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STATE OF NEW YORK
DEPARTMENT OF CONSERVATION
WATER POWER AND CONTROL COMMISSION

MAPPING OF GEOLOGIC FORMATIONS AND AQUIFERS OF LONG ISLAND, NEW YORK

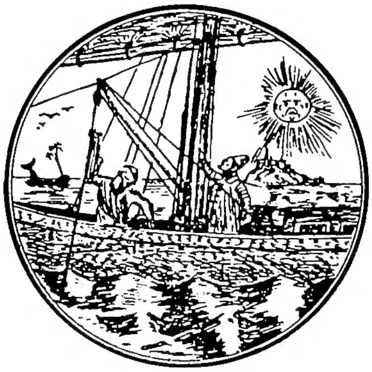
Prepared by the Water Power and Control Commission with the Cooperation of the U. S. Geological Survey

Material Compiled for the Commission
by
RUSSELL SUTER
Consultant

Geological Data Prepared
by
WALLACE DE LAGUNA
and
NATHANIEL M. PERLMUTTER
U. S. Geological Survey

Roosevelt Hall

BULLETIN GW-18
ALBANY, N. Y.
1949



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M. L. Brashears, Jr.	*District Geologist*

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FOREWORD

Water Power and Control Commission

FOREWORD

In 1945 the Water Power and Control Commission called the attention of the Legislature to the fact that the work of administering the provisions of Article XI of the Conservation Law in so far as the ground waters of Long Island were concerned was seriously handicapped by lack of factual data as to the geology and aquifers of that Island and of even greater dearth of practical and tested hydrologic theory by which the effects of pumping of ground water could be foreseen, regulated and controlled.

It, therefore, asked for a special appropriation for this purpose, stating that a period of five years would be about the least extent of time in which the work could be completed. Acting on this request, the Legislature included an item of $30,000 in the budget appropriations for 1946-47, and again appropriated the sum of $25,000 in the budget for 1947-48.

In this present report, the factual data to date are set forth. This material is the essential base for theoretical studies and administrative procedure.

Studies in theoretical and applied ground water hydrology have not as yet gone forward.

Such work will require the continuous effort of men of certain relatively rare aptitudes and interest, and to date it has not been possible to obtain the services of men with these qualifications.

This work is most urgent, and it should be pushed energetically as soon as the necessary personnel can be obtained.

The present report is based on work and contributions of many men and organizations extending over a period of a good many years, and without outside aid these results would not have been possible.

The greater part of this work has been done as a cooperative effort with the Geological Survey of the U. S. Department of the Interior under the direction of Secretaries Harold L. Ickes, Julius Krug and Directors W. G. Mendhall and W. E. Wrather and District Geologists D. G. Thompson, R. M. Leggette and M. L. Brashears, Jr. The geologic data used are largely the work of Dr. Wallace de Laguna and Nathaniel M. Perlmutter of the local office of the Survey.

In addition, the people of Long Island have awakened to the fact that their water supply presents a serious problem, and the county, city, town, village and district officials, engineers and well drillers have been most cooperative and helpful in the common cause.

For this Commission the work was directed by Executive Engineer Russell Suter until his retirement at the end of March, 1948, since which date he has been retained in a consulting capacity to complete this report.

WATER POWER AND CONTROL COMMISSION

Albany, New York

November, 1949

HISTORICAL INTRODUCTION

Russell Suter

HISTORICAL INTRODUCTION

Ground water, partly as spring runs and more particularly as well water, was the sole supply of the people of Long Island up to 1917, when the Catskill water supply project of the City of New York was first introduced into the island boroughs of Kings and Queens.

Since then the population of the island has increased enormously with resultant increase in the draft on the ground water despite the upland water distribution in the west end of the island. Pumping difficulties delayed this development somewhat, but the general introduction of the deep well turbine pump, which came into general use at the end of World War I, made it possible to increase the use of ground water for industrial purposes.

Early in the 1930's a series of water supply applications from the City of New York and various water supply corporations supplying portions of that municipality first made it clear that overpumping of ground water had assumed serious proportions and that regulation of industrial pumping was essential. Whereupon the Legislature, by Laws of 1933, Chapter 563, declared that the situation constituted an emergency and charged the Water Power and Control Commission with the duty of regulating industrial as well as public water supply well pumping.

It immediately became evident that to perform its functions properly the Commission needed more knowledge of the structure of the island, amount of pumping, ground water levels and ground water hydrology.

The first attempt at an economic study of the geology of water resources of the island was made about the time of the search for water by the City of New York which finally culminated in the installation of the Catskill supply. These studies are given in the Burr-Hering-Freeman report (6) and those of Veatch (9) and Fuller (15). Later they were carried on by the Board of Water Supply of the City of New York as shown in the reports of Spear (14) and Crosby (11).

In 1933 a surface ground water contour map was prepared by Thomas H. Wiggin, Consulting Engineer, and others and introduced as an exhibit in one of the then current water supply applications. This showed that in the western part of the island there had been serious recession of the upper ground water levels from those previously reported.

By resolution adopted April 9, 1931, the Legislature had set up a joint legislative committee to investigate the potable water resources of the State. This body interested itself in the island situation and engaged the cooperative services of the Geological Survey to make a study of the ground water levels of the island and the fluctuations of such levels (18). This work was continued by the Commission and participated in by the counties of Nassau and Suffolk. It still continues and results of observations on ground water levels are published annually by the Survey.

By the Laws of 1936, Chapter 839, the Legislature directed the Commission to study and report on this whole subject. An appropriation of $25,000 was made for this, and by later legislation this original sum was made advailable over a number of years. The report as required by law was made on February 1, 1937, and is known as Bulletin GW–2—"Engineering Report on the Water Supplies of Long Island".

The work done in connection with this earlier report, not all of which was published, included a well census covering Kings and Queens Counties, report on ground water consumption published as GW–1, collection of well logs and reports of borings, a geologic study of the western end of the island—Bulletin GW–7—and a general engineering report—Bulletin GW–2—including redetermination of ground water levels, discussion of the whole problem, pointing out of the additional information needed, suggestions and tests as to methods of showing the various structures and an outline of the hydrologic questions.

In continuation of this work, all available well logs were collected, edited by the U. S. Geological Survey, and have been published in the GW series of pamphlets. There are now two volumes of well logs for each county (GW—3 to 6 and 8 to 11).

It became apparent that the original concept of a single body of ground water underlying the whole island must be modified and that for purposes of study, each aquifer should be considered as a unit, although there appear to be numerous interconnections between them. To do this required an intensive geologic study of the well logs and the development of a method of delineating the formations and aquifers so as to show them in three dimensions and in better fashion than was done by Professor Crosby's sections. These last were drawn by projecting well logs, frequently somewhat remote onto selected sections, a method which fails to give satisfactory results.

With such data at hand, more elaborate studies of hydrologic conditions will be possible.

To do this work the present appropriation was asked for and the work has proceeded as well as the critical shortage of manpower would permit.

A new cooperative agreement with an allocation of funds to the Geological Survey produced the geological correlations of well logs contained in this report. The well census was extended over the whole island. All known wells have been assigned numbers, have been plotted on sectional maps and data with regard to them have been filed and classified. The contour maps contained in this report were prepared and profiles drawn from them. These it is proposed to amend from time to time as more data become available.

These maps on a larger scale and a full set of profiles have also been made available in Bulletin GW–19, "Ground Water Atlas of Long Island," which can be obtained as a whole or as separate sheets from the Commission.

The Commission has not yet been able to secure the services of suitable men to carry on the proposed hydrologic studies and that work has perforce been left to the future. The need for it is imperative.

The data given here are in many cases disappointingly vague, must contain many errors and certainly lack greatly in precision. But, they are the best that now can be obtained and the maps have been drawn, with them as a base, with as much accuracy as is possible. As the data are increased by later additions, the maps and profiles will be amended and kept up to date.

In spite of the unsatisfactory condition of the basic data, it is thought that these maps even now will serve as a basis for much needed and contemplated studies of water levels, salt water intrusion, recharge and interconnections of aquifers which heretofore have been impossible.

At the end of this report will be found a schedule of references and a statement of the well information on file in the Long Island office of the Commission, where they are available for public inspection and use. The Commission invites such use and its employees will be glad to aid the public in using it.

PART I

BASIC GEOLOGIC DATA

GEOLOGIC CORRELATION OF LOGS OF WELLS IN LONG ISLAND

Nathaniel M. Perlmutter
Geologist

CONTENTS

INTRODUCTION

Preface

The rapid growth of population accompanied by expansion of industrial and agricultural activities on Long Island during the past 25 years has resulted in the drilling of large numbers of wells for public supply, air-conditioning, industrial, and agricultural purposes.

The increased usage of ground water has raised many serious problems with regard to the conservation and protection of present supplies. Intrusion of salt water into water-bearing beds along the shore lines, the lowering of water levels in certain localities due to over-pumping, and estimation of the safe yields of the aquifers are some of the problems which are confronting Federal, State, County, and municipal agencies concerned with the proper development of the ground-water resources of Long Island.

All of these problems require intensive Island-wide studies of the geologic and hydrologic factors affecting the occurrence and movement of ground water. This report deals with the geologic phase, and includes information as to the distribution, geologic structure, and thickness of the unconsolidated deposits on Long Island. It also contains information as to areas of recharge of the various aquifers, the nature of the various confining beds, and the physical properties of the sediments of which the aquifers are composed.

The geologic work which forms the basis of this report and the following report by Wallace de Laguna was performed under the supervision of M. L. Brashears, Jr., District Geologist for New York and New England for the Geological Survey, and was carried on in financial cooperation with the New York State Water Power and Control Commission whose work on this project was directed by Mr. Russell Suter, Consulting Engineer, and formerly Executive Engineer for the Water Power and Control Commission. Much assistance was furnished by the Nassau County Department of Public Works, the Suffolk County Board of Supervisors, and the Suffolk County Water Authority and is here gratefully acknowledged.*

Previous Investigations

Shortly after the completion of the work of the Burr-Hering-Freeman Commission on Additional Water Supply for the City of New York (6), the U. S. Geological Survey in 1906 published the first systematic island-wide report, by A. C. Veatch (9), on the geology and hydrology of Long Island. This report contains a brief outline of the geology together with geologic correlations for a considerable number of wells drilled prior to 1906, including many of those drilled by the Burr-Hering-Freeman Commission. In 1914, a more detailed geologic report based upon extensive field work by M. L. Fuller, was published by the Geological Survey (15). W. O. Crosby also made studies for the Board of Water Supply of the City of New York (11). His report, which contains a number of fundamental geologic differences with the reports of Veatch and Fuller, has never been published. A discussion of some of these differing theories expressed by these investigators, together with a contour map of the buried pre-Pleistocene surface of Long Island, based upon information available at that time, is contained in a technical paper published in 1937 (27).

**Compiler's Note.* It is understood that the official scientific name of the youngest of the Cretaceous strata is Magothy (?). This symbol is all very well as indicating that the stratum on Long Island may not be the same as the Magothy stratum in New Jersey. It is, however, an awkward symbol as written and particularly awkward in that it cannot be easily expressed in words, either in dictation or in conversation. Therefore, in the geologic report the authors have not always been consistent and have frequently used the term Magothy without the question mark.

In spite of the large amount of data collected by the earlier geologists and engineers, there was still much work to be done. It was apparent that there were many places on Long Island where geologic and hydrologic data were either lacking or were too vague to be of any real value. In 1932, as a result of severe drought conditions and the salting of water-bearing beds in Brooklyn due to overpumping, the U. S. Geological Survey in cooperation with the State of New York and Nassau and Suffolk Counties, began a systematic and continuous investigation of the groundwater resources of Long Island. A part of this work has consisted of the collection and interpretation of geologic data from well logs and well samples, and the publication of records of significant wells drilled since 1906.

Purpose and scope of present report

The tables accompanying this report contain geologic correlations and classifications according to aquifer of most of the important and representative wells drilled on Long Island, and include many of the wells published in the early reports of Veatch, (9) Fuller, (15) and Crosby, (11) ; as well as most of the wells published by the Water Power and Control Commission since 1937. (30, 34, 35, 36, 53, 55, 59, 62). Correlations for about 2,000 wells are included in these tables. In this report, a geologic correlation of a well is defined as an attempt to group all of the sediments penetrated by a well into specific geologic units. This is shown in the correlation tables by indicating the contacts between the surfaces of the various stratigraphic units in terms of mean sea level. This report, which describes the water-bearing formations of Long Island is followed by a report of the geologic history of Long Island.

Cross-sections and contour maps have been prepared which show the thickness, geologic structure and distribution of the major geologic units found on Long Island. These have been drawn by the New York Water Power and Control Commission with the assistance and guidance of the writer and Wallace de Laguna of the Geological Survey. Many of the geologic correlations included in the accompanying tables were made by various members of the U. S. Geological Survey who have worked on Long Island at one time or another since 1932. During the early years, the studies were made by D. G. Thompson, F. G. Wells, Watson Monroe, and H. R. Blank. The geologic work was continued by R. M. Leggette, M. L. Brashears, Jr., and C. M. Roberts. In the fall of 1946, the authors began a re-study and re-evaluation of all of the earlier correlations and have prepared original correlations for many wells drilled since 1938.

PHYSICAL GEOLOGY

Units of Correlation

Keeping in mind the limitations imposed by the nature of the data and the necessity for utilizing the results of this report for hydrologic studies, the geologic units shown in Table 1 were selected and found to be most practicable.

Each of the units has a common geologic origin, representing material deposited at approximately the same time by a common agency of deposition. A variety of materials may be present in each unit but each consists predominantly of a specific lithologic type such as the Jameco gravel, or the clay member of the Raritan formation. The units may comprise part of a single geologic formation as in the case of the Lloyd sand member of the Raritan formation. Or the unit may consist of several formations of a similar lithologic nature as in the case of the upper Pleistocene deposits, which include all material laid down after the close of Jacob time.

The selection of the geologic units here used is based to some extent on the fact that almost all of the available information is in the form of logs, compiled by well drillers and supplemented by a smaller number of logs compiled by geologists from microscopic examinations of well samples. Subdivisions of the geologic column therefore depend largely upon lithologic differentiation, general stratigraphic relationships, and mineralogical composition. In most instances standard correlation criteria such as fossil and mineral content, grain size, color and sorting were not available since this type of information is not included in ordinary well logs. A great deal of reliance has, of necessity, been placed on a relatively small number of examinations of samples made by geologists who have had an opportunity to follow the drilling of wells in the field, or have examined samples collected through the cooperation of local well drillers.

TABLE 1. STRATIGRAPHIC SEQUENCE AND CORRELATIONS OF MESOZOIC AND CENOZOIC FORMATIONS ON LONG ISLAND

AGE	VEATCH	FULLER	CROSBY	PRESENT REPORT
Recent	Post Glacial and Recent	Recent		Recent deposits
Pleistocene	Wisconsin Harbor Hill Ronkonkoma	Wisconsin Harbor Hill Ronkonkoma	Glacial	Upper Pleistocene deposits
	Tisbury (Manhasset) gravel	Manhasset Hempstead Gravel Montauk till Herod gravel		
	Sankaty	Jacob sand Gardiners clay		Gardiners clay (includes Jacob sand if present)
	Jameco gravel	Jameco gravel		Jameco gravel
	Mannetto gravel	Mannetto gravel		?
Pliocene			Sankaty Pensauken Lafayette	
Miocene			Kirkwood Bethpage	
Upper Cretaceous	Higher Cretaceous beds Matawan Raritan	Higher Cretaceous beds Matawan Magothy Raritan	Monmouth Matawan Magothy Raritan Potomac	Magothy (?) formation* Raritan formation Clay member Lloyd sand member

*May include beds younger than Magothy in age which have not yet been differentiated.

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Unconformity ……………………
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Transition - - - - - - - - - - - -

Well drilling methods

The method used to drill a well or test boring affects the reliability of the log, the accuracy of the samples collected, and the subsequent correlation of well samples. It is important therefore to be acquainted to some extent with the various methods of drilling, and procedures for obtaining samples, in order to properly evaluate drilling information for geologic purposes. The cable-tool and hydraulic-rotary methods are the principal methods used for drilling on Long Island. Jetting and drive-point methods have been used only to construct shallow, small diameter wells.

Cable-tool or spudding method: Most of the water wells greater than 4 inches in diameter and less than 600 feet in depth are constructed by this method. The well casing is driven down by dropping a heavy weight upon it or is bailed down by removing material at the bottom of the casing with a bailing device. The latter has the effect of causing the casing to settle slowly of its own weight as material is removed. Most wells require a combination of driving and bailing. A heavy steel bit, raised and lowered by a cable, is used to drill through hard layers of tough clays, pyrite, cobbles, and large boulders. This method is also known as drop-tool drilling or churn drilling.

Samples collected by this method of drilling are in most cases fairly reliable for geologic studies if properly collected. The materials penetrated by the casing are picked up in the bailer, hoisted to the surface and dumped on the ground. Certain precautions are necessary to prevent contamination or mixing of samples from different horizons. This is most apt to occur when the hole is drilled or bailed too far ahead of the casing in a caving or weak formation. Another source of contamination is careless dumping of material from the bailer upon previously deposited cuttings and subsequent collection of mixed samples from the pile. Contamination of samples from the critical Pleistocene-Cretaceous contact zone is a frequent source of difficulty in correlating well samples. Contamination takes place when the casing is driven across the contact before the well is thoroughly bailed out at the change of formation. When accurate undisturbed samples are desired for geologic or mechanical analyses, drive core samples are taken. The coring device generally consists of a 2-inch pipe about 3 feet long with a hinge valve at the bottom, which is driven into the undisturbed beds below the casing by means of a heavy drill stem attached to a set of drilling jars.

Rotary method: Most of the deep wells on Long Island are drilled by the hydraulic-rotary method. The hole is cut by a rotating bit connected to a string of hollow steel drill rods. A drilling fluid composed generally of a suspension of red-colored Raritan clay mined in New Jersey mixed at times with clay conditioners is pumped down through the hollow rods, emerges through holes in the bottom of the bit and flows back up to the surface, laden with cuttings, in the annular space between the drill rods and the wall of the hole. A casing is not inserted until drilling of the hole has been completed. Continuous circulation of drilling mud enables material pentrated by the drill to be brought to the surface and by mudding the wall of the hole prevents major caving before the casing is inserted in the hole. Many of the wells in the old Flatbush franchise area of the New York Water Service Corporation in Kings County were drilled by this method as were also a number of other deep wells on Long Island.

One of the chief advantages of this method of drilling is the great reduction in drilling time for deep wells. However, most of the samples collected by this method have proved to be unsatisfactory for geologic studies as the unconsolidated sediments on Long Island frequently cave during drilling operations. In addition, the sorting action of the hydraulic process separates most of the fine sands and clays from the coarser materials. The samples are collected in a trough or mud ditch at the land surface, quite frequently in a highly contaminated condition due to caving of the hole, re-circulation of material, or incomplete removal of material before drilling deeper. It is believed that the correlations for a number of the earlier deep wells were based upon examinations of much contaminated rotary well samples. This has led to considerable confusion in interpreting well logs, particularly in Kings and Queens Counties.

Jetting methods: Much of the data available for the northern parts of Kings and Queens Counties are based upon information from test borings for City Tunnels 1 and 2. The primary purpose of these borings was to determine the depth and character of the bedrock. The casings in many instances were washed in rapidly with relatively little attention being given to the details of the overburden. These logs, therefore, lack the details found in logs of water wells where the record of the overburden is of major importance.

Drive-point method: Where the water table is close to the surface and a small supply of water is desired for domestic purposes, small diameter wells are frequently constructed by driving a well-point and attached pipe to relatively shallow depths. Many wells of this type have been driven along the south shore of Nassau and Suffolk Counties. Little information of geologic importance can be obtained from the records of such wells.

Other aids to correlation

Hydrology: Much hydrologic information in the form of pumping test data, interference studies, and hydrographs from automatic water-stage recorders has been obtained by the Geological Survey. In most instances the hydrologic data substantiates geologic correlations. Hydrologic interference between wells screened in the Jameco gravels in Kings and Queens Counties has been recorded on many occasions by the Geological Survey (68). Mutual interference has also been observed between several wells screened in the Lloyd sand member of the Raritan formation in Queens and Nassau Counties by Leggette (32). Jacob has also noted a similar effect between Lloyd wells situated in the southern part of Queens and Kings Counties (46) (49). In much of the remainder of Long Island, much hydrologic data has been obtained in water-table wells.

Paleontology: Fossils visible to the naked eye are rarely found in Long Island sediments. Only in the case of the Gardiners clay, a marine inter-glacial deposit which contains shells, shell fragments, foraminifera, and diatoms (33), has such evidence been of value for correlation purposes. Fossil plant leaves, spores, and small pieces of lignite have been found in many of the Cretaceous beds but these have not been studied in much detail.

Marine Cretaceous fossils are rarely found in Long Island sediments since the formations are predominantly terrestrial in character. A few specimens were noted in the early reports of Veatch (9) and Fuller (15). In several instances it has been shown that some of the "Cretaceous" fossils mentioned in these earlier reports are of Pleistocene rather than Cretaceous age. In addition, many of the Cretaceous fossils noted in other early papers on Long Island geology have been found in Pleistocene drift deposits, and consequently are of no value in identifying the strata in which they are found. In most cases, it has been found that the presence of shells in a sediment is a fairly safe indication that the deposit is probably not older than Pleistocene in age. It should not be assumed that all shell-bearing layers are from the Gardiners clay, a subdivision of the Pleistocene, since shells are frequently found in later Pleistocene sediments and also in recent clays. Shell-bearing layers from formations older than Pleistocene in age may be found in unexplored parts of the Island but the data are very meager.

Heavy minerals: In some coastal plain areas where paleontologic data are scarce, heavy mineral studies have been used to trace beds over somewhat limited distances. This technique involves the separation of minerals from sand residues according to specific gravity of the minerals. Widely scattered samples from the same horizon are then examined for similar minerals or suites of minerals. Whether this procedure could be used to define certain beds occurring throughout Long Island, is a matter upon which one can only speculate at present since neither the facilities nor time have been available to make a large scale study of this type. If the heavy mineral composition varies as much from place to place horizontally as does the lithology, particularly in the case of the Magothy (?) formation where the need for differentiation is greatest, then this technique will be of little value in future correlation studies.

Electrical logging: Electrical logs have recently been procured for a few deep wells. These have not yet been studied in sufficient detail to determine their usefulness in geologic classification of the Long Island sediments. Thus far a preliminary examination of these logs has not yielded much additional information beyond a differentiation of the log into major geologic units which can also be readily determined from well samples. Electric logs can only be obtained from uncased rotary wells.

Usually the first 100 or 150 feet of record are missing due to the installation of casing in rotary-type wells to prevent caving at the surface. In some instances this prevents logging of the critical Pleistocene-Cretaceous contact. Electrical logs also record the relative salinity of the water-bearing formations since the conductivity of the strata will vary directly as the chloride content of the formation water. Electrical logging might be of assistance in correlating certain beds within the Magothy (?) formation but here again the rapid lithologic variations horizontally characteristic of this formation cast considerable doubt upon the feasibility of this method. Logs are now available for wells at Long Beach, Westbury, Baldwin, and Bay Park in Nassau County and for two wells at the Brookhaven National Laboratory in central Suffolk County.

The logs of some of the deep abandoned cased wells in Kings County and elsewhere might be checked by radioactivity logging but would be handicapped by lack of basic control data to interpret a log of this type on Long Island.

STRATIGRAPHY

Long Island is composed of consolidated rocks overlain by loose unconsolidated sediments. The consolidated rocks are dense metamorphic and igneous basement rocks of pre-Cambrian age. The unconsolidated sediments overlie a southeasterly sloping bedrock platform, and consist of upper Cretaceous and Pleistocene sands, gravels, and clays. (See table 1, Stratigraphic Sequence for Long Island).

The Cretaceous sediments rest directly upon bedrock and are divided into the Raritan formation and the overlying Magothy (?) formation. The Raritan formation which has long been recognized as the equivalent of the Raritan formation of New Jersey, is composed of a sand member (Lloyd sand member) and a clay member both of which are widely distributed on Long Island. The Magothy (?) formation, which consists of a great thickness of alternating fine sands, clays, silts, and some coarse beds of sand and gravel, is thought by some geologists to represent a northeasterly thickening of the Magothy formation of New Jersey. This correlation has never been satisfactorily established and it is probable that the so-called Magothy formation of Long Island includes not only the equivalent of the Magothy formation of New Jersey but also some of the younger Cretaceous beds in New Jersey. The primary reasons for the failure to solve this problem are the marked change in lithology between the Cretaceous beds of Long Island and those of New Jersey and the lack of paleontological data in the Long Island sediments.

No definite occurrences of Tertiary strata are indicated by present evidence, but their complete absence cannot be verified since much of the southeastern part of the Island is relatively unexplored. Tertiary beds undoubtedly occur offshore to the southeast.

In contrast to earlier reports, the Pleistocene deposits are here divided into only three groups. Each of these is essentially a hydrologic unit and is distinctive enough to be recognized in well logs and samples. The oldest fluvio-glacial deposit, the Jameco gravel, is separated from the upper Pleistocene outwash by the Gardiners clay, an inter-glacial deposit. The Manetto gravel is not included as a separate unit in this report because of the difficulty in recognizing the formation in well logs or samples. Further, the Manetto does not appear to be of hydrologic importance as it is of limited horizontal distribution and probably is hydrologically connected with other Pleistocene deposits wherever it occurs.

DESCRIPTION OF THE CORRELATION UNITS AND THE CRITERIA USED IN THEIR IDENTIFICATION

Bedrock

The bedrock floor of Long Island consists predominantly of pre-Cambrian schists and gneisses. Locally, as in northeastern Kings and northwestern Queens Counties, there are occurencies of granodiorite. A narrow band of limestone cuts across the promontory projecting into the East River near well Q 375 in Astoria. This belt of limestone continues beneath the East River between Welfare Island and northwestern Queens County. It is shown on Berkey's geologic map of New York City (19). Outside of this small area it is not likely that limestone occurs in any significant amount. The metamorphic rocks have been invaded in places by pegmatitic and granitic instrusions such as was encountered at well Q 1030 in Rockaway Park, Queens. There bedrock was found to be a normal granite showing no signs of metamorphism (67). It has been thought by some geologists that diabase intrusions and sandstones of Triassic age might possibly extend from the mainland of Connecticut over to Long Island but no reliable occurrences of Triassic rocks have been observed anywhere on Long Island.

The greatest concentration of bedrock data occurs in the northwestern part of the Island where hundreds of bedrock test borings were made in connection with pre-construction studies for City of New York Water Tunnels 1 and 2. The amount of bedrock information decreases rapidly to the east, so that in Suffolk County, which includes almost two-thirds of the land area of Long Island, there are only about 5 wells that are known to have been drilled to bedrock.

A decayed or weathered zone is usually encountered over the bedrock except in the northwestern corner of the Island where glacial scouring has removed most of these deposits. In most other places, the residual weathered deposits have been preserved by a mantle of Cretaceous sediments. The zone of decay appears to range from 5 feet to as much as 100 feet. It commonly consists of red, gray, yellow, white, green, or mottled colored clay; or sandy clay with partially decayed rock and mineral fragments. Where good core samples are available a definite graduation from sound rock to an almost pure clay can be observed. Frequently some doubt exists as to whether the clay immediately overlying bedrock is the lower part of the Lloyd sand member of the Raritan formation or is actually weathered rock. If samples are available, a geologist can usually determine the age of the material in question. Decayed bedrock usually contains some indication of the original minerals of which the rock was composed such as angular, ragged quartz grains and pieces of garnet, biotite, amphibole, pyroxene, feldspar or the altered equivalents of these minerals. In some instances, the residual clays appear to have been reworked and redeposited. These deposits exhibit a finely laminated structure indicating subaqueous deposition. In these instances, the clays should be considered as Cretaceous in age.

In northern Kings and northwestern Queens Counties, where bedrock lies close to the surface and is overlain chiefly by coarse glacial deposits, drillers occasionally confuse large buried glacial boulders with the bedrock surface.

The strike of the buried surface of the bedrock floor is approximately northeast-southwest. It has a dip of about 80 feet per mile, and a relief of as much as 100 feet in the northwestern part of the Island (64). The strike assumes a more easterly direction toward the eastern part of the Island and the relief is probably considerably less where the Cretaceous covering has protected the surface from glacial scouring. In general, the bedrock surface is a gently inclined southeasterly sloping peneplain.

In Kings County, well records indicate bedrock ranges in depth from about 50 feet to 700 feet below sea level. It crops out at the surface in Queens County near Long Island City and Astoria, and dips to about 1,100 feet below sea level in the southeastern part of the County. In Nassau County its depth ranges from about 160 feet to an estimated depth of about 1,800 feet below sea level, increasing toward the southeast. Beneath Suffolk County, bedrock ranges in depth from about 400 feet below sea level at Lloyd Neck to an estimated depth of about 2,200 feet in the south-central part of the County.

Most wells which tap bedrock usually produce water of poor quality and insufficient quantity. The occurrence of a good supply depends upon the penetration of water-bearing joints and fractures, whose locations are impossible to predict in advance. Bedrock wells on Long Island are few in number and are confined almost entirely to the industrial sections of Long Island City and Astoria in northwestern Queens, where bedrock lies close to the surface and only a thin veneer of impermeable till overlies it. The salinity of the water in most of the rock wells near the East River is high but some wells yield fresh water. Drilling several hundred feet into bedrock has usually proven to be a fruitless task since bedrock is the lowest limit of profitable drilling for water on Long Island.

Upper Cretaceous deposits

The Upper Cretaceous deposits on Long Island are represented by the Raritan formation and Magothy (?) formation. It is usually possible to distinguish between these two formations in well logs. This is not always the case, however, since the distinction is primarily lithologic and is subject to some variation depending upon local depositional environment. The contact is commonly marked by a change from the basal coarse sands and gravels of the Magothy (?) formation to the solid clays of the Raritan formation. This problem is further discussed in the detailed descriptions given below.

The contact between the Pleistocene and the Cretaceous deposits is an erosional unconformity with considerable relief and in most places is marked by an abrupt lithologic and mineralogic change. In some places, the mineralogic differences provide the best evidence, in others the lithologic differences are more easily recognized. Since the determination of the depth of this contact and the lithologic and mineralogic differences on either side of it is of considerable importance, some of the major criteria used in establishing the contact will be emphasized.

A common feature helpful in establishing the contact surface, is an abrupt change from the coarse clean sands and gravels of the Pleistocene to the silty clays, fine sands, and solid clays of the Cretaceous. The Cretaceous sands are composed of minerals which have been subject to long weathering and consequently consist only of chemically stable minerals or the highly altered equivalents of the less stable minerals. The chief mineral constituents are angular quartz grains with much smaller quantities of tourmaline, rutile, zircon, kaolin, partially or completely kaolinized muscovite, and weathered white chert grains. Carbonaceous material associated with pyrite or marcasite is commonly observed in Cretaceous samples.

Although the Pleistocene deposits are chiefly characterized by coarse texture, they may also consist in part of sandy clays, solid clays, and fine sands. When these materials overlie similar Cretaceous deposits, it is very difficult to determine the Pleistocene-Cretaceous contact from a well log without the aid of samples. Glacial sands may contain all the minerals found in the Cretaceous sediments, and in addition usually contain a significant amount of rock fragments such as gneiss, schist, granite, pegmatite, diabase, sandstone, limestone, shale; and minerals such as amphibole, pyroxene, fresh muscovite and biotite, chlorite, and unweathered feldspar. Some of the glacial clays contain shell fragments, partially carbonized wood or other fairly fresh organic material.

Careful interpretation is called for where only a small amount of typically Pleistocene material is present since the glacial deposits in some localities may be composed of a large percentage of re-worked Cretaceous material. Contamination of samples is another factor which also must be kept in mind in correlating well samples. This is more fully discussed under methods of well drilling.

Color alone is not a sufficient criterion for differentiating between Cretaceous and Pleistocene deposits. In general, the Cretaceous sediments are light or brightly colored except where a high percentage of lignitic material imparts a dark gray or black color. Most of the glacial sands are rusty brown in color due to iron staining but they may also be gray, white or tan in color. Brown iron-stained zones are also frequently observed in the Magothy (?) formation, and therefore it should not be taken for granted that a brown colored sand is Pleistocene in age. Red has often been considered a characteristic Cretaceous color but some of the late Pleistocene till deposits in Kings and Queens Counties, and other Pleistocene clays are also reddish colored. Green-colored clays may result from the presence of large amounts of glauconite or chlorite and may be of Pleistocene or Cretaceous age. Some of the residual clays resulting from the weathering of the bedrock are also greenish in color due to the presence of chlorite, hornblende and other green-colored mineral constituents of the original rock.

Raritan formation—Lloyd sand member

The lower water-bearing sandy portion of the Raritan formation is referred to as the Lloyd sand member of the Raritan. It was first defined by A. C. Veatch (9), who named it after Lloyd Neck, a locality in northwestern Suffolk County where several old wells derive water from this aquifer. The Lloyd sand member does not crop out at the surface anywhere on Long Island. It extends an unknown distance northward beneath Long Island Sound where it is probably overlain by younger Cretaceous, Pleistocene, or Recent sediments depending upon how much erosion occurred during or after Cretaceous time. The upper surface of the Lloyd slopes in a southeasterly direction. It varies in thickness from about 20 feet in northwestern Queens to about 300 feet or more in southeastern Suffolk County.

The water-bearing zones in the Lloyd sand member consist of medium to coarse sands and fine to medium gravels. They consist almost entirely of clear quartz. The coarser particles commonly exhibit a sub-angular to rounded water-worn appearance. Lithologically the Lloyd varies from beds of fairly clean coarse sand and gravel to fine sandy clay, clayey sand, and very thin layers of clay. The amount and nature of the clay present varies considerably from locality to locality. The coarse zones in some places do not yield as much water as might be expected due to the presence of much clay in the pore spaces between the coarse material which reduces its permeability considerably. This is exemplified by test wells recently drilled at the Brookhaven National Laboratory in Suffolk County where the yield from the Lloyd was relatively small despite the considerable amount of development to which the test wells were subjected.

The Lloyd sand seems to consist of two or three water-bearing zones separated by layers of clay or less permeable zones which are commonly very thin but which may be as much as 40 feet in thickness. The layers of clay in the Lloyd cover large areas but do not appear to be of Island-wide extent. A pumping test by Jacob (49) at well Q 1030 at Rockaway Park in Queens County shows that the entire thickness of the Lloyd sand at that locality acted as a hydrologic unit despite the presence of intraformational layers of clay. This hydrologic property appears to be characteristic of the Lloyd in many other parts of Long Island.

The Lloyd sand is everywhere overlain by the clay member of the Raritan formation except possibly at the western end of the Island, and on some of the necks in the northern part of Nassau County. The clay provides an impermeable cover for the Lloyd sand member and thus the Lloyd is a true artesian aquifer. Recharge may occur by means of valleys cut through the Raritan clay, valleys which are now filled with more permeable material of late Cretaceous or Pleistocene age; or by slow seepage of water through the clay into the Lloyd sand. In the western end of the Island, particularly in Kings County, Pleistocene deposits are in direct contact with the Lloyd. As the water level in Lloyd observation wells in Kings County and western Queens County stands higher above sea level than in Pleistocene wells in Kings County, it is believed that the Lloyd is continually discharging water into these Pleistocene beds.

Lloyd sand — Kings County: The limiting line of the deposits roughly bisects the County along a northeast-southwest line. According to present correlations, the Lloyd sand member is missing in the area north and west of the limiting line shown on the accompanying contour map of the Lloyd. This absence may be due either to non-deposition or erosion of the Lloyd, and subsequent deposition of younger Cretaceous or Pleistocene deposits directly upon bedrock. The elevation of the upper surface of the Lloyd ranges from about 250 to 680 feet below sea level. Its thickness ranges from about 100 feet to about 250 feet, increasing toward the southeast. The Lloyd sand may be in contact with the Jameco gravel in parts of Kings County where it forms part of the walls of buried valleys filled with the Jameco gravel. Records for six Lloyd wells are shown in the accompanying correlation table for Kings County. Only 2 of these wells, industrial wells in southeastern Kings County, are in use at present.

Lloyd sand member—Queens County: The Lloyd sand member underlies all of Queens County except a small area in the northwestern part of the County where bedrock rises close to the land surface. It appears to be missing also in the vicinity of La Guardia air field and in a small area near Whitestone in the northeastern part of the County. The absence of the aquifer, as in Kings County, may be the result of either erosion or non-deposition. The aquifer thins out rapidly in the northwestern part of the county, suggesting that this area may represent the original limit of deposition of the Lloyd. The elevation of the top of the Lloyd ranges from about 100 to 900 feet below sea level. Its thickness ranges from about 2 feet in northern Queens to over 300 feet in southeastern Queens. The Lloyd sand takes on increasing importance as an aquifer in Queens County where it is tapped by a number of industrial and public supply wells.

Lloyd sand member—Nassau County: Except for a small area near the northern tip of Manhasset Neck, the Lloyd sand member appears to underlie all of Nassau County. The top of the Lloyd ranges from about 100 to 1,400 feet below sea level, and its thickness ranges from about 60 to 300 feet. More Lloyd wells have been drilled in Nassau County than in any of the other three Long Island Counties. Most of the Lloyd wells in Nassau County are situated along the north and south shores and many of them yield large quantities of water by natural flow. In many places along the shore lines, particularly on the south shore, the Lloyd sand is the only aquifer from which moderate to large supplies of fresh water can be pumped. Most of the

Lloyd wells in Nassau County are used to furnish public supplies, although a number of industrial and estate wells tap the aquifer wherever no other satisfactory water-bearing horizon is present.

Lloyd sand member—Suffolk County: Although only a few wells have been drilled into the Lloyd sand member in Suffolk County, the small amount of data available indicates that the aquifer is present beneath all of the County. Information on the extent and character of the Lloyd sand in Suffolk County is confined to a few wells located in the northwestern section of the County, two recently drilled test wells at Brookhaven National Laboratory near the center of the County, and two wells on the north fluke in the extreme northeastern part of the Island. In Suffolk, the top of the Lloyd ranges from about 200 to an estimated 1,700 feet below sea level. The aquifer thickens from about 150 feet at Lloyd Neck in the northwestern part of the County to over 300 feet in the southeastern part of the County. Fresh water is obtained from most Lloyd wells in Suffolk, but only salt water has been pumped from Lloyd wells at Crane Neck Point on the northeast shore of Smithtown Bay (well S 91) and at Orient Point (well S 189). All water in the Lloyd sand in Suffolk County is under artesian pressure, and flowing wells may be expected along the north and south shores where the land surface is close to sea level.

Raritan formation—clay member

The clay member of the Raritan formation on Long Island typically consists of laminated silty and solid clays with subordinate sandy layers. Light and dark gray colored clays are most commonly observed, with beds of red, white, yellow, and mottled clays being less frequently reported. Layers of lignite and pyrite interbedded with carbonaceous clays are found throughout the member over the entire Island. Plant spores, leaves, and lignitized wood are abundant at various depths. These carbonaceous layers have not been traced horizontally for any great distance. Marine fossils have never been reported from the Raritan clay member.

The clay member covers the Lloyd sand throughout the Island except at the western end, where much post-Cretaceous erosion has occurred. Valleys formed during several cycles of erosions may have cut entirely through the clay in various parts of the Island, and thus possiby afford avenues for downward percolation of water to recharge the Lloyd sand member. Sandy layers within the clay member also probably assist downward movement of water through the clay member.

Clay member—Kings County: The limiting line of the Raritan clay member can only be roughly drawn in Kings County due to the lack of data and the uncertainty of the correlation of a number of deep wells in the Flatbush section of the County. The northwestern limit of the clay member appears to roughly parallel the limit of the overlying Magothy (?) formation but in some places it extends somewhat further to the north and northwest. In the southeastern portion of the County, the clay member overlies the Lloyd sand member whereas in a few places in northeastern Kings County, the clay member rests directly upon bedrock.

The irregularities of the contour lines shown on the accompanying contour map of the Raritan clay member, are due chiefly to the unusual erosional features which characterize the upper surface of the clay member. In northern Kings County accurate correlation of the clay member in well logs is obscured by the lithologic resemblance of the clay member to overlying Pleistocene clays.

In Kings County the clay member ranges in depth from about 60 feet at Greenpoint in northern Kings to about 500 feet below sea level in southeastern Kings County, and its thickness ranges from about 30 to 220 feet, increasing toward the south.

Clay member—Queens County: The clay member appears to underlie the entire County with the exception of parts of the northwestern section of the County, and in the vicinity of the mouth of Flushing Bay. Test borings in this area, at La Guardia Airfield, revealed glacial sands and clays resting directly upon bedrock.

The elevation of the upper surface of the clay member varies from about 25 feet above sea level in northern Queens County to about 600 feet below sea level at Far Rockaway. Its thickness ranges from about 30 to 300 feet, increasing toward the southeast.

Clay member—Nassau County: Except for scattered erosional irregularities in and around the north shore necks, the clay member extends throughout the remainder of Nassau County. It appears to be completely eroded beneath parts of Great Neck and the northern part of Manhasset Neck. These old erosional channels, now filled with younger permeable deposits, readily permit downward percolation of water into the underlying Lloyd sand. In at least one area, Port Washington, heavy pumping from Lloyd wells has caused an inflow of sea water through these old channels. Extensive buried valleys in the Raritan clay member may exist in other areas but available data is too meager to determine their existence, if they do exist. The top of the clay member ranges from about 16 feet above sea level at Great Neck to about 1,100 feet below sea level on the barrier beach in southeastern Nassau County, and its thickness ranges from about 60 feet to 300 feet.

Clay member—Suffolk County: Only a very limited amount of data concerning the clay member is available for Suffolk. Deep wells, which penetrate the clay, are confined to the northwestern corner of the County, two wells at Brookhaven National Laboratory in central Suffolk County, and two wells on the north fluke at the northeastern end of the Island. The top of the clay here ranges from about 100 to 1,400 feet below sea level. The thickness of the clay ranges from about 100 to 300 feet. The accompanying contour map of the top of the clay is of necessity highly generalized. It is quite conceivable that buried valleys which cut though the clay may exist in the County but well data is too meager to permit the identification of such features.

Magothy (?) formation

The beds included within this unit represent the uppermost Cretaceous deposits on Long Island. The application of the name Magothy to these beds originated largely through the work of some of the early investigators who believed that they represented a northeasterly thickening of the Magothy formation which crops out in New Jersey. The question mark following the term Magothy indicates the present uncertainty regarding the exact geologic age of the great thickness of sediments on Long Island included within the term. Inability to differentiate the unit at this time has greatly influenced the decision to continue the use of the questionable term Magothy (?) formation in this report.

The Magothy (?) deposits consist chiefly of fine clayey sands, fine sands, silts, layers of solid clays, and several coarse water-bearing zones composed of sand and gravel. The most commonly observed colors of the beds are light and dark gray, brown, buff, yellow, and occasionally some red and pink layers. The thickest and most extensive of the water-bearing zones occurs in the lower part of the Magothy (?) formation, just above the Raritan clay.

The Magothy (?) consists almost entirely of angular clear quartz and contains small amounts of chert, kaolin, partially kaolinized muscovite, and dark heavy minerals. The coarser beds commonly consist of subangular to rounded milky quartz pebbles. Lignitic material is a fairly common constituent of the deposits along the south shore. The lignite may be brown or black, may consist of tiny particles or large chunks in which the original fibrous structure of the wood is still very apparent. Pyrite or marcasite, a brassy, metallic-looking sulphide of iron is frequently associated with the lignitic material as scattered nodules or in thin solid layers.

The layers of solid clay in the Magothy (?) formation resemble those found in the Raritan clay member but are not as thick or as extensively distributed as in the latter.

In many places the upper part of the Magothy (?) formation is too fine in texture or too clayey in composition to yield large quantities of water, but thin water-bearing zones, 4 or 5 feet thick, are found at various depths and yield satisfactory amounts of water for domestic purposes.

Magothy (?) formation—Kings County: Less than 10 wells penetrate the Magothy (?) formation in the entire County and the limits and distribution of the formation are not clear. However, the small amount of data available indicates that the Magothy beds probably do not extend beyond an imaginary line, trending northeast-southwest roughly from Ridgewood to Fort Hamilton. The absence of the formation in the northwestern part of Kings may be the result of erosion, non-deposition or a combination of both. Within the franchise area of the old Flatbush plant of the New York Water Service Corporation, the Magothy beds have been almost entirely removed. Many of the present correlations indicate that glacial sands and clays rest directly upon the Raritan formation in that area. As far as is known none of the wells in Kings County that tap the Magothy are being operated at present.

The elevation of the upper surface ranges from about 180 feet to 245 feet below sea level. A maximum thickness of about 280 feet is attained in the southeastern part of the County.

Magothy (?) formation — Queens County: About three-quarters of Queens County is underlain by the Magothy (?) formation. In the northwestern part of the County where bedrock and the Raritan formation lie at shallow depths, the Magothy is not present. As shown on the accompanying contour map the most conspicuous topographic feature on the Magothy surface in Queens County, is a deep valley extending from southern Queens toward the northeastern part of the County.

The formation is tapped by many wells in Queens that are used for air-conditioning and public supply purposes. Most of these are situated in the southern and eastern part of the County. From an elevation of about 15 feet above sea level in northeastern Queens the surface of the Magothy drops to about 350 feet below sea level in the deep buried valley where it passes beneath the barrier beach in southern Queens. In the County, the formation ranges in thickness from about 30 to 400 feet.

Magothy (?) formation — Nassau County: All of Nassau County is underlain by the Magothy (?) formation except for a few small areas along the necks and bays on the north shore, where glacial erosion has removed these beds. The most important of these are situated at the northern tips of Great Neck and Manhasset Neck. In a few places along the north shore the Magothy (?) crops out at the land surface, but in many instances the beds have been badly disturbed by ice shove and show local arching and faulting of the beds. These outcrops have been described and mapped by Fuller (15).

A remnant of the original Cretaceous highland, often referred to as the "core of the Island", is represented by the hilly area in east-central Nassau County where the Magothy beds rise to at least 220 feet above sea level and are overlain by only a relatively thin mantle of glacial deposits. The buried surface of the Magothy slopes gently to the south and north from the highland area. Westward, it drops off rapidly to below sea level while to the east of the highland area it slopes gently to the east and remains above sea level for some distance into Suffolk County. Re-entrants in the surface of the Magothy along the north shore coincide approximately with the southerly extensions of existing valleys along the north shore, and suggest the former existence of larger and deeper embayments. Most of the north shore necks or peninsulas are underlain by cores of the Magothy lying at relatively high elevations. Deep buried valleys of the type and extent of those situated in Kings and Queens Counties do not appear to be present in southern Nassau County. The upper surface of the formation ranges from about 220 feet above sea level in east-central Nassau to about 150 feet below sea level at Long Beach. Its thickness ranges from about 60 to 800 feet. In many parts of Nassau County, where the Gardiners clay is missing, the upper beds of the Magothy are in contact with and closely connected hydrologically with the overlying beds of Upper Pleistocene age. As a result the ground water in the Magothy frequently exists under water-table conditions and does not exhibit artesian conditions common to the lower beds of the Magothy.

More wells have been drilled into the Magothy (?) formation in Nassau County than in any other part of Long Island. The coarse beds just above the Raritan clay are tapped by many public supply wells, particularly those for the principal south shore communities; as at Freeport, Rockville Center, Lynbrook, and Valley Stream. The increase in withdrawals by these rapidly growing communities may cause an inflow of sea water in the future as the salt water has already been drawn into the Magothy beneath the Long Beach area to the south.

Magothy (?) formation—Suffolk County: Except for the western part of the County, limited areas along the southern barrier beaches, and a small area in the vicinity of the Brookhaven National Laboratory in the central part of the County, little is known of the topography and depth of the upper surface of the Magothy (?) formation. Outside of these areas information as to the depth of the Magothy consists of widely scattered well logs which make it impossible to contour the surface beyond Lake Ronkonkoma, with any degree of certainty.

The high Cretaceous terrace which exists in eastern Nassau County continues eastward into Suffolk where at places such as in the West Hills area it rises more than 300 feet above sea level. East of the West Hills area, the surface of the Magothy descends gradually and lies below sea level in the eastern half of the County, except for the region near Port Jefferson. There, evidence from a few wells indicates that the Magothy surface rises somewhat above sea level in a small area. It seems probable that most of the high ground in the eastern part of Suffolk County consists of Upper Pleistocene rather than Cretaceous deposits.

Buried valleys of pre-Pleistocene age may exist in several places in the County but the details of these important buried features can only be brought out by a widespread program of test drilling. A suggestion of such a valley is indicated by the unusual thickness of the upper Pleistocene deposits in the Nissequogue River Valley near Smithtown. Along the south shore of Suffolk County, considerable doubt exists regarding the depth of the top of the Magothy. This situation is due primarily to lack of well samples. Because of the nature of the sediments the age of these deposits cannot be easily established from a study of well logs, but must be based on detailed microscopic studies of the mineral and fossil assemblages in the sediments in that area. Only well logs are now available.

In the western part of Suffolk County, many domestic wells draw water from thin coarse zones in the upper part of the Magothy (?) formation. Private companies seeking larger quantities of water for public supply purposes, generally have to drill wells several hundred feet or more in depth before a satisfactory zone is penetrated. A test well at Brookhaven National Laboratory showed that large supplies of fresh water are available from the lower part of the Magothy (?) formation in central Suffolk County.

The top of the buried Magothy surface ranges from about 300 feet above sea level in the West Hills to an unusual depth of 250 feet below sea level at one locality on the south fluke. The thickness of the Magothy increases from about 230 feet in northwestern Suffolk to about 1,000 feet in the southeastern part of the County.

Jameco gravel

The Jameco gravel is considered to be one of the earliest of the Pleistocene outwash deposits on Long Island. Some indications of an older deposit, the Mannetto gravel, have been observed in eastern Nassau and western Suffolk Counties. In other parts of Long Island, the Mannetto gravel was either never deposited or has been removed by later erosion. In this report, the Mannetto deposits are not recognized as a separate unit but if present have probably been included with later Pleistocene beds due to the difficulty in separating the gravels in well logs.

The Jameco gravel is most extensively distributed in Kings and Queens Counties and in a small area in southern Nassau County. The distribution and extent of the gravels in Suffolk County is at present not well known.

The Jameco either rests unconformably on the Cretaceous deposits or on bedrock in northwestern Kings County. In turn it is overlain by the Gardiners clay. The name Jameco was first introduced by A. C. Veatch (9), who applied it to the water-bearing sands beneath the Gardiners clay at the Jameco pumping station of the City of New York situated in southern Queens County. As typically developed in the western part of the Island, the Jameco deposits consist predominantly of dark brown, dark gray or multi-colored beds of coarse sand and gravel containing some cobbles, boulders, and scattered layers of silt and clay. In contrast to the Cretaceous deposits, the Jameco contains very little quartz and is composed chiefly of fragments of fresh granite, diabase, gneiss, schist, sandstone, shale, and pegmatite. It contains also grains of chemically unstable minerals such as felspar, amphibole, pyroxene, biotite, and chlorite. The pebbles and grains of the Jameco are usually well rounded and water worn. The composition of the deposits may vary somewhat from place to place depending on the source of the outwash material.

In the type locality at the western end of Long Island, the gravels lie 100 or more feet below sea level and are overlain by beds of Gardiners clay which confine the water in the Jameco gravels under artesian pressure. Numerous breaks or channels in the clay permit direct recharge of the Jameco from overlying deposits of Upper Pleistocene age. The formation has a gentle southward slope, and nowhere crops out at the land surface.

Jameco gravel—Kings County: The Jameco beds can be tapped by wells almost everywhere in the County except the northern and northwestern sections. The limits of the deposit are indicated on the accompanying contour map of the Jameco. Its thickness ranges from about 50 to 150 feet. The thickest beds occur as valley fill deposits in deep pre-glacial valleys which cross the county from northeast to southwest. The elevation of the upper surface of the Jameco ranges from about 100 to more than 200 feet below sea level. The aquifer has, in the past, been an important source of water for public supply in the Flatbush section of Kings County. Heavy pumping caused gradual encroachment of sea water. The resultant contamination of the aquifer necessitated complete abandonment in 1947 of all the remaining public supply wells in Kings County.

At the present time only a few industrial wells draw water from the Jameco gravels in Kings County. The aquifer may take on renewed importance as a source of ground water for cooling purposes if the water temperature of the upper Pleistocene deposits continues to rise due to excessive recharge of warm water from recharge wells.

Jameco gravel—Queens County: The area in which the Jameco is developed to the greatest degree lies in the southern part of Queens. Except for a few isolated remnants the Jameco is absent in the northwestern part of the County. The top of the Jameco ranges from about 80 to 250 feet below sea level. It lies at greatest depths in the vicinity of Rockaway Beach in southern Queens. The thickness of the Jameco ranges from 30 to 150 feet, being thickest where it fills pre-Pleistocene valleys.

