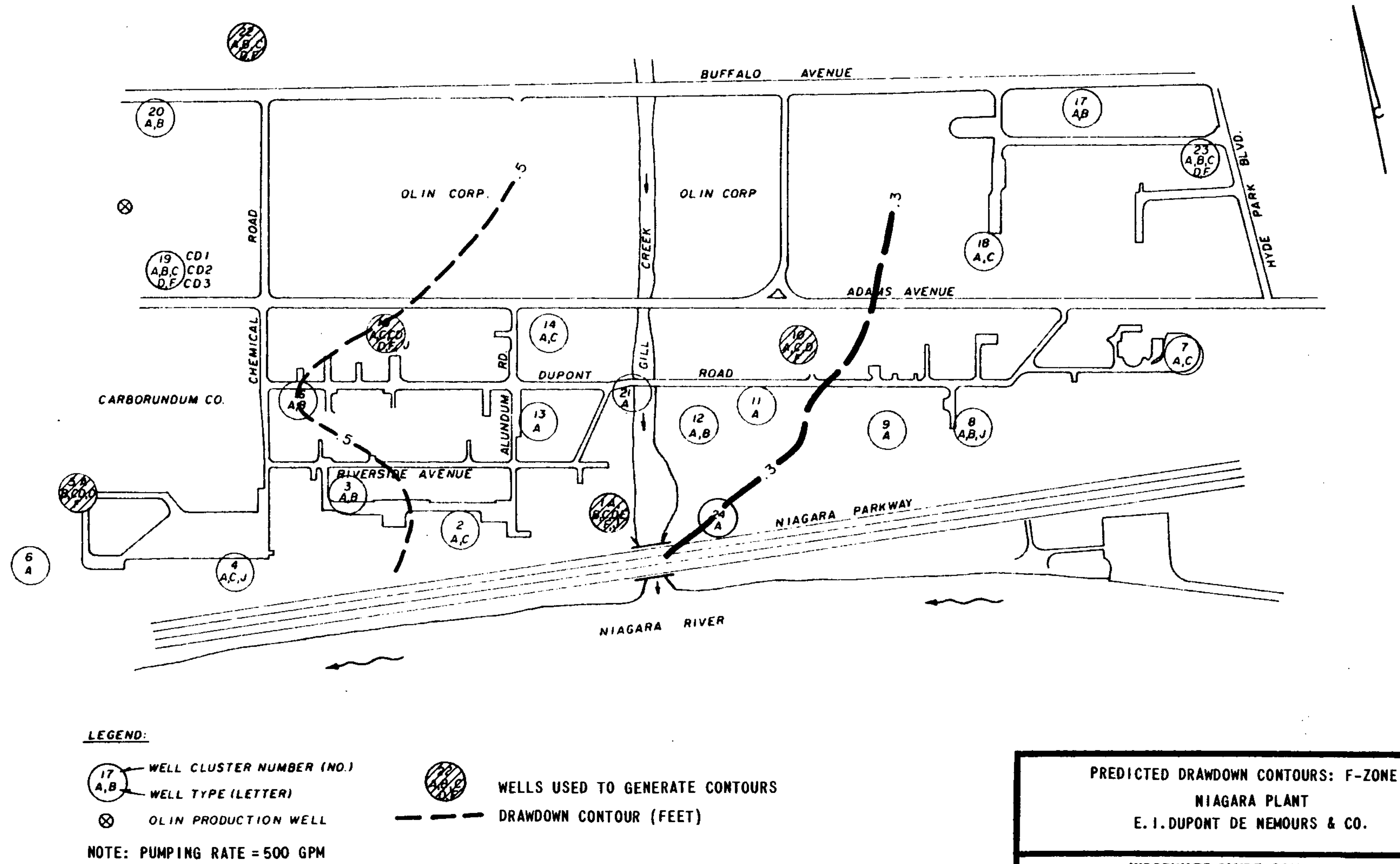

MONITORING WELL 1F
MONITORING WELL 5F
MONITORING WELL 10F
MONITORING WELL 15F
CHANGE IN PUMP RATE (GPM)
CHANGE IN HEAD (FEET)
0
200
400
600
800
1000
1200
1400
1600
1800
0.5
1.0
1.5
2.0
2.5
3.0

PLATE 24



MONITORING WELL 22 F
CHANGE IN PUMP RATE (GPM)
1800
1600
1400
1200
1000
800
600
400
200
0
0
2.0
4.0
6.0
8.0
10.0
12.0
CHANGE IN HEAD (FEET)

PLATE 25



PREDICTED DRAWDOWN CONTOURS: F-ZONE
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: 5/16/85
CHECKED: J.C.E.		JOB: 83C2236

PLATE 26

DO NOT COPY
APPENDIX

Appendix A

APPENDIX A

Presented as Appendix A is the compilation of data collected during the course of the October, 1984 pump test. These data include the groundwater levels measured in the selected monitoring wells at the DuPont Niagara Plant site.

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 1A Depth to Water[2]	Well 1A Elevation from TOC[3]	Well 1B Depth to Water	Well 1B Elevation from TOC
10/23/84					
4:20	AM	9.87	562.56	10.50	561.11
4:51		9.81	562.62	10.48	561.13
5:22		9.81	562.62	10.43	561.18
5:54		9.80	562.63	10.42	561.19
6:27		9.78	562.65	10.44	561.17
7:02		9.72	562.71	10.41	561.20
7:24		9.63	562.80	10.32	561.29
10:22		9.83	562.60	10.49	561.12
1:20	PM	10.02	562.41	10.06	561.55
10/24/84					
7:26	AM	9.61	562.82	10.22	561.39
9:30		9.67	562.76	10.23	561.38
11:20		9.76	562.67	10.33	561.28
12:17	PM	9.83	562.60	10.39	561.22
12:37		9.85	562.58	10.42	561.19
1:06		9.88	562.55	10.43	561.18
1:26		9.92	562.51	10.49	561.12
2:28		10.06	562.37	10.59	561.02
2:52		10.08	562.35	10.66	560.95
3:15		10.10	562.33	10.65	560.96
3:45		10.12	562.31	10.67	560.94
4:50		10.20	562.23	10.76	560.85
10/25/84					
10:04	AM	9.77	562.66	10.33	561.28
11:01		9.91	562.52	10.47	561.14
12:00	PM	10.08	562.35	10.62	560.99
12:30		10.12	562.31	10.67	560.94
2:50		10.25	562.18	10.81	560.80
4:21		10.25	562.18	10.81	560.80

