Hurricane Protection Unit
New England Division
Corps of Engineers, U.S. Army

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

BEACH EROSION BOARD
OFFICE OF THE CHIEF OF ENGINEERS

GEOMORPHOLOGY OF THE SOUTH SHORE OF LONG ISLAND, NEW YORK

TECHNICAL MEMORANDUM NO. 128

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SEPTEMBER 1961

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FOREWORD

The regional studies are a part of the General Investigations program of the Beach Erosion Board and are designed to simplify and expedite the solution of local problems by giving a compilation of all existing data pertinent to shores and shore processes in a particular region. Three components of the regional studies are geomorphology (Chapter I), littoral materials (Chapter II), and littoral forces (Chapter III). This report presents the geomorphology of the selected coastal compartment. The littoral materials chapter for this compartment will be reported separately and a portion of the littoral forces chapter has been published in Beach Erosion Board Technical Memorandum No. 55. This report treats, in broad scope, the geologic factors which have influenced the development of the south shore of Long Island to date. The interpretation of geologic events has been drawn from the works of many authors while the history of shore line changes and inlet migration has been compiled mainly from United States Coast and Geodetic Survey and Corps of Engineers data.

The author of the report, Norman E. Taney, is Chief of the Geology Branch of the Engineering Division of the Beach Erosion Board under the supervision of Jay V. Hall, Jr., Chief of the Division. At the time this report was completed, the technical staff of the Board was under the supervision of Major General Keith R. Barney, President of the Board, Colonel H. E. Sprague, Executive, and R. O. Eaton, Chief Technical Advisor. The report was edited for publication by A. C. Rayner, Chief, Project Development Division.

Views and conclusions stated in the report are not necessarily those of the Beach Erosion Board.

This report is published under authority of Public Law 166, 79th Congress, approved July 31, 1945.

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APPENDIX A: Ranges Along the South Shore of Long Island

APPENDIX B: Comparative Profile Data for the South Shore of Long Island

ERAS	PERIODS	EPOCHS	GEOLOGIC TIME (Years)	ASSOCIATED EVENT
CENOZOIC	QUATERNARY	RECENT	2.5×10^4	
		PLEISTOCENE	1.0×10^6	GLACIATION
	TERTIARY	PLIOCENE	1.1×10^7	CASCADIAN REVOLUTION
		MIOCENE	3.0×10^7	
		OLIGOCENE	4.0×10^7	SCHOOLEY PENEPLAIN
		EOCENE	6.0×10^7	
MESOZOIC	CRETACEOUS		1.25×10^8	LARAMIDE REVOLUTION
	JURASSIC		1.55×10^8	FALL ZONE PENEPLAIN
	TRIASSIC		1.85×10^8	PALISADE DISTURBANCE
PALEOZOIC	PERMIAN		2.25×10^8	APPALACHIAN REVOLUTION
	PENNSYLVANIAN		2.75×10^8	
	MISSISSIPPIAN		3.15×10^8	
	DEVONIAN		3.60×10^8	ACADIAN DISTURBANCE
	SILURIAN		3.85×10^8	
	ORDOVICIAN		4.50×10^8	TACONIC DISTURBANCE
	CAMBRIAN		5.55×10^8	GREEN MOUNTAIN DISTURBANCE
PROTEROZOIC	KEWEENAWAN			KILLARNEY REVOLUTION
	HURONIAN		(?) 1.45×10^9	
ARCHEOZOIC	TIMISKAMINGIAN			
	KEEWATIN		(?) 4.50×10^9	LAURENTIAN REVOLUTION

CHART OF GEOLOGIC TIME

GEOMORPHOLOGY OF THE SOUTH SHORE OF LONG ISLAND, NEW YORK

by

Norman E. Taney
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INTRODUCTION

All coasts with their varied forms and different stages of development follow the law of uniformitarianism which sets forth in essence that the present is the key to the past. Upon amplification, the doctrine further states that the processes now functioning could have produced all of the geologic and geomorphic features of the earth if given sufficient time. It follows then that all coastal types go through orderly routines controlled by existing processes during morphological aging with each type having its own variations. Today's coast is one of the stages in the aging process and from observations of current conditions one is able to deduce past occurrences and to predict future events, if the particular development pattern is known. It is apparent, therefore, that it is virtually impossible to assess a local coastal problem unless full consideration is given to all of the factors which have influenced the development of the present form of that segment of coast. The purpose of this report is to depict the geologic and geomorphic factors.

DESCRIPTION OF THE AREA

Long Island is a long narrow island which projects east-northeastward from New York City to form a fish-like extension of New York State. The island lies south of and is approximately parallel to the Connecticut shore of New England and is separated from that shore by Long Island Sound. To the south and through to the northeast are the relatively unlimited fetches of the Atlantic Ocean. To the north and west lies the continental mass of the United States.

The island is part of the Coastal Plain province which lies along the eastern border of the United States. Figure 1 shows the physiographic provinces of the northeastern United States. The seaward extension of the Coastal Plain, the Continental Shelf, is some 80 to 100 miles wide south of Long Island, and much wider to the east due to the presence of Georges Bank. Long Island Sound to the north is relatively shallow.

