DISTRIBUTION AND TREND OF NITRATE, CHLORIDE, AND TOTAL SOLIDS IN WATER IN THE MAGOTHY AQUIFER IN SOUTHEAST NASSAU COUNTY, NEW YORK, FROM THE 1950's THROUGH 1973

U.S. GEOLOGICAL SURVEY

Water–Resources Investigations 76–44

Prepared in cooperation with the

Nassau County Department of Public Works

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UNITED STATES DEPARTMENT OF THE INTERIOR

Thomas S. Kleppe, Secretary

GEOLOGICAL SURVEY

V. E. McKelvey, Director

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Mineola, New York 11501

CONTENTS

ILLUSTRATIONS

ILLUSTRATIONS (Continued)

TABLES

CONVERSION FACTORS AND ABBREVIATIONS

Multiply English units	by	To obtain SI (metric units)
feet (ft)	0.3048	metres (m)
square miles (mi^2)	2.590	square kilometres (km^2)

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ABSTRACT

Concentrations of nitrate, chloride, and total solids in water in the Magothy aquifer, southeast Nassau County, N.Y., show a steadily increasing trend from the early 1950's through 1973. Vertical distribution of nitrate, chloride, and total-solids concentrations as shown in cross sections of the study area indicate downward movement of these constituents from tens of feet to a few hundred feet in this time period. Maximum concentrations are in a zone underlying the areas of Westbury, Hicksville, and Plainview. Nitrate (as nitrogen) concentration increased from 4-5 milligrams per litre to 7 milligrams per litre in the area of Westbury and from 3 to 10 milligrams per litre in Plainview during the period 1950-73. Lowest nitrate concentrations are in the area south of a line running from North Merrick to South Farmingdale. Also, during the period analyzed (1950-73), a 10-milligram-per-litre line of equal-chloride concentration on a cross section in the Westbury area moved downward a distance of less than 50 feet (15 metres), and in the area of Hicksville, nearly 150 feet (45 metres). Total-solids concentration doubled during the period 1950-73 in the area of Plainview, where maximum downward movement of pollutants was observed.

INTRODUCTION

Hydrogeology and quality of water of southeast Nassau County are being studied cooperatively by the U.S. Geological Survey and the Nassau County Department of Public Works. The area of study includes mainly suburban residential communities. Sewage in this area is disposed of through individual cesspools and septic tanks. Seepage from cesspools, septic tanks, and other waste disposal systems has modified the chemical quality of ground water in the upper glacial and Magothy aquifers (Perlmutter and Koch, 1972) and streams (Koch, 1970) in the study area. Construction of a communal sewer system in Sewer District 3, scheduled to be completed in 1985, will replace the present system of individual cesspools and septic tanks and will provide facilities for collection, treatment, and discharge of waste water.

Knowledge of the chemical quality of water in the Magothy aquifer before sewer construction is essential to an evaluation of the effects of the sewering on water quality in the aquifer after the construction is completed and the sewer system is operating. This report presents concentrations of nitrate, chloride, and total solids in Sewer District 3, southeast Nassau County, N.Y. (fig. 1), for the 1950's, the 1960's, and the early 1970's. All nitrate concentrations in the report are the nitrogen equivalent of nitrate (milligrams per litre nitrogen multiplied by 4.428 equals milligrams per litre nitrate). Unless noted otherwise, water-quality data used in this report were supplied by the Nassau County Department of Health.

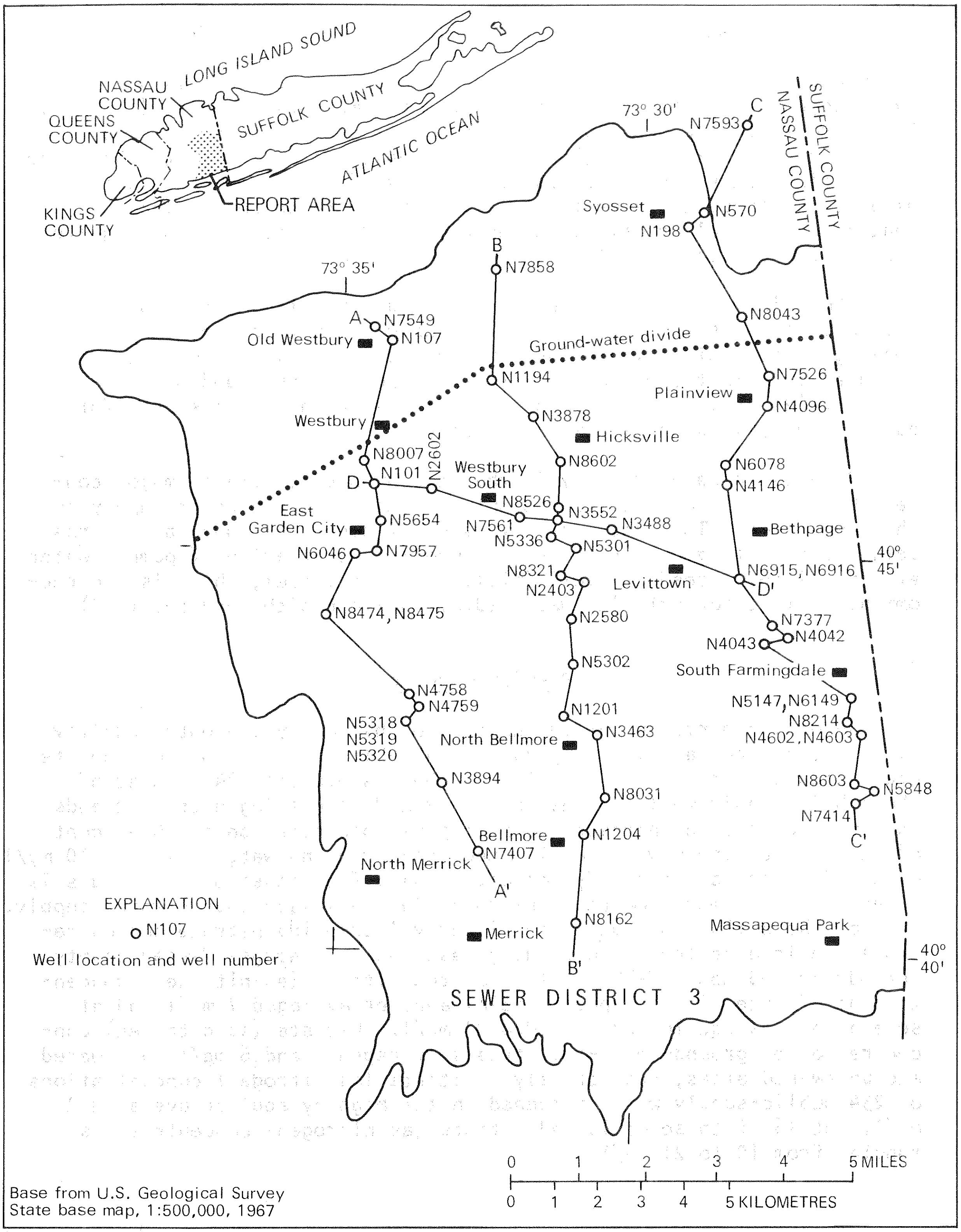


Figure 1.--Locations of study area and wells used in constructing cross sections and generating trend lines.

GENERAL HYDROGEOLOGIC AND WATER-QUALITY DESCRIPTION

Long Island is underlain by consolidated bedrock that is overlain by a wedge-shaped mass of unconsolidated sedimentary deposits (fig. 2). The bedrock surface dips southeast from near sea level in northwest Nassau County to 1,600 ft (480 m) below sea level at the south shoreline of Suffolk County. Unconsolidated deposits of Cretaceous age, which also dip southeast, are mantled nearly everywhere on Long Island by Quaternary glacial deposits. A generalized description of this aquifer system is shown in table 1.

The principal public water supply is derived from the Magothy aquifer, which is the major aquifer of concern in this report. The upper glacial aquifer is not used for domestic supply because it is polluted by domestic waste water from cesspools (Cohen and others, 1968, p. 64) and, at many places, has been abandoned as a source for public supply in southeast Nassau County.

Changes in water quality in the Magothy aquifer are of major concern because this aquifer is the only source of public water supply for the study area. The water quality is still generally good, but it has been deteriorating. Nitrate (as nitrogen) concentration of pumped water at some places exceeds 10 mg/l (milligrams per litre), which is the recommended limit for drinking water (U.S. Public Health Service, 1962).

Previous Studies

Several reports on various aspects of hydrology and water quality of the study area and vicinity have been published. Two of the reports are discussed here. Smith and Baier (1969) state that 24 percent of the public supply wells in Nassau County had increasing nitrate trends in 1969 and that the nitrate (as nitrogen) concentration of 16 percent of the public supply wells will exceed the drinking water limit of 10 mg/l within 50 years of the study period. Sewage from cesspool discharges is cited as the primary source of nitrates in the Nassau County water supply. Most of the wells that have significantly increasing nitrate concentrations lie in a central band running east and west across Nassau County. Perlmutter and Koch (1972) state that the nitrate (as nitrogen) concentration of water in the upper glacial aquifer averaged 7 mg/l and at several places equaled or exceeded 23 mg/l. Nitrate (as nitrogen) concentration of ground-water-fed streams averaged 3 and 6 mg/l in sewered and unsewered areas, respectively. Nitrate (as nitrogen) concentrations of 234 public-supply wells screened in the Magothy aquifer averaged 2 mg/l, but 16 of these wells had nitrate (as nitrogen) concentrations ranging from 10 to 21 mg/l.

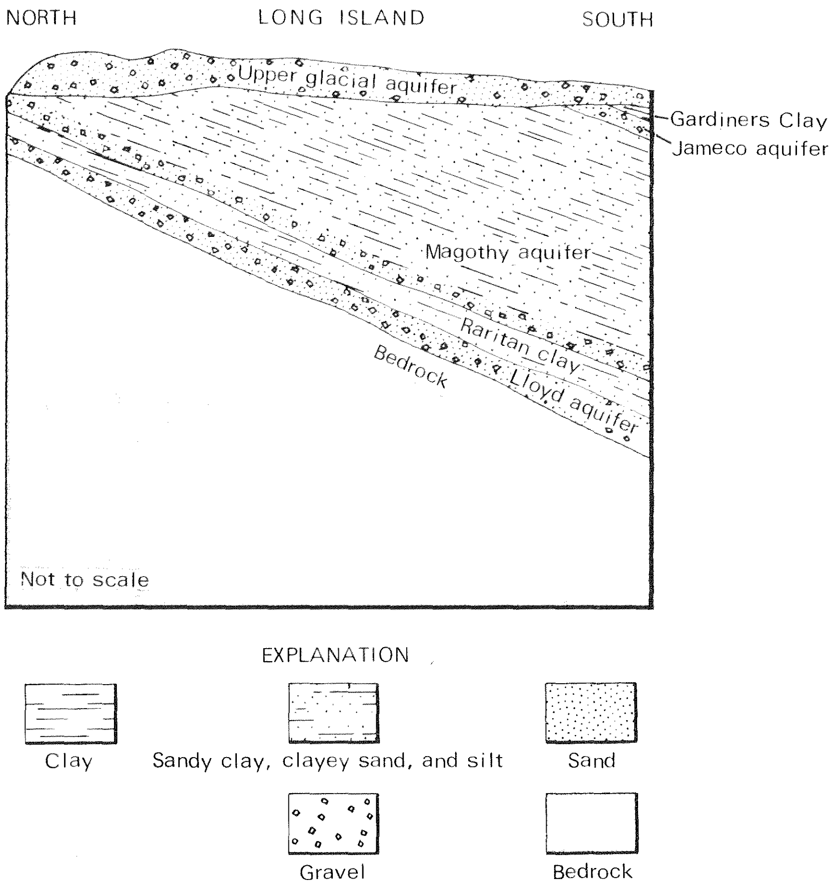


Figure 2.--Generalized cross sections of the aquifer systems on Long Island, N.Y.

Table 1.--Generalized description of hydrogeologic units underlying the study area [1/]

Hydrogeologic unit	Water-bearing character
Upper glacial aquifer	Mainly sand and gravel of moderate to high permeability; also includes clayey deposits of glacial till of low permeability.
Gardiners Clay	Clay, silty clay, and a little fine sand of low to very low permeability.
Jameco aquifer	Mainly medium to coarse sand of moderate to high permeability.
Magothy aquifer	Coarse to fine sand of moderate permeability; locally contains gravel of high permeability, and abundant silt and clay of low to very low permeability.
Raritan clay	Clay of very low permeability; some silt and fine sand of low permeability.
Lloyd aquifer	Sand and gravel of moderate permeability; some clayey material of low permeability.

1/ Adapted from Cohen, Franke, and Foxworthy (1968).

TREND OF WATER-QUALITY CHANGES WITH TIME

Eleven public-supply wells having extensive chemical-quality records and suitable areal distribution in the study area were used to compute the trend of pollution constituents with time. (See tables 2, 3, and 4.) The data include a few anomalous values for which there are no ready explanations. Most water samples were collected annually from public-supply wells. When more than one water sample (generally less than 4) for a given well was analyzed during a given year, the data were averaged and were considered as one datum point for that year.

Figure 3 shows the trend of the concentrations of nitrate, chloride, and total solids from the 1950's to 1973. Trend lines were fitted through the data points by the least square method of analysis. Smith and Baier (1969), in their study of nitrate pollution of ground water in Nassau County, found that 72 of 234 public-supply wells screened in the Magothy aquifer showed a significant increase in nitrate concentration between 1952 and 1969. In the present study, the slope of the fitted line shows that the concentration of nitrate has increased in all 11 public-supply wells investigated (fig. 3A). The standard error of estimate, which is a measure of scatter about the fitted line, ranged from 0.02 to 1.7 mg/l nitrate as nitrogen. Water samples from four wells (N3552, N4096, N5301, and N6078) show rapid rates of increase in nitrate concentration during the period of record. Water from well N3552 has a nitrate (as nitrogen) concentration in excess of the U.S. Public Health Service (1962) recommended limit of 10 mg/l for drinking water. Several trend lines of chloride (fig. 3B) and total-solids (fig. 3C) concentrations show rapid rates of increase. The standard error of estimate for chloride ranged from 0.5 to 4.6 mg/l, and the standard error of estimate for total solids ranged from 7.5 to 22 mg/l. Water in well N5654 (fig. 3B) showed a decrease in chloride, which may be attributed to local, short-term chloride pollution in the surrounding area of the well before the period of study. Between 1967 and 1973, the chloride concentration of this well increased slightly but averaged 16 mg/l for the 6-year period.

Although the trend lines accurately represent the data points, extrapolation of the lines to predict future concentrations must be done with caution. The rate of change of the concentration of each constituent with time depends in part on the pumping rate and the quantity of water withdrawn by the given well and nearby wells. Recharge rates, sewering, and changes in sources of pollution all have an effect on the final concentration of each constituent. Therefore, the linear relationship between concentration and time shown in figure 3 is only an assumption that seems applicable to the period of observation.

