GEOLOGY OF THE "20-FOOT" CLAY AND GARDINERS CLAY IN SOUTHERN NASSAU AND SOUTHWESTERN SUFFOLK COUNTIES, LONG ISLAND, NEW YORK

By Thomas P. Doriski and Franceska Wilde-Katz

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Dallas L. Peck, Director

For additional information write to:

U.S. Geological Survey
5 Aerial Way
Syosset, New York 11791

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Multiply inch-pound units	By	To obtain SI units
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)

GEOLOGY OF THE "20-FOOT" CLAY AND GARDINERS CLAY IN SOUTHERN NASSAU AND SOUTHWESTERN SUFFOLK COUNTIES, LONG ISLAND, NEW YORK

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ABSTRACT

Data from 1978-79 drilling was compiled with information from previous reports and historical records to prepare surface-contour and isopach maps of the "20-foot" clay and Gardiners Clay in southern Nassau and southwestern Suffolk Counties. These units are major confining layers in the upper part of the ground-water reservoir along Long Island's south shore. Where present, they influence the ground-water flow patterns locally.

The "20-foot" clay, previously mapped in Nassau County only, was found in test borings in Suffolk County also. Its surface altitude ranges from 20 to 40 feet below NGVD (National Geodetic Vertical Datum of 1929); thickness ranges from 0 to 30 feet. The surface altitude of the Gardiners Clay ranges from 40 to 120 feet below NGVD; thickness ranges from 0 to 90 feet. Previously known discontinuities in both formations are more accurately delineated, and several new discontinuities have been inferred from the new data.

The Matawan Group-Magothy Formation undifferentiated, the Monmouth Group, and the Jameco Gravel directly underlie the Gardiners Clay. Revised surface altitudes of these formations are depicted on maps and cross sections of the south-shore area.

INTRODUCTION

In the late 1970's, the U.S. Geological Survey began a study to predict, by digital computer model, the impact of sanitary sewering on the ground-water reservoir in southern Nassau and southwestern Suffolk Counties. To accurately predict the impact of hydrologic changes (such as sewering, pumping, or artificial recharge) on a ground-water reservoir, it is necessary to understand the geologic framework.

In 1978-79, the Survey conducted a drilling program to gain more complete information on the geologic framework of the system, especially the extent and thickness of two important confining units that strongly influence ground-water flow patterns in the upper part of the ground-water reservoir.

Location and Geologic Setting

Southern Nassau County and adjacent southwestern Suffolk County are on Long Island's outwash plain, which extends about 10 mi southward from the Ronkonkoma and Harbor Hill terminal moraines to the south shore. The south shore is characterized by swamps and lagoons bordering Great South Bay, which is in turn contained by the south-shore barrier islands (fig. 1).

Long Island is underlain by a thick sequence of unconsolidated Cretaceous and Pleistocene sediments extending from land surface to crystalline bedrock. These sediments contain the ground-water reservoir, the only source of freshwater for Nassau and Suffolk Counties. Along the south shore, the upper part of this sequence contains the two confining layers that were studied in detail--the "20-foot" clay and the Gardiners Clay.

Purpose and Scope

This report depicts in detail the areal extent, altitude, thickness, and lithology of the "20-foot" clay and Gardiners Clay (the two thickest and most extensive near-surface confining layers in the area) and redefines the surface of the geologic units that directly underlie these clay units at various locations--the Matawan Group-Magothy Formation, undifferentiated, the Monmouth Group, and the Jameco Gravel.