The island, although part of the Coastal Plain, is not representative of the province. Glaciation and the attendant effects of ice cover and ice movement mask the typical topography expected. Conspicuous features present are the cuesta-like ridge of the north shore, the Harbor Hill and Ronkonkoma

moraines (the former coinciding with the north shore for much of the eastern part of the island), outwash fans and aprons, erratics, kettles and kettle valleys, and other similar phenomena. Intermittent streams and the presence of several drainage systems without surface outlets indicate glaciation and hide the gently sloping terraces of the Coastal Plain visible in other areas to the south. However, much information concerning the attitude of the subsurface has been gleaned by the geologic correlation of wells, A. C. Veatch (1906), and Suter,de Laguna, and Perlmutter (1949).

The oldest rocks forming the basement complex are exposed on the surface northwest from the island at New York City and are mainly pre-Cambrian and early Paleozoic gneisses and schists. The peneplained surface of the basement dips to the southeast at a rate of about 80 feet per mile. Along the south shore the basement ranges from 700 feet below mean sea level at the Rockaway Peninsula to, it is believed, over 2,000 feet below mean sea level in Suffolk County. No trace of the Triassic red beds and intrusives has been found, although it has been postulated that these less resistant strata form the bottom of Long Island Sound. Thus atop the basement are found the poorly consolidated to unconsolidated deposits of upper Cretaceous, Pleistocene, and Recent ages. The Cretaceous deposits in general end in northeast-southwest belts at the western end of the island and thicken and dip gently toward the southeast. Finally, the glacial and Recent materials mantle most of Long Island.

The submerged extension of the Coastal Plain, the Continental Shelf shown on figure 2, is a gently sloping plain which also dips to the southeast. The surface itself shows the characteristic features of subaerial erosion and wave formed shores. The Franklin and Nicholls former shores complete with offshore bars and lagoons were mapped and indicate a rising sea, Veatch and Smith (1939). The presence of former shores is further substantiated by the presence on the shelf of sand and even gravel near the continental slope, Shepard and Cohee (1936), and Stetson (1938 and 1949). Normally such coarse grained clastic sediments are found close to the low water shoreline and, as a consequence, their presence at and close to the continental slope indicates an ocean bottom not in equilibrium with present sea level.

Crossing the Continental Shelf south of Long Island is the submarine valley of the Hudson River. The valley varies in width from 2 to 10 miles and is more than 100 feet below the surface of the plain. It appears to be a typical drainage system with tributaries, such as the Guerney Channel, entering the valley and a delta-like region at a depth of 40 - 45 fathoms. Further to the southeast, at the edge of the Continental Shelf, is the head of the Hudson Canyon (see figure 2). This great canyon has been cut back into the edge of the shelf for 19 miles and is as much as 3,700 feet deep beneath its rim. It has been postulated that the glacially enlarged Hudson River flowed in this enormous gorge (6 miles wide) during Pleistocene times when sea level was substantially beneath its present elevation, Veatch and Smith (1939).