The irrgularities of the upper surface of the Jameco, as shown on the accompanying contour map, suggest that some erosion of the Jameco surface may have taken place before deposition of the overlying Gardiners clay. The aquifer is tapped in southern Queens County by many public supply wells. Intrusion of salt water from Jamaica Bay has caused abandonment of some of these Jameco wells which are situated near the northern shore of Jamaica Bay. However, the Jameco wells to the north, though heavily pumped, still yield fresh water. Records from water stage recorders operated by the Geological Survey indicate that pumping of wells screened in the Jameco formation in southern Queens causes a widespread drawdown of the piezometric surface, and that the pumping wells mutually interfere with one another.

Jameco gravel—Nassau County: The Jameco gravel has been indentified in Nassau County with certainty only in a narrow fringing area along the south shore. There, the deposits range in thickness from about 25 to 4 feet and are relatively unimportant hydrologically in Nassau County. There are deep lying outwash deposits in the north shore embayment which resemble both the Jameco and the Upper Pleistocene. However, as they are discontinuous and are not covered by Gardiners clay, it seems more appropriate to place them in the Upper Pleistocene.

Jameco gravel—Suffolk County: The meager data available at present indicates that no extensive beds of Jameco gravels lie beneath the south shores of the County. The deep lying glacial gravels in the north shore embayments, although they resemble somewhat the Jameco, have been correlated as Upper Pleistocene deposits because they appear to be more closely related to the local beds of Upper Pleistocene than to the deep Jameco gravels of Kings and Queens Counties. Early investigators tentatively classified certain gravel beds in the eastern and northern parts of Suffolk County as part of the Jameco formation. Folding caused by the thrust of the Pleistocene ice sheets has so obscured true stratigraphic relations that certain identification of the beds cannot be made. However, as along the south shore, these gravels are hydrologically unimportant.

Gardiners clay

A sharp lithologic change from gravel to clay marks the contact between the subaerial outwash deposits known as the Jameco gravel and the overlying Gardiners clay, a marine interglacial formation. The clays contain warm water fauna and were probably deposited under conditions similar to those which prevail in the bays along the south shore of Long Island at the present time.

The Gardiners normally consists of a dark gray or greenish gray silty clay containing woody material, diatoms, foraminifera, and fragments of larger shells; chiefly pelecypods and gastropods. In some places, the Gardiners may consist of fine sand, sandy clay, and scattered discontinuous lenses of coarse sands; 5 or 10 feet thick. The minerals in the sand residues consist of angular quartz, biotite, chlorite, muscovite, amphibole, and pyroxene. It may also contain glauconite in varying amounts. This mineral may have been derived from the reworking of Tertiary or Cretaceous beds which in places contain glauconite.

The Gardiners clay is the only formation on Long Island which can now be traced from place to place on the basis of fossil content. Even this procedure is rendered difficult by virtue of the fact that much of the fauna resembles or is identical to existing types. The Gardiners clay is not everywhere fossiliferous. The amount of fossil material present varies from rare to abundant in different localities indicating local variations in depth of water and environment.

Sea level in Gardiners time was at least 50 feet lower than the present level and no beds of Gardiners clay are known to occur above this depth except where they have been pushed up by folding due to the movement of Upper Pleistocene ice sheets.

Gardiners clay—Kings County: The accompanying contour map of the formation shows that the Gardiners clay underlies all of the County except a narrow belt along the East River and Newtown Creek in the northern part of the County. In these areas it is believed that the clay was eroded in some places and in other places was never deposited.

Correlation of the formation in the Williamsburgh and Greenpoint sections has been hampered by the presence of clays geologically younger than the Gardiners clay, and the dissection of the Gardiners surface which in some places has left the formation as an outlier surrounded and overlain by younger glacial deposits.

The formation has a gentle slope southward and its upper surface ranges from 50 to 180 feet below sea level. Its normal thickness is about 50 feet, but in the northern parts of Kings County, where the unit rests on bedrock, it is generally only about 10 feet thick. In the buried valleys in the central part of the County it may in places have a thickness of nearly 100 feet.

In some places the formation consists chiefly of sand and probably does not provide a very tight seal over the underlying Jameco gravel. This enables recharge of the Jameco to take place and also results locally in the occurrence of water table conditions in the Jameco formation which normally is under artesian pressure.

Gardiners clay—Queens County: The Gardiners is readily identified in the southern half of the County, where it overlies the Jameco gravels. Near the central part of the County the Gardiners clay overlaps the Jameco and rests directly on the Magothy (?) formation. In the vicinity of Newtown Creek in the northwest part of the County, the Gardiners lies directly on the Raritan clay member, or bedrock. The presence of younger clays in this area hampers geologic correlation as it does in Kings County. In the northern embayments a depth criterion alone is not enough to identify the clay since it is known that Upper Pleistocene valley fill deposits extend in places to a depth of as much as 100 feet below sea level.

The upper surface of the Gardiners, which has been considerably eroded in places, ranges from 50 to 200 feet below sea level. Its thickness ranges from about 10 feet to 150 feet, the latter representing an unusual thickness observed in a well located in a buried Pleistocene valley in the southeastern part of Queens County.

Gardiners clay—Nassau County: The Gardiners clay extends from southern Queens into the southern part of Nassau County, appearing as a fringing deposit beneath the south shore areas of Nassau County. It overlaps the Jameco and in its northernmost extension rests directly on the Magothy (?) formation.

The upper surface of the Gardiners clay dips gently to the south and ranges from about 40 to 100 feet below sea level. It ranges from about 20 feet to 60 feet in thickness.

Gardiners clay—Suffolk County: Very little is known of the occurrence and distribution of the Gardiners clay in Suffolk County. There are several reasons for this situation. Primarily, there are broad areas in the County which are devoid of information. Secondly, certain clay beds at the eastern end of the Island which were correlated as Gardiners clay by earlier investigators have been folded by ice shove and pushed up above sea level so that their stratigraphic relationship to the deep-lying Pleistocene clays in western Long Island is somewhat obscure. Finally, the superposition of lithologically similar beds of different geologic age beneath the south shore of the County has made a clear cut separation of the upper 200 feet of sediments in that area very difficult. These beds consist in part of fossiliferous glauconitic clays that have been classified by different investigators as Gardiners clay, as part of the Magothy (?) formation, and even as Tertiary beds. Both Veatch and Fuller (9) (15) considered that the northern limit of the Tertiary formations lay to the south of Long Island.

The age of these deposits apparently cannot be determined by a superficial examination of well samples, but requires detailed micropaleontologic studies of samples from many wells.

The available data suggests that the Gardiners clay probably underlies the entire south shore of the County and extends inland in the eastern part of the County for an unknown distance. At Brookhaven National Laboratory in the central part of the County where the clay has been detected in some core samples from test wells. In the western part of the

County the clay extends inland a short distance and wedges out over the rising Cretaceous highland. In the Peconic River valley near Riverhead in eastern Suffolk County, the thick clays reported in driller's logs have been correlated as Upper Pleistocene valley filling deposits but some of these clays may actually be of Gardiners age.

The surface of the Gardiners clay lies about 65 feet below sea level at the Brookhaven National Laboratory and about 100 feet below sea level in the shore areas to the south. At Gardiners Island, the Gardiners clay has been folded and lies above sea level. Its thickness is quite variable. It is only about 10 feet thick in some wells at the Brookhaven Laboratory and may be up to 50 feet thick along the south shore. The maximum thickness is unknown since the south shore beds have not been satisfactorily correlated.

An unusual depth for the Gardiners clay is indicated at well S 184 near Sag Harbor in the southeastern part of Suffolk County. At that locality, Lohman (33) has identified Pleistocene diatoms at a depth of about 260 feet below sea level.

Upper Pleistocene deposits

The remaining glacial deposits not assigned to one of the previously described Pleistocene formations are referred to in this report as upper Pleistocene. It includes the Manhasset formation which Fuller (15) correlated with the Illinoian stage of the Pleistocene glaciation; and the till, terminal moraines, and outwash deposits of Wisconsin stage. (9) (15).

A wide variety of materials is found in the upper Pleistocene of Long Island. The deposits include beds of fine to coarse stratified sand and gravel, boulder clays or tills consisting of unstratified mixtures of clay and boulders, and some fresh water lake deposits composed of silt and clay. The upper Pleistocene consists of a heterogeneous mixture of rock fragments of all types, quartz, biotite, muscovite, amphibole, pyroxene, feldspar, and limonite. The outwash deposits in Nassau and Suffolk Counties are frequently low in rock and mineral particles and consist chiefly of yellow-stained and clear quartz. The clayey till deposits are best developed in northern Kings and Queens Counties where the imperviousness of the till occasionally requires drilling into bedrock to obtain water. The terminal moraine deposits composed of unstratified sand, boulders and clay, underlie most of the elevated areas of the Island. The youngest moraine, the Harbor Hill moraine, extends along the north shore to the eastern extremity of the north fluke. The older Ronkonkoma moraine forms a ridge across the central part of the Island and extends to the eastern end of the south fluke. The outwash deposits are best developed south of the Ronkonkoma moraine but also occur in the area between the moraines particularly in Suffolk County.

The upper Pleistocene deposits are commonly thickest beneath the moraines. They may be as much as 200 feet thick in Kings and Queens Counties, and probably attain a thickness of about 300 feet in Suffolk County beneath the highest points of the Ronkonkoma moraine. The thickness of the Upper Pleistocene deposits is considerably less than the figures mentioned above in those parts of Nassau and Suffolk Counties underlain by a core of high Cretaceous deposits. The upper Pleistocene deposits extend to a depth of about 150 feet below sea level in parts of Kings County and may occur at greater depth in some of the north shore embayments.

Most of the wells drilled on Long Island are screened in the upper Pleistocene deposits where unconfined water table conditions exist except locally where clayey till deposits support perched water tables.

Recent deposits consisting of beach sands, river and bay silts, and muds are included in the Correlation Tables under the heading, "Recent and Upper Pleistocene deposits". These deposits are not very thick in most places and for that reason are not classified separately. These recent bods of clays and silts help to protect the underlying permeable deposits from the encroachment of salt water which completely surrounds the entire Island.

GEOLOGIC HISTORY OF LONG ISLAND

Wallace de Laguna
Geologist

CONTENTS

INTRODUCTION

In order to understand the complex interrelation of the geologic and hydrologic units found on Long Island it is essential to understand clearly the geologic history of the Island and the manner in which the events of that history determined the physical make-up of the various units and their present distribution underground. This comprehensive viewpoint is required both to interpret the data obtained from individual wells and other underground borings, and to provide a basis for comparison from well to well.

The geologic history however must for the most part be based on and derived from the same well records which one is also called on to interpret. For this reason the advantages of an historical analysis becomes greater as more and more well records are made available for study. In areas where wells are far apart, or where the data available are either lacking in detail or are unreliable, little can be deduced as to the history of the area and a clarification of the record is not possible. Where more information is available, a more nearly complete history may be established, and this in turn may then be used to interpret new data, or to predict the underground conditions in advance of drilling. Considerable judgment is required therefore in interpreting the record, for a premature decision as to the history of an area, that is one which is in error because it is based on inadequate data, will result in an incorrect evaluation and analysis of later information obtained in that area, thus compounding the error and concealing the truth.

In the following history of the geology of Long Island an attempt is therefore made to distinguish between well established events from which deductions may safely be made, and theories which although they serve to suggest answers to many of the problems are themselves problems, the solution of which requires the critical evaluation of data which are not yet available. Unfortunately, well established events are few in number.

The geologic history up to the beginning of Cretaceous time is important for only two facts, (1) the bedrock over a wide area had been worn down to a nearly level surface, and (2) contained two long narrow patches of diabase. One of these now forms the Palisades of New Jersey, while the other forms East Rock and West Rock at New Haven, and continues north to and along the valley of the Connecticut River. Since the Palisades strip must have supplied the diabase found so abundantly in the Pleistocene Jameco gravel, there is a suggestion that the Jameco gravel was formed by a stream which had followed the Hudson Valley, and that the Jameco gravel may have been deposited only in the western part of the Island.

The Cretaceous history is one of deposition on the rock floor mentioned above. The Lloyd sand and the clay member of the Raritan formation resemble the corresponding beds in New Jersey, but the overlying formations, the so-called Magothy sands, are not comparable. The Long Island Cretaceous deposits appear to be fluvial rather than marine, and individual beds can be traced for only short distances. The important hydrologic problems are the hydraulic interconnection between aquifers, the method by which ground-water descends from the Pleistocene water-table beds to recharge the artesian Magothy formation, and in particular the pattern of flow through the Raritan clay into the underlying Lloyd sand. What little is known of the geologic history of this period suggests alternative answers to these questions.

There are no records of early Tertiary events on Long Island. As far as we know, the late Tertiary and the early part of the Pleistocene were dominantly periods of erosion. A great deal of material was eroded and removed, but virtually nothing is known of the erosional pattern developed. There may be buried valleys dating from this period in almost any part of the Island, although the possibility of Long Island Sound having once drained westward now seems to be ruled out by well records. But because these buried valleys may exist is no reason for assuming that they do, and all of the known facts, including the overdeepening of Long Island Sound, can be explained without them. These buried valleys, if they existed, would be of considerable importance to the water supply of Long Island.

During the Pleistocene we know, from records in other parts of the country, that the continental ice sheet advanced four separate times, but it is not certain that the ice reached as far south as Long Island on each of these occasions. There are records of three widely separated advances, the Manneto, the Jameco, and the three here presumed Wisconsin fluctuations represented by the Montauk, the Ronkonkoma moraine, and the Harbor Hill moraine. For each of these ice advances there must have been a drop in sea level and local erosion, as well as the more obvious deposition of moraine and outwash. For each of the interglacial periods there must have been a corresponding high sea level and presumably interglacial deposition.

The actual record however is very fragmentary. The only interglacial deposit so far identified is the Gardiners clay, of importance hydrologically because over wide areas it forms the bottom of the water table aquifer, and locally seals underlying sands and gravels, particularly the Jameco gravel in Brooklyn.

The rest of the glacial deposits however, except for the Jameco gravel, act as one hydrologic unit, and the deciphering of the history of late Pleistocene and advances and retreats of the ice offers little hope of contributing materially to our understanding of the hydraulics of ground-water resources of the Island.

GEOLOGIC HISTORY OF THE BEDROCK

Most of the bedrock which underlies Long Island is of pre-Cambrian age, to science. Little is lost to us however from our lack of knowledge of these most distant ages, for these rocks are all of low permeability and are not important sources of well water on Long Island. We can properly start our history perhaps a billion years later when in Permian time and in the early part of Triassic time, the previously mountainous surface of the land was slowly worn away until it was a flat or gently undulating plain, at or near the sea level of that time. This slow erosion effectively removed all traces of earlier mountains or valleys.

The next major geologic event, which took place a short time later, was the formation of the Triassic red beds and trap rock of New Jersey and Connecticut. The deposition of these sediments and the formation of the related igneous rocks was preceded by a cracking of the crust of the earth on a magnificent scale, the zone of fractures running from the Bay of Fundy south to the Carolinas. Two fracture zones of this group are important to the geologic history of Long Island. One of these ran north from New Haven and formed the east side of what is now the Connecticut Valley, the other ran southwest through the north-central part of New Jersey along a line marked roughly by Trenton and Bayonne.

A large block of the crust of the earth, bounded in part by these two fracture zones, slowly sank during the later part of the Triassic period and formed an immense depression. Into this trough, as it was formed, was swept layer after layer of mud, silt, sand and gravel, which for reasons that have never been entirely explained, are now largely bright brick-red in color. While these materials were being deposited by running water, layers of rock were also formed by intermittant outpourings of molten lava. Some of this lava reached the land surface and spread out in great sheets, and some of it was forced between the recently formed beds of clay and sand, far beneath the surface. This lava hardened into the strong brittle black trap rock which now forms the Palisades, the Watchung Mountains of New Jersey, and some of the ridges in the Connecticut Valley.

As this huge trough filled up with sediments and lava it sank still farther and it was not until near the close of Triassic time, that the deposition and the sinking stopped. Earth forces were then released which compressed the trough and arched up the beds within it. At the same time the crust beneath all or most of the eastern part of the United States was also raised, although there is little evidence that it was folded or crushed. Then began another long period of slow wearing down of the land surface until, some millions of years later, it had once more been reduced to a nearly level featureless plain at or near sea level. This plain has been named the Fall Zone peneplain.

The slow erosion which formed the Fall Zone peneplain extended through approximately all of the Jurassic period into the early part of the next time interval, the Cretaceous period. This protracted wearing down of the land removed a large part of the Triassic red beds and trap as well as vast amounts of the older bedrock. The products of this erosion were carried far from their source and their final resting place has not yet been discovered. It is possible that they are now covered by the ocean. Remnants of the Triassic rocks are now found on the west bank of the Hudson River in New Jersey, and in a long belt running north from New Haven, Connecticut. These two patches, large as they are, are all that remains of a much more extensive body of similar material. There is every reason in fact to believe that the Triassic rocks once covered all of the area that is now Long Island. It is not known whether they were entirely removed from this area during the formation of the Fall Zone peneplain, and it is possible that the belt of Triassic rocks exposed at New Haven passes under the Sound and underlies central Long Island in the area between Port Jefferson and Riverhead in Suffolk County. Granite gneiss however was encountered by test wells drilled at the Brookhaven National Laboratory at Upton in central Suffolk County. The presence of Triassic rock, either red beds or trap, would have no direct influence on the ground-water resources of Long Island for these rocks are not highly permeable. Of more importance is the present distribution of the two Triassic remnants mentioned above, for, as explained below, they provide a clue to the origin of the Jameco gravel, an important Pleistocene aquifer.

While the history of the Triassic rocks themselves has only an indirect bearing on the hydrologic regimen of Long Island, the Fall Zone peneplain is a factor of much importance since it is the foundation on which was deposited the younger water-bearing formations. It was, as stated above, slowly worn down to a nearly level surface by the action of rain, frost, and running water during what must have been a very long time. At the end of this process, low hills rose above the general plain to a height of roughly a hundred feet. Through the slow attack of percolating ground water, chemical decomposition of the bedrock was probably extended a hundred feet or so below the surface and over wide areas left nothing but quartz and clay in the upper layers. We know nothing now of the pattern of hills or valleys which may have existed at that time, nor of the factors which controlled the depth of the chemical attack. We do know fairly well the general position of the buried bedrock surface for drilling operations today strike bedrock usually within 50 feet of its predicted position.

One of the most important chapters in the history of Long Island geology began in the middle of Cretaceous time, when the previously nearly level surface of the Fall Zone peneplain was slowly and gently tipped toward the southeast. This was part of a slow gentle arching of the earth's crust which extended north and south along the eastern part of North America. The center line of this arch runs roughly along the crest of the Appalachian Mountains, and in fact it was this arching which gave them their present elevation.

The area which is now Long Island was well out on the flank of this arch, so that it was tipped away from the center of the uplift and was lowered rather than raised with respect to sea level. The upraised part of the peneplain to the north and west was quickly attacked by erosion and such streams and rivers as drained the area flowed more rapidly down the newly created slopes to the sea than they had for many millions of years. The sediments which they carried were deposited as the rivers reached the sea, and also on the outer margins of the land where the slopes were gentler than they were near the center of the uplift. The area that is now Long Island was near the strand line, sometimes above sea level, sometimes below it, but for the most part it was in a zone of deposition, and hundreds of feet of gravel, sand, and clay accumulated there during the next few million years. These are the Cretaceous sediments, named for the geologic period during which they were deposited. The material of which they are composed was derived by the erosion of uplifted portions of the Fall Zone peneplain to the north and west, and the bedrock surface on which they rest is the Fall Zone peneplain itself.

THE CRETACEOUS SEDIMENTS

The composition of the Cretaceous sediments tells something of the nature of the Fall Zone peneplain and of the conditions of deposition. The sediments contain, in important amounts, only clay, quartz and muscovite (white mica). The other minerals such as feldspar, hornblende and biotite (black mica) which were present in the source rock, are not found in the Cretaceous sediments, showing that they had been chemically decomposed by long continued exposure to warmth and moisture. The products of such decomposition are soluble salts, which were no doubt carried away in solution to add their contribution to the salinity of the sea, and clay which is inert and lags behind. This was without question the origin of the clay which forms so large a part of the Cretaceous deposits. The evidence indicates such wide spread and complete decomposition of the bedrock that it seems probable that climatic conditions in the Cretaceous resembled the moister parts of the tropics of today where in areas like the Congo and New Guinea, all the rocks, over wide areas, have been decomposed to great depths.

There are reasons for believing that the material forming the Cretaceous sediments was not transported any great distance. In the first place the divide along the crest of the uparching was not more than 300 miles to the north or west of Long Island. The headwaters of the streams which transported the sediments were situated near this divide. Another reason is the lack of sorting shown by most of the Cretaceous deposits. The beds of sand and gravel contain a large proportion of clay, and many, though not all of the clay beds contain streaks of silt, sand or even gravel. Running water efficiently separates and sorts the material it carries, as shown by the presence of thick beds of pure clay or pure sand in many parts of the world. Thus the presence of the two intermixed in beds totaling many hundreds of feet suggests that the water which deposited them did not travel very far. This intermixing also indicates that the beds were not reworked after deposition, either by the sea or by the streams which deposited them.

There is little evidence available to show whether the beds were deposited in the sea, in bays or similar sheltered water, or on low lying river flood plains. Very few fossils have been uncovered in the Cretaceous sediments on Long Island, particularly of the type which would indicate clearly conditions at the time of deposition.

In all probability the Cretaceous beds were formed along the rather indefinite boundary zone between a low-lying and swampy shore and a coast studded with shallow bays and islands. Rivers from the slightly higher land to the north washed in mud, sand, and some gravel which tended to fill in some of the lakes and swamps on the land and some of the bays and shallow water of the ocean. In New Jersey, where the Cretaceous beds crop out and the opportunity for study is better than on Long Island, the Raritan formation is regarded as a terrestrial deposit whereas the Magothy beds are regarded as marine deposits. The intermingling of clay, sand and gravel, observed in the Magothy beneath Long Island suggests that here also it may be terrestrial. None of the Cretaceous layers show the continuity of structure or composition that characterize most marine sediments, and most marine sediments of Cretaceous age contain abundant fossils.

This lack of continuity in the Cretaceous beds is of considerable importance hydrologically. In the first place it is not possible to predict in advance at what depth water will be available, nor in what quantity. It also increases the uncertainty as to the quality of the water, and makes it much more difficult to determine the safe yield of any well, or the danger of salt water intrusion into a well field. By and large it is necessary to treat the Magothy as a single hydrologic unit since the occurrence and movement of water in it is not known in any detail, except very locally. A better idea of its mode of origin would make possible a far better understanding of many of its hydrologic problems.

The oldest of the Cretaceous deposits on Long Island is the Lloyd sand member of the Raritan formation. How long a time was required for its deposition is not known, but the coarse sand and pebbles which form much of the Lloyd suggest fairly rapid deposition by swiftly moving streams or currents. However, conditions were not entirely constant throughout its formation, for there are locally one, two or more layers of clay interbedded with the layers of sand and gravel. These changes in the nature of the material deposited were probably not caused by changes in sea level. It is more likely that they were the result of shifts in the positions of the streams which deposited the sediments, and the clay beds may therefore be local in extent rather than regional. That they are indeed not extensive is shown by the fact that the withdrawal of water from one bed of the Lloyd sand causes a lowering of the water pressure in all the other beds of the Lloyd regardless of any intervening layers of clay. In other words the Lloyd sand in some places at least is hydrologically a unit.

One consistent variation shown by the Lloyd is an increase in its thickness from northwest to southeast. This increase in thickness down the dip is characteristic of all the Cretaceous deposits along the Atlantic coastal plain.

The generally eastward tilting of the Fall Zone peneplain away from the axis of uplift lowered the outer parts of the peneplain more than the inner, and there was consequently a greater accumulation of sediment in those areas which sank the most. As any one unit is traced inland, it becomes thinner until it finally wedges out. The next overlying unit however overlaps the preceding one and extends still further inland, showing that the sinking of the outer portions of the peneplain was not a simple single movement, which took place in a limited time, and then was over and done with. Rather it was a very slow but generally steady process, in which, as the geologist commonly finds, sinking more or less kept pace with deposition.

The original landward limit of the Lloyd sand member of the Raritan formation is suggested by its apparent wedging out in central Kings and Queens Counties. Following the general pattern of Cretaceous deposition, the clay member of the Raritan, which overlies the Lloyd sand, overlapped the Lloyd and reached an unknown distance farther north. The still higher so-called Magothy formation probably extended still farther inland than the clay member of the Raritan. However, subsequent erosion of both the Magothy and the Raritan clay has removed so much material that their northern limit today, in a general way, is the northern shore of Long Island.

Presumably if the lower contact of the Lloyd sand were followed down the dip far enough to the southeast another group of Cretaceous beds older than the Lloyd would appear between the Lloyd sand and the bedrock. These pre-Lloyd beds have not been found in any of the wells drilled on Long Island. There is, however, a slight chance that older Cretaceous beds exist beneath the Lloyd in south central Suffolk County.

In the western half of Long Island, where the Lloyd has been explored by many wells and test holes, it has been found to be comparatively uniform. From this evidence alone one might suppose that it extended with little change under the eastern half of the Island as well. The Orient Beach State Park well, (S 189), the one well which has penetrated the Lloyd in eastern Suffolk County, and for which a reliable log is available, shows conditions however which are unique. Bedrock, here deeply weathered, is overlain by only 14 feet of sand and gravel. Above this is 50 feet of nearly solid clay, and above this 50 feet more of clayey sand with but a little gravel. On top of this lies 100 feet or so of clay which, without doubt, belongs to the clay member of the Raritan formation. The Lloyd sand in this well may be represented by the bottom 14 feet and no more. A second interpretation would place the next-overlying 100 feet of clay and clayey sand also in the Lloyd. This seems the more reasonable interpretation of the two, since, along the strike, variations in the type of material present in the deposits seem to be more marked than variations in their thickness.

The two deep wells drilled at Brookhaven National Laboratory in central Suffolk County penetrated about 250 feet of mixed and interbedded sand, gravel and clay which in this area make up the Lloyd sand. This material resembles that in the type locality more closely than it does that found at Orient Point, but is in a sense intermediate between them. It contains more clay, both as separate beds, and intermixed with the sand and gravel, than is found in western Long Island, but less clay than was found at Orient Beach. The second Brookhaven well, although gravel packed and carefully developed, yielded relatively little water, about one third as much as has been obtained from similar Lloyd wells farther west in Nassau County.

These are not enough data to give a clear picture of the underground conditions, and so, lacking the facts, no reliable historical interpretation can be made. Speculation however suggests that the Lloyd sand was deposited by a river which followed roughly the course of the present Hudson River. The shore line then was some distance to the south and east of its present location, and the Lloyd sand was deposited above sea level on the coastal plains of that time. Such a deposit would be coarser and would contain less clay near the principal channel of the stream. If this were the case then the poor water yielding qualities of the Lloyd observed at Orient Beach and at Brookhaven are not due to local variations in texture, but are representative of the eastern half of Long Island.

The Lloyd sand grades upward into the Raritan clay. The change may possibly be due to a shift in the relative heights of sea and land, but the plant fossils in the clay, which suggest strongly that this too was deposited on land,—or at least not in the sea itself,—would rule out the actual invasion of the area by the sea. More likely then would be a change in the carrying power of the streams, or a change in the material available to them for transportation. Possible causes of the former would be a decrease in average rainfall or in the intensity of storms, a tilting of the land, or a slight down-folding of the broad arch whose formation had initiated this erosion cycle. W. O. Crosby (11) felt that all, or at least most of the changes in grain size, from clay to sand to gravel, and back again, were the result of changes in relative sea level. To this the present writer does not agree.

The Raritan clay itself ranges from 50 to 300 feet in thickness and is composed for the most part of tough, compact, banded clay of many colors but predominantly gray and red. It contains some sand layers and very locally, if the well logs are to be believed, a substantial proportion of sand. These variations in thickness and composition are important, since they affect very markedly the extent to which the clay member of the Raritan formation seals the Lloyd sand. This clay seal both tends to prevent water from percolating into the Lloyd from above and traps in it such water as it may contain. But the clay seal is far from perfect for water descends from the Magothy as is clearly shown by the shape of the piezometric surface of the water contained in the Lloyd. This surface follows closely the shape of the piezometric surface of the water in the Magothy and of the water table, except in areas where there is appreciable pumpage. Not enough detail is available however to define the chief areas of recharge, although much of it seems to take place in west-central Nassau and eastern Suffolk Counties.

The thickness of the clay member of the Raritan formation increases as the formation is traced down its dip to the southeast, but this thickening is very irregular. Part of this irregularity may be due to the difficulty of determining the contact between the clay and the Lloyd sand. As reported in most wells this contact is gradational but covers a very short vertical distance. In certain areas, however, there appear to be beds of sandy clay along the contact which are described as clay in some logs and as sand in others. Since the contact between the clay and the Lloyd is placed either above or below these sandy clays, depending on the emphasis given in their description, an artificial irregularity may be given to this contact, where perhaps none actually exists in nature.

Irregular or random variations in the position of the upper surface of the clay member of the Raritan formation occur where it is in contact with the so-called Magothy formation. On Long Island the contact may not be everywhere gradational and it is quite possible that there was a brief period of erosion following the deposition of the clay member of the Raritan. In New Jersey it is known that there was such an erosional interval, which suggests that following the deposition of the Raritan clay there was an uplift of the land. How great this uplift may have been, how long it lasted, and how deeply the underlying clay was eroded are so far matters of speculation. It is possible that during the erosional period streams locally cut completely through the clay member of the Raritan formation and that these old channels are now filled with Magothy sands which are directly in contact with the Lloyd sand. Permeable channels such as these would permit downward percolation of water into the Lloyd sand, and their existence has therefore an important bearing on the rate of recharge to the Lloyd sand, and also the shape of its piezometric surface.

The few logs which in the past have been interpreted as showing the Magothy formation in contact with the Lloyd are however now held subject to other interpretations. There is in fact not enough information at present to say how deeply the clay member of the Raritan formation was eroded, if at all. The greatest single difficulty is in placing the contact between the top of the clay and the Magothy beds. Not enough is known of the manner of the formation of the clay to indicate whether it might be expected to locally contain sandy beds in appreciable number, particularly in its upper part, or whether the Raritan-Magothy contact should properly always be placed on the upper surface of a considerable thickness of solid clay. In other words it is possible that in those places where the clay member of the Raritan formation is believed to be unusually thin or even lacking, that some of the overlying sandy clay belongs more properly to the Raritan formation, and not to the Magothy as has usually been assumed. In New Jersey, where the Raritan formation is extensively exposed at the land surface, the upper part is commonly sandy and it shows abrupt changes in composition, from layer to layer.

If the clay member of the Raritan formation was indeed formed in shallow fresh water or on flood plains, then abrupt variations from its normal composition of pure clay might be expected. The broad flats in which the clay was formed must have been crossed in places by the streams and rivers which supplied the clay and along these channels sandy clay and sand might well have been laid down. In fact, if the Raritan clay was indeed formed above sea level, as its content of fossil leaves seems to suggest, it is remarkable that it does not show even more variation in content than has been observed.

This uncertainty as to the history of the Raritan formation means that there are three possibilities, not mutually exclusive, by which water from the overlying formations could find its way into the Lloyd sand. The simplest perhaps would be by seeping directly through the clay itself. The Raritan clay has a low permeability but water may pass slowly through it, and, because of the large area underlain by the Lloyd, the total amount of such seepage would be considerable. A second possibility depends on the presence of areas in which the clay member of the Raritan contains sufficient sand to appreciably increase its permeability, and so make possible an easy movement of water into the Lloyd at these places. A third possibility, as explained above, depends on the suggestion that there may be valleys cut through the clay and now filled with sandy material of Magothy age. The answer to this important problem will have to agree with what is known of the geologic history of the Island and also with the hydrology of the Lloyd sand. Up to now not enough data are available to determine the relative importance of these three possibilities. The true picture, when it is determined, will have an important bearing on the proper development of the ground water contained in the Lloyd.

Following the presumed erosion of the upper surface of the Raritan clay the deposition of sediments was resumed. In New Jersey, the deposit which overlies the Raritan is called the Magothy formation, and the same name has been applied to the sands and clays which overlie the Raritan formation in Long Island. This correlation has not been verified and indeed is open to considerable question. In New Jersey, the Magothy formation has a thickness of 25 to 30 feet near the Delaware River which increases to about 175 feet near Raritan Bay 50 miles to the northeast. On Long Island, 50 miles farther to the northeast, the so-called Magothy formation has a measured thickness of nearly 1,000 feet even though the top of the formation has been subjected to erosion. It cannot now be said whether the great increase in thickness from a maximum of 175 feet in New Jersey to over 1,000 feet in Long Island represents an actual increase in the thickness of the Magothy formation or whether the tentative correlations on Long Island have through error included in the Magothy formation several younger beds.

The problem actually is more complex than this. The great majority of the Upper Cretaceous formations which overlie the Raritan in New Jersey are unquestionably marine. The beds contain marine fossils and glauconite, a mineral which is formed in the sea, characteristically at depths of several hundred feet, and in areas where other sediments are not being deposited. The individual formations in New Jersey can be traced over wide areas for the composition and other characteristics are fairly constant. In these respects the New Jersey material is so different from the so-called Magothy of Long Island, that it is doubtful if any attempt should be made to apply the same formational names in both areas. Certainly the conditions of deposition must have been very different. The Long Island material, lacking glauconite and the marine fossils, and showing marked variation in detail over short horizontal distances, may well be terrestrial rather than marine. Whatever its environment at the time of its deposition, its rate of formation was probably more rapid than that of the New Jersey material.

Little can be deduced concerning the details of the deposition of the so-called Magothy. In many places the lower part of the formation contains beds of very coarse sand or gravel, not unlike those of the Lloyd sand member of the Raritan. However, existing evidence suggests that these are not a continuous deposit for these beds are not encountered in all wells, and even in those in which sand and gravel are found the thickness and relative depth are not the same. In some areas there is a suggestion that the gravel lenses form a step-like series down the dip, each lens overlapping the lens to the south of it, in much the same manner that shingles overlap on a roof. Geologically this picture is logical for it duplicates in detail something of the pattern of overlap shown by the formations themselves. About the best that can be said is that there are extensive beds of coarse sand and gravel near the bottom of the Magothy and that this is therefore an important water producing horizon. As to the origin of the gravels little can be said except that the coarse material suggests a comparatively steep gradient and, at least from time to time, a rapid flow of water. The absence of all except the most resistant minerals suggests a deep weathering of the bedrock in the area supplying the materials deposited.

Above the lower horizons where coarse material is common, the Magothy formation shows no consistant composition or typical cross section. Locally there are thick beds of clay which can apparently be traced at most for a mile or so, only to lose their individuality and blend into the general succession of sand and clays. Such a pattern is more common in terrestrial than in marine deposits, but in any case reflects changes in the drainage pattern of the streams supplying the sediment and of the flow of water in those streams. In a gravel pit at Port Washington a clay filled stream channel a few hundred feet wide can actually be seen. Changes in composition between clay and sand do not always represent uplift or subsidence of the land, as has been argued by some of the earlier students of Long Island geology. The evidence available suggests a relatively slow but steady sinking of the area that is now Long Island during the entire period that the so-called Magothy formation was being deposited, with a continuous accumulation of sediment, although at very different rates at different places and at different times.

This brings to a close of what is known of the history of the formation of the Cretaceous beds on Long Island. At that time these beds reached well north of their present limit, possibly fifty miles or more although there is now little evidence on which to base such a figure. This did not bring to a close however the Cretaceous deposition in this area if one may judge by what is known of the geologic history of New Jersey, where several younger formations were laid down before the end of the period.

At the close of the Cretaceous the sea retreated from the area that is now Long Island, the land was upraised and probably gently tilted once more to the southeast, and some erosion took place. It has been suggested that the sea advanced again over the land several times during the Tertiary periods which followed, possibly even as far as the former limit of the Cretaceous seas but no definite record of such advances has been found.

TERTIARY HISTORY

During the latter part of the Tertiary, erosion became more important than deposition and vast amounts of material were removed from the Long Island area and surrounding areas. Sea level, at least during parts of this period, was somewhat lower than at present and the resulting erosion created for the first time the important characteristic topographic features of present-day Long Island. The depression which is now Long Island Sound was first formed at this time, probably as the valley of a large stream which drained out to the east, although this question is the subject of a controversy that will be discussed below.

Whatever the details may have been it is certain that the depression that now forms the Sound was located by the relative ease of erosion of the weathered bedrock which formed the surface of the Fall Zone peneplain and of the Lloyd sand. South of this depression, the more resistant massive clays which comprise the upper part of the Raritan formation formed the core of a line of hills the upper part of which was composed of the sands and clays of the Magothy formation. These hills, considering the lowered sea level of that time, must have risen 400 to 600 feet above the sea. The slope south from this line of hills was gentle and while undulating, was relatively smooth. The northern slope, down into the depression which is now the Sound, was steeper and was carved into a series of short steep straight valleys more or less parallel to one another. These valleys, altered to some extent by subsequent glacial scour and partly filled by debris left by the retreating ice sheets, now form the embayments of the north shore of Long Island.

The location and shape of these hills formed in the Tertiary must be judged from the position of the upper surface of the Cretaceous sediments as revealed in well records. In a general way this surface corresponds with the present topography, although the surface today is everywhere higher because of the blanket of glacial deposits which covers the older formations. In eastern Nassau and western Suffolk counties, the tops of the buried Tertiary hills are now encountered in well drilling at an elevation of about 200 feet above the present level of the sea. In these areas the present land surface lies about 300 feet or so above sea level. To the west, both the former and the present land surface are lower, so that in the central part of Nassau County the Cretaceous beds extend no higher than 50 to 60 feet above sea level. Along the western boundary of Nassau County, and in a relatively broad belt running west through the north-central part of Queens County, the surface of the Cretaceous is about at sea level and slopes off gently to the north and south. This surface merges with the surface of the bedrock in the vicinity of Astoria in northwestern Queens County, and cannot be traced beyond this point.

The configuration of the Cretaceous surface in northern Queens has been the subject of considerable speculation. It has been the opinion of a number of the early students of Long Island geology (9, 11, 15) that a river, the so-called Sound River, which eroded the depression now occupied by Long Island Sound, once flowed from east to west. In Northern Queens, somewhere in the vicinity of Bayside or Flushing, it is imagined to have turned south, passing through southwestern Queens or eastern Kings Counties and reaching the sea somewhere south of Jamaica Bay. The headwaters of the Sound River are believed to have included the Housatonic and probably also the Connecticut Rivers or the ancestors of these streams. The reasons for believing that this drainage turned west rather than east along the lowland that is now Long Island Sound are not strong. The Delaware, the Susquehanna and the Potomac Rivers have been deflected to the south and west where they cross the weak beds of the basal Cretaceous and the reasons advanced to explain this coincidence are used as arguments to show that the Sound River must have done likewise. Of more force in suggesting a drainage to the west have been the well records which reveal segments of buried valleys believed by some to be the former channel of the Sound River. In southern Kings County for example, a valley roughly half a mile wide and 75 to 100 feet deep has been found cut into the upper surface of the Cretaceous beds and another similar segment of a buried valley has been observed in south-central Queens.

The Cretaceous surface in these places is about 200 feet below sea level and the bottoms of the supposed valleys are about 100 feet deeper. There is however, no proof that these valleys ever carried the drainage of the Sound River. The valley segment in Kings County is poorly outlined even in the two or three miles near the center of the County where it is most clearly defined by well records. Attempts to trace it to the northeast into Queens County are blocked by a lack of data, and it is impossible to say whether it connects with the depression of Long Island Sound or not. However, available well records in the central and northern parts of Queens County do not show any valley in the Cretaceous surface reaching to 300 feet or so below sea level, but the spacing of the wells in this area is such that it is barely possible that the valley may exist, but has been missed by existing borings. This remote possibility is a poor reason for believing that a connecting link exists between the Sound, and either or both of the buried valley segments to the south. A simple explanation is that they were carved by drainage that originated on the exposed surface of the Cretaceous sediments at the same time that the Long Island Sound depression was being formed by eastward flowing streams. If this were the case the valleys would head at the former divide in north-central Queens County. The extent and distribution of these valleys is a matter of importance for they were later filled with beds of coarse sand and gravel, the Jameco gravel, and so form one of the important sources of water in western Long Island.

The data so far available do not yet permit a reconstruction of the drainage pattern developed in late Tertiary time and attempts to do so, based on present information, would probably fall into error. One or two generalizations however may be made. The southern slope of the buried late Tertiary surface in Nassau County and in much of Queens County is smooth or gently rolling, and has a gradient to the south of roughly 10 feet to the mile. Over wide areas the depth to this surface can be predicted to within 10 or 20 feet. The northern slope of the late Tertiary surface however was far more uneven and has a much steeper slope, its gradient being about 20 to 50 feet to the mile. Prediction of position of the upper surface of the Cretaceous is therefore less accurate in this area.

The late Tertiary surface slopes irregularly downward to the east from its high point near the Nassau-Suffolk County line, but the details of its shape cannot be closely shown as there are too few deep wells in this area. About at the site of the Brookhaven National Laboratory a central valley running east begins to take shape in the present surface and it is possible, although not likely, that this reflects the shape of the buried surface of the Cretaceous beds. This valley, which is now followed by the Peconic River and also, where drowned, forms Peconic Bay, may be due only to the deposition of the low ridges formed to the north and south of it by the Ronkonkoma and Harbor Hill moraines. Its presence gives the eastern end of the Island a markedly "drowned" appearance, but it does not necessarily indicate that the eastern end has been more deeply submerged than the western, or that the Island has tilted.

PLEISTOCENE HISTORY

The oldest Pleistocene formation on Long Island is the little known Mannetto gravel, which lies in the broad flat summit areas of the Mannetto and Wheatley hills and has been tentatively identified at lower elevations in some of the peninsulas of the north shore. These deposits resemble the coarser parts of the younger beds of Pleistocene glacial outwash except that they consist almost entirely of quartz sand and contain relatively few pebbles or boulders of gneiss or schist. These few erratics, though water worn and rounded, are in places all deeply weathered, so much so that most of them can be very easily broken and crumbled. Since these pebbles could not have been transported in this weak condition, they must have weathered in place, and the degree and depth of weathering possibly imply an age appreciably greater than beds of Jameco gravel. Existing evidence suggests strongly that the Mannetto is early or mid-Pleistocene in age but does not enable one to date it more exactly.

Most of the students of Long Island geology have classified the Mannetto as glacial outwash because it contains pebbles and small boulders of material other than quartz or chert. These are not present however in such amounts as to demand the work of ice. The bedding is well marked and the formation was certainly deposited by running water which had at times at least sufficient force to move cobbles as much as six inches in diameter. Most of the material however is sand and small pebbles and there is considerable clay and silt, particularly in the lower part of the formation. It contains no beds of till and if the material is a glacial deposit the ice sheet has left no unmistakeable record of its presence, although the deposits do resemble glacial outwash. If this is what they are then the ice sheet which supplied the water which formed them advanced to a line somewhere north of the north shore of Long Island but did not, as far as is known, reach Long Island itself. The depression which is now Long Island Sound probably existed at this time but may well not have been as deep as it is at present. Certainly there has been much erosion since the deposition of the Mannetto for the beds now found are but the remnants of a once much more extensive deposit. The original extent of the Mannetto is not known, and only a few poorly exposed patches of it have been found.

More progress has been made in the study of the glacial geology of New Jersey than has been possible on Long Island. Three separate periods of glaciation have been recognized there;

the Jerseyan, the Illinoian, and the Wisconsin. The till of Jerseyan age is very deeply weathered and only scattered remnants of it are left preserved on divides and on the crests of low hills much as are the remnants of the Mannetto. The Illinoian till is also deeply weathered though less so than the older Jerseyan. It also has been greatly eroded and only small remnants of the formation can now be identified. Beds of sand and gravel, the Bridgeton and Pensauken formations are in a sense associated with each of these tills but as they contain the remains of plants which grew in a warm climate they are regarded as interglacial rather than glacial deposits. These two formations are very similar to one another and both closely resemble the Mannetto in composition, degree of weathering, and in the physiographic position of their remnants. The Mannetto then may be related to either the Jerseyan or the so-called Illinoian glacial periods of New Jersey, but so few facts are available that no correlation is possible.

It is also possible that the Mannetto is a late Tertiary deposit and has no connection or relation to the Pleistocene ice sheets. This seems unlikely since none of the Tertiary deposits of New Jersey resembles the Mannetto. Far too little data on the Mannetto is yet available, to determine its origin, age, or present distribution. It is not possible to identify this formation in well records, or, as a rule in well samples, and it is even uncertain if the surface exposures that have been assigned to the Mannetto do indeed all represent material of the same age.

This very real uncertainty as to the age and distribution of the Mannetto raises of itself no ground water problem. Where the Mannetto is found it is not found in contact with the below and with upper Pleistocene outwash or till above. It is not found in contact with the Gardiners clay, the Jameco gravel, or the Jacob sand. Under these circumstances it is probably included with the upper Pleistocene in the correlation of well logs, a confusion which is of little direct importance since the sands and gravel of the Mannetto are hydrologically the equivalent of the greater part of the upper Pleistocene and form part of the same hydrologic unit. Indirectly the confusion is unfortunate for an accurate and detailed knowledge of the Mannetto would throw some light on the early Pleistocene history of Long Island, a history which is of great importance in the solution of the broader hydrologic problems.

The oldest of the undoubted Pleistocene formations on Long Island is the Jameco gravel which in the type area in south-central Queens County extends from about 135 to 250 feet below sea level. The formation is typically about 100 feet thick with its upper surface generally being about 100 feet below sea level. Nowhere does it crop out at the land surface. Locally, where it fills the buried valley segments in southern Kings and Queens Counties, it reaches more than 300 feet below sea level but such depths are uncommon.

The Jameco gravel underlies all of Kings County except for a belt, a mile or so wide, which parallels the East River. To the east it underlies southern but not central Queens and extends eastward into southern Nassau County. It may extend even farther east along the south shore of the Island but there is not enough data to determine the limit of the formation in this direction. On the northeast, the Jameco gravel probably extends to Flushing Bay in Queens County but how much farther east it may extend and whether it is present at all in northern Nassau and Suffolk Counties is uncertain. One difficulty in determining the boundaries of the Jameco along the north shore of Long Island results from the possibility of a change in its composition from west to east, and also from a break in the continuity of the deposits.

The Jameco gravel is easily traced through Kings and western Queens Counties for in this area it forms a continuous deposit and is overlain by a nearly unbroken blanket of Gardiners clay. In this area also the Jameco gravel contains a large proportion of grains, pebbles, and cobbles of dark diabase (trap) rock similar to that which forms the Palisades of New Jersey. This high proportion of dark rock gives the entire formation a dark color, a characteristic that is readily noted in many well logs. This distinctive composition gives added assurance that in western-most Long Island, the gravels which have been assigned to the Jameco do indeed all belong to the same formation. To the east the proportion of diabase apparently decreases and the formation loses this identifying characteristic.

Along the north shore a second hindrance to the identification of the Jameco gravel is that it would be found only in discontinuous patches because of the very uneven surface of the Cretaceous beds on which it would rest. The Cretaceous surface beneath the peninsulas along the north shore is close to or above sea level, so that the Jameco, which is hardly to be expected at levels higher than 70 or 80 feet below sea level, would only be found underlying the north shore embayments. Gravels which may be of Jameco age do indeed underlie parts of these embayments but as they are isolated pockets lacking continuity with the type area and have no characteristics which can serve to definitely distinguish them from more recent glacial deposits, their true age is uncertain.

Earlier reports of studies of the Jameco gravel state or imply that it is older than Wisconsin and most estimates place it as older than Illinoian. If one accepts the correlations and descriptions of the pre-Wisconsin glacial deposits of New Jersey where the opportunities to study material of this age are better than they are on Long Island, than the freshness and lack of weathering of the Jameco represents a real problem. The pebbles and mineral and rock grains which it contains are universally described as fresh or only slightly weathered. The Illinoian of New Jersey is described as deeply weathered and the older Jerseyan is even more so. These glacial deposits however are all at or near the surface and are generally above the water table, whereas on Long Island the Jameco gravel is entirely below the water table where it has been subjected to a slower rate of weathering. Whether this difference in location is responsible for the striking difference in weathering it is impossible to say but there is a possibility at least that the Jameco gravel is very much younger than has been commonly believed.

That the Jameco gravel is of glacial origin need not perhaps be questioned but neither has it been proved. The high proportion of boulders of fresh igneous and metemorphic rock points to a rapid and dominantly mechanical attack on the bedrock, which, in an area of moderate relief, suggests the action of frost or glacial ice, but glacial outwash is not the only type of deposit formed of gravel which has been but little weathered. The high proportion of diabase in the formation suggests that the source of at least a large part of the material was to the northwest along the present west bank of the Hudson River. Although it is true that the diabase once was found to the north of Long Island all the way from its present exposures on the Hudson to its present outcrops at New Haven nevertheless by the time the Jameco was formed erosion had reduced the diabase to about its present extent and the source of the diabase in the Jameco must therefore have been in the area that is now New Jersey.

Although the last ice sheet, and therefore presumably the earlier ones, moved in a direction a little east of south, and so might have carried in some material from the west side of the Hudson, the fact is that diabase is not a major constituent of the post-Jameco tills and outwash in western Long Island. The origin of the Jameco gravel in western Long Island then must in some fashion differ from that of the later outwash deposits since its composition is different.

One explanation suggested by the very meagre evidence is that the Jameco gravel was deposited by the outwash from a retreating glacier while its ice front lay 20 to 50 miles north of Long Island Sound. At this distance most of the melt water would find its way into the valley of the Hudson where diabase crops out along the west bank of the river. Now at this time the valley of the Hudson was not as deep as it is today, for much of the depth of the present day valley is known to be due to the scour of glacial ice and loaded glacial streams, a process which was then just starting. Not only was the valley floor at a higher level than it is today, but it is probably also safe to assume that sea level was also lower, since a drop in sea level always accompanied the accumulation on the continents of large volumes of ice. It may therefore be assumed that the Hudson was not then an estuary, as it is today, but a rapidly flowing stream, capable of carrying in flood time the coarse sediments which now form the Jameco gravel. While this hypothetical river of glacial origin seems the most logical source of material of the composition of the Jameco gravel, the main valley of the Hudson, then as now, flowed west of Manhattan and Long Island, and so out to sea. We must imagine that the river was deflected to the east, across Kings and Queens Counties, where the formation is now found, either by a tongue of stagnant ice, or an ice lobe which advanced from the west. Later in the Pleistocene time, probably during the height of the Wisconsin ice advance, part at least of the flow of the Hudson was indeed deflected east through the Harlem River, by the temporary blocking of the main channel by the ice of the glacier itself.

It is a necessary part of the hypothetical origin of the Jameco outlined above, that the ice in the Hudson River Valley was at that time some distance to the north, so that the melt water would have an opportunity of collecting in the Hudson Valley, along the west bank of which is found the only obvious source of the diabase which forms such an outstandingly large part of the formation. One must assume therefore that the blocking of the lower Hudson Valley which resulted in the deflection of the river eastward over Queens and Kings Counties was the result of the independent advance of a separate lobe of the ice. This lobe might have moved out from the low lands of the Passaic River and blocked the Hudson near what is now the Narrows. Such an independent movement of a lobe of the main ice sheet is entirely in keepin with what we know of the behavior of large ice sheets.

A second hypothesis of the origin of the Jameco gravel imagines it to be the normal outwash of a glacier which advanced nearly but not quite to the present north shore of Long Island. A series of streams may be imagined to have flowed from points scattered along the front of the ice, spreading a blanket of gravel and sand for some distance to the south. The topography which must have guided these streams and their deposits is not known to us today. The depression which is now Long Island Sound must have existed then, but how deep or how wide it was, and to what extent it may have been filled in, it is quite impossible to say. The depression may have deflected to the east all of the outwash which reached it, or part of the outwash may have been swept across it into central and eastern Long Island and may underlie some of the embayments on the north shore of Nassau and Suffolk Counties. If this hypothesis is correct and the gravels were deposited by many separate streams, then considerable variation in composition might be expected. Whether some difference between the direction of the movement of the ice sheet of Jameco time and the later glaciations could account for the unusual composition of the Jameco in the type area must remain a matter of speculation. Since we know so little of the earlier Pleistocene history of this area it is possible that the Jameco ice was the first to reach the vicinity of northwestern Long Island. If this were the case, then in its passage down the lower valley of the Hudson, where we know that the ice sheets cut diagonally across the edge of the Palisades, this glacier might have been able to pry loose and pick up more diabase than the later glaciers.