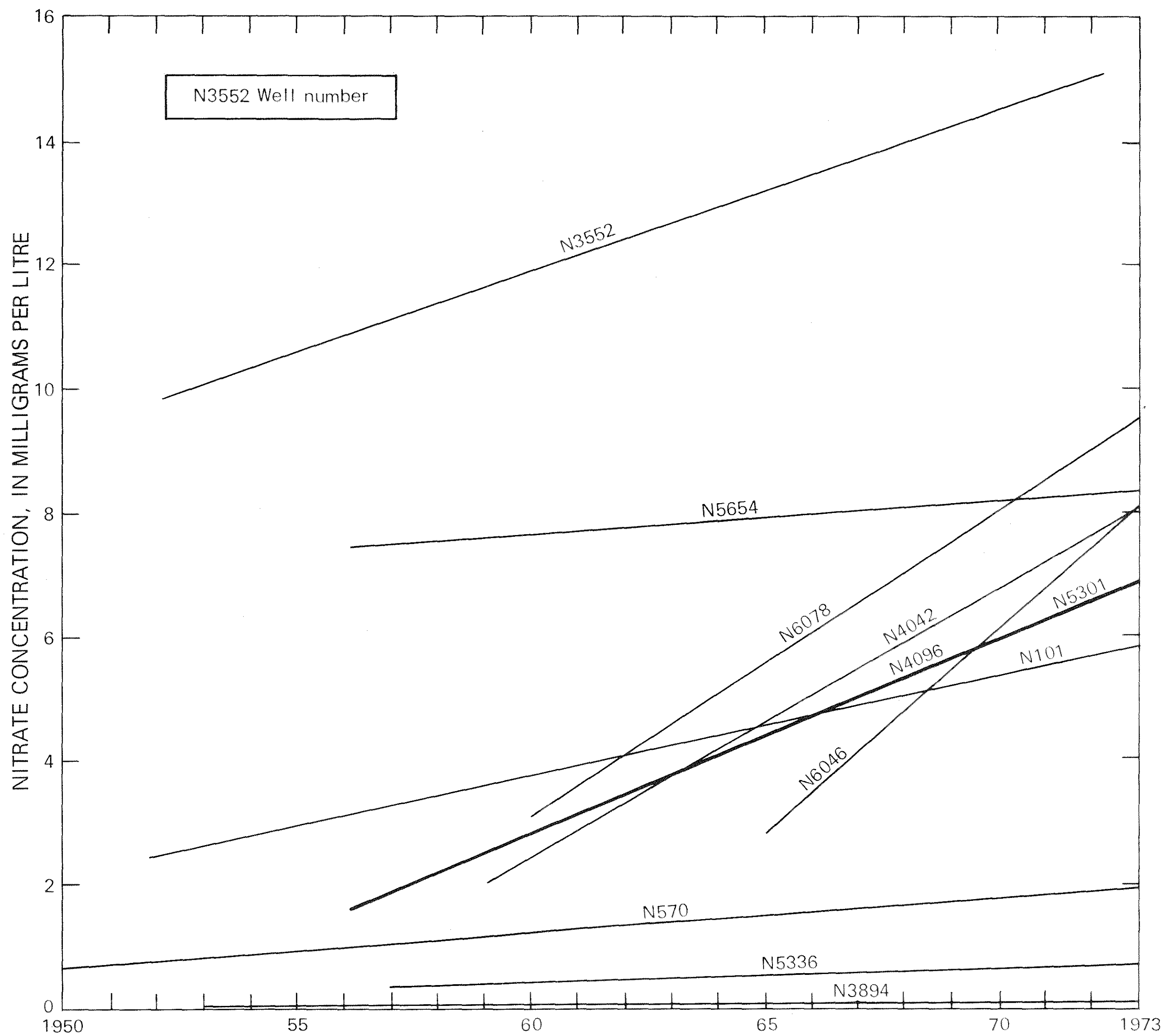


Figure 3A.--Trend of nitrate concentration from 1950-73.

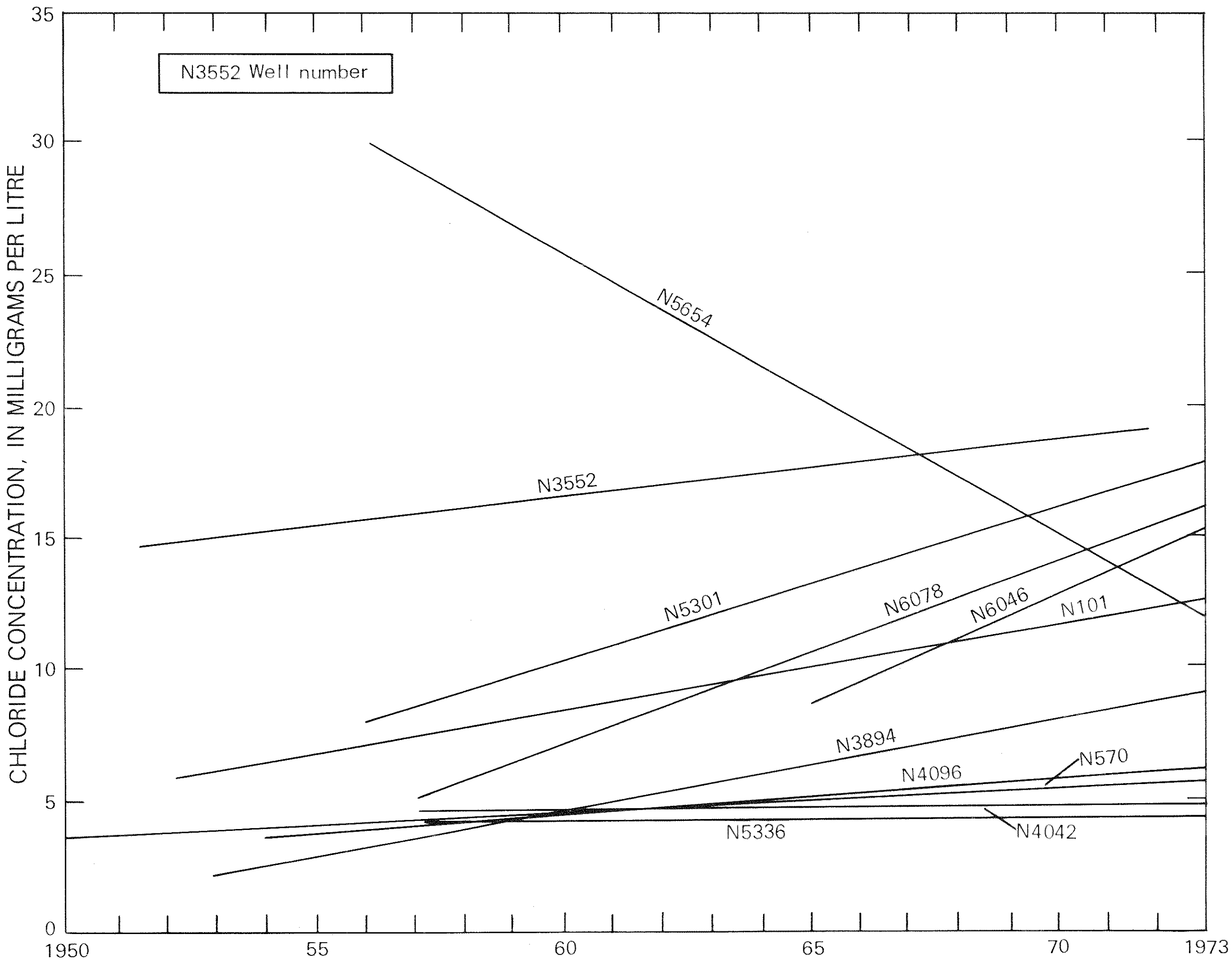


Figure 3B.--Trend of chloride concentration from 1950-73.

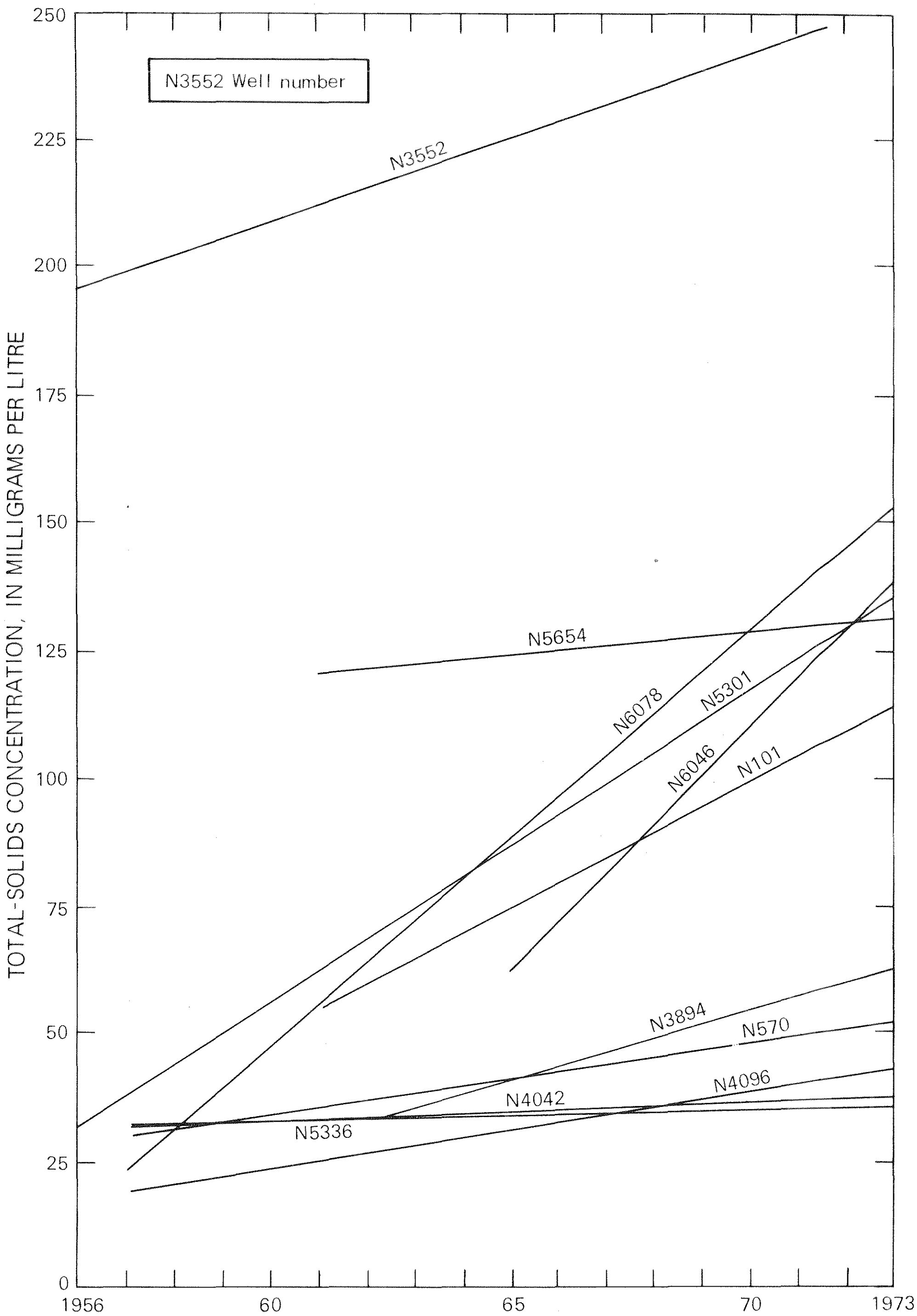


Figure 3C.--Trend of total-solids concentration from 1956-73.

Table 2.--Nitrate (as nitrogen) concentration of water from selected wells, southeast Nassau County, N.Y.

(All data reported in milligrams per litre. Source of data: Nassau County Department of Health)

Year	Well number										
	N101	N570	N3552	N3894	N4042	N4096	N5301	N5336	N5654	N6046	N6078
1950	--	0.55	--	--	--	--	--	--	--	--	--
51	--	--	--	--	--	--	--	--	--	--	--
52	2.84	.70	9.40	--	--	--	--	--	--	--	--
53	--	--	10.0	1/0.02	--	--	--	--	--	--	--
54	3.10	.90	11.2	1/.02	--	1.15	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--
56	--	--	10.2	--	--	--	1/1.92	--	4.10	--	--
57	2.90	.97	10.2	--	--	.43	2.00	1/0.25	7.80	--	--
58	2.20	--	--	--	--	--	--	--	9.60	--	--
59	5.00	--	--	.02	2.65	--	--	--	9.50	--	--
60	1/4.55	.96	1/9.10	--	3.40	.56	--	1/.41	8.40	--	5.10
61	1/3.85	1.50	13.3	--	2.00	1.00	3.10	.80	6.85	--	5.60
62	2.90	1.20	13.4	1/.02	2.60	.71	3.70	1/.41	7.60	--	1/4.50
63	3.90	--	13.3	.0	2.40	.82	3.10	.48	7.10	--	--
64	3.70	1.90	13.8	.04	4.00	1.00	3.80	.50	6.20	--	3.30
65	3.75	1.50	15.0	.04	4.35	.74	4.20	.50	8.20	2.70	4.20
66	4.70	2.12	13.8	.02	5.50	.36	1/4.65	.50	8.50	--	1/4.15
67	1/4.90	2.10	--	.0	5.60	.95	4.75	--	1/8.35	1/3.98	--
68	1/5.30	1.52	1/15.4	1/.04	6.20	1/1.08	5.10	1.12	9.10	4.40	1/4.73
69	1/7.20	1.24	--	1/.05	1/7.60	1.28	1/5.88	.62	1/8.90	5.55	5.30
70	1/6.25	1.80	1/12.2	1/.07	1/7.40	1.32	1/6.43	.78	1/9.11	--	1/8.53
71	1/5.75	1/1.00	15.0	1/.03	1/6.40	1/1.56	1/6.87	1/.60	1/7.78	7.80	1/9.60
72	1/5.15	1/2.50	13.8	1/.01	1/7.25	1.46	1/6.65	.62	1/7.80	7.80	1/10.6
73	1/5.20	1.84	--	1/.01	7.80	1.52	1/6.80	.87	1/7.10	1/7.10	11.6

1/ Average value

Table 3.--Chloride concentration of water from selected wells, southeast Nassau County, N.Y.

(All data reported in milligrams per litre. Source of data: Nassau County Department of Health)

Year	Well number										
	N101	N570	N3552	N3894	N4042	N4096	N5301	N5336	N5654	N6046	N6078
1950	--	3.8	--	--	--	--	--	--	--	--	--
51	--	--	--	--	--	--	--	--	--	--	--
52	6.2	4.0	14.8	--	--	--	--	--	--	--	--
53	--	--	15.8	1/ 3.5	--	--	--	--	--	--	--
54	6.6	3.6	15.6	1/ 4.5	--	4.0	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--
56	--	--	16.0	--	--	--	1/ 5.3	--	35.6	--	--
57	8.2	5.2	16.2	--	5.4	4.0	9.4	1/ 4.2	29.2	--	5.4
58	8.0	--	--	--	--	--	--	--	27.8	--	--
59	8.0	--	--	4.0	--	--	--	--	35.5	--	--
60	1/ 10.5	4.4	1/ 16.2	--	4.2	4.0	--	1/ 4.0	1/ 25.5	--	8.6
61	1/ 8.4	4.4	15.6	--	4.0	3.8	11.4	1/ 5.0	21.7	--	9.0
62	8.4	4.6	15.8	1/ 5.3	6.0	6.0	11.4	1/ 10.2	19.8	--	1/ 9.7
63	7.8	--	15.6	3.4	4.0	5.0	13.0	3.8	18.4	--	--
64	8.0	4.6	17.0	5.6	17.0	6.0	12.8	4.2	18.0	--	8.2
65	8.0	5.4	17.2	5.6	3.8	2.4	13.2	4.0	17.0	9.0	9.0
66	9.4	5.4	19.6	4.5	18.4	4.4	1/ 13.7	4.0	16.6	--	1/ 8.3
67	1/ 10.5	5.0	--	6.5	4.0	5.2	15.0	--	1/ 16.2	1/ 9.4	--
68	1/ 10.9	4.6	1/ 19.1	1/ 6.4	3.8	1/ 5.2	14.0	5.0	16.2	10.8	10.4
69	1/ 11.3	4.8	--	1/ 8.2	5.6	6.2	1/ 15.3	4.2	1/ 16.5	11.8	11.4
70	1/ 13.5	4.8	17.2	1/ 7.1	5.2	6.2	1/ 18.6	5.0	1/ 16.7	--	1/ 12.6
71	1/ 13.8	1/ 5.0	21.0	1/ 9.6	1/ 5.8	1/ 6.5	1/ 16.5	1/ 4.1	1/ 14.9	14.2	1/ 15.6
72	1/ 11.5	1/ 6.7	19.6	1/ 10.4	4.6	6.2	1/ 16.4	5.0	1/ 16.6	14.4	1/ 18.2
73	1/ 12.3	6.2	--	1/ 10.8	5.0	5.0	1/ 15.4	3.4	1/ 16.1	1/ 14.6	17.4

1/ Average value

Table 4.--Total-solids concentration of water from selected wells, southeast Nassau County, N.Y.