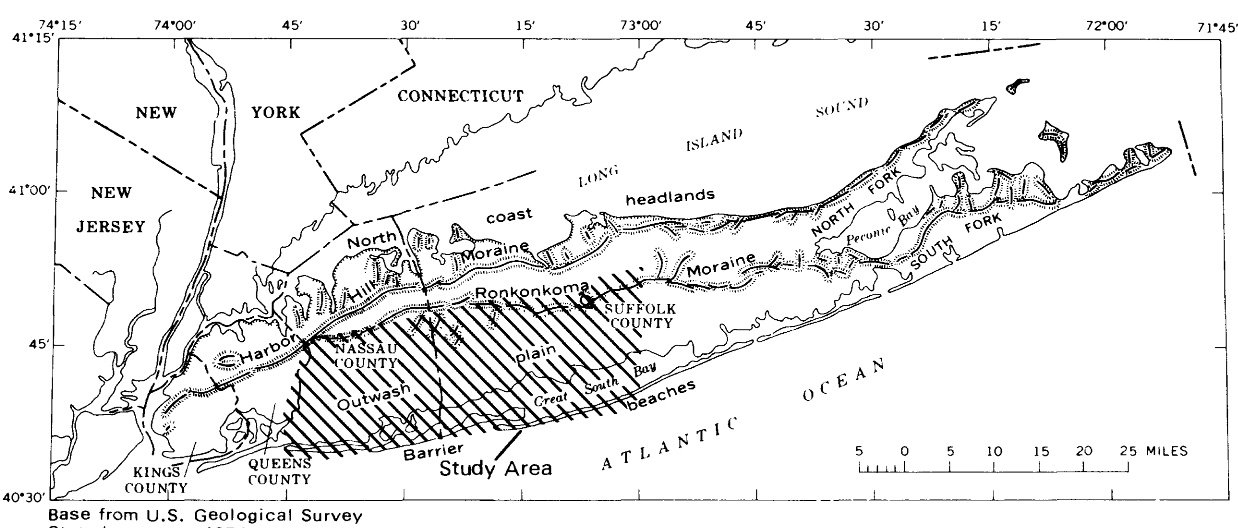

Figure 1.--Location of study area on Long Island, New York. (Modified from McClymonds and Franke, 1972, p. 3.)

Previous Investigations

Veatch and others (1906), Fuller (1914), and Suter and others (1949) mapped and described the geology of Long Island; Perlmutter and Crandell (1959) and Perlmutter and Todd (1965) described the hydrogeology of the south shore. Hydrogeologic and geologic information on western Suffolk County was updated by Soren (1971) and Jensen and Soren (1971, 1974); the information on Nassau County was updated by Perlmutter and Geraghty (1963) and Ku and others (1975).

Method of Investigation

A drilling program was conducted in 1978-79 to gain detailed geologic and hydrologic information on the "20-foot" clay and Gardiners Clay. (Locations of well borings are shown in pl. 1.) All test holes and wells in this program were drilled with standard or reverse rotary drilling rigs. Split spoon cores were taken at 5- to 10-ft intervals from just above the clay units to the underlying units. Wash samples were examined continuously during drilling. Geophysical logs (gamma-ray, resistivity, and spontaneous potential) were made at each site to supplement the core and wash-sample data. This information, supplemented by published data (previous hydrogeologic reports and surface-extent maps) and well records on file at the U.S. Geological Survey office in Syosset, N.Y., and the New York State Department of Environmental Conservation at Stony Brook, N.Y., was used to prepare the maps and cross sections herein.

All wells and test borings used in this report are listed in table 2 (at end of report), which also gives land-surface altitude and well depth to indicate which wells and borings are deep enough to be considered control points on the Gardiners Clay maps (pls. 5 and 6) in the areas of discontinuity. Some wells penetrated only the "20-foot" clay.

Acknowledgments

This report was prepared in cooperation with the New York State Department of Environmental Conservation, the Nassau-Suffolk Regional Planning Board, the Suffolk County Department of Health Services, the Nassau County Department of Public Works, and the U.S. Environmental Protection Agency. The authors extend thanks to Geraghty and Miller, Inc., and R. E. Wright Associates, Inc., for their assistance in establishing and supervising the drilling programs, and to Layne-New York, Strata Well, and Delta Well drilling companies for their assistance in obtaining geological and geophysical information.

GEOLOGIC UNITS

The geologic units and corresponding hydrogeologic units that form the ground-water reservoir of Long Island, and their stratigraphic relationships, are summarized in table 1. The following sections describe the composition, extent, altitude, and thickness of the "20-foot" clay and the Gardiners Clay and the extent and altitude of the units directly underlying them. The unit descriptions are given in order of deposition, from oldest to youngest.

Matawan Group-Magothy Formation, Undifferentiated

The Matawan Group-Magothy Formation, undifferentiated, is a deltaic deposit of Cretaceous age that extends throughout the area studied. Its upper surface altitude ranges from 250 to -500 ft NGVD (pl. 2); thickness ranges from 400 ft at the northern extent of the study area to 900 ft beneath the south shore. The Matawan Group-Magothy Formation disconformably overlies the Raritan Formation and is disconformably overlain by the Monmouth Group, the Jameco Gravel, the Gardiners Clay, or upper Pleistocene deposits, depending on location. The Matawan Group-Magothy Formation is typically a gray and white, fine to coarse sand with some interstitial clay. Detailed lithologic descriptions are given in Soren (1978); Ku and others (1975); and Jensen and Soren (1974).