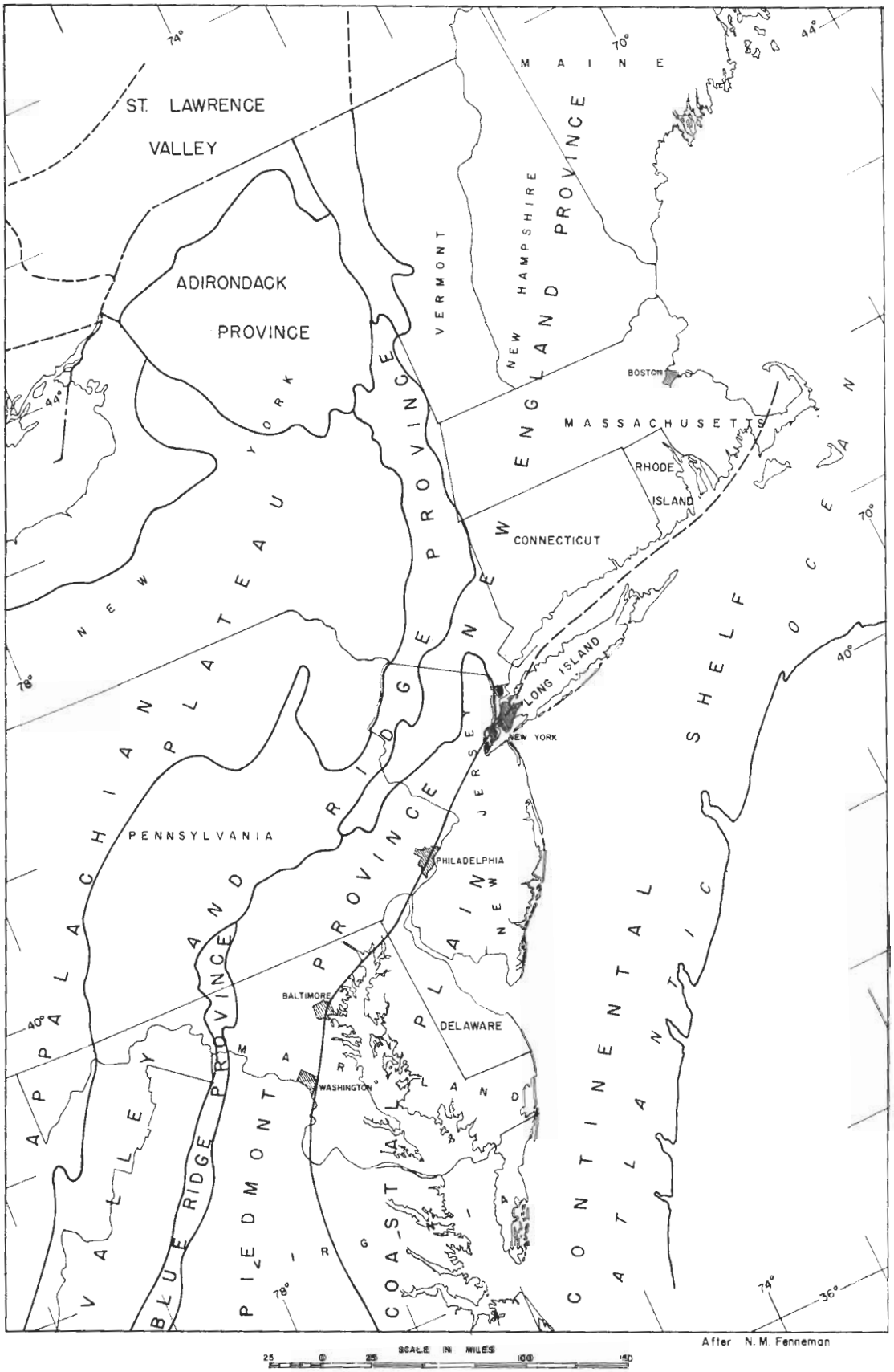


FIGURE I. PHYSIOGRAPHIC PROVINCES OF THE NORTHEASTERN UNITED STATES.