(All data reported in milligrams per litre. Source of data: Nassau County Department of Health)

Year	Well number										
	N101	N570	N3552	N3894	N4042	N4096	N5301	N5336	N5654	N6046	N6078
1956	--	--	193	--	--	--	48	--	--	--	--
57	--	27	181	--	34	20	41	1/ 42	--	--	38
58	--	--	--	--	--	--	--	--	--	--	--
59	--	--	--	--	--	--	--	--	--	--	--
60	--	30	1/ 199	--	36	26	--	1/ 27	--	--	65
61	64	32	205	--	--	33	39	26	144	--	69
62	65	30	199	1/ 37	--	27	70	1/ 155	125	--	1/ 70
63	69	--	242	67	22	19	60	26	124	--	--
64	52	43	225	31	--	22	75	26	119	--	62
65	54	37	246	21	28	25	81	29	93	67	67
66	72	60	238	26	97	39	1/ 68	39	111	--	1/ 66
67	1/ 88	47	--	53	45	22	106	--	1/ 107	1/ 73	--
68	1/ 110	46	1/ 245	1/ 45	44	1/ 26	137	43	1/ 144	99	1/ 72
69	1/ 134	60	--	1/ 48	24	40	116	38	1/ 122	83	101
70	1/ 98	36	223	1/ 47	39	55	124	48	1/ 132	--	1/ 127
71	114	1/ 46	223	1/ 39	1/ 41	1/ 42	1/ 142	35	146	119	1/ 145
72	1/ 105	1/ 46	239	1/ 61	48	28	1/ 115	40	1/ 139	146	176
73	1/ 108	46	--	1/ 84	25	50	1/ 117	16	1/ 123	126	181

1/ Average value

VERTICAL DISTRIBUTION OF NITRATE, CHLORIDE, AND TOTAL SOLIDS

Sections showing vertical distributions of nitrate, chloride, and total solids in the Magothy aquifer during two different time intervals are shown for these constituents in figures 4, 5, and 6.

Distribution of nitrate, chloride, and total solids in the upper glacial aquifer is irregular, and only average ranges in concentration are shown in figures 4, 5, and 6, respectively. Early data (1950's) on nitrate and total-solids concentrations for water in the upper glacial aquifer are lacking; therefore, the concentrations shown are only approximations. Dissolved-solids concentrations are used as an approximate substitute for total solids.

Nitrate

Nitrate is one of the parameters of principal concern in water in the Magothy aquifer at several locations in Nassau County. Nitrate is derived chiefly from infiltration of sewage, fertilizers, and from leachates of solid-waste disposal sites. Perlmutter and Koch (1972) consider concentrations in excess of 1 mg/l of nitrate (NO_3^-) or 0.23 mg/l of nitrate (as nitrogen) as an indication of activities of man.

Sections A-A' and B-B' in figures 4A-4D show some downward movement of equal nitrate concentration lines between the early 1950's and 1973. For example, in the vicinity of well N5654 (fig. 4A) in Westbury, nitrate (as nitrogen) concentrations were 4-5 mg/l during the period 1952-63. By 1973, the concentration at the same depth had increased to more than 7 mg/l (fig. 4B). Generally, downward movement ranged from no significant movement in the area south of North Merrick and South Farmingdale to a maximum movement of a few hundred feet in the areas of Westbury, Hicksville, and Plainview (figs. 4E and 4F). There also seems to be definite horizontal movement of equal nitrate concentration lines through the Magothy aquifer, but the rate is difficult to determine because of insufficient data for the upper part of the aquifer.

The increase in nitrate concentration with time near well N6078 in Plainview (figs. 4E and 4F) is much greater than in the other wells. In the 1952-63 period, nitrate (as nitrogen) concentration of ground water near the well was 3 mg/l, but in 1973 the concentration was more than 10 mg/l--a threefold increase.

East-west section D-D' (figs. 4G and 4H) also shows a more rapid downward movement of nitrate in the eastern part of the study area than in the central and western parts. The rapid downward movement in the eastern part may be partly due to a large increase in population in and adjacent to the Plainview area (Nassau County Planning Commission, 1974, p. 18), which resulted in a corresponding increase in the number of cesspools, septic tanks, and storm-water basins. Also, pumpage from the Magothy aquifer has increased significantly over the years. For 1973, section D-D' (figs. 4G and 4H) shows that the depth of downward migration is distributed uniformly across the width of the section. At about 100 feet below sea level, the nitrate (as nitrogen) concentration is about 10 mg/l, and at a depth of 400 feet below sea level, the concentration is approximately 1 mg/l.

As inferred from sections in figures 4A-4F, there is a zone of high-nitrate water in the Magothy aquifer in the areas of Westbury, Hicksville, and Plainview. Smith and Baier (1969) also reported that wells showing increasing nitrate trends lie in the same area just south of the ground-water divide (fig. 1). The high nitrate concentration in water along this zone could be attributed to, in addition to cesspools and septic tank effluents, a combination of the following factors:

1. In the areas of Hicksville and Levittown, large-scale farming and associated use of fertilizers since 1920 (Perlmutter and Koch, 1972) has undoubtedly contributed nitrate to the ground-water system. More recently, fertilizers applied to lawns and gardens have added to the source of nitrate in ground water.

2. Under natural conditions, the vertical (downward) movement of water in the vicinity of the ground-water divide is greater than in other parts of the study area. As a result, concentrations of nitrate and other pollutants in ground water tend to be greater near the divide than elsewhere. The rate of vertical movement near the ground-water divide is computed to be 5 to 25 ft (1.5 to 7.5 m) per year with an average of 10 ft (3 m) per year according to Perlmutter and Koch (1972). At this rate, water would move 500 ft (150 m) from the water table to the base of the Magothy aquifer in about 50 years. Using a steady-state electrical analog model, Franke and Cohen (1972) estimated that it would take 100 years for water to move from the water table to the base of the Magothy aquifer (500 ft or 150 m) along the Nassau-Suffolk County boundary. However, the rates of vertical movement would be accelerated by pumping.

EXPLANATION

— — — 1 — — ? — — Line of equal nitrate (as nitrogen) concentration, in milligrams per litre. Question mark where approximately located

N7957 Well number

Sample well. Number on left is nitrate (as nitrogen) concentration, in milligrams per litre; number in parentheses is year that data were collected other than within indicated time interval

Well screen

2.65(66)

0.02 Nitrate (as nitrogen) concentration, in milligrams per litre, from integrated water sample

4–15 Approximate range of nitrate (as nitrogen) concentration, in milligrams per litre, in the upper glacial aquifer

•••••••••••• Water table, position is approximate

0 1 2 3 4 5 MILES

0 1 2 3 4 5 KILOMETRES

Vertical scale greatly exaggerated

Figure 4.--Vertical distribution of nitrate in water in the Magothy aquifer (along sections A-A' - D-D'), southeast Nassau County, N.Y.