On the correct interpretation of the origin of the Jameco gravel depends the recognition of the formation in other areas. If it was deposited during the temporary deflection of the Hudson River then it is probably of very limited extent, and its composition would be much the same throughout. If on the other hand it was the direct outwash of an ice sheet which advanced nearly to the northern edge of Long Island then the area covered by the formation can be expected to be much larger although its composition would presumably vary from place to place.

The Gardiners clay apparently lies conformably over the Jameco gravel although the contact has been observed at only one locality. If one accepts the glacial origin of the Jameco then the Gardiners clay presumably was formed during the following interglacial period. It contains plant and animal fossils which suggests deposition in a climate about as warm as that found on Long Island today. In fact by far the greater part of the fossils are identical with those living in this area today, a fact which makes the deduction concerning the climate relatively certain but makes it impossible to date the Gardiners clay as belonging to any particular subdivision of the Pleistocene. However the general similarity of the flora and fauna of the Gardiners in the very few but widely scattered localities where they have been studied suggests that all the samples believed to be Gardiners clay came from the same interglacial period, even if it is impossible to say which one.

In Western Long Island, and probably over the rest of the island as well, the upper surface of the Gardiners clay is 50 feet or more below sea level, except locally where it has been folded by the push of later icesheets and stands higher. The obvious explanation for its origin is then as follows. With the retreat of the ice which directly or indirectly deposited the Jameco gravel, the volume and force of the streams from the mainland decreased and they either were deprived of the coarse sand and gravel which the ice had supplied to them, or lacked the ability to transport it. At the same time the melting ice cap supplied water to the ocean, raising its level, an effect which is widely recognized from studies in many parts of the world.

It is not possible to say with assurance if the Jameco gravel was deposited above or below sea level but its general composition and distribution suggests that it was deposited above. The Gardiners clay however contains marine and brackish water fossils and it was deposited probably in shallow bays so that sea level, when it was formed, must have been something less than 50 feet lower than at present, and in all probability more than 50 feet higher than it had been in Jameco time. This inferred rise could of itself account for the quiet water in which the Gardiners clay was deposited for any change in sea level, up or down, which brings the sea in contact with a gently sloping shore line results in the formation of off shore bars and barrier beaches. Such a barrier beach, formed after the most recent post glacial rise in sea level, fringes the southern shore of Long Island today, where it encloses a series of large bays.

Similar bays, at a lower level and quite possibly larger, may well have existed along the south shore of Long Island, in Gardiners time. The source of the clay itself is something of a question. With sea level lowered 50 feet, an appreciably larger area of Long Island would be exposed to erosion than is the case today, but it is difficult to see how this area could have supplied the 50 foot thick clay blanket of the Gardiners, since so much of the core of the Island is sand. A possible additional source of clay was the Hudson River, which need not have emptied directly into the bays in order to have furnished them with sediment. All that would be required would be a connection between the lower Hudson and the bays or quiet water where the Gardiners was accumulating. Tidal action then would suffice to sweep in mud, and possibly, in time, distribute it as far east as the Nassau-Suffolk County line. Sources for the material of the Gardiners clay farther east in Suffolk County are harder to find. A red color of some of the clay here is responsible for the suggestion (15) that it came from the Connecticut Valley where the Triassic bedrock is red. Recent brief studies of the Gardiners however suggest that the red clay associated with it is not part of the Gardiners clay itself. These studies also suggest that the Gardiners clay in the vicinity of the Brookhaven National Laboratory has a thickness of only about ten feet, indicating a volume of material whose origin is less difficult to account for.

In several places the Gardiners clay contains the green mineral glauconite, the characteristic constituent of the Cretaceous green sand beds of New Jersey. This mineral is believed to form commonly in quiet deep ocean water, at many times greater depth than was the Gardiners clay. Pleistocene glauconite is uncommon in any case. It is no easier to imagine how the mineral could have been derived by reworking from the Cretaceous beds, since on Long Island the Cretaceous contains very little glauconite. This however is the preferred explanation and suggests the Cretaceous beds as also the source for much of the other material in the Gardiners.

To the north and east of Long Island the Gardiners clay has been tentatively identified as far away as Cape Cod, to the south a correlation has been suggested with the Cape May formation which is however largely sand and gravel. While the relation of these more distant beds to the type locality is highly speculative there seems to be no reason to doubt that the Gardiners clay on Long Island is a part of a more extensive formation. There is considerable doubt however that it exists in the bays of the north shore and it certainly cannot be present there over very wide areas. Over most of the central part of the island, it cannot have been deposited at all since this area was above sea level at that time. Its distribution therefore in western Long Island is very similar to that of the underlying Jameco gravel, that is it underlies much of Kings and Queens Counties, where over wide areas the upper surface of the Cretaceous formation is well below sea level, and extends along the southern part of Nassau and Suffolk Counties. Along the north shore, it may or may not be present in the bays. In eastern Suffolk County, the Gardiners clay appears to be widely distributed where the less easily recognized Jameco gravel has not been found at all.

The most recent work on Gardiners Island, at the type locality for the Gardiners clay, shows that there at least the typical fossiliferous dark clay is overlain by dark brown and reddish varved clays. These varved clays are not interglacial, but glacial in origin and must have been deposited in fresh water at a time when the ice was in the immediate vicinity. The extent of these varved clays, or their exact relation to the other formations on the Island, is not known, but their presence even locally is an added complication, and the exact manner of their origin is difficult to deduce.

With the formation of the ice sheet which followed the Gardiners interglacial period, probably the ice which laid down the Montauk till, sea level must have fallen as water was removed from the ocean to form the ice. With the fall in sea level the Gardiners clay would have been exposed and further deposition prevented. In places it may well have been eroded, although there is no evidence of this.

As the ice advanced still farther south, the sea level would at first have dropped a little more and would then have remained at about the same level, or even have risen slightly. This failure of the sea level to drop as the ice front approached Long Island, and the possibility that sea level may even have risen is due to the great weight of the ice, which actually compressed the "solid land" beneath it as it advanced. A few hundred miles in from the edge of the ice it is known that the land was forced down even more than the sea level was lowered by the removal of water. At the outermost margin of the ice it is not known which effect predominated, but it was probably that of the removal of the water for there is no evidence to show that the sea level on Long Island was ever higher than it is now. It would be of considerable interest to know what did happen to the sea level around Long Island during the Pleistocene for this would help more than anything else to explain the complex history of this period.

It seems safe to assume however that, at the time when the post-Gardiners ice sheet was advancing across what is now Long Island, sea level in this area was below the level of Gardiners time. Perhaps as this ice sheet advanced, but more probably as it retreated, the varved clays above the Gardiners were laid down in fresh water lakes. The southern margin of the lakes were formed by at least a low ridge of land on Long Island, possibly the terminal moraine of the ice sheet. The northern margin of the lake was almost certainly the ice sheet itself.

The varved clays are apparently overlain with soft fluffy silty sand, probably a part of the Jacob sand, but the Gardiners clay, the varved clay and this sand are so folded and distorted on Gardiners Island that their relations are not clear. This folding was due to pushing by one of the ice sheets, possibly the Montauk sheet or possibly the sheet which deposited the Ronkonkoma moraine.

Attempts to trace the Gardiners clay and to identify it in well records or exposures in other parts of Long Island are greatly hampered by the complex and little understood history of this period, and by the inadequacies of the available data. So far we have no evidence of any other interglacial deposit besides the Gardiners clay, so that any fossiliferous material of Pleistocene age overlain by later glacial deposits may be called Gardiners. Shells are not always reported in the well logs however, even where they are known to be present, and at many localities the only fossils in the Gardiners are microscopic remains the driller could not have seen. The varved clays as well as other records show that there are glacial as well as interglacial clays in the Pleistocene, particularly in eastern Suffolk County, and until much more work has been done the identification of the Gardiners is not possible in most well records and even in some outcrops.

Along the south shore of western Suffolk, and westward into Kings County, an interglacial clay can be identified in many of the reliable logs of sufficient depth, although the continuity and extent of the deposit is open to question. The best data are for the western end of the Island, where the formation can be mapped with some detail, a peculiar circumstance since this cannot be done in the vicinity of the type locality.

Although these problems of the true age and proper correlation of the Gardiners clay and related Pleistocene deposits may seem academic, they are in fact of some importance. In many areas, the Gardiners marks the bottom of the water table aquifer, and is the lower limit of the highly permeable glacial deposits. Below it lie the less permeable sands of the Magothy formation which contain artesian water, differing in static head and in composition from the water in the higher levels.

The Gardiners clay grades upward into the Jacob sand, a formation which is not easy to identity in well logs, and the distribution and history of which are therefore poorly known. The best surface exposures of the formation are in the bluffs and beaches of the north shore, particularly in the eastern half of the island. It appears to mark the transition from the clay of the warm interglacial period which precedes it to the sand and gravel of the glacial outwash which overlies it. It is possible that the source of the material was on the mainland, since some feldspar, biotite, hornblende and other mineral grains are present which could not have been derived from the underlying Cretaceous deposits. The silt and sand in the Jacob could not have been carried across any distance of open water, so that the depression of Long Island Sound must have been largely filled in. There is a suggestion therefore that the Jacob sand extended from the mainland on the north, south to the hills which form the present day backbone of Long Island, perhaps even farther south some distance toward the sea. The Jacob sand in turn grades upward into the Manhasset formation without any marked break.

Along the peninsulas of the north shore, where it is best developed, the Manhasset formation is 150 to 250 feet thick and is largely composed of beds of sand and gravel. These were undoubtedly deposited as glacial outwash since there is a well developed glacial till, the Montauk till, present in the middle of the formation. How far south on the island the ice reached is not known, but its limits apparently corresponded roughly with those of the later ice advances. The till cannot be traced in well records, although it has been recognized in a few logs, and unsuccessful attempts have been made to outline its distribution. This till is not thick enough, extensive enough, or impermeable enough to offer any serious obstacle to the downward movement of the ground water, although locally it may form some of the perched water tables found along the north shore of Long Island.

The Manhasset formation forms the great bulk of the material above sea level north of the hilly central strip of the island. In the central hilly strip itself, where the underlying Cretaceous beds rise 200 feet or more above sea level, the Manhasset is much thinner, and its contacts with the Mannetto possibly lying below, and more recent glacial deposits above, are difficult to determine. In the southern half of Long Island it is quite impossible to distinguish between the Manhasset outwash and the younger outwash gravels.

The belief that the Manhasset formation is of Illinoian age, and represents an earlier glacial advance than the relatively recently vanished Wisconsin ice sheet, is based largely on the supposed deep erosion of the Manhasset prior to the deposition of the Wisconsin till. The magnitude of this erosion depends on how continuous and extensive a deposit one imagines the Manhasset formation to have been at the time it was first deposited. At present it is cut off abruptly along the margins of the bays and necks in Nassau and Suffolk Counties, and the bluffs of the north shore to the east. If the Manhasset formation at one time filled these bays and extended northward well into what is now Long Island Sound, then the amount of erosion has been very great. But the most recent ice advances, the Ronkonkoma and the Harbor Hill, failed to deposit substantial quantities of material in the bays and the Sound, and even appear to have deepened them locally, and there is no reason to believe that the earlier ice sheet behaved in a radically different fashion.

The best evidence that two superimposed glacial deposits belong to two separate glacial periods and not to two advances of the same ice sheet, is to find between them deposits formed during a warm interglacial period. Granted that the Jameco is of glacial origin, then the Gardiners clay, a relatively warm water deposit, proves that the Jameco and the Manhasset formation must belong to separate glacial periods. But no such interglacial deposit separates the Manhasset formation from the overlying till and outwash of the Ronkonkoma and Harbor Hill ice sheets. Fuller (15) did indeed try to identify the muck, clay and fossil shells or wood in certain well records as representing such an interglacial deposit, but a critical examination of these localities shows that the material is either Gardiners clay or may be explained as deposits of Recent age. In fact the highly dubious nature of the data that Fuller was called upon to use in trying to show the existence of an interglacial deposit between the Manhasset and the overlying till and outwash, suggests that such deposits do not exist. There is then a possibility, even a probability, that the Jameco is late Illinoian in age, that the Gardiners clay is Sangamon, and that the Manhasset formation and the overlying Ronkonkoma and Harbor Hill deposits were all formed during the Wisconsin by fluctuations of the same ice sheet. Their common lack of weathering strongly substantiates this conclusion.

Since the material overlying the Gardiners clay is all classed as upper Pleistocene in the geologic correlations of Long Island, it might well appear that the details of their history and formation could be of little importance in the hydrology of Long Island. In a general way this is true. The upper Pleistocene over wide areas acts as a hydrologic unit, water passing easily from one part of it to another. The upper Pleistocene is the source of most of the well water pumped on Long Island and the intelligent development of this unit cannot help but be influenced by a more complete understanding of the composition of its beds, and their distribution and history.

TABLES OF GEOLOGIC CORRELATIONS OF WELL LOGS IN LONG ISLAND

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Geologists

CONTENTS

TABLES OF TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN LONG ISLAND, NEW YORK

NOTES

Caution: The reader must keep in mind that all the figures shown, indicate feet above or below sea level, unlike the well logs from which they are derived, where all measurements are made downward from some point at or near the land surface. The first figure in the column headed "Recent and Upper Pleistocene" is the elevation of the land surface.

Wells included: In general, a correlation has been attempted for every well log published in the "Records of Wells" bulletins published jointly by the New York State Water Power and Control Commission and the U. S. Geological Survey. Also included are a small number of wells taken from U. S. Geological Survey Professional Paper 44, 1906 and some previously unpublished records of recent wells from the files of the New York State Water Power and Control Commission.

Map coordinates: The map coordinates refer to the five minute grid square in which the well is located. These squares coincide with the lines of latitude and longitude printed on the U. S. Geological Survey 1:62500 topographic maps for Long Island, although the method of designation has been changed on the accompanying maps. Where the coordinates are followed by an asterisk (*), that well number does not appear on the map, as where there is more than one well at the same location, only the number of the deepest well or the well having the most satisfactory log is shown.

Total depth: The total depth, in feet, is calculated from the land surface, regardless of the measuring point used for the published log. The bottom is taken as the lowest point described in the well log, and this figure is underlined in the tables.

Recent and upper Pleistocene: This column includes all the Recent and youngest glacial deposits, measured downward from the land surface to the top of the Gardiners clay, the surface of the bedrock or the top of the Cretaceous beds.

Reliability of correlation: The tables are based on the assumption that the driller in each case has accurately reported the nature and depth of the beds penetrated. The notations "good", "fair" or "poor" indicates the confidence of the geologist in his interpretation of the record. Question marks indicate that the boundaries or existence of a formation are uncertain. For a description of the geologic units and a discussion of the geology of the area, the reader is referred to the accompanying text.

Abbreviations used in column "Aquifer Developed"—
U.P.—Upper Pleistocene
G—Gardiners Clay
J—Jameco gravel
M—Magothy (?) formation
BM—Basal Magothy (?) gravel
R—Raritan formation—clay member
L—Raritan formation—Lloyd sand member
Br—Bedrock

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN KINGS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 1	A-2	No record -575 to -673. Bedrock may be at -625.	750	+ 5 -150	-150 -163	-163 -229	-229 -393	-393 -471	-471 -575	(No record -575 to -673)	at **-673**	Fair	-477 -519	L	K 1
K 8	B-2		197	+169 **- 28**								Good	?		K 8
K 9	C-1*	Near K-638.	149	+ 4 - 91	- 91 -125	-125 -145 149					at **-145**	Good	-125 -145	J	K 9
K 10	C-2*	Near K-638. No log; sample suggests J from -128 to -152.	161	+ 9 ?	? -128	-128 **-152**						Poor	Probably -128 to -152	Probably J	K 10
K 12	C-2	No log. Only record is Br. at -50.	112	+ 49 ?							- 50 **- 63**	——	?		K 12
K 14	C-2*	Near K-1279.	95	+ 29 **- 66**								Good	- 48 **- 68**	UP	K 14
K 15	C-2*	Clay -93 to -99. May be G. Near K-12.	114	+ 15 - 93						- 93 **- 99**		Fair	- 67 - 92	UP	K 15
K 18	C-2*	No record +48 to 0. Near K-320.	114	+ 48 **- 66**								Good	- 45 - 65	UP	K 18
K 19	C-2*	No log; hydrologic data suggests Jameco gravel at -97. Near K-657.										Fair	- 97 ?	J	K 19
K 20	C-2		148	+ 52 - 94	- 94 **- 96**							Fair	?		K 20
K 22	C-2*	Near K-23.	139	+ 74 **- 65**								Good	- 22 - 63	UP	K 22
K 23	C-2	Log only to -95.	?	+ 73 - 95	?	?					at **-170**	Fair	- 59 - 93	UP	K 23
K 33	C-2		176	+ 14 -102	-102 -131	-131 **-162**						Good	- 61 to - 80 -138 to -161	UP and J	K 33
K 36	C-2		108	+ 28 - 77	- 77 **- 80**							Good	- 45 - 75	UP	K 36
K 37	C-2*	Near K-893.	130	+ 25 - 92	- 92 **-105**							Good	? - 79	UP	K 37
K 40	C-2		136	+100 **- 36**								Good	- 16 - 36	UP	K 40
K 43	C-3*	Near K-1104.	165	+ 55 **-110**								Good	- 80 -110	UP	K 43
K 45	C-3*	Near K-1035.	177	+105 **- 72**								Good	- 50 - 64	UP	K 45
K 49	C-2*	Near K-50.	333	+ 18 -114							-114 **-315**	Fair	? -193	Br	K 49
K 50	C-2		169	+ 28 **-141**							at **-141**	Fair	- 4 - 24	UP	K 50
K 59	C-2*	Near K-893.	76	+ 17 **- 59**								Good	- 48 - 58	UP	K 59
K 64 #2	C-2*	K 1275, deeper, same location.	168	+ 10 - 65	- 65 -110	-110 **-158**						Good	?		K 64 #2
K 64 #5	C-2*	K 1275, deeper, same location.	165	+ 10 - 58	- 58 -125	-125 **-155**						Good	?		K 64 #5
K 64 #6	C-2*	K 1275, deeper, same location.	174	+ 10 - 67	- 67 -130	-130 **-164**						Good	?		K 64 #6

K 64 #7	C-2*	K 1275, deeper, same location.	165	+ 10 − 68	− 68 −122	−122 **−153**		Good	?			K 64 #7
K 80	C-2*	K 1018, deeper, same location.	101	+ 30 − **71**				Good	− 56	− 71	UP	K 80
K 82	C-2*	No record −44 to −100. Near K-1313.	120	+ 20 − 44	?		at **−100**	——	?	−100	UP	K 82
K 89	C-2*	Near K-90.	122	+ 55 − **67**				Good	− 40	− 50	UP	K 89
K 90	C-2		101	+ 51 − **50**				Good	− 30	− 50	UP	K 90
K 96	C-2*	Near K-1055.	74	+ 57 − **17**				Good	?			K 96
K 110	C-2	Same location −K 881. No record −64 to −88.	160	+ 72 − 88			at − **88**	Fair	− 40	− 63	UP	K 110
K 117	C-2*	K 1251, shallower, same location. Near K-320.	108	+ 45 − **63**				Good	− 37	− 62	UP	K 117
K 118	C-2*	Near K-320.	100	+ 37 − **63**				Good	− 43	− 63	UP	K 118
K 131	C-2	No record −98 to −258.	312	+ 54 − 98					− 61	− 93	UP	K 131
K 139	C-3*	Near K-543.	106	+ 55 − **51**				Good	− 31	− 51	UP	K 139
K 155	B-2*	Near K-8.	202	+150 − **52**				Good	− 37	− 52	UP	K 155
K 165	B-1*	Near K-1012.	93	+ 15 − **78**				Good	− 55	− 73	UP	K 165
K 167	B-1		150	+ 13 − 73	− 73 − 82	− 82 **−137**		Good	−117	−137	J	K 167
K 174	B-2*	Near K-575.	110	+ 25 − **85**				Good	− 70	? − 85	UP	K 174
K 178	A-2*	Near K-550.	118	+ 5 **−113**				Good	−108	−123 ?	UP	K 178
K 182	C-2*	K 1130, shallower, same location. Near K-893.	94	+ 20 − **74**				Good	?		UP	K 182
K 191	B-3*	K 1134, deeper, same location. Near K-619.	68	+ 36 − **32**				Good	?		UP	K 191
K 201	B-2*	K 1090, deeper, same location. Near K-304.	83	+ 17 − **66**				Good	− 51	− 66	UP	K 201
K 210	A-2*	Near K-1247.	150	+ 10 **−140**				Good	−114	−136	UP	K 210
K 211	A-2*	Near K-1247.	118	+ 5 **−113**				Good	−103	−113	UP	K 211
K 229	A-2*	Near K-1247.	118	+ 5 **−113**				Good	− 98	−113	UP	K 229
K 244	B-2*	Near K-890.	134	+ 67 − **67**				Good	− 34	− 50	UP	K 244
K 245	B-1*	Near K-719.	178	+130 − **48**				Good	− 27	− 43	UP	K 245
K 249	C-2*	Well deepened. Near K-1055.	175	+ 40 −133	−133 **−138**			Good	− 50	− 65	UP	K 249
K 251	B-1*	Near K-719.	177	+110 − **67**				Good	− 43	− 63	UP	K 251
K 252	C-1*	Near K-650.	131	+ 63 − **68**				Good	?		UP	K 252
K 254	C-2*	K 900, shallower, same location. Near K-90.	100	+ 53 − **47**				Good	?		UP	K 254

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN KINGS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 255	C-2*	K 952, shallower, same location. Near K-36.	123	+ 54 − **69**								Good	− 49 − 69	UP	K 255
K 256	C-2*	Well deepened. Near K-1055.	206	+ 50 −124	−124 ? −**156**						at −**156**	Good	− 40 − 56	UP	K 256
K 259	C-2*	Bottom may touch Gard. clay. Near K-320.	113	+ 40 − **73**	(at −73?)							Fair	?	UP	K 259
K 260	C-2*	Near K-261.	109	+ 40 − **69**								Good	− 48 − 68	UP	K 260
K 261	C-2	K 1061, shallower, same location.	110	+ 50 − 59							− 59 − **60**	Good	− 39 − 59	UP	K 261
K 269	C-2*	Near K-1055.	116	+ 60 − **56**								Good	− 38 − 52	UP	K 269
K 271	C-2*	Near K-261.	122	+ 76 − **46**								Good	− 28 − 41	UP	K 271
K 272	C-2*	K 1073, deeper, same location. Near K-320.	89	+ 34 − **55**								Good	− 27 − 47	UP	K 272
K 276	C-2*	K 935, shallower, same location. Near K-261.	117	+ 45 − **72**								Good	− 44 − 69	UP	K 276
K 277	C-2*	Near K-320.	146	+ 37 − 97	− 97 145 −109						at −**109**	Fair	?	UP	K 277
K 283	A-2*	Near K-1021.	154	+ 7 −**147**								Fair	−107 −142	UP	K 283
K 284	B-1*	Near K-699.	167	+ 75 − **92**								Good	− 63 − 89	UP	K 284
K 285	B-2	No record +8 to −64. Probably all UP.	127	+ 63 + 8								Fair	− 38 − 64	UP	K 285
K 290	C-2*	Near K-320.	110	+ 45 − 64	− 64 − 65 110						at − **65**	Fair	− 38 − 64	UP	K 290
K 296	B-2*	K 1205, shallower, same location. Near K-525.	119	+ 69 − **50**								Good	− 30 − 50	UP	K 296
K 298	B-2*	Near K-1287.	88	+ 50 − **38**								Good	− 29 − 38	UP	K 298
K 299	C-3	K 1040, shallower, same location.	132	+ 69 − **63**								Good	− 38 − 63	UP	K 299
K 300	B-2*	K 1207, shallower, same location. Near K-514.	71	+ 30 − **41**								Good	− 28 − 40	UP	K 300
K 303	B-2*	K 1209, same location, same depth. Near K-514.	118	+ 14 −**104**								Good	− 50 − 90	UP	K 303
K 304	B-2		109	+ 15 − **94**								Good	− 71 − 91	UP	K 304

K 305	B-2		87	+ 17 **− 70**								Good	− 50 − 70	UP	K 305
K 308	B-1	K 1211, shallower, same location.	146	+ 76 **− 70**								Good	− 44 − 70	UP	K 308
K 309	C-2*	K 942, shallower, same location. Near K-261.	110	+ 53 **− 57**								Good	− 37 − 57	UP	K 309
K 310	B-2		88	+ 27 **− 61**								Good	− 49 − 60	UP	K 310
K 311	B-2	Log starts 15 feet below land surface. See G-W8.	96	+ 43 **− 53**								Good	− 33 − 53	UP	K 311
K 316	B-1*	K 1041, deeper, same location. Near K-584.	124	+ 65 **− 59**								Good	− 50 − 55	UP	K 316
K 318	A-2*	Near K-1021.	135	+ 7 **−128**								Good	−108 −128	UP	K 318
K 319	B-1*	Near K-718.	162	+ 80 **− 82**								Good	?	UP	K 319
K 320	C-2		114	+ 38 − 63	− 63 − 75						− 75 **− 76**	Good	?	UP	K 320
K 323	B-2*	Near K-517.	139	+ 85 **− 54**								Good	− 36 − 46	UP	K 323
K 326	C-2*	K 1214, shallower, same location. Near K-1275.	108	+ 26 **− 82**								Good	− 66 − 82	UP	K 326
K 328	B-2*	Near K-310.	112	+ 30 **− 82**								Good	− 57 − 74	UP	K 328
K 331	C-2*	Near K-670.	110	+ 40 **− 70**								Good	− 54 − 70	UP	K 331
K 332	B-2*	Near K-1039.	112	+ 42 **− 70**								Good	− 50 − 70	UP	K 332
K 335	C-3*	Near K-1104.	104	+ 45 **− 59**								Good	− 44 − 59	UP	K 335
K 336	B-2		118	+ 26 **− 92**								Good	− 77 − 92	UP	K 336
K 340	C-2*	Near K-261.	136	+ 66 **− 72**								Good	− 49 − 68	UP	K 340
K 341	B-2*	Near K-575.	103	+ 22 **− 81**								Good	− 71 − 81	UP	K 341
K 345	C-2*	Near K-956.	146	+ 17 **−129**								Good	−109 −129	UP	K 345
K 426	C-2*	Near K-637.	140	+ 38 − 64	− 64 **−102**							Good	− 48 − 64	UP	K 426
K 457	C-1*	Near K-708.	57	+ 7 **− 50**								Good	− 28 − 48	UP	K 457
K 458	C-2		178	+ 5 −173							at **−173**	Poor	——	——	K 458
K 459	C-2*	K 873, deeper well, at same location. Near K-20.	140	+ 75 **− 65**								Fair	− 38 − 53	UP	K 459
K 461	C-2	K 679, shallower, same location.	225	+ 33 −172				−172 −192		?	at **−192**	——	?		K 461
K 464	B-3		494	+ 5 −159	−159 −202	−202 −245	−245 −284	−284 −443	−443 **−489**			Fair	?	L	K 464
K 465	C-2	Only record is Br at −55.	181 or 400	+ 10 ?							at − 55	——	?		K 465
K 501	B-2*	K 525 deeper, same location.	112	+ 47 **− 65**								Good	− 15 − 55	UP	K 501

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN KINGS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 502	B-2*	Near K-532.	106	+ 11 − **95**								Good	− 42 − 90	UP	K 502
K 503	B-2*	K 529, deeper, same location.	137	+ 63 − **74**								Good	− 34 − 74	UP	K 503
K 504	B-2*	K 515, deeper, same location.	108	+ 20 − **88**								Good	− 45 − 88	UP	K 504
K 505	B-2*	Near K-532.	91	+ 16 − **75**								Good	− 32 − 76	UP	K 505
K 506	B-2*	K 524, deeper, same location.	113	+ 33 − **80**								Good	− 19 − 62	UP	K 506
K 507	B-2*	K 519, deeper, same location.	100	+ 31 − **69**								Good	− 19 − 62	UP	K 507
K 508	B-2*	Near K-1354.	116	+ 50 − **66**								Good	− 22 − 64	UP	K 508
K 509	B-2*	K 515, deeper same location.	97	+ 20 − **77**								Good	− 33 − 77	UP	K 509
K 510	B-2*	Near K-529.	120	+ 63 − **57**								Good	− 4 − 48	UP	K 510
K 511	B-2*	K 518, deeper, same location.	93	+ 12 − **81**								Good	− 41 − 80	UP	K 511
K 512	B-2*	Near K-529.	106	+ 48 − **58**								Good	− 10 − 53	UP	K 512
K 513	B-2*	Near K-523.	105	+ 53 − **52**								Good	− 2 − 39	UP	K 513
K 514	B-2	From record by F. G. Wells.	560	+ 26 −149	−149 −167	−167 −197	Probably not present	−197 −418	Probably not present	−418 −440	−440 −**534**	Fair	− 22 − 64	UP	K 514
K 515	B-2	K 507, K 509, shallower, same location.	343	+ 20 −146	−146 −180	−180 343 −323		at −**323**				Fair	−186 to −196 −282 to −321	J	K 515
K 516	B-2*	K 533, deeper, same location. Near K-1339.	106	+ 42 − **64**								Good	− 16 − 59	UP	K 516
K 517	B-2		303	+ 78 −110	−110 −165	−165 298 −220		−220 −225				Poor	−169 −212	J	K 517
K 518	B-2	K 511, shallower, same location.	330	+ 13 −157	−157 −184	−184 −**317**						Fair	−287 −302	J	K 518
K 519	B-2	K 507, shallower, same location.	250	+ 29 −131	−131 −157	−157 −221						Poor	−166 −209	J	K 519
K 520	B-2*	Near K-1339.	310	+ 42 − 98	− 98 −168	−168 −**268**						Fair	−211 −253	J	K 520
K 521	B-2		430	+ 34 −136	−136 −179	−179 251 −223		−223 −323	−323 −**376**			Fair	−336 −384	L	K 521
K 522	B-2	K 527, shallower, same location.	300	+ 50 − 91	− 91 −131	−131 290 −240		−240 −**250**				Fair	−144 to −194 −223 to −243	J	K 522

K 523	B-2	Br. data vague.	535	+ 47 −123	−123 −153	−153 251 −204	−204 −384			−384 ? **−488**	?	Fair	−155	−221	J	K 523
K 524	B-2	K 506, shallower, same location.	390	+ 33 −176	−176 −198	−198 281 −254	Probably missing	−254 −336	−336 −349	?	−349 **−357**	Fair	−193	−253	J	K 524
K 525	B-2	K 501, shallower, same location.	400	+ 47 −173	−173 −217	−217 301 −260	−260 **−353**					Poor	−213	−253	J	K 525
K 526	B-2	Record used is composite of K 526 (to −146) and K 531.	378	+ 82 −146	−146 −208	−208 338 −256		−256 −288	Missing	−288 −291	−291 **−296**	Fair	−208	−276	J	K 526
K 527	B-2*	K 522, deeper, same location.	145	+ 49 **− 96**								Good	− 34	− 85	UP	K 527
K 528	B-2	K 1352, shallower, same location.	360	+ 61 −159	−159 −195	−195 278 −237	Probably absent	−237 −298	Probably absent	?	−298 **−299**	Fair	−192	−242	J	K 528
K 529	B-2	K 503, shallower, same location.	220	+ 62 −151	−151 **−158**							Fair	− 38	− 83	UP	K 529
K 530	B-2		160	+ 33 −112	−112 **−127**							Fair	− 62	−112	UP	K 530
K 531	B-2	See composite record with K 526 above.														K 531
K 532	B-2		470	+ 16 −146	−146 −178	−178 325 −312	Probably absent	−313 −409	Probably absent	−409 **−454**		Fair	−294	−309	J	K 532
K 534	B-2		469	+ 17 −150	−150 ?	? 319 −302	May be absent	−302 −404	Probably absent	−404 −416	−416 **−452**	Poor	−283	−295	J	K 534
K 537	B-3	From Crosby's record.	213	+ 19 −128	−128 −164	−164 **−194**						Poor	?			K 537
K 538	C-3	K 1139, shallower, same location.	172	+ 10 − 60	− 60 −112	−112 **−162**						Fair	?			K 538
K 541	B-1*	Near K-308.	120	+ 90 **− 30**								Good	?		UP	K 541
K 543	C-3	From Crosby's record.	284	+ 63 −129	−129 −218	−218 **−221**						Fair	?			K 543
K 550	A-2		110	+ 5 **−105**								Good	+ 83	−103	UP	K 550
K 569	C-2	(Veatch No. 65.)	190	+ 15 ?	? −175	at **−175**						Poor	?			K 569
K 575	B-2		106	+ 24 **− 82**								Good	− 68	− 82	UP	K 575
K 576	B-1*	Near K-693.	123	+ 82 **− 41**								Good	− 21	− 37	UP	K 576
K 577	B-3*	Near K-464.	100	+ 12 **− 88**								Good	− 80	− 88	UP	K 577
K 578	C-3*	Near K-1104.	92	+ 44 **− 48**								Good	− 37	− 48	UP	K 578
K 579	C-2		825	+ 7 − 75							− 75 **−818**	Good	?			K 579
K 580	B-2		69	+ 18 **− 51**								Good	− 39 ?	− 51	UP	K 580
K 584	B-1		145	+ 60 − 70	− 70 **− 85**							Fair	?			K 584
K 594	C-2*	Near K-1313.	91	+ 30 **− 61**								Good	− 51	**− 59**	UP	K 594
K 615	C-2*	Near K-131.	140	+ 80 **− 60**								Good	− 45	− 60	UP	K 615

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN KINGS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 619	B-3		451	+ 25 −101	−101 −120	−120 231 −206	Probably absent	−206 −403	−403 −426	?	at −**426**	Fair	?	L	K 619
K 620	C-3*	Near K-1104.	96	+ 44 − **52**								Good	− 31 − 51	UP	K 620
K 624	C-3*	Near K-543.	85	+ 45 − **40**								Good	− 19 − 39	UP	K 624
K 627	B-2*	Near K-529.	116	+ 65 − **51**								Good	− 31 − 51	UP	K 627
K 630	B-2*	Near K-644.	105	+ 25 − **80**								Good	− 57 − 82	UP	K 630
K 634	C-3*	Near K-1054.	100	+ 20 − **80**								Good	− 65 − 80	UP	K 634
K 635	B-2		75	+ 20 − **55**								Good	− 43 − 55	UP	K 635
K 636	B-1		98	+ 50 − **46**								Good	?	UP	K 636
K 637	C-2	Correlation from log in GW-8.	221	+ 44 − 55	− 55 −114	−114 215 −168	Absent	Absent	Absent	?	−168 **−177**	UP & G Fair J Poor	− 32 − 54	UP	K 637
K 638	C-2	See log GW-8. K 1332 shallower, same location.	175	+ 9 −135	−135 −136	−136 175 −166	Absent	Absent	Absent	?	at −**166**	Good	−151 −166	J	K 638
K 639	C-2	K 1010, same location, shallower.	190	+ 28 −122	−122 −142	−142 **−162**						Good	None		K 639
K640#5	C-1	Only record is elev. of Br.									at − 71		?		K640#5
K 641	C-1	Only record is elev. of Br.									at − 64		?		K 641
K642#2	C-2	Only record is elev. of Br.									at − 91		?		K642#2
K 643	B-2*	Near K-304.	142	+ 15 **−127**								Fair	None		K 643
K 644	B-2		153	+ 25 **−128**								Fair	None		K 644
K 645	C-2*	Near K-652.	96	+ 15 − **81**								Good	Probably None		K 645
K 646	C-2*	From Crosby record. Near K-648.	194	+ 10 − 97	− 97 −144	−144 **−184**						Good	Probably None		K 646
K 648	C-2		197	+ 38 −112	−112 −114	−114 **−159**						Good	None		K 648
K 650	C-2	K 1245, shallower, same location.	195	+ 10 −111	−111 −167	−167 **−185**						Good	None		K 650

K 651	C-2*	Near K-652.	165	+ 15 ?	? −135	−135 **−150**						Poor	None	K 651
K 652	C-2		200	+ 10 −133	−133 ?	? **−190**						Poor	None	K 652
K 654	C-2		158	+ 25 −100							−100 **−133**	Good	None	K 654
K 655	C-2		214	+ 43 −147						−147 −156	−156 **−175**	Fair	None	K 655
K 656	C-2*	Shaft 16A same location. Near K-655.	159	+ 43 − 89							− 89 **−116**	Good	None	K 656
K 657	C-2	Log unreliable except for data on Br.	228	+ 44 ?	?	?					−162 **−184**		None	K 657
K 658	C-2		202	+ 61 −103	−103 −120						−120 **−141**	Fair	None	K 658
K 659	C-2*	Near K-655.	170	+ 38 −106							−106 **−132**	Poor	None	K 659
K 660	C-2*	Near K-320.	125	+ 35 − 67							− 67 **− 90**	Fair	None	K 660
K 661	C-2	Shaft 15A, better log, used. Same location.	147	+ 62 − 66	− 66 − 70						− 70 **− 85**	Good	None	K 661
K 662	C-2*	Near K-684.	108	0 (River) − 98							− 98 **−108**	Fair	None	K 662
K 663	C-2	No record −151 to −161.	195	+ 14 −101	−101 −121	−121 **−151?**				−151 ? −161	−161 **−181**	Fair	None	K 663
K 664	C-2		179	+ 17 −104	−104 −142						−142 **−162**	Fair	None	K 664
K 665	C-2*	Near K-664.	170	+ 12 −108	−108 −140						−140 **−158**	Fair	None	K 665
K 666	C-2	Record unsatisfactory. G and J may be present.	214	+ 55 −139							−139 **−159**	Poor	None	K 666
K 667	C-2	Record unsatisfactory. G and J may be present.	201	+ 45 −143							−143 **−156**	Poor	None	K 667
K 668	C-2		200	+ 57 −123							−123 **−143**	Fair	None	K 668
K 669	C-1		182	+ 48 −114							−114 **−134**	Fair	None	K 669
K 670	C-2	Use record Shaft 14A. Same location.	120	+ 8 − 70			Absent	− 70 − 74	Absent	− 74 −100	−100 **−112**	Good	None	K 670
K 671	C-2*	Near K-1279.	135	+ 37 −76							− 76 **− 98**	Fair	None	K 671
K 672	C-2*	Near K-673.	170	+ 20 − 74	Absent	Absent	Absent	− 74 −130			−130 **−150**	Poor	None	K 672
K 673	C-2		195	+ 14 − 98	Absent	Absent	Absent	− 98 −161	Absent		−161 **−181**	Poor	None	K 673
K 674 #5	C-2*	Other borings, same location, very similar. Near K-664.	97	+ 12 − 85							at **− 85**	Fair	None	K 674 #5
K 675	C-2		222	+ 13 −148	−148 −190						−190 **−209**	Fair	None	K 675
K 676	C-2*	Near K-654.	163	+ 28 −127							−127 **−135**	Fair	None	K 676
K 677	C-2		215	+ 19 −107	Absent	Absent	Absent	−107 −176	Absent		−176 **−196**	Poor	None	K 677
K 678	C-2		221	+ 39 − 63	Absent	Absent	Absent	− 63 −160	Absent	−160 −162	−162 **−182**	Poor	None	K 678
K 679	C-2*	K 461, deeper, same location.	218	+ 35 − 85	Absent	Absent	Absent	− 85 −163	Absent		−163 **−183**	Poor	None	K 679

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN KINGS COUNTY, LONG ISLAND, N. Y.

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 680	C-3		434	+ 5 −105	−105 −151	−151 210 −211	−211 −284	−284 −408	−408 **−429**			Fair	Probably None		K 680
K 682	C-2*	Near K-710.	53	+ 10 − 43							at **− 43**	Good	None		K 682
K 684	C-2		104	+ 5 − 98							− 98 **− 99**	Good	None		K 684
K 685	C-2*	Near K-684.	91	+ 7 − 73							+ 73 **− 84**	Good	None		K 685
K 686	C-2		146	0 −146							at **−146**	Poor	None		K 686
K 687	C-2*	Near K-664.	200	+ 46 −128						−128 −129	−129 **−154**	Good	None		K 687
K 688	C-2*	Near K-50.	111	0 (River) −107							−107 **−111**	Good	None		K 688
K 689	C-2	Shaft 13A same location.	160	+ 31 −109						−109 −111	−111 **−129**	Good	None		K 689
K 690	C-2		194	+ 12 −161						−161 −162	−162 **−182**	Fair	None		K 690
K 691	C-2*	Near K-673.	186	+ 20 −121						−121 −147	−147 **−166**	Fair	None		K 691
K 692	C-2*	Near K-711.	85	+ 3 − 82							at **− 82**	Good	None		K 692
K 693	B-1	No record −32 to −43.	105	+ 62 **− 43**								Fair	None		K 693
K 694	C-2*	Near K-654.	106	+ 16 − 87							− 87 **− 90**	Good	None		K 694
K 695	B-1		41	0 (River) **− 41**								Good	None		K 695
K 696	B-2*	Near K-8.	103	+140 **+ 37**								Good	None		K 696
K 697	B-2*	Near K-526.	95	+143 **+ 48**								Good	None		K 697
K 698	B-1*	Near K-922.	100	0 (River) **−100**								Fair	None		K 698
K 699	B-1		141	+ 55 − 82	− 82 **− 86**							Fair	None		K 699
K 700	C-1		127	+ 6 −110						−110 −121	at **−121**	Fair	None		K 700
K 701	C-1		83	0 (River) **− 83**								Good	None		K 701
K 702	C-2*	Near K-668.	136	+ 31 **− 85**							− 85 **−105**	Good	None		K 702

K 703	C-1	Use Record Shaft 17A same location.	138	+ 18 − 93	− 93 −104	−104 128 −110		−110 **−120**	Good	None	K 703
K 704	C-1*	Near K-700.	130	+ 7 −121			−121 **−123**		Fair	None	K 704
K 705	C-1		151	+ 10 −112			−112 −121	−121 **−141**	Fair	None	K 705
K 706	C-2*	Near K-23.	40	+ 86 **+ 46**					Good	None	K 706
K 707	C-2*	Near K-1055.	50	+ 56 **+ 6**					Good	None	K 707
K 708	C-1		120	+ 6 − 82				− 82 **−114**	Good	None	K 708
K 709	C-2*	Near K-12.	139	+ 58 − 60				− 60 **− 81**	Good	None	K 709
K 710	C-2		54	+ 13 − 28			− 28 − 31	− 31 **− 41**	Good	None	K 710
K 711	C-2		74	0 (River) − 74				at **− 74**	Fair	None	K 711
K 712	B-1*	Near K-693.	69	+ 72 **+ 3**					Fair	None	K 712
K 713	C-2*	Near K-465.	52	+ 6 **− 46**					Fair	None	K 713
K 714	C-2*	Near K-638.	100	0 (River) **−100**					Fair	None	K 714
K 715	C-2*	Near K-637.	120	+ 36 − 74	− 74 **− 84**				Fair	None	K 715
K 716	C-2*	Near K-110.	128	+ 67 **− 61**					Good	None	K 716
K 717	C-2*	Near K-667.	202	+ 45 −141				−141 **−157**	Poor	None	K 717
K 718	B-1	No record +39 to −296.	435	+ 80 ?	?	?		−296 **−345**	Poor	None	K 718
K 719	B-1		89	+130 **+ 41**					Good	None	K 719
K 720	C-1*	Near K-700.	103	+ 13 **− 90**					Fair	None	K 720
K 721	C-2*	Near K-956.	85	+ 18 **− 67**					Good	None	K 721
K 722	C-2*	Near K-110.	103	+ 60 **− 43**					Good	None	K 722
K 723	C-2*	Near K-110.	141	+ 57 − 72				− 72 **− 84**	Good	None	K 723
K 724	C-2		137	+ 48 − 73	− 73 **− 89**				Fair	None	K 724
K 725	C-2*	Near K-668.	115	+ 14 − 79				− 79 **−101**	Fair	None	K 725
K 726	B-1*	Near K-1271.	45	+ 35 **− 10**					Good	None	K 726
K 727	B-1*	Near K-922.	29	+ 20 **− 9**					Good	None	K 727
K 728	C-2*	Near K-12.	132	+ 36 − 81				− 81 **− 96**	Good	None	K 728
K 729	C-2		175	+ 45 − 90	− 90 −108			−108 **−130**	Fair	None	K 729

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IN KINGS COUNTY, LONG ISLAND, N. Y.

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 730	C-2*	Near K-261.	134	+ 36 - 68							- 68 - **98**	Good	None		K 730
K 731	C-2*	Near K-654.	210	+ 23 -160						-160 -167	-167 -**187**	Fair	None		K 731
K 873	C-2*	K 459, shallower, same location. Near K-20.	161	+ 78. - **83**								Good	- 60 - 82	UP	K 873
K 879	C-2*	Near K-658.	147	+ 60 - **87**								Good	- 76 - 87	UP	K 879
K 880	B-2		71	+ 30 - **41**								Good	- 28 - 40	UP	K 880
K 881	C-2*	K 110, deeper, same location.	141	+ 75 - **66**								Good	- 40 - 65	UP	K 881
K 884	C-2*	Near K-40.	182	+120 - **62**								Good	- 42 - 58	UP	K 884
K 886	C-2*	Near K-710.	89	+ 10 - **79**								Good	?		K 886
K 887	C-2		127	+ 49 - 66	- 66 - **76**							Fair	- 41 - 51	UP	K 887
K 888	B-2*	Near K-1026.	51	+ 23 - **28**								Good	- 19 - 28	UP	K 888
K 889	C-2*	Near K-724.	74	+ 15 - **59**								Good	- 47 - 57	UP	K 889
K 890	B-1	K 1065, shallower, same location.	177	+127 - **50**								Good	- 33 - 50	UP	K 890
K 893	C-2		118	+ 20 - 61	- 61 - **98**							Fair	- 45 - 61	UP	K 893
K 894	C-2		282	+ 30 - 57	- 57 -148	Probably absent	Probably absent	-148 -**252**				Fair	- 42 - 57	UP	K 894
K 898	C-2	Near K-673.	84	+ 7 - **77**								Fair	- 36 - 49	UP	K 898
K 900	C-2*	K 254, deeper, same location. Near K-90.	53	+ 53 **0**								Good	+ 28 + 2	UP	K 900
K 902	C-3*	Near K-1035.	80	+ 50 - **30**								Good	- 22 - 30	UP	K 902
K 907	C-2*	Near K-639.	130	+ 80 - **50**								Good	- 25 - 47	UP	K 907
K 910	C-3*	Deepened. Near K-1104.	192	+ 45 -136?	-136? -**147**							Good	- 21 - 41	UP	K 910
K 912	C-2*	Near K-261.	83	+ 45 - **38**								Good	- 26 - 38	UP	K 912

K 916	C-2*	K 920, deeper, same location. Near K-638.	162	+ 13 −118	−118 −128	−128 **−149**			Fair	−137 −149	J	K 916
K 917	C-2*	Near K-652.	106	+ 10 − **96**					Fair	− 80 − 96	UP	K 917
K 918	C-2*	Near K-894.	90	+ 17 − **73**					Good	− 57 − 73	UP	K 918
K 919	B-2*	Near K-522.	73	+ 50 − **23**					Good	− 13 − 23	UP	K 919
K 920	C-2*	K 916, shallower, same location. Near K-638.	164	+ 13 −117	−117 −122	−122 **−151**			Fair	−139 −151	J	K 920
K 921	C-2	Veatch No. 30.	331	+118 ?	?	at − 99	?	at **−213**	Fair	at − 99	J	K 921
K 922	B-1		150	+ 12 − 87	− 87 −102	−102 **−138**			Good	−117 −138	J	K 922
K 923	B-2*	Near K-529.	121	+ 67 − **54**					Good	− 37 − 53	UP	K 923
K 924	C-2*	Near K-50.	66	+ 20 − **46**					Good	− 34 − 45	UP	K 924
K 925	C-3*	Near K-1104.	94	+ 41 − **53**					Good	− 41 − 53	UP	K 925
K 928	B-2*	Near K-311.	63	+ 43 − **20**					Good	− 8 − 20	UP	K 928
K 930	C-2*	K 956, deeper, same location.	180	+ 20 −123	−123 −129	−129 **−160**			Fair	−136 −160	J	K 930
K 931	C-2*	K 956, deeper, same location.	110	+ 20 − **90**					Good	− 78 − 90	UP	K 931
K 935	C-2*	K 276, deeper, same location. Near K-261.	100	+ 45 − **55**					Good	− 39 − 54	UP	K 935
K 937	C-2*	K 320, deeper, same location.	90	+ 36 − **54**					Good	− 21 − 54	UP	K 937
K 940	B-2*	Near K-580.	94	+ 12 − **72**					Good	− 60 − 72	UP	K 940
K 942	C-2*	K 309, deeper, same location. Near K-261.	75	+ 53 − **22**					Good	− 5 − 22	UP	K 942
K 943	C-2*	Near K-320.	110	+ 39 − **76**					Good	− 61 − 76	UP	K 943
K 946	B-2*	Near K-518.	70	+ 24 − **46**					Good	− 34 − 46	UP	K 946
K 951	B-1*	Near K-718.	105	+ 75 − **30**					Good	− 22 − 30	UP	K 951
K 952	C-2*	K 255, deeper, same location. Near K-36.	122	+ 67 − **55**					Good	− 38 − 55	UP	K 952
K 954	C-2*	Near K-261.	92	+ 40 − **52**					Good	− 41 − 51	UP	K 954
K 955	C-2*	Near K-893.	80	+ 18 − **62**					Fair	− 42 − 54	UP	K 955
K 956	C-2	K 930, K 931, shallower, same location.	181	+ 22 − 96	− 96 −130	−130 **−160**			Good	−135 −160	J	K 956
K 957	B-2*	Near K-532.	62	+ 25 − **37**					Good	− 19 − 26	UP	K 957
K 1010	C-2*	K 639, deeper, same location.	181	+ 20 ?	? −136	−136 **−161**			Fair	−144 −160	J	K 1010
K 1012	B-1		181	+ 16 −100	−100 −124	−124 **−165**			Good	−132 −157	J	K 1012
K 1018	C-2*	K 80, shallower, same location. Near K-663.	116	+ 18 − 76	− 76 − **98**				Fair	None		K 1018

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IN KINGS COUNTY, LONG ISLAND, N. Y.