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
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DUPONT PLANT SITE
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	Well 1C		Well 1D	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
4:20 AM	12.59	560.48	15.75	556.37
4:51	12.47	560.60	16.44	555.68
5:22	12.43	560.64	16.64	555.48
5:54	12.39	560.68	16.67	555.45
6:27	12.38	560.69	16.33	555.79
7:02	12.37	560.70	16.20	555.92
7:24	12.35	560.72	16.52	555.60
10:22	11.33	561.74	15.03	557.09
1:20 PM	12.29	560.78	14.67	557.45
10/24/84				
7:26 AM	12.07	561.00	14.14	557.98
9:30	11.85	561.22	14.18	557.94
11:20	11.93	561.14	14.27	557.85
12:17 PM	11.96	561.11	14.84	557.28
12:37	11.97	561.10	14.99	557.13
1:06	11.99	561.08	15.04	557.08
1:26	12.03	561.04	15.08	557.04
2:28	12.17	560.90	15.25	556.87
2:52	12.18	560.89	15.33	556.79
3:15	12.23	560.84	15.35	556.77
3:45	12.29	560.78	15.34	556.78
4:50	12.40	560.67	15.44	556.68
10/25/84				
10:04 AM	12.04	561.03	15.16	556.96
11:01	12.11	560.96	15.22	556.90
12:00 PM	12.21	560.86	15.61	556.51
12:30	12.27	560.80	15.69	556.43
2:50	12.49	560.58	15.94	556.18
4:21	12.58	560.49	15.93	556.19

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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	Well 1E		Well 1F	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
4 20 AM	11.96	559.02	13.09	559.60
4:51	11.89	559.09	13.27	559.42
5:22	11.95	559.03	13.29	559.40
5:54	11.96	559.02	13.35	559.34
6:27	11.95	559.03	13.19	559.50
7:02	11.11	559.87	13.12	559.57
7:24	11.88	559.10	13.14	559.55
10:22	11.81	559.17	12.84	559.85
1:20 PM	11.52	559.46	12.85	559.84
10/24/84				
7:26 AM	11.19	559.79	12.25	560.44
9:30	11.09	559.89	12.42	560.27
11:20	11.06	559.92	12.53	560.16
12:17 PM	11.13	559.85	12.80	559.89
12:37	11.14	559.84	12.85	559.84
1:06	11.18	559.80	12.91	559.78
1:26	11.28	559.70	12.98	559.71
2:28	11.37	559.61	13.17	559.52
2:52	11.46	559.52	13.18	559.51
3:15	11.47	559.51	13.20	559.49
3:45	11.54	559.44	13.23	559.46
4:50	11.67	559.31	13.39	559.30
10/25/84				
10:04 AM	11.38	559.60	12.81	559.88
11:01	11.50	559.48	13.00	559.19
12:00 PM	11.56	559.42	13.26	559.43
12:30	11.62	559.36	13.37	559.32
2:50	11.89	559.09	13.54	559.15
4:21	11.99	558.99	13.55	559.14

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
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Time		Well 1J Depth to Water	Well 1J Elevation from TOC
10/23/84			
4:20	AM	17.87	554.21
4:51		18.02	554.06
5:22		18.35	553.73
5:54		18.56	553.52
6:27		18.66	553.42
7:02		18.58	553.50
7:24		18.68	553.40
10:22		18.17	553.91
1:20	PM	15.88	556.20
10/24/84			
7:26	AM	15.35	556.73
9:30		15.20	556.88
11:20		15.19	556.89
12:17	PM	15.38	556.70
12:37		15.48	556.60
1:06		15.57	556.51
1:26		15.65	556.43
2:28		15.88	556.20
2:52		15.93	556.15
3:15		16.01	556.07
3:45		16.06	556.02
4:50		16.22	555.86
10/25/84			
10:04	AM	16.60	555.48
11:01		16.61	555.47
12:00	PM	16.78	555.30
12:30		16.81	555.27
2:50		17.12	554.96
4:21		17.25	554.83

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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		Well 2A		Well 2C	
Time		Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84					
4:09	AM	7.95	562.15		570.10
4:39		7.90	562.20	14.15	555.95
5:10		7.87	562.29	14.39	555.71
5:42		7.77	562.33	14.65	555.45
6:17		7.76	562.34	14.95	555.15
6:46		7.73	562.37	14.98	555.12
7:18		7.66	562.44	14.98	555.12
10:18		7.62	562.48	14.12	555.98
1:10	PM	7.70	562.40	12.43	557.67
10/24/84					
7:23	AM	7.40	562.70	11.66	558.44
9:23		7.66	562.44	11.77	558.33
9:45		7.68	562.42	11.83	558.27
11:09		7.78	562.32	11.87	558.23
11:36		7.82	562.28	11.88	558.22
12:31	PM	7.88	562.22	12.24	557.86
12:55		7.97	562.13	12.45	557.65
1:19		7.97	562.13	12.62	557.48
2:17		8.13	561.97	12.95	557.15
2:42		8.21	561.89	13.05	557.05
3:07		8.20	561.90	13.14	556.96
3:31		8.18	561.92	13.16	556.94
3:57		8.24	561.86	13.18	556.92
4:55		8.11	561.99	13.10	557.00
10/25/84					
10:57	AM	7.68	562.42	12.93	557.17
11:55		7.87	562.23	13.13	556.97
12:33	PM	7.95	562.15	13.32	556.78
2:45		8.12	561.98	13.73	556.37

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
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		Well 3A		Well 3B	
Time		Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84					
3:56	AM	4.26	564.73	10.58	558.40
4:32		4.30	564.69	10.82	558.16
5:03		4.30	564.69	11.18	557.80
5:37		4.30	564.69	11.25	557.73
6:11		4.28	564.71	11.23	557.75
6:39		4.30	564.69	11.03	557.95
7:12		4.30	564.69	11.09	557.89
10:14		4.00	564.99	9.86	559.12
10/24/84					
7:32	AM	4.05	564.94	9.12	559.86
9:16		4.01	564.98	9.59	559.39
9:49				9.57	559.41
11:04		4.28	564.71	9.61	559.37
11:32		4.25	564.74	9.65	559.33
12:26	PM	4.26	564.73	10.07	558.91
12:48		4.26	564.73	10.17	558.81
1:14		4.26	564.73	10.14	558.84
2:13		4.23	564.76	10.35	558.63
2:36		4.24	564.75	10.37	558.61
3:02		4.25	564.74	10.43	558.55
3:25		4.25	564.74	10.42	558.56
4:04		4.25	564.74	10.45	558.53
4:55		4.04	564.95	10.16	558.82
10/25/84					
10:02	AM	4.03	564.96	10.78	558.20
11:13		4.08	564.91	9.94	559.04
11:51		4.04	564.95	10.08	558.90
12:36	PM	4.05	564.94	10.22	558.76
2:38		4.05	564.94	10.36	558.62