The upper surface of the Matawan Group-Magothy Formation is depicted in the cross sections in plate 3. One area of the Matawan Group-Magothy Formation surface that is of particular interest in relation to the Gardiners Clay is the valley in the triangular area bounded by Veterans Memorial Highway, Sunrise Highway, and Connetquot River in Suffolk County (pls. 2 and 3, cross sections B-B' and C-C'; wells 65340 and 67074, pl. 1). No deep-well data have as yet been obtained from this valley south of Sunrise Highway; therefore, interpretation of the position of the overlying units is somewhat tentative.

In this report, the valley is interpreted as post-Cretaceous and may be related to a Pliocene erosion interval described by Veatch (1906, p. 32, pl. 6a). Veatch shows a drainage channel from Connecticut crossing Long Island in the same area as the valley shown on plate 2. (The valley beneath Lake Ronkonkoma may also be connected to the valley south of Veterans Memorial Highway.) If the valley was formed during a Pliocene erosion interval, the Monmouth Group and the upper surface of the Matawan Group-Magothy Formation (both Cretaceous) were eroded away. After this erosion period, the valley was probably filled in with channel deposits. Driller's and geologist's logs, as well as geophysical logs from wells 65340, 67074, and 68690 (not included in pl. 1 because of proximity to 65340) indicate that the deposits from -130 to -270 ft NGVD are different from typical Pleistocene outwash deposits and may be a localized Pliocene or Pleistocene (pre-Sangamon) channel deposit. If this interpretation is correct, the Gardiners Clay is continuous and relatively uniform over this area, which is important if it is to act as a confining layer.

Table 1.--Summary of stratigraphy and correlative hydrostratigraphy of deposits underlying southern Nassau and southwestern Suffolk Counties, New York

System	Series	Age	Stratigraphic Unit		Hydrostratigraphic Unit
QUATERNARY	Holocene	Postglacial	Holocene (recent) deposits		Upper glacial aquifer
	Pleistocene	Wisconsin (upper Pleistocene)	Upper Pleistocene deposits		
			"20-foot" clay		"20-foot" clay
			Upper Pleistocene deposits unconformity		Upper glacial aquifer
		Sangamon	Gardiners Clay unconformity		Gardiners Clay
		Pre-Sangamon (Illinoian or Kansan)	Jameco Gravel[1]		Jameco aquifer[1]
Quaternary and Tertiary, undifferentiated		Pre-Sangamon to Post-Cretaceous, undifferentiated	Reworked Matawan-Magothy channel deposits		Upper glacial or Magothy aquifer
unconformity					
CRETACEOUS	Upper Cretaceous		Monmouth Group unconformity		Monmouth greensand
			Matawan Group-Magothy Formation, undifferentiated unconformity		Magothy aquifer
			Raritan Formation	Unnamed clay member	Raritan confining unit
				Lloyd Sand Member	Lloyd aquifer
unconformity					
Precambrian			Bedrock		Relatively impermeable bedrock

[1]Present in Nassau County only

Two other interpretations are that (1) all units were deposited, then eroded, by a glacial meltwater stream of Wisconsin age, or (2) the valley was formed during the Cretaceous, so that the Monmouth Group and Gardiners Clay overlying it contain corresponding valleys. In either case, the Gardiners Clay would be discontinuous and not function as a confining layer in this area.

Monmouth Group

The Monmouth Group is a marine deposit of Cretaceous age that occurs along the barrier islands primarily in Suffolk County. Its upper surface altitude ranges from -70 to -165 ft NGVD (pls. 3, 4); thickness ranges from 0 to 200 ft. The Monmouth Group disconformably overlies the Matawan Group-Magothy Formation and is disconformably overlain by the Gardiners Clay. The Monmouth Group is typically a greenish-black glauconitic and lignitic clay, silt, or clayey to silty sand. A more detailed lithologic description of the Monmouth Group is given in Jensen and Soren (1974).