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 1020	A-2*	Near K-550.	113	+ 5 **−108**								Fair	− 98 −108	UP	K 1020
K 1021	A-2		120	+ 10 **−110**								Fair	− 90 −110	UP	K 1021
K 1023	C-3*	Near K-543.	97	+ 38 **− 59**								Good	− 42 − 58	UP	K 1023
K 1025	B-3	No log below 0, but screen set 0 to −16.	49	+ 5 **− 44**								Good	0 − 16	UP	K 1025
K 1026	B-2		92	+ 25 **− 67**								Good	− 51 − 67	UP	K 1026
K 1033	B-2*	Near K-336.	73	+ 25 **− 48**								Good	− 28 − 48	UP	K 1033
K 1035	C-3		150	+ 53 **− 97**								Good	− 71 − 97	UP	K 1035
K 1040	C-3*	K 299, deeper, same location.	129	+ 70 **− 59**								Good	− 37 − 57	UP	K 1040
K 1041	B-1*	K 316, shallower, same location. Near K-584.	142	+ 65 **− 77**								Good	− 54 − 77	UP	K 1041
K 1042	C-2*	Near K-639.	198	+ 92 **−106**								Fair	− 86 −102	UP	K 1042
K 1046	B-2*	Near K-524.	94	+ 26 **− 68**								Good	− 52 − 68	UP	K 1046
K 1048	B-2*	K 1049, shallower, same location. Near K-522.	117	+ 38 **− 79**								Good	− 57 − 79	UP	K 1048
K 1049	B-2*	K 1048, deeper, same location. Near K-522.	89	+ 38 **− 51**								Good	− 20 − 51	UP	K 1049
K 1051	C-2*	Near K-663.	86	+ 20 **− 66**								Good	− 51 − 66	UP	K 1051
K 1054	C-3		90	+ 26 − 63	− 63 **− 64**							Fair	− 42 − 62	UP	K 1054
K 1055	C-2		130	+ 53 **− 77**								Good	− 51 − 76	UP	K 1055
K 1056	A-3	Veatch 130; V 131, 132 similar.	740	+ 7 ?	? −123	−123 220 −213	−213 −493	−493 −683	−683 **−733**			Fair	?	L	K 1056
K 1060	B-3*	Near K-537.	77	+ 25 **− 52**								Good	− 40 − 52	UP	K 1060
K 1061	C-2*	K 261, deeper, same location.	102	+ 50 **− 52**								Good	− 31 − 51	UP	K 1061
K 1065	B-1*	K 890, deeper, same location.	172	+134 **− 38**								Good	− 14 − 38	UP	K 1065
K 1068	A-2*	Near K-1247.	120	+ 10 **−110**								Good	− 90 −110	UP	K 1068

K 1069	C-1*	Near K-700.	61	+ 8 − **53**				Good	− 41 − 51	UP	K 1069
K 1073	C-2*	K 272, shallower, same location. Near K-320.	133	+ 32 − 75			− 75 − **101**	Good	None		K 1073
K 1074	B-2*	Near K-311.	72	+ 43 − **29**				Good	− 23 − 28	UP	K 1074
K 1077	C-3*	Near K-1054.	90	+ 24 − **36**				Good	− 14 − 34	UP	K 1077
K 1086	A-2*	Near K-1247.	118	+ 5 − **113**				Good	− 103 − 113	UP	K 1086
K 1089	B-2*	Near K-523.	75	+ 40 − **35**				Good	− 13 − 35	UP	K 1089
K 1090	B-2*	K 201, shallower, same location. Near K-304.	126	+ 17 − **109**				Good	− 93 − 109	UP	K 1090
K 1091	C-1*	Near K-700.	131	+ 18 − **113**				Good	− 95 − 105	UP	K 1091
K 1101	B-2*	Near K-524.	71	+ 45 − **26**				Good	− 6 − 26	UP	K 1101
K 1102	C-2*	K 259, deeper, same location. Near K-320.	103	+ 35 − **68**				Good	− 48 − 68	UP	K 1102
K 1104	C-3		168	+ 43 − 93	− 93 − 110	− 110 − **125**		Fair	− 113 − 125	J	K 1104
K 1112	C-2*	Near K-50.	64	+ 17 − **47**				Good	− 26 − 36	UP	K 1112
K 1114	C-3*	Near K-538.	64	+ 16 − **48**				Good	− 17 − 48	UP	K 1114
K 1116	C-3*	Near K-538.	64	+ 15 − **49**				Good	− 17 − 49	UP	K 1116
K 1118	C-3*	Near K-538.	75	+ 27 − **48**				Good	− 16 − 48	UP	K 1118
K 1119	C-3*	Near K-538.	76	+ 27 − **49**				Good	− 17 − 49	UP	K 1119
K 1123	C-2*	Near K-689.	93	+ 17 − **76**				Good	− 56 − 76	UP	K 1123
K 1130	C-2*	K 182, deeper, same locality. Near K-893.	89	+ 18 − 63	− 63 − **71**			Good	− 51 − 63	UP	K 1130
K 1134	B-3*	K 191, shallower, same location. Near K-619.	98	+ 31 − **67**				Good	− 57 − 67	UP	K 1134
K 1138	B-2*	Near K-575.	148	+ 20 − **128**				Good	− 107 − 128	UP	K 1138
K 1139	C-3*	K 538, deeper, same location.	122	No log available. Hydrologic data suggests Jameco at − 115.							K 1139
K 1148	B-1*	Near K-1271.	150	+ 11 − 86	− 86 − 100	− 100 − **139**		Good	− 118 − 139	J	K 1148
K 1158	B-2*	Near K-575.	79	+ 25 − **54**				Good	− 34 − 54	UP	K 1158
K 1160	C-2*	K 1275, deeper, same location.	155	+ 10 − 69	− 69 − 86	− 86 − **145**		Fair	− 125 − 145	J	K 1160
K 1164	B-3*	Near K-619.	97	+ 24 − **73**				Good	− 42 − 72	UP	K 1164
K 1169	C-2*	Near K-320.	107	+ 40 − **67**				Good	− 56 − 67	UP	K 1169
K 1178	C-2*	Near K-458.	72	+ 17 − **55**				Good	− 44 − 55	UP	K 1178
K 1189	B-1*	Log very poor, use K 922, same location.									K 1189

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN KINGS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
K 1190	C-1*	Near K-703.	74	+ 10 **− 64**								Good	− 39 − 63	UP	K 1190
K 1192	C-1*	Near K-669.	112	+ 30 **− 82**								Good	− 39 − 64	UP	K 1192
K 1205	B-2*	K 296, deeper, same location. Near K-525.	58	+ 69 **+ 11**								Good	+ 31 + 11	UP	K 1205
K 1207	B-2*	K 300, deeper, same location. Near K-514.	38	+ 30 **− 8**								Good	+ 2 − 8	UP	K 1207
K 1209	B-2*	K 303, same location, same depth. Near K-514.	118	+ 14 **−104**								Good	− 43 − 90	UP	K 1209
K 1211	B-1*	K 308, deeper, same location.	116	+ 76 **− 40**								Good	− 6 − 36	UP	K 1211
K 1214	C-2*	K 326, deeper, same location. Near K-1275.	60	+ 26 **− 34**								Good	− 13 − 34	UP	K 1214
K 1230	C-3*	Near K-1054.	95	+ 26 **− 69**								Good	− 41 − 68	UP	K 1230
K 1240	C-2*	Near K-686.	108	+ 55 **− 53**								Good	− 32 − 52	UP	K 1240
K 1241	C-2*	Near K-20.	143	+120 **− 23**								Good	− 11 − 23	UP	K 1241
K 1245	C-2*	K 650, deeper, same location.	144	+ 10 **−134**								Poor	−132 −137	UP	K 1245
K 1246	C-2*	Near K-1313.	85	+ 9 **− 76**								Good	− 41 − 63	UP	K 1246
K 1247	A-2		113	+ 12 **−101**								Good	− 96 −101	UP	K 1247
K 1248	C-2*	Near K-921.	145	+ 70 **− 75**								Good	− 60 − 75	UP	K 1248
K 1251	C-2*	K 117, deeper, same location. Near K-320.	107	+ 45 **− 62**								Good	− 50 − 62	UP	K 1251
K 1252	B-2*	Near K-524.	61	+ 20 **− 41**								Good	− 35 − 41	UP	K 1252
K 1255	A-2*	Near K-1247.	169	+ 10 **−159**								Good	−148 −159	UP	K 1255
K 1257	A-2*	Near K-1.	140	+ 6 **−134**								Good	−114 −134	UP	K 1257
K 1267	B-2*	Near K-575.	129	+ 20 **−109**								Good	−105 −109	UP	K 1267
K 1271	B-1	Veatch No. 5.	1,503	+ 5 − 96	− 96 −134	−137 212 −207					−207 **−1,498**	Good	Probably None	Br	K 1271
K 1273	C-2	Veatch No. 35.	275	+ 40 − 65	Gardiners and Cretaceous to −**235**. Jameco not present here. See also K 894.							Fair	− 23 − 65	UP	K 1273
K 1274	C-2*	Veatch No. 37. K 1275 same location.	165	+ 10 ?	? −140	−140 **−155**						Poor	−140 −155	J	K 1274
K 1275	C-2	Veatch No. 38.	175	+ 10 − 77	− 77 −117	−117 **−165**						Fair	−114 −165	J	K 1275
K 1279	C-2	Veatch No. 51.	316	+ 10 **− 93**							− 93 **−306**	Good	at −265 and −284	Br	K 1276

K 1283	C-2*	Veatch No. 62. Near K-724.	240	+ 45 **-195**					Poor	- **7** - 30	UP	K 1283
K 1286	C-3	Veatch No. 135.	164	+ 10 - 60	- 60 -108	-108 **-154**			Fair	Uncertain	J	K 1286
K 1287	B-2		161	+ 50 - 82	- 82 - 97	- 97 **-111**			Fair	-103 -111	J	K 1287
K 1288	C-2*	Near K-663.	102	+ 30 - 72	at - **72**				Fair	- 49 - 62	UP	K 1288
K 1293	B-3*	Near K-619.	90	+ 35 - **55**					Good	- 43 - 55	UP	K 1293
K 1294	C-3*	Near K-131.	101	+ 58 - **43**					Good	- 43 - 45	UP	K 1294
K 1301	C-2*	Near K-686.	101	+ 44 - **57**					Good	- 37 - 57	UP	K 1301
K 1302	C-2*	K 1314, shallower, same location. Near K-320.	102	+ 41 - **61**					Good	- 41 - **61**	UP	K 1302
K 1303	C-2*	K 1333, shallower, same location. Near K-673.	100	+ 26 - **74**					Good	- 27 - **39**	UP	K 1303
K 1305	C-2*	K 1275, deeper, same location.	166	+ 10 - 72	- 72 - 96	- 96 **-156**			Fair	-124 -153	UP	K 1305
K 1309	B-2		231	+ 43 -113	-113 -168	-168 **-188**			Fair	-173 -182	UP	K 1309
K 1313	C-2	K 1340, shallower, same location.	161	+ 31 - 72	- 72 -129		-129 ? -130	at **-130**	Fair	None		K 1313
K 1314	C-2*	K 1302, deeper, same location. Near K-320.	97	+ 41 - **56**					Good	- 28 - 56	UP	K 1314
K 1317	B-2*	Near K-305.	50	+ 14 - **36**					Good	- 14 - 34	UP	K 1317
K 1329	B-2*	Near K-517.	162	+ 46 **-116**					Good	- 76 -116	UP	K 1329
K 1331	B-2*	Near K-519.	145	+ 50 - **95**					Good	- 55 - 95	UP	K 1331
K 1332	C-2*	K 638, deeper, same location.	168	+ 10 -121	-121 -129	-129 **-158**			Fair	-146 -158	J	K 1332
K 1333	C-2*	K 1303, deeper, same location. Near K-673.	70	+ 26 - **44**					Good	- 31 - 43	UP	K 1333
K 1336	C-2*	Near K-1273.	163	+ 50 - 52	- 52 **-113**				Fair	Probably None		K 1336
K 1338	B-2*	K 526, deeper, same location.	200	+ 79 **-121**					Fair	- 71 -111	UP	K 1338
K 1339	B-2		165	+ 50 -115	at **-115**				Good	?		K 1339
K 1340	C-2*	K 1313, deeper, same location.	155	+ 35 - 82	- 82 -120			at **-120**	Fair	- 51 - 72	UP	K 1340
K 1341	C-2*	Near K-1273.	86	+ 27 - **59**					Good	- 53 - 59	UP	K 1341
K 1344	C-2*	K 1275, deeper, same location.	171	+ 10 - 85	- 85 -118	-118 **-161**			Fair	-128 -158	J	K 1344
K 1343	B-2	Wrongly numbered K 1346 in G-W 8.	168	+ 39 -122	-122 **-129**				Fair	- 95 -127	UP	K 1346
K 1350	C-2*	Near K-33.	93	+ 20 - **73**					Fair	- 55 - 73	UP	K 1350
K 1352	B-2*	K 528, deeper, same location.	180	+ 61 **-119**					Good	?	UP	K 1352
K 1354	B-2		180	+ 60 -105	-105 **-120**				Good	?	UP	K 1354
K 1355	B-2*	Near K-528.	175	+ 46 **-129**					Good	?	UP	K 1355
K 1356	A-2		152	+ 5 **-147**					Good	-107 -128	UP	K 1356

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 13	D-2		86	+ 24 – 65	89						at – **65**	Good	No record	UP	Q 13
Q 17	C-2		175	+ 17 – 9	176						– 9 –**158**	Good	None	Br	Q 17
Q 21	C-3*	Q 1279, deeper, same location.	50	– 19 – **31**								Good	– 19 – 31	UP	Q 21
Q 23	C-3		59	+ 5 – 54	59							Good	No record	UP	Q 23
Q 27	C-3*	Q 1241, better log, same location.	301	+ 57 + **7**				+ 7 –190	–190 –244		at –**244**	Good	No record	L	Q 27
Q 28	C-3		125	+110 – **15**								Good	No record	UP	Q 28
Q 29	C-3		225	+ 80 – 96	176		– 96 –**145**					Good	– 46 – 76	UP	Q 29
Q 30 #1	C-3*	Q 31, deeper, same location.	121	+ 61 – **60**								Good	No record	UP	Q 30 #1
Q 30 #2	C-3*	Q 31, deeper, same location.	129	+ 77 – **52**								Good	No record	UP	Q 30 #2
Q 31	C-3	Q 30, shallower, same location.	491	+ 70 – 84	154		– 84 –200	–200 –360	–360 –421		at –**421**	Good	–361 –421	L	Q 31
Q 33	D-3	Q 455, 456, and 457, same location.	220	+ 37 – 66	103			– 66 –126	–126 –179	–179 –183	at –**183**	Good	– 35 – 57	UP	Q 33
Q 37	C-4		143	+ 72 – 28	100		– 28 – **71**					Good	– 7 – 28	UP	Q 37
Q 43	C-3	Q 148, shallower, same location.	97	+ 55 – **42**								Good	– 22 – 47	UP	Q 43
Q 47 #2	C-3*	Q 1081, better log, same location.	131	+ 75 – **56**								Fair	– 33 – 53	UP	Q 47 #2
Q 47 #4	C-3*	Q 1081, better log, same location.	135	+ 75 – **60**								Fair	No record	UP	Q 47 #4
Q 52	C-3		150	+ 80 – **70**								Fair	No record	UP	Q 52
Q 57	C-2		77	+ 21 – **56**								Good	No record	UP	Q 57
Q 62	D-2		129	+ 38 – 51	89			– 51 – 81		– 81 – 86	– 86 – **91**	Fair	No record	UP	Q 62
Q 64 #3	C-3		155	+ 35 – 80	115.			– 80 –**120**				Good	No record	UP	Q 64 #3
Q 64 #4	C-3*	Same location as Q 64 #3.	143	+ 35 – 96	131			– 96 –**108**				Good	No record	UP	Q 64 #4
Q 64 #5	C-3*	Same location as Q 64 #3.	112	+ 35 – 61	76			– 61 – **77**				Good	No record	UP	Q 64 #5
Q 65	C-3		284	+ 20 – 60	80			– 60 –190	–190 –241	–**241** –**264**		Good	–194 –242	L	Q 65
Q 67	C-3*	Near Q-1376.	67	+ 63 – **4**	67							Good	No record	UP	Q 67

Q 76 #1	C-4	Q 458, 459 and 1343, shallower, same location.	91	+ 50 − **41**							Good	− 10 − 40	UP	Q 76 #1
Q 76 #2	C-4		89	+ 50 − **39**							Good	− 9 − 39	UP	Q 76 #4
Q 86	C-4		135	+ 57 − **78**							Good	− 56 − 76	UP	Q 86
Q 87	C-4		148	+ 61 − **87**							Fair	− 70 − 87	UP	Q 87
Q 91	C-5		135	+ 28 −**107**							Good	− 90 −107	UP	Q 91
Q 93	C-5		135	+ 80 − **55**							Good	− 33 − 55	UP	Q 93
Q 95	D-2		96	+ 7 − **87** 94						− 87 − **89**	Good	No record	UP	Q 95
Q 96	C-3*	Near Q-206.	65	+ 50 − **15**							Good	No record	UP	Q 96
Q 102	C-4*	Q 1035, deeper, same location.	72	+ 59 − **13**							Good	− 4 − 13	UP	Q 102
Q 111	B-4	Correlation of upper portion of log is uncertain.	1,016	+ 9 −111	−111 ?	110 None	? −597	−597 −853	−853 −**1007**		Fair	No record	L	Q 111
Q 113	C-4*	Near Q-1239.	104	+ 61 − **43**							Good	− 22 − 43	UP	Q 113
Q 115	C-5	Near Q-361.	90	+ 75 − **15**							Good	+ 5 − 15	UP	Q 115
Q 119	C-4*	Near Q-565. Q 547, shallower, same location.	110	+ 60 − 50			at − **50**				Good	− 28 − 49	UP	Q 119
Q 122	C-2*	Near Q-57.	125	+ 50 ? − **75**	?						Fair	− 3 − 15	UP	Q 122
Q 123	A-4		960	+ 8 −197	−197 −242	−242 356 −348	−348 −455	−455 −751	−751 −952		Good	−875 −940	L	Q 123
Q 125	D-3*	Near Q-417. Q 549, shallower, same location.	82	+ 45 − **37**							Good	− 26 − 37	UP	Q 125
Q 127	D-4	Q 367, Q 550, Q 368, Q 977, same location.	200	+ 40 − 50 90				− 50 ?−160			Fair	− 35 − 50	UP	Q 127
Q 128	C-4*	Near Q-1417.	140	+ 58 − **82**							Good	− 60 − 80	UP	Q 128
Q 129	B-5*	Q 989, deeper, same locaton.	121	+ 26 − **95**							Fair	− 73 − 94	UP	Q 129
Q 130	C-3*	Near Q-1378.	87	+ 45 − **42**							Good	− 14 − 30	UP	Q 130
Q 131	B-4*	Q 1383, deeper, same location.	118	+ 26 − **92**							Fair	− 71 − 92	UP	Q 131
Q 133	A-4*	Located about 400 yards west of Q 1030.	99	+ 10 − **89**							Good	− 68 − 89	UP	Q 133
Q 142	C-3	Q 244, shallower, same location.	107	+ 50 − **57**							Good	− 36 − 57	UP	Q 142
Q 143	C-4*	Q 1275, deeper, same location.	91	+ 58 − **33**							Good	− 12 − 33	UP	Q 143
Q 145	C-4*	Q 213, deeper, same location.	120	+110 − **10**							Good	+ 10 − 10	UP	Q 145
Q 147	C-3*	Q 1328, deeper, same location.	93	+ 64 − **29**							Good	− 19 − 29	UP	Q 147
Q 148	C-3*	Q 43, deeper, same location.	30	+ 55 + **25**							Good	+ 35 + 25	UP	Q 148

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 149	D-4	Q 150, shallower, same location.	103	+ 20 − **83**								Good	− 63 − 83	UP	Q 149
Q 150	D-4*	Q 149, deeper, same location.	73	+ 20 − **53**								Good	− 10 to − 30 − 38 to − 53	UP	Q 150
Q 154	C-4*	Q 1239, deeper, same location.	95	+ 55 − **41**								Good	− 25 − 41	UP	Q 154
Q 161	D-2		150	+ 5 − 9	12					− 9 ?	? **−145**	Fair	None	Br	Q 161
Q 164	C-3		112	+ 80 − **32**								Good	− 17 − 32	UP	Q 164
Q 165	D-2		200	+ 5 0	15						0 − **95**	Good	None	Br	Q 165
Q 171	C-2	Location uncertain.	500	+ 20 − 36	56						− 36 **−480**	Good	None	Br	Q 171
Q 183	D-3		170	+ 5 − 5	10			− 5 −131	−131 **−165**			Good	No record	Prob- ably L	Q 183
Q 184	C-3	Veatch #79.	582	+ 90 − 49	177			− 49 −114			−114 **−492**	Good	No record	No record	Q 184
Q 187	C-3		130	+ 30 **−100**								Good	− 88 −100	UP	Q 187
Q 189	C-3*	Near Q-1412.	103	+ 48 − **55**								Good	− 43 − 55	UP	Q 189
Q 191	D-4		85	+ 10 − **75**								Fair	− 57 − 69	UP	Q 191
Q 192	C-3	No water obtained.	175	+102 ?− **73**								Fair	No record	No record	Q 192
Q 200	C-4*	Q 1239, deeper, same location.	46	+ 55 + **9**								Good	+ 21 + 11	UP	Q 200
Q 202	C-3*	Q 537, deeper, same location.	112	+120 + **8**								Good	+ 38 + 8	UP	Q 202
Q 206	C-3	Q 971, shallower, same location.	221	+ 51 − 95	146			− 95 −170			at **−170**	Fair	− 61 to − 81 and − 89 to − 95	UP	Q 206
Q 207	D-3*	Q 1093, deeper, same location.	46	+ 55 + **9**								Good	+ 19 + 9	UP	Q 207
Q 213	C-4	Q 145, shallower, same location.	124	+110 − **14**								Good	− 3 − 14	UP	Q 213
Q 214	C-4*	Near Q-565.	85	+ 60 − **25**								Good	No record	UP	Q 214
Q 237	C-3		577	+ 36 −108		−108 ? 213 **−177**	−177 −262	−262 −420	−420 −520		−520 **−541**	Good	No record	No record	Q 237

Q 243	C-3*	Near Q-537. Q 1067, shallower, same location.	104	+ 78 – **26**								Good	– 21 – 26	UP	Q 243
Q 244	C-3*	Q 142, deeper, same location.	53	+ 50 – **3**								Good	+ 17 – 3	UP	Q 244
Q 258	C-2*	Q 1317, deeper, same location.	54	+ 15 – **39**								Good	– 29 – 39	UP	Q 258
Q 263	D-3*	Near Q-62. Veatch #99.	125	+ 38 – 20				– 20 – 80			– 80 – **87**	Good	No record	No record	Q 263
Q 268	C-3	Depth to Raritan clay probably greater than –103.	297	+ 27 –103				?	?		–266 –**270**	Poor	No record	No record	Q 268
Q 271	C-4*	Q 273, deeper, same location.	89	+ 20 – **69**								Good	– 38 – 68	UP	Q 271
Q 272	C-4		495	+ 13 – 82 95				– 82 –313	–313 –457	–457 –**482**		Good	– 47 – 87	UP	Q 272
Q 273	C-4	Q 271, shallower, same location.	488	+ 26 – 98 124				– 98 –282	–282 –438	–438 ?–**462**		Good	–282 to –348 –350 to –412	L	Q 273
Q 274	C-4		407	+ 20 – 25			– 25 –**148**	–148 –284	–284 –387	at –**387**		Fair	No record	No record	Q 274
Q 275	D-7	Douglaston well field.	456	+ 5 – 75			– 75 –230	–230 –385	–385 –**451**			Good	No record	No record	Q 275
Q 276	D-7	Douglaston well field.	531	+ 25 – 25			– 25 –191	–191 –371	–371 –**506**			Good	–159 –185	BM	Q 276
Q 277	D-5*	Douglaston well field. Q 278, deeper, same location.	152	+ 16 – 59			– 59 –**136**					Good	– 98 –128	M	Q 277
Q 278	D-5	Douglaston well field. Q 277, shallower, same location.	536	+ 16 – 59			– 59 –196	–196 –334	–334 –**520**			Good	–364 to –384 –421 to –431 –445 to –496	L	Q 278
Q 282	C-4		463	+ 30 – 38 108			– 38 –133	–133 –277	–277 –**433**			Good	–312 to –323 –341 to –414	L	Q 282
Q 283	C-4		447	+ 27 – 41 68			– 41 –123	–123 –283	–283 –383	–383 –**420**		Fair	–282 to –325 –340 to –382	L	Q 283
Q 287	B-4		722	+ 5 –155	–155 –230	–230 320 –315	–315 – ?	– ? –655	–655 –**717**			Good	No record	L	Q 287
Q 290	A-3	Well #3.	728	+ 5 –195	–195 ?–201	–201 310 ?–305	–305 –490	–490 –674	–674 –**723**			Fair	No record	L ?	Q 290
Q 293	C-3*	Q 1328, deeper, same location.	80	+ 64 – **16**								Good	– 6 – 16 + 4 to – 34	UP	Q 293
Q 301	C-4*	Near Q-322.	110	+ 67 – 43 109			at –43 ?					Fair	+ 9 to – 1 – 6 to – 25	UP	Q 301
Q 302	C-4*	Q 557, deeper, same location.	104	+ 58 – **44**								Good	+ 15 – 34	UP	Q 302
Q 303	C-4*	Q 558, deeper, same location.	100	+ 33 – **67**								Good	– 15 – 59	UP	Q 303
Q 304	C-4*	Q 559, deeper, same location.	71	+ 16 – **55**								Good	– 32 – 52	UP	Q 304
Q 305	C-4*	Q 1311, deeper, same location.	92	+ 62 – **30**								Good	– 19 – 25	UP	Q 305
Q 306	C-4*	Q 562, deeper, same location.	97	+ 26 – 47	– 47 – **71**							Fair	– 13 – 42	UP	Q 306
Q 307	C-4*	Q 564, deeper, same location.	96	+ 70 – **26**								Good	+ 17 – 27	UP	Q 307

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 308	C-4*	Q 565, deeper, same location.	107	+ 65 − **42**								Good	+ 7 − 36	UP	Q 308
Q 310	C-5		111	+ 47 − 58	105		− 58 − **64**					Fair	− 11 − 54	UP	Q 310
Q 311	C-4		260	+ 28 −100	−100 −177	−177 −**232**						Good	−174 −232	J	Q 311
Q 312	C-4		276	+ 22 − 48	− 48 −148	−148 264 −242	−242 −**254**					Fair	−194 −254	J	Q 312
Q 313	C-5		111	+ 97 − **14**								Good	+ 34 − 9	UP	Q 313
Q 314	C-4		310	+ 32 − 84	− 84 −163	−163 312 −278		at −**278?**				Good	−212 −272	J	Q 314
Q 317	C-4	Q 566, shallower, same location.	600	+ 61 − 62	173		− 62 ?−231	−231 −389	−389 ?−**539**			Fair	−426 to −436 −446 to −494	L	Q 317
Q 318	C-4*	Q 567, deeper, same location.	250	+131 + 21	152		+ 21 −**119**					Good	− 85 −115	M	Q 318
Q 319	C-4		142	+124 − **18**								Good	+ 4 − 16	UP	Q 319
Q 321	C-5		152	+143 − **9**								Good	+ 13 − 2	UP	Q 321
Q 322	C-4		130	+ 79 − **51**								Good	− 27 − 47	UP	Q 322
Q 324	C-4*	Q 556, deeper, same location.	123	+ 40 − 25	165		− 25 − **83**					Poor	− 5 − 25	UP	Q 324
Q 331	B-5		56	+ 15 − **41**								Good	No record	UP	Q 331
Q 332	B-5		375	+ 8 −111	119		−111 −**267**					Fair	No record	No record	Q 332
Q 333	B-5*	Q 1197, better log, same location.	140	+ 12 − 46	− 46 − 79	− 79 −**128**						Fair	No record	J	Q 333
Q 334	B-4*	Q 1305, better log, same location.	190	+ 8 − 67	− 67 −103	−103 −**182**						Good	No record	J	Q 334
Q 335	B-4		335	+ 13 − 69	− 69 −147	−147 297 −284	−284 −**322**					Good	No record	J	Q 335
Q 336	C-4		173	+ 10 − 85	− 85 −135	−135 −**163**						Good	No record	J	Q 336
Q 337	B-4		222	+ 8 −106	−106 −163	−163 −**214**						Good	No record	J	Q 337
Q 338	B-4		230	+ 10 − 90	− 90 −195	−195 −**225**						Good	No record	J	Q 338
Q 339	B-4*	Near plotted position of Q 680.	212	+ 10 −100	−100 −172	−172 −**202**						Good	No record	J	Q 339

Q 340	C-3*	Q 634, better log, same location.	148	+ 9 − 71	− 71 −113	−113 **−139**							Fair	No record	J	Q 340
Q 341	C-3		246	+ 70 − 58	128		− 58 **−176**						Fair	No record	No record	Q 341
Q 344	B-3	Crosby's log.	336	+ 10 − 80	− 80 ? −110	−110 168 −178	−178 **−326**						Good	No record	No record	Q 344
Q 345	C-3	Crosby's log.	219	+ 10 − 70	− 70 ? −143	−143 199 −189	−189 **−210**						Good	No record	J	Q 345
Q 350	C-3	Well is now plugged at 223 feet in Jameco gravel.	655	+ 32 − 78	− 78 ? −103	−103 240 −208	−208 −265	−265 −453	−453 −578	−578 **−623**			Fair	−414 −426 −514 −538 −543 to −553	L	Q 350
Q 354	C-3		105	+ 40 **− 65**									Good	− 18 − 62	UP	Q 354
Q 355	C-3*	Near Q-362.	120	+ 45 **− 75**									Good	No record	UP	Q 355
Q 359	C-4*	Near plotted position of Q 1239.	46	+ 40 **− 6**									Good	No record	UP	Q 359
Q 360	D-3		90	+ 60 **− 30**									Good	− 17 − 20	UP	Q 360
Q 361	C-5		101	+ 77 **− 24**									Good	− 12 − 24	UP	Q 361
Q 362	C-3		90	+ 60 **− 30**									Good	0 − 14	UP	Q 362
Q 363	C-4*	Near Q-1064.	89	+ 30 **− 59**									Good	− 47 − 59	UP	Q 363
Q 364	C-3	Well abandoned. No water yielded.	189	+ 63 − 27	90			− 27 **−126**					Fair	None	No record	Q 364
Q-365	C-4	Q 366, shallower, same location.	92	+ 40 **− 52**									Good	− 30 − 52	UP	Q 365
Q 366	C-2*	Q 365, deeper, same location.	47	+ 40 **− 7**									Good	+ 21 − 7	UP	Q 366
Q 367	D-4*	Q 127, deeper, same location.	90	+ 35 **− 55**									Good	− 40 − 55	UP	Q 367
Q 368	D-4*	Q 127, deeper, same location.	35	+ 30 **− 5**									Good	+ 10 − 5	UP	Q 368
Q 369	C-2*	Near Q-427.	152	+ 80 − 61	141							− 61 **− 72**	Good	No record	UP	Q 369
Q 370	C-4*	Q 1275, deeper, same location.	30	+ 58 **+ 20**									Good	+ 38 + 28	UP	Q 370
Q 372	C-2	Test boring.	69	0 **− 69**									Good	None	None	Q 372
Q 373	D-3	Test boring.	52	+ 42 **− 10**									Good	None	None	Q 373
Q 374	D-2	Test boring.	64	+ 33 − 17	50							− 17 **− 31**	Good	None	None	Q 374
Q 375	D-2	Test boring.	58	+ 15 − 41	56						− 41 **− 43**		Good	None	None	Q 375
Q 376	D-2	Test boring.	121	+ 43 − 59	102							− 59 **− 79**	Good	None	None	Q 376
Q 377	D-3	Test boring.	87	+ 64 − 3	67							− 3 **− 23**	Good	None	None	Q 377
Q 378	D-3	Test boring.	103	+ 75 − 7	82							− 7 **− 28**	Good	None	None	Q 378
Q 379	D-2	Test boring.	147	+ 52 − 74	126							− 74 **− 95**	Good	None	None	Q 379

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 380	D-3	Test boring.	108	+ 78 − 10	98						− 10 − **30**	Good	None	None	Q 380
Q 381	D-3	Test boring.	96	+ 19 − 46	65					− 46 − 56	− 56 − **75**	Good	None	None	Q 381
Q 382	D-3	Test boring.	127	+ 58 − 49	[illegible]						− 49 − **69**	Fair	None	None	Q 382
Q 386	C-2	Test boring.	222	+ 75 − 73	138						− 73 − **147**	Poor	None	None	Q 386
Q 387	C-2*	Near Q-388. Test boring.	176	+ 64 − 88	152					− 88 − 91	− 91 − **112**	Fair	None	None	Q 387
Q 388	C-2	Test boring.	203	+ 70 − 106	176						− 106 − **133**	Poor	None	None	Q 388
Q 389	D-2*	Near Q-62. Test boring.	84	+ 35 − 28	63						− 28 − **49**	Fair	None	None	Q 389
Q 390	C-2	Test boring.	211	+ 23 − 56	− 56 ? − 171 174						− 171 − **188**	Fair	None	None	Q 390
Q 391	C-2*	Near Q-39. Test boring.	197	+ 62 − 115							− 115 − **135**	Poor	None	None	Q 391
Q 392	C-2*	Near Q-390. Test boring.	166	+ 65 − 85							− 85 − 101	Poor	None	None	Q 392
Q 393	C-2	Test boring.	170	+ 17 − 59	− 59 − 133 150						− 133 − **153**	Fair	None	None	Q 393
Q 394	C-2	Test boring.	175	+ 48 − ?	− ? ? − 107 155					− 107 − 114	− 114 − **127**	Poor	None	None	Q 394
Q 395	C-2*	Near Q-398. Test boring.	74	+ 7 − 67							at − **67?**	Poor	None	None	Q 395
Q 396	C-2*	Near Q-398. Test boring.	63	+ 5 − **58**								Poor	None	None	Q 396
Q 397	C-2	Test boring.	55	0 − **55**								Good	None	None	Q 397
Q 398	C-2	Test boring.	67	+ 2 − 60							− 60 ?− **65**	Fair	None	None	Q 398
Q 399	C-2*	Near Q-398. Test boring.	68	+ 13 − **55**								Good	None	None	Q 399
Q 400	C-2*	Test boring. Same location as K 711.	74	0 − 74							at − **74?**	Fair	None	None	Q 400
Q 401	D-3*	Near Q-601. Test boring.	76	0 − **76**								Fair	None	None	Q 401
Q 402	D-4	Test boring.	65	+ 10 − **55**								Good	None	None	Q 402
Q 403	A-3		870	+ 5 − 192	− 192 − 206	− 206 242 − 237	− 237 − 490	− 490 − 643	− 643 − 865		at − **865**	Good	No record	No record	Q 403

Q 404	D-2	Test boring.	46	+ 43 + 8	51				+ 8 − **3**	Good	None	None	Q 404
Q 405	D-3	Test boring.	95	0 − 67	161			− 67 − 72	− 72 − **95**	Good	None	None	Q 405
Q 406	D-2	Test boring.	82	+ 53 − 24	77				− 24 − **29**	Good	None	None	Q 406
Q 407	D-2	Test boring.	50	+ 22 − 23	45				− 23 − **28**	Good	None	None	Q 407
Q 408	D-2	Test boring.	57	+ 8 − 42	40				− 42 − **51**	Good	None	None	Q 408
Q 409	D-2	Test boring.	90	+ 35 − **55**						Fair	None	None	Q 409
Q 410	D-2*	Near Q-95. Test boring.	68	+ 13 − **55**						Good	None	None	Q 410
Q 411	D-3	Test boring.	125	+ 64 − 41	105				− 41 − **61**	Good	None	None	Q 411
Q 412	D-3	Test boring.	128	+ 66 − 42	108				− 42 − **62**	Good	None	None	Q 412
Q 413	D-3	Test boring.	121	+ 56 − 38	94				− 38 − **65**	Good	None	None	Q 413
Q 414	D-3	Test boring.	124	+ 21 − 59	80			− 59 − 71	− 71 −**103**	Good	None	None	Q 414
Q 415	D-3	Test boring.	110	+ 8 − 78	86			− 78 − 82	− 82 −**102**	Good	None	None	Q 415
Q 416	D-3	Test boring.	143	0 − 89	89			− 89 −106	−106 −**143**	Good	None	None	Q 416
Q 417	D-3	Test boring.	120	+ 46 − 54	100				− 54 − **75**	Good	None	None	Q 417
Q 418	C-2	Test boring.	53	+ 7 − 41	38				− 41 − **46**	Good	None	None	Q 418
Q 419	D-2*	Near Q-962. Test boring.	38	+ 14 − **14**						Good	None	None	Q 419
Q 420	D-3	Test boring.	41	+ 35 − **6**						Good	None	None	Q 420
Q 421	C-3	Test boring.	41	+ 30 − **11**						Good	None	None	Q 421
Q 422	C-2*	Near Q-966. Test boring.	66	+ 7 − 49	56				− 49 − **59**	Good	None	None	Q 422
Q 423	C-2*	Near Q-966. Test boring.	69	+ 17 − 42	59				− 32 − **52**	Good	None	None	Q 423
Q 424	C-2*	Near Q-398. Test boring.	50	+ 14 − **36**						Good	None	None	Q 424
Q 425	C-2*	Near Q-386. Test boring.	159	+ 75 − 64	139				− 64 − **84**	Good	None	None	Q 425
Q 426	C-3	Test boring.	63	+ 63 − 38	101		− 38 − 64		− 64 − **84**	Fair	None	None	Q 426
Q 427	C-3	Test boring.	227	+ 91 − 37	128		− 37 −121		−121 −**136**	Fair	None	None	Q 427
Q 428	C-3	Test boring.	267	+ 98 − ?	?				−148 −**169**	Fair	None	None	Q 428
Q 429	C-2	Test boring.	234	+ 64 − ?	− ? −108	−108 ? 213 −149			−149 −**170**	Fair	None	None	Q 429
Q 430	C-3*	Near Q-428. Test boring.	246	+101 −125	226				−125 −**145**	Fair	None	None	Q 430

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 431	C-3*	Near Q-184. Test boring.	243	+104 −118	[illegible]✓						−118 −**139**	Fair	None	None	Q 431
Q 432	C-2*	Near Q-434. Test boring.	302	+115 − 33	− ? −167 282✓						−167 −**187**	Fair	None	None	Q 432
Q 433	C-3	Fine gray sands are either upper Pleistocene or Gardiners. Pleistocene deposits at least to −118.	194	+ 28 − ?	?						−146 −**166**	Fair	None	None	Q 433
Q 434	C-2	The clay may be all upper Pleistocene, all Gardiners or the lower portion may be Raritan.	263	+ 89 − 53	− 53 ? − !			?			−147 −**174**	Fair	None	None	Q 434
Q 435	C-2	Test boring.	259	+ 8 − ?	− ? ?−128	−128 10✓ ?−176					−176 −**196**	Fair	None	None	Q 435
Q 436	C-2	Test boring.	217	+ 8 − 57	− 57 −156 ✓			−156 −187		−187 −191	−191 −**209**	Fair	None	None	Q 436
Q 437	C-3	Test boring.	260	+ 5 − 95	− 95 −131 ✓			−131 −207			−207 −**255**	Fair	None	None	Q 437
Q 438	C-2	Test boring.	208	+ 4 − 83	− 83 −113 ✓			−113 −184			−184 −**204**	Fair	None	None	Q 438
Q 439	D-3	Test boring.	128	+ 10 − **98**								Fair	None	None	Q 439
Q 440	C-3	Age of clay at bottom of log uncertain. Test boring.	121	+ 27 − 83	10?			− 83 ?− 94				Fair	None	None	Q 440
Q 441	D-3	Test boring.	85	+ 2 − **83**								Fair	None	None	Q 441
Q 442	C-4	Test boring.	94	+ 10 − **84**								Fair	None	None	Q 442
Q 443	C-3*	Near Q-440. Test boring.	103	+ 27 − **76**								Fair	None	None	Q 443
Q 444	C-3*	Near Q-1028. Test boring.	80	+ 2 − **80**								Fair	None	None	Q 444
Q 445	C-3	Test boring.	45	+ 19 − **26**								Fair	None	None	Q 445
Q 446	C-3	Test boring.	90	+ 2 − **88**								Fair	None	None	Q 446
Q 447	C-3	Test boring.	91	+ 2 − **89**								Fair	None	None	Q 447

Q 448	C-3	Test boring.	60	+ 7 − **53**							Fair	None	None	Q 448
Q 449	C-3	Test boring.	91	+ 1 − **90**							Poor	None	None	Q 449
Q 450	D-3*	Near Q-601. Test boring.	82	+ 10 − **72**							Fair	None	None	Q 450
Q 451	D-3	Test boring.	159	+ 17 −**142**			?				Poor	None	None	Q 451
Q 452	D-3	Test boring.	91	+ 4 − **87**							Fair	None	None	Q 452
Q 453	C-2*	Near Q-386. Test boring.	147	+ 68 − 77	145					− 77 − **79**	Fair	No record	No record	Q 453
Q 455	D-3*	Q 33, deeper, same location.	110	+ 37 − 25	62		− 25 − **73**				Good	No record	No record	Q 455
Q 456	D-3*	Q 33, deeper, same location.	80	+ 37 − **53**							Good	− 37 − 53	UP	Q 456
Q 457	D-3*	Q 33, deeper, same location.	48	+ 37 − **11**							Good	− 1 − 11	UP	Q 457
Q 458	C-4*	Q 76, deeper, same location.	67	+ 50 − **17**							Good	+ 3 − 17	UP	Q 458
Q 459	C-4*	Q 76, deeper, same location.	56	+ **50** − **6**							Good	+ 34 − 6	UP	Q 459
Q 460	D-4	Q 461 to Q 486, same location.	457	+ 11 − 2	13	− 2 −146	−146 −297	−297 −389	−389 −**446**		Good	No record	No record	Q 460
Q 461	D-4*	Q 460, deeper, same location.	377	+ 11 − 2	13	− 2 −156	−156 −297	−297 −**366**			Good	No record	No record	Q 461
Q 462	D-4	Q 460, deeper, same location.	405	+ 7 − 4	11	− 4 −167	−167 −271	−271 −393	at −**393**		Good	−354 −394	L	Q 462
Q 463	D-4*	Q 460, deeper, same location.	431	+ 7 − 3	10	− 3 −144	−144 −240	−240 −392	−392 −**424**		Good	−344 −384	L	Q 463
Q 464	D-4*	Q 460, deeper, same location.	367	+ 6 − 4	[illegible]	− 4 −145	−145 −272	−272 −**361**			Good	−321 −360	L	Q 464
Q 465	D-4*	Q 460, deeper, same location.	441	+ 5 − 4	0	− 4 −141	−141 −276	−276 −396		−396 −**436**	Good	−295 −334	L	Q 465
Q 466	D-4*	Q 460, deeper, same location.	391	+ 7 − 19	26	− 19 −130	−130 −295	−295 −**384**			Fair	−340 −381	L	Q 466
Q 467	D-4*	Q 460, deeper, same location.	399	+ 6 − 8	14	− 8 −147	−147 −261	−261 −392		−392 −**393**	Good	−348 −388	L	Q 467
Q 468	D-4*	Q 460, deeper, same location.	400	+ 4 − 17	21	− 17 −136	−136 −296	−296 −**396**			Good	No record	L	Q 468
Q 469	D-4*	Q 460, deeper, same location.	391	+ 5 − 11	16	− 11 −186	−186 −252	−252 −**386**			Good	−344 −385	L	Q 469
Q 470	D-4*	Q 460, deeper, same location.	379	+ 6 − 13	19	− 13 −150	−150 −242	−242 −**373**			Good	−343 −369	L	Q 470
Q 472	D-4*	Q 460, deeper, same location.	130	+ 5 − 50	55	− 50 −**125**					Good	− 97 −117	M	Q 472
Q 474	D-4*	Q 460, deeper, same location.	131	+ 9 − 12	21	− 12 −**122**					Good	− 94 −114	M	Q 474
Q 475	D-4*	Q 460, deeper, same location.	134	+ 7 − 14	21	− 14 −**127**					Good	− 18 − 39	M	Q 475
Q 476	D-4*	Q 460, deeper, same location.	107	+ 4 − 16	20	− 16 −**103**					Good	− 80 −101	M	Q 476
Q 480	D-4*	Q 460, deeper, same location.	390	+ 9 − 28	27	− 28 −183	−183 −278	−278 −**381**			Good	−354 −384	L	Q 480

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 481	D-4*	Q 460, deeper, same location.	158	+ 8 − 12	20		− 12 −125	−125 −150				Good	− 58 − 80	M	Q 481
Q 482	D-4*	Q 460, deeper, same location.	298	+ 9 − 45	54		− 45 −159	−159 −265	−265 **−289**			Good	−269 −289	L	Q 482
Q 484	D-4*	Q 460, deeper, same location.	391	− 7 − 56	[illegible]		− 56 −154	−154 −268	−268 **−384**			Good	−256 −276	L	Q 484
Q 485	D-4*	Q 460, deeper, same location.	80	+ 6 − 29	[illegible]		− 29 − **74**					Good	− 49 − 74	M	Q 485
Q 486	D-4*	Q 460, deeper, same location.	335	+ 5 − 65	71		− 65 −150	−150 −255	−255 **−330**			Good	−307 −329	L	Q 486
Q 489	D-4*	Q 490, deeper, same location.	200	+ 10 −110	170			−110 −155	−155 **−190**			Good	No record	No record	Q 489
Q 490	D-4	Q 489 to Q 500, same location.	224	+ 5 − 45	40			− 45 −135	−135 −219		at **−219**	Good	No record	No record	Q 490
Q 491	D-4*	Q 490, deeper, same location.	214	+ 9 − 63	72			− 63 −142	−142 **−205**			Good	−170 −203	L	Q 491
Q 492	D-4*	Q 490, deeper, same location.	228	+ 6 − 60	66			− 60 −171	−171 **−222**			Good	−180 −212	L	Q 492
Q 493	D-4*	Q 490, deeper, same location.	219	+ 4 − 45	49			− 47 −166	−166 −215		at **−215**	Good	−173 −205	L	Q 493
Q 494	D-4*	Q 490, deeper, same location.	218	+ 5 − 60	15			− 60 −153	−153 −208		−208 ?**−213**	Good	−177 −202	L	Q 494
Q 495	D-4*	Q 490, deeper, same location.	193	+ 4 − 41	15			− 41 −170	−170 **−189**			Good	−157 −183	L	Q 495
Q 496	D-4*	Q 490, deeper, same location.	151	+ 9 − 44	[illegible]			− 44 **−142**				Fair	− 21 − 41	UP	Q 496
Q 497	D-4*	Q 490, deeper, same location.	70	+ 9 − 44	53			− 44 − **61**				Good	− 21 − 42	UP	Q 497
Q 498	D-4*	Q 490, deeper, same location.	68	+ 9 − 44	53			− 44 **− 59**				Good	− 21 − 42	UP	Q 498
Q 499	D-4*	Q 490, deeper, same location.	73	+ 9 − 50	59			− 50 **− 64**				Good	− 21 − 47	UP	Q 499
Q 500	D-2*	Q 490, deeper, same location.	71	+ 9 − 50	59			− 50 − **62**				Good	− 20 − 47	UP	Q 500
Q 534	C-3	Q 501 to Q 535, same location. Logs too vague for correlation.	146	+ 13 ?**−133**								Poor	Bottom at −117	UP	Q 534
Q 537	C-3	Q 202, shallower, same location.	125	+120 − **5**								Fair	Bottom at − 5	UP	Q 537
Q 542	A-4*	Data below −949 is questionable. Q 1030, better log, same location.	1,260?	+ 6 −191	−191 −237	−237 297 −291	−291 −455	−455 −684	−684 **−949**			Fair	−746 −794	L	Q 542

Q 547	C-4*	Q 119, deeper, same location.	60	+ 60 – **0**								Good	+ 20 0	UP	Q 547
Q 549	D-3*	Q 125, deeper, same location.	60	+ 45 – **15**								Good	+ 7 – 15	UP	Q 549
Q 550	D-4*	Q 127, deeper, same location.	40	+ 40 **0**								Good	+ 10 0	UP	Q 550
Q 555	C-3		78	+ 64 – **14**								Good	Bottom at – 14	UP	Q 555
Q 556	C-4	Q 324, Q 570, Q 569, Q 571, same location.	423	+ 40 – ?	– ? – 98	17?	– 98 ? –371	–371 ? –**363**				Fair	No record	No record	Q 556
Q 557	C-4	Q 302, shallower, same location.	197	+ 58 – 43	101		– 43 –**139**					Good	–108 –127	M	Q 557
Q 558	C-4	Q 303, shallower, same location.	163	+ 33 –127	–127 –**130**							Good	– 92 –122	UP	Q 558
Q 559	C-4	Q 304, shallower, same location.	214	+ 16 – 97	– 97 –161	–161 214 –198	–198 –251	–251 –**281**				Good	–158 –197	J	Q 559
Q 560	C-4*	Q 562, deeper, same location.	78	+ 28 – **50**								Good	– 15 – 44	UP	Q 560
Q 561	C-4*	Q 562, deeper, same location.	90	+ 25 – 65	at – **65**							Good	– 31 – 60	UP	Q 561
Q 562	C-4	Q 306, Q 560, Q 561, Q 572, same location.	681	+ 23 – 67	– 67 –120	143	–120 –238	–238 –458	–458 –628	–628 –649	–649 –**658**	Good	–477 to –497 –515 to –585	L	Q 562
Q 563	C-4*	Q 564, deeper, same location.	138	+ 70 – 68		13?	at – **68?**					Good	– 41 – 61	UP	Q 563
Q 564	C-4	Q 307, Q 563, shallower, same location.	299	+ 70 – 48		118	– 48 –**229**					Good	–171 –212	M	Q 564
Q 565	C-4	Q 308, shallower, same location. Magothy-Raritan contact indefinite.	560	+ 65 – 49			– 49 ? –249	–249 –415	–415 –**495**			Fair	–417 to –437 –442 to –482	L	Q 565
Q 566	C-4*	Q 317, deeper, same location.	292	+ 61 – 62	123		– 62 ? –**231**					Good	– 16 to – 45 –201 to –220	UP M	Q 566
Q 567	C-4	Q 318, shallower, same location.	635	+131 + 21	152		? ?–117	–117 –410	–410 –**504**			Fair	–413 to –453 –465 to –490	L	Q 567
Q 568	C-5		869	+ 50 – 55	105		– 55 –354	–354 –554	–554 –811		–811 –**819**	Good	–252 –312	BM	Q 568
Q 569	C-4*	Q 556, deeper, same location.	62	+ 30 – 32	127		at – 32					Good	– 10 – 30	UP	Q 569
Q 570	C-4*	Q 556, deeper, same location.	62	+ 30 – 32	122		at – 32					Good	– 12 – 32	UP	Q 570
Q 571	C-4*	Q 562, same location. No record 0 to 330 and 370 to 417.	630	+ 30 ?	? ?		? ?–387	–387 ? –540	–540 –600		at –**600**	Fair	No record	No record	Q 571
Q 572	C-4*	Q 562, better log, same location. No record 0 to 580 feet.	783	+ 25 ?	? ?				? –650		–650 –**758**	Fair	No record	No record	Q 572
Q 580	C-5*	Q 581, deeper, same location.	668	+115 + 15	130		+ 15 –283	–283 –535	–535 –**553**			Good	No record	L	Q 580
Q 581	C-5	Q 580, Q 582, same location.	690	+100 0	100		0 –284	–284 –475	–475 –**590**			Good	No record	L	Q 581
Q 582	C-5*	Q 581, same location.	701	+110 + 16	126		+ 16 –280	–280 –461	–461 –**591**			Good	–576 –593	L	Q 582
Q 583	C-4*	Q 273, better log, same location.	416	+ 10 – 80	90			– 80 ?–228	–228 ? –**406**			Good	No record	No record	Q 583
Q 584	C-4*	Depth to bedrock estimated. Q 273, better log, smae location.	630	+ 10 –120	130			–120 –320	–320 ?–440	–500 ? ?	? –**620**	Good	No record	No record	Q 584

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 586	C-3		435	+ 15 −135	[illegible]			−135 −325	−325 −414		−414 **−420**	Good	No record	No record	Q 586
Q 589	C-4*	Q 590, deeper, same location.	123	+ 23 − 49	72		− 49 − **98**					Good	− 27 − 47	UP	Q 589
Q 590	C-4	Q 589 to Q 594, same location.	123	+ 21 − 41	62		− 41 **−102**					Good	− 29 − 49	M	Q 590
Q 591	C-4*	Q 590, better log, same location.	126	+ 20 − 53	73		− 53 **−106**					Good	− 30 − 50	M	Q 591
Q 592	C-4*	Q 590, better log, same location.	125	+ 24 − 36	60		− 36 **−101**					Good	− 21 − 41	UP	Q 592
Q 593	C-4*	Q 590, deeper, same location.	120	+ 22 − 28	50		− 28 − **98**					Good	− 22 − 42	UP and M	Q 593
Q 594	C-4*	Q 590, deeper, same location.	121	+ 21 − 39	60		− 39 **−100**					Good	− 13 − 33	UP	Q 594
Q 595	C-4	Correlation based in part on adjacent wells.	432	+ 20 ?			? −115	−115 −235	−235 **−412**			Fair	No record	No record	Q 595
Q 596	C-3	Test boring.	50	+ 8 − **42**								Good	None	None	Q 596
Q 597	C-3	Test boring.	89	0 − **89**								Fair	None	None	Q 597
Q 598	D-3	Test boring.	54	0 − **54**								Good	None	None	Q 598
Q 599	D-3	Test boring.	71	0 − **71**								Good	None	None	Q 599
Q 600	D-3	Test boring.	50	+ 16 − **34**								Good	None	None	Q 600
Q 601	D-3	Test boring.	156	0 − 89	89			− 89 ? **−156**				Good	None	None	Q 601
Q 602	C-2*	Near Q-386. Test boring.	159	+ 50 − 85	135						− 85 **−109**	Good	None	None	Q 602
Q 603	C-2*	Near Q-390. Test boring.	202	+ 69 − 53	− 53 −109	178				−109 −111	−111 **−133**	Good	None	None	Q 603
Q 604	C-3*	Near Q-437. Q 1279, deeper, same location.	37	+ 20 − **17**								Good	− 2 − 17	UP	Q 604
Q 633	B-3	Veatch #136.	191	+ 12 − 83	− 83 −116	−116 **−179**						Good	No record	J ?	Q 633
Q 634	C-3	Q 340, same location, Veatch #137.	149	+ 10 − 87	− 87 −131	−131 **−139**						Good	No record	J ?	Q 634
Q 669	D-3	Veatch #186.	159	+ 10 − 66				− 66 −100	−100 − ?	? **−149**		Good	No record	No record	Q 669