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
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DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 4A		Well 4C	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
4:02 AM			10.80	559.18
4:31			10.99	558.99
4:50			11.22	558.76
5:12			11.31	558.67
5:26			11.33	558.65
5:47			11.34	558.64
6:10			11.36	558.62
6:34			11.17	558.81
6:52			11.09	558.89
7:10			11.10	558.88
7:27			11.17	558.81
10:11			10.50	559.48
12:55 PM	10.11	559.88	10.24	559.74
10/24/84				
7:20 AM	9.61	560.38	9.73	560.25
11:01	9.76	560.23	9.92	560.06
11:11	9.77	560.22	9.95	560.03
11:24	9.78	560.21	9.95	560.03
11:36	9.78	560.21	9.95	560.03
11:59	10.06	559.93	10.27	559.71
12:13 PM	10.12	559.87	10.34	559.64
12:26	10.17	559.82	10.39	559.59
12:39	10.21	559.78	10.44	559.54
12:54	10.27	559.72	10.48	559.50
1:38	10.35	559.64	10.64	559.34
1:51	10.40	559.59	10.67	559.31
2:07	10.41	559.58	10.70	559.28
2:50	10.51	559.48	10.79	559.19
3:07	10.54	559.45	10.82	559.16
3:22	10.55	559.44	10.82	559.16
5:12	10.68	559.31	10.97	559.01
10/25/84				
10:00 AM	10.12	559.87	10.40	559.58
10:51	10.26	559.73	10.56	559.42
11:45	10.49	559.50	10.82	559.16
12:37 PM	10.68	559.31	11.06	558.92
2:33	10.84	559.15		
3:10			11.21	558.77

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
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DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 5A		Well 5B	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
3:54 AM	15.73	556.93	16.05	556.77
4:18	15.59	557.07	16.20	556.62
4:26	15.82	556.84		
4:41	16.13	556.53	16.76	556.06
4:58	16.46	556.20	17.11	555.71
5:18	16.68	555.98	17.20	555.62
5:35	16.75	555.91	17.21	555.61
5:52	Dry	555.37	17.30	555.52
6:14	16.82	555.84	17.01	555.81
6:24	16.63	556.03	16.87	555.95
6:42	16.49	556.17	16.79	556.03
6:58	16.45	556.21	16.77	556.05
7:22	16.60	556.06	17.12	555.70
10:07	15.28	557.38	15.47	557.35
12:23 PM	14.58	558.08	15.00	557.82
10/24/84				
7:15 AM	14.13	558.53	14.51	558.31
11:04	14.19	558.47	14.64	558.18
11:15	14.21	558.45	14.65	558.17
11:29	14.23	558.43	14.66	558.16
11:51	14.58	558.08	15.25	557.57
12:04 PM	14.74	557.92	15.35	557.47
12;18	14.84	557.82	15.41	557.41
12:32	14.94	557.72	15.49	557.33
12:44	15.01	557.65	15.52	557.30
1:29	15.15	557.51	15.65	557.17
1:43	15.19	557.47	15.69	557.13
1:57	15.22	557.44	15.73	557.09
2:36	15.31	557.35	15.84	556.98
2:56	15.36	557.30	15.80	557.02
3:13	15.37	557.29	15.86	556.96
5:09	15.51	557.15	16.00	556.82
10/25/84				
9:55 AM	15.09	557.57	15.51	557.31
10:43	15.20	557.46	15.64	557.18
11:24	15.36	557.30	15.95	556.87
12:44 PM	15.71	556.96	16.23	556.59
2:23	15.92	556.74	16.39	556.43

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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DUPONT PLANT SITE
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	Well 5CD		Well 5D	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10				
41	19.13	553.67	18.05	555.35
4:58	19.69	553.11	18.44	554.96
5:18	19.72	553.08	18.48	554.92
5:35	19.69	553.11	18.56	554.84
5:52	19.81	552.99	18.61	554.79
6:14	19.00	553.80	18.15	555.25
6:24	18.84	553.96	18.00	555.40
6:42	18.71	554.09	17.93	555.47
6:58	18.70	554.10	17.85	555.55
7:22	19.58	553.22	18.44	554.96
10:07	15.31	557.49	16.22	557.18
12:23 PM	15.70	557.10	15.65	557.75
10/24/84				
7:15 AM	15.24	557.56	15.20	558.20
11:04	15.36	557.44	15.31	558.09
11:15	15.37	557.43	15.35	558.05
11:29	15.38	557.42	15.36	558.04
11:51	16.40	556.40	16.11	557.29
12:04 PM	16.46	556.34	16.18	557.22
12:18	16.57	556.23	16.25	557.15
12:32	16.64	556.16	16.34	557.06
12:44	16.69	556.11	16.38	557.02
1:29	16.82	555.98	16.53	556.87
1:43	16.89	555.91	16.55	556.85
1:57	16.90	555.90	16.60	556.80
2:36	16.99	555.81	16.69	556.71
2:56	17.02	555.78	16.71	556.69
3:13	17.03	555.77	16.71	556.69
5:09	17.25	555.55	16.85	556.55
10/25/84				
9:55 AM	16.74	556.06	16.38	557.02
10:43	16.87	555.93	16.51	556.89
11:24	17.21	555.59	16.78	556.62
12:44 PM	17.71	555.09	17.21	556.19
2:23	17.85	554.95	17.35	556.05