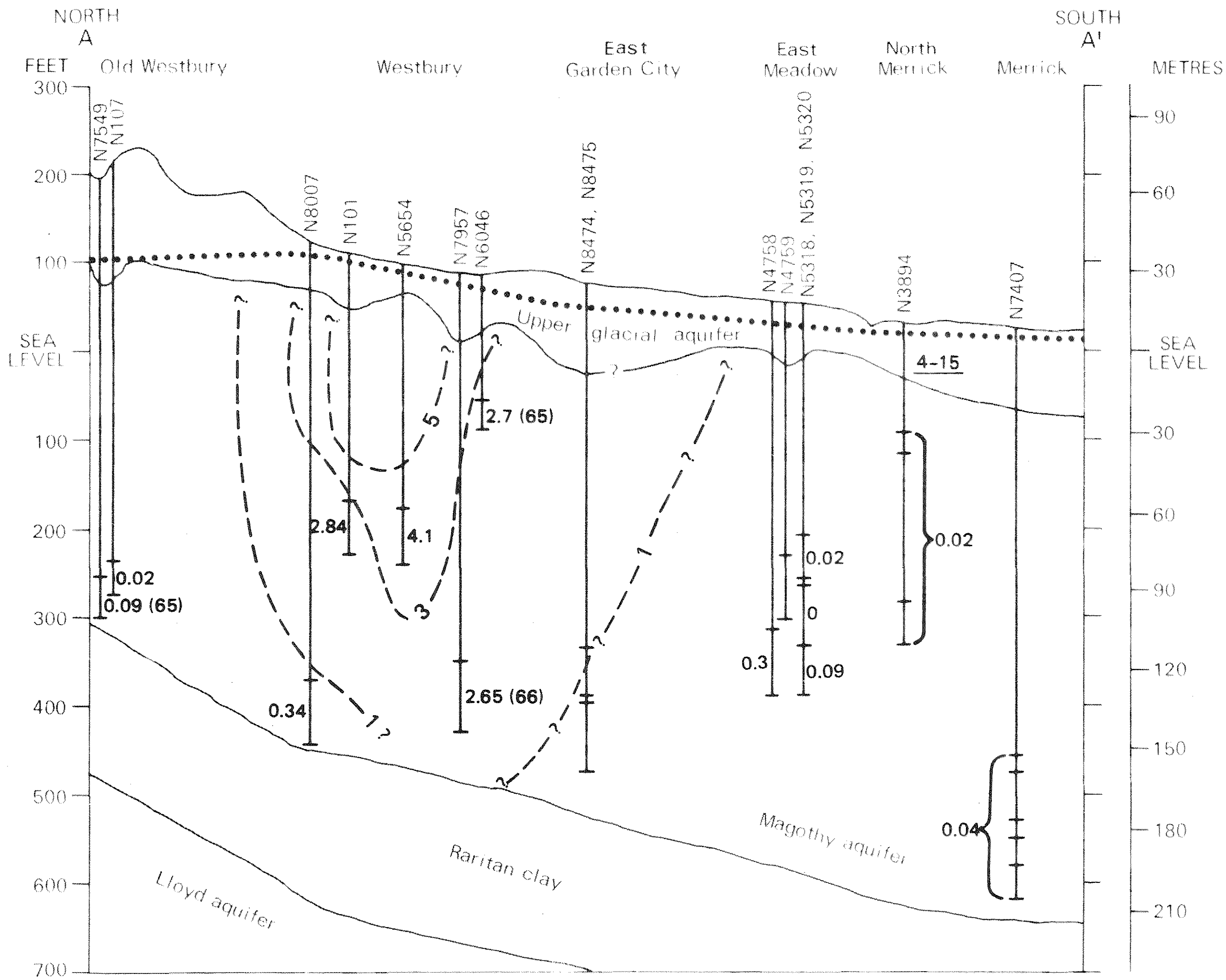


Figure 4A

Nitrate (as nitrogen) data 1952-63

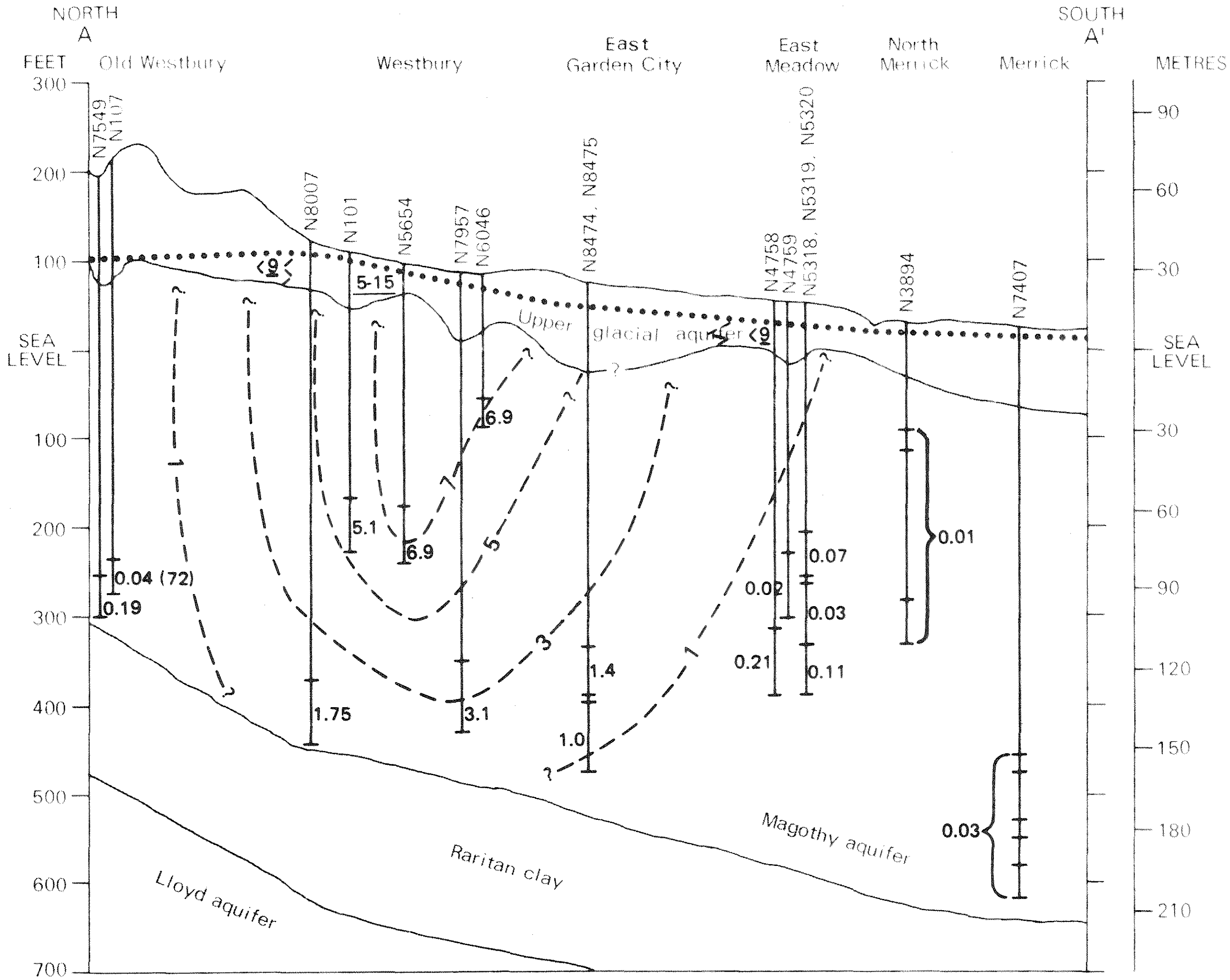


Figure 4B Nitrate (as nitrogen) data 1973

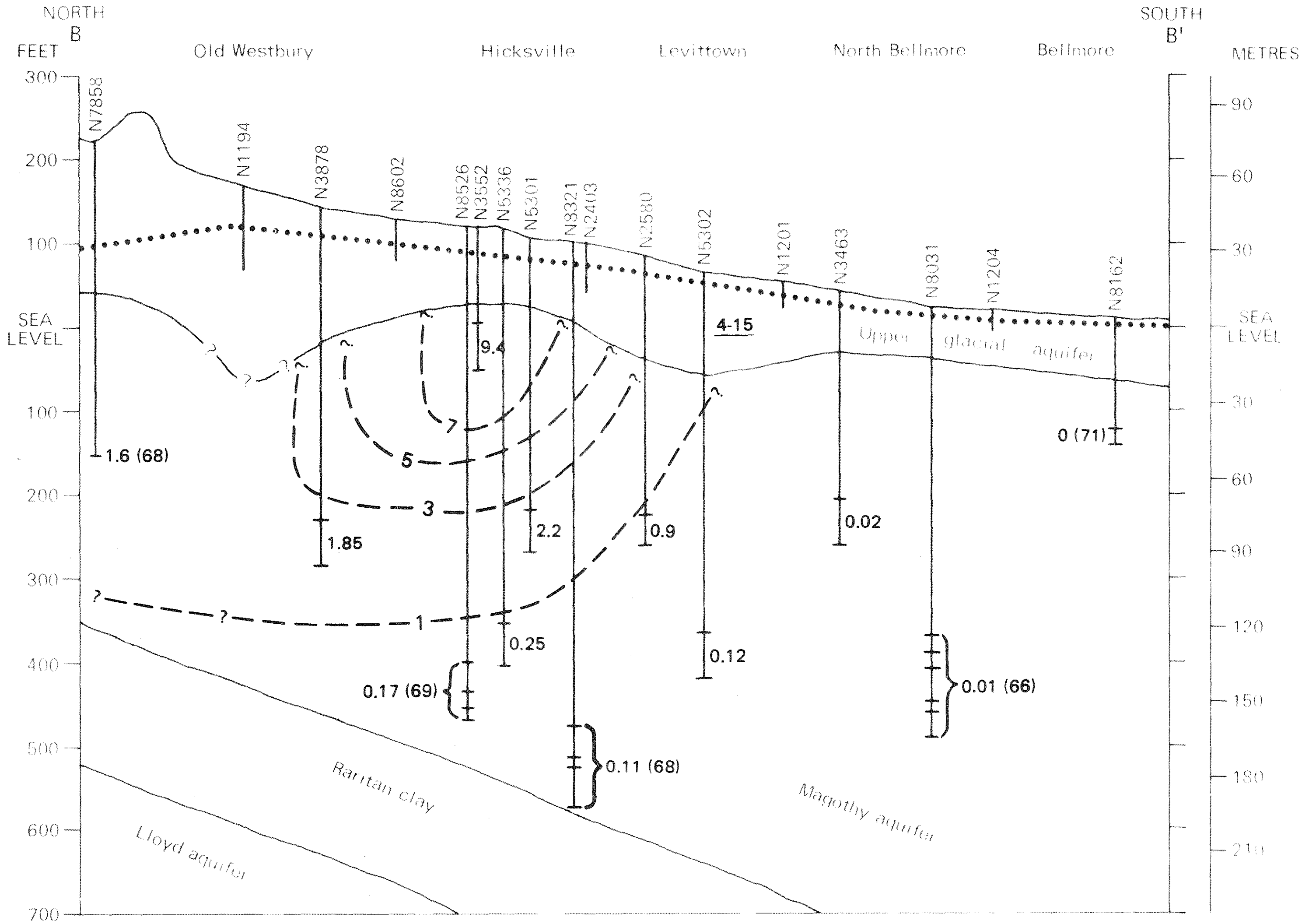
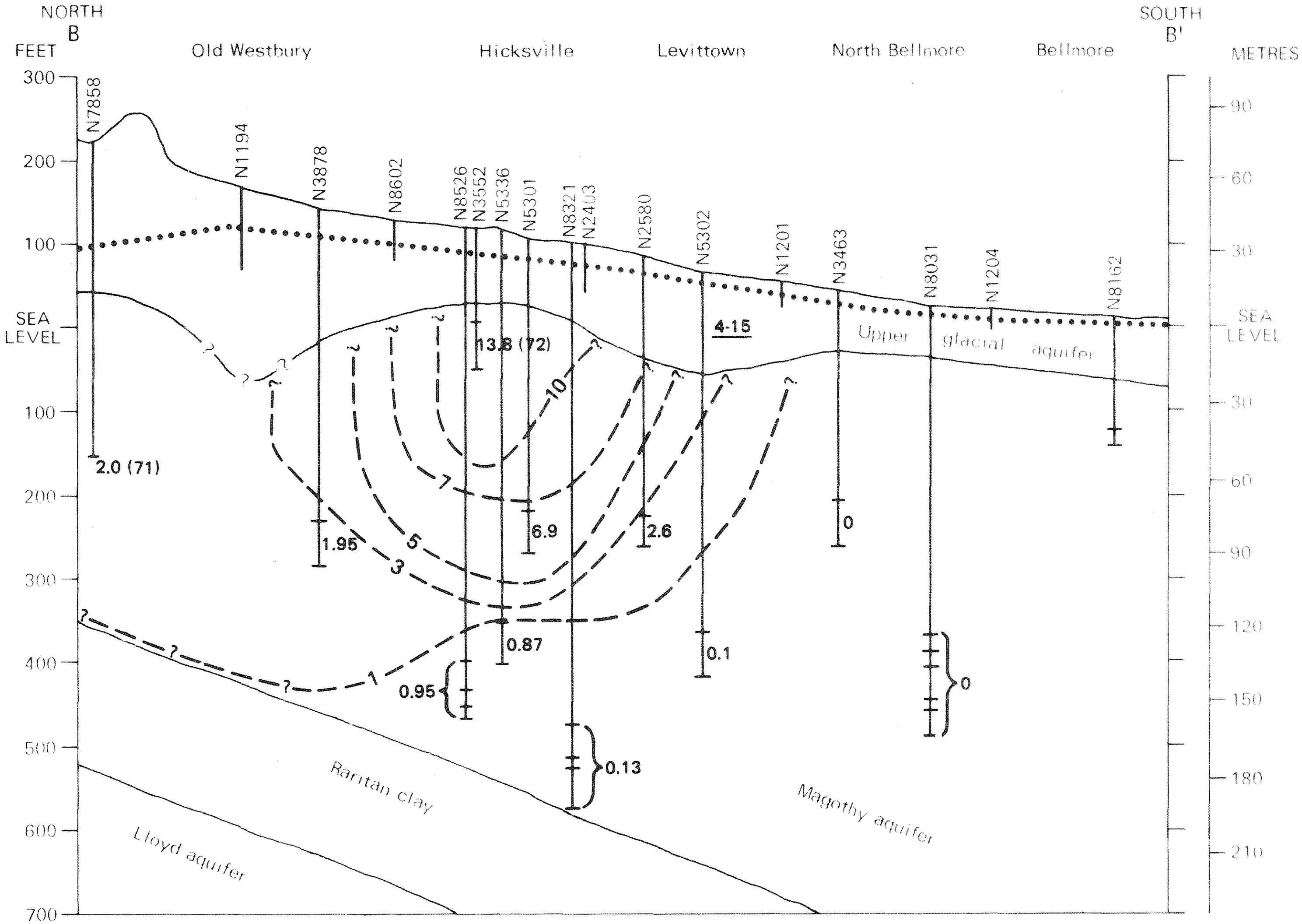


Figure 4C

Nitrate (as nitrogen) data 1952-57



Nitrate (as nitrogen) data 1973

Figure 4D

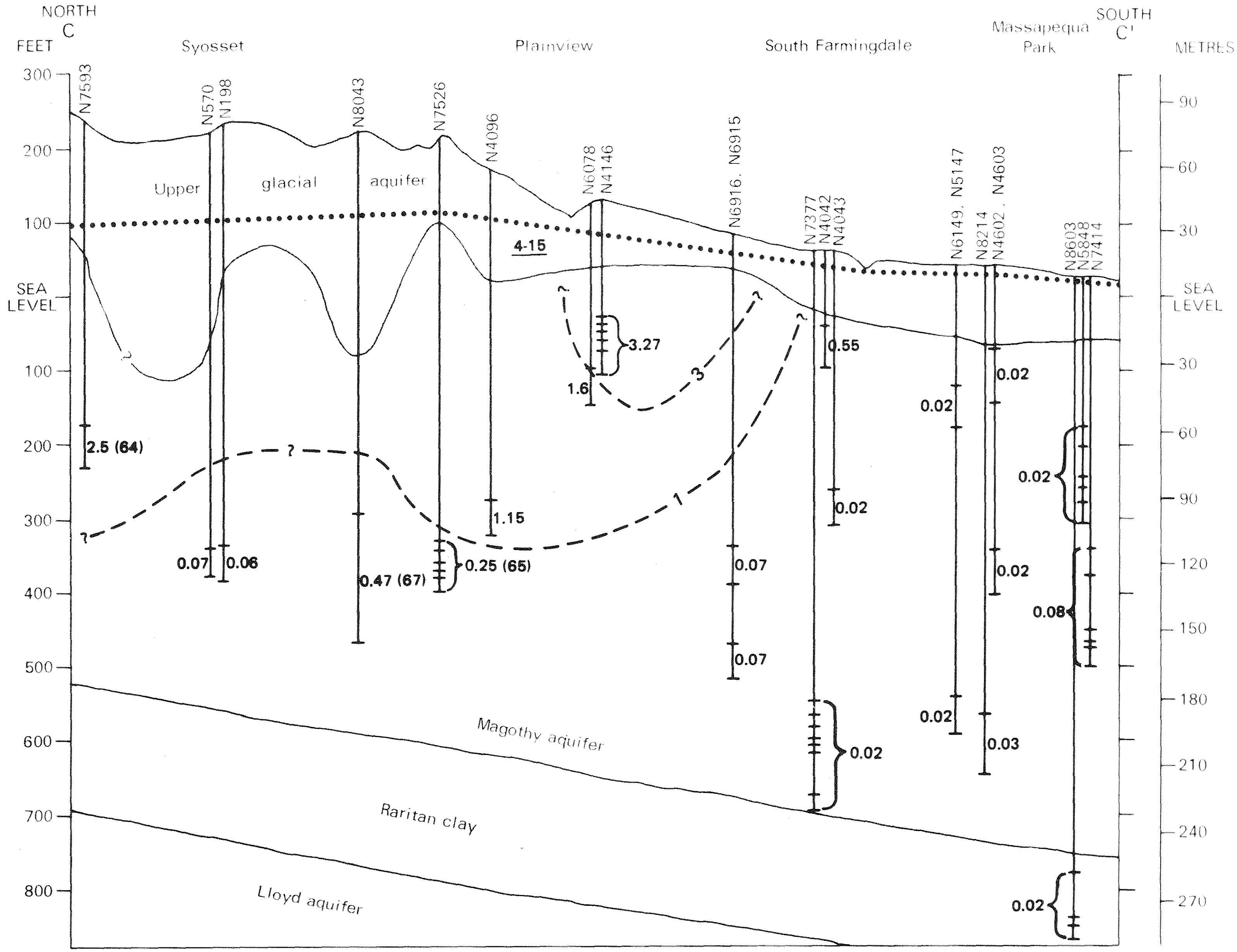
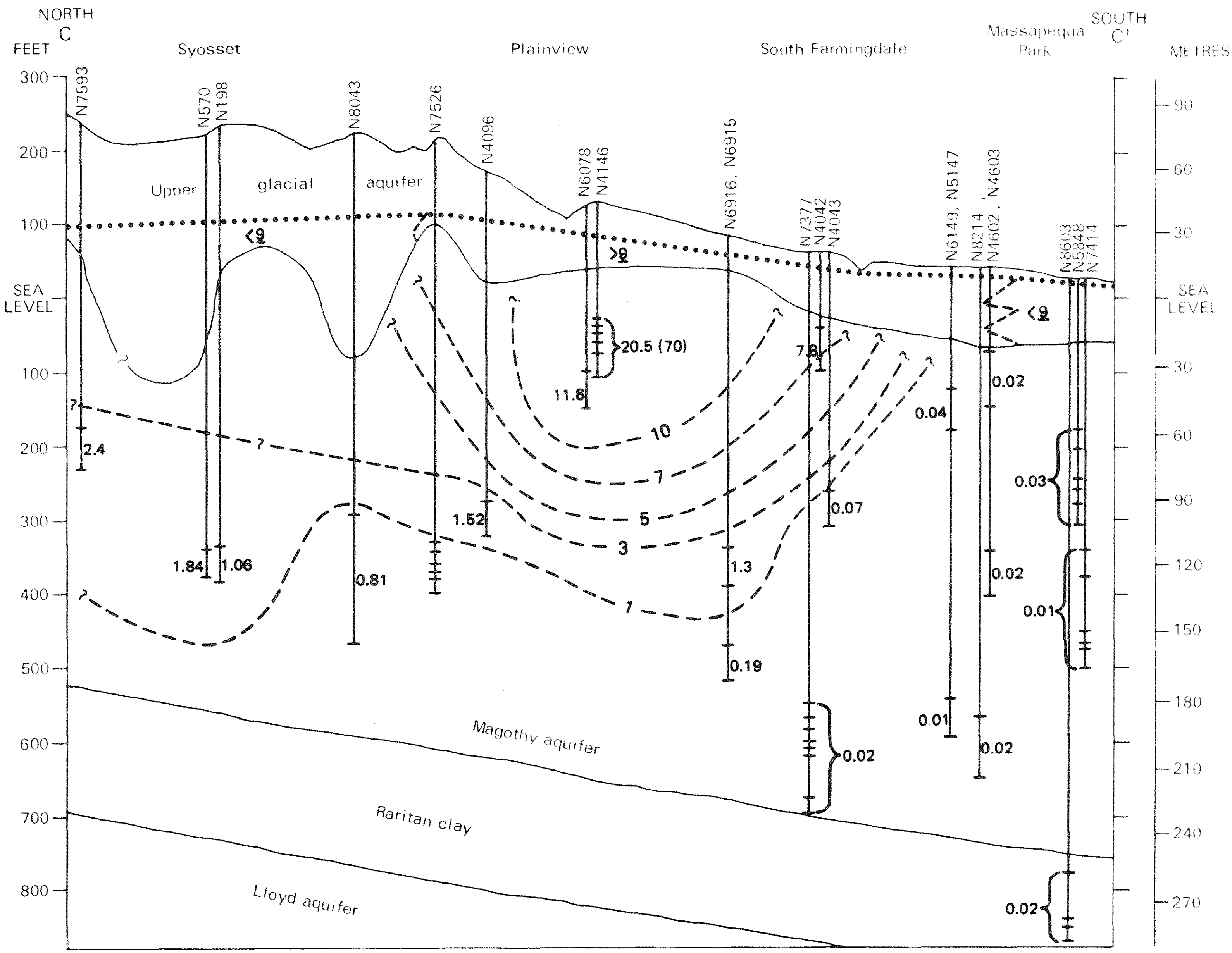