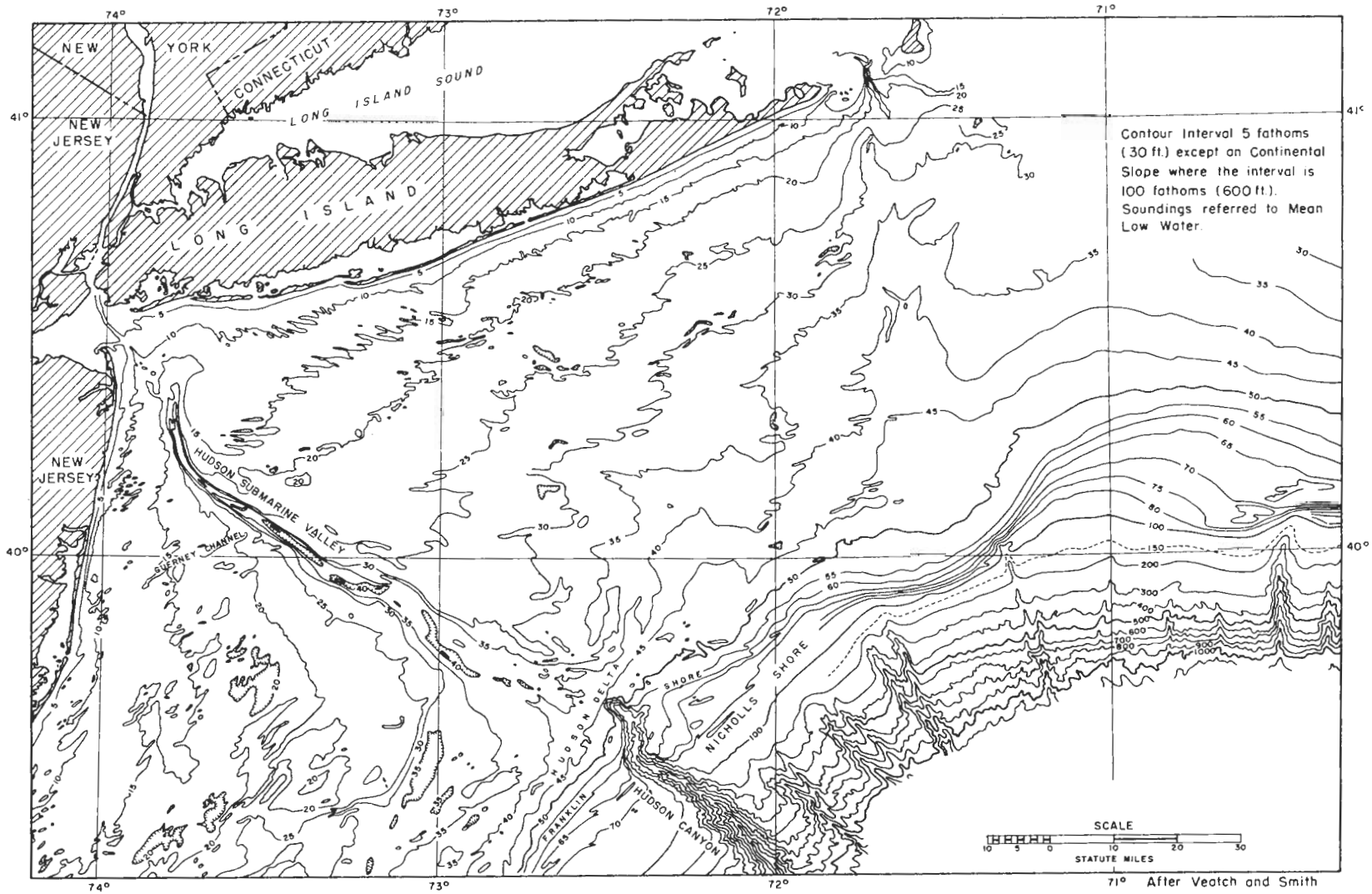


FIGURE 2. SUBMARINE TOPOGRAPHY ON CONTINENTAL SHELF OFF LONG ISLAND, NEW YORK

GEOLOGIC HISTORY

Pre-Cretaceous Time. As in many other areas, very little is known of the pre-Cambrian and early Paleozoic history of Long Island. It is believed, Fuller (1914), that from Silurian or Devonian times to the close of the Paleozoic era the island was subaerial and subject to the normal erosive forces. The early and middle Mesozoic times may have seen the deposition of Triassic red beds and mafic intrusives, but no record of this deposition has been found. During the Jurassic period the land was elevated and eroded and the Fall Zone or possibly the Schooley peneplain, the top of the basement complex, was formed. Late Jurassic or early Cretaceous times witnessed the beginning of the regimen which still exists today.

Cretaceous Period. Uplift and warping or the withdrawal and return of vast volumes of water by developing or wasting glaciers cause successive cycles of transgression and regression of the sea which, in turn, leads to alternate periods of deposition and erosion. Starting late in the Jurassic or early in the Cretaceous period, uplift and gentle arching caused the peneplained surface to tilt downward to the southeast. In turn, a transgressing sea laid down the Cretaceous deposits now found on Long Island. No evidence is available which shows the presence of any pre-Raritan sediments of the same age as the Potomac group of nearby New Jersey. If such sediments were deposited, erosion may well have removed them prior to Raritan times, the earliest Cretaceous sediments found. The Lloyd gravel, the lower member of the Raritan formation, and the Raritan clay, the upper member, were deposited on a subsiding land mass under fresh or brackish water conditions. A minor regression resulted in some erosion of the upper, clay member. Further warping and sinking then caused the deposition of great thicknesses of Magothy clays under marine conditions. This widespread formation rests unconformably on the Raritan clay and, in places, possibly directly on the Lloyd. While post-Magothy erosion has removed much of this formation, great thicknesses still remain (see subsequent section on subsurface formations). The extensive post-Magothy erosion created numerous and deep stream channels and greater relief than is found on the island today (see figure 10). Although these former channels have been filled with later materials, their influence may still be seen on several of the present drainage channels.

Tertiary Period. The end of the Cretaceous is significant on Long Island in that no Tertiary deposits have been identified and that the Quaternary sediments rest unconformably on the Cretaceous. Nearby in New Jersey Eocene, Miocene, and Pliocene (Lafayette formation) deposits were accumulated and have been identified. Nondeposition or post-Lafayette erosion, however, may explain the absence of Tertiary sediments.

Quaternary Period. The Quaternary was characterized by worldwide glaciation and extensive glacial deposits. On the North American continent an area of some four million square miles was affected during the Pleistocene epoch. The ice cover was not, however, static with one ice advance and subsequent recession more than 900,000 years later. Rather it was a

time during which the continental ice front advanced and receded for several cycles. Each of these cycles was accompanied by the lowering (advancing ice sheet) and raising (retreating ice sheet) of sea level and thus produced alternate periods of regressing and transgressing seas. South from Long Island along the Atlantic Coastal Plain the fluctuations in sea level are seen as a series of terraces at varying elevations.

In areas covered by the great ice sheets, such as north of the Ohio and Missouri Rivers, four distinct glacial stages have been determined. These stages represent colder climates, possibly greater precipitation than at present, and active ice growth and advance generally from north to south. Separating the stages of ice growth and advance are warmer, nonglacial stages during which the ice receded. The four glacial and the intervening nonglacial stages as identified in the midcontinent area are given (most recent on top) in table 1. The Wisconsin stage has been subdivided into several substages representing comparatively minor oscillations of the ice front.

Fuller (1914) postulated a schedule of events for Long Island which included all four glacial stages and the intervening nonglacial stages (see table 2)

Later work by Fleming; MacClintock and Richards; Suter, de Laguna and Perlmutter; and others indicate that all post-Gardiners material is of Wisconsin age and, therefore, only two glacial stages are represented on the island (see table 3). The age of the pre-Sangamon is undecided.