Q 671	B-5	Veatch #188.	190	+ 5 −185	? ?	? **−185**				Fair	No record	J ?	Q 671
Q 676	B-4	Veatch #193.	203	0 −140	−140 −202	−202 −203	203			Good	No record	J	Q 676
Q 678	B-4	Veatch #197.	271	+ 12 − 98	110		− 98 **−259**			Good	No record	No record	Q 678
Q 680	B-4	Veatch #199.	192	+ 10 −105	−105 −175	−175 **−182**				Good	No record	Probably J ?	Q 680
Q 681	B-4	Veatch #202.	156	+ 5 − 84	− 84 −137	−137 **−151**				Good	No record	J	Q 681
Q 682	B-4	Veatch #203.	258	+ 9 − 74	− 74 −145	−145 **−249**				Good	No record	J	Q 682
Q 683	B-4	Veatch #205.	293	+ 11 − 61	− 61 −201	−201 −249	260 −249 **−282**			Good	No record	No record	Q 683
Q 684	B-4	Veatch #206.	420	+ 11 − 54	− 54 −159	−159 −219	230 −219 **−409**			Good	No record	No record	Q 684
Q 689	C-4	Veatch #211.	122	+ 40 − 71	− 71 − **82**					Good	No record	No record	Q 689
Q 690	C-4	Veatch #212.	200	+ 20 − 75	− 75 −169	−169 **−180**				Good	No record	J	Q 690
Q 710	D-4	Veatch #236.	64	+ 75 + 14			+ 14 **+ 11**			Fair	No record	No record	Q 710
Q 714	D-4	Upper part of clay may be Recent and Pleistocene in age. Veatch #240.	175	+ 10 ?				? **−185**		Fair	No record	No record	Q 714
Q 715	D-4	Veatch #241.	120	+ 18 **−102**						Good	No record	No record	Q 715
Q 719	B-5	Veatch #272. Upper part of log consists of alternating sands and clays.	228	0 − ?	− ? −150	−150 −228				Good	No record	J	Q 719
Q 720	B-5	Veatch #291.	406	+ 18 − 45	− 45 − 81	− 81 −127	145 −127 **−388**			Good	No record	No record	Q 720
Q 721	B-5	Veatch #292.	412	+ 22 − 48		− 48 − 80	102 − 80 **−390**			Good	No record	No record	Q 721
Q 722	B-5	Veatch #293.	390	+ 17 − 41			− 41 **−373**			Good	No record	No record	Q 722
Q 724	C-5	Veatch #295.	357	+ 27 − 53			− 53 **−330**			Good	No record	No record	Q 724
Q 947	D-3		112	+ 75 − **37**						Good	− 25 − 37	UP	Q 947
Q 948	C-3		126	+ 90 − **36**						Good	− 20 − 36	UP	Q 948
Q 952	C-2*	Near Q-388. Well abandoned. Insufficient water obtained.	107	+ 79 − **28**						Good	None	UP	Q 952
Q 954	D-2		301	+ 12 − 15					− 15 **−289**	Good	None	Br	Q 954
Q 955	C-3*	Q 956, deeper, same location.	85	+ 15 − **70**						Good	− 53 − 68	UP	Q 955
Q 956	C-3*	Near Q-437. Q 955, Q 1371, same location. Near Q-1314.	100	+ 15 − **85**						Good	− 68 − 83	UP	Q 956
Q 957	C-4*	Q 958, shallower, same location.	182	+ 45 − 49			− 49 **−137**			Good	−104 −135	M	Q 957

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 958	C-4*	Q 957, deeper, same location.	62	+ 45 – **17**								Good	+ 13 – 13	UP	Q 958
Q 960	D-3*	Near Q-360.	102	+ 70 – **32**								Good	– 4 – 24	UP	Q 960
Q 962	D-2		195	+ 20 – 25	45						– 25 – **175**	Good	– 6 – 11	UP	Q 962
Q 963	D-3*	Q 964, deeper, same location.	94	+ 20 – **74**								Fair	– 52 – 67	J	Q 963
Q 964	D-3	Q 963, Q 1326, same location.	125	+ 20 – **105**								Fair	– 85 – 105	J	Q 964
Q 966	C-2		155	+ 8 – 37	85						– 37 – 192	Good	None	Br	Q 966
Q 971	C-3*	Q 206, deeper, same location.	134	+ 53 – 81	134			at – 81?				Good	– 71 – 81	UP	Q 971
Q 974	C-3	Q 975, shallower, same location.	113	+ 65 – **48**								Good	– 28 – 44	UP	Q 974
Q 975	C-3*	Q 974, deeper, same location.	54	+ 65 – **11**								Good	+ 24 + 11	UP	Q 975
Q 977	D-4*	Q 127, deeper, same location.	112	+ 36 – **76**								Good	– 42 – 54	UP	Q 977
Q 978	C-3*	Well abandoned, insufficient water. Near Q-426.	175	+ 60 – 86	126			– 86 ?– **115**				Fair	No record	UP	Q 978
Q 979	C-3*	Near Q-341.	117	+ 80 – **37**								Good	– 20 – 32	UP	Q 979
Q 981	B-4		120	+ 7 – **113**								Fair	– 93 – 113	UP	Q 981
Q 982	C-2		80	+ 20 – **60**								Good	– 45 – 60	UP	Q 982
Q 983	C-3		97	+ 64 – **33**								Good	– 11 – 22	UP	Q 983
Q 985	C-4		201	+ 46 – 61	101		– 61 – **154**					Good	– 131 – 143	M	Q 985
Q 988	B-4*	Q 1383, deeper, same location.	138	+ 26 – **112**								Good	– 3 to – 25 – 96 to – 112	UP	Q 988
Q 989	B-5	Q 129, shallower, same location.	135	+ 26 – 104	– 104 ?– **109**							Fair	– 83 – 105	UP	Q 989
Q 991	A-3		123	+ 6 – **117**								Good	– 105 – 116	UP	Q 991
Q 992	C-5		110	+ 55 – **55**								Good	– 28 – 41	UP	Q 992

Q 1026	C-3		295	+ 8 − 48	56			− 48 − 83	− 83 −234	−234 **−287**			Good	−260 −281	L	Q 1026
Q 1027	C-3*	Q 1026, deeper, same location.	283	+ 8 − 44	52			− 44 − 82	− 82 −232	−232 **−275**			Good	−239 −266	L	Q 1027
Q 1028	C-3	0 to 165 feet missing, remainder too vague for correlation.	424	+ 5 ?					?	?		−316 **−419**	Fair	No record	No record	Q 1028
Q 1030	A-4	Q 1071, Q 562, located nearby.	1,049	+ 6 −192	310	−192 −240	−240 −304	−304 −455	−455 −715	−715 −975	−975 −1016	−1016 **−1043**	Good	−724 −789	L	Q 1030
Q 1032	C-3	Well abandoned, no water.	273	+ 50 − 21					− 21 −182	−182 ?−211		−211 **−223**	Good	None	No record	Q 1032
Q 1035	C-4	Q 102, Q 1097, same location.	277	+ 62 − 89	101			− 89 −189	−189 −215				Fair	−126 −191	M	Q 1035
Q 1036	C-4	Q 1037, same location.	183	+ 55 − 40				− 40 **−128**					Good	− 71 −113	M	Q 1036
Q 1037	C-4*	Q 1036, better log, same location.	200	+ 55 ?− 23	78			− 23 **−145**					Good	+ 5 to − 16 − 33 to − 49	UP M	Q 1037
Q 1040	C-3	Q 1066, shallower, same location.	105	+ 60 − **45**									Good	− 2 to − 23 − 33 to − 44	UP	Q 1040
Q 1041	D-5*	Q 1042, deeper, same location.	193	+ 5 − 76	81			− 76 **−188**					Good	−159 −179	BM	Q 1041
Q 1042	D-5		204	+ 5 − 76	91			− 76 **−199**					Good	−172 −182	BM	Q 1042
Q 1043	D-5*	Q 1042, deeper, same location.	125	+ 6 − 73	79			− 73 **−119**					Good	− 47 − 67	UP	Q 1043
Q 1045	D-5*	Q 1042, deeper, same location.	186	+ 5 − 28	33			− 28 **−181**					Good	−159 −179	BM	Q 1045
Q 1047	D-5*	Q 1042, deeper, same location.	147	+ 5 **−142**									Fair	−123 −143	UP	Q 1047
Q 1048	D-5*	Near plotted position of Q 278.	183	+ 6 − 93	99			− 93 **−177**					Good	−155 −175	BM	Q 1048
Q 1049	D-5*	Near plotted position of Q 278.	160	+ 6 −109	115			−109 **−154**					Good	−140 −160	M	Q 1049
Q 1053	D-5	Douglaston well field.	202	+ 12 −132	144			−132 **−190**					Good	−169 −189	BM	Q 1053
Q 1056	D-5*	Near plotted position of Q 278.	171	+ 6 −129	135			−129 **−165**					Good	−126 −146	M	Q 1056
Q 1057	D-5*	Q 1042, deeper, same location.	47	+ 9 − 38	47			at − **38**					Fair	− 24 − 44	M	Q 1057
Q 1063	C-4		152	+ 40 − 29	69			− 29 **−112**					Good	− 17 − 33	UP	Q 1063
Q 1064	C-4	Q 1394, same location.	90	+ 41 − 49	90			at − **49**?					Good	− 31 − 49	UP	Q 1064
Q 1066	C-3*	Q 1040, deeper, same location.	68	+ 60 − **8**									Good	+ 18 − 8	UP	Q 1066
Q 1067	C-3*	Q 243, deeper, same location.	55	+ 80 + **25**									Good	+ 51 + 25	UP	Q 1067
Q 1068	C-3*	Q 1279, deeper, same location. Near Q-437.	42	+ 20 − **22**									Good	− 9 − 22	UP	Q 1068
Q 1069	C-3		112	+ 80 − **32**									Good	− 22 − 32	UP	Q 1069
Q 1071	A-4*	Located near plotted position of Q 1030.	863	+ 8 −192		−192 −240	−240 −328	−328 −468	−468 **−749**	−749 **−855**			Good	−759 −824	L	Q 1071
Q 1073	C-3		115	+ 80 − **35**									Good	− 14 − 25	UP	Q 1073
Q 1074	C-3*	Q 1075, deeper, same location.	112	+ 55 − **57**									Good	Bottom at − 44	UP	Q 1074

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Coordinates Map	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 1075	C-3	Q 1074, shallower, same location.	128	+ 55 − **73**								Good	Bottom at − 61	UP	Q 1075
Q 1081	C-3	Q 47 and Q 1363, same location.	135	+ 75 − **60**								Good	− 27 − 57	UP	Q 1081
Q 1085	C-2		170	+ 6 − 78	− 78 ? −130	−130 ? 104 −158				−158 −163	−163 −**164**	Fair	−130 −140	J	Q 1085
Q 1086	C-3*	Q 1241, better log, same location.	349	+ 52 − 38				− 38 −206	−206 −227	−227 ?−297	at −**297**	Good	−206 −226	L	Q 1086
Q 1087	C-3*	Q 1241, deeper, same location.	118	+ 52 − 38				− 38 − **66**				Good	− 16 − 36	UP	Q 1087
Q 1093	D-3	Q 207, shallower, same location.	42	+ 53 + 11							at + **11?**	Good	+ 21 + 11	UP	Q 1093
Q 1097	C-4*	Q 1035, deeper, same location.	85	+ 58 − **27**								Good	+ 5 − 27	UP	Q 1097
Q 1098	C-2*	Q 1349, shallower, same location. Near Q-388.	215	+ 72 − 62							− 62 −**143**	Good	None	Br	Q 1098
Q 1197	B-5	Q 333, same location.	127	+ 15 − 48	− 48 − 90	− 90 132 −117	−117 −**119**					Good	No record	J ?	Q 1197
Q 1221	D-2		178	+ 17 − 21	38					− 21 − 25	− 25 −**161**	Good	None	Br	Q 1221
Q 1230	B-4		164	+ 10 −**154**								Good	−113 −151	UP	Q 1230
Q 1235	C-3	Q 1321, shallower, same location.	131	+ 65 − **66**								Good	− 30 − 57	UP	Q 1235
Q 1239	C-4	Q 154, Q 200, same location.	200	+ 50 − 43	93		− 43 −**150**					Good	−122 −137	M	Q 1239
Q 1241	C-3	Q 27, Q 1086, Q 1087, same location.	317	+ 52 − 8	60			− 8 −204	−204 −249	−249 ?−**265**		Good	−209 −249	L	Q 1241
Q 1242	C-3		106	+ 43 − **63**								Good	− 39 − 63	UP	Q 1242
Q 1243	C-4*	Near Q-1314.	77	+ 43 − **34**								Good	− 17 − 33	UP	Q 1243
Q 1244	C-4		117	+ 69 − **38**								Good	− 24 − 35	UP	Q 1244
Q 1246	D-2		220	+ 42 − 21	63						− 21 −**178**	Good	None	Br	Q 1246
Q 1257	D-2		150	+ 30 − 17	47						− 17 −**110**	Good	None	Br	Q 1257
Q 1258	C-2		63	+ 55 − **8**								Good	+ 5 − 5	UP	Ql 258
Q 1260	D-5		96	+130 + **34**								Good	+ 34 + 31	UP	Q 1260
Q 1272	D-2		195	+ 10 + 8	18						+ 8 −**185**	Good	None	Br	Q 1272
Q 1273	C-3	Q 1297, shallower, same location.	154	+112 − **42**								Good	− 20 − 42	UP	Q 1273

Q 1274	C-3*	Near Q-437.	80	+ 15 − 40	− 40 ? − **65**							Good	No record	UP	Q 1274
Q 1275	C-4*	Q 143, Q 370, same location. Near Q-1239.	173	+ 62 − 33	95		− 33 **−111**					Good	− 90 −111	M	Q 1275
Q 1278	C-3	Upper part of blue clay may be Pleistocene in age.	184	+ 70 − ?			− ? **−114**					Good	− 2 − 23	UP	Q 1278
Q 1279	C-3*	Q 21, Q 604, Q 1068, same location. Near Q-437.	58	+ 20 − **38**								Good	− 25 − 33	UP	Q 1279
Q 1291	C-4		71	+ 42 − 27	69		− 27 − **29**					Good	− 19 − 24	UP	Q 1291
Q 1293	C-5		680	+115 − 23	138		− 23 −306	−306 −503	−503 **−565**			Good	−529 −552	L	Q 1293
Q 1297	C-3*	Q 1273, deeper, same location.	136	+112 − **24**								Good	− 4 − 24	UP	Q 1297
Q 1299	D-4		93	+ 35 − **58**								Good	− 53 − 58	UP	Q 1299
Q 1300	C-4		122	+100 − **22**								Good	− 5 − 21	UP	Q 1300
Q 1304	B-4	Veatch #195.	154	+ 14 −121	−121 −132	−132 **−140**						Good	No record	J	Q 1304
Q 1305	B-4	Veatch #196.	178	+ 12 − 66	− 66 −111	−111 **−166**						Good	No record	J	Q 1305
Q 1311	C-4	Veatch #220.	407	+ 60 − 57	117		− 57 **−347**					Good	No record	No record	Q 1311
Q 1314	C-4		227	+ 50 −100	150		−100 **−177**					Good	−114 −145	M	Q 1314
Q 1315	C-4*	Near plotted position of Q 1035.	219	+ 50 − 95	145		− 95 **−169**					Good	−131 −156	M	Q 1315
Q 1317	C-2	Q 258, shallower, same location.	80	+ 20 − **60**								Good	− 45 − 57	UP	Q 1317
Q 1321	C-3*	Q 1235, deeper, same location.	100	+ 73 − **27**								Good	− 5 − 27	UP	Q 1321
Q 1326	D-3*	Q 964, deeper, same location.	72	+ 20 − **52**								Good	− 20 − 52	UP	Q 1326
Q 1328	C-3	Q 147, Q 293, Q 1329, same location.	122	+ 60 − **62**								Good	− 49 − 55	UP	Q 1328
Q 1329	C-3*	Q 1328, deeper, same location.	121	+ 60 − **61**								Good	− 56 − 61	UP	Q 1329
Q 1340	C-3*	Q 1350, deeper, same location.	109	+ 60 − **49**								Good	− 23 − 49	UP	Q 1340
Q 1343	C-4*	Q 76, deeper, same location.	89	+ 50 − **39**								Good	− 9 − 39	UP	Q 1343
Q 1344	C-4		100	+ 58 − **42**			at −**42**?					Good	− 26 − 42	UP	Q 1344
Q 1349	C-2*	Q 1098, deeper, same location.	95	+ 72 − **23**								Good	− 12 − 16	UP	Q 1349
Q 1350	C-3*	Q 1340, shallower, same location. Near Q-427.	130	+ 60 − **70**								Good	No record	UP	Q 1350
Q 1352	D-3	Test boring.	208	+ 13 −169	182 ?	?					−169 **−195**	Good	None	None	Q 1352
Q 1353	D-4	Test boring.	162	0 −109	109			−109 −142		−142 −155	−155 **−162**	Good	None	None	Q 1353

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN QUEENS COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
Q 1363	C-3*	Q 1081, deeper, same location.	142	+ 75 − **67**								Good	− 50 − 60	UP	Q 1363
Q 1368	C-2*	Near Q-982.	72	+ 20 − **52**								Good	− 42 − 52	UP	Q 1368
Q 1371	C-3*	Q 956, deeper, same location.	97	+ 15 − **82**								Good	− 60 − 80	UP	Q 1371
Q 1372	C-5*	Q 1384, deeper, same location.	224	+ 80 − 31	111		− 31 −**144**					Good	−114 −142	M	Q 1372
Q 1373	C-3*	Q 1374, same location.	262	+ 50 + 17	167			+ 17 −144	−144 −173	−173 −203	−203 −**212**	Good	−144 −156	L	Q 1373
Q 1374	D-3	Q 1373, same location.	255	+ 50 + 26	76			− 26 ? −146	−146 −174	−174 −**205**		Good	No record	L	Q 1374
Q 1376	C-3	Q 1379, shallower, same location.	211	+ 84 −113	197		−113 −**127**					Good	No record	UP	Q 1376
Q 1378	C-3		212	+ 42 −111		−111 ? −**170**						Good	− 35 to − 79 −127 to −147	UP and J ?	Q 1378
Q 1379	C-3*	Q 1376, deeper, same location.	210	+ 84 −113			−113 −**130**					Good	− 24 to − 48 − 72 to −108	UP	Q 1379
Q 1383	B-4	Q 131, Q 988, same location.	250	+ 26 ?−114	? ?		? −**224**					Fair	−204 −224	M ?	Q 1383
Q 1384	C-5	Q 1372, shallower, same location.	232	+ 80 − 26	106		− 26 −152					Good	−116 −142	M	Q 1384
Q 1386	C-3		105	+ 20 − **85**								Good	− 69 − 85	UP	Q 1386
Q 1392	C-4	Q 1395, shallower, same location.	361	+ 60 − 81	141		− 81 −192	−192 −**301**				Good	No record	No record	Q 1392
Q 1394	C-4*	Q 1064, better log, same location.	93	+ 41 − 52	93		at −**52?**					Good	− 31 − 52	UP	Q 1394
Q 1395	C-4*	Q 1392, deeper, same location.	120	+ 60 − 74	134		− 74 − **75**					Good	− 30 − 56	UP	Q 1395
Q 1399	B-5		118	+ 26 − **92**								Good	− 81 − 91	UP	Q 1399
Q 1400	C-3		302	+ 20 − 58	78			− 58 −210	−210 −281	−281 −**282**		Good	− 8 − 24	UP	Q 1400
Q 1401	C-3		150	+ 65 − **85**								Good	− 65 − 85	UP	Q 1401
Q 1402	C-3	Q 1406, same location, shallower.	134	+ 92 − **42**								Good	− 29 − 42	UP	Q 1402
Q 1406	C-3*	Q 1402, same location, deeper.	126	+ 92 − **34**								Good	− 9 − 34	UP	Q 1406
Q 1412	C-3		140	+ 42 − 78	− 78 − **98**							Good	− 64 − 80	UP	Q 1412

Q 1417	C-4		102	+ 60 − **42**				Good	− 37 − 41	UP	Q 1417
Q 1422	C-4		137	+ 55 − **82**				Good	− 52 − 67	UP	Q 1422
Q 1423	C-4		302	+ 55 − 95	150 ?	− 95 − **247**		Fair	− 7 − 23	UP	Q 1423
Q 1425	C-4*	Near Q-985.	93	+ 60 − **33**				Good	− 17 − 32	UP	Q 1425
Q 1450 T	C-5		132	+ 55 − 82	137	− 62 − **77**		Good	No record	UP	Q 1450 T
Q 1465 T	D-3		127	+ 12 − 59	71		− 59 − **105**	Good	None	None	Q 1465 T
Q 1503	C-4		107	+ 75 − 32	107	at − **32**		Good	− 16 − 32	UP	Q 1503

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
2	B-5		82	+ 19 − 48	67		− 48 − **63**					Poor	Not given		2
3	B-5	N 246 (V 287) same .ocation, shallower.	465	+ 10 − 56	66		− 56 −**455**					Fair	Not given		3
4	B-5	Typical of group of 15 shallow wells at this location.	70	+ 10 − 45	55		− 45 − **60**					Fair	Not given		4
5	B-5*	N 6, same location, deeper.	320	+ 9 − 58	67		− 58 −**311**					Fair	Not given		5
6	B-5	N 5, N 248, same location, shallower.	338	+ 10 − 57	67		− 57 −**328**					Fair	Not given		6
7	C-5		970	+ 20 − 40	60		− 40 −520	−520 −760	−760 −**950**			Fair	−831 −891	L	7
10	C-5*	N 11, same location, deeper.	402	+ 49 − 81	130		− 81 −**353**					Poor	−281 −348	M	10
11	C-5	N 10, N 12, N 13, N 693, same location, shallower.	440	+ 46 − 34	80		− 34 −380	−380 −**394**				Fair	−159 to −227 −242 to −362	M	11
12	C-5*	N 11, same location, deeper.	425	+ 42 − 36	78		− 36 −**383**					Fair	−323 −381	M	12
13	C-5*	N 11, same location, deeper.	435	+ 42 − 28	70		− 28 −**393**					Fair	−187 −245	M	13
14	C-5		115	+100 − **15**								Fair	+ 23 − 6	UP	14
15	C-5*	Near N-14.	107	+113 + 6	119		at + **6**					Fair	+ 41 + 12	UP	15
16	C-5		445	+ 95 + 9	105		+ 9 −337	−337 −**350**				Fair	−283 −343	M	16
17	C-5		476	+104 + 4	108		+ 4 −364	−364 −**372**				Fair	−501 −361	M	17
18	D-5		84	+120 + **36**								Fair	+ 40 + 37	UP	18
19	D-5		121	+120 + 22	142		+ 22 − **1**					Poor	+ 33 + 13	UP	19
20	D-5		216	+200 + 55	255		+ 55 − **16**					Fair	Not given	UP	20
21	D-5*	N 23, same location, deeper.	444	+ 10 − 60	70		− 60 −180	−180 −380?	−380 ? −**434**			Poor	Not given	L ?	21
22	D-5*	N 23, same location, deeper.	155	+ 15 − 58	3		− 58 −140					Fair	−110 −130	M	22
23	D-5	N 21, N 22, same location, shallower. Cor. from samples.	467	+ 15 − 57	72		− 57 −181	−181 −283	−283 −419	−419 −467	at −**467**	Good	−389 −419	L	23
24	D-5	Correlation based in part on samples.	460	+ 12 − 53	65		− 53 −162	−162 −261	−261 −438	−438 −460	at −**460**	Good	−348 to −358 −386 to −416	L	24
26	D-5	Correlation based in part on samples.	74	None	None		+ 30 − **44**					Fair	− 38 − 46	M	26

27	D-5		225	+ 90 + 35			+ 35 **−135**					Fair	−121 −135	M	27
28	D-5*	N 29, same location, deeper. Correlation from examination of samples.	142	+ 28 **−114**								Good	− 83 −108	UP	28
29	D-5	N 28, same location, shallower. Correlation from examination of samples.	206	+ 29 **−177**								Fair	Not given		29
30	D-5*	N 31, same location, deeper.	212	+ 20 − 47			None	− 47 −129?	−129 ? **−192**			Poor	−144 −183	L ?	30
31	D-5	N 30, same location, shallower.	372	+ 20 − 9			None	− 9 −151	−151 −348		−348 **−352**	Poor	−153 to −213 −163 to −191	L ?	31
32	E-5*	Log believed unreliable. Use N 33, same location.													32
33	E-5	Log of N 32, same location, believed unreliable. See also N 1995.	369	+ 24 − 77			None	− 77 −215	−215 −341	−341 −344	−344 **−345**	Fair	Not given	L ?	33
34	E-5*	Log N 34 believed unreliable. Use N 33, same location.													34
36	E-5	N 37, same location. Correlation in part from samples.	280	+ 35 −125			None	None	−125 −185	−185 **−245**		Fair	Not given	L ?	36
37	E-5*	N 36, same location, better log.	220	+ 35 −110				−110 −123	−123 −184	−184 **−185**		Fair	Not given	L ?	37
39	E-5	Correlation based in part on examination of samples.	138	+ 5 **−133**								Good	−129 −133	UP	39
41	E-5*	N 42, same location, has better log.						−823							41
42	B-6	Log of N 41, same location, believed even less reliable.	1,203	+ 5 − 59	− 59 ?	? −124	−124 −832 −823	−832 −1040	−1040 **−1198**			Poor	−545 to −603 −1139 to −1179	M and L	42
43	B-5	Presence of Gardiners or Jameco uncertain.	1,285	+ 5 ?	?	?	−145 ? −792	−792 −1025	−1025 **−1280**			Fair	−1188 −1259	L	43
44	B-5	Presence of Gardiners or Jameco uncertain.	1,283	+ 5 ?	?	?	? −787	−787 −1028	−1028 **−1278**			Fair	−1184 −1254	L	44
45	B-5	Presence of Gardiners or Jameco uncertain.	1,133	+ 5 ?	?	? −126	−126 −775	−775 −1012	−1012 **−1128**			Fair	−1047 −1117	L	45
46	B-6	Presence of Gardiners or Jameco uncertain.	1,291	+ 6 − 94	− 94 −115	−115 −138	−138 −905	−905 −1181	−1181 **−1285**			Fair	−1195 −1255	L	46
47	B-6	Presence of Gardiners or Jameco uncertain.	182	+ 6 − 52	− 52 − 95	− 95 −130	−130 **−176**					Poor	−161 −176	M	47
48	B-6	N 49, same location, shallower.	523	+ 17 − 38			− 38 **−506**					Fair	Not given	M ?	48
49	B-6*	N 48, same location, deeper.	355	+ 17 − 45			− 45 **−338**					Fair	Not given	M ?	49
50	B-6*	Log of N 48, same location, believed more reliable.	528	+ 17 − 89?			− 89 ? **−511**					Poor	−425 to −445 −456 to −496	M	50
51	B-6*	Near N-324.	93	+ 20 − 40			− 40 **− 73**					Fair	Not given	M ?	51
52	B-6		550	+ 28 − 21			− 21 **−522**					Fair	Not given	M ?	52

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
54	B-6		101	+ 28 – 20 48			– 20 **– 73**					Fair	Not given	M ?	54
55	B-6*	N 57, same location, deeper.	68	+ 11 – 23 34			– 23 **– 57**					Fair	None		55
56	B-6*	N 57, same location, deeper.	79	+ 11 – 23 34			– 23 **– 68**					Fair	None		56
57	B-6	N 55, N 56, N 58, N 59, N 60, N 61, same location, shallower.	150	+ 11 – 27 38			– 27 **–139**					Fair	Not given		57
58	B-6*	N 57, same location, deeper.	127	+ 11 – 30 41			– 30 **–116**					Fair	Not given		58
59	B-6*	N 57, same location, deeper.	126	+ 11 – 21 32			– 21 **–115**					Fair	Not given		59
60	B-6*	N 57, same location, deeper.	128	+ 11 – 29 40			– 29 **–117**					Fair	Not given		60
61	B-6*	N 57, same location, deeper.	137	+ 11 – 32 43			– 32 **–126**					Fair	Not given		61
62	B-6	N 63, N 64, N 65, same location, shallower.	200	+ 15 – 33 48			– 33 **–185**					Fair	Not given		62
63	B-6*	N 62, same location, deeper.	69	+ 15 – 34 49			– 34 **– 54**					Fair	Not given		63
64	B-6*	N 62, same location, deeper.	48	+ 15 **– 33**								Fair	Not given	UP	64
65	B-6*	N 62, same location, deeper.	45	+ 15 **– 30**								Fair	Not given	UP	65
68	B-6	N 69, same location, shallower.	552	+ 21 – 31 52			– 31 **–531**					Fair	None		68
69	B-6*	N 68, same location, deeper.	505	+ 21 – 31 52			– 31 **–484**					Fair	None		69
70	B-6		42	+ 22 **– 20**								Fair	at – 18	UP	70
72	C-6		616	+ 45 – 18 63			– 18 –561	–561 **–571**				Fair	None		72
73	C-6		716	+ 42 – 22 64			– 22 –610	–610 **–674**				Fair	None		73
74	C-6		224	+ 50 – 30 80			– 30 **–174**					Poor	–169 –174	M	74
75	C-6*	N 76, same location, deeper.	188	+ 55 – 26 81			– 26 **–133**					Fair	– 77 –126	M	75
76	C-6	N 75, same location, shallower.	195	+ 55 – 15 70			– 15 **–140**					Fair	– 90 –137	M	76
77	C-6		85	+ 50 – 10 60			– 10 **– 35**					Fair	Not given		77

78	C-6*	Near N-80.	381	+ 59 0	59	0 **−322**				Fair	−277 −315	M	78
79	C-6*	Near N-80.	492	+ 62 − 1	63	− 1 **−430**				Fair	−276 −356	M	79
80	C-6		482	+ 58 − 25	93	− 25 **−424**				Fair	−371 −422	M	80
81	C-6		425	+ 63 + 5	68	+ 5 **−362**				Fair	−297 −357	M	81
82	C-6*	N 83, same location, deeper.	580	+ 64 − 35	99	− 35 **−478**				Fair	? −470	M	82
83	C-6	N 82, same location, shallower.	1,003	+ 65 − 10	75	− 10 −519	−519 −698	−698 −938	**at −938**	Fair	−196 −256	M	83
84	C-6	Correlation based in part on examination of samples.	307	+ 73 + 2	75	+ 2 **−234**				Good	Not given	M ?	84
86	C-6		45	+ 85 **+ 40**						Fair	+ 45 + 40	UP	86
87	C-6	Samples available are believed seriously contaminated.	806	+ 80 + 11	91	+ 11 −519	−519 −650	−650 **−726**		Fair			87
88	C-6*	No correlation given since log is believed in error. Near N-87.											88
89	C-6*	No correlation given since log is believed in error. Near N-87.											89
90	C-6*	See N 575, same location, deeper and better log.											90
91	C-6*	Near N-1420.	82	+ 84 + **2**						Fair	Not given	UP	91
92	C-6*	N 1420, same location, deeper.	88	+ 80 − 8	88	at − **8**				Fair	Not given	UP	92
93	C-6*	N 1420, same location, deeper.	82	+ 80 − **2**						Fair	Not given	UP	93
94	C-6*	N 1420, same location, deeper.	526	+ 80 − 12	92	− 12 −435	−435 **−446**			Fair	at −292	M	94
95	C-6*	N 1420, same location, deeper.	546	+ 80 − 1	81	− 1 −456	−456 **−466**			Fair	−393 −453	M	95
96	C-6*	Near N-100.	64	+105 + **46**						Fair	+ 57 + 47	UP	96
97	C-6		377	+112 + 9	121	+ 9 **−265**				Fair	−197 −257	M	97
98	C-6*	N 97, same location, deeper.	367	+112 + 9	121	+ 9 −255				Fair	−196 −254	M	98
99	C-6	Correlation based in part on examination of samples.	85	+105 + **20**						Good	Not given	UP	99
100	C-6		95	+105 + 15	120	+ 15 + **10**				Fair	? + 22	UP	100
101	D-6	N 1667, same location, shallower.	399	+115 + 52	167	+ 52 **−284**				Fair	−160 −231	M	101
102	D-6		97	+120 + 46	166	+ 46 + **23**				Fair	+ 49 + 29	UP and M	102
103	D-6	N 104, same location, shallower.	428	+130 + 63	193	+ 63 **−298**				Fair	−200 −250	M	103

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IN NASSAU COUNTY, LONG ISLAND, N. Y.

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
104	D-6*	N 103, same location, deeper.	406	+130 + 18	148		+ 18 **−276**					Poor	at −246	M	104
105	D-6		506	+154 + 62	216		+ 62 **−353**					Fair	−258 −298	M	105
107	D-6		502	+211 +152	363		+152 **−306**					Fair	−244 −284	M	107
108	D-6		226	+230 +200	430		+200 **+ 4**					Fair	Not given	M	108
109	D-6	N 110, same location, shallower.	531	+ 50 ?			? −270	−270 −372	−372 **−481**			Fair	−382 to −392 −413 to −474	L	109
110	D-6*	N 109, same location, deeper.	520	+ 55 ?			? −297	−297 −336	−336 **−465**			Fair	−390 −460	L	110
111	D-6*	Use N 2002, same location, log more reliable.													111
112	E-6		169	+ 50 + 5	55		+ 3 **−119**					Fair	Not given	M	112
115	E-6*	Log believed unreliable. Use N 119, same location.													115
118	E-6*	Log believed unreliable. Use N 119, same location.													118
119	E-6	N 115, N 118, N 120, same location, poorer log.	573	+ 77 + 12	89		+ 12 −135	−135 −395	−395 −495		−495 **−496**	Fair	Not given	L ?	119
120	E-6*	N 119, same location, better log.	558	+ 80 − 14			− 14 −124	−124 −312	−312 −478		at **−478**	Fair	Not given		120
121	E-6	Samples available were seriously contaminated.	415	+110 + 25	135		+ 25 − 97	− 97 −289	−289 −305			Fair	− 39 to − 61 − 77 to − 97	M	121
122	E-6	Depth to Br. only.	475	+ 5 ?	? ?		? ?	? ?			? **−467**	Poor	Not given	Not given	122
123	E-6		304	+ 21 − 16?			− 16 ? −127	−127 −202	−202 **−283**			Fair	Not given	L ?	123
127	B-7	Log insufficient for correlation. Near N-128.													127
128	B-7		1,034	+ 6 − 69	− 69 − 91 97		− 91 **−1028**					Fair	−952 −1028	M	128
129	B-7		1,024	+ 10 − 55	− 55 − 91 101		− 91 **−1014**					Fair	−879 to −889 −902 to −941	M	129
130	B-7		68	+ 10 **− 58**								Fair	Not given	UP	130
131	B-7*	N 132, same location, deeper.	533	+ 20 − 59			− 59 **−513**					Fair	−149 to −207 −453 to −503	M	131
132	B-7		658	+ 20 − 64			− 64 **−638**					Fair	−446 −486	M	132

133	B-7*	N 132, same location, deeper.	533	+ 24	− 63	87	− 63	**−507**	Fair	−445	−487	M	133
134	B-7*	N 132, same location, deeper.	557	+ 20	− 51	71	− 51	**−537**	Fair	−447	−497	M	134
135	B-7		150	+ 20	− 10	30	− 10	**−130**	Fair	None			135
136	B-7		122	+ 25	− 10	35	− 10	**− 97**	Fair	None			136
137	B-7		90	+ 10	− 55	65	− 55	**− 80**	Fair	Not given			137
138	B-7		125	+ 25	− 17	42	− 17	**−100**	Fair	None			138
139	C-7		115	+ 40	− 14	[illegible]	− 14	**− 75**	Fair	None			139
140	C-7	Test well.	156	+ 62	+ 7	69	+ 7	**− 94**	Fair	None			140
141	C-7	N 142, same location, shallower.	109	+ 40	− 3	43	− 3	**− 69**	Fair	None			141
142	C-7*	Use N 141, same location, deeper, more reliable.											142
143	C-7		85	+ 60	− 6	66	− 6	**− 25**	Fair	None			143
144	C-7		57	+ 90	**+ 33**				Fair	Not given		UP	144
145	C-7*	N 1793, same location, deeper, better log.	289	+ 90	− 20	110	− 20	**−199**	Poor	−187	−199	M	145
146	C-7		170	+ 80	− 9	89	− 9	**− 90**	Fair	None			146
147	C-7		208	+105	+ 10	115	+ 10	−103	Fair	Not given			147
148	C-7	Samples available are believed to be contaminated.	523	+115	− 2	117	− 2	**−408**					148
149	D-7*	N 150, same location, deeper.	127	+161	+ 72	233	+ 72	**+ 34**	Fair	Not given			149
150	D-7	N 149, samei ocation, shallower.	148	+162	+ 67	229	+ 67	**+ 14**	Fair	Not given			150
151	D-7		81	+145	+ 64	209			Fair	Not given			151
152	D-7		501	+142	+ 82	[illegible]	+ 82	**−359**	Fair	−294	−334		152
153	—	Log lacks detail needed for correlation.											153
154	—	Log lacks detail needed for correlation.											154
157	D-7		360	+219	+ 59	278	+ 59	**−141**	Poor	−216	−241	M	157
159	D-7		362	+280	+170	450	+170	**− 82**	Fair	Not given		M	159
164	E-7		147	+170	**+ 23**				Poor	Not given		UP	164
165	E-7		210	+110	− 35	145	− 35	**−100**	Poor	− 15	− 25	UP ?	165

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN NASSAU COUNTY, LONG ISLAND, N. Y.

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
166	E-7*	N 613, same location, deeper.	118	+ 50 − 5	55		− 5 − **68**					Fair	− 45 − 65	M	166
167	E-7*	N 613, same location, deeper.	123	+ 50 + 29	79		+ 29 − **73**					Fair	− 50 − 70	M	167
169	E-7	Location uncertain.													169
171	—	Location uncertain.													171
173	E-7		397	+ 20 0	20		0 ?	? −270	−270 −**377**			Poor	Not given	L ?	173
174	E-7		236	+ 5 −195	200		−195 −231	at −**231**				Poor	Not given		174
175	E-7*	Location uncertain but near N 502. Near N-176.	155	+ 40 − 34	74		− 34 −115						− 41 − 44	M	175
176	E-7	Only partial log is available.		+ 6 ?			?	at −304	at −321				Not given	L ?	176
177	E-7	N 505, same location, shallower.		+ 10 − 71	81		− 71 −134	−134 −284	−284 −**314**			Fair	Not given		177
178	B-8		68	+ 10 − **58**								Fair	Not given	UP	178
179	C-8*	N 180, same location, deeper.	179	+ 17 − 50	67		− 50 −**162**					Fair	Not given		179
180	C-8	N 179, same location, shallower.	762	+ 17 − 51	68		− 51 −**745**					Fair	None		180
181	C-8		1,012	+ 24 − 89	113		− 89 −**988**					Fair	Not given	M ?	181
182	B-8*	N 183, same location, deeper.	31	+ 10 − **21**								Fair	Not given	UP	182
183	B-8	N 182, same location, shallower.	33	+ 10 − **23**								Fair	Not given	UP	183
184	C-8		161	+ 10 − 91	101		− 91 −**151**					Fair	Not given		184
185	C-8		272	+ 45 − 25	70		− 25 −**227**					Fair	None		185
186	C-8		221	+ 80 + 62	142		+ 62 −**141**					Fair	None		186
187	C-8		94	+100 + 65	165		+ 65 + **6**					Fair	Not given		187
188	C-8		150	+ 75 + 3	78		+ 3 − **75**					Fair	None		188
189	C-8*	N 190, same location, deeper, better log.	190	+145 ?			? − **45**					Poor	0 − 40	M	189

190	C-8	N 189, N 617, same location, shallower.	700	+146 +102	248			+102 **−554**				Fair	−478 −538	M	190
191	C-8	Composite record with N 192.													191
192	C-8*	Composite record with N 191, N 746, N 747, same location, shallower. Near 191.	320	+105 + 93	198			+ 93 **−215**				Fair	− 7 − 68	M	192
194	D-8		385	+320 +180	500			+180 **− 65**				Fair	− 20 − 65	M	194
195	D-8		300	+270 +215	485			+215 **− 30**				Fair	− 13 − 24	M	195
196	D-8		170	+245 +165	410			+165 **+ 75**				Fair	+ 89 + 79	M	196
97	D-8	Log too poor to permit correlation. Near N-198.													197
198	D-8		925	+237 +187	224			+187 −393	−393 −579	−579 **−688**		Fair	−329 −379	M	198
199	D-8		611	+233 +183	216			+183 **−378**				Fair	−311 −367	M	199
200	E-8	Log does not permit correlation. Near N-539.													200
201	E-5		60	+ 45 − 15	60							Fair	Not given	UP	201
206	D-4	V 246.	114	+ 62 **− 52**								Fair	+ 11 + 10	UP	206
209	D-4	V 249.	60	+ 40 + 29	69			+ 29 + 16	+ 16 **− 20**			Fair	None		209
215	D-4	V 255	159	+ 30 ?				?	? −120	−120 **−129**		Fair	Not given	L ?	215
216	E-4	V 256. Only reliable figure is elevation of bedrock.	512	+ 10 ?				?	?	?	−220 **−502**		Not given		216
217	E-4*	No correlation possible. V 257. Near N-216.													217
218	E-4	V 258.	108	+ 20 **− 88**								Poor	− 83 − 88	UP	218
219	B-5	V 259.	62	+ 5 **− 57**								Poor	Not given	UP	219
220	B-5	V 260.	100	+ 5 **− 95**								Poor	− 15 − 25	UP	220
221	B-5	V 261.	100	+ 8 **− 92**								Poor	− 62 − 92	UP	221
222	B-5	V 262.	70	+ 10 **− 60**								Fair	− 50 − 60	UP	222
232	B-5	Correlation based in part on examination of samples. V 273.	155	+ 8 − 46		− 46 −107	−107 **−147**					Poor	Not given	J	232
236	B-5	Correlation in part from examination of samples. V 277.	536	+ 14 − 59	73			− 59 **−522**				Fair	Not given	M ?	236
237	B-5	V 278.	200	+ 16 − 62	78			− 62 **−184**				Fair	Not given		237
238	B-5	V 279.	390	+ 17 − 61	78			− 61 **−373**				Fair	Not given		238

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
239	B-5	V 280.	353	+ 17 − 65	82		− 65 **−353**					Fair	Not given	M ?	239
240	B-5	V 281.	410	+ 18 − 62	80		− 62 **−392**					Fair	−282 −287	M	240
241	B-5	V 282.	242	+ 15 − 63	78		− 63 **−227**					Fair	Not given	M ?	241
244	B-5	V 285. Correlation based in part on examination of samples.	208	+ 9 − 63	72		− 63 **−199**					Good	Not given	M ?	244
246	B-5*	N 3, same location, deeper, V 287.	331	+ 8 − 62	70		− 62 **−323**					Fair	Not given		246
248	B-5	V 289.	190	+ 14 − 42	56		− 42 **−176**					Good	Not given		248
252	C-5	V 299.	120	+ 50 − 23	73		− 23 **− 70**					Fair	Not given		252
261	C-5	V 310.	149	+ 90 + 13	103		+ 13 **− 59**					Fair	Not given		261
263	D-5	V 317.	755	+200 + 55	255		+ 55 −260	−260 −460	−460 **−555**			Fair	−500 −550	L	263
268	D-5	V 322.	116	+165 + 51	216		+ 51 **+ 49**					Fair	Not given	M ?	268
270	D-5	V 324.	147	+ 15 − 56	71		− 56 **−132**					Fair	Not given	M ?	270
272	D-5	V 326.	79	+ 65 + 23	88		+ 23 **− 14**					Fair	Not given	M ?	272
273	D-5*	V 327. Near N-272.	93	+ 75 + 19	94		+ 19 **− 18**					Fair	Not given	M ?	273
275	D-5	V 329.	112	+100 + 10	110		+ 10 **− 12**					Poor	+ 7 − 12	M	275
276	D-5	V 330.	25	+180 **+155**								Fair	Not given	UP	276
284	D-5	V 338.	129	+160 + 75	235		+ 75 **+ 31**					Fair	? + 79	UP	284
286	D-5	V 340.	87	+ 95 + 50	145		+ 50 **+ 8**					Fair	Not given	M ?	286
287	D-5	V 341.	52	+ 85 + 59	144		+ 59 **+ 33**					Poor	Not given		287
290	D-5	V 344.	240	+ 20 + 14	34			+ 14 −220	at **−220**			Fair	? −220	L	290
291	D-5	V 345.	237	+ 40 − 10	[illegible]			− 10 **−197**				Poor	? −197	R ? L ?	291
296	D-5	V 350.	52	+ 80 + 74	154		+ 74 **+ 28**					Fair	Not given	M ?	296

297	D-5	V 351.	113	+ 20 − **93**					Fair	− 80 − 93	UP	297
298	D-5	V 352.	80	+ 40 − 40 80					Fair	Not given	UP	298
300	D-5	V 354.	87	+100 + **13**					Fair	Not given		300
303	D-5	V 357.	129	+ 15 − **45**			− 45 −**114**		Fair	Not given		303
310	E-5	V 364.	83	+100 + 48 148			+ 48 + **17**		Fair	Not given	M ?	310
312	E-5	V 366.	91	+130 +108 238			+108 + **39**		Fair	Not given	M ?	312
314	E-5	V 368.	250	+ 60 −190 250				at −**190**	Fair	Not given	UP	314
319	B-6	V 373 correlation based in part on examination of samples.	386	+ 5 − 71	− 71 − 77	− 77 -10 − 85	− 85 −**381**		Poor	? −378	M	319
320	B-6	V 374.	383	+ 5 − 69	− 69 −108	−108 124 −124	−124 −**378**		Fair	? −118	J ?	320
324	B-6	V 377.	587	+ 8 − 48 56			− 48 −**579**		Fair	−570 −579	M	324
325	B-6	V 378.	74	+ 20 − 7 27			− 7 − **54**		Fair	Not given		325
329	B-6	V 382.	97	+ 22 − 29 51			− 29 − **75**		Fair	Not given		329
351	C-6	V 404.	97	+ 58 − 3 61			− 3 − **39**		Fair	Not given		351
354	C-7	V 407.	125	+ 80 + 60 140			+ 60 − **45**		Fair	Not given		354
373	D-6	V 426.	180	+150 + 75 225			+ 75 − **30**		Fair	Not given	M ?	373
374	D-7	V 427.	103	+200 +190 390			+190 + **97**		Fair	None		374
375	D-6	V 428.	150	+180 + 80 260			+ 80 + **30**		Fair	Not given	M ?	375
377	D-6	V 430.	343	+198 +112 310			+112 −145		Fair	Not given	M	377
378	D-6	V 431. Correlation based in part on examination of samples.	435	+328 +179 507			+179 −**107**		Fair	Not given	M	378
381	D-6	V 434.	300	+300 +200 500			+200 0		Fair	Not given	M	381
384	D-6	V 437.	250	+135 + 35 170			+ 35 −**115**		Fair	Not given	M	384
393	D-6	V 446.	140	+180 + 44 224			+ 44 + **40**		Poor	Not given	M	393
397	E-6	V 450.	106	+ 40 − 5 45			− 5 − **66**		Fair	? − 5	UP ?	397
403	E-6	V 456.	222	+160 + 70 230			+ 70 − **62**		Fair	− 52 − 62	M	403
404	E-6	V 457.	186	+160 + 75 235			+ 75 − **26**		Fair	− 22 − 26	M	404
406	E-6	V 459.	170	+162 + 12 174			+ 12 − **8**		Fair	− 3 − 8	M	406
407	E-6	V 460.	127	+118 + 28 146			+ 28 − **11**		Fair	Not given		407

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN NASSAU COUNTY, LONG ISLAND, N. Y.