Jameco Gravel

The Jameco Gravel, a stream deposit, is pre-Sangamon, possibly of Illinoian or Kansan age (Soren, 1978). It occurs primarily in Queens County but extends into the extreme southwestern part of Nassau County, where its upper surface altitude ranges from -80 to -140 ft NGVD (pls. 3, 4) and thickness ranges from 0 to 100 ft. It disconformably overlies the Matawan Group-Magothy Formation and is disconformably overlain by the Gardiners Clay. The Jameco Gravel is typically a dark brown and dark gray granule to cobble gravel. The depositional history and a more detailed lithologic description of the Jameco Gravel are given in Soren (1978).

Gardiners Clay

The Gardiners Clay is a marine deposit along the south shore of Long Island. In southern Nassau County and southwestern Suffolk County, its upper surface altitude ranges from -40 to -120 ft NGVD (pls. 3, 5); thickness ranges from 0 ft at the northern limit to 90 ft at the barrier islands (pls. 3, 6). The deposit disconformably overlies either the Matawan Group-Magothy Formation, the Monmouth Group, or the Jameco Gravel, depending on location, and is disconformably overlain by upper Pleistocene deposits.

The age of the Gardiners Clay exceeds 38,000 years, according to carbon-14 dating tests on oyster shells found in the unit at two localities in Nassau County (Swarzenski, 1963, p. 20). As a result of this dating, as well as the stratigraphic position of this unit, the Gardiners Clay has been considered to be of Sangamon age (Soren, 1971, p. 15).

The Gardiners Clay is typically grayish-green to gray and contains a few sand and silt beds, which generally make up less than 10 percent of the total thickness of the unit in a specific area. The mineral assemblage commonly contains glauconite, quartz, muscovite, biotite, pyroxene, amphibole, and a complete clay mineral suite of illite, chlorite, mixed-layer clays, and minor kaolinite (Lonnie, 1982). The clay also contains diatoms, foraminifera, shell fragments of pelecypods and gastropods, and peat. A more detailed discussion of the Gardiners Clay is given in Perlmutter and Geraghty (1963, p. A32-A35).

The surface of the Gardiners Clay in plate 5 is a revision of the areal-extent maps by Perlmutter and Geraghty (1963, p. 33A) and Jensen and Soren (1974). The major difference between plate 5 and those maps is the improved delineation of the unit's absence in long, narrow north-south channels along the south shore (pls. 5, 6). These absences probably correspond to areas of erosion by glacial meltwater streams and areas of nondeposition. Although the Gardiners Clay is generally continuous along the south shore, these areas are delineated because of their hydrologic importance in influencing the ground-water flow patterns. Where the clay is absent, the upper aquifer has good hydraulic connection with the lower aquifer; where the clay is present, the upper aquifer has poor hydraulic connection with the lower aquifer. This discontinuity and other discrepancies between plates 5 and 6 and earlier maps were determined through the 1978-79 drilling program and the correlation of unpublished well and test-hole data.

The thickness of the Gardiners Clay (pl. 6) is hydrologically important because it largely controls the water-transmitting property of the clay. The thickness of the formation increases southward to the barrier islands. In some areas along the south shore, the lower several feet of the Gardiners Clay may contain a sand or gravel facies. These facies are included as part of the clay unit in the geologic isopach map (pl. 6) but are not represented in the Geological Survey's ground-water model developed by Reilly and others (written commun., 1981) because they are not confining.

"20-Foot" Clay

The "20-foot" clay is a marine deposit within the upper Pleistocene deposits near the south shore. Its upper surface altitude ranges from -20 to -40 ft NGVD (pls. 3, 7); thickness ranges from 0 ft at the northern limit to 30 ft at the barrier islands (pls. 3, 8). The unit overlies upper Pleistocene deposits that range in thickness from 2 to 40 ft and is overlain by upper Pleistocene deposits. The "20-foot" clay was probably deposited during an interstadial period in the Wisconsin glaciation (table 1). The upper Pleistocene deposits underlying the "20-foot" clay are generally a light brown, fine to medium-grained sand (although drillers' logs report some gravel), and are considered to be outwash deposits. The deposits that overlie the "20-foot" clay are also outwash but, in general, are brown, coarser grained, and contain more gravel. The "20-foot" clay directly overlies the Matawan Group-Magothy Formation or Gardiners Clay at several locations where the upper Pleistocene deposits have been removed by erosion. (See pl. 3, well N-5227 near Jones Inlet.)

The surface of the "20-foot" clay in plate 7 is revised from the areal-extent map by Perlmutter and Geraghty (1963, p. 33A) and shows the discontinuity of the clay layer (absences of the unit in narrow, north-south channels) in greater detail. Previous reports do not indicate the "20-foot" clay to extend into Suffolk County, but data obtained during the 1978-79 drilling program indicate it to be present on the barrier island in Suffolk County (pl. 7).