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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DUPONT PLANT SITE
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Time		Well 5F Depth to Water	Well 5F Elevation from TOC
10/23/84			
3:54	AM	16.26	556.74
4:18		16.58	556.42
4:26			
4:41		17.14	555.86
4:58		17.30	555.70
5:18		17.34	555.66
5:35		17.36	555.64
5:52		17.44	555.56
6:14		17.03	555.97
6:24		16.98	556.02
6:42		16.97	556.03
6:58		16.95	556.05
7:22		17.25	555.75
10:07		15.73	557.27
12:23	PM	15.35	557.65
10/24/84			
7:15	AM	14.85	558.15
11:04		15.00	558.00
11:15		15.02	557.98
11:29		15.03	557.97
11:51		15.61	557.39
12:04	PM	15.69	557.31
12:18		15.74	557.26
12:32		15.80	557.20
12:44		15.85	557.15
1:29		15.97	557.03
1:43		16.02	556.98
1:57		16.02	556.98
2:36		16.14	556.86
2:56		16.17	556.83
3:13		16.17	556.83
5:09		16.27	556.73
10/25/84			
9:55	AM	15.79	557.21
10:43		15.95	557.05
11:24		16.18	556.82
12:44	PM	16.66	566.34
2:23		16.67	556.33

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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Time		Well 7A Depth to Water	Well 7A Elevation from TOC	Well 7C Depth to Water	Well 7C Elevation from TOC
10/23/84					
4:10	AM	15.75	555.44	20.70	550.47
4:55		15.78	555.41	20.73	550.44
5:47		15.77	555.42	20.80	550.37
6:25		15.78	555.41	20.87	550.30
7:20		15.78	555.41	20.94	550.23
10/24/84					
8:45	AM	15.62	555.57	20.68	550.49
12:26	PM	15.25	555.94	20.01	551.16
1:45		15.15	556.04	19.83	551.34
2:50		15.11	556.08	19.69	551.48
3:45		15.08	556.11	19.67	551.50
4:40		15.05	556.14	19.60	551.57
10/25/84					
10:30	AM	15.44	555.75	20.29	550.88
11:10		15.37	555.82	20.22	550.95
11:59		15.33	555.86	20.10	551.07
12:23	PM	15.33	555.86	20.10	551.07
2:43		15.21	555.98	29.82	541.35
4:09		15.14	556.05	19.67	551.50

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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Time		Well 8A Depth to Water	Well 8A Elevation from TOC	Well 8B Depth to Water	Well 8B Elevation from TOC
10/23/84					
4:10	AM	5.79	562.42	6.34	561.68
4·55		5.77	562.44	6.22	561.80
5:47		5.79	562.42	6.22	561.80
6:25		5.62	562.59	6.26	561.76
7:20		5.65	562.56	6.05	561.97
10/24/84					
10:38	AM	5.40	562.81	6.18	561.84
12:45	PM	5.42	562.79	6.29	561.73
1:45		5.43	562.78	6.41	561.61
2:50		5.46	562.75	6.43	561.59
4:40		5.52	562.69	6.58	561.44
10/25/84					
10:19	AM	5.39	562.82	6.25	561.77
11:04		5.39	562.82	7.31	560.71
11:59		5.42	562.79	6.43	561.59
2:43	PM	5.58	562.63	6.65	561.37
4:09		5.64	562.57	6.65	561.37

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
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DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

		Well 10A		Well 10C	
Time		Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84					
3:55	AM	7.56	561.89	12.80	557.78
4:42		7.56	561.89	12.95	557.63
5:26		7.56	561.89	12.95	557.63
6:13		7.59	561.86	13.00	557.58
7:05		7.59	561.86	13.01	557.57
10/24/84					
8:40	AM	7.53	561.92	12.87	557.71
10:25		7.52	561.93	12.86	557.72
11:19		7.52	561.93	12.86	557.72
12:20	PM	7.53	561.92	12.86	557.72
12:50		7.53	561.92	12.86	557.72
1:53		7.55	561.90	12.87	557.71
2:55		7.55	561.90	12.87	557.71
4:43		7.57	561.88	12.90	557.68
10/25/84					
10:15	AM	7.53	561.92	12.84	557.74
10:59		7.54	561.91	12.83	557.75
11:53		7.53	561.92	12.82	557.76
12:20	PM	7.56	561.89	12.81	557.77
2:38		7.57	561.88	12.84	557.74
4:12		7.57	561.88	12.82	557.76

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 10D Depth to Water	Well 10D Elevation from TOC	Well 10F Depth to Water	Well 10F Elevation from TOC
10/23					
13		19.47	551.13	12.79	557.61
7:05		19.49	551.11	12.63	557.77
10/24/84					
8:40	AM	18.90	551.70	11.76	558.64
10:25		18.58	552.02	11.85	558.55
11:19		18.45	552.15	11.85	558.55
12:20	PM	18.30	552.30	12.10	558.30
12:50		18.23	552.37	12.16	558.24
1:53		18.12	552.48	12.31	558.09
2:55		18.01	552.59	12.41	557.99
4:43		17.92	552.68	12.50	557.90
10/25/84					
10:15	AM	18.58	552.02	12.18	558.22
10:59		18.44	552.16	12.29	558.11
11:53		18.32	552.28	12.47	557.93
12:20	PM	18.27	552.33	12.56	557.84
2:38		18.00	552.60	12.72	557.68
4:12		16.80	553.80	12.73	557.67

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 9A		Well 11A	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
3:55 AM	10.08	561.87	5.65	562.27
4:40	10.09	561.86	5.65	562.27
5:26	10.07	561.88	5.65	562.27
6:15	10.01	562.94	5.52	562.30
7:07	9.98	561.97	5.61	562.31
10/24/84				
10:20 AM			5.58	562.34
10:38	10.84	561.10		

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 12A Depth to Water	Well 12A Elevation from TOC	Well 12B Depth to Water	Well 12B Elevation from TOC
10/23/84					
3:55	AM	11.17	561.76	12.51	559.63
4:40		11.17	561.76	12.63	559.51
5:26		11.18	561.75	12.55	559.59
6:15		11.19	561.74	12.58	559.56
7:07		11.17	561.76	12.59	559.55
10/24/84					
8:36	AM	11.12	561.81	12.41	559.73
10:20		11.14	562.79	12.49	559.65
11:55		11.15	561.78	12.50	559.64
12:15	PM	11.15	561.78	12.50	559.64
12:55		11.15	561.78	12.52	559.62
1:59		11.17	561.76	12.63	559.51
3:01		11.19	561.74	12.64	559.50
4:40		11.21	561.72	12.69	559.45
10/25/84					
10:19	AM	11.15	561.78	12.45	559.69
10:55		11.15	561.78	12.51	559.63
11:50		11.20	561.73	12.56	559.58
12:17	PM	11.17	561.76	12.67	559.47
2:35		11.20	561.73	12.68	559.46