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
409	E-6	V 462.	80	+ 40 − 30	70		− 30 − **40**					Fair	− 38 − 40	M	409
410	E-6	V 463.	73	+ 30 + 2	35		+ 2 − **43**					Fair	− 40 − 43	M	410
412	E-6	V 465.	215	+115 − 10	125		− 10 −**100**					Fair	+ 36 + 32	UP	412
416	E-6	V 469. Correlation based in part on examination of samples.	97	+ 5 − **92**								Fair	− 90 − 92	UP	416
417	E-6	V 470. Correlation based in part on examination of samples.	230	+ 9 − 71	80		− 71 −131	−131 −216	−216 −**221**			Fair	? −221	L	417
418	E-6	V 471.	225	+ 10 − 70	80		− 70 ?	? −190	−190 −**215**			Poor	? −215	L	418
419	E-6*	V 472. Near N-417.	210	+ 10 ?			? −128	−128 −188	−188 −**200**			Fair	Not given	L ?	419
420	E-6	V 473.	342	+ 13 − 67	80			− 67 −247	−247 −**327**			Fair	−247 −327	L	420
421	E-6	V 474. Location is not confirmed.	92	+ 60 − **32**								Fair	? + 35	UP	421
423	E-6	V 476.	265	+180 + 60	240		+ 60 − 85					Fair	− 80 − 85	M	423
426	E-6	V 479.	132	+150 + 26	216		+ 26 + **18**					Fair	Not given	M ?	426
428	E-6	V 481.	92	+ 80 + 48	128		at + **48**					Fair	Not given	UP	428
430	E-6*	V 483. Near N-423.	138	+140 + 14	154		+ 14 + **2**					Fair	Not given		430
431	E-6	V 484.	108	+140 + 32	172		at + **32**					Fair	Not given		431
432	E-6	V 485.	144	+120 + 20	140		+ 20 − 24					Fair	Not given		432
434	B-7	V 487. Other wells at same location are similar.	110	+ 16 − 19	35		− 19 − **94**					Fair	Not given		434
436	B-7	V 489.	100	+ 14 − 26	40		− 26 − **86**					Fair	Not given		436
438	B-7	V 491. Correlation based in part on examination of samples.	100	+ 10 − 35	45		− 35 − **90**					Fair	Not given		438
440	C-7	V 493.	90	+ 10 − 30	40		− 30 − **80**					Fair	Not given		440
448	D-7	V 501.	56	+118 + 72	190		+ 72 + **62**					Fair	Not given		438

449	D-7	V 502.	135	+142 + 85 229	+ 85 + **7**				Fair	Not given		440
453	D-7	V 506.	80	+152 + 99 251	+ 99 + **72**				Fair	Not given	M ?	453
454	D-7	V 507.	150	+159 + 84 243	+ 84 + **9**				Fair	+ 29 + 9	M	454
456	D-7	V 509.	60	+115 + 95 210	+ 95 + **55**				Poor	Not given		456
458	D-7	V 511.	209	+200 +102 302	+102 − **9**				Poor	+ 5 − 5	M	458
459	D-7	V 512.	220	+300 +170 470	+170 + **80**				Fair	+100 + 80	M	459
460	D-7	V 513.	60	+230 +180 410	+180 +**170**				Fair	Not given		460
462	D-7	V 515.	175	+240 +190 430	+190 + **65**				Fair	Not given	M ?	462
463	D-7	V 516.	168	+240 +200 440	+200 + **72**				Fair	Not given	M ?	463
467	D-7	V 520.	278	+145 + 40 185	+ 40 −**133**				Poor	Not given	M ?	467
468	D-7	V 521.	396	+165 + 90 255	+ 90 −**231**				Poor	Not given		468
470	E-7	V 523.	149	+220 +100 320	+100 + **71**				Fair	Not given		470
472	E-7	V 525. Correlation based in part on examination of samples. See also N 585.	160	+ 40 −**120**					Fair	? + 10	UP	472
474	E-7*	V 527. Near N-479.	110	+ 18 − **92**					Fair	− 72 − 92	UP	474
475	E-7	V 528.	140	+ 30 −**110**					Fair	Not given	UP	475
476	E-7*	N 479. Same location. V 529. Near N-479.	57	+ 10 − **47**					Fair	− 43 − 47	UP	476
477	E-7*	N 479. Same location. V 530. Near N-479.	65	+ 10 − **55**					Fair	Not given	UP	477
479	E-7	V 532.	83	+ 10 − **73**					Fair	Not given	UP	479
486	E-7	V 539.	190	+ 3 −117 120	−117 −**187**				Fair	? −182	M	486
490	E-7	V 543. Log incomplete.	220	+ 5 ?	? −**215**				Poor	Not given		490
493	E-7	V 546.	200	+ 5 −**195**					Poor	Not given	UP	493
496	E-7	V 549.	90	+ 10 − **80**					Fair	Not given	UP	496
500	E-7	V 553.	465	+ 5 − 95 100	− 95 ?	?	? −450?	−450 ? −**460**	Poor	? −460	L	500
502	E-7	V 555.	370	+ 12 ?	? −148	−148 −318	−318 −**358**		Fair	? −348	L	502
504	E-7	V 557.	298	+ 10 − 40 50	− 40 −140	−140 −285	−285 −**288**		Fair	Not given	L ?	504
505	E-7*	V 558. N 177, same location, deeper.	321	+ 10 − 50 60	− 50 −120	−190 −290	−290 −**311**		Fair	−290 −310	L	505

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
506	E-7	V 559.	318	+ 9 − 51	60		− 51 ?	? −291	−291 **−309**			Fair	−291 −309	L	506
511	E-7	V 564.	330	+ 10 − 90	100		− 90 −190	−190 −290	−290 **−320**			Fair	−290 −320	L	511
520	C-8	V 574.	85	+ 75 + 3	78		+ 3 **− 10**					Fair	Not given		520
521	C-8	V 575.	42	+100 + 84	184		+ 84 **+ 58**					Poor	Not given		521
522	C-8	V 576.	55	+100 + 85	185		+ 85 **+ 45**					Poor	Not given		522
527	D-8	V 583.	75	+145 + 95	240		+ 95 **+ 70**					Fair	Not given		527
529	D-8	V 587.	144	+190 + 92	282		+ 92 **+ 46**					Fair	+ 52 + 46	M	529
533	D-8	V 591.	96	+150 +130	280		+130 **+ 54**					Poor	Not given	M ?	533
535	E-8	V 595.	195	+225 + 39	264		+ 39 **+ 30**					Fair	Not given	M ?	535
536	E-8	V 596.	228	+250 + 60	310		+ 60 **+ 22**					Fair	Not given	M ?	536
538	E-8	V 598.	163	+ 55 + 15	70		+ 15 **−108**					Fair	Not given	M ?	538
539	E-8	V 599.	150	+ 55 + 15	70		+ 15 **− 95**					Fair	? − 95	M	539
542	E-8	V 603.	177	+140 + 5	145		+ 5 **− 37**					Poor	− 30 − 37	M	542
543	E-8	V 604.	243	+200 + 75	275		+ 75 **− 43**					Poor	− 35 − 43	M	543
545	E-8	V 609.	77	+ 10 − 40	50		− 40 **− 67**					Fair	− 48 − 67	M	545
546	E-8*	V 610. Near N-545.	165	+ 45 − 35	80		− 35 **−120**					Fair	Not given		546
554	E-7		247	+ 5 − 36	41		− 36 **−242**					Poor	−215 −239	M	554
557	C-6		37	+ 75 **+ 38**								Fair	+ 46 + 38	UP	557
558	D-5		182	+ 25 − 55	20		− 55 **−157**					Fair	−117 −127	M	558
559	B-5		150	+ 25 − 65	− 65 −104	−104 **−125**						Poor	−107 −123	J	559
561	E-8		360	+140 + 2	142		+ 2 **−220**					Poor	−210 −220	M	561

564	C-6		72	+ 75 + **3**					Fair	+ 13 + 3	UP	564
565	E-6		60	+ 40 − **20**					Fair	− 15 − 20	UP	565
568	B-5		35	+ 20 − **15**					Fair	− 10 − 15	UP	568
569	B-5		40	+ 20 − **20**					Fair	− 6 − 11	UP	569
570	D-8		610	+238 +185	423	+185 −372			Poor	−324 −364	M	570
571	E-6		182	+ 20 + 15	35	+ 15 **−162**			Poor	−158 −162	M	571
572	E-8		362	+200 + 50	250	+ 50 **−162**			Poor	−152 −162	M	572
575	C-6	N 90, same location, log believed inaccurate.	562	+ 91 + 8	99	+ 8 **−481**			Fair	−407 to −423 −443 to −448	M	575
576	D-7		409	+155 + 65	220	+ 65 **−254**			Fair	−344 −354	M	576
577	B-5		45	+ 10 − **35**					Poor	− 28 − 35	UP	577
578	C-6		415	+110 − 20	130	− 20 **−305**			Poor	−240 −290		578
580	B-7*	N 634, same location, better log.	45	+ 25 − **20**					Fair	+ **1** − **15**	UP	580
582	B-6*	Near N-48.	65	+ 20 − **45**					Fair	− 40 − 45	UP	582
585	E-7*	Near N-493.	89	+ 15 − **74**					Good	− 39 − 59	UP	585
586	E-7		249	+120 + 56	176	+ 56 **−129**			Fair	−125 −129	M	586
587	B-7		51	+ 20 − **31**					Poor	− 19 − 31	UP	587
590	E-80		165	+120 − **45**					Poor	− 32 − 42	UP	590
592	D-6		414	+225 + 15	240	+ 15 −189			Fair	−152 −179	M	592
594	C-8		36	+ 40 + **4**					Poor	+ 10 + 4	UP	594
595	C-7		34	+ 80 + **46**					Fair	+ 53 + 46	UP	595
599	D-5	Correlation based in part on examination of samples.	454	+ 71 + 65	136	+ 65 −109	−109 −214	−214 −383	Fair	−340 −383	L	599
601	B-5		45	+ 30 − **15**					Fair	− 8 − 14	UP	601
602	C-5		37	+ 35 − **2**					Fair	+ 10 − 5	UP	602
603	E-7		112	+ 5 − 70	75	− 70 **−107**			Poor	−102 −107	M	603
607	E-7		93	+ 10 − **83**					Fair	− 80 − 83	UP	607
608	D-7	Correlation based in part on examination of samples.	381	+260 +148	408	+148 **−121**			Good	−106 −102	M	608
610	D-8		417	+250 +229	479	+229 **−167**			Poor	−152 −167	M	610

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
613	E-7	N 166, N 167, same location, shallower.	140	+ 50 + **24**	74		+ 24 − **90**					Poor	− 66 − 86	M	613
615	C-6*	Near N-351.	45	+ 60 + **15**								Fair	+ 25 + 15	UP	615
617	C-8*	Use correlation for N 190, same location, better log.													617
629	C-5		71	+ 55 − **16**								Poor	+ 6 − 16	UP	629
631	E-5		117	+ 80 − **37**								Poor	− 32 − 37	UP	631
632	C-7		49	+ 80 + **31**								Fair	+ 42 + 31	UP	632
633	C-7		49	+ 80 + **31**								Fair	+ 42 + 31	UP	633
634	B-7	N 580, same location.	45	+ 25 − **20**								Fair	+ 1 − 15	UP	634
636	B-6		65	+ 20 − **45**								Fair	− 37 − 45	UP	636
637	B-7		187	+ 5 − 37	42		− 37 −**182**					Poor	−180 −183	M	637
638	D-6		560	+300 +143	443		+143 −**260**					Poor	−245 −260	M	638
641	C-5		63	+ 40 − **23**								Fair	− 2 − 13	UP	641
650	D-6	N 651, same location, shallower.	356	+106 + 46	152		+ 46 −**250**					Poor	−200 −240	M	650
651	D-6*	N 650, same location, deeper.	348	+105 + 17	122		+ 17 −**243**					Poor	−195 −235	M	651
654	B-4		150	+ 15 − 82	− 82 −110	−110 −**135**						Poor	−119 −135	J ?	654
661	E-6	Log incomplete	400	+ 40 ?			?	?	−286 −356			Poor	−286 −356	L	661
662	D-6	Correlation based in part on examination of samples.	368	+ 10 − 53			− 53 −275	−275 −337	−337 −**358**			Good	−337 −353	L	662
666	B-7		104	+ 5 − 72			− 72 − **99**					Poor	− 88 − 99	M	666
667	B-7		89	+ 5 − 69	− 69 − **84**							Poor	− 73 − 84	G ?	667
668	C-7*	N 920, same location, deeper.	40	+ 47 + **7**								Fair	+ 18 + 7	UP	668

669	C-6		68	+ 40 - 27	67			- 27 - **28**					Fair	- 15 - 26	UP	669
675	D-5	Correlation based in part on examination of samples.	290	+ 10 - 20	30			- 20 - 72	- 72 -230	-230 **-280**			Good	-259 -276	L	675
687	D-5	Correlation based in part on examination of samples.	370	+ 13 -187	200			None	None	-187 -307	-307 -347	-347 **-357**	Fair	-267 -297	L	687
693	C-5*	N 11, same location, deeper.	107	+ 50 - 46	96			- 46 - **57**					Fair	- 18 - 43	UP	693
695	E-6		294	+ 20 + 12	32			+ 12 -130	-130 -252	-252 **-274**			Fair	-268 -274	L	695
746	C-8*	N 192, same location, deeper.	123	+105 + 55	160			+ 55 - **18**					Fair	+ 2 - 18	M	746
747	C-8*	N 192, same location, deeper.	242	+105 + 65	170			+ 65 **-138**					Fair	- 88 -128	M	747
831	B-5		134	+ 25 - 59		- 59 - 97	- 97 **-109**						Poor	-104 -109	J ?	831
832	C-8		160	+125 + 97	222			+ 97 - **35**					Fair	- 27 - 35	M	832
834	—	Log does not permit correlation.													L	834
838	C-6		12	+ 38 + **26**									Fair	+ 10 + 14	UP	838
842	E-6	Correlation based in part on examination of samples. N 1595 same location.	442	+ 10 - 10	70			- 10 -207	-207 -334	-334 -431		-431 **-432**	Good	-355 -405	L	842
843	C-7		32	+ 60 + **28**									Fair	+ 35 + 28	UP	843
906	E-6*	Log believed unreliable. Use N 842, same location.														906
920	C-7		44	+ 45 + **1**									Fair	+ 12 + 1	UP	920
922	C-7		51	+ 85 + **34**									Fair	+ 48 + 38	UP	922
925	D-5		97	+100 + 35	135			+ 35 + **3**					Fair	+ 7 + 1	M	925
936	C-7		61	+105 + **44**									Fair	+ 52 + 43	UP	936
937	D-7		168	+140 + 75	215			+ 75 - **28**					Fair	- 13 - 28	M	937
939	B-7		168	+ 22 - 26	48			- 26 **-146**					Fair	- 70 - 91	M	939
941	C-5		67	+ 52 - 11	63			- 11 - **15**					Fair	+ 5 - 11	UP	941
949	D-8		189	+234 +142	376			+142 + **45**					Fair	+ 62 + 52	M	949
1035	C-7		79	+ 80 + 14	94			+ 14 + **1**					Fair	+ 51 + 40	UP	1035
1121	D-5*	Near N-1788.	177	+220 + **43**									Fair	None		1121
1291	D-5	N 1581, same location, shallower.	409	+100 - 39?	139			- 39? -139	-139 -240	-240 **-309**			Poor	-276 -301	L	1291
1293	D-6		144	+165 + 50	215			+ 50 + **21**					Fair	- 5 - 27	M	1293

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
1294	B-7		59	+ 20 − **39**								Fair	− 13 − 23	UP	1294
1297	C-7		40	+ 50 + **10**								Fair	+ 25 + 10	UP	1297
1298	D-5		385	+ 15 − 60 75			− 60 −132	−132 −243	−243 −366		−366 −**370**	Fair	−271 −321	L	1298
1300	D-5		381	+175 + 64 239			+ 64 −**206**					Fair	− 32 to − 68 −130 to −190	M	1300
1301	C-7		66	+118 + **52**								Fair	+ 64 + 54	UP	1301
1326	D-5	Correlation based in part on examination of samples.	206	+100 + 16 116			+ 16 −**106**					Good	− 84 − 95	M	1326
1328	D-5	Correlation based in part on examination of samples.	785	+184 + 67 251			+ 67 −242	−242 −364	−364 −574	−574 −601?	at −**601?**	Good	−483 −573	L	1328
1331	C-6		52	+ 40 − **12**								Fair	− 6 − 10	UP	1331
1332	D-5		237	+165 + 74 239			+ 74 − **72**					Poor	− 14 − 34	M	1332
1334	C-5		53	+ 35 − **18**								Fair	− 2 − 12	UP	1334
1335	B-5		142	+ 23 − 61	− 61 −101	−101 −**119**						Poor	−114 −119	J ?	1335
1336	C-7		40	+ 55 + **15**								Fair	Not given	UP	1336
1419	C-6		44	+ 35 − **9**								Fair	+ 6 − 9	UP	1419
1420	C-6	Correlation based in part on examination of samples, N 92, N 93, N 94, N 95, same location, shallower.	866	+ 80 − 1 81			− 1 −448	−448 −604	−604 −**786**			Good	−710 −784	L	1420
1461	D-7	Correlation based in part on examination of samples.	72	+130 + 85 215			+ 85 + **58**					Good	None		1461
1465	C-8		329	+102 + 43 145			+ 43 −**227**					Good	? −227	M	1465
1477	E-7	Correlation based in part on examination of samples.	194	+220 + 37 257			+ 37 + **26**					Good	None		1477
1479	D-5	Correlation based in part on examination of samples.	61	+ 60 − **1**								Good	None		1479

1481	D-7	Correlation based in part on examination of samples.	76	+150 + 80		230	+ 80 + **74**					Good	None		1481
1482	E-5			+ 11 −106		117		−106 −140				Poor	None		1482
1486	E-8		500	+ 5 −115		120	−115 −315	−315 −475	−475 **−495**			Poor	Not given	L ?	1486
1487	D-8	Correlation based in part on examination of samples.	207	+122 + 89		211	+ 89 − **85**					Good	None		1487
1497	E-7		140	+100 + 82		182	+ 82 − **40**					Poor	− 28 − 39	M	1497
1498	C-5		82	+115 + **33**								Fair	+ 46 + 40	UP	1498
1499	B-6		245	+ 5 − 52	− 52 − 78	83	− 78 **−240**					Poor	−224 −240	M	1499
1581	D-5*	Log of N 1291, same location, more reliable.													1581
1585	C-5		88	+ 60 − 18		78	− 18 − **28**					Fair	− 7 − 18	UP	1585
1586	C-6*	Near N 1796.	98	+ 50 − 13		63	− 13 − **38**					Fair	+ 10 − 1	UP	1586
1588	D-6		82	+112 + **30**								Fair	+ 41 + 30	UP	1588
1593	B-5*	N 1837, same location, deeper.	39	+ 10 − **29**								Fair	− 21 − 24	UP	1593
1595	E-6*	N 842, same location, deeper.	134	+ 10 − 7		17	− 7 **−124**					Fair	− 85 −115	M	1595
1601	C-6	Correlation based in part on examination of samples.	666	+ 31 − 25		56	− 25 −592	−592 **−635**				Good	−499 −549	M	1601
1602	C-6		591	+ 33 − 47		80	− 47 **−558**					Good	−412 −462	M	1602
1603	C-6		551	+ 40 − 18		58	− 18 **−511**					Good	−444 −489	M	1603
1605	C-6*	N 1761, same location, deeper.	16	+ 55 + **39**								Fair	+ 47 + 43	UP	1605
1618	D-5	Correlation based in part on examination of samples.	585	+ 83 − 52		135	− 52 −249	−249 −324	−324 −488	−488 −503	at **−503**	Good	−387 −467	L	1618
1633	C-7		40	+ 55 + **15**								Fair	+ 12 + 17	UP	1633
1635	B-6		38	+ 20 − **18**								Fair	− 9 − 15	UP	1635
1648	B-5*	Near N-2.	79	+ 20 − 49		69	− 49 − **59**					Fair	− 41 − 47	UP	1648
1651	E-6		494	+160 + 52		212	+ 52 − 85	− 85 −203	−203 **−330**			Good	−235 −315	L	1651
1658	C-8		300	+115 + 67		182	+ 67 **−185**					Good	+ 54 + 17	M	1658
1665	C-8		109	+117 + 56		173	+ 56 + **8**					Good	+ 49 + 16	M	1665
1667	D-6*	N 101, same location, deeper.	248	+118 + 43		161	+ 43 **−130**					Fair	− 89 −119	M	1667
1669	C-6		28	+ 65 + **37**								Fair	+ 40 + 37	UP	1669
1670	E-7		211	+145 +104		249	+104 − **66**					Fair	− 48 − 63	M	1670

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
1686	D-5		350	+100 − 25 125			− 25 −125	−125 **−250**				Poor	−110 −120	M	1686
1696	C-6		490	+ 91 + 34 125			+ 34 **−399**					Fair	−347 −377	M	1696
1697	C-6		602	+ 85 0 85			0 −439	−439 **−517**				Fair	−393 −433	M	1697
1715	D-5	N 1716, N 2030, same location, shallower.	518	+102 − 63 165			− 63 −165	−165 −264	−264 −417		at **−417**	Good	−328 −378	L	1715
1716	D-5*	N 1715, same location, deeper.	509	+101 −157 258			None	−157 −253	−253 −407		at **−407**	Good	−324 −374	L	1716
1734	C-7		52	+ 58 + **6** 1								Fair	+ 11 + 16	UP	1734
1735	C-6*	Near N-1761.	21	+ 50 + **29**								Fair	+ 33 + 29	UP	1735
1742	B-6		272	+ 20 − 37 57			− 37 **−252**					Poor	− 13 − 37	UP	1742
1743	B-7	Log incomplete.	40	+ 10 − **20**								Fair	− 20 − 30	UP ?	1743
1744	B-5*	Near N-2.	77	+ 26 − 46 72			− 46 − **51**					Poor	+ 9 + 4	UP	1744
1747	B-5	Near N-237.	79	+ 26 − 49 75			− 49 − **53**					Poor	− 42 − 52	UP and M	1747
1757	B-5*	Near N-236.	51	+ 20 − **31**								Fair	− 23 − 27	UP	1757
1760	B-6*	Near N-1916.	23	+ 25 + **2**								Fair	+ 5 + 2	UP	1760
1761	C-6		29	+ 55 + **26**								Fair	+ 29 + 26	UP	1761
1762	B-6*	Near N-1916	23	+ 25 + **2**								Fair	+ 5 + 2	UP	1762
1767	D-8*	Log incomplete, does not permit correlation. Near N-949.													1767
1769	B-5*	Near N-2.	85	+ 26 − 50 76			− 50 − **59**					Poor	− 44 − 49	UP	1769
1771	D-5	Correlation based in part on examination of samples.	401	+225 + 54 277			+ 54 **−176**					Good	+ 95 + 65	UP	1771
1777	C-6		35	+ 88 + **53**								Fair	+ 59 + 53	UP	1777
1778	B-5		23	+ 26 + **3**								Fair	+ 6 + 3	UP	1778
1781	C-6*	Near N-351.	53	+ 50 − **3**								Fair	+ 6 − 3	UP	1781

1788	D-5		324	+226 + **77**	303	+ 77 − **98**					Fair	Not given		1788
1793	C-7	N 145, same location, shallower.	300	+ 90 + 21	111	+ 21 −**210**					Fair	? −211	M	1793
1796	C-6		30	+ 50 + **20**							Fair	+ 27 + 20	UP	1796
1802	D-5	Correlation based in part on examination of samples.	746	+132 + 9	141	+ 9 −284	−284 −427	−427 −579	−579 −614	at **−614**	Good	−509 −559	L	1802
1803	E-6*	Near N-695.	117	+ 40 − 1	41	− 1 − **77**					Poor	− 61 − 73	M	1803
1804	D-5	Correlation based in part on examination of samples.	266	+120 + 5	125	+ 5 −**146**					Good	−100 −130	M	1804
1805	E-7		354	+ 16 − 85	101	− 85 −141	−141 −289	−289 −**338**			Fair	−325 −336	L	1805
1807	C-7		38	+ 45 + **7**							Fair	+ 17 + 7	UP	1807
1810	B-6		32	+ 15 − **17**							Fair	− 13 − 17	UP	1810
1814	C-7		60	+ 70 + 11	87	+ 11 + **10**					Poor	+ 32 + 22	UP	1814
1818	—	Log believed unreliable.												1818
1822	C-6		30	+ 65 + **35**							Fair	+ 40 + 35	UP	1822
1825	D-6		367	+200 + 82	282	+ 82 −**167**					Fair	−153 −167	M	1825
1826	B-8		35	+ 8 − **27**							Fair	− 24 − 27	UP	1826
1835	D-5	N 1841, same location, shallower.	307	+125 + 4	129	+ 4 −**182**					Fair	− 85 −135	M	1835
1837	B-5*	N 1593, same location, shallower.	119	+ 6 − 89		− 89 −**113**					Poor	Not given		1837
1840	C-8		159	+ 65 − 10	75	− 10 − **94**					Fair	− 4 − 24	UP and M	1840
1841	D-5*	N 1835, same location, deeper.	285	+130 + 20	[illegible]	+ 20 −**155**					Fair	− 79 −129	M	1841
1856	C-8*	Near N-1937.	63	+ 77 + **14**							Fair	+ 24 + 14	UP	1856
1858	D-5*	Near N-1804.	107	+125 + **18**							Fair	+ 36 + 21	UP	1858
1862	C-5	Log incomplete.	23	+ 65 + **51**							Fair	+ 45 + 42	UP ?	1862
1864	B-5		40	+ 10 − **30**							Poor	− 10 − 30	UP	1864
1868	—	Record believed unreliable. Correlation impossible.												1868
1869	B-7		132	+ 10 − 33	43	− 33 −**122**					Fair	−103 −119	M	1869
1877	D-6			+ 20 ?		? −240	−240 −395	−395 −**535**			Fair	−527 −535	L	1877
1911	D-7		178	+131 + 90	221	+ 90 − **47**					Fair	− 2 − 32	M	1911
1913	D-8	Correlation based in part on examination of samples.	315	+123 + 76	199	+ 76 −**192**					Good	Not given		1913

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
1916	B-6		90	+ 22 − 42	64		− 42 − 68					Poor	− 34 − 54	UP and M	1916
1917	E-6	Correlation based in part on examination of samples.		+ 10 − 93	103		− 93 −180	−180 −283	−283 **−301**			Fair	−286 −296	L	1917
1922	D-8	Correlation based in part on examination of samples.	193	+125 + 63	188		+ 63 − **68**					Good	− 5 − 35	M	1922
1923	C-8	Correlation based in part on examination of samples.	358	+112 + 44	156		+ 44 −246					Good	−181 −236	M	1923
1926	D-4	Correlation based in part on examination of samples.	300	+ 51 − 47	98		None	− 47 −174	−174 −249	at **−249**		Good	−175 −227	L	1926
1927	B-6	Correlation based in part on examination of samples.	1471	+ 10 − 89	− 89 −121	−121 −152 162	−152 −859	−859 −1134	−1134 −1458		−1458 −1461	Fair	−1149 −1209	L	1927
1937	C-8	Correlation based in part on examination of samples.	180	+109 +101	210		+101 − **71**					Good	− 12 − 37	M	1937
1941	D-6	Correlation based in part on examination of samples.	78	+ 68 + 9	77		+ 9 − **10**					Good	None		1941
1958	C-5		757	+116 + 16	132		+ 16 −296	−296 −522	−522 −638		−638 **−640**	Good	−551 −611	L	1958
1960	C-7*	Near N-448.	199	+117 + 71	188		+ 71 − **82**					Fair	− 13 − 43	M	1960
1964	E-8		105	+115 + 95	210		+ 95 + **15**					Fair	+ 22 + 8	M	1964
1965	C-8		177	+ 65 − 22	87		− **22** **−112**					Poor	− 78 −104	M	1965
1995	E-5	Correlation based in part on examination of samples.	113	+ 23 − 82	105		None	− 82 − **90**				Good	− 59 − 68	UP	1995
2002	D-6		472	+ 20 − 3	23		− 3 −227	−227 −403	−403 **−452**			Good	−416 −447	L	2002
2007	C-8		123	+100 + 76	176		+ 76 − **23**					Poor	− 15 − 23	M	2007
2015	—	Log incomplete, correlation not possible.													2015
2017	E-7		395	+ 6 −136	142		−136 −197	−197 −329	−329 **−389**			Poor	?	L	2017
2025	E-7		401	+ 60 − 29	89		− 29 −155	−155 −335	−335 −341			Poor	−372 −378	L	2025

2028	D-5	Correlation based in part on examination of samples.	610	+259 + 63	322	+ 63 −233	−233 −351			Fair	−166 −226	M	2028
2030	D-5*	N 1715, same location, deeper. Correlation from samples.	365	+102 − 73	175	− 73 −161	−161 −256	−256 **−263**			− 88 −113	M	2030
2035	D-5		146	+140 + 73	213	+ 73 − **6**				Poor	+ 6 − 4	M	2035
2045	B-7		133	+ 10 − 41	51	− 41 **−123**				Fair	−102 −112	M	2045
2052	D-6	Correlation based in part on examination of samples.	409	+160 − 33	193	− 33 −206	−206 **−249**			Fair	−125 −145	M	2052
2066	D-8	Correlation based in part on examination of samples.	185	+124 + 64	288	+ 64 − **61**				Fair	+ 3 − 29	M	2066
2072	D-7	Correlation based in part on examination of samples.	170	+170 + 70	240	+ 70 **0**				Fair	Not given		2072
2081	E-7	Correlation based in part on examination of samples.	174	+165 +112	277	+112 − **9**				Fair	0 − 7	M	2081
2088	E-8		605	+139 + 59	2 8	+ 59 −262	−262 −439	−439 **−466**		Poor	Not given	L ?	2088
2097	C-5	Correlation based in part on examination of samples.	116	+ 42 − 44	86	− 44 − **74**				Good	Not given		2097
2132	E-7		469	+ 15 −125	140	−125 −193	−193 −391	−391 **−454**		Poor	Not given	L ?	2132
2185	C-6		264	+ 60 − 5	65	− 5 **−204**				Fair	−199 −204	M	2185
2191	D-5*	Correlation from samples. N 2420, same location, shallower. Near N-1771.	306	+227 + 74	301	+ 74 − **79**				Fair	Not given		2191
2201	D-7*	Correlation in part from examination of samples. Near N-2602.	601	+115 + 65	180	+ 65 −482	−482 **−486**			Good	None	M	2201
2214	D-5		393	+ 40 − 28	68		− 28 −180	−180 −350	−350 **−353**	Poor	Not given	L ?	2214
2269	D-5	Correlation based in part on examination of samples.	250	+111 − 78	189	− 78 **−139**				Good	Not given	M	2269
2400	D-6	Correlation based in part on examination of samples.	487	+160 0	160	0 −317	−317 **−327**			Good	Not given	M ?	2400
2409	E-8*	N 2410, same location, possibly better log. Samples examined.	90	+ 20 − 66	86	− 66 − **70**				Good	Not given		2409
2410	E-8	N 2909, same location. Correlation based on samples.	90	+ 20 − 2	22	− 2 − **70**				Good	Not given		2410
2413	C-5	Correlation based in part on examination of samples.	509	+ 40 − 52	92	− 52 −469	at −469			Fair	Not given		2413
2420	D-5*	N 2191, same location, deeper. Correlation from samples.	256	+227 + 49	276	+ 49 − **29**				Fair	Not given		2420
2422	C-6	Correlation based in part on examination of samples.	125	+ 95 + 70	165	+ 70 − **30**				Good	Not given		2422

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN NASSAU COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
2424	D-6	Correlation based in part on examination of samples.	470	+ 20 + 8	28		+ 8 −214	−214 −400	−400 **−450**			Good	Not given		2424
2528	E-7	Correlation based in part on examination of samples.	343	+100 − 52	152		− 52 −194	−194 **−243**				Good	Not given		2528
2560	E-7	Correlation based in part on examination of samples.	417	+ 10 − 55	65		− 55 −140	−140 −310	−310 **−407**			Good	−397 −407	L	2560
2569	D-6	Correlation based in part on examination of samples.	152	+ 8 **−144**								Good	None		2569
2570	D-6	Correlation based in part on examination of samples.	50	+ 51 + 45	96		+ 45 + **1**					Good	None		2570
2571	D-6	Correlation based in part on examination of samples. Near N-2569.	67	+ 42 + 6	48		+ 6 − **25**					Good	None		2571
2572	B-6	Correlation based in part on examination of samples.	100	+ 10 − 66	− 66 − 87	97	− 87 − **90**					Poor	None		2572
2574	B-6	Test boring possibly clay in lower Magothy.	548	+ 20 − 79	99		− 79 −482	−482 **−528**				Fair		M	2574
2597	B-5*	Samples Av. −494 to −943. Near N-44.	1254	+ 6 −103	−103 −117	−117 −243 249	−243 −790	−790 −1084	−1084 **−1248**			Fair	−1169 −1229	L	2597
2602	D-7		858	+115 + 73	188		+ 73 −441	−441 −635	−635 **−743**			Fair	−645 −685	L	2602
2749	D-5*	Test boring near N-1479.	398	+ 60 −190	250		None	−190 −246	−246 **−338**	Br @ −338		Fair	None	L	2749
3129	C-7		142	+ 90 + 35	125		+ 35 − **52**					Fair	− 6 − 48	M	3129
3143	C-7	Test boring.	271	+ 85 − 9	94		− 9 **−185**					Fair	Not given	M	3143

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
2	D-8*	S-3, same location.	138	+ 97 + 59 38			+ 59 **− 41**					Good	No record	M	2
3	D-8	S-2, same location.	288	+ 97 + 62 35			+ 62 **−191**					Good	−175 −191	M	3
6	E-8	Correlation based in part on examination of samples.	400	+140 − 10 150			− 10 **−260**					Good	No record	M	6
7	E-8*	S-6, same location.	322	+140 − 23 163			− 23 **−182**					Good	No record	M	7
8	E-8	Upper 200¹ feet of log may be generalized.	600	+ 10 ?			? −230	−230 −455	−455 **−590**			Poor	No record	No record	8
9	E-8	Log incomplete.	570	+110 − 30 140			− 30 **−285**	−285 −410?	−410 ? **−460**			Poor	Bottom at −460	L ?	9
10	F-8		54	+ 15 **− 39**								Good	− 25 − 38	UP	10
11	F-8*	S-4984, same location.	114	+ 35 **− 79**								Good	No record	UP	11
12	B-9		314	+ 7 ?	?		? **−308**					Poor	−295 −303	M	12
13	C-9		370	+ 30 − 54 84			− 54 **−340**					Fair	No record	No record	13
14	C-9		101	+ 33 **− 68**								Good	No record	UP	14
15	C-9		101	+ 40 − 61 101			− 18 **− 61**					Fair	No record	No record	15
16	C-8		129	+ 20 ?	?		− 60 ? **−109**					Poor	No record	No record	16
17	C-9		125	+ 60 − 33 93			− 33 **− 65**					Good	No record	No record	17
18	D-9		400	+ 56 − 18 74			− 18 **−344**					Good	No record	No record	18
19	D-10	Location uncertain.	203	+130 + 90 40			+ 90 **− 73**					Good	No record	M	19
20	D-9		105	+110 ? + **5**								Poor	No record	UP	20
22	D-9	Correlation based in part on examination of samples.	179	+240 +150 90			+150 **+ 67**					Fair	+ 65 + 61	M	22
24	D-9	Correlation based in part on examination of samples.	132	+150 +114 36			+114 **+ 18**					Good	+ 23 + 18	M	24
25	E-9	Location uncertain.	280	+220 +130 90			+130 **− 60**					Fair	No record	M	25
27	E-9*	S 29, same location.	240	+170 **− 70**								Fair	+ 12 − 36	UP	27

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
28	E-9*	S 29, same location.	240	+157 − **83**								Fair	+ 31 − 17	UP	28
29	E-9	S 27, 28, same location.	277	+162 ?−**115**								Fair	No record	UP	29
30	E-9	Pleistocene-Cretaceous contact uncertain.	207	+200 + 77	[illegible]		+ 77 − **7**					Good	No record	M ?	30
31	E-9		245	+ 14 ?−226	240		−226 ? −**231**					Poor	No record	UP	31
32	E-9*	S-31, same location.	205	+ 14 −191	205		?					Poor	−159 −188	UP	32
33	F-9		141	+ 87 + 29	58		+ 29 − 54					Fair	No record	M ?	33
34	F-9	No record, except depth to bedrock.	1,650	+ 5 ?			?	?	?	at −**597**		Poor	No record	No record	34
36	C-10		102	+ 18 − 51	136		− 51 − **84**					Good	No record	No record	36
37	C-10	S 38, 39, same location.	820	+ 33 − 65	98		− 65 −**787**					Good	No record	No record	37
38	C-10*	S 37, same location.	200	+ 32 − 63	95		− 63 −**168**					Good	No record	No record	38
39	C-10*	S 37, same location. Log probably generalized.	170	+ 30 ?			? −**140**					Fair	No record	No record	39
40	B-12		420	+ 15 ?	?		? −**405**					Good	No record	No record	40
42	D-10		1,008	+120 − 38	158		− 38 −**888**					Fair	No record	M ?	42
44	D-10		308	+180 ?			? −**128**					Poor	No record	M ?	44
45	D-10		129	+160 + 33	127		+ 33 ? + **31**					Fair	No record	UP	45
46	E-10	Log probably generalized.	267	+140 −**127**								Poor	No record	No record	46
47	E-10		185	+190 + **5**								Poor	No record	No record	47
48	E-10		740	+120 − 90	210		− 90 ? −398	−398 −575	−575 −**620**			Poor	No record	L	48
49	E-10		725	+135 −177?	312		−177 ? −395	−395 −600	−600 −**605**			Poor	−560 −593	L	49
50	E-10*	Near location of S 49.	225	+143 − **82**								Fair	No record	UP	50

51	E-10	Correlation based in part on examination of samples.	553	+170 + 36	134	+ 36 **−383**	Good	No record	No record	51
52	E-10*	S 53, same location.	180	+ 62 **−118**			Fair	No record	UP	52
53	E-10		194	+ 62 **−132**			Fair	No record	UP	53
54	F-10		125	+ 15 **−110**			Fair	No record	UP	54
56	B-11	Correlation based in part on examination of samples.	640	+ 4 − 92	− 92 ? ?	? **−636**	Fair	No record	M ?	56
57	C-11		100	+ 30 − ?		? **− 70**	Poor	No record	No record	57
58	C-11		468	+ 38 − 80	118	− 80 **−430**	Fair	No record	No record	58
59	D-11		117	+ 32 − 70	102	− 70 **− 85**	Fair	No record	No record	59
60	D-11*	Correlation based in part on examination of samples. S 715, same location.	830	+ 45 −112	[illegible]	−112 **−785**	Good	−745 −785	M	60
61	D-10	Correlation based in part on examination of samples.	194	+ 93 − 52	125	− 52 **−101**	Good	No record	No record	61
62	D-10*	S 61, same location.	200	+ 92 − 43	135	− 43 **−108**	Good	− 8 − 38	UP	62
63	E-11		115	+ 30 **− 85**			Poor	No record	No record	63
64	E-11	Poor log.	205	+ 20 ?**−185**			Poor	No record	No record	64
65	E-11		153	+ 50 **−103**			Poor	No record	UP	65
66	E-11		100	+ 80 **− 20**			Fair	No record	UP	66
67	E-11*	S 68, same location.	480	+ 64 −155	219	−155 ? **−416**	Poor	No record	M ?	67
68	E-11		414	+ 66 −175	241	−175 ? **−348**	Poor	No record	M ?	68
70	E-11		490	+124 − 69	193	− 69 **−366**	Good	−338 −354	M	70
71	E-11*	S 70, same location.	504	+122 −190?	312	−190 ? **−382**	Poor	−349 −365	M	71
72	E-11*	S 70, same location.	500	+121 −154	275	−154 ? **−379**	Poor	−352 −366	M	72
73	E-11*	S 70, same location.	598	+108 −104	212	−104 **−490**	Fair	−352 −368	M	73
74	C-12	S 75, same location.	111	+ 10 **−101**			Fair	No record	UP	74
75	C-12*	S 74, same location.	109	+ 10 **− 99**			Fair	No record	UP	75
76	C-12		120	+ 15 **−105**			Poor	No record	UP	76
78	C-9	S 79, same location.	121	+ 41 − 50	91	− 50 **− 80**	Good	No record	No record	78
79	C-9*	S 78, same location.	85	+ 41 **− 44**			Good	− 33 − 44	UP	79

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
80	D-12		121	+ 35 − **86**								Fair	No record	No record	80
82	D-12*	Near map location of S 334.	154	+ 60 ?− **94**								Poor	No record	No record	82
83	E-12	Log probably generalized.	230	+ 60 ?			? −**170**					Poor	No record	No record	83
84	E-12		215	+120 − **95**								Poor	No record	No record	84
85	E-12	Log probably generalized.	255	+110 ?			? −**145**					Poor	No record	No record	85
86	E-12		170	+120 ?− **50**								Poor	No record	No record	86
87	E-12		199	+160 ?− **39**								Poor	− 25 − 35	No record	87
88	C-9		116	+ 40 − 43	83		− 43 − **76**					Good	No record	No record	88
89	G-27	Location very uncertain	105	+ 20 ? − **85**								Poor	No record	UP	89
90	G-27		84	+ 45 − **39**								Poor	No record	UP	90
92	D-13		180	+ 15 − 72	87		− 72 −**165**					Fair	No record	No record	92
93	G-27		112	+ 30 ? − **82**								Poor	No record	UP?	93
94	D-13		118	+ 35 − **83**								Good	No record	No record	94
95	D-13		463	+ 26 − **31**			−131 −**437**					Fair	No record	No record	95
96	D-13		96	+120 + **24**								Fair	No record	UP	96
97	E-13*	S-98, same location.	89	+120 + **31**								Good	No record	UP	97
98	E-13		149	+240 + **91**								Good	No record	UP	98
99	E-13		255	+260 + **5**								Fair	No record	No record	99
100	E-13		162	+220 + **58**								Fair	No record	No record	100
101	E-13		80	+180 +**100**								Good	No record	No record	101
102	E-13		100	+130 + **30**								Good	No record	No record	102

103	E-13		50	+120 + **70**			Good	No record	No record	103
104	E-13	Correlation based in part on examination of samples.	241	+235 − **6**			Good	No record	UP	104
105	E-13	Log may be generalized.	220	+ 95 ?		? −**125**	Poor	No record	No record	105
106	E-13	Correlation based in part on examination of samples.	93	+110 + **18**			Good	+ 31 + 21	UP	106
107	E-13		300	+120 ?		−? −**180**	Poor	No record	No record	107
108	E-13	Well abandoned, no water.	190	+ 80 ?	?	−**110**	Poor	No record	No record	108
109	F-13		167	+200 + **33**			Poor	No record	No record	109
111	F-13		162	+ 50 + 28	2.2	+ 28 −·**112**	Fair	No record	No record	111
112	F-13	Location uncertain.	245	+ 10 + 10		+ 10 −**235**	Fair	No record	M	112
113	F-13*	Same location as S 112.	334	+ 5 − 5?		− 5 ? −**329**	Fair	−315 −325	M	113
114	F-13		333	+ 5 − 6	//	− 6 −**328**	Fair	No record	M	114
115	F-13		167	+160 − **7**			Good	No record	UP	115
116	F-13		205	+140 − **65**			Poor	No record	No record	116
118	G-27		96	+ 40 − **56?**			Poor	No record	UP	118
119	G-26		92	+ 70 − **22**			Poor	No record	UP	119
120	D-14		99	+ 27 − **72**			Fair	No record	No record	120
121	E-14		143	+170 + **27**			Good	No record	No record	121
122	E-14		173	+ 80 − **93**			Poor	No record	No record	122
123	F-13		256	+150 −**106**			Poor	No record	No record	123
125	F-14		100	+ 80 − **20**			Good	No record	No record	125
126	F-14		57	+ 70 + **13**			Good	No record	No record	126
127	D-15		99	+ 37 − **62**			Good	No record	UP	127
128	D-15		931	+ 36 −136	172	−136 −**896**	Good	No record	No record	128
129	D-16		99	+ 29 − **70**			Good	No record	UP	129
130	F-15		129	+130 + **7**			Good	No record	UP	130
131	G-26		99	+ 80 − **19**			Good	No record	UP	131
132	F-15		123	+ 40 − **83**			Poor	No record	UP	132

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Coordinates Map	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
133	F-15		72	+ 40 – **67**								Poor	No record	UP	133
134	F-15		95	+ 60 – **35**								Good	No record	UP	134
135	F-15		101	+100 – **1**								Good	No record	UP	135
136	E-16	Location uncertain.	81	+ 90 + **9**								Good	No record	UP	136
137	F-15		200	+175 – **25**								Good	No record	UP	137
138	F-16		105	+120 + **15**								Good	No record	UP	138
139	F-16	S 140, 796, same location.	200	+120 – **80**								Poor	No record	UP	139
140	F-16*	S 139, same location.	171	+102 – **69**								Poor	– 45 – 65	UP	140
141	G-26	Location uncertain.	159	+145 ? – **14**								Poor	No record	No record	141
142	D-17		100	+ 52 – **48**								Good	No record	UP	142
145	F-17		91	+ 40 – **51**								Fair	No record	No record	145
146	F-17		106	+100 – **6**								Good	No record	UP	146
147	F-16		126	+130 + **4**								Good	No record	UP	147
148	F-17*	S-4048, same location.	111	+ 95 – **16**								Poor	No record	No record	148
149	F-17		174	+130 – **44**								Good	No record	UP	149
150	F-17		122	+100 – **22**								Good	No record	UP	150
151	D-18		346	+ 10 –106?	1?3		–143 ? –**336**					Poor	No record	No record	151
152	D-18		270	+ 5 ?	13?3		–128 ? –**265**					Poor	No record	M	152
153	D-18		269	+ 5 ?	130 ?		–125 ? –**264**					Poor	No record	M ?	153
155	G-26		38	+ 20 – **18**								Good	No record	UP	155
157	E-18		100	+ 57 – **43**								Good	No record	UP	157

158	E-18		88	+69 −**19**						Good	No record	UP	158
159	E-18		96	+30 −**66**						Fair	No record	UP	159
160	E-18		180	+10 ?−**170**						Poor	No record	UP	160
161	G-26		87	+50 −**37**						Good	No record	UP	161
162	G-19	Location very uncertain	136	+100 ?−**36**						Poor	No record	No record	162
163	G-19		96	+70 −**26**						Good	No record	UP	163
164	E-20		123	+60 −**63**						Good	No record	UP	164
165	E-20	Location uncertain.	103	+20 −**83**						Fair	No record	UP	165
167	F-20		620	+20 −**74?**	155 ?	−135 ? −**600**				Poor	No record	No record	167
168	F-20		200	+30 ?−**170**	?	?				Poor	Bottom at −62	UP	168
169	G-20		90	+20 −**70**						Fair	No record	UP	169
170	G-20		168	+5 −**163?**						Poor	No record	No record	170
171	G-20		154	+20 −**134?**						Poor	No record	No record	171
172	G-20		84	+75 −**9**						Good	No record	UP	172
174	F-21		96	+80 −**16**						Good	No record	UP	174
175	E-21		120	+110 −**10**						Good	No record	UP	175
178	H-21		55	+20 −**35**						Fair	−20 −35	UP	178
179	H-22	Test boring #7.	149	+1 −**148**						Poor	No record	None	179
181	F-22		46	+15 −**31**						Good	−16 −31	UP	181
182	F-22		159	+130 −**29**						Poor	No record	UP	182
183	F-22		193	+100 −**93**						Poor	No record	UP	183
184	F-22		540	+30 ?	315 ?	−285 −**510**				Poor	No record	No record	184
185	F-22		100	+60 −**40**						Poor	No record	No record	185
186	E-24		70	+17 −**52**						Fair	No record	No record	186
187	G-22	Test boring #4.	127	+1 −**126**						Fair	No record	No record	187
188	G-22		87	+25 −**62**						Good	No record	No record	188
189	H-22	Lloyd sand member contains salt water.	668	+5 −208	213	−208 −387	−387 −487	−487 −612	−612 −**663**	Fair	No record	No record	189
190	F-23		76	+40 −**36**						Good	No record	No record	190

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
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Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
192	E-24		93	+ 75 − **18**								Good	No record	No record	192
196	E-24		34	+ 20 − **14**								Good	No record	No record	196
207	D-3		141	+240 +184? 56			+184 ? − **99**					Fair	No record	M	207
208	D-3		155	+360 +300? 60			+300 ? +**205**					Fair	No record	M	208
209	E-8		195	+200 +110 90			+110 + **5**					Fair	No record	M	209
211	E-8		195	+ 5 −**191**								Poor	No record	UP	211
213	E-8		179	+ 20 − 75 95			− 75 −**159**					Fair	No record	M	213
214	E-8		70	+ 40 − 20 60			− 20 − **30**					Good	No record	M	214
215	E-8	Correlation based on examination of samples.	184	+ 5 − 10 15			− 10 −**179**					Good	No record	M	215
216	E-8	Correlation based on examination of samples.	176	+ 5 −**171**								Good	No record	UP	216
217	E-8		398	+ 18 − 12 30			− 12 −244	−244 −376	−376 −380			Fair	No record	L	217
218	E-8		92	+ 10 0 10			0 − **82**					Fair	No record	M	218
220	E-8		168	+120 +110 10			+110 − **48**					Fair	No record	M	220
221	E-8		181	+180 +100 80			+100 − **1**					Fair	No record	M ?	221
222	E-8		264	+180 +100 70			+100 − **84**					Fair	No record	M ?	222
225	E-8	Well abandoned in Raritan Clay.	498	+125 − 39 164			− 39 −292	−292 ?−**373**				Fair	No record	M	225
226	E-8	V 629.	97	+ 40 − **57**								Poor	No record	UP	226
227	E-8	V 630.	142	+ 30 + 20 10			+ 20 −**112**					Good	No record	M	227
228	E-8	V 631.	131	+120 + 40 80			+ 40 − **11**					Fair	No record	M	228
229	E-8	V 632.	56	+ 20 − **36**								Poor	No record	UP?	229
230	F-8	V 633.	248	+ 5 −117 122				−117 ? −217	−217 −**243**			Poor	No record	L	230

234	C-9	V 637.	30	+ 50 + **20**		Good	No record	UP	234
236	C-9	V 639.	92	+ 60 0	0 – **32**	Good	No record	No record	236
238	C-9	V 641.	31	+ 60 + **29**		Good	No record	UP	238
245	E-9	V 648.	267	+200 + 80 120	+ 80 – **67**	Fair	No record	M	245
246	E-9	V 649.	200	+170 + 80 90	+ 80 – **30**	Good	No record	No record	246
249	E-9	V 652.	75	+ 10 – **65**		Poor	No record	UP	249
250	E-9	V 653.	258	+200 + 46	+ 46 – **58**	Good	No record	M	250
251	E-9	V 654.	185	+200 + 15		Good	No record	UP	251
254	E-9	V 657.	117	+ 20 – **97**		Poor	No record	UP	254
256	E-9	V 659.	186	+220 + **34**		Good	No record	UP	256
257	E-9	V 660, Poor log.	196	+180 – **16**		Fair	No record	UP	257
261	E-9	V 664.	75	+ 20 – **55**		Good	No record	UP	261
263	E-9	V 666.	143	+140 – **3**		Good	No record	UP	263
266	F-9	V 669, Poor log.	340	+ 10 –120?	–120 ? **–330**	Poor	No record	No record	266
267	F-9	V 670.	350	+ 5 – 25	– 25 **–345**	Good	No record	M	267
268	B-10	V 671.	270	+ 10 ? ?	–? **–260**	Poor	No record	M	268
271	C-10	V 674.	70	+ 10 – **60**		Good	No record	UP	271
277	E-10	V 680.	142	+170 + 52	+ 52 + **28**	Fair	No record	M	277
278	E-10	V 681.	170	+180 + 90 90	+ 90 + **10**	Fair	No record	None	278
282	E-10	V 685.	160	+ 15 – 15	– 15 ? **–145**	Poor	No record	M ?	282
291	C-11	V 694.	102	+ 40 – 60 100	– 60 – **62**	Fair	No record	UP	291
293	C-11	V 696.	30	+ 20 – **10**		Good	No record	UP	293
304	D-11	V 707.	103	+ 80 – 17	– 17 ? – **23**	Poor	No record	No record	304
305	D-11	V 708.	44	+120 + **76**		Good	No record	UP	305
307	D-11	V 710.	50	+ 80 + **30**		Good	No record	UP	307
308	E-11	V 711.	168	+ 60 **–108**		Poor	No record	UP	308
310	E-11	V 713.	125	+ 65 – **60**		Good	No record	UP	310
312	E-11	V 715.	100	+100 **0**		Good	No record	UP	312

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
316	E-11	V 719.	90	+ 40 − **50**								Good	No record	UP	316
317	E-11	V 720.	212	+120 − 10?	130		− 10 ? − **92**					Fair	No record	M ?	317
318	E-11	V 721.	146	+ 10 − 90	100		− 90 ? **−136**					Poor	No record	M ?	318
320	E-11	V 723.	117	+ 60 − **57**								Poor	No record	UP	320
328	D-12	V 731.	56	+ 80 + **24**								Good	No record	UP	328
334	D-12	V 737.	117	+ 80 − **37**								Poor	No record	UP	334
337	D-12	V 740.	75	+ 80 + **5**								Fair	No record	UP	337
348	E-12	V 751.	250	+140 **−110**								Poor	No record	UP	348
350	E-12	V 753.	97	+100 + **3**								Good	No record	UP	350
351	E-12	V 754, location uncertain.	160	+100 ?− 40	140		− 40 ?− **60**					Fair	No record	M	351
352	E-12	V 755.	90	+140 + **50**								Good	No record	UP	352
357	F-12	V 760.	252	+ 80 + 18	62		+ 18 **−172**					Fair	No record	M	357
358	F-12	V 761, log incomplete.	90	+ 60 ?			? − **30**					Poor	No record	M ?	358
360	F-12	V 763, Correlation based on examination of samples.	320	+ 40 − 45	85		− 45 **−280**					Good	No record	M	360
362	F-12	V 765.	50	+ 40 − **10**								Good	No record	UP	362
366	F-12	V 769, abandoned, salt water.	50	+ 5 − **45**								Good	No record	None	366
368	F-12	V 771, abandoned, salt water.	165	+ 10 −100?	110		−100 ? **−155**					Poor	No record	None	368
369	C-13	V 772.	45	+ 20 − **25**								Good	No record	UP	369
372	C-13	V 775, abandoned.	72	+ 5 − **67**								Poor	No record	None	372
375	D-13	V 778, Correlation based on examination of samples.	140	+ 25 − 65?	90		− 65 ? **−115**					Good	No record	No record	375

376	D-13	V 779.	50	+ 50 **0**				Good	No record	UP	376
378	D-13	V 782.	90	+105 + **15**				Good	No record	UP	378
381	E-13	V 785.	110	+145 + **35**				Good	No record	UP	381
388	E-13	V 792.	53	+130 + **77**				Good	No record	UP	388
391	E-13	V 795.	70	+130 + **60**				Fair	No record	UP	391
393	F-13	V 796.	85	+180 + **95**				Good	No record	UP	393
394	F-13	V 798.	95	+160 + **65**				Good	No record	UP	394
397	F-13	V 801.	96	+ 50 + 30	20		+ 30 ?− **46**	Fair	No record	M ?	397
400	F-13	V 804.	75	+ 10 − **65**				Fair	No record	UP	400
407	F-13	V 811, Correlation based on examination of samples.	370	+200 − 80	280		− 80 −**170**	Good	No record	M	407
408	F-13	V 812.	95	+100 + **5**				Good	No record	UP	408
409	D-14	V 813.	45	+ 10 − **35**				Good	No record	UP	409
410	D-14	V 814.	68	+110 + **42**				Good	No record	UP	410
414	E-14	V 818.	39	+100 + **61**				Good	No record	UP	414
415	F-14	V 819.	128	+115 − **13**				Good	No record	UP	415
420	F-15	V 824.	123	+140 + **17**				Good	No record	UP	420
421	F-15	V 825.	347	+135 − 88?	? ? ?		− 88 ? −**212**	Poor	No record	No record	421
422	F-15	V 826.	94	+ 20 − **74**				Poor	No record	UP	422
423	F-15	V 827.	47	+ 20 − **27**				Good	No record	UP	423
424	F-15	V 828.	110	+110 **0**				Good	No record	UP	424
428	D-16	V 832.	34	+ 15 − **19**				Good	No record	UP	428
432	D-16	V 836.	33	+ 20 − **13**				Good	No record	UP	432
437	E-16	V 841.	36	+ 50 + **14**				Good	No record	UP	437
442	E-16	V 846.	42	+ 55 + **13**				Good	No record	UP	442
444	F-16	V 848.	60	+120 + **60**				Fair	No record	UP	444
455	D-18	V 858.	225	+ 5 ?	120	?	−175 ? −**220**	Poor	No record	M	455
456	D-18	V 859, Correlation based in part on examination of samples.	247	+ 10 ?	156	?	−146 ? −**237**	Poor	No record	M	456