TABLE 1

Glacial Stages of the Pleistocene in Midcontinent

Wisconsin	-	glacial
Sangamon	-	interglacial
Illinoian	-	glacial
Yarmouth	-	interglacial
Kansan	-	glacial
Aftonian	-	interglacial
Nebraskan	-	glacial

TABLE 2

Pleistocene Events of Long Island (Fuller)

Stage	Substage	Origin	Equivalent stage in midcontinent area
Wisconsin	Harbor Hill Ronkonkoma	glacial (terminal moraines)	Early Wisconsin
Vineyard		interglacial	Sangamon
Manhasset	Hempstead Montauk Herod	glacial	Illinoian
Jacob	None	transitional	Yarmouth
Gardiners	None	interglacial	
Jameco	None	glacial	Kansan
Post-Mannetto	None	interglacial	Aftonian
Mannetto	None	glacial	Nebraskan

TABLE 3

Later Interpretation of Pleistocene Events on Long Island

Stage	Substage	Origin
Wisconsin	Harbor Hill Ronkonkoma Manhasset	glacial
Sangamon	Jacob Gardiners	transitional interglacial
Pre-Sangamon	Jameco Mannetto	glacial

The oldest Pleistocene formation found on Long Island is the Mannetto gravel. As it is not found at or beneath the present south shore of the island, it is beyond the scope of this report and is not discussed further. Following post-Mannetto erosion, during which much of the enormous canyon of the Hudson River was cut into the continental slope, the Jameco gravel was deposited. Stratification points to waterlaid deposits while the presence of granite and diabase pebbles and cobbles indicate glacial outwash.

The position of the ice front during Jameco times is conjectural, varying in possible position from just north of the island to 20 to 50 miles to the north. The determination of age is also problematical in that the pebbles and cobbles show practically no weathering. It is accepted, however, as of glacial origin and pre-Wisconsin in age.

As the Jameco ice retreated the weather became warmer and sea level rose as the melting ice sheet supplied water to the oceans. The presence of marine and brackish water fossils indicate deposition of the Gardiners clay in shallow bays on the west and slightly deeper water at the eastern end of the island. The fossil entourage and the position of the Gardiners clay suggest a climate much the same as that found on the island today with sea level probably on the order of 50 feet below the present level. A rise in sea level from the lowered level of the preceding glacial stage to that of Gardiners' times, with essentially the same conditions as exist now, would account for offshore bars and lagoons, as are found along the south shore at present.

As the weather grew colder and the ice sheet reformed and advanced after the interglacial period, the Jacobs sand was laid down. This transitional formation, interglacial to glacial, contains marine fossils but no ripple marks nor marsh accumulations which suggests deposition in deeper water than that which prevailed during Gardiners' times. The growth of the continental ice sheet is very strongly indicative of a lowering sea and the exposure of more land surface. These apparently contradictory statements are not opposed, however, for it is recognized that the enormous weight of the ice cap is fully capable of severely depressing the surrounding and underlying "solid" land. By this mechanism, it is believed, the transitional Jacobs sand was deposited as a marine formation.

With further southward advance of the ice sheet the silty sands of the Jacobs gave way to the Herod gravel, the lowest member of the Manhasset formation. As the ice advanced still further and overrode the island, the Montauk till was deposited. In places the till member lies unconformably on the lower member as minor folding and faulting caused by ice shove separates the two. The upper member, the Hempstead gravel, was then deposited atop the till either as a retreatal outwash deposit or as the result of a second advance of the ice front.

The position of sea level during the Manhasset stage is quite clouded. In Gardiners' times the melting ice sheet furnished great volumes of water to the oceans and raised the level of the sea until only the highest parts of the island were exposed (see figure 3). Then as the ice cap grew sea level dropped. The lower Herod and the Hempstead exhibit stratification and sorting typical of subaqueous deposition while the Montauk member is banded and is interpreted as a water-laid deposit by Fleming (1935). Wind faceted pebbles in the late Herod and the position of the formation above present sea level are disturbing factors in accurately determining the elevation of sea level relative to the land surface during Manhasset times. The difficulty in deciphering the fluctuations of sea level during and subsequent to