The "20-foot" clay is lithologically similar to the Gardiners Clay, with the same mineral assemblage and fossils. In this study, the "20-foot" clay and Gardiners Clay were identified primarily by stratigraphic position. Their correlation in western Nassau County was relatively easy because they are separated by 15 to 40 ft of upper Pleistocene deposits; in eastern Nassau County, however, they are separated by a smaller thickness of upper Pleistocene deposits (2 to 15 ft), and the correlations in this area are more tentative.

SUMMARY

A drilling program conducted during 1978-79 provided new hydrologic and geologic information on the "20-foot" clay and Gardiners Clay that enabled revision of previous maps. The new surface-altitude and isopach maps depict the extent of the two units in greater detail than previous reports, especially the discontinuities in the general area of deposition along the south shore of Long Island. The "20-foot" clay, which was previously reported and mapped in Nassau County only, was encountered in some of the well borings in Suffolk County. The new information also allowed revision of the topography of the underlying units in contact with these clay layers--the Matawan Group-Magothy Formation, Monmouth Group and the Jameco Gravel.

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Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York

[Altitudes are feet above NGVD of 1929; depths are feet below land-surface altitude. N, Nassau; Q, Queens; S, Suffolk]

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
N 2	19	82	N 941	55	67
N 3	5	465	N 1038	60	115
N 6	15	338	N 1335	25	142
N 17	104	470	N 1346	5	148
N 47	6	182	N 1499	6	245
N 48	17	523	N 1585	65	88
N 54	28	101	N 1602	30	593
N 57	11	150	N 1658	115	300
N 62	10	200	N 1742	20	272
N 69	21	505	N 1744	20	77
N 72	45	616	N 1869	10	132
N 73	30	716	N 1922	125	191
N 93	75	82	N 1927	10	1,471
N 101	108	399	N 1958	113	754
N 130	5	68	N 2006	45	63
N 134	15	556	N 2064	5	71
N 135	20	150	N 2203	5	182
N 136	25	122	N 2225	5	174
N 137	10	90	N 2349	55	106
N 138	25	125	N 2359	5	63
N 140	55	156	N 2400	166	487
N 141	28	109	N 2413	52	526
N 184	10	161	N 2572	5	100
N 185	45	272	N 2574	20	544
N 248	15	190	N 2580	75	76
N 319	10	386	N 2597	6	1,244
N 320	5	383	N 2921	8	120
N 440	8	80	N 3078	5	146
N 559	25	150	N 3147	121	250
N 578	110	415	N 3185	100	499
N 629	55	71	N 3193	85	320
N 637	5	187	N 3197	20	48
N 647	12	44	N 3245	5	215
N 693	90	107	N 3312	70	307
N 914	10	114	N 3325	5	120

Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
N 3355	183	1,248	N 3905	130	770
N 3448	7	1,250	N 3926	14	115
N 3465	80	562	N 3937	25	677
N 3479	30	72	N 4077	76	538
N 3488	117	351	N 4095	150	527
N 3520	30	475	N 4120	35	458
N 3529	10	106	N 4149	5	878
N 3581	8	57	N 4150	7	826
N 3603	75	533	N 4334	65	161
N 3605	48	585	N 4382	114	220
N 3618	88	420	N 4411	17	568
N 3636	50	356	N 4425	60	375
N 3653	15	47	N 4512	35	522
N 3668	55	566	N 4516	10	62
N 3685	55	150	N 4657	15	72
N 3704	55	200	N 4875	25	148
N 3705	24	190	N 5079	10	153
N 3720	35	586	N 5112	18	57
N 3721	40	101	N 5145	30	504
N 3734	10	140	N 5149	147	192
N 3741	20	122	N 5153	25	355
N 3758	110	100	N 5187	35	614
N 3855	20	42	N 5227	10	1,288
N 3861	7	623	N 5233	12	549
N 3862	7	310	N 5260	55	518
N 3863	11	217	N 5292	5	92
N 3864	5	636	N 5301	107	504
N 3865	4	850	N 5302	65	490
N 3866	6	452	N 5303	60	515
N 3867	6	550	N 5304	55	503
N 3876	90	406	N 5368	130	150
N 3878	150	607	N 5484	90	579
N 3881	80	494	N 5524	5	144
N 3894	30	415	N 5654	102	335
N 3895	40	503	N 5655	130	260

Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
N 5705	145	513	N 6644	90	238
N 5731	15	102	N 6651	225	620
N 5768	5	850	N 6657	5	411
N 5777	5	83	N 6660	15	88
N 5795	10	47	N 6706	6	743
N 5906	10	111	N 6741	180	423
N 5975	12	63	N 6757	5	71
N 6004	10	67	N 6769	10	72
N 6046	101	356	N 6780	5	66
N 6075	10	111	N 6791	5	78
N 6077	150	467	N 6813	10	238
N 6093	240	606	N 6817	28	578
N 6148	50	566	N 6819	130	262
N 6149	47	717	N 6834	25	703
N 6150	59	704	N 6848	110	112
N 6191	180	676	N 6893	40	564
N 6192	127	657	N 6915	90	586
N 6202	132	264	N 6929	10	35
N 6315	104	355	N 6956	170	654
N 6354	10	114	N 6965	5	137
N 6355	5	130	N 6992	24	111
N 6376	200	247	N 6996	132	120
N 6384	5	82	N 7022	60	64
N 6437	65	291	N 7030	160	538
N 6442	31	612	N 7114	9	202
N 6043	16	46	N 7117	60	491
N 6450	10	1,331	N 7124	70	155
N 6455	15	84	N 7133	9	150
N 6467	4	698	N 7160	60	699
N 6468	5	704	N 7161	10	700
N 6469	5	703	N 7353	120	415
N 6580	160	702	N 7377	65	766
N 6610	10	230	N 7433	25	95
N 6623	20	138	N 7469	20	278
N 6636	60	200	N 7482	35	460

Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
N 7487	50	128	N 8319	15	180
N 7500	90	474	N 8344	10	60
N 7503	60	665	N 8354	5	1,275
N 7518	133	460	N 8369	160	195
N 7521	13	572	N 8390	45	83
N 7522	25	637	N 8414	7	1,080
N 7526	210	694	N 8434	10	68
N 7529	45	72	N 8457	105	440
N 7548	20	507	N 8466	11	474
N 7562	160	683	N 8472	126	196
N 7663	6	177	N 8480	58	719
N 7720	70	563	N 8481	8	80
N 7764	60	246	N 8482	16	82
N 7776	5	1,238	N 8487	35	70
N 7781	217	550	N 8514	5	250
N 7795	40	760	N 8520	21	934
N 7852	75	615	N 8557	9	1,295
N 7854	35	672	N 8601	104	340
N 7884	7	743	N 8662	45	60
N 8004	85	748	N 8665	57	610
N 8008	10	393	N 8668	141	493
N 8031	25	523	N 8672	35	763
N 8034	15	69	N 8704	5	67
N 8043	222	688	N 8751	20	71
N 8082	15	46	N 8807	118	150
N 8109	5	153	N 8818	55	502
N 8162	10	154	N 8829	60	68
N 8171	10	383	N 8830	40	92
N 8188	12	162	N 8837	20	681
N 8195	20	703	N 8858	10	104
N 8216	30	665	N 8873	7	207
N 8248	120	518	N 8881	40	71
N 8250	50	693	N 8896	30	97
N 8251	25	685	N 8935	15	366
N 8253	25	700	N 8988	26	110

Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
N 9173	38	884	Q 2426	10	244
N 9234	105	205	Q 2955	25	455
N 9318	55	462	Q 3056	40	469
N 9523	20	138	S 12	7	315
N 9532	10	140	S 15	40	101
N 9533	10	145	S 16	20	129
N 9534	20	85	S 17	50	125
N 9535	5	105	S 18	56	400
N 9536	5	80	S 19	130	203
N 9537	28	68	S 24	150	132
N 9538	10	145	S 37	33	820
N 9539	6	60	S 42	120	1,008
N 9541	28	105	S 58	38	468
N 9550	15	125	S 74	10	111
N 9551	10	95	S 78	41	121
N 9552	15	95	S 88	40	116
N 9553	5	85	S 92	15	180
N 9554	20	100	S 95	26	463
N 9556	20	155	S 375	25	140
N 9565	40	100	S 731	85	129
N 9567	25	140	S 1052	5	97
N 9576	15	75	S 1296	240	216
N 9577	25	80	S 1370	10	375
N 9579	55	185	S 1793	320	273
N 9643	20	70	S 1801	200	175
N 9683	25	65	S 1834	10	304
N 9684	20	70	S 2314	80	480
N 9685	15	80	S 2424	110	150
N 9792	31	562	S 2459	10	131
Q 568	60	869	S 4761	5	530
Q 720	25	406	S 5134	175	160
Q 721	15	412	S 5670	230	183
Q 1815	55	306	S 5716	200	159
Q 1958	50	442	S 5869	200	191
Q 2259	50	374	S 6187	5	310