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
457	D-18	V 860, Log may be generalized.	277	+ 10 ?	?		? −267					Poor	No record	M	457
474	F-20	V 877.	88	+ 40 − 48								Poor	No record	None	474
478	E-21	V 881.	111	+100 − 11								Poor	No record	UP	478
482	G-21	V 884.	53	+ 20 − 33								Good	No record	UP	482
483	G-21	V 885.	35	+ 15 − 20								Fair	No record	UP	483
486	G-21	V 888.	62	+ 40 − 22								Poor	No record	UP	486
487	D-13	V 780.	50	+ 60 + 10								Good	No record	UP	487
488	H-21	V 890.	65	+ 35 − 30								Fair	No record	UP	488
490	H-21	V 892, Poor log	690	+ 16 − 84?	?		? ?	? ?	? −654		−674	Poor	No record	L	490
492	H-21	V 894	50	+ 40 − 10								Good	No record	UP	492
495	F-22	V 897, Correlation based in part on examination of samples. Cretaceous contact uncertain.	300	+ 30 − 82	157		−122 ? −270					Poor	No record	M	495
499	F-22	V 901.	145	+130 − 15								Fair	No record	UP	499
502	F-22	V 904.	182	+ 40 −?142								Poor	No record	UP	502
505	G-22	V 907.	60	+ 60 0								Poor	No record	UP	505
506	H-22	V 908.	76	+ 80 + 4								Good	No record	UP	506
509	I-23	V 911, Location very uncertain.	89	+ 60 − 29?								Fair	No record	UP	509
512	I-24	V 914.	291	+ 20 − 88	108?		− 88 ? −271					Poor	No record	No record	512
518	G-20		96	+ 40 − 56								Good	− 53 − 56	UP	518
519	D-13		34	+ 20 − 14								Good	− 8 − 14	UP	519
520	E-12		78	+140 + 62								Good	− 59 − 62	UP	520

522	E-12		115	+140	+ **25**				Good	+ 28	+ 25	UP	522
523	E-12		75	+130	+ **55**				Good	+ 58	+ 55	UP	523
524	E-12		53	+ 40	− **13**				Good	− 10	− 13	UP	524
525	D-12		100	+155	+ **55**				Good	+ 58	+ 55	UP	525
527	F-17*	Near map location of S 1838.	132	+100	− **32**				Good	− 23	− 33	UP	527
530	F-14		232	+220	− **12**				Good	− 8	− 12	UP	530
534	E-10		136	+230	+ **94**				Fair	+ 96	+ 94	UP	534
535	F-15		95	+ 20	− **75**				Fair	− 39	− 75	UP	535
539	E-12		57	+100	+ **43**				Good	+ 46	+ 43	UP	539
552	F-17		113	+100	− **13**				Good	− 10	− 13	UP	552
569	E-19		55	+ 40	− **5**				Good	− 13	− 15	UP	569
575	B-11*	Near location of S 56.	405	+ 10	?		?	**−395**	Poor	−333	−372	M	575
582	E-11		135	+120	− **15**				Poor	− 13	− 15	UP	582
584	D-8		332	+260	+147	113	+147	− **72**	Fair	− 62	− 72	M	584
605	D-13		46	+ 15	− **31**				Good	− 24	− 31	UP	605
609	C-10		61	+ 10	− **51**				Good	− 36	− 51	UP	609
614	E-21		86	+ 50	− **56**				Good	− 46	− 56	UP	614
619	F-17		167	+ 30	−**137**				Poor	None installed		UP	619
620	F-18*	Near map location of S 5246.	79	+ 10	− **69**				Poor	− 61	− 69	UP	620
626	D-15		103	+ 10	− **93**				Good	− 83	− 93	UP	626
638	F-18		89	+ 10	− **79**				Poor	− 64	− 79	UP	638
643	E-9	Location uncertain.	50	+ 80	+ **30**				Fair	+ 32	+ 30	UP	643
644	F-17		158	+140	− **18**				Poor	− 16	− 18	UP	644
646	E-12		150	+130	?− **20**				Fair	− 17	− 20	UP?	646
647	E-10		144	+170	+ **26**				Good	+ 30	+ 26	UP	647
651	D-8		274	+310	+132	178	+132	+ **36**	Fair	+ 46	+ 36	M	651
652	E-8		57	+ 15	− **42**				Good	− 32	− 42	UP	652
657	E-14		54	+ 90	+ **36**				Good	+ 40	+ 36	UP	657

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
660	E-12		145	+180 + **35**								Good	+ 45 + 35	UP	660
670	E-20		90	+ 40 − **50**								Poor	− 35 − 50	UP	670
680	E-9		200	+200 +111	81		+111 **0**					Fair	+ 13 + 7	M	680
681	F-18		255	+ 10 −**245**								Poor	−230 −245	UP	681
689	C-9	Upper part of log is generalized.	193	+ 10 ?	?		? −**183**					Poor	No record	M ?	689
701	E-9		198	+180 − **18**								Fair	− 19 − 22	UP	701
702	F-13		155	+160 + **5**								Fair	+ 41 + 5	UP	702
703	B-12		408	+ 5 ?	?		−104 ? −403					Poor	−383 −398	M	703
715	D-11		865	+ 49 −109			−109 −**816**					Fair	−776 −816	M	715
716	F-18		223	+ 20 −**203**								Poor	−198 −203	UP	716
719	E-10	Log may be generalized.	185	+140 ?− **45**								Poor	− 25 − 45	UP?	719
727	C-8		74	+ 80 + **6**								Good	+ 19 + 6	UP	727
731	C-9		129	+ 85 − 29			− 29 − **44**					Good	− 1 − 17	UP?	731
739	E-9		165	+180 + 60			+ 60 + **15**					Fair	+ 5 + 15	M	739
750	D-8		349	+320 +220			+220 − **29**					Good	+ 6 − 15	M	750
759	E-8		134	+140 + 78			+ 78 + **6**					Poor	+ 8 + 6	UP?	759
760	E-18		47	+ 10 − **37**								Good	− 27 − 37	UP	760
776	F-12		133	+ 80 − **53**								Fair	− 51 − 53	UP	776
777	E-13		235	+240 + **5**								Fair	+ 7 + 5	UP	777
785	E-10		138	+145 + **7**								Good	+ 9 + 7	UP	785
786	H-22		43	+ 40 − **3**								Good	No record	UP	786

794	E-9		189	+ 50 0?	50?		0 ? −**139**	Poor	−131	−139	M ?	794
795	D-8		432	+370 +182	185		+182 − **62**	Good	− 38	− 58	M	795
796	F-16*	S 139, same location.	160	+ 97 − **63**				Good	− 33	− 63	UP	796
808	F-17		20	+ 69 + **49**				Good	+ 52	+ 49	UP	808
818	E-9		204	+200 + 99	101?		+ 99 − **4**	Fair	+ 9	+ 6	M ?	818
832	D-18		63	+ 10 − **53**				Good	− 37	− 52	UP	832
848	F-9*	S 3554, same location.	80	+ 58 − **22**				Good	− 16	− 21	UP	848
851	C-9		64	+ 60 − **4**				Good	+ 6	− 3	UP	851
852	E-11		143	+120 − **23**				Good	− 13	− 23	UP	852
853	F-14		145	+150 + **5**				Good	+ 8	+ 5	UP	853
866	E-12		167	+160 − **7**				Good	+ **14**	− 7	UP	866
873	E-10		192	+ 20 − 53	73		− 53 −**172**	Poor	−**149**	−169	M	873
875	E-10		210	+ 50 ?			? −**160**	Poor	−**1**56	−**1**60	M ?	875
911	D-16		64	+ 50 − **14**				Good	+ **1**	− **14**	UP	911
912	E-11		416	+100 − ?			? −**316**	Poor	−**2**99	−315	M	912
914	E-10		131	+110 − **21**				Poor	− 21	− 24	UP	914
919	F-13		306	+220 − **86**			at −86?	Poor	− 66	− 86	UP?	919
927	D-8	Cretaceous contact uncertain. Log probably generalized.	519	+350 − ?			? −**169**	Fair	−125	−140	M	927
933	D-14		106	+ 60 − **46**				Good	− 15	− 40	UP	933
935	E-10		132	+ 80 − **52**				Poor	− 47	− 52	UP	935
939	E-14		166	+180 + **14**				Good	+ 22	+ 14	UP	939
970	F-14		248	+100 − ?		?	− ? −**148**	Poor	No record		No record	970
992	D-13		69	+ 20 − **49**				Good	− 34	− 39	UP	992
994	C-9		60	+ 20 − **40**				Good	− 30	− 40	UP	994
1036	B-9	Located near S 1114.	232	+ 5 − 75?	50	?	− 75 ? −**227**	Poor	−217	−227	M	1036
1039	F-9*	S 3554, same location.	91	+ 68 + **7**	61		+ **7** ?− **23**	Fair	− 17	− 23	M	1039
1046	F-19		74	+ 40 − **34**				Good	− 32	− 34	UP	1046

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
1052	B-9		97	+ 5 − 55	60 ?		− 55 ? − **92**					Poor	− 89 − 92	M ?	1052
1062	C-9		75	+ 70 − **5**								Good	+ 15 − 5	UP	1062
1081	F-9	Abandoned, salt water.	109	+ 40 − 15	55		− 15 − **69**					Fair	No record	None	1081
1093	F-21	Location uncertain.	61	+ 40 − **21**								Poor	− 17 − 21	UP	1093
1099	F-13		204	+150 − **54**								Poor	− 49 − 54	UP	1099
1101	F-23		63	+ 40 − **23**								Good	− 15 − 23	UP	1101
1102	G-20		113	+ 10 − **103**?								Poor	− 62 − 64	UP?	1102
1114	B-9*	S 1036 located near this well.	232	+ 5 − 55?	60 ?		− 55 ? − **227**					Poor	−222 −227	M	1114
1126	F-9*	S 1081, same map location.	73	+ 65 + 18?	47		+ 18 ? − **18**					Fair	+ 2 − 3	M ?	1126
1172	E-11		100	+ 26 − **74**								Fair	− 68 − 74	UP	1172
1215	F-17		115	+100 − **15**								Good	− 4 − 14	UP	1215
1222	F-16		151	+120 − **31**								Good	− 21 − **31**	UP	1222
1232	F-18		65	+ 60 − **5**								Good	No record	UP	1232
1250	H-21		70	+ 5 − **65**								Good	− 45 − 65	UP	1250
1264	C-16		315	+ 5 − 97	102 ?		? − **310**					Poor	−284 −296	M	1264
1265	D-9		90	+130			+ 45 + **40**					Fair	+ 52 + 46	UP	1265
1277	E-18		41	+ 20 − **24**								Good	− 26 − 31	UP	1277
1296	D-9		216	+240 + 80			+ 80 + **24**					Good	+ 32 + 25	M	1296
1370	B-11		375	+ 10 − 94	− 94 ? ?		? − **365**					Poor	−353 −360	M	1370
1399	F-25		339	+ 20 − 95?	− 95 ? −150? 170?		−150 ? − **319**					Poor	None installed	No record	1399
1407	D-16		82	+ 60 − **22**								Good	− 16 − 22	UP	1407

1411	D-9	S 2424 located near this well.	98	+100 + 80	201	+ 80 ?+ **2**	Fair	+ 5	+ 2	M	1411
1445	D-9		183	+135 + 87	47	+ 87 − **48**	Good	− 22	− 48	M	1445
1497	F-12		257	+ 10 −172?	182?	−172 ? −**247**	Fair	−234	−239	M	1497
1528	F-13		125	+140 + **15**			Good	+ 18	+ 15	UP	1528
1529	E-9		106	+ 60 + 41	19	+ 41 − **46**	Good	− 38	− 40	M	1529
1531	E-16		138	+ 50 − **80**			Poor	− 85	− 88	UP	1531
1532	B-11		364	+ 10 − 92	− 92 ?	? −**354**	Poor	−344	−354	M	1532
1533	B-10		375	+ 10 − 96	− 96 ? ?	? −**365**	Poor	−335	−365	M	1533
1545	E-11		95	+ 80 − **15**?			Poor	− 12	− 15	UP	1545
1547	D-11		75	+120 + **45**			Good	+ 42	+ 45	UP	1547
1552	D-11		130	+140 + **10**			Good	+ 13	+ 10	UP	1552
1568	F-14		150	+150 **0**			Good	+ 3	0	UP	1568
1569	E-12		134	+160 + **26**			Good	+ 29	+ 26	UP	1569
1592	D-16		220	+ 10 −175?	195	−175 ? −**210**	Poor	−205	−210	M	1592
1601	E-10*	Same location as S 935.	124	+ 80 − **44**			Poor	− 43	− 48	UP	1601
1609	F-17		77	+ 90 + **13**			Fair	− 11	− 31	UP	1609
1610	F-18		93	+ 65 − **28**			Good	+ 1	− 19	UP	1610
1632	E-13		111	+130 + **19**			Fair	+ 55	+ 19	UP	1632
1686	D-11		183	+180 − **3**			Good	+ 33	− 3	UP	1686
1689	E-13		115	+160 + **45**			Good	+ 52	+ 44	UP	1689
1735	E-8		58	+ 40 − **18**		at − 18?	Poor	− 14	− 18	UP	1735
1743	D-16		229	+ 10 −164?	174	−164 ? −**319**	Poor	−309	−319	M	1743
1764	F-9		82	+ 40 ?− **42**			Poor	− 31	− 41	UP	1764
1773	E-8		109	+ 40 − 26	66	− 26 ?− **69**	Poor	− 58	− 68	M ?	1773
1776	F-16		130	+100 − **30**			Good	− 10	− 30	UP	1776
1777	F-18		92	+ 50 − **42**			Good	− 25	− 40	UP	1777
1781	D-12		139	+160 + **21**			Good	+ 24	+ 21	UP	1781
1787	E-19		61	+ 45 − **16**			Good	− 14	− 16	UP	1787

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS
IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
1790	F-18*	S 4122, same location.	84	+ 40 − **44**								Good	− 24 − 44	UP	1790
1793	D-9		273	+320 +132	198		+132 + **47**					Good	+ 50 + 47	M	1793
1801	D-9		175	+200 +148	53?		+148 + **25**					Good	+ 33 + 27	M	1801
1818	G-19		113	+ 40 − **73**								Fair	− 57 − 73	UP	1818
1820	E-13		125	+160 + **35**								Good	+ 31 + 27	UP	1820
1822	F-16		136	+120 − **16**								Good	− 7 − 27	UP	1822
1834	B-9		304	+ 10 − 92?	102 ?		− 92 ? −**294**					Poor	−279 −290	M	1834
1838	F-17	S 527, same map location.	133	+100 − **33**								Good	− 18 − 33	UP	1838
1842	E-9		445	+200 +147?	53 ?		+147 ? −**245**					Fair	−225 −245	M	1842
1853	D-9		48	+120 + **72**								Good	− 72 − 79	UP	1853
1865	F-15		167	+140 − **27**								Good	− 11 − 26	UP	1865
1880	C-10		40	+ 10 − **30**								Good	− 20 − 30	UP	1880
1888	E-8*	Near location of S 2532.	54	+ 50 − **4**								Good	+ 7 + 4	UP	1888
1892	F-17		98	+ 90 − **8**								Good	+ 5 − 10	UP	1892
1900	D-14		61	+ 30 − **31**								Good	− 16 − 31	UP	1900
1929	F-17		60	+105 − **50**								Good	− 30 − 50	UP	1929
1950	E-9*	S 4099, same location.	168	+200 + **32**								Good	+ 37 + 32	UP	1950
1951	E-9		488	+220 +114?	106 106		+114 ? −**268**					Fair	−248 −268	M	1951
1985	F-25*	S 1399, same location.	39	+ 20 − **19**								Good	− 3 − 19	UP	1985
1994	C-9*	Near map location of S 3015.	85	+ 85 **0**								Fair	+ 13 0	UP	1994
2000	C-9		30	+ 10 − **20**								Good	− 10 − 20	UP	2000

2010	F-17		162	+110 − **52**			Poor	− 42 − 52	UP	2010
2062	E-10		193	+180 − **13**			Good	− 7 − 13	UP	2062
2063	D-10*	S 4266, same location.	76	+100 + **24**			Good	+ 36 + 25	UP	2063
2144	G-26*	S 2147, same location.	38	+ 10 − **28**			Good	− 16 − 28	UP	2144
2145	G-26*	S 2229, same location.	75	+ 40 − **35**			Good	− 23 − 35	UP	2145
2147	G-26	S 2144, same location.	59	+ 10 − **49**			Good	− 34 − 49	UP	2147
2150	G-27		70	+ 60 − **10**			Good	+ 5 − 10	UP	2150
2151	G-26*	Near map location of S 93.	74	+ 30 − **44**			Fair	− 32 − 44	UP	2151
2181	F-13		346	+ 60 −108?	168	−108 ? **−286**	Poor	−271 −286	M ?	2181
2229	G-26	S 2145, same location.	84	+ 40 − **44**			Good	− 29 − 44	UP	2229
2282	E-10		105	+150 + **47**			Good	+ 50 + 47	UP	2282
2314	D-9	Correlation based on examination of samples.	490	+ 80 + 66	14	+ 66 **−410**	Good	−385 −400	M	2314
2320	G-20		44	+ 10 − **34**			Good	No record	UP	2320
2327	F-19		151	+ 20 **−131?**			Poor	No record	UP	2327
2374	E-18		56	+ 10 − **46**			Poor	− 37 − 46	UP	2374
2378	E-10		183	+100 + 38	62?	+ 38 − **83**	Fair	− 80 − 83	M	2378
2405	F-23		88	+ 40 − **48**			Fair	− 15 − 45	UP	2405
2406	E-11		143	+100 − **43**			Poor	No record	UP	2406
2424	D-9*	Located near S 1411.	150	+110 + 98		+ 98 ? − **40**	Fair	− 37 − 40	M	2424
2425	E-10		134	+140 + 86		+ 86 + **6**	Fair	+ 9 + 6	M	2425
2426	E-11		137	+ 80 − **57**			Poor	− 60 − 57	UP	2426
2431	E-10		130	+160 + **30**			Good	+ 33 + 30	UP	2431
2438	E-10		98	+ 40 − **58**			Good	− 58 − 66	UP	2438
2459	C-10		131	+ 10 − 62?	72	− 62 ? **−121**	Poor	−115 −120	M ?	2459
2466	E-11		153	+100 − **53**			Fair	− 50 − 53	UP	2466
2469	E-11*	Near S-4945.	173	+160 − **13**			Good	− 10 − 13	UP	2469
2476	E-15		101	+ 74 − **27**			Good	− 12 − 27	UP	2476

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
2477	E-15		43	+ 80 + **37**								Good	+ 39 + 37	UP	2477
2485	E-15		75	+ 70 – **5**								Good	+ 5 – 5	UP	2485
2488	E-10		107	+100 + 69	31 169		+ 69 ?– **7**					Fair	– 4 – 7	M ?	2488
2514	E-11	Near location of S 70.	429	+ 60 – 90?	150?.		– 90 ? **–369**					Poor	–317 –348	M	2514
2532	E-8	S 1888 same location on map.	232	+ 60 – 5	65		– 5 **–182**					Good	–167 –192	M	2532
2534	F-17		146	+100 – **46**								Good	– 43 – 46	UP	2534
2536	E-21		55	+ 70 + **15**								Good	– 12 – 15	UP	2536
2550	E-14		107	+145 + **38**								Good	+ 33 + 38	UP	2550
2555	C-9		63	+ 20 – **43**								Good	– 38 – 43	UP	2555
2567	E-11		145	+140 – **5**								Fair	– 5 – 8	UP	2567
2569	F-23		67	+ 25 – **42**								Good	– 49 – 61	UP	2569
2570	F-23		90	+ 40 – **50**								Fair	– 20 – 50	UP	2570
2586	F-16		146	+130 – **16**								Good	– 14 – 16	UP	2586
2602	F-13		140	+155 + **15**								Good	+ 15 + 13	UP	2602
2638	C-9		180	+ 10 – 49?	59 ? ?.		– 49 ? **–170**					Poor	No record	No record	2638
2650	F-13		200	+160 – **40**								Poor	– 40 – 43	UP	2650
2653	D-9		114	+180 + 90	90? 270?,		+ 90 + **66**					Fair	+ 68 + 66	M	2653
2654	F-17		140	+100 – **40**								Good	– 19 – 40	UP	2654
2676	F-19		59	+ 40 – **19**								Fair	– 8 – 18	UP	2676
2691	E-11		67	+ 70 + **3**								Fair	– 3 + 3	UP	2691
2700	E-11		145	+140 – **5**								Fair	– 2 – 5	UP	2700

2712	G-20		68	+ 20 **− 48**			Good	− 46 − 48	UP	2712
2730	D-9		335	+200 + 83	~~285~~ 117	+ 83 **−135**	Fair	−129 −135	M	2730
2735	C-8		96	+ 80 **− 16**			Fair	0 − 16	UP	2735
2747	F-14		90	+145 **+ 55**			Good	+ 20 + 17	UP	2747
2947	H-22		28	+ 20 **− 8**			Good	− 5 − 8	UP	2947
2978	E-9	Log is too poor to correlate accurately (rotary well).	271	+ 15 ?		? **−256**	Poor	−202 −242	UP or M	2978
2979	E-9		152	+ 15 −115	130	−115 ? **−137**	Poor	No record	?	2979
2981	D-9		103	+170 + 95	75 ~~265~~	+ 95 ? **+ 67**	Fair	+ 70 + 67	M ?	2981
3014	E-9		175	+140 **− 35**			Good	− 25 − 35	UP	3014
3015	C-9	S 1994, near same location.	80	+ 80 **0**			Good	+ 5 − 6	UP	3015
3043	D-10		104	+140 **+ 36**			Good	+ 39 + 36	UP	3043
3045	G-20		55	+ 20 **− 35**			Good	− 19 − 34	UP	3045
3082	D-9		201	+120 + 52	66 ~~+172~~	+ 52 **− 81**	Fair	− 74 − 81	M	3082
3087	D-8		185	+220 **+ 35**			Fair	+ 37 + 35	UP	3087
3123**	F-20	Abandoned, salt water.	459	+ 8 −182	190	−182 **−451**	Fair	No record	None	3123
3184	D-8		270	+240 +115	~~355~~ 125	+115 **− 30**	Good	− 26 − 30	M	3184
3194	E-10		176	+130 + 17	~~+147~~ 113	+ 17 **− 46**	Good	− 43 − 46	M	3194
3197	E-15		135	+ 85 **− 50**			Good	− 29 − 49	UP	3197
3200	E-12		115	+110 **− 5**			Fair	+ 5 − 5	UP	3200
3212	C-11		27	+ 10 **− 17**			Good	− 14 − 17	UP	3212
3236	E-9		208	+240 +190	~~430~~ 50	+190 ? **+ 32**	Fair	− 29 + 32	M	3236
3243	E-12		75	+120 **+ 45**			Good	+ 48 + 45	UP	3243
3253	F-19		41	+ 10 **− 31**			Poor	− 4 − 24	UP	3253
3309	E-12		148	+145 **− 3**			Fair	+ 7 − 3	UP	3309
3369	E-11*	S 4283, same location.	118	+120 **− 28**			Fair	No record	UP	3369
3381	F-21		101	+ 10 **− 91?**			Poor	− 89 − 91	UP	3381
3390	D-17		150	+ 6 **−144**			Poor	−134 −144	UP	3390

TENTATIVE GEOLOGIC CORRELATIONS OF WELL LOGS

IN SUFFOLK COUNTY, LONG ISLAND, N. Y.

Well Number	Map Coordinates	Remarks	Total Depth	Recent and Upper Pleistocene Deposits	Gardiners Clay	Jameco Gravel	Magothy (?) Formation	Raritan Formation		Bedrock		Reliability of Correlation	Screen Setting	Aquifer Developed	Well Number
								Clay Member	Lloyd Sand Member	Weathered	Fresh				
3405	E-15		65	+ 60 − **5**								Good	+ 5 − 5	UP	3405
3418	E-18		55	+ 30 − **25**								Good	− 14 − 24	UP	3418
3438	D-12		101	+100 − **1**								Good	+ 19 − 1	UP	3438
3446	C-9		65	+ 20 − **45**								Good	− 37 − 45	UP	3446
3451	G-27	Same log as 3583.	90	+ 10 − **80**								Good	− 76 − 80	UP	3451
3462	E-12		141	+170 + **29**								Good	+ 32 + 29	UP	3462
3463	F-15		65	+ 70 + **5**								Good	− 2 − 5	UP	3463
3468	E-18		53	+ 45 − **8**								Good	+ 3 − 7	UP	3468
3487	F-18		91	+125 + **34**								Good	+ 24 + 34	UP	3487
3488	G-19		92	+ 40 − **52**								Poor	− 40 − 50	UP	3488
3495	D-19		360	+ 6 −134?	140		−134 ? −**340**					Poor	No record	No record	3495
3504	C-8		75	+ 80 + 21	+0T59		+ 21 + **5**					Fair	+ 40 + 23	UP	3504
3506	D-18		102	+ 40 − **62**								Good	− 51 − 61	UP	3506
3546	E-14		142	+150 + **8**								Good	+ 11 + 5	UP	3546
3547	G-27		154	+120 − **34**								Poor	− 22 − 29	UP	3547
3550	B-10	Correlation uncertain, upper part of log may be generalized.	303	+ 5 − 75	− 75 ? ?		? −**298**					Poor	−288 −298	M	3550
3553	C-10		61	+ 20 − **41**								Good	− 14 − 34	UP	3553
3554	F-9	Correlation based on examination of samples.	106	+ 71 − 19	90		− 19 − **35**					Good	− 24 − 30	M	3554
3558	C-8		106	+ 80 − **26**								Good	+ 6 − 9	UP	3558
3564	G-26		68	+ 33 − **35**								Good	No record	UP	3564
3565	G-26		100	+ 2 − **98**								Poor	No record	UP?	3565

3566	G-26	S 3567, same location.	58	+ 10 − **48**			Good	− 37 − 47	UP	3566
3567	G-26*	S 3566, same location.	58	+ 10 − **48**			Poor	− 30 − 45	M	3567
3570	F-17		160	+ 80 − **80**			Poor	− 60 − 80	UP	3570
3581	E-24		23	+ 10 − **13**			Good	− 8 − 13	UP	3581
3582	G-26	Correlation based on examination of samples.	147	+ 10 −**136**			Fair	No record	UP	3582
3583	G-27	S 3451, same location.	105	+ 10 − **95**			Fair	− 90 − 94	UP	3583
3584	G-27		147	+100 − **47**			Fair	− 43 − 47	UP	3584
3585	H-24		90	+ 80 + 32	+ 32 − **10**		Poor	− 7 − 10	UP	3585
3599	G-27		69	+ 20 − **49**			Fair	− 43 − 47	UP	3599
3608	E-15		83	+110 + **27**			Good	+ 30 + 27	UP	3608
3636	C-15		377	+ 10 − 62	138 ?	−128 ? −**367**	Poor	−349 −364	M	3636
3639	E-10*	Near map location of S 48.	466	+130 ?		− ? −**336**	Poor	−293 −333	M	3639
3721	F-17		90	+ 40 − **50**			Good	− 35 − 50	UP	3721
3722	F-17		110	+ 20 − **90**			Poor	− 70 − 90	UP	3722
3752	D-10		79	+120 + 62	~~−182~~ 58	+ 62 + **41**	Fair	+ 49 + 46	M	3752
3764	F-18		54	+ 40 − **14**			Good	+ 6 − 14	UP	3764
3765	F-17		54	+ 60 − **7**			Good	+ 13 − 7	UP	3765
3767	F-17		74	+ 60 − **14**			Poor	+ 1 − 14	UP	3767
3771	D-9		195	+240 + 93	[illegible] 127	+ 93 + **45**	Good	+ 48 + 45	M	3771
3776	E-10		115	+100 − **15**			Good	− 12 − 15	UP	3776
3782	E-13		123	+130 + **7**			Good	+ 10 + 7	UP	3782
3868	F-12	Correlation based on examination of samples.	114	+ 99 + 44	[illegible] 55	+ 44 − **15**	Good	− 10 − 15	M	3868
3869	E-14	Correlation based on examination of samples.	44	+ 84 + **44**			Good	+ 48 + 44	UP	3869
3870	E-14	Correlation based on examination of samples.	44	+ 88 + **44**			Good	+ 48 + 44	UP	3870
3871	E-14		92	+128 + **36**			Good	+ 40 + 36	UP	3871
3874	D-9		110	+180 + **96**		+ 96 + **70**	Fair	+ 73 + 70	M	3874
3875	F-16		115	+ 80 − **35**			Good	− 15 − 35	UP	3875
3876	F-18		78	+ 10 − **68**			Poor	− 50 − 70	UP	3876

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
3878	F-17		86	+ 60 – **26**								Good	– 11 – 26	UP	3878
3906	E-13		123	+ 10 + **17**								Poor	+ 18 + 15	UP	3906
3927	D-9		178	+120 + 59	~~217~~ 161		+ 59 – **58**					Good	+ 30 + 9	M	3927
3957	F-16		115	+ 70 – **45**								Good	– 30 – 45	UP	3957
3958	F-17		110	+ 85 – **25**								Good	– 10 – 25	UP	3958
3969	E-10		91	+ 60 + 16	~~70~~ 44		+ 16 – **31**					Good	– 33 – 35	M	3969
4023	F-14		170	+180 + **10**								Fair	+ 13 + 10	UP	4023
4024	E-10		68	+110 + **42**								Good	– 44 – 46	UP	4024
4046	F-10		83	+ 40 – **43**								Fair	– 35 – 38	UP	4046
4048	F-17		172	+100 – **72**								Good	– 52 – 72	UP	4048
4058	E-10*		82	+ 60 – **22**								Good	– 16 – 22	UP	4058
4066	F-17		137	+ 85 – **52**								Good	– 27 – 47	UP	4066
4070	F-14		158	+180 + **22**								Poor	No record	UP	4070
4074	E-9		162	+140 – **22**								Good	– 11 – 23	UP	4074
4075	D-9		188	+130 + 86			+ 86 – **58**					Good	– 20 – 50	M	4075
4080	E-16		70	+ 40 – **30**								Good	– 10 – 30	UP	4080
4081	F-19		117	+ 40 – **77**								Fair	– 57 – 77	UP	4081
4084	F-18		60	+ 50 – **10**								Good	+ 5 – 10	UP	4084
4085	F-18		60	+ 10 – **50**								Good	– 35 – 50	UP	4085
4087	F-17		117	+100 – **17**								Good	+ 3 – 17	UP	4087
4099	E-9		191	+200 + 12	~~118~~		+ 12 + **9**					Fair	+ 23 + 12	UP	4099

4116	F-18		124	+ 80	**− 44**							Good	− 19	− 41	UP	4116
4122	F-18	S 1790, same location.	87	+ 40	**− 47**							Good	− 25	− 45	UP	4122
4125	F-17		97	+ 40	**− 56**							Poor	− 40	− 55	UP	4125
4134	F-17	Test boring.	225	+ 24	−142	166	−142	**−201**				Poor	None installed		None	4134
4137	D-9		117	+150	+ 82	~~135~~ 68	+ 82	**+ 33**				Fair	+ 38	+ 33	M ?	4137
4152	F-14		147	+ 70	**− 77**							Fair	− 46	− 76	UP	4152
4161	D-9		146	+220	+134	86 ~~354~~	+134	**+ 74**				Fair	+ 82	+ 79	M	4161
4162	F-17	Test boring.	130	+ 15	**−115**							Poor	None installed		None	4162
4184	E-10		162	+140	**− 22**							Good	+ 2	− 22	UP	4184
4190	D-10		94	+140	+ 90	~~230~~	+ 90	**+ 46**				Fair	+ 49	+ 46	M	4190
4191	E-10		98	+120	**+ 22**							Good	+ 25	+ 22	UP	4191
4204	F-14		137	+140	**+ 3**							Fair	+ 6	+ 3	UP	4204
4246	F-13		132	+160	**+ 28**							Good	+ 31	+ 28	UP	4246
4249	F-14		137	+150	**+ 13**							Fair	+ 16	+ 13	UP	4249
4266	D-10	S 2063, same location.	125	+100	− 5	105	− 5	**− 25**				Good	+ 19	− 1	M	4266
4268	E-10		75	+110	**+ 35**							Good	+ 40	+ 35	UP	4268
4283	E-11	Correlation uncertain. Bottom deposit may be Cretaceous or Pleistocene.	200	+ 90	**−110**							Poor	− 75	− 86	UP?	4283
4400	D-9		93	+140	+ 53	61 ~~193~~	+ 53	**+ 47**				Good	+ 57	+ 52	M	4400
4464	D-13		84	+105	+ 84	~~189~~ 21						Good	No record		UP	4464
4466	E-8		370	+ 20	?		?		?	?	**−350**	Poor	No record		L	4466
4482	E-8*		50	+ 20	− 17	37	− 17	**− 30**				Fair	+ 7	− 15	UP	4482
4509	E-10		215	+165	**− 50**							Good	− 14	− 44	UP	4509
4519	D-10		118	+160	+ 97	~~257~~ 63	+ 97	? **+ 42**				Fair	+ 45	+ 42	M ?	4519
4521	E-12		243	+150	− 90	240	− 90 ?	? **− 93**				Poor	− 62	− 87	UP	4521
4532	E-10	Location uncertain.	350	+150	+ 63	~~273~~ 87	+ 63	**−200**				Fair	−191	−200	M	4532
4533	F-8		142	+ 60	? + 38	~~45~~ 22	+ 38	**− 82**				Fair	− 55	− 63	M	4533
4534	D-9		119	+130	**+ 11**							Fair	+ 15	+ 10	UP	4534

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
4571	F-12	No water obtained.	569	+ 15 ?	275		−260 ? **−554**					Poor	No record	None	4571
4583	E-10		550	+165 +104	269 61		+104 **−385**					Good	+ ? −362	M	4583
4594	D-9	Cretaceous contact may be higher.	183	+215 + 89	[illegible]		+ 89 **+ 32**					Poor	+ 40 + 35	M ?	4594
4606	E-9		105	+ 70 **− 35**								Good	+ 30 + 24	UP	4606
4615	E-10		148	+130 **− 18**								Fair	+ 7 − 13	UP	4615
4644	E-15		140	+ 90 **− 50**								Good	No record	UP	4644
4653	D-9		112	+150 +120	30		+120 **+ 38**					Good	+ 47 + 44	M	4653
4656	D-9		141	+100 + 33	67		+ 33 **− 41**					Good	− 37 − 41	M	4656
4676	F-18		104	+ 60 **− 44**								Good	No record	UP	4676
4679	D-17		92	+ 20 **− 72**								Good	− 43 − 64	UP	4679
4690	E-24		114	+ 80 **− 34**								Good	− 19 − 34	UP	4690
4725	G-19		118	+ 50 **− 68**								Good	− 43 − 69	UP	4725
4761	B-12		530	+ 5 −105	−105 ? ?		? **−530**					Poor	−510 −525	M	4761
4788	G-21		74	+ 10 **− 64**								Poor	− 59 − 64	UP	4788
4790	E-10		337	+100 + 20	X80		+ 20 **−227**					Good	−226 −237	M	4790
4811	E-9		181	+150 + 63	87		+ 63 **− 31**					Fair	− 27 − 31	M	4811
4812	D-9		115	+ 90 + 87	3		+ 87 **− 25**					Fair	− 15 − 24	M	4812
4814	F-17		151	+ 10 **−141**								Poor	−120 −141	UP	4814
4827	E-9		199	+215 **+ 16**								Fair	+ 21 + 16	UP	4827
4828	E-9		141	+185 + 95	X90		+ 95 **+ 44**					Good	+ 39 + 44	M	4828
4829	F-15		97	+130 **+ 17**								Good	+ 22 + 17	UP	4829

4873	E-11		261	+160 **−101**			Poor	− 81 −101	UP	4873
4900	E-10	Cretaceous contact may be slightly higher.	233	+120 + 4?	120?	+ 4 ? **−113**	Fair	− 99 −109	M	4900
4909	D-9		171	+150 + 60	90	+ 60 **− 21**	Fair	− 14 − 20	M	4909
4940	F-8		121	+100 − 6	106	− 6 ? **− 21**	Fair	− 16 − 20	M ?	4940
4945	E-11		223	+150 + 59	91	+ 59 **− 73**	Fair	− 69 − 73	M	4945
4984	F-8	Same location S 11.	170	+ 60 + 15?	45	+ 15 ? **−110**	Fair	− 93 −109	M ?	4984
4997	D-9		180	+240 +150	90	+150 **+ 60**	Good	+ 52 + 48	M	4997
4998	E-9		129	+170 **+ 41**			Good	+ 46 + 40	UP	4998
5007	D-9		167	+220 + 79	141	+ 79 **+ 53**	Good	+ 56 + 52	M	5007
5049	E-11		160	+160 + 50	110	+ 50 **0**	Good	+ 3 0	M	5049
5053	E-10		195	+ 20 − 19	39	− 19 **−175**	Good	−165 −175	M	5053
5068	E-9		190	+ 80 + 50	30	+ 50 **+110**	Good	− 71 −108	M	5068
5120	H-22		145	+ 25 **−120**			Poor	None	UP	5120
5140	F-17		270	+ 30 −101?	131 ?	−101 ? **−240**	Poor	No record	M	5140
5149	F-16		148	+110 **− 38**			Poor	− 19 − 31	UP	5149
5196	F-17*	S 5700, same location.	87	+ 20 **− 67**			Poor	− 49 − 55	UP	5196
5234	E-15	S 5517, same location.	110	+100 **− 10**			Good	+ 2 − 10	UP	5234
5235	E-15*	Near S 2476.	81	+ 80 **− 1**			Good	− 35 − 50	UP	5235
5246	F-18	S 620, S 5245, same location.	130	+ 10 **−120**			Poor	? + 10	UP	5246
5277	G-20		99	+ 60 **− 33**			Good	No record	UP	5277
5340	F-18		100	+ 10 **− 90?**			Poor	No record	No record	5340
5344	F-17		40	+ 40 **0**			Good	+ 15 0	UP	5344
5368	E-11		160	+100 **− 60**			Fair	No record	UP?	5368
5501	F-17		127	+110 **− 17**			Good	No record	UP	5501
5503	F-19		50	+ 30 **− 20**			Poor	− 5 − 20	UP	5503
5505	F-17		85	+ 60 **− 25**			Fair	+ 28 + 25	UP	5505
5517	F-15*	S 5234, same map location.	91	+100 **+ 9**			Good	+ 15 + 9	UP	5517
5518	E-15		55	+ 75 **+ 21**			Good	+ 36 + 26	UP	5518

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								Clay Member	Lloyd Sand Member	Weathered	Fresh				
5600	E-8		122	+ 20 − 21	41		− 21 ? − **102**					Fair	− 96 −102	M ?	5600
5602	G-19		110	+ 50 − **10**								Good	− 45 − 60	UP	5602
5606	E-10		132	+140 + 34	106		+ 34 + 8					Good	+ 13 + 8	M	5606
5615	F-22		165	+135 − **30**								Good	− 6 − 26	UP	5615
5616	D-12		116	+100 − **16**								Good	No record	UP	5616
5619	D-16		272	+ 5 −175?	180?		−175 ? −**267**					Poor	−257 −267	M	5619
5625	D-18		82	+ 50 − **32**								Good	− 17 − 32	UP	5625
5671	E-10		166	+100 + 19	81		+ 19 − **66**					Good	− 62 − 66	M	5671
5689	D-9		77	+100 + 26	74		+ 26 + **23**					Fair	+ 40 + 27	UP	5689
5700	F-17		126	+ 20 −**106**								Poor	− 3 − 18	UP	5700
5707	F-17		142	+ 85 − **57**								Fair	− 37 − 57	UP	5707
5716	D-9	Location uncertain.	154	+230 +161	69		+161 + **76**					Fair	+ 76 + 71	M	5716
5755	C-15		306	+ 5 − 95	130??		−125 ? −**301**					Poor	−213 −221	M	5755
5902	F-13		530	+120 + 8	112		+ 8 −**410**					Good	−368 −408	M	5902
6117	F-18		68	+ 60 − **8**								Good	− 3 − 7	UP	6117
6409	E-15		1562	+117 − 92	207		− 92 −975	−975 −1148	−1148 −1407	−1407 −1445	−1445	Good		L	6409
6434	E-15		1580	+ 85 − 72	159		− 72 −913	−913 −1103	−1103 −1413	−1413 −1495	−1495	Good		L	6434
7271	C-9	Test well abandoned. No thick water bearing zone present.	406	+100 + 26	74		+ 26 −306					Good	None	None	7271

PART II

TOPOGRAPHIC MAPS AND SECTIONS

TOPOGRAPHIC MAPPING OF GEOLOGIC FORMATIONS AND AQUIFERS OF LONG ISLAND

Russell Suter

CONTENTS

I

THE PROBLEM

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Based on the geologic and other data now available to show graphically the various aquifers and other formations making up Long Island, this to be done in such manner as to facilitate the work of the Commission in the regulation of use of Long Island ground waters.

To conserve and apportion the available ground waters of Long Island, particularly with regard to the present and future needs of the people of that island for water for domestic purposes, the Legislature has required that the Commission be advised of the sinking of virtually all wells on the island and that the permission of the Commission must be obtained before most large capacity wells may be put down.

To enable it properly to perform these duties, the Commission, for over sixteen years, has been accumulating data with regard to wells and ground water conditions on the island. In this work it has been greatly aided by the cooperative work of the United States Geological Survey, the cost of which work is shared by the Federal Government, the State of New York and the counties of Nassau and Suffolk.

By direction of the Legislature, the Commission in 1937 published a preliminary report on these matters (GW–2). As part of or in continuation of that study up to the present time, the following has been done:

Data on all discoverable wells have been collected, the wells given official numbers and plotted on record maps, and the data have been filed and indexed for reference.

Water levels in many wells have been measured and the results published annually by the Survey.

All available well logs have been collected and such of them as appear to be reliable have been edited by the Survey and published in Bulletins GW–3, 4, 5, 6, 8, 9, 10 and 11.

Considerable data have been collected on the salinity, hardness and temperature of the ground water, interference between wells, rainfall affecting ground water and many other matters, some of which are the subject matter of certain of the bulletins in the GW series.

The rock floor under the island was partly mapped by the Survey and published as Bulletin GW–15. This map, as extended, is republished herein.

As the basis for this work, the Survey has correlated, as far as possible, the available well logs and determined the elevations of the surface of the various aquifers and other geologic formations. This information for Kings county was published in Bulletin GW–17. The data in that Bulletin, amended and extended, are included herein so that, as to that particular subject, this Bulletin is complete.

All this material is available to the Commission and to the public, but it is not in a form convenient for many uses, and without rearrangement not too convenient for important studies which must be undertaken. Some of these are:

A. Determination of what aquifers are available under a given point on the island and the approximate depths to each.

B. Studies of the hydrology of each aquifer by itself and determination of the points of recharge, discharge and interconnection.

C. Study of the safe yields of the various aquifers, how best they may be developed and what restrictions must be placed on the drafts upon each.

D. Studies of water levels and the fluctuations thereof, salt water penetrations, chemical quality, temperature and whatnot.

Years ago it was held generally that the ground waters of Long Island were practically a unit and should be considered as such (GW–2—Fig. 12) (14). It is now well established that, although many and perhaps all of the aquifers have points of hydrologic intercommunication, they must be considered as essentially separate entities, particularly for hydrologic studies. Serious errors have resulted in attempts to draw contours of the ground water surface, lines of equal salinity and of temperature in which no distinction as to aquifers has been made.

At present when a proposed well is under consideration, it is usually necessary to make quite an elaborate study of known nearby wells, vertical sections through the proposed well, and by other means to try to determine from what aquifer it will draw water and what wells or points of recharge and discharge will be affected by pumping from the proposed well and the magnitude of the effects. This process has been repeated for practically each new well. Although it is certain that the data available for the geologic determination of the aquifers are insufficient in quantity, the wells poorly located for the purpose and the logs deficient in precision, it is thought that the united efforts of all the men most versed in the subject and covering the entire island will produce results far more dependable than those resulting from such scattered effort, and much time will be saved in having this general study available for all proposed wells.

It is contemplated that as new facts come in, they will be plotted on the maps and profiles contained in this Bulletin and suitable corrections in such maps and profiles made. As long as a continuous study is projected, it appears that the true facts eventually will emerge and that no one should be led astray by erroneous tentative deductions from inaccurate data.

Some are of the opinion that this work is premature. Perhaps, it would be if this were a scientific geologic study. The immediate situation demands action by the Commission now. It would stop all well sinking for decades to wait for additional and more precise data, and if the Commission were to try to do so, it would, by that very act, prevent the further accumulation of data.

Particularly in view of the fact that hydrologic studies are urgently needed and that they are more or less impossible unless the limits of the various aquifers are at least partly known and can be reasonably assumed in their entirety, the Commission is justified for this purpose in going some distance outside of the established data. The assumptions necessary constitute a gross case of extrapolation. This, of course, is always dangerous and to be avoided as far as possible, but apparently must be done as a first approximation in making the hydrologic studies. As these progress, their theoretical determinations will be tested, corrected and changed.

In view of all these facts the Commission stated the above problem and made arrangements to have this Bulletin prepared.

II

METHOD ADOPTED

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Graphic representation of an irregular solid is difficult for all but the simplest forms. In this case it is necessary to represent perhaps up to a dozen interlocking solids which are most irregular. In the case of Long Island, several methods of doing this have been tried.

Geologists customarily map the area covered by a given stratum and then add a few vertical sections (profiles, from which the relief of the surface may be inferred). This method gives good results in proper cases, but is not suitable for showing a very irregular surface.

Veatch (9) used contours to show parts of the rock surface and the Lloyd sand. These have been very useful and even rather prolonged extensions of them have met the test of well sinking in good shape.

Crosby (11) drew a large number of sections across the island, projected on them the logs of the nearby wells and then drew profiles of all the strata in which he was interested. These sections have been most useful. The projection of well logs on to vertical planes, often remote, is intrinsically unsound unless the tops of all the strata are planes with the same strike and sections are taken in the direction of the dip. Any other condition may lead to gross distortion.

In this Bulletin standard engineering practice has been followed and contours have been sketched for the top surface of each aquifer and geologic formation. Such maps give the information in three dimensions but fail to show graphically the thickness of superposed strata so they were supplemented by numerous north-south and east-west vertical sections. These sections have been plotted on all of the coordinated lines shown on the maps but only a few of them are here reproduced; all are available in GW–19.

Contours are map projections of lines of equal elevation on the surface shown and contour maps consist of contours spaced usually at equal vertical distances apart. A person following a contour on the ground would travel continuously a perfectly level course. Contours also may be described as the successive shorelines of the ocean if it were raised or lowered by equal increments. From this it follows that a contour is always a closed figure, even though it has to go around three continents for the purpose, and except for purely fanciful conditions a contour can never be a loop on the end of a single line or cross itself. Contours swing inland in a valley and out on a ridge. They are irregular on rough ground, smooth where the topography is smooth. If close together, the slope is steep and vice-versa. A skilled topographer can so draw contours as to give to an experienced observer a rather clear picture of the contoured ground and not infrequently this picture will also reveal something of the underlying and invisible strata and of the geologic history of that particular area.

Contours shown on the accompanying maps lack precision. In making a contour map of the ground, the topographer picks critical points of the landscape, summits, ridge lines, streams and breaks in slope and determines the geographic location of these points and the surface elevations at each. He then proceeds to sketch the contours by interpolation between these points being guided at all times by the appearance of the terrain. It is axiomatic that for best results contours should never be drawn by a man who has not seen the locality to be mapped and that they should, if possible, be drawn in the field (as by a plane table survey).

Not only is this axiom violated perforce in this case because it is impossible to see the surface, but also the points (wells) are usually poorly located for this purpose and the determination of the limits of the successive strata and even the geologic correlations of the well logs lack seriously in precision. Further difficulty results from the fact that the wells sunk for reasons entirely aside from the determination of underground topography only by remote accident happen to be at critical points. In theory, it is wrong even to assume that they have done so, yet it is virtually impossible so to assume and yet get any results.

The distribution of wells is most uneven. In one locality they are reasonably close together and immediately alongside over a wide area there may be no wells at all. Thus, in Brooklyn practically no wells have been sunk in the Harbor Hill moraine on account of the difficulty and high cost of sinking wells in masses of boulders; nor have they been sunk in numbers in the Gravesend region and other areas south of the moraine where much of the water is salt; nor in Jamaica bay where, in general, water is not needed. In eastern Suffolk county the wells are few and deep wells even fewer for various reasons. Several of these areas contain important points of underground topography such as the limits of strata, deep valleys and possible points of intercommunication between aquifers normally separated by heavy clay beds.

In drawing the contours, these matters have been considered and an effort made to show the general accuracy of the results by using different contour intervals, broken or dotted lines. Thus, it is known that the North Shore bays are deeply eroded in the older strata, a most important point hydrologically, but there is substantially no data as to this. To draw the nearby contours across these bays as though they were not there or to draw no contours in them would be misleading. Therefore, they have been partly contoured almost entirely by guess. The difficulty is partly overcome by using dotted contours which indicate deep depressions but are noncommittal as to the exact form of the eroded surfaces. When the wells are badly scattered, 100-foot contours are shown and these are broken lines when they are based on little or no factual information. Even when a 20-foot contour interval is used, the details of the contour lines are omitted. Thus, when a contour reaches the inner valley of a stream flowing across a fairly level and uniform plain, it turns upstream and follows the near valley wall perhaps for miles before crossing over and returning on the other wall to a point opposite the first turn. This gives a long thin loop or horn. Actually wherever a tributary stream joins, there should be a similar twig on this horn. At the upper end of such a valley there are apt to be several tributaries and the contours bulging downstream between these streams give the familiar "oak leaf" pattern. Where only the facts of the existence of such a valley are known, and neither the exact location of the main stream nor of the branches are shown by the data, a relatively broad simple loop is drawn on these maps. This is the best that can be done under the circumstances, and if the convention is known, should not be misleading.

III

GENERAL DESCRIPTION OF THE ISLAND AND SURROUNDINGS

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Along the Atlantic coast line of the United States, there is a geologic phenomenon known as the continental shelf. This consists of a vast deposit of sands, gravels and clays, with a wedge-shaped section, resting upon rock and feathering out to nothing at the landward edge. The shelf itself is approximately 150 miles wide, sloping gently from the inward margin to a point where the ocean is about 600 feet deep; thence it plunges in a distance of about 40 miles to a depth of 6000 feet and better (GW–2—Figures 4 and 7). A large percentage of the southern portion of this shelf is exposed at slight elevation, composing the so-called tidewater sections in the southern states. At the north, the exposed portion comprises much of eastern Maryland, all of Delaware, South Jersey, Long Island and the New England islands to the east. In other words, appearances are that the northeasterly end of the shelf has settled.

Long Island is the unsubmerged portion of the inner edge of the continental shelf fronting the Westchester county and Connecticut shorelines and separated from them by the depression of Long Island sound. It is underlain by a rock surface, sloping gently to the southeast, and that rock is exposed in the extreme northwesterly corner of the island. Over most of the area there are deep deposits of sand, gravel and clay resting on this rock floor and as yet unconsolidated. Also along this margin of the shelf the glaciers have deposited a vast accumulation of drift which covers practically all of Long Island and extends seaward of it.

In these unconsolidated materials the geologists have identified more or less finally a number of formations and assigned appropriate names to them as set forth in Wallace de Laguna's report, these being Cretaceous formations subdivided from the rock upwards into Lloyd sand member of the Raritan, clay member of the Raritan and Magothy (?). On top of these there are a number of glacial deposits representing advances of the ice and interglacial eras. At the extreme west end these consist of Jameco with overlying Gardiners clay; on the north shore of the island there is the Manetto, the Manhasset; over all is the Wisconsin. These subdivisions seem to be subject to change and the chronological sequence of the beds still to be in doubt.

In these formations there are a number of water-bearing beds or aquifers which are of such extent and continuity as to be of economic importance, and it is the mapping of these aquifers with which this report primarily is concerned. These are Lloyd, two or three in the lower Magothy, Jameco and the so-called Upper Glacial, that is glacial deposits of an age later than the Gardiners clay.

These geologic terms have been more or less loosely used by well drillers, waterworks officials and engineers until they have passed into the speech of the people but not always with exact geologic accuracy. In such speech, the larger subdivisions are ignored and the average person would not know whether Jameco and Gardiners clay were Pleistocene or Cretaceous.

As this is not a geologic report but is written for engineers, well drillers, similar practical users and the common man, it has seemed best to adhere to the common rather than the scientific usage; thus Lloyd and Raritan are used for the Lloyd and clay members respectively of the Raritan. Magothy is not queried, and certain specific and well-known aquifers in it are distinguished as Magothy I, II and III. Jameco and Gardiners clay are spoken of as entities without reference to their Pleistocene classification. The rest is spoken of as Glacial or Upper Glacial, Pleistocene being a little too difficult for ordinary speech. This Upper Glacial is also held to include Recent on the principle that it may be interglacial after all.

This separation of Jameco and Gardiners from Pleistocene has always been confusing and various names have been tried for the remnant, such as Post-Gardiners and Post-Jameco. These names are reasonable enough in Brooklyn and neighboring areas but are not appropriate in those parts of the island where neither Gardiners nor Jameco occur. The geologists have adopted the name Upper Pleistocene which I have translated as Upper Glacial when such distinction is needed.

Many descriptions of Long Island formations have been written and well logs correlated, but the first attempt to show these data graphically was made by the sections prepared by Crosby (11) ; although these were made by projecting neighboring well logs onto the selected section lines and in spite of differences in nomenclature and the failure to show the important Jameco aquifer and overlying Gardiners clay under Brooklyn, these sections have been of the greatest help to this Commission.