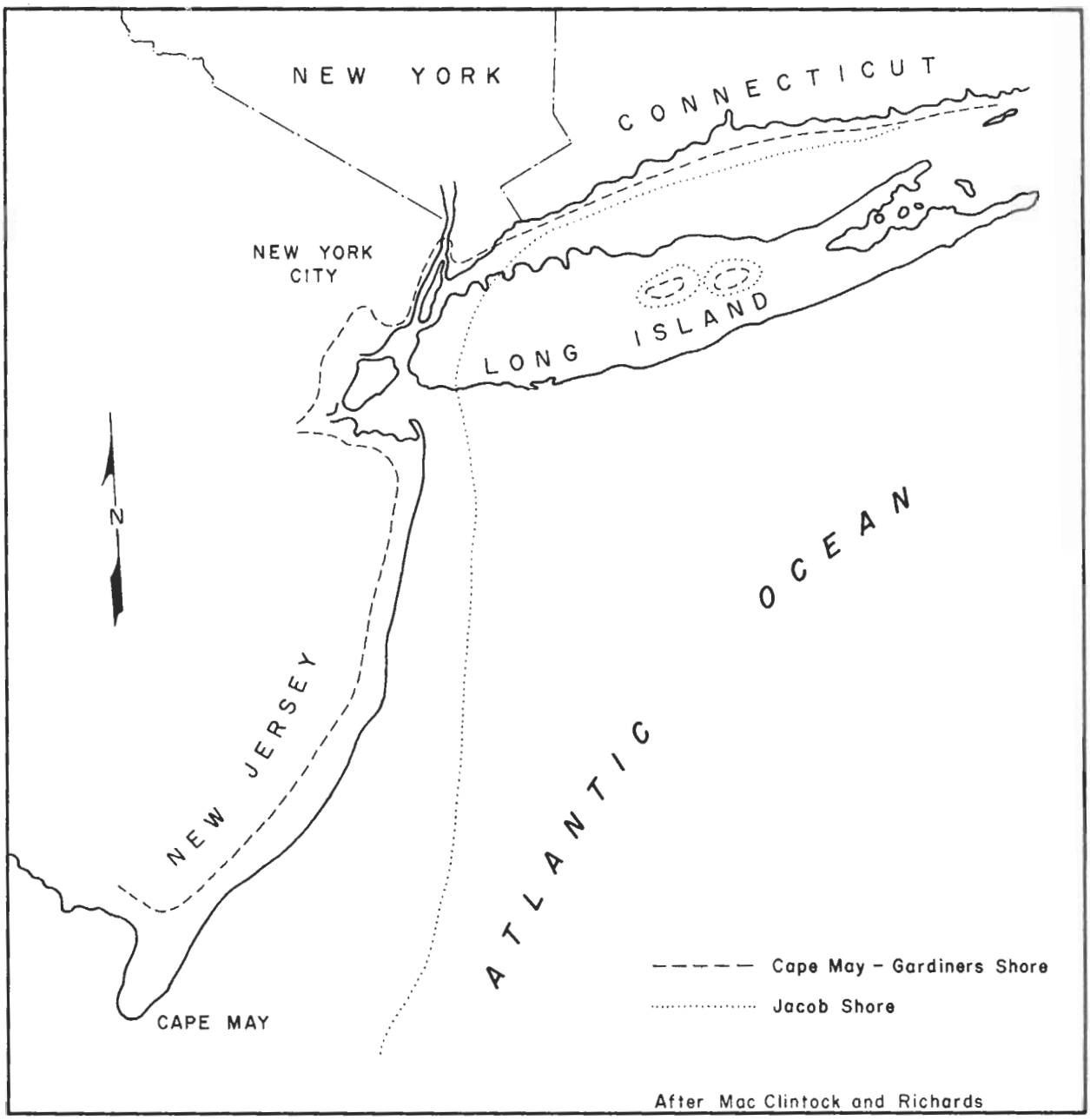


FIGURE 3. PALEOGEOGRAPHIC MAP OF LONG ISLAND DURING GARDINERS AND JACOBS AGES

Manhasset times also complicates the determination of the history of the island during the late Wisconsin.

Fuller, table 2, postulated a long period of erosion, the Vineyard, after the deposition of the Manhasset and then the final advance, slight withdrawal, readvance and retreat of the ice during the Wisconsin glacial stage. Contemporary geologists, table 3, do not recognize the Vineyard and place all post-Gardiners deposits into the Wisconsin age of glaciation. No erosional features, interglacial lagoon nor marine deposits similar to the Gardiners clay have been found and identified as Vineyard in age. In general, an oscillating ice front which first deposited the Manhasset formation, then the Ronkonkoma moraine and its attendant drift and outwash, and finally the Harbor Hill moraine and outwash is the mechanism used to explain the Wisconsin glacial stage. Fleming, in fact, suggests that the Harbor Hill and Ronkonkoma ridges were built during Herod times and then veneered with boulders during a later ice advance.

On the order of 10,000 years ago as the ice melted and withdrew at the end of the Wisconsin sub-epoch, sea level rose and reached its present elevation. During the recent epoch stream erosion and deposition have been minor, but the headlands of the eastern end of the south fluke have been cut back and truncated by wave and littoral forces and the sediments moved westward. As these littoral materials moved westward, a narrow beach was built abutting the headlands and separating the headlands from the sea. This process also sealed off the small bays from the ocean to the south. West of Southampton a combination of spit and offshore bar has enclosed a series of bays or lagoons which are intermittently connected to the ocean by tidal inlets. The inlets are cut through during storms and would, in the normal course of events, be sealed naturally unless they are stabilized and maintained. During the most recent past migration of the inlets to the west has resulted in overlapping, such as is found at Fire Island, Rockaway, and East Rockaway Inlets, see figures 22, 23 and 24.