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 14A		Well 14C	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
11	8.13	564.11	17.23	554.87
12:12 PM	8.11	564.13	17.23	554.87
12:44	8.10	564.14	17.23	554.87
2:02	8.10	564.14	17.23	554.87
3:03	8.09	564.15	17.21	554.89

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 15CD Depth to Water	Well 15CD Elevation from TOC	Well 15D Depth to Water	Well 15D Elevation from TOC
10/23/84					
3:54	AM	18.88	552.52	15.47	556.13
4:12		19.89	551.51	16.17	555.43
4:30		21.77	549.63	17.09	554.51
4:47		22.62	438.78	17.39	554.21
4:58		22.75	548.65	17.42	554.18
5:23		22.69	548.71	17.42	554.18
5:55		22.76	548.64	17.45	554.15
6:06		22.43	548.97	17.15	554.45
6:15		21.33	550.07	16.84	554.76
6:30		21.04	550.36	16.58	555.02
6:45		20.99	550.41	16.78	554.82
7:00		20.97	550.43	16.75	554.85
7:25		20.65	550.75	17.35	554.25
10:40		16.43	554.97	14.91	556.69
1:25	PM	16.03	555.37	14.73	556.87
10/24/84					
7:36	AM	15.42	555.98	14.05	557.55
9:11		15.52	555.88	14.24	557.36
10:57		15.60	555.80	14.32	557.28
11:10		15.62	555.78	14.38	557.22
11:20		15.63	555.77	14.36	557.24
12:10	PM	17.48	553.92	15.24	556.36
12:25		17.61	553.79	15.33	556.27
12:35		17.65	553.75	15.35	556.25
12:45		17.69	553.71	15.37	556.23
1:00		17.72	553.68	15.42	556.18
2:00		17.91	553.49	15.59	556.01
3:30		18.04	553.36	15.69	555.91
3:50		18.07	553.33	15.71	555.89
5:00		18.14	553.26	15.83	555.77
10/25/84					
10:10	AM	17.92	553.48	15.38	556.22
10:25		17.96	553.44	15.47	556.13
10:45		17.96	553.44	15.52	556.08
11:20		18.33	553.07	15.74	555.86
11:35		18.71	552.69	15.93	555.67
11:55		18.96	552.44	16.06	555.54
12:15	PM	19.03	552.37	16.16	555.44
12:42		19.11	552.29	16.21	555.39
2:30		19.30	552.10	16.36	555.24

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 15F Depth to Water	Well 15F Elevation from TOC	Well 15J Depth to Water	Well 15J Elevation from TOC
10/23/84					
3:54	AM	12.78	558.92	50.0	521.7
4:12		12.67	559.03	101.0	470.7
4:30		12.83	558.87	NM	
4:47		12.99	558.71	NM	
4:58		13.08	558.62	NM	
5:23		13.10	558.60	NM	
5:55		13.13	558.57	101.0	470.7
6:06		13.15	558.55	NM	
6:15		13.05	558.65	100.9	470.8
6:30		12.94	558.76	100.9	470.8
6:45		12.90	558.80	100.8	470.9
7:00		12.98	558.72	NM	
7:25		12.95	558.75	NM	
10:40		12.34	559.36		
1:25	PM	12.30	559.40	100.66	471.04
10/24/84					
7:36	AM	11.66	560.04	100.5	471.28
9:11		11.82	559.88	100.8	471.03
10:57		11.94	559.76	100.8	471.03
11:10		11.97	559.73	100.8	571.03
11:20		11.97	559.73	100.8	571.03
12:10	PM	12.32	559.38	100.8	471.03
12:25		12.34	559.36		
12:35		12.37	559.33	100.8	471.03
12:45		12.40	559.30		
1:00		12.43	559.27		
2:00		12.62	559.08		
3:30		12.75	558.95	100.2	471.53
3:50		12.76	558.94		
5:00		12.91	558.79		
10/25/84					
10:10	AM	12.34	559.36		
10:25		12.40	559.30		
10:45		12.44	559.26	100	471.7
11:20		12.59	559.11		
11:35		12.67	559.03		
11:55		12.78	558.92		
12:15	PM	12.85	558.85		
12:42		12.94	558.76		
2:30		13.08	558.62		

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

		Well 15CD		Well 15	
10/23/84					
3:54	AM	18.88	552.52	15.47	556.13
4:12		19.89	551.51	16.17	555.43
4:30		21.77	549.63	17.09	554.51
4:47		22.62	438.78	17.39	554.21
4:58		22.75	548.65	17.42	554.18
5:23		22.69	548.71	17.42	554.18
5:55		22.76	548.64	17.45	554.15
6:06		22.43	548.97	17.15	554.45
6:15		21.33	550.07	16.84	554.76
6:30		21.04	550.36	16.58	555.02
6:45		20.99	550.41	16.78	554.82
7:00		20.97	550.43	16.75	554.85
7:25		20.65	550.75	17.35	554.25
10:40		16.43	554.97	14.91	556.69
1:25	PM	16.03	555.37	14.73	556.87
10/24/84					
7:36	AM	15.42	555.98	14.05	557.55
9:11		15.52	555.88	14.24	557.36
10:57		15.60	555.80	14.32	557.28
11:10		15.62	555.78	14.38	557.22
11:20		15.63	555.77	14.36	557.24
12:10	PM	17.48	553.92	15.24	556.36
12:25		17.61	553.79	15.33	556.27
12:35		17.65	553.75	15.35	556.25
12:45		17.69	553.71	15.37	556.23
1:00		17.72	553.68	15.42	556.18
2:00		17.91	553.49	15.59	556.01
3:30		18.04	553.36	15.69	555.91
3:50		18.07	553.33	15.71	555.89
5:00		18.14	553.26	15.83	555.77
10/25/84					
10:10	AM	17.92	553.48	15.38	556.22
10:25		17.96	553.44	15.47	556.13
10:45		17.96	553.44	15.52	556.08
11:20		18.33	553.07	15.74	555.86
11:35		18.71	552.69	15.93	555.67
11:55		18.96	552.44	16.06	555.54
12:15	PM	19.03	552.37	16.16	555.44
12:42		19.11	552.29	16.21	555.39
2:30		19.30	552.10	16.36	555.24