Studies of these matters soon showed that the surfaces of the various beds were too irregular to permit the projection of well logs onto selected section lines without confusing distortion, and in Bulletin GW-2 an attempt was made to show some of the surfaces by contours and then to section the contoured area. These particular attempts were unsatisfactory on account of lack of data and poor geologic correlations of the logs, but they did point the way towards the suitability of the method if contours can be drawn with reasonable precision.

IV

SURFACE TOPOGRAPHY

SURFACE TOPOGRAPHY

Long Island sound is a body of salt water lying in a depression eroded in the landward margin of the continental shelf. It is bounded on the north by the concave, rocky coast of Westchester county and the State of Connecticut, on the south by the somewhat abrupt north shore of Long Island, curving in a direction opposite to the north shore and composed almost entirely of unconsolidated materials. On the west it connects with East river through Hellgate. On the east it is limited by a picket line of islands, part of a glacial moraine, extending from Orient point on Long Island to Watch hill in the southwest corner of Rhode Island. The maximum width is about 23 miles, just east of New Haven.

It is reasonable to believe that the combination of natural phenomena which caused the sound to be excavated did not cease to operate at Watch hill and that the sound is but the western end of a depression which extends far to the east. In that case the New England islands would represent the high points on an easterly continuation of the south fluke of Long Island which are high enough to rise above the ocean. It will be noted that Long Island itself appears to be lower at the east end, a feature common to the entire continental shelf (9) (GW–2—Fig. 7), as above noted. In front of Rhode Island this shelf is entirely submerged except for isolated islands.

Long Island sound receives all northward flowing drainage of Long Island, which is rather small in volume, also the drainage from a considerable portion of Westchester and adjacent counties in New York and all the drainage from Connecticut. The only real river entering the sound is the Connecticut itself which enters at the extreme eastern end.

There are strong tidal currents in Hellgate, but it is thought that the bulk of the out-flow of water from the sound is to the east. To escape to the ocean, this water has to pass over two barriers, the moraines and underlying formations which extend for the entire length of Long Island and continue further to the east.

Study of the Coast Survey charts shows that under present conditions the out-flow passes the inner barrier through Plum gut and The Race, just west of Fishers island. The second barrier is passed between Montauk point and Block island, and thence the water flows in a southerly direction over a well marked channel in the continental shelf in the general direction of the Hudson canyon. Perhaps it would be better to say that the above would be the course followed were sea level to be reduced by several hundred feet. With the present ocean level the escaping water, although generally following the above course, is spread out and diffused through salt water, affected by tidal phenomena and other things so it does not flow in a well appointed stream. It is probable that a portion of the flow is eastward in a well developed depression passing north of Block island.

The configuration of the bed of Long Island sound is irregular and complicated. The north shore is practically on rock. Only as it enters East river is exposed rock found on the south but this serves to establish a sill to escape in that direction and under the existing channel. Little is known of the rock surface under most of the sound but as far as known, rock contours as given here are approximately parallel to the north shore. A well on Orient point struck rock at Elevation -654.

A deep, rather narrow trough generally follows the 41° :00′ parallel of latitude and extends from close to the Connecticut shore east of the mouth of Mianus creek to a point not far from the north shore of the island at about the meridian of Baiting Hollow. This starts at the west at about 15 fathoms, drops to 20 fathoms north of Sunken Meadow, briefly drops to below 25 fathoms north of Old Field point and thence continues easterly under the 20 fathom line. East of Old Field point the 15 fathom depth expands easterly into a triangular shape bounded on the east by the meridian of Fresh Pond landing, northeast of Calverton, up to a point about six miles south of Sachem head and Faulkners island in Connecticut, thence easterly as a channel as far as the meridian of the mouth of the Hammonasset.

Starting at Hart's island-Hewlett point line (Queens-Nassau line) on the west the sound deepens to over five fathoms near both shores but does not reach 10 fathoms before the western end of the trough is met. It is constricted by a shoal running out from Eaton neck to meet another running south from Wilson Point (Norwalk) and again on the line at Stratford point (Housatonic river), Old Field point (west of Port Jefferson harbor), by a shoal running south from the first point and a good sized bar or near island in the center of the sound. The deepest point in the sound is off Norwalk; one almost as deep is in the above trough off Old Field point. The sill which would limit the drawdown of the sound were sea level to be depressed is a line running from Cornfield (Connecticut river) to Roanoke point (north of Riverhead) and is less than 15 fathoms deep. East of this line the outlet of the sound to the east is blocked by the extensive delta deposits of the Connecticut, of irregular contour, grooved and pitted by tidal scour. The submerged channel of the Connecticut runs easterly to The Race (off the west end of Fishers island) and thence continues through the intermorainal space (Block Island sound) through the southern morain between Montauk point and Block island. There is a well marked broad depression in the ocean floor running a little east of south to the Hudson submarine canyon over 120 miles distant. The sill of the channel at Block island is less than 15 fathoms, The Race is depressed to over 25 fathoms, and the submerged channel running east to the north of Block island is about 20 fathoms.

Basically, Long Island is the unsubmerged portion of a gently sloping, slightly concave plain, the upper edge of which has been plowed out to form Long Island sound. The north shore is a more or less abrupt escarpment from the top of which the surface slopes to the south and east passing under the waters of the Atlantic. The whole island is slightly down to the eastward and probably continues submerged far to the east, the New England islands being part of the same general formation.

The north shore is indented by many bays and harbors with intervening necks and off-lying islands connected by bar beaches. The south shore in general changes to swamps and lagoons at sea level, which last are contained by long barrier beaches topped by dunes. There is a westerly drift of sand all along these beaches.

The north shore, except in the bays, is being eroded by wave wash. The bays are filling. The south shore lagoons are filling. The beaches are moving westward. From Napeague beach to Montauk point the south shore is eroding.

The most conspicuous features of the topography are the two moraines of the latest Wisconsin ice advance which traverse the island from end to end with an intermorainal trough between them except where they merge and cross near Lake Success. The older of these, Ronkonkoma moraine, starts at Montauk point and runs well inland on the island to Lake Success, thence westerly from Little Neck bay to East river. In this last area there seem to be several deposits of morainal material; that just north of Newtown creek may be the main branch. To the eastward of Montauk point this moraine also forms Block island and others beyond.

The younger, Harbor Hill moraine, starts in Brooklyn at the Narrows opposite Staten island and runs thence to Lake Success and continues along the heads of the bays to Port Jefferson. East of that point it crowns the north shore escarpment, and has been heavily eroded.

It forms the north fluke of the island and in more or less submerged condition continues as Plum, Gull and Fishers islands finally going ashore at Watch hill in Rhode Island.

The greater submergence of the easterly end of the island has flooded the intermorainal space, splitting that end of the island into two flukes separated by Flanders, Little and Great Peconic bays, Shelter and Gardiners Island sounds. In this interfluke area are Shelter and Gardiners islands and numerous smaller bodies of land.

These two Wisconsin moraines are thought to be due to the two latest glacial advances of that age. An earlier and even more important ice advance formerly known as the Manhasset and which some suppose to have passed clear over the entire island (15) is now thought possibly to be Wisconsin.

Still earlier glacial periods are represented by the outwash materials known as Jameco in the western part of the island and by heavy deposits on the necks of the north shore and Wheatley hills known as Manetto.

All these complications in the glacial formations increase the difficulty of determining the preglacial surface.

It seems that in some measure the present surface topography and drainage channels existing in it were controlled by the earlier topography, and for that reason careful study of the present drainage system is necessary.

The preglacial water parting appears over the greater part of the island to follow the earlier moraine, but the present apparent water parting is, with two large and several small exceptions, the newer moraine.

In general the glacial material which forms nearly all of the surface of the island is so porous that rainfall sinks into it rapidly and does not again emerge until near sea level. This means that permanently flowing streams are not common but the drainage channels for such streams are well developed and are shown on the Federal contour maps. At least one stream that should be of considerable size disappears underground—Coram sink. Such conditions lead to heavy ground water recharge, and undrained depressions must be particularly favorable regions for such recharge.

In the western part of the island where the youngest moraine is distant from the south shore of the sound, the northward flowing streams start out in the normal direction perpendicular to the moraine, but in most cases eventually turn sharply to run into the nearest bay. The depressions of the bays themselves all extend to the Harbor Hill moraine. The necks between the bays have rather irregular surfaces and the drainage of them also is irregular.

South of the southerly moraine in the western counties, the streams run down the outwash plain to the Atlantic and fringing bays. These streams are simple, fairly straight over considerable distances and with few branches. North and west of the root of Rockaway peninsula they are oriented on Jamaica bay. Further east many run nearly due south, but there is a tendency for the upper reaches to run more nearly southwest, almost at an angle of 45 degrees with the general trend of the contours and then to turn south at or near the 100 foot contour. This is most marked in the case of East Meadow brook which rises in the intermorainal area near Syosset and flows southwest to a point northwest of Freeport and then slightly east of south passing through the village of Freeport into East bay.

The intermorainal area drains through Gowanus and Newtown creeks, Flushing and Little Neck bays, in that part where Harbor Hill moraine is south of Ronkonkoma moraine. At the head of Manhasset bay the condition reverses from that point nearly to the Suffolk County line; the space in question drains to the south through numerous streams. At the Suffolk County line

Cold Spring harbor drains a portion of this space, and has started to develop east and west flowing tributaries in it. South of the Huntington and Northport bays complex, the drainage is to the south through Massatayan, Carll and Sampawams creeks. A small area north of Commack drains to the north through a small channel which is part of the common boundary of the towns of Huntington and Smithtown, passing Fort Salonga. The intermorainal area south of Smithtown bay forms the basin of Nissequogue river and drains to the sound. A narrow strip just east of that basin drains into Lake Ronkonkoma which has no visible outlet. As this strip is full of kettle holes, of which Ronkonkoma is one, the surface contours may not show at all the real drainage conditions, and it may well be that Ronkonkoma is a part of the ancient channel to the south to Connetquot river while the northern portion actually drains to Carmans river. From Stony Brook to the line, Yaphank-Wading River, there is a large basin which, though well supplied with drainage channels, really has no visible outlet. Carmans river rises near Middle Island in a valley between two ridges which extend from a point north of Yaphank in directions slightly east and west respectively of north. The drainage channel from the west ceases in a kettle valley running from Coram to the south end of the westerly ridge, but the topography suggests that the underground flow is Carmans river. The remainder drains into Peconic river and the bays, but there is some doubt about the upper end of Peconic valley—say west of Manorville. This area is filled with wandering drainage channels and may well contribute to Wading river and perhaps to Forge river as well. This is the area of Camp Upton and the present Brookhaven Laboratory so that tests to determine the direction of ground water flow under the region might well be studied in connection with the problem of disposal of wastes from that laboratory.

From Mount Sinai harbor eastward small ravines in the north shore bluffs have generally cut back through the moraine and drain small areas of the intermorainal basin.

When the ice was still present, numerous outwash channels were formed, many of which are still in action. Most of these were described by Fuller (15), others are shown by the contour maps. They are:

From Flushing bay via Maple Grove, Dunton and Three Mile Mills to Jamaica bay;

From the head of Manhasset bay to the head of Jamaica bay through Floral Park and Rosedale;

From Hempstead harbor through Albertson, East Williston, Mineola, Garden City, Hempstead and Rockville Center to Broad channel and the Atlantic;

From South Huntington on the west side of Massapequa valley to Massatayan creek and so to South Oyster bay;

From South Huntington down the east side of Massapequa valley to Carlls river, through Wyandanch, to Great South Bay at Babylon;

From the head of Northport bay to Sampawams creek at Babylon through Commack and Edgewood;

From near Smithtown in the valley of Nissequogue river to Connetquoit river.

V

GEOLOGIC FORMATIONS TO BE MAPPED

GEOLOGIC FORMATIONS TO BE MAPPED

Starting with the basement rocks and proceeding upwards, the following formations are to be mapped:

Solid rock surface.

Surface of disintegrated rock is not to be mapped.

Lloyd gravel surface—These gravels are an important aquifer.

Raritan clay surface.

Magothy surface—Much of this formation is water bearing. In Nassau county three Magothy aquifers occur in the lower part of the stratum which are so well known and appear to be so continuous over considerable distances that they are known as Magothy I, II and III. More study will be required before mapping of these aquifers will be justified. To some extent they may be indicated on the profiles. In places where the top of the Magothy beds is gravel and Glacial gravel rests on them, the two formations may be a single aquifer.

Jameco gravel surface—Glacial—This is an important aquifer in the western part of the island.

Gardiners clay surface—Interglacial—Not water bearing, but more or less impervious.

The uppermost complex of beds is the Upper Glacial and Recent, comprising every deposit of age later than the Gardiners interglacial period. The surface of this formation is the present ground surface which has been mapped by various Government agencies and of which topographic maps of various sorts are available (Coast Survey, Geological Survey and Army). This formation contains sands, gravels, clays and hardpans, but usually it will yield water to wells of suitable depth, frequently in large quantities. These aquifers have irregular depth, boundaries and thickness. Most are more or less interconnected, but many are "perched". No attempt at mapping these has been made, but the free water surface (water table) is under continuous observation and results are published by the Geological Survey. This free water surface has been mapped a number of times.

All of these surfaces have been subjected to sub-aerial erosion except the Lloyd where covered by Raritan and perhaps parts of the Jameco and Gardiners. Such erosion should have resulted in a more or less normal topography of stream valleys, hills and ridges, but as each major erosion cut down the rock in places some of the surfaces bear traces of two or more drainage systems superposed on each other. This particularly is true of the Raritan when not presently covered by Magothy. The final erosion of the Cretaceous or pre-glacial surface is complicated by changes in sea level, cutting by ice and greatly altered by glacial streams during several different advances and retreats of the ice including deposition, erosion, re-deposition and re-erosion of glacial material.

Raritan formations suffered the most from these multiple erosion effects and as mapped constitute a species of topographic nightmare. It should be studied as two entities with an indefinite connecting zone. That to the eastward of the limit of the Magothy was chiefly eroded during one major period and was then submerged by the ocean. The westerly end was eroded during three major periods and a number of minor periods and was submerged and re-elevated several times. The two sections are topographically unrelated to each other, but the western end forms part of the Cretaceous surface which is also the upper surface of the Magothy, as reshaped during the Glacial period.

VI

SEQUENCE OF MAPPING

SEQUENCE OF MAPPING

It is quite evident that paucity of data makes the mapping of any of these buried surfaces most difficult. When it is necessary to contour some four surfaces lying between the roughly known rock and the accurately surveyed present surface, the difficulties are greatly increased. The chief trouble, of course, being to keep the contoured surfaces from intersecting each other. Reliance for avoiding this error was largely placed on study of the sections. The contours were first drawn, sections then made from them and inconsistencies disclosed by and corrected on the sections where carried back to the maps and the contours made to conform. Frequently special sections at odd locations and directions were often required for this purpose.

As above explained, any attempt at drawing contours of these subterranean and invisible surfaces requires certain assumptions as to the hydrology of the surface in question; that is the location and elevation of the ocean and of the ponds and streams existing on the surface. On study of the situation, it appeared that the only one of these surfaces which gave promise of being so little altered by a subsequent erosion that the stream valleys would be completely masked is the upper Cretaceous surface, which over most of the island, is the top of the Magothy. Accordingly, contours of this surface were first attempted by making the following assumptions:

Sea level is assumed to be several hundred feet lower than at present, leaving Long Island sound as a valley and exposing a considerable portion of the pre-glacial continental shelf, which surface lies at considerable depth below the subsequent glacial fill.

Hudson river, constricted between the Palisades and the rocky hills of Westchester, is assumed to have been nearly in its present position, but at the bottom of a rock gorge several hundred feet deeper than the present channel. This river ran out on the continental shelf, presumably in a deep valley; the upper end of this depression was wide and fanned out to include not only the present lower bay but most of Kings and part of Nassau counties. One lobe of this ran up from the Coney island-Gravesend region towards Flushing bay and must have been drained by a stream running into the Hudson in the lower bay. There should be a considerable notch in the rock wall east of the Hudson where this stream passed over it, but it has not been found. This lobe represents Crosby's Sound River valley. It is cut through to the sound or nearly so but apparently never was occupied by a stream of any magnitude. Another lobe covered Jamaica bay and headed towards Little Neck bay, stopping rather abruptly in Jamaica. The drainage apparently was to the south into the Hudson gorge. This is Veatch's Sound River valley. Further to the east on the south shore there must have been a number of streams tributary to Hudson canyon, but these have been covered by the westerly drift of the beach sand and barrier beaches formed as the ocean again rose and submerged this area.

Long Island sound was a valley with gently sloping floor from the present Connecticut shore to a stream running easterly near the present north shore of the island. This valley floor presumably rested on rock at both ends, but could not have done so in the middle. On the south it was bounded by a rather abrupt escarpment in soft material which probably was being undercut by the stream and eroded away. Along this escarpment, numerous small streams ran northward to join Sound river. They deeply notched the escarpment and are now represented by the existing north shore bays. The western end of the ridge now forming the island was low and had little relief; there was a group of hills of considerable height near the present Nassau-Suffolk line. Information is insufficient to show the condition in the present Shelter island and Flukes complex. Sound river perhaps ran out onto the shelf between Orient point and Block island or, a theory which better fits the contours of the bottom of the Sound, the north fluke may have been non-existent and Sound river may have passed into what is now Peconic bay and out near the site of the present Shinnecock canal. The lesser drainage was not far different from that now existing except in so far as that has been modified by glacial action. It is improbable the Peconic valley existed at all.

Having determined as well as possible what the shape of the Cretaceous surface was, the next step was to draw the contours on the top of the Jameco fill and its overlying Gardiners clay.

The rock contours were assumed as those already determined by the U. S. Geological Survey and shown in GW–13. These were, however, extended to cover the sound and the entire area of the island although such extensions are decidedly problematical, they being determined in large measure by the present Connecticut shoreline, three deep wells in Suffolk county and assumptions as to the general shape and slope in those sections where there is no information.

It is then assumed that the Lloyd rested on or near the rock and contours were drawn, filling in the missing gaps by assuming the thickness of the Lloyd strata. The Raritan clay surface was then interpolated between the top of the Lloyd and the ceiling fixed by the deeper Magothy wells.

As there is very little information with regard to anything but the glacial deposits in Suffolk county, west of the hills south of Huntington, reliance was placed on drawing meridian sections and trying to determine from the glacial wells the probable ceiling of the top of the Magothy. This is far from satisfactory and all the contours in eastern Suffolk must be considered as purely tentative.

VII

DESCRIPTION OF FORMATIONS AS MAPPED

DESCRIPTION OF FORMATIONS AS MAPPED

ROCK SURFACE

Except on the western end of the island there is little data with regard to the depth to rock and about all that it is possible to do is to hang the whole eastward extension of the contours on the wells at Coney island, Long Beach, Brookhaven Laboratory, Greenport and Orient point and to draw them approximately parallel to the Connecticut shoreline.

The result is a concave surface sloping to the south and east from the rocky shore of Connecticut. On the island the only outcrops are along East river in Long Island City. This surface has a dip of about 70 feet to the mile and the deepest point at Sayville is at about Elevation —2100.

This is an extension of the rock surfaces in Manhattan, Westchester county and Connecticut. It may be that it is as rough as it is in those localities. This is true of the western edge of the island where the only real attempts at drawing accurate contours have been made (GW–2 and 13).

It is known that the depression of East river was caused by solution of dolomitic limestone involved in two folds and faults, one on either side of Welfare island (12). Tunnels under the river have shown this solution of the limestone at very considerable depths and it has caused a good deal of trouble even during the excavation of the deep city water tunnels.

A study of these contours seems to indicate that East river is paralleled by a somewhat similar depression further to the southeast end at a lower elevation.

Determination of these contours is complicated by the fact that frequently there is doubt as to whether the reported rock was the top of the solid rock or of the decayed rock, which last in many cases is of considerable depth. Doubtless, the ordinary driller would report only solid rock, but this doubt is always present.

It is thought that in Long Island City the Lloyd and Raritan may never have been deposited. Down towards Coney Island along the tip of the Hudson gorge deposits of these formations have not been identified, but they may have been deposited there and subsequently eroded away.

Running south from Brooklyn Navy Yard there seems to be a rock ridge which is covered by a hill composed of Magothy, Jameco and Gardiners formations with a possibility of Raritan and Lloyd underneath. The persistence of this hill through a number of strata suggests that the ridge may be wider and longer than shown here, thus making it a better base for a hill.

In general this rock is gneiss with interbedded Inwood limestone and in the northwesterly corner there is a heavy intrusion of diorite.

This underlying rock does not appear to be capable of carrying water except in small amounts seeping through cracks along East river, nor does it appear that faults cut by the city tunnel under Long Island were particularly wet (Berkey and Blank—City Tunnel No. 2).

LLOYD GRAVELS

This formation appears to underly the entire island except at the extreme west end. The limit at present is roughly a line from Flushing bay to Coney Island. It is thought that these gravels were never deposited in the northwesterly end of the island, but perhaps they may have been deposited and then eroded off farther to the south. The upper surface of this formation generally follows the rock surface but with a slightly flatter slope (60 feet in a mile). The thickness increases towards the south and the thicker portions are, in places, divided by clay beds into one or more separate aquifers. Not much is known about the Lloyd in eastern Suffolk, but at Brookhaven Laboratory it is reported that the formation is present but is not a good aquifer. The Lloyd has long been used as a source of water supply chiefly on the north shore from Flushing to beyond Huntington and on the south shore on the beaches, particularly Rockaway and Long Beach. In general these Lloyd wells have some artesian flow when first drilled. The southern wells are apt to yield water with a high iron content which requires treatment. The Lloyd well at Orient point is reported to be saline. As the Lloyd formation does not cross Long Island sound, it must, of necessity, terminate somewhere in that body of water. How freely it communicates with the waters of the sound has not been determined, but it is known that salt water intrusion does take place in certain spots. There is no information as to how far out to sea this stratum runs. It is possible that it extends all the way to the escarpment terminating the Continental Shelf. If this is the case, the outcrop probably would be at great depth and, if it follows the known trend under the island, should be of great thickness.

RARITAN

The second member of the Raritan formation, officially known as the Raritan clay member, lies on top of the Lloyd gravel and usually extends beyond it so that these clays constitute a fairly effective seal except where erosion has removed it leaving the Lloyd exposed. The Raritan probably once covered most of the island with a surface slope of about 60 feet to the mile. Information with regard to it is scanty in Nassau county and almost absent in Suffolk. As this is not an aquifer, it is seldom drilled except for a well passing through it to the Lloyd gravel.

This formation was exposed to erosion after it was laid down, was then deeply buried by the overlying Magothy beds which in turn were heavily eroded. This second erosion exposed the Raritan to the west of a line running from Oyster Bay to Coney Island except for certain isolated patches of Magothy and other places where the rock surface was uncovered. Nowhere has it been clearly demonstrated that the Raritan was eroded in such fashion as to expose the Lloyd, but this almost certainly happened in the sound, in some of the north shore bays and perhaps in the Gravesend region.

After the main Magothy erosion, the exposed Raritan surface was further cut by outflow streams from the subsequent glaciers. All these erosions have given the Raritan surface in Queens and Kings a most complicated pattern which is particularly difficult to decipher at the limit of the overlying Magothy. Little definite information is available as to the erosion of this stratum where it is covered by the Magothy. Where it is not so covered it is described below.

PRE-GLACIAL AND MAGOTHY SURFACES

According to the geologists, the Magothy strata were deposited all over the present island in great depth. They extended northward into Connecticut. The subsequent Magothy erosion removed vast quantities of this fresh deposit including all of it in Connecticut. The excavation of Long Island sound, of the North Shore bays, numerous stream valleys along the south shore and in the west end of the island exposed large areas of Raritan, rock and possibly Lloyd. This resulted in a land mass somewhat similar to that now existing, except that it was lower by the thickness of the glacial deposits. It probably had considerably more relief and variation of topographic features than the present island, and lacked the North fluke. The water parting was probably about on the line of the older Wisconsin moraine, and there was a group of hills, still visible, on or near the Nassau-Suffolk county line.

To draw contours intelligently, it is necessary to attempt to restore the drainage plan. This must be very vague over the eastern part of the island where there are but few Magothy wells. More can be done at the western end where the streams were directed either towards the sound or the head of the Hudson canyon. These results disclosed a rather unusual pattern.

Hudson river is presumed to have been at its present location emptying into a vast canyon in the Continental Shelf. The head of this gorge appears to have extended far enough north and west to include Jamaica bay and the heavily eroded region north of Coney island.

East river, which still occupies a rock valley, must have been in the same position as at present except at its lower end where the existing stream has been pushed to the east of its original valley by glacial material. It is assumed that East river ran directly into the Hudson somewhere near Governors island.

Starting east of the present Hellgate, a wide, but not overdeep, valley extended eastward, which valley later was modified and submerged as the present Long Island sound. The final erosion of this valley must have been made by an easterly flowing stream (Sound river) which lay close to the present north shore of the island. This stream, of course, picked up all the drainage from the north. On the south it had many small tributaries running in short and steep courses down the rather abrupt northern slope of the prospective island. These streams ran in narrow and deep gorges originating near the height of land and cutting deeply into the northward facing scarp. These are the present North Shore bays and quite likely there were more of them at that time as some may have been buried or washed away in the Suffolk county area.

How far west Sound river originated is unknown. Somewhere it must have turned south across the axis of the island. Various points where this might have happened suggest themselves, including the Nissequogue-Connetquot area, Carmans river, Peconic bay and the gap west of Block island. It may even have continued in an extension of the sound westerly to another canyon in the Continental Shelf which lies east of Cape Cod. This last idea seems improbable as not providing enough slope to enable the river to accomplish the erosion of the sound.

In the west end the streams were oriented on the Hudson canyon and traces of such drainage seem still faintly to show through the overlying drift (East Meadow brook and others). Three fair-sized valleys appear in this region.

The westernmost valley is a small one parallel to East river and not far distant from it, but at a somewhat lower level. This may represent the remnants of the valley of a stream which came down from north of the Sound. Some remnants of Magothy are west of it, but in general it is in the Raritan and lower strata.

East of this is a more considerable valley heading up towards Flushing bay. There are indications that this later served as a glacial outwash channel. This is Crosby's "Sound River Valley".

Still farther east is a more important valley running somewhat west of south and so deeply cut as to suggest that in places it extends down to the Raritan. This valley heads up somewhat abruptly at the water parting, suggesting that it was modified by glacial outwash also. This is Veatch's "Sound River Valley".

Both Professors Veatch and Crosby advanced the theory that the final pre-glacial excavation of the Sound was made by the Connecticut which they assumed turned westward and then southward and ran into the Hudson canyon. They were aware of the two last described indentations in the pre-glacial surface and assumed that these extended farther to the north and east in sufficient size and at an elevation low enough before hitting rock to cross the island. The many wells which have been sunk since those times seem, as shown by the map, to negative those theories, and it now appears that Sound river in this sense did not exist. No new theory has been offered. This is a most important question as any such valley crossing the island might well make a cross-connection with most, if not all, of the aquifers (GW–2, Fig. 13).

This important unsolved problem is further commented upon below.

As above noted, the eroded Magothy surface was quite irregular and over considerable areas at the western end of the island it was removed entirely. It was also deeply channeled by numerous streams; the north shore bays seem to have cut into it as far back as the then existing water parting near the southern ridge and to the north cutting down either to the rock or to whatever level matched the easterly flowing Sound river. This particular point has not yet been determined and is of importance as these ravines may have cut through all the Cretaceous strata to the rock, were later filled more or less with glacial material and thus may have brought the salt water of the sound practically into contact with all the Cretaceous aquifers, as has been particularly exemplified by one of the Lloyd wells at Port Washington. It is also quite probable that similar ravines once were formed further to the east, such formations as Mount Sinai harbor and Wading river possibly representing the last remnants of such ravines. It is well also to note that the north shore of the south fluke contains signs of similar erosion—particularly Three Mile harbor and the extension thereof under Gardiners Island sound. Furthermore, on the south shore, east of Babylon, there appear to be evidences of a large number of deeply cut southward trending valleys which subsequently have been filled by glacial material which has settled, giving rise to the basins with peculiar oak-leaf contours so prevalent in Suffolk county. All of this is quite indefinite, and it should be noted that although these indentations are shown by borings well inland from the south shore, the Magothy wells along the bar beach are rather consistently shallower. Just what the drainage system was cannot be told, but can be assumed either as draining across the bar beach between the scattered borings or that there was a lateral valley similar to Peconic river in Great South bay and extending eastward. This last sounds rather fanciful, but at least should be borne in mind as additional information comes in.

JAMECO

This formation is stated to be the earliest of the glacial series and it is supposed that it is material originating up the Hudson valley transported by the outwash from an ice cap which never reached the island and to have thus been dumped in the positions now found.

It is of considerable but unknown depth and extent in Kings county and extends well along the south shore of Kings and Nassau counties.

Many of the boundaries of the Jameco are quite indefinite; particularly near Newtown creek where it is in unexplored territory, under a moraine and anyone's guess as to where it is. The well logs indicate a narrow neck extending to the north, but the top of the deposit so shown does not meet the contours worked out for the underlying Raritan. By assuming it to be spread out in territory where there is no information, a fairly good fit was obtained. All of this is rather poorly supported guesswork. This deposit has been studied as a construction problem and as such is most baffling. In western Kings it is pretty well piled up and not impossible, but farther east it forms a sort of lining to a depression which could occur only if it were poured over the edge of the depression. This would involve transportation over a fairly high part of the island. It might have been so deposited as to fill the depression and subsequently to have been eroded out, but this seems fanciful.

In the Gravesend region there is a considerable hill resting on a similar hill of Magothy materials. This hill in turn is capped by Gardiners. Although this hill must have resulted from the erosion of the deposited strata, it is so shaped that erosion is not evident.

All this must remain a puzzle until more evidence comes in.

This formation has not been identified elsewhere in the island but it may occur and on account of changed source of origin it may not have been readily identified.

In Kings county, particularly, the Jameco was once a good aquifer but now has largely been salted by overpumping and perhaps also by lack of recharge from rainfall. This area is paved and sewered in such manner that a large percentage of the rainfall is carried at once to salt water.

GARDINERS CLAY

This formation is said to have been laid down in lagoons similar to Jamaica, Great South and other bays now existing almost continuously along the south shore of the island. It is apt to be dark in color, contains much organic matter and is rich in fossils. Shells found in it appear to be those of oysters, clams, mussels, scallops, etc., the same or very similar to those now existing in the present lagoon. Unfortunately, the geologists find it difficult to identify this clay in well logs and the real extent of it has not been determined.

The type locality from which this stratum was named is Gardiners island where it outcrops but where it has been much distorted by ice shove so that the strata are vertical instead of horizontal. It is best known in the area under Brooklyn and in that neighborhood where the Gardiners lies on the Jameco aquifer and under the upper glacial deposits.

These two deposits were correlated as being the same, and it was assumed from reasoning by analogy and from the present conditions that the two were more or less connected along the south shore of the island. Fuller (15) noted clay outcrops in the north shore bluffs which he believed to be the same formation, but for a period the geologists abandoned the idea that this stratum was continuous. Borings at Brookhaven Laboratory showed Gardiners and led to reconsideration of the correlations which are now held to show Gardiners in a number of scattered locations. It is now assumed to be nearly continuous for the whole length of the south shore resting on Magothy and not rising above Elevation -60, but the information with regard to it is insufficient to justify attempting to draw contours on it.

Under Brooklyn the Gardiners surface more or less parallels that of Jameco much as though the former were a blanket spread over the latter formation and generally extends outside of it for some distance. This gives considerable slope to the surface. Still reasoning from analogy and present conditions, it is improbable that this formation was deposited in a lagoon of fixed location. So to assume would require a confining bar beach of unusual height and the deposit of the clay in relatively deep water.

As it is believed to be an interglacial formation, it must first have been laid down during a period when the melting ice sheet was replenishing the ocean and sea level was rising. It is, therefore, suggested that the original lagoons were formed on the Continental Shelf farther south and at a materially lower elevation than the present northerly limit of this stratum. As sea level rose, the bar beach was forced in a northerly direction over the clay deposited in the original lagoon and the lagoon itself was kept moving inward and upwards until the next advance of an ice sheet caused recession of sea water. This would give a sloping formation terminating in a flat top and the sloping portion would be covered by beach and dune sand. The top would not be covered but left as a level swampy area until eroded by the outwash of the advancing ice and eventually buried by glacial drift (GW–2, Fig. 6).

It is regrettable that the northerly limit of this clay in the western part of the island lies in a well-less region under the Harbor Hill moraine and can be only guessed at.

Under Brooklyn this formation is highly important hydrologically. Farther east its importance cannot be determined until more is known of its location and characteristics. It is probable, however, that over a broad belt along the south shore it provides a more or less impervious barrier between the Upper Glacial and Magothy, a condition which might have considerable importance in the case of recharge of well water even though the upper and lower strata were hydrologically connected north of the edge of the clay sheet. This question needs further study, both geologic and hydrostatic.

GLACIAL

Glacial deposits on the island have been ascribed to a number of advances and retreats of continental ice sheets, some of which have not extended beyond the Sound but at least one of which is believed to have covered the entire island. Despite these numerous advances, only one interglacial period (Gardiners) has been described and only two terminal moraines are apparent. These last are assumed to mark two stages in the latest ice advance (Wisconsin). The location of other moraines, if such there be, is a matter of some importance from the hydrologic standpoint.

Certain other features of the glacial materials and surface together with some features of the lower strata are noted below.

IX

SPECIAL PROBLEMS

SPECIAL PROBLEMS

In attempting to draw these contours, a number of unsolved problems have presented themselves. Most of these may have important effects on the continuity of the strata and the movement of ground water. These are listed below to call attention to the need of further study as additional information becomes available.

Long Island Sound

Veatch and Crosby were of the opinion that the sound was excavated by the Connecticut and other streams which turned westward on reaching the site of the sound and then ran across the western end of the island to the Hudson canyon. Although the southern ends of these "Sound River Valleys" clearly exist and have been shown, no connection of the sound wide or deep enough to have carried a river large enough to excavate the sound has been found and that particular theory has been abandoned. No definite theory has been advanced to replace it but the inference is that "Sound River" is now supposed to run in an easterly direction. The data now seem to show that the North Fluke is substantially all glacial which in some measure simplifies this problem.

The Connecticut river north of the sound runs in a normal manner downhill on the steepest possible slope. What formations or set of circumstances caused this river to turn off its normal course at right angles and to proceed practically on a contour with no slope worth mentioning? Such changes in course happen but only under special circumstances.

The study of the shape of the bottom of the sound shows it to be compartmented with depressions separated by north and south ridges whose outlet streams may have crossed these ridges. These all seem to drain eastward into a channel near and parallel to the north shore which heads into the North Fluke and might represent an outlet from the sound if that Fluke were not there. As at least part of the North Fluke is Pre-Wisconsin, is it possible that such a channel could have survived the advance and retreat of several ice sheets?

Details as to the sound are of hydrologic and practical importance in determining the location of the exposures of the Lloyd and other aquifers to salt water.

Did the Connecticut ever cross the island?

If the Connecticut river ever crossed Long Island, such passage should be marked by a deep gorge cutting through many of the unconsolidated strata, which gorge, if subsequently filled with porous material, might give more or less free interconnection between various aquifers with important effects on recharge.

Fuller notes a number of refilled outwash channels crossing the island which seem to be connected with the Harbor Hill moraine of the Wisconsin. The largest of these runs from Nissequogue valley to Connetquot river. This particular channel is at too high an elevation to have much effect, but it follows a course which possibly once was such a channel.

There appears to be an extensive indentation of the north shore under the basin drained by Nissequogue river. This depression is poorly defined by existing borings, but it seems to extend as far south as the Ronkonkoma moraine. That moraine is deeply notched by a glacial outwash channel. Further south there appears to be another deep indentation of the south shore. These two approach each other closely in the neighborhood of Hauppauge, and it is possible that they may meet. More drilling will be required to prove what the conditions actually are.

If the North Fluke were removed, it might be that Sound river ran south through what are now Peconic and Shinnecock bays to the ocean. Otherwise, it must have passed through Block Island sound or even further east in spite of the lack of grade.

Connecticut river should have been a tributary of the Hudson gorge, but no trace of a connection between the two can be found.

Crosby's "Sound River Valley"

Wells are seldom drilled in a moraine on account of difficulties with boulders and high costs. There is no object, as a rule, in drilling for salt water. These two conditions are responsible for the grave lack of wells in various parts of Kings and Queens counties. This is unfortunate as the Cretaceous strata are heavily eroded in southern Kings and the aquifers quite likely are interconnected through the Jameco. In addition, more information as to the Jameco and Gardiners beds in this locality is badly needed.

Veatch's "Sound River Valley"

There is a deep valley in the Cretaceous heading up under Jamaica and running south. Veatch supposed that this connected with Long Island sound, but this appears not to be the case. The contours of this valley drawn from the available data show results which are topographically unsatisfactory. They show a deep gorge terminating in a narrow steep sided head. Such shape would be expected if there were a southward running stream passing over a rock ledge in a waterfall to form the head of the gorge. In this case, neither the feeder stream nor the necessary resistant ledge are known or even suspected. Further information about this is needed.

Undrained Basins

The best gathering grounds for ground water are level gravel deposits like Hempstead Plains or basins and valleys without surface drainage outlets. Of these last, two are of importance.

Lake Ronkonkoma is a sink. It lies in the Ronkonkoma moraine just east of Nissequogue glacial outwash channel into which it probably once overflowed. The apparent tributary drainage area extends to the north to the Harbor Hill moraine and is a rather narrow strip.

East of this basin the intermorainal area extends easterly to include Peconic bay, but there are two sections which do not drain into that bay.

The western end of this area is a wide deep valley in which a stream runs easterly as far as Coram, thence southerly to the Ronkonkoma moraine where it goes underground in Coram sink. Topographically this stream should be a branch of Carmans river and very possibly some water carried by it in flood times reaches that stream. Study of the flow in these streams would be profitable.

Yaphank Complex

A strip of territory running across the island in the neighborhood of Yaphank and Camp Upton (Brookhaven Laboratory) topographically is so peculiar that it should be studied with care. Fuller noticed this and put a map of it in his report, but he did not discuss it at any length except to state that the two ridges were Pre-Wisconsin.

Near Coram the Ronkonkoma moraine turns sharply south, thence runs east just north of Yaphank and then north again through Manorville and Calverton. In this southward sag, the moraine is less massive than elsewhere, or else it has been partly buried by glacial outwash.

Coram sink above mentioned lies at the westerly foot of a north and south ridge several miles long, the southern end of which rests on the Ronkonkoma moraine. The hamlet of Middle Island is on the east side of this ridge. Further east there is another ridge some five miles long running more nearly northeast. These ridges form a "V" pointing south, the apex of which is notched and occupied by Carmans river. In the "V" shaped area between the ridges there is a small lake and a number of converging streams which drain the area to the north and parts of the territory northwest of the western ridge. These streams join to form Carmans river which flows to the Atlantic.

There is some evidence that the stream disappearing in Coram sink once flowed around the northerly ends of these ridges to Peconic river.

East of the easterly ridge and occupying the space down to and north of the sag in the moraine is Camp Upton. This area is a sort of basin and is the headwaters of Peconic river. There are numerous streams in it, but they all seem somewhat uncertain. Some run into sinks, others have interrupted courses. Some show signs of having reversed the direction of flow. Kettle holes and valleys are numerous and appear to define an earlier drainage system running northerly towards Wading river. This section probably is a good gathering ground, but the direction of underground flow is obscure and needs study. This particularly is true on account of the wastes from the Laboratory. South of Ronkonkoma moraine and to the east a neck extends to the south. Topographically this neck seems to differ somewhat from its neighbors. It extends further south almost touching Great South Beach and it is but little eroded, Carmans river runs along its west side.

West of the neck and extending from the moraine at Yaphank to the bay there is a flat bottomed valley about three miles wide, sloping to the south.

This whole area needs study as to its history and the significance of the formations and their effect on the ground water of the island.

PART III

REFERENCES AND INFORMATION

SUGGESTIONS AS TO THE USE OF MAPS

Russell Suter

HOW TO USE MAPS AND PROFILES

A. Commonly the information we are asked to give the public is the probable depth of a well at a selected spot and reaching a specified aquifer.

First it is necessary to determine the location of the proposed well, its latitude and longitude, and the surface elevation at the proposed site. These data most easily can be obtained by using the topographic maps of the United States Geological Survey or the maps recently published by the United States Army Engineers, but, particularly in the City of New York and other built-up areas, special detailed street maps may have to be used first in order to locate the well on the topographic maps.

Lists and key maps of the above topographic sheets are appended.

The site of the proposed well is plotted on the appropriate topographic map by reference to streets, roads and other objects. The elevation at the site is determined and the latitude and longitude.

The site of the well is then plotted on the corresponding maps in this report. As the well must be located on several maps, three point dividers will be found very convenient. Finally, the elevation of the top of each formation and aquifer under this site is obtained by interpolation between the contours on the various maps.

From this information, a prospective log of the well can be plotted. This may be checked by locating nearby wells and looking up the data on them, either from our publications or in our Long Island office. Estimates of water levels, quality and probable yield can be obtained in the same manner.

B. From studies of water levels and the fluctuating drawndown, interference between wells and other characteristics, the profiles will be most useful. If the published profiles are too remote or inconveniently oriented, special profiles readily can be prepared from the contour maps.

C. We depend on the logs furnished us by the drillers to correct these maps and profiles and keep them up to date. Eventually the driller will help himself as well as others by giving us the most accurate information possible. This is more particularly important in those cases where our maps are found to be greatly in error, as may too often happen.

D. Drillers and others doing much of this work and needing the most accurate information will probably prefer to use our Geological Atlas (Bulletin GW–19) or separate sheets from it. This atlas contains the same maps as are contained in this report but on a larger scale and are constantly subject to revision to keep them as nearly up to date as possible. This atlas also contains profiles on all fifteen minute meridians and parallels of latitude and longitude, only a few of which are reproduced in this report. This atlas, or individual sheets from it, may be obtained from the Commission at cost.

TOPOGRAPHIC MAPS OF LONG ISLAND

U. S. Geological Survey

U. S. Army

TOPOGRAPHIC MAPS OF LONG ISLAND BY THE U. S. GEOLOGICAL SURVEY

Geological Survey maps at a scale of 1:62,500 (About 1 inch = 1 mile) with contour intervals of 20 feet, covering Long Island counties in some 14 quadrangles, are entitled as follows:

Staten Island
Harlem
Brooklyn
Stamford (Conn.)
Oyster Bay
Hempstead
Northport
Babylon
Setauket
Fire Island
Moriches
Riverhead
Shelter Island
Sag Harbor
New London (Conn.)
Gardiners Island
Easthampton
Stonington (Conn.)
Montauk

These may be purchased locally or directly from the Director, U. S. Geological Survey, Washington, D. C.

TOPOGRAPHIC MAPS OF LONG ISLAND PUBLISHED BY THE CORPS OF ENGINEERS OF THE UNITED STATES ARMY

These may be obtained from:

Army Map Service
6500 Brooks Lane
Washington 16, D. C.

Jersey City, N. J.
Narrows
Mt. Vernon
Central Park
Brooklyn
Coney Island
Flushing
Jamaica
Far Rockaway
Stamford, Conn.
Glenville, Conn.
Mamaroneck
Sea Cliff
Lynbrook
Lawrence
Oyster Bay
Hicksville
Freeport
Jones Inlet
Lloyd Harbor
Huntington
Amityville
Jones Beach
Northport
Greenlawn
Bay Shore West
St. James
Central Islip
Bay Shore East
Port Jefferson
Patchogue
Sayville
Middle Island
Bellport
Howell Point
Wading River
Moriches
Riverhead
Eastport
Mattituck Hills
Mattituck
Quogue
Southold
Southampton
Shinnecock Bay
Orient
Greenport
Sag Harbor
New London, Conn.
Plum Island
Gardiners Island
East Hampton
Gardiners Island East
Gardiners Island West
Napeague Beach
Mystic, Conn.
Montauk Point

SUMMARY OF INFORMATION ON LONG ISLAND WELLS AVAILABLE IN THE LONG ISLAND OFFICE WATER POWER AND CONTROL COMMISSION

SUMMARY OF INFORMATION ON LONG ISLAND WELLS AVAILABLE IN THE LONG ISLAND OFFICE OF WATER POWER AND CONTROL COMMISSION

The following data are on file in the Long Island office of the Commission and there may be consulted by the public:

Water Supply Applications involving Long Island Water Supply Systems and wells—110 series—complete files. Published decisions may be found in the annual reports of the State Water Supply Commission and the Conservation Commission prior to 1920, thereafter in State Department Reports.

Long Island Well Applications complete files, decisions are summarized in annual reports, important decisions are published in State Department Reports.

Well Location Maps—There are on file sectional maps and atlases covering Long Island on which the locations of all known wells have been plotted together with the official identifying number.

Well Data—Data on all known wells filed by official number. This is made up of census sheets, drillers' final reports and similar data. This file is cross indexed as to the special data given with regard to each well.

Drillers' Preliminary Reports

Drillers' Final Reports (filed under well data)

Water Levels in Observation Wells—These water levels are published annually in the bulletins of the U. S. Geological Survey, a list of which will be found below, under reference. More recent observations, not yet published, can be consulted in blueprint form.

Observation Wells—Wells in which observation of water levels and other characteristics are taken. These are shown on various maps, and the data are on file. Water levels, fluctuations, charts showing such fluctuations are on file.

Pumpage Data

Recharge Data, also designs of diffusion wells.

Geological Correlations of Well Logs—Those included in this report, data to keep them up to date and early correlations made by other parties, notably Veatch and Crosby.

Geologic Maps and Sections—Those included in this report and others.

Topographic Maps—United States Government, United States Coast Survey Charts.

Ground Water Level Maps—Contour maps made from time to time showing the upper ground water surface on definite dates.

LONG ISLAND GROUND WATER BULLETINS
Water Power and Control Commission
In cooperation with
U. S. Geological Survey

LONG ISLAND

Ground Water Bulletins

GW–

1.	Withdrawal of Water in Long Island	*D. G. Thompson*
2.	Engineering Report—Water Supplies of L. I.	*R. Suter*
3.	Records of Wells—Kings (1)	*R. M. Leggette*
4.	Records of Wells—Suffolk (1)	*R. M. Leggette*
5.	Records of Wells—Nassau (1)	*R. M. Leggette*
6.	Records of Wells—Queens (1)	*R. M. Leggette*
7.	Report—Geology and Hydrology Kings and Queens	*J. H. Sanford*
8.	Record of Wells—Kings (2)	*R. M. Leggette and M. L. Brashears, Jr.*
9.	Record of Wells—Suffolk (2)	*C. M. Roberts and M. L. Brashears, Jr.*
10.	Record of Wells—Nassau (2)	*C. M. Roberts and M. L. Brashears, Jr.*
11.	Record of Wells—Queens (2)	*C. M. Roberts and M. C. Jaster*
12.	Water Table in Western and Central Parts of Long Island	*C. E. Jacob*
13.	Configuration of Rock Floor—Western Long Island	*W. de Laguna* *M. L. Brashears, Jr.*
14.	Correlation of Ground Water Levels and Precipitation	*C. E. Jacob*
15.		
16.		
17.	Geological Correlation of Logs of Wells in Kings County, New York	*W. de Laguna*
18.	Mapping of Geological Formations and Aquifers of Long Island, N. Y.	*R. Suter and others*
19.	Geologic Atlas of Long Island, N. Y.	*R. Suter*

In general these bulletins have been published in small editions; copies of them have been deposited in most of the libraries in the City of New York and on Long Island so that they may be available for ready reference.

Aside from Bulletins GW–2, GW–18 and GW–19, these generally are unavailable for public distribution. The three above mentioned may be obtained from the Commission.

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MAURICE L. BRASHEARS, JR.
District Geologist

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VIII

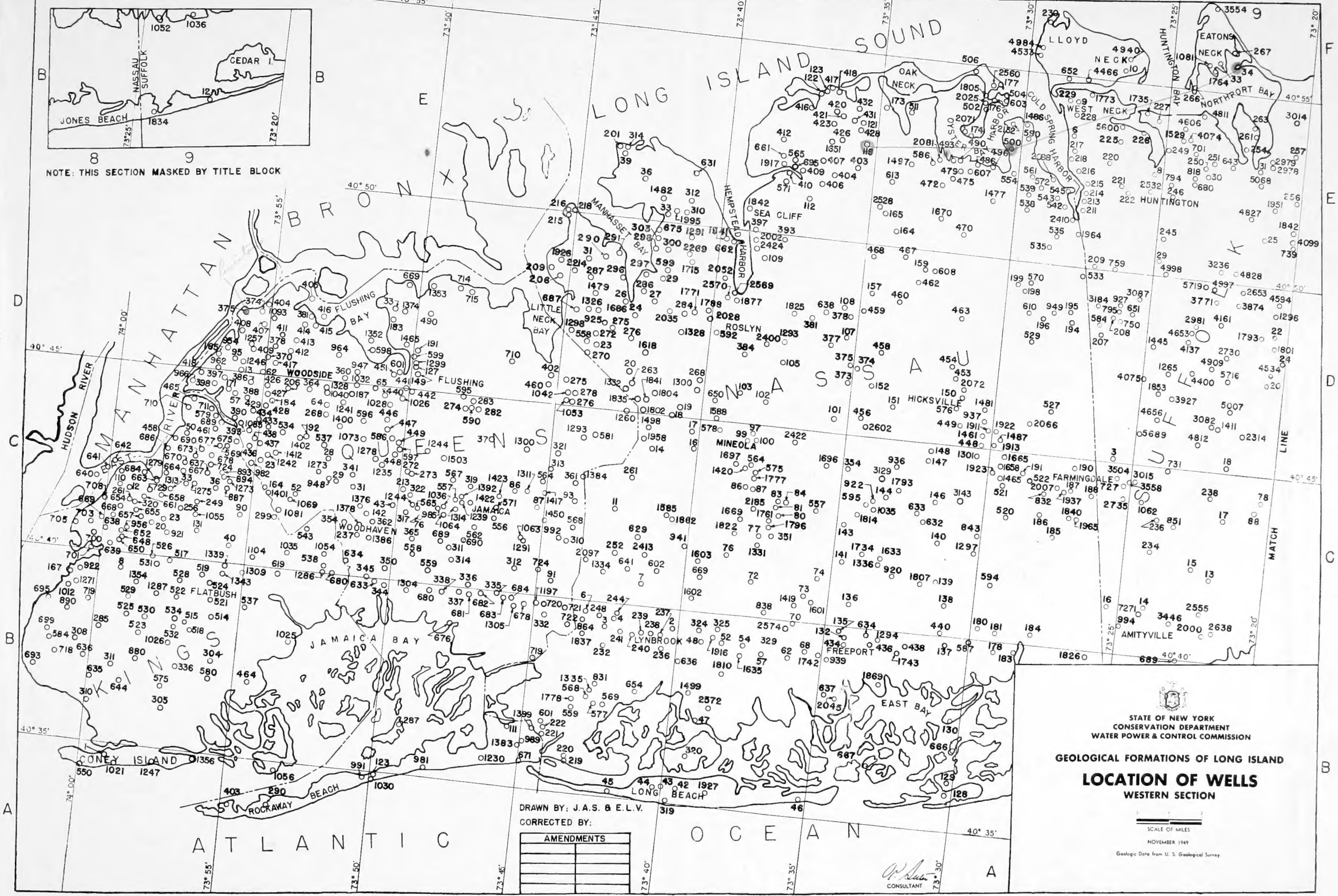
MAPS AND PROFILES

LIST OF PLATES

GEOLOGIC FORMATIONS OF LONG ISLAND

PLATE V

BULLETIN G. W. 18



DRAWN BY: J.A.S. & E.L.V.

CORRECTED BY:

AMENDMENTS	

CONSULTANT

STATE OF NEW YORK
CONSERVATION DEPARTMENT
WATER POWER & CONTROL COMMISSION

GEOLOGICAL FORMATIONS OF LONG ISLAND

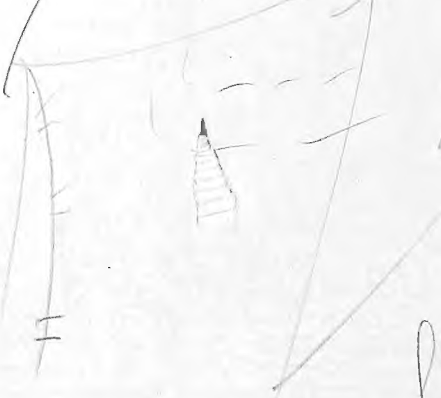
LOCATION OF WELLS

WESTERN SECTION

SCALE OF MILES

NOVEMBER 1949

Geologic Data from U. S. Geological Survey



Well
We