Figure 4E Nitrate (as nitrogen) data 1952-63



Nitrate (as nitrogen) data 1973

Figure 4F

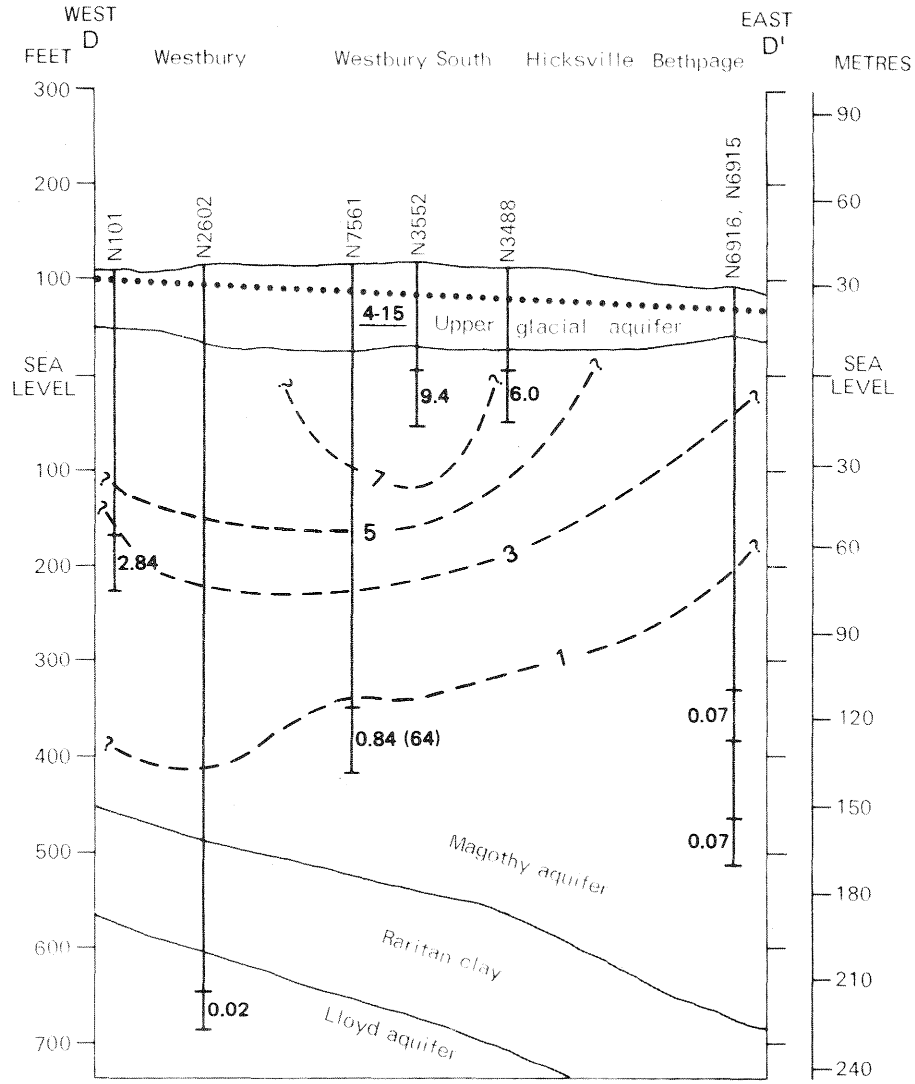


Figure 4G Nitrate (as nitrogen) data 1950-61

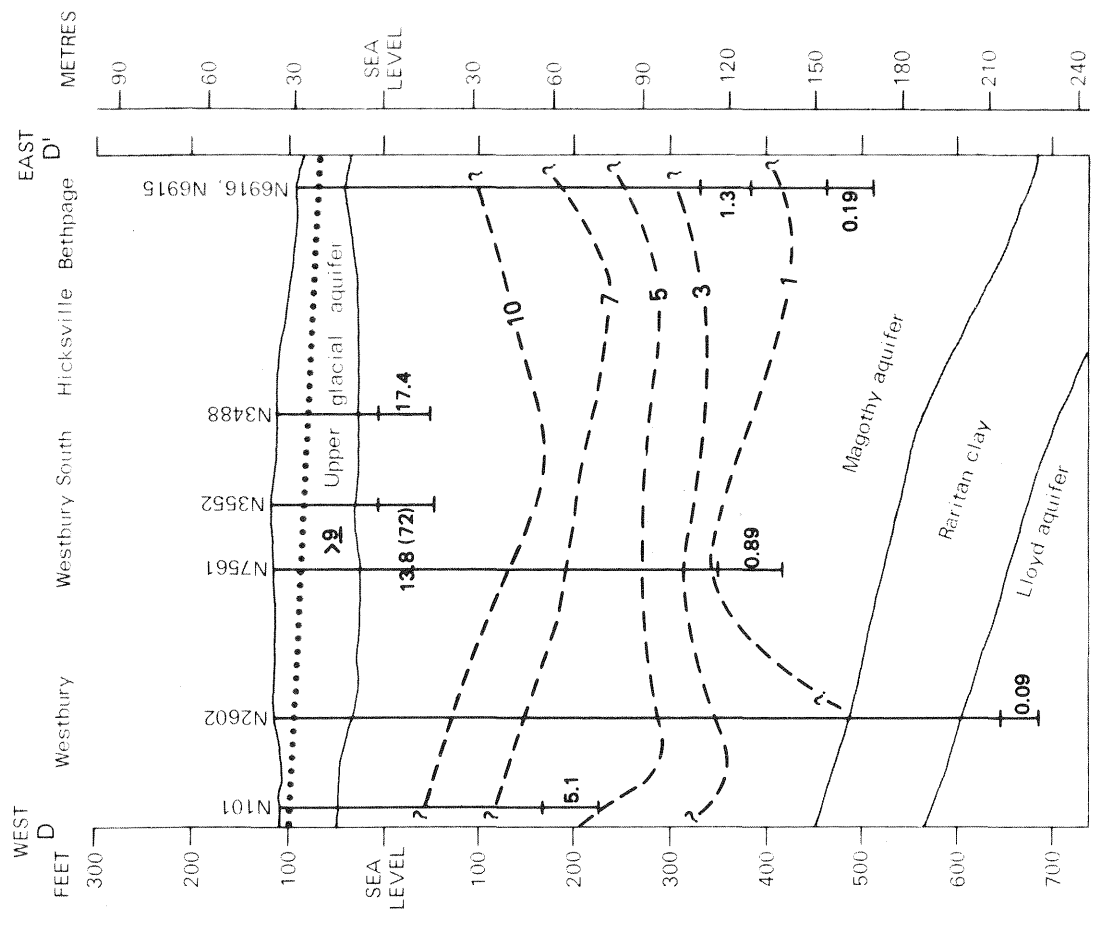


Figure 4H

Nitrate (as nitrogen) data 1973

Chloride

Chloride in the Magothy aquifer is derived from domestic sewage, salts used in deicing roads, precipitation, industrial wastes, leaching from sanitary landfills, and, locally, sea-water encroachment near the shores. Uncontaminated ground water on Long Island has a chloride concentration of less than 10 mg/l (Perlmutter and Geraghty, 1963, p. 39). Higher chloride concentration in the study area shows perceptible downward movement, as shown in figures 5A-5H. The 10-mg/l line of equal chloride concentration moved downward a distance of less than 50 ft (15 m) in the Westbury area (figs. 5A and 5B) and nearly 150 ft (45 m) in the Hicksville area (figs. 5C and 5D). Horizontal movement is difficult to discern because of scarcity of data in the upper part of the Magothy aquifer. The downward movement of chloride covers a broader area than does that of nitrate. For 1973, the highest concentration of chloride--more than 20 mg/l--was in ground water in the areas of Westbury, Hicksville, and Plainview. However, this value is considerably below the 250-mg/l limit of the U.S. Public Health Service (1962) drinking-water standard.

EXPLANATION

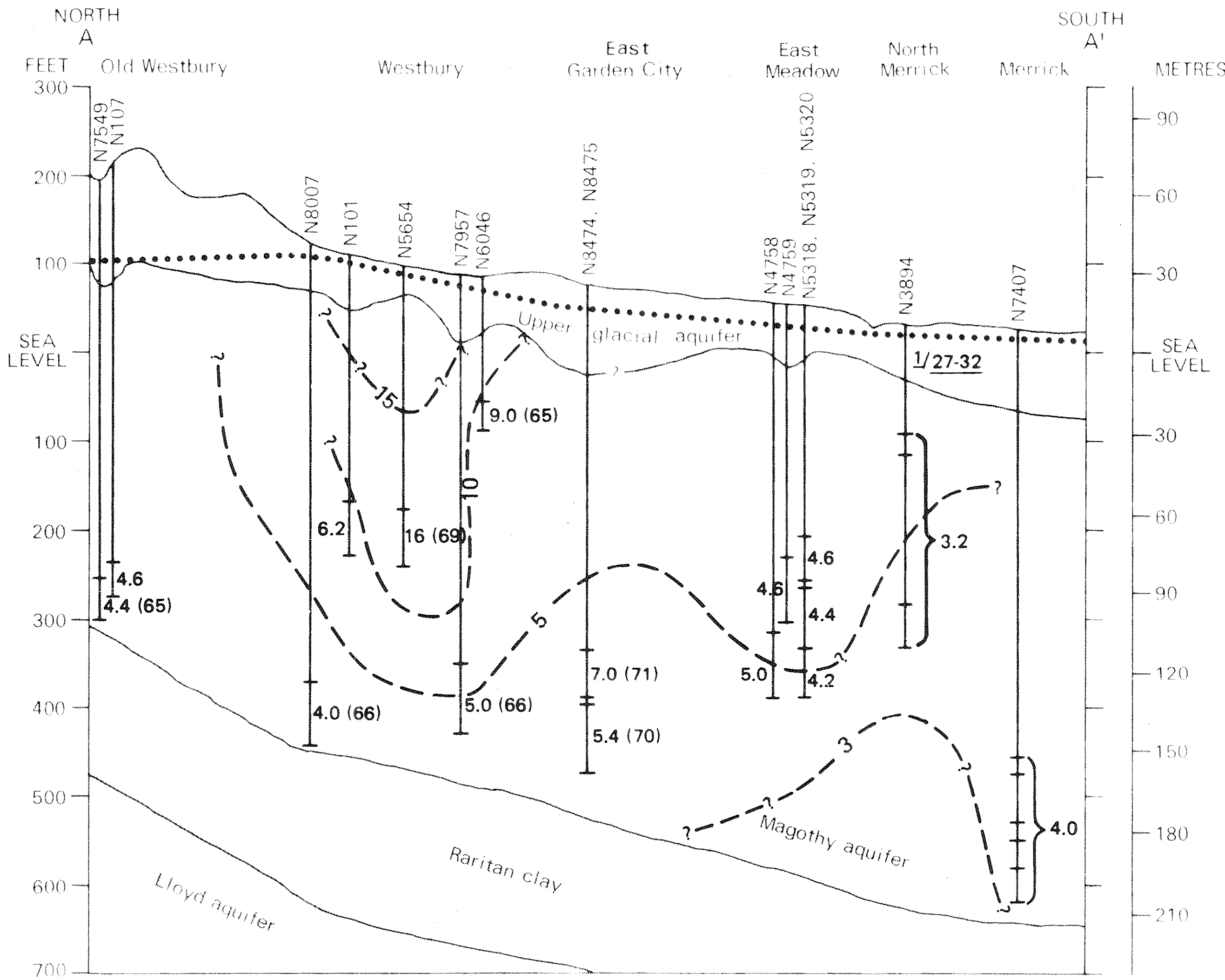
— — — 10 — — ? — —	Line of equal chloride concentration, in milligrams per litre. Question mark where approximately located
N7957	Well number
	Sample well. Number on left is chloride concentration, in milligrams per litre; number in parentheses is year that data were collected other than within indicated time interval
5.0(66)	Well screen
5.0 {	Chloride concentration, in milligrams per litre, from integrated water sample
10–35	Approximate range of chloride concentration, in milligrams per litre, in the upper glacial aquifer
•••••••••••	Water table, position is approximate

0 1 2 3 4 5 MILES

0 1 2 3 4 5 KILOMETRES

Vertical scale greatly exaggerated

Figure 5.--Vertical distribution of chloride in water in the Magothy aquifer (along sections A-A' - D-D'), southeast Nassau County, N.Y.



1/ Based on data from DeLuca, Hoffman and Lubke (1965)

Figure 5A Chloride data 1952-63

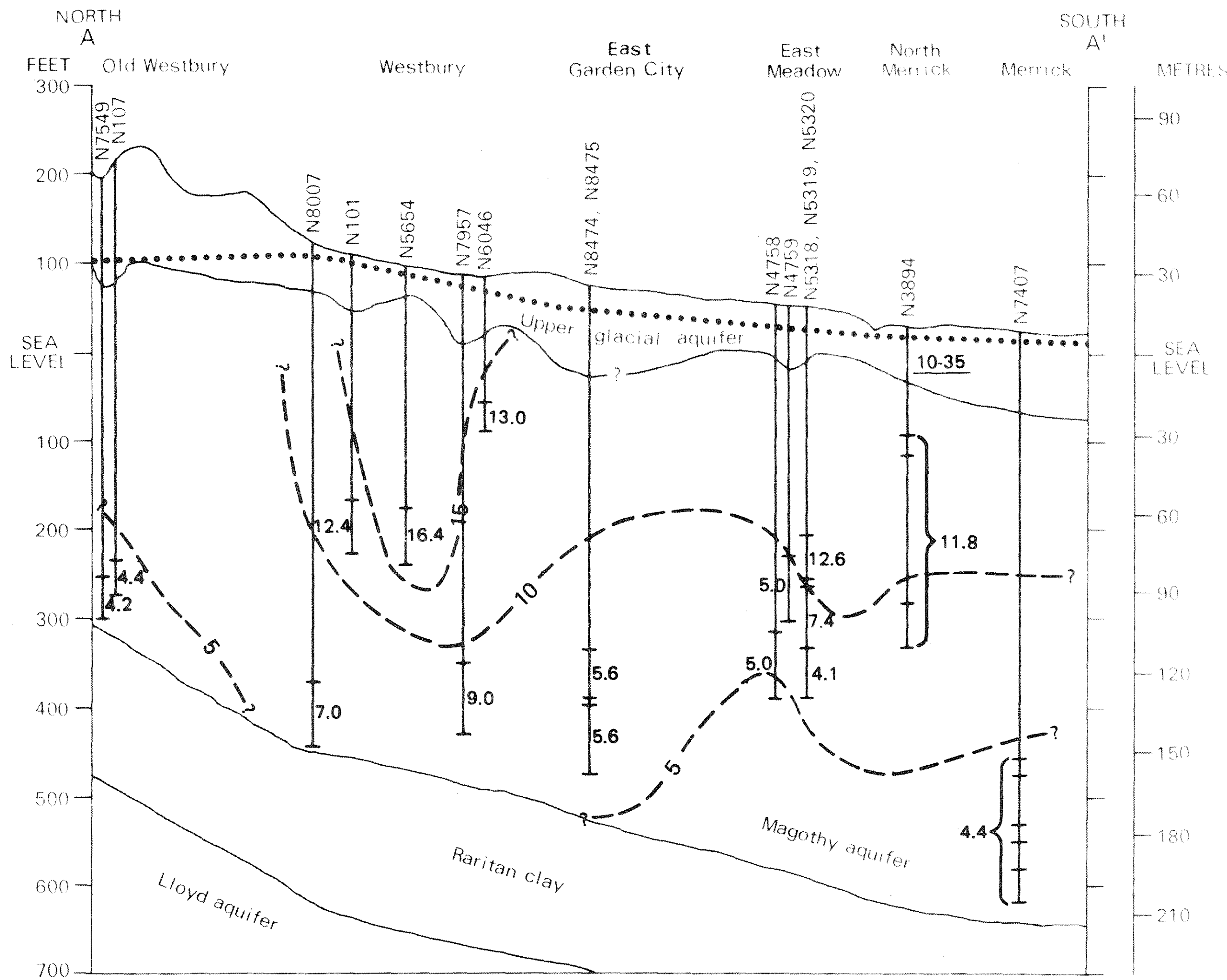
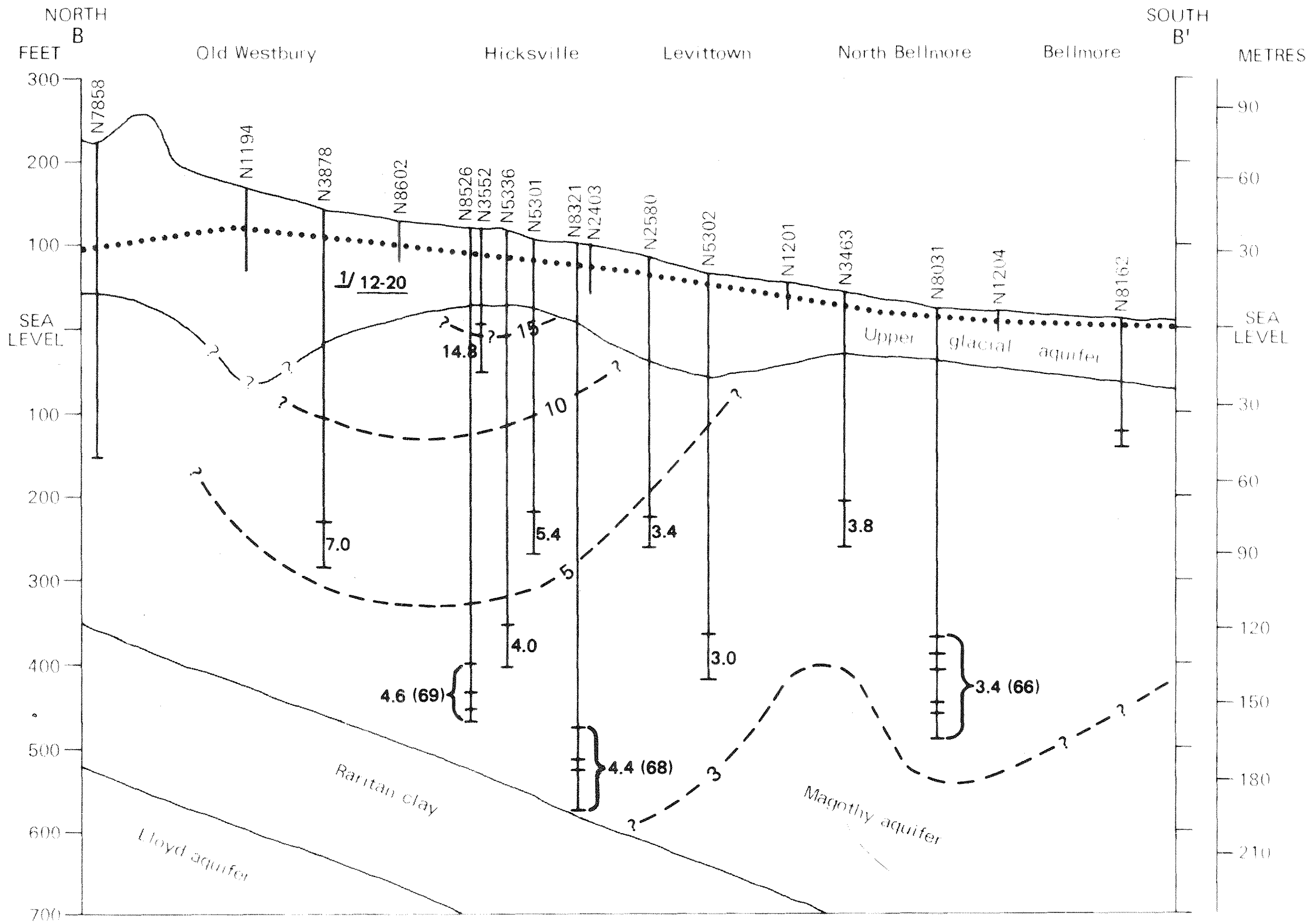