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 16A		Well 16B	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10 23/84				
3:50 AM	8.05	564.28	15.54	557.36
4:19	8.05	564.28	15.64	557.26
4:40	8.05	564.28	15.98	556.92
4:52	8.04	564.29	16.28	556.62
5:25	8.05	564.28	16.47	556.43
6:11	8.03	564.30	16.45	556.45
7:05	8.05	564.28	16.08	556.82
7:30	8.05	564.28	16.42	556.48
10:35	8.02	564.31	14.94	557.96
10/24/84				
7:42 AM	7.98	564.35	14.18	558.72
9:23	7.94	564.39	14.25	558.65
11:00	7.97	564.36	14.28	558.62
11:15	7.93	564.40	14.38	558.52
11:25	7.94	564.39	14.34	558.56
12:15 PM	7.94	564.39	14.92	557.98
12:25	7.94	564.39	14.98	557.92
12:40			15.00	557.90
12:55	7.94	564.39	15.05	557.85
2:05	7.94	564.39	15.22	557.68
3:25	7.94	564.39	15.31	557.59
3:55	7.94	564.39	15.33	557.57
5:05	7.99	564.34	15.45	557.45
10/25/84				
10:12 AM			15.06	557.84
10:30	7.97	564.36	15.09	557.81
10:55	7.98	564.35	15.12	557.78
11:20			15.24	557.66
11:50			15.44	557.46
12:10 PM			15.47	557.43
12:37			15.56	557.34
2:25			15.70	557.20
4:39	8.00	564.33	15.80	557.10

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 19A		Well 19B	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
3:50 AM	9.68	563.99	17.38	555.88
4:18	9.71	563.96	19.24	554.02
4:32	9.72	563.95	19.87	553.39
4:45	9.72	563.95	20.53	552.73
5:00	9.70	563.97	20.96	552.30
5:15	9.72	563.95	20.98	552.28
5:45	9.72	563.95	21.07	552.19
6:05	9.72	563.95	21.06	552.20
6:20	9.72	563.95	20.74	552.52
6:35	9.72	563.95	20.12	553.14
6:50	9.68	563.99	20.00	553.26
7:15	9.68	563.99	20.51	552.75
9:55	9.71	563.96	17.83	555.43
12:05 PM	9.68	563.99	17.05	556.21
10/24/84				
8:10 AM	9.67	564.00	16.41	556.85
9:40	9.71	563.96	16.49	556.77
10:50	9.68	563.99	16.52	556.74
11:40	9.68	563.99	17.41	555.85
12:00 PM	9.71	563.96	17.61	555.65
12:15	9.69	563.98	17.76	555.50
12:30	9.71	563.96	17.85	555.41
1:04	9.72	563.95	17.94	555.32
1:37	9.69	563.98	18.04	555.22
10/25/84				
10:02 AM	9.72	563.95	17.92	555.32
10:27	9.72	563.95	17.92	555.32
10:47	9.83	563.84	18.06	555.20
11:25	9.82	563.85	18.32	554.94
11:52	9.82	563.85	18.65	554.61
12:25 PM	9.79	563.88	18.74	554.52
1:42	9.73	563.94	18.82	554.44

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 19CD1 Depth to Water	Well 19CD1 Elevation from TOC	Well 19CD2 Depth to Water	Well 19CD2 Elevation from TOC
10/23/84					
3:50	AM	20.67	552.64	20.95	552.46
4:18		20.71	552.60	21.91	551.50
4:32		20.68	552.63	24.13	549.28
4:45		20.72	552.59	24.93	548.48
5:00		20.72	552.59	25.00	548.41
5:15		20.73	552.58	24.88	548.53
5:45		20.73	552.58	24.95	548.46
6:05		20.90	552.41	23.98	549.43
6:20		20.77	552.54	23.18	550.23
6:35		20.79	552.52	23.06	550.35
6:50		19.85	553.46	23.03	550.38
7:15		20.79	552.52	24.48	548.93
9:55		20.85	552.46	18.88	554.53
12:05	PM	18.05	555.26	18.03	555.38
10/24/84					
7:05	AM	17.84	555.47	17.35	556.06
9:40		17.64	555.67	17.37	556.04
10:50		17.60	555.71	17.40	556.01
11:40		17.79	555.52	19.12	554.29
12:00	PM	18.00	555.31	19.26	554.15
12:15		18.02	555.29	19.46	553.95
12:30		18.04	555.27	19.51	553.90
1:04		18.04	555.27	19.65	553.76
1:37		18.09	555.22	19.75	553.66
5:14		18.15	555.16	20.04	553.37
10/25/84					
10:02	AM	18.49	554.82	19.69	553.72
10:27		18.50	554.81	19.92	553.49
10:47		18.55	554.76	19.98	553.43
11:25		18.56	554.75	20.56	552.85
11:52		18.56	554.75	20.90	552.51
12:25	PM	18.56	554.75	21.00	552.41
1:42		18.62	554.69	21.13	552.28

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time	Well 19CD3 Depth to Water	Well 19CD3 Elevation from TOC	Well 19D Depth to Water	Well 19D Elevation from TOC
10/23/84				
3:50 AM	15.29	554.40		
4:18	15.94	553.75		
4:32	16.93	552.76		
4:45	17.58	552.11		
5:00	17.80	551.89		
5:15	17.82	551.87		
5:45	17.82	551.87		
6:05	17.53	552.16		
6:20	16.98	552.71	18.54	554.54
6:35	16.88	552.81	18.50	554.58
6:50	16.84	552.85	18.47	554.61
7:15	17.68	552.01	19.01	554.07
9:55	14.39	555.30	16.91	556.17
12:05 PM	13.55	556.14	16.25	556.83
10/24/84				
7:05 AM	13.01	556.68	15.79	557.29
9:40	13.06	556.63	15.83	557.25
10:50	13.04	556.65	15.89	557.19
11:40	13.38	556.31	16.68	556.40
12:00 PM	14.27	555.42	16.81	556.27
12:15	14.39	555.30	16.88	556.20
12:30	14.47	555.22	16.94	556.14
1:04	14.55	555.14	17.05	556.03
1:37	14.64	555.05	17.13	555.95
5:14	14.87	554.82	17.43	555.65
10/25/84				
10:02 AM	14.54	555.15	17.03	556.05
10:27	14.68	555.01	17.17	555.91
10:47	14.69	555.00	17.19	555.89
11:25	15.02	554.67	17.53	555.55
11:52	15.30	554.39	17.77	555.31
12:25 PM	15.40	554.29	17.85	555.23
1:42	15.50	554.19	17.99	555.09