Table 2.--*Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)*

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
S 6678	1	124	S19565	44	119
S 7148	170	144	S20300	75	232
S 8128	144	385	S20305	10	448
S 8205	235	203	S20369	120	312
S 8861	290	246	S20566	26	775
S 8943	240	268	S20635	41	704
S 9067	85	300	S20924	10	485
S11279	5	408	S20955	22	630
S11428	5	180	S21009	45	432
S11538	12	120	S21362	158	565
S12079	141	445	S21375	18	501
S12379	18	75	S22015	140	722
S12441	3	162	S22169	5	433
S12628	5	159	S22278	60	184
S12873	82	388	S22351	21	558
S13591	170	309	S22494	50	120
S13854	10	319	S22577	61	907
S14326	70	225	S22910	125	946
S14825	140	193	S23058	40	217
S14904	3	238	S23059	105	204
S14940	3	191	S23183	61	500
S15008	5	479	S23445	110	610
S15212	7	290	S23455	30	81
S15539	20	315	S23626	4	526
S16395	10	477	S23823	70	407
S16526	120	301	S23848	50	634
S16604	210	183	S24846	90	517
S16936	75	211	S25674	50	625
S17181	1	314	S27258	26	607
S18003	26	671	S27739	140	925
S18075	110	627	S28035	125	326
S18473	65	660	S28212	10	325
S19048	25	735	S28339	15	686
S19123	20	209	S29491	25	499
S19317	3	484	S29776	195	720

Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
S29962	208	675	S41342	130	663
S30007	101	592	S41344	79	693
S30235	280	340	S41513	108	719
S30343	60	350	S42054	40	723
S30421	125	270	S42761	75	333
S30506	75	621	S42762	26	714
S30550	6	507	S42827	35	753
S31023	100	384	S43088	90	902
S31113	7	508	S43101	40	703
S31624	110	439	S43516	55	803
S32412	110	900	S44032	118	753
S32501	26	632	S44137	39	720
S32841	61	648	S44186	165	673
S33005	33	681	S45220	10	724
S33230	240	360	S45347	130	643
S33379	134	1,580	S45839	40	726
S34021	260	710	S46235	40	721
S34063	200	736	S47672	100	734
S34100	53	711	S47711	25	221
S35063	13	710	S48422	95	735
S35669	70	118	S50630	20	243
S35670	45	172	S51609	99	729
S36460	76	611	S51673	25	778
S36714	63	354	S52236	80	98
S37140	35	312	S53274	109	800
S37144	76	202	S53339	50	798
S37145	98	210	S54099	170	703
S37494	60	622	S54155	38	721
S37681	42	583	S54957	50	378
S38035	132	450	S56423	50	800
S38192	66	605	S56508	6	709
S39518	76	725	S57008	111	635
S40057	110	623	S58708	132	423
S40330	43	337	S60127	132	489
S40818	55	754	S60812	38	488

Table 2.--Well depth and altitude data on selected wells in southern Nassau, southwestern Suffolk, and eastern Queens Counties, New York (continued)

Well no.	Land-surface altitude	Well depth	Well no.	Land-surface altitude	Well depth
S61664	28	763	S66149	40	183
S63311	130	802	S66150	25	163
S65196	69	124	S66151	5	150
S66132	100	140	S66152	115	193
S66133	63	161	S66153	50	163
S66134	50	150	S66154	30	153
S66135	30	168	S66155	20	155
S66136	5	144	S66156	15	173
S66137	160	143	S66556	50	753
S66138	60	150	S67074	70	832
S66139	45	152	S67081	4	125
S66140	24	112	S67082	12	234
S66141	5	133	S67083	12	125
S66142	150	203	S67084	9	205
S66143	70	185	S67085	7	122
S66144	55	143	S67086	10	125
S66145	40	175	S67087	10	205
S66146	10	143	S67088	10	225
S66147	10	184	S67197	64	763
S66148	66	153			