Figure 5B

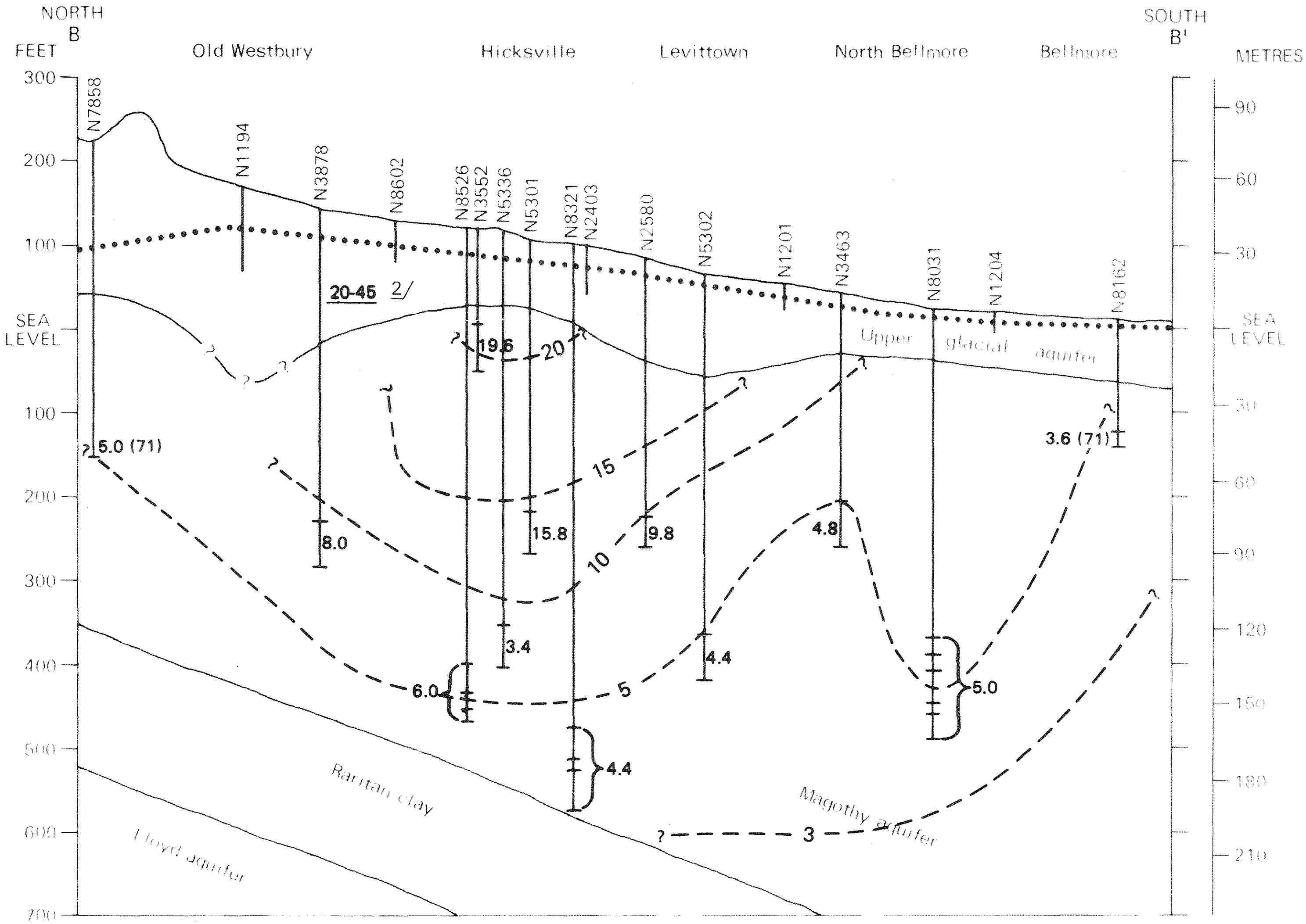
Chloride data 1972-73



1/ Based on data from DeLuca, Hoffman and Lubke (1965)

Figure 5C

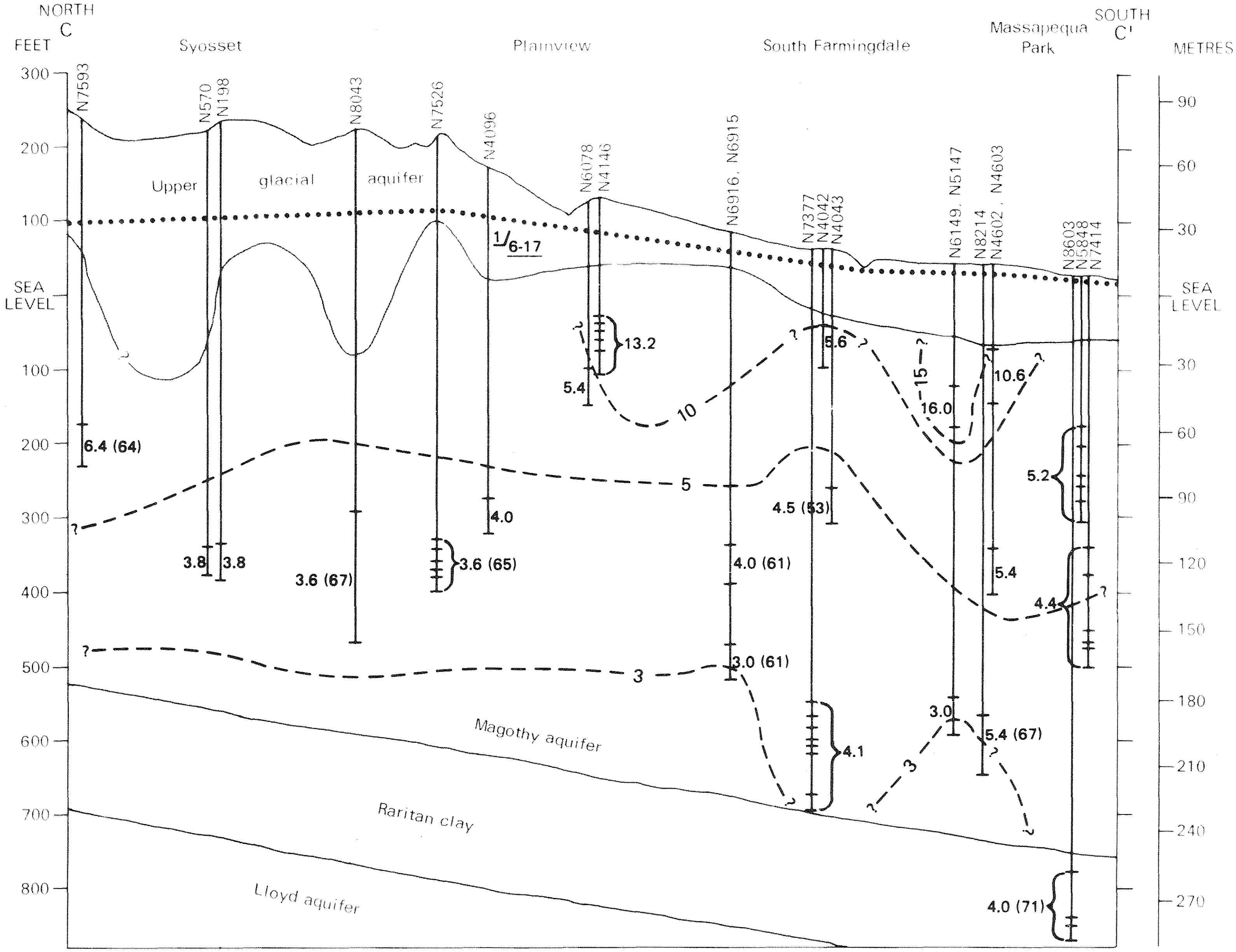
Chloride data 1952-63



2/ Based on data from 1966–74

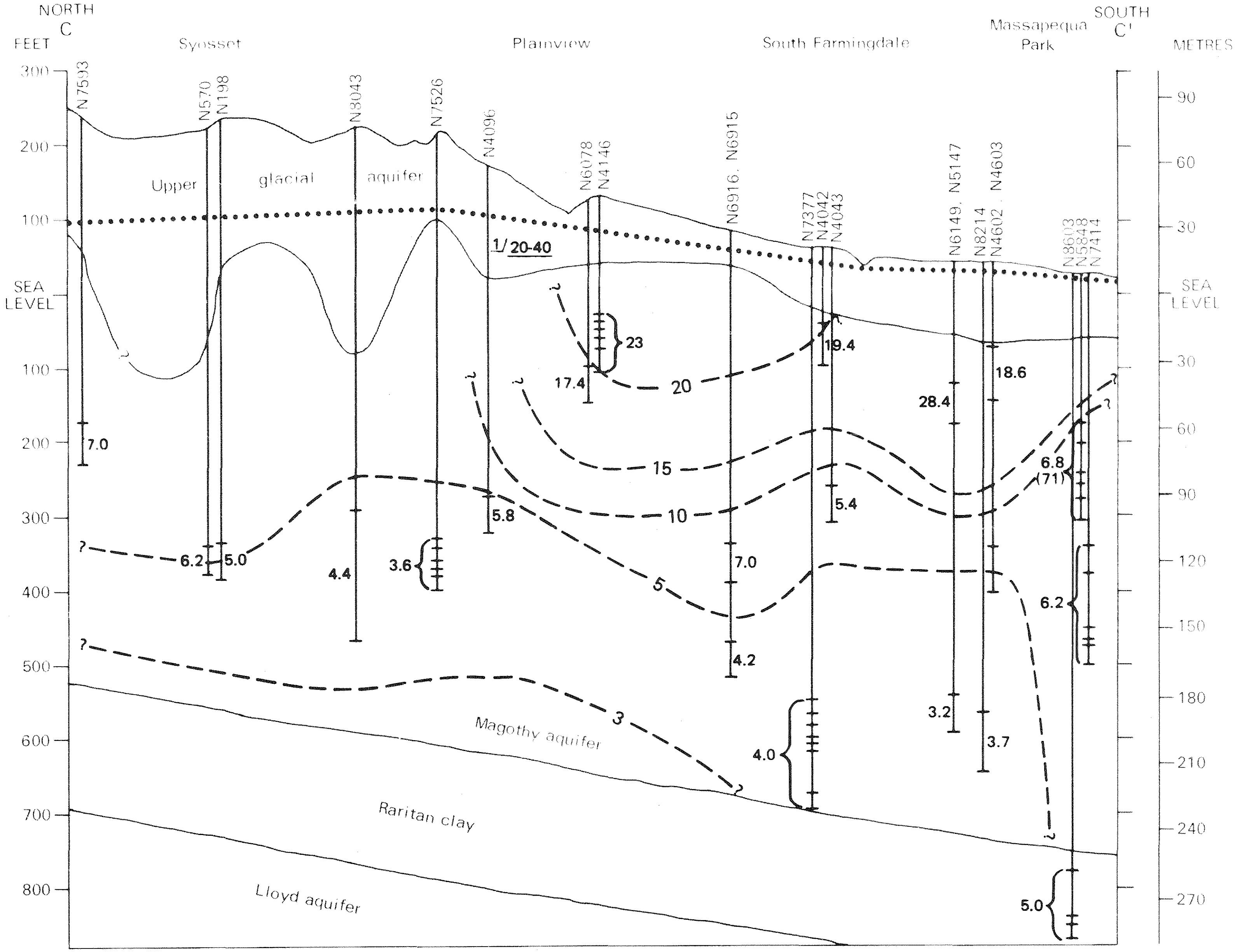
Figure 5D

Chloride data 1972-73



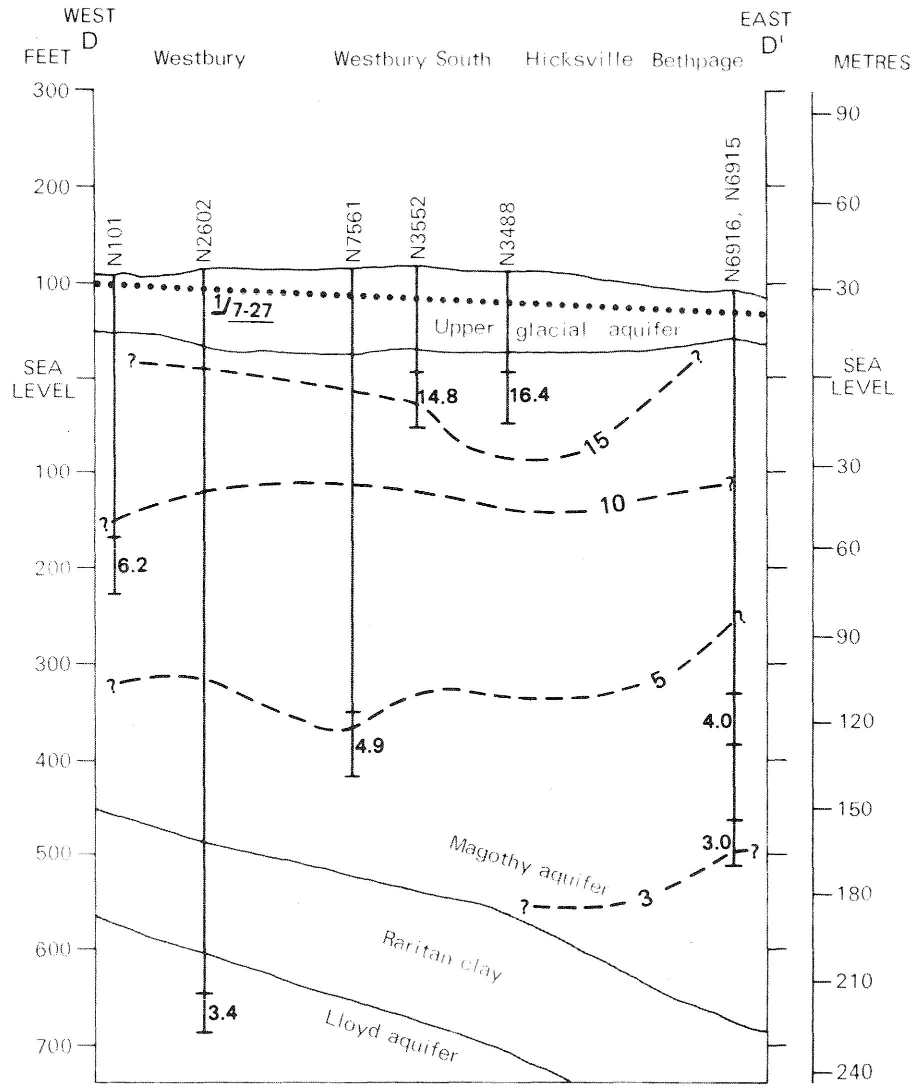
1/ Based on data from DeLuca, Hoffman and Lubke (1965)

Figure 5E Chloride data 1950-63



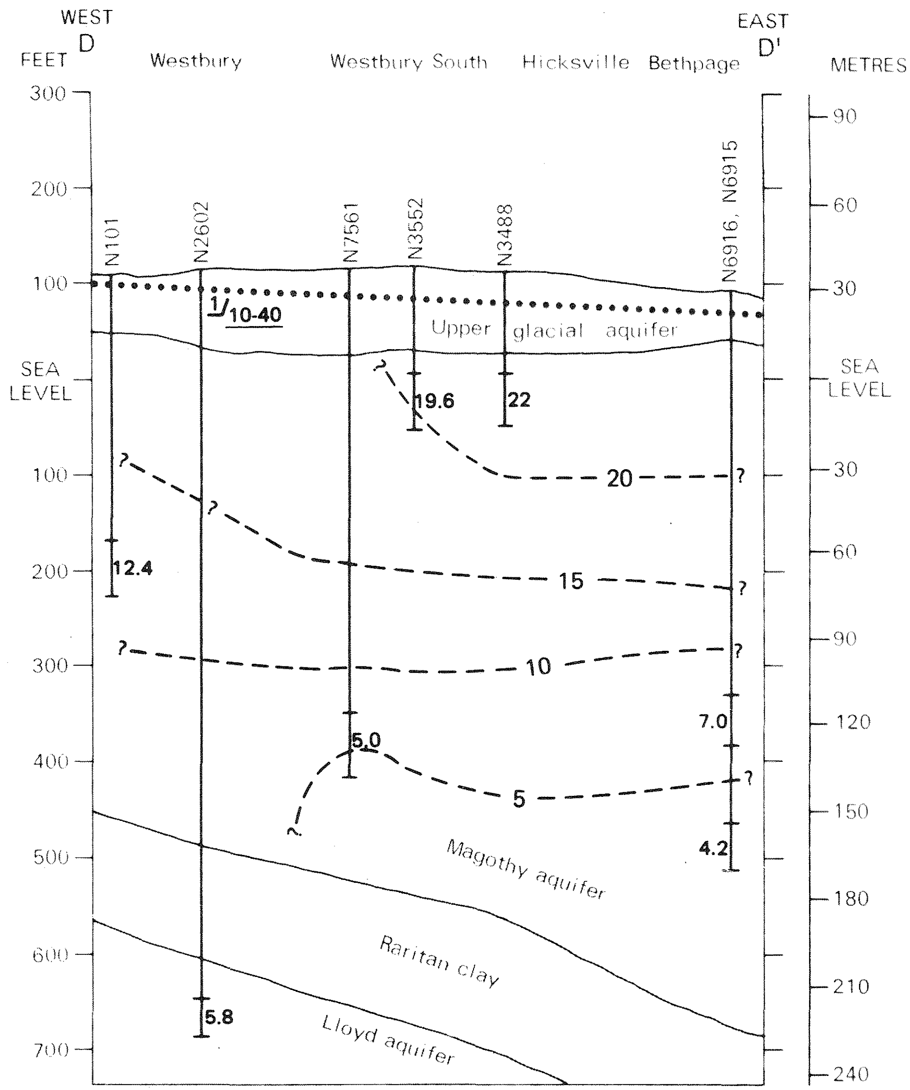
1/ Based on data from DeLuca, Hoffman and Lubke (1965)

Figure 5F Chloride data 1973



1/ Based on data from DeLuca, Hoffman and Lubke (1965)

Figure 5G Chloride data 1950-63



1/ Based on data from DeLuca, Hoffman and Lubke (1965)

Chloride data 1973

Figure 5H

Total Solids

Total solids in water represents the sum of suspended solids and dissolved solids. The suspended solids in public-supply well water generally remain constant, provided there is no frequent surging of production wells and the well structure remains sound. Hence, any increase in total-solids concentration over the years in well water may be attributed to dissolved solids (determined by residue-on-evaporation method), which can then be used as an indicator of the overall quality of water. Figures 6A-6H show significant downward movement of water having higher-than-normal total-solids concentration between the 1950's and 1973. As with nitrate and chloride, the greatest downward movement is shown in figures 6E and 6F. Overall downward movement ranges from a few feet to approximately 300 ft (91 m). A zone of high total-solids concentration of more than 200 mg/l is in the areas of Hicksville and Plainview. The total-solids concentration in ground water in the Plainview area approximately doubled in 20 years.