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 19F Depth to Water	Well 19F Elevation from TOC
10/23/84			
6:20	AM	18.44	555.06
6:30		18.32	555.18
6:50		18.25	555.25
7:15		18.81	554.69
9:55		16.62	556.88
12:05	PM	15.48	557.62
10/24/84			
7:05	AM	15.48	558.02
9:40		15.39	558.11
10:50		15.45	558.05
11:40		16.08	557.42
12:00	PM	16.34	557.16
12:15		16.42	557.08
12:30		16.44	557.06
1:04		16.66	556.84
1:37		16.65	556.85
5:14		16.94	556.56
10/25/84			
10:02	AM	16.49	557.01
10:27		16.55	556.95
10:47		16.60	556.90
11:25		16.92	556.58
11:52		17.15	556.35
12:25	PM	17.31	556.19
1:42		17.40	556.10

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 20A		Well 20B	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
3:58 AM	Dry		13.71	556.36
4:23	Dry		13.74	556.33
4:38	Dry		13.82	556.25
4:50	Dry		13.90	556.17
5:00	Dry		13.95	556.12
5:15	Dry		13.98	556.09
5:45	Dry		14.04	556.03
6:10	Dry		14.07	556.00
6:30	Dry		14.08	555.99
6:40	Dry		14.03	556.04
7:00	Dry		14.00	556.07
7:15	Dry		14.00	556.07
9:57	Dry		13.76	556.31
11:57	Dry		13.71	556.36
10/24/84				
8:13 AM	Dry		13.31	556.76
9:50	Dry		13.32	556.75
11:00	Dry		13.32	556.75
11:50	Dry		13.33	556.74
12:05 PM	Dry		13.43	556.64
12:25	Dry		13.47	556.60
12:40	Dry		13.48	556.59
1:10	Dry		13.51	556.56
1:48	Dry		13.55	556.52
10/25/84				
10:15 AM	Dry		13.58	556.49
10:42	Dry		13.60	556.47
10:57	Dry		13.64	556.43
11:37	Dry		13.64	556.43
12:03 PM	Dry		13.67	556.40
12:39	Dry		13.62	556.45
1:53	Dry		13.65	556.42

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 22A		Well 22B	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
3:52 AM	6.81	564.32	13.80	557.04
4:12	6.83	564.30	13.81	557.03
4:25	6.81	564.32	13.87	556.97
4:31	6.81	564.32	13.93	556.91
4:50	6.81	564.32	13.94	556.90
5:05			13.94	556.90
5:15	6.81	564.32	13.93	556.91
5:28	6.81	564.32	13.94	556.90
5:38	6.81	564.32	13.94	556.90
5:48	6.81	564.32	13.93	556.91
6:00	6.81	564.32	13.94	556.90
6:12	6.98	564.15	14.11	556.73
6:25	6.99	564.14	14.12	556.72
6:35	6.98	564.15	14.11	556.73
6:45	6.98	564.15	14.11	556.73
6:55	6.98	564.15	14.11	556.73
7:05	6.98	564.15	14.14	556.70
7:15	6.99	564.14	14.14	556.70
7:25	6.99	564.14	14.14	556.70
7:30	6.99	564.14	14.14	556.70
7:40	6.99	564.14	14.14	556.70
7:50	6.99	564.14	14.12	556.72
8:00	6.99	564.14	13.95	556.89
9:30	6.79	564.34	13.95	556.89
11:25	Dry		13.92	556.92
10/24/84				
6:56 AM	6.88	564.25	13.74	557.10
9:16	6.88	564.25	13.74	557.10
9:28	6.88	564.25	13.74	557.10
9:40	6.88	564.25	13.74	557.10
11:10	6.88	564.25	13.73	557.11
11:25	6.88	564.25	13.73	557.11
11:35	6.88	564.25	13.74	557.10
11:45	6.88	564.25	13.75	557.09
11:55	6.88	564.25	13.76	557.08
12:10 PM	6.88	564.25	13.76	557.08
12:20	6.88	564.25	13.76	557.08
12:30	6.88	564.25	13.75	557.09
12:45	6.88	564.25	13.76	557.08
1:00	6.88	564.25	13.76	557.08
1:15	6.88	564.25	13.76	557.08

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 22A Depth to Water	Well 22A Elevation from TOC	Well 22B Depth to Water	Well 22B Elevation from TOC
10/24/84					
1:30		6.88	564.25	13.76	557.08
2:00		6.88	564.25	13.77	557.07
2:30		6.88	564.25	13.78	557.06
3:00		6.88	564.25	13.78	557.06
3:30		6.88	564.25	13.78	557.06
4:00		6.88	564.25	13.78	557.06
10/25/84					
10:18	AM	6.67	564.46	13.81	557.03
10:40		6.97	564.16	13.81	557.03
11:15		6.97	564.16	13.81	557.03
11:43		6.96	564.17	13.81	557.03
12:07	PM	6.96	564.17	13.81	557.03
12:43		6.96	564.17	13.81	557.03
2:03		6.96	564.17	13.81	557.03