Two features are found on and north of the barrier beaches. On the beaches and offshore islands the winds have erected sand dunes of varying height and length. Ranging in height from 10 to more than 30 feet and in length from circular mounds to miles, the dunes front most of the Atlantic coast. However, those of the Rockaways, as well as the once conspicuous dunes of Coney Island have been modified greatly by human activity. In the lagoons north of the barrier islands are the fresh and salt marshes of Recent age. The salt marshes have increased the area of the island by at least 100 square miles. The marshes fringe the shores of the bays and, west from Fire Island Inlet, are present as islands.

GEOLOGIC FORMATIONS

Most of the surface of Long Island is covered with stratified or unstratified glacial deposits. The narrow barrier beaches formed by marine forces and the marshes are the non-glacial areas. All of the surface

deposits rest unconformably upon Cretaceous sediments. No Tertiary deposits are now visible on the surface nor have they been found in wells. Beneath the Cretaceous is the peneplained basement complex.

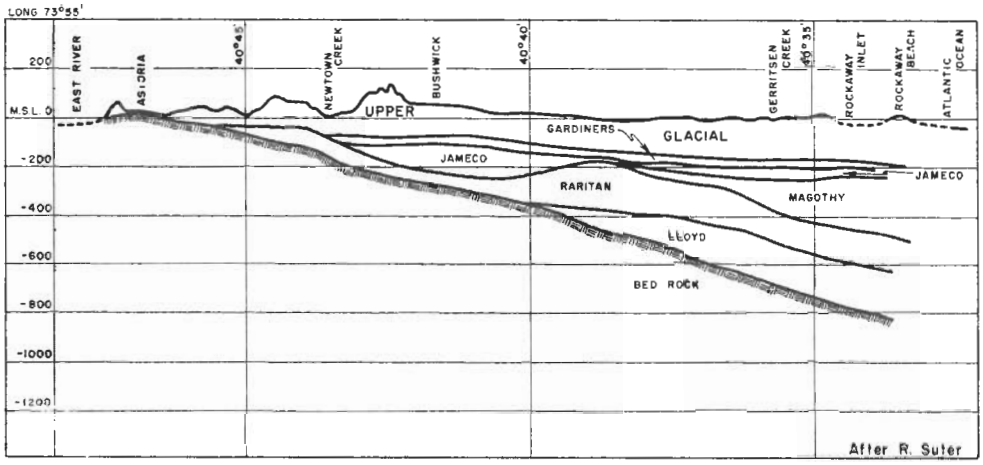
Subsurface Formations. The attitude of the subsurface has been deduced by many geologists from the geologic correlation of well logs. Vertical sections are given by Fuller (1914) and Suter, de Laguna, and Perlmutter (1949) and are shown in figures 4, 5, 6, and 7; however, such sections contain inherent inaccuracies due to the means of collecting and analyzing the data. The wells are not equally spaced and are lacking in some areas, such as along the Harbor Hill moraine in Kings County or in eastern Suffolk County. Difficulties in distinguishing various formations and in correlating such well logs lead to erroneous information. Contouring a hidden surface without knowledge of critical areas of change lacks precision. The above, plus the absence of numbers of deep wells in Suffolk County, subject the maps and the vertical sections derived from them to change as further data are acquired.

The basement complex has been penetrated by a number of wells at the western end of the island; however, only six wells reach to this surface in all of Suffolk County. Because data are so lacking, only a very generalized subsurface contour map on top of the basement can be drawn, figure 8. The basement is made up of gneiss, schist, some quartzite and some dolomite of pre-Cambrian and early Paleozoic age. It is a deeply weathered peneplain which slopes gently to the southeast.