EXPLANATION

— — 100 — — ? — — Line of equal total-solids concentration in milligrams per litre. Question mark where approximately located

N7957 Well number

Sample well. Number on left is total-solids concentration, in milligrams per litre; number in parentheses is year that data were collected other than within indicated time interval

Well screen

54(66)

22 { Total-solids concentration, in milligrams per litre, from integrated water sample

100-300 Approximate range of dissolved-solids concentration, in milligrams per litre, in the upper glacial aquifer

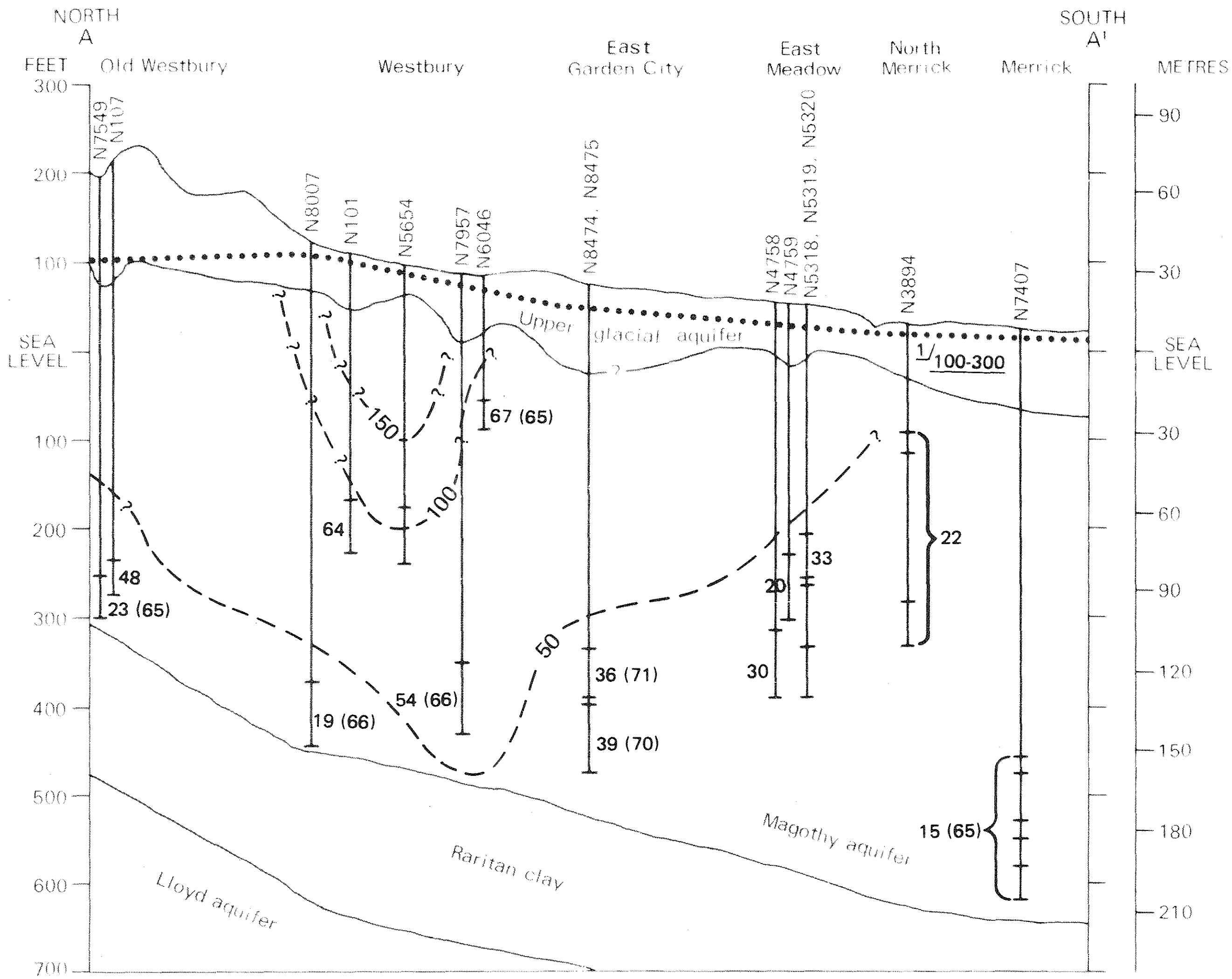
• • • • • • • • • • • Water table, position is approximate

0 1 2 3 4 5 MILES

0 1 2 3 4 5 KILOMETRES

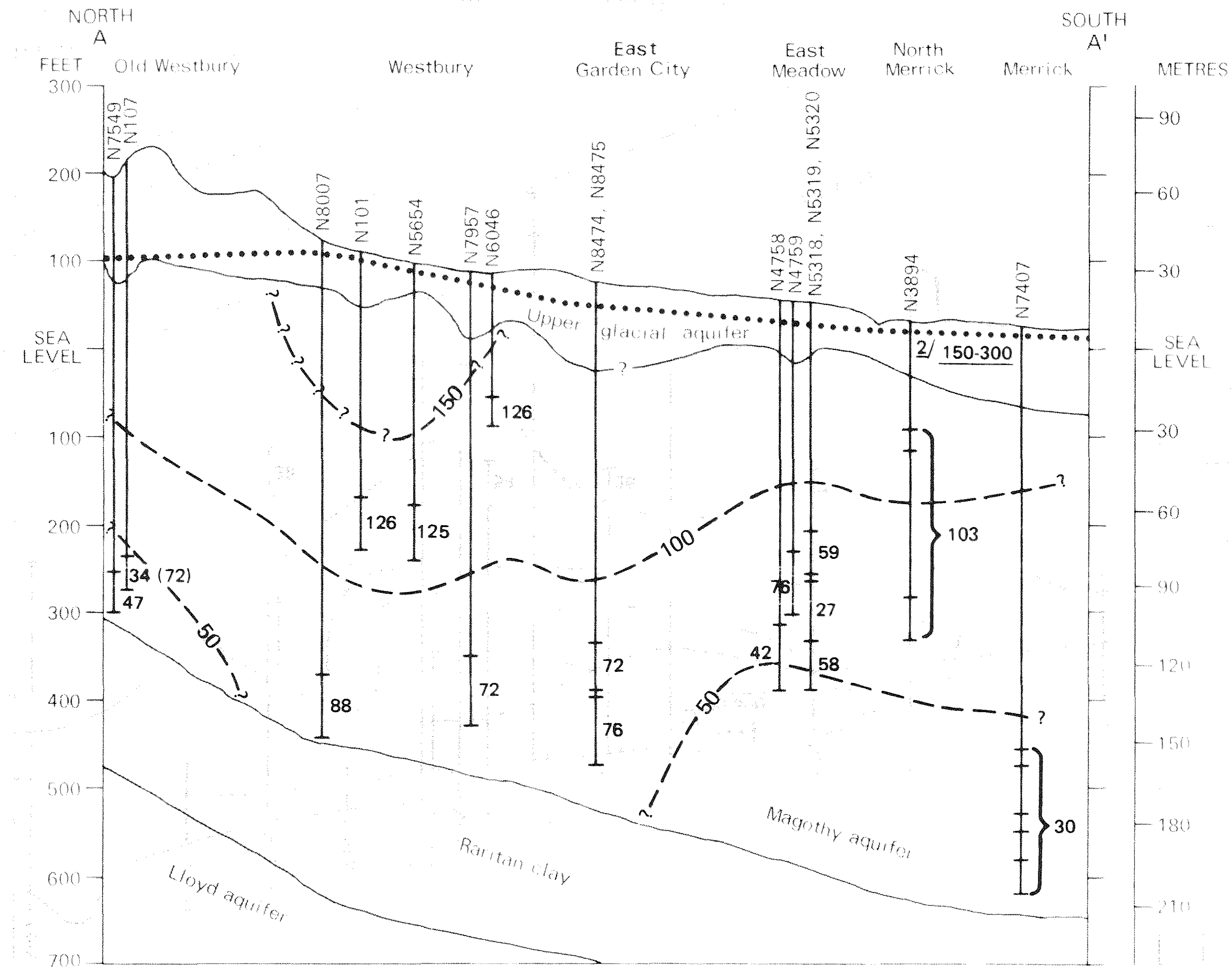
Vertical scale greatly exaggerated

Figure 6.--Vertical distribution of total solids in water in the Magothy aquifer (along sections A-A' - D-D'), southeast Nassau County, N.Y.