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 22C Depth to Water	Well 22C Elevation from TOC	Well 22D Depth to Water	Well 22D Elevation from TOC
10/23/84					
3:52	AM	20.05	550.73	15.33	555.66
4:12		21.31	549.47	15.35	555.64
4:25		21.88	548.90	15.98	555.01
4:31		23.62	547.16	16.38	554.61
4:50		24.37	546.41	16.89	554.10
5:05		24.40	546.38	16.91	554.08
5:15		24.33	546.45	16.90	554.09
5:28		24.34	546.44	16.90	554.09
5:38		24.34	546.44	16.92	554.07
5:48		24.35	546.43	16.92	554.07
6:00		23.51	547.27	16.95	554.04
6:12		22.87	547.91	16.58	554.41
6:25		22.72	548.06	16.46	554.53
6:35		22.67	548.11	16.39	554.60
6:45		22.64	548.14	16.39	554.60
6:55		22.60	548.18	16.38	554.61
7:05		23.97	546.81	16.73	554.26
7:15		24.37	546.41	16.96	554.03
7:25		24.52	546.26	16.99	554.00
7:30		24.57	546.21	16.96	554.03
7:40		24.57	546.21	16.92	554.07
7:50		24.51	546.27	16.92	554.07
8:00		23.04	547.74	16.54	554.45
9:30		21.37	549.41	15.92	555.07
11:25		16.80	553.98	14.09	556.90
10/24/84					
6:56	AM	16.09	554.69	13.56	557.43
9:16		16.06	554.72	13.55	557.44
9:28		16.06	554.72	13.55	557.44
9:40		16.06	554.72	13.57	557.42
11:10		16.13	554.65	13.65	557.34
11:25		16.15	554.63	13.68	557.31
11:35		16.15	554.63	13.70	557.29
11:45		17.87	552.91	14.41	556.58
11:55		18.05	552.73	14.49	556.50
12:10	PM	18.25	552.53	14.59	556.40
12:20		18.41	552.37	14.67	556.32
12:30		18.47	552.31	14.71	556.28
12:45		18.53	552.25	14.75	556.24
1:00		18.56	552.22	14.77	556.22
1:15		18.63	552.15	14.82	556.17

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time	Well 22C Depth to Water	Well 22C Elevation from TOC	Well 22D Depth to Water	Well 22D Elevation from TOC
10/24/84				
1:30	18.65	552.13	14.86	556.13
2:00	18.75	552.03	14.96	556.03
2:30	18.82	551.96	15.03	555.96
3:00	18.86	551.92	15.05	555.94
3:30	18.88	551.90	15.09	555.90
4:00	18.80	551.98	15.11	555.88
10/25/84				
10:18 AM	18.79	551.99	14.89	556.10
10:40	18.81	551.97	14.91	556.08
11:15	19.40	551.38	15.15	555.84
11:43	19.98	550.80	15.42	555.57
12:07 PM	20.14	550.64	15.55	555.44
12:43	20.25	550.53	15.69	555.30
2:03	20.40	550.38	15.76	555.23

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 22F Depth to Water	Well 22F Elevation from TOC
10/23/84			
3:52	AM	20.49	550.79
4:12		20.36	550.92
4:25		21.66	549.62
4:31		23.99	547.29
4:50		25.13	546.15
5:05		25.87	545.41
5:15		26.08	545.20
5:28		26.04	545.24
5:38		26.03	545.25
5:48		26.05	545.23
6:00		26.09	545.19
6:12		25.34	545.94
6:25		24.17	547.11
6:35		23.73	547.55
6:45		23.52	547.76
6:55		23.45	547.83
7:05		23.40	547.88
7:15		24.63	546.65
7:25		25.43	545.85
7:30		25.88	545.40
7:40		26.08	545.20
7:50		26.17	545.11
8:00		25.92	545.36
9:30		21.98	549.30
11:25		16.72	554.56
10/24/84			
6:56	AM	15.90	555.38
9:16		15.80	555.48
9:28		15.80	555.48
9:40		15.81	555.47
11:10		15.87	555.41
11:25		15.88	555.40
11:35		15.94	555.34
11:45		17.22	554.06
11:55		17.74	553.54
12:10	PM	17.97	553.31
12:20		18.15	553.13
12:30		18.26	553.02
12:45		18.34	552.94

PUMP TEST RESULTS(1)
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 22F	
Time	Depth to Water	Elevation from TOC
10/24/84		
1:00	18.40	552.88
1		
30	18.52	552.76
2:00	18.60	552.68
2:30	18.70	552.58
3:00	18.77	552.51
3:30	18.78	552.50
4:00	18.80	552.48
10/25/84		
10:18 AM	18.73	552.55
10:40	18.84	552.44
11:15	19.11	552.17
11:43	19.78	551.50
12:07 PM	20.04	551.24
12:43	20.14	551.14
2:03	20.31	550.97

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

Time		Well 23A Depth to Water	Well 23A Elevation from TOC	Well 23B Depth to Water	Well 23B Elevation from TOC
10/23/84					
4:00	AM	19.54	550.28	19.78	549.85
4:10		19.57	550.25	19.77	549.86
4:52		19.57	550.25	19.85	549.78
5:20		19.57	550.25	19.86	549.77
5:55		19.58	550.24	19.92	549.71
6:21				19.96	549.67
7:02		19.60	550.22	20.01	549.62
10/24/84					
7:50	AM	19.58	550.24	19.50	550.13
11:30		19.31	550.51	18.66	550.97
12:30	PM	19.12	550.70	18.53	551.10
1:35		18.94	550.88	18.40	551.23
2:40		18.74	551.08	18.33	551.30
4:32		18.46	551.36	18.22	551.41
10/25/84					
10:25	AM	19.46	550.36	18.89	550.74
11:15		19.36	550.46	18.80	550.83
12:05	PM	19.25	550.57	18.77	550.86
2:52		18.78	551.04	18.37	551.26
4:00		18.56	551.26	18.26	551.37

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing

PUMP TEST RESULTS[1]
OCTOBER 1984
DUPONT PLANT SITE
NIAGARA FALLS, NEW YORK

	Well 23C		Well 23D	
Time	Depth to Water	Elevation from TOC	Depth to Water	Elevation from TOC
10/23/84				
4:00 AM	23.17	546.57	19.81	550.06
4:10	23.18	546.56	19.78	550.09
4:52	23.24	546.50	19.81	550.06
5:20	23.25	546.49	19.86	550.01
5:55	23.31	546.43	19.94	549.93
6:21	23.31	546.43	19.94	549.93
7:02	23.37	546.37	19.94	549.93
10/24/84				
7:50 AM	23.05	546.69	19.41	550.46
11:30	22.50	547.24	18.58	551.29
12:30 PM	22.40	547.34	18.43	551.44
1:35	22.32	547.42	18.30	551.57
2:40	22.25	547.49	18.22	551.65
4:32	22.13	547.61	18.06	551.81
10/25/84				
10:25 AM	22.67	547.07	18.81	551.06
11:15	22.57	547.17	18.70	551.17
12:05 PM	22.49	547.25	18.60	551.27
2:52	22.28	547.46	18.27	551.60
4:00	22.20	547.54	18.17	551.70

(1) Pumping wells = Olin Corporation Production Wells
(2) Measurements in feet
(3) TOC = Top of Casing