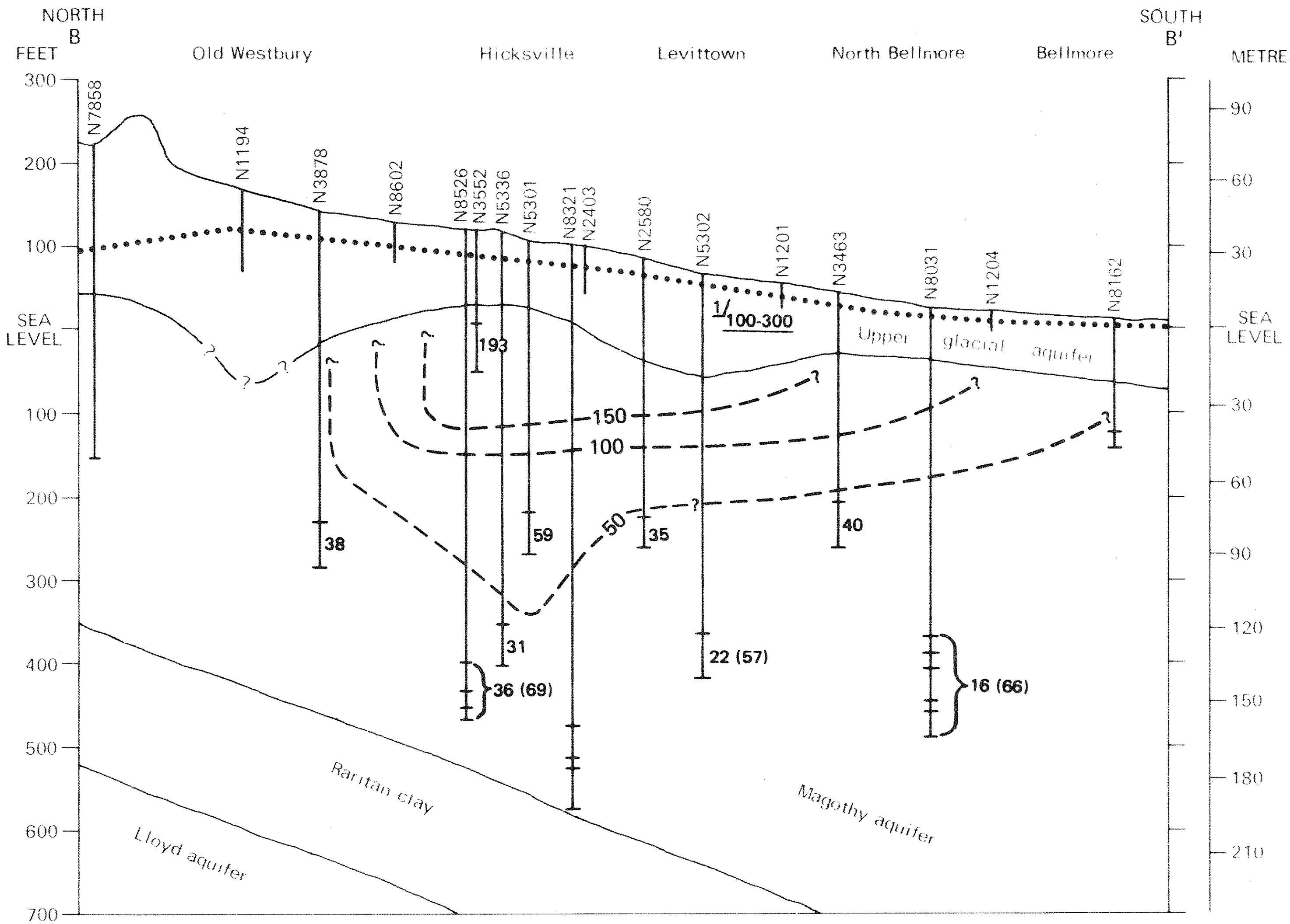
1/ Dissolved-solids data poor

Figure 6A Total-solids data 1956-62



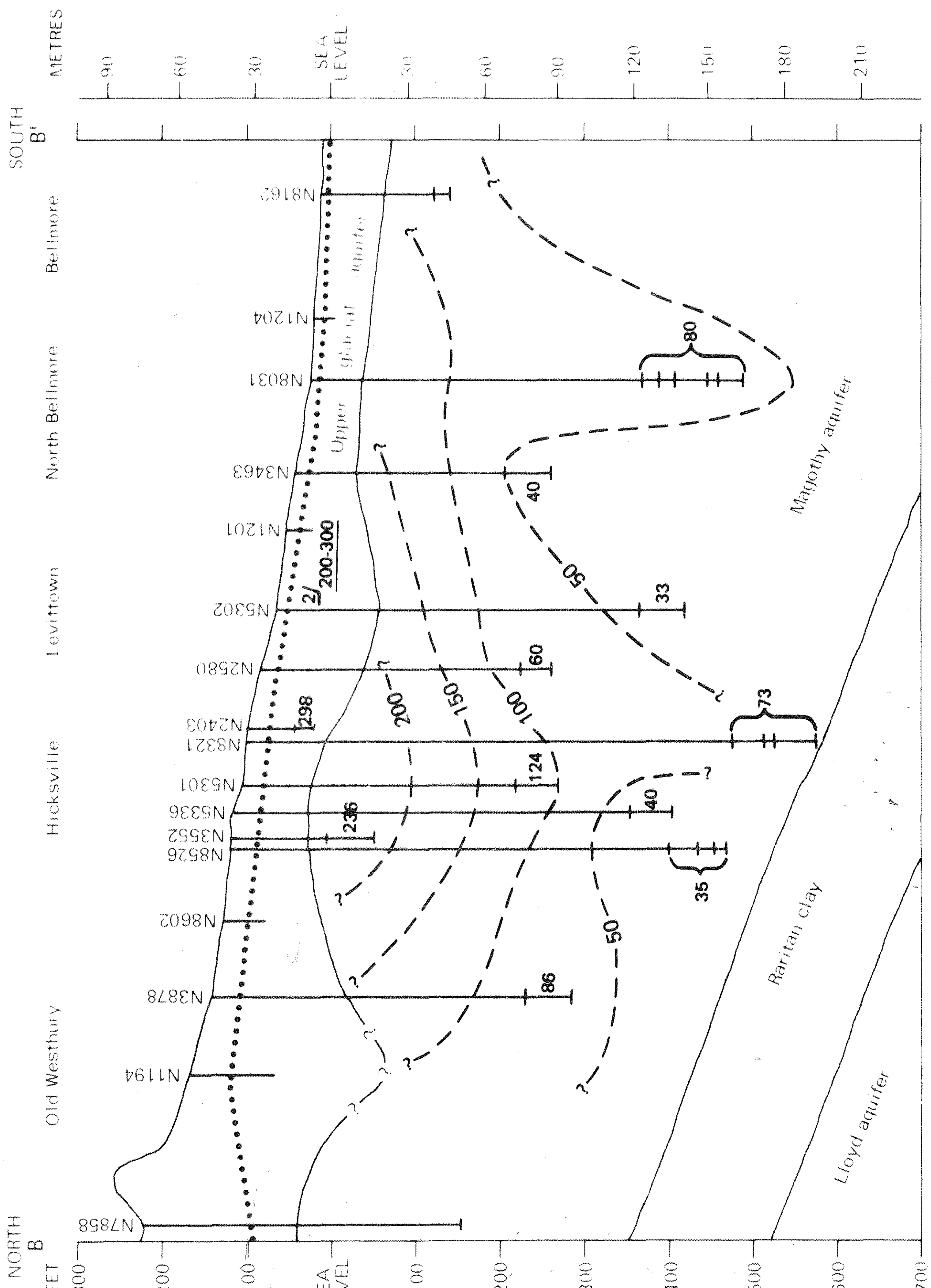
2/ Dissolved-solids data from 1966-69

Figure 6B Total-solids data 1973



1/ Dissolved-solids data poor

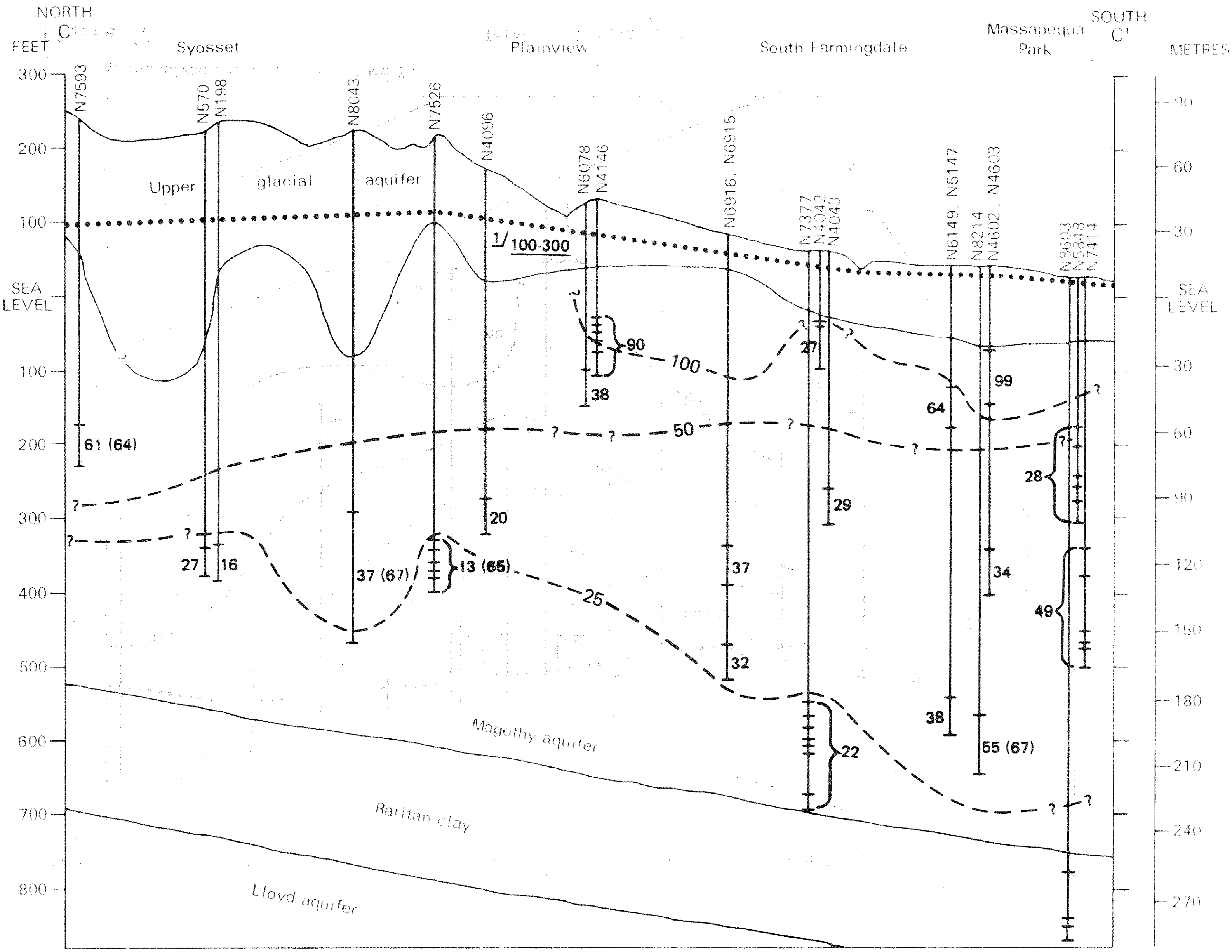
Figure 6C Total-solids data 1955-61



2/Dissolved-solids data from 1966-69

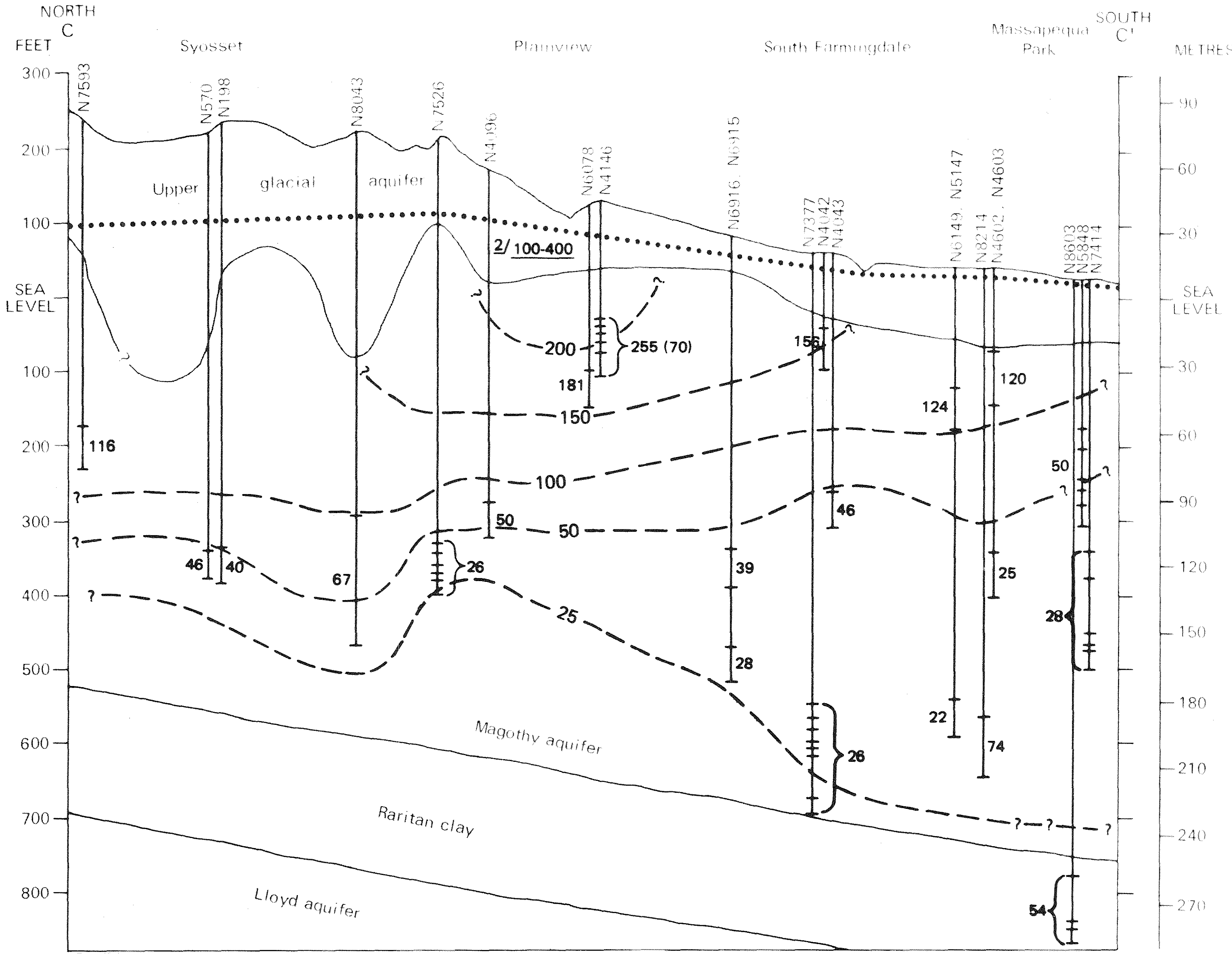
Total-solids data 1973

Figure 6D



1/ Dissolved-solids data poor

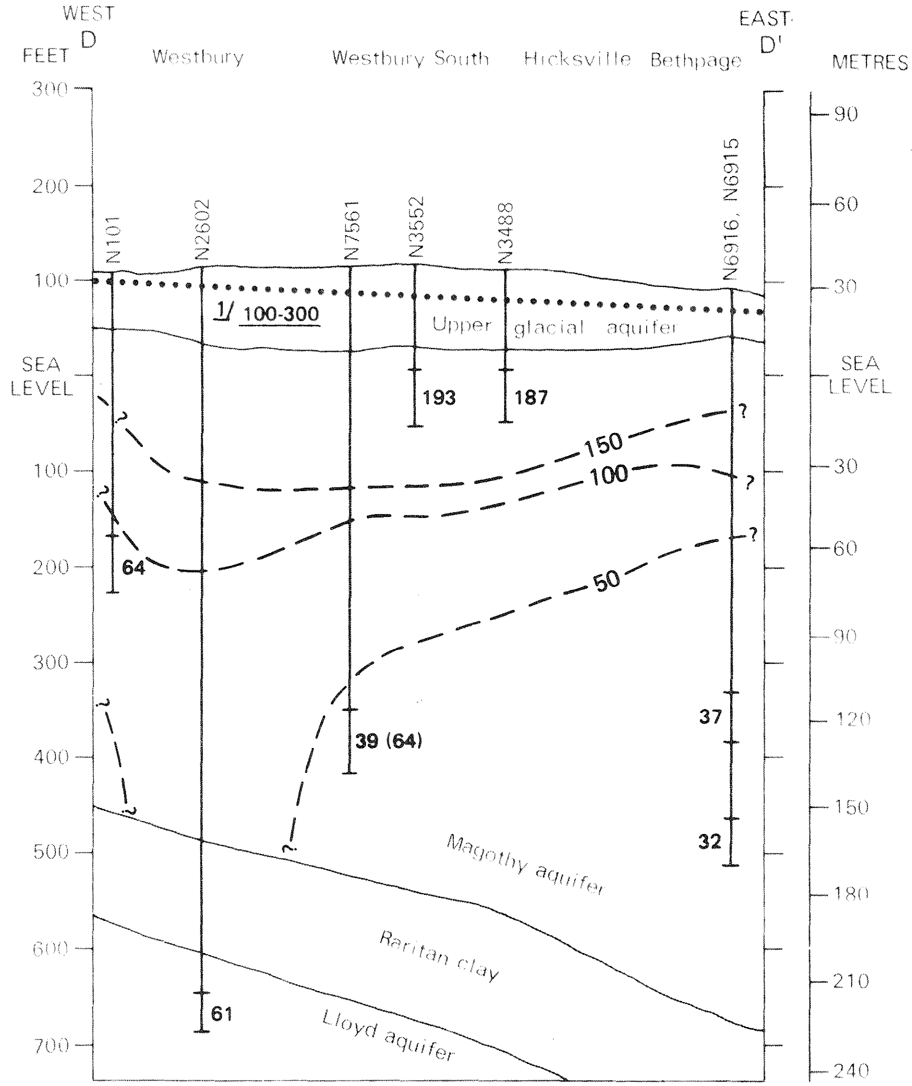
Figure 6E Total-solids data 1956-61



2/ Dissolved-solids data from 1966-69

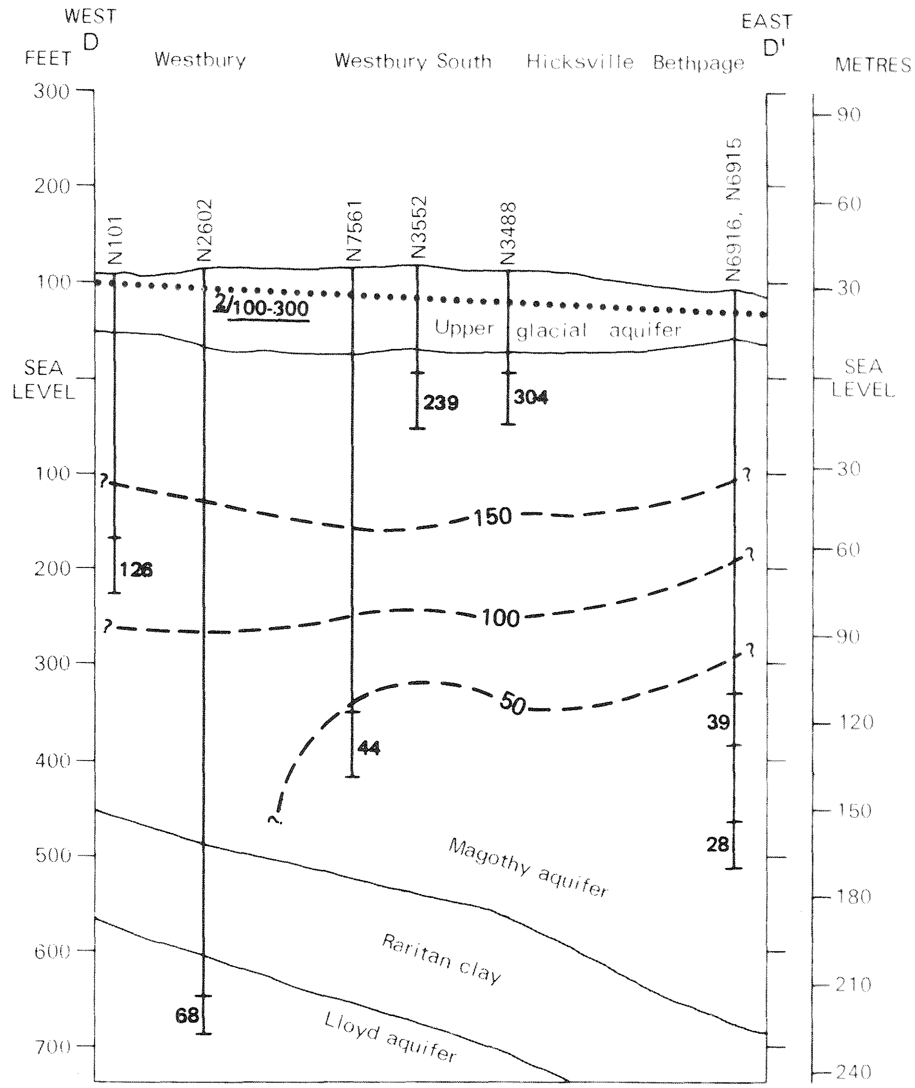
Figure 6F

Total-solids data 1973



1/ Dissolved-solids data poor

Figure 6G Total-solids data 1956-61



2/ Dissolved-solids data from 1966-69

Figure 6H Total-solids data 1973

CONCLUSIONS

Trend lines of selected wells in the study area indicate significant increases of nitrate, chloride, and total-solids concentrations with time. One of these wells has nitrate (as nitrogen) concentration in excess of the recommended limit of 10 mg/l set by the U.S. Public Health Service (1962) for drinking water. In the future, many other wells may pump water with a nitrate (as nitrogen) concentration that exceeds this limit.

Vertical distribution of nitrate, chloride, and total-solids concentrations indicates significant downward movement of these constituents from tens of feet to a few hundred feet. Maximum downward movement is in a zone in the areas of Westbury, Hicksville, and Plainview. Several wells in this zone yield water that has nitrate (as nitrogen) concentration in excess of 10 mg/l. Concentrations of chloride and total solids may also increase with time. Water from the Magothy aquifer containing the lowest concentrations of nitrate, chloride, and total solids, is south of a line running from North Merrick to South Farmingdale.

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