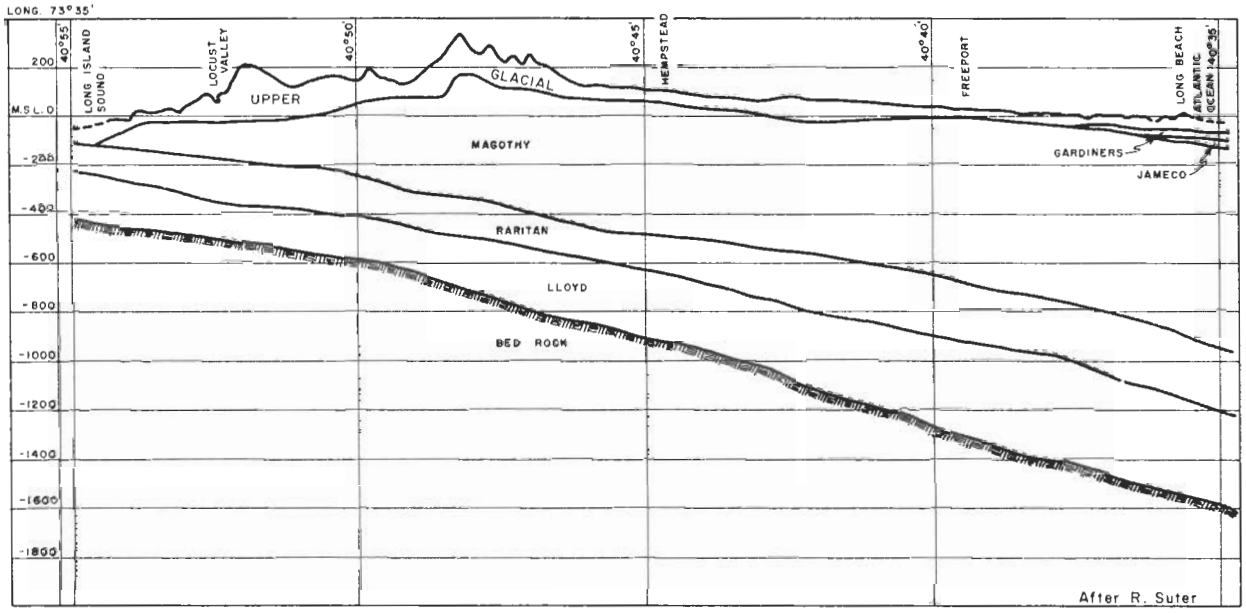
The Cretaceous sediments lying unconformably on the basement pinch out along the northeast-southwest line at the western end of the island. Usually the younger formations overlap the older and extend further to the northwest. All of the Cretaceous formations thicken toward the southeast.

The Lloyd gravel, a part of the oldest Cretaceous formation found in the wells, ends approximately along a line from Flushing Bay to Coney Island. The upper face of this member slopes downward to the southeast at approximately 60 feet per mile. The gradually thickening member is composed of medium to coarse clear sand and fine to coarse gravel. Mixed with the gravels in patches locally are some fine sandy clay, clayey sand, and very thin layers of clay. The thickness varies from 20 to slightly over 300 feet.

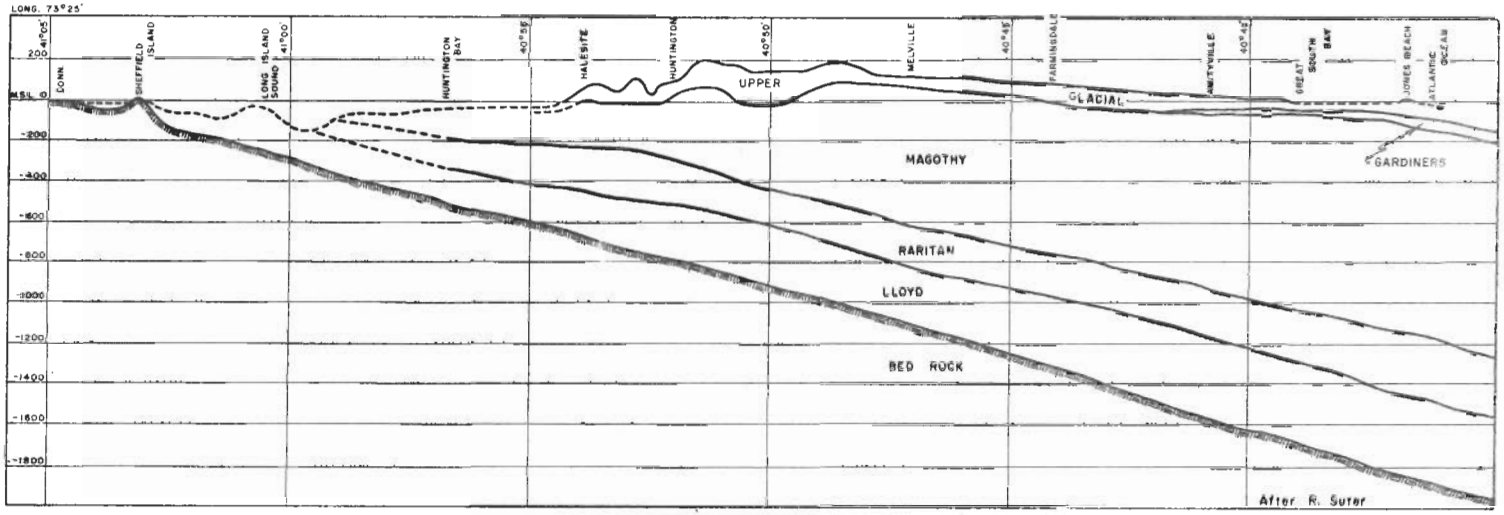
The second part of the Raritan formation, the Raritan clay member, lies conformably on the Lloyd gravel. Clay, silty clay, and some sandy layers make up this member with light to dark gray colors being most common. Floral fossils present at all depths and the absence of marine fossils would point to subaerial deposition. Erosion subsequently removed parts of the Raritan clay until it now extends just to the west and northwest of the Lloyd member. The same erosion may have completely removed the clay member in limited areas and exposed the Lloyd to the overlying Magothy. The surface of the Raritan clay is shown in figure 9. The thickness of the Raritan clay varies from 30 to 300 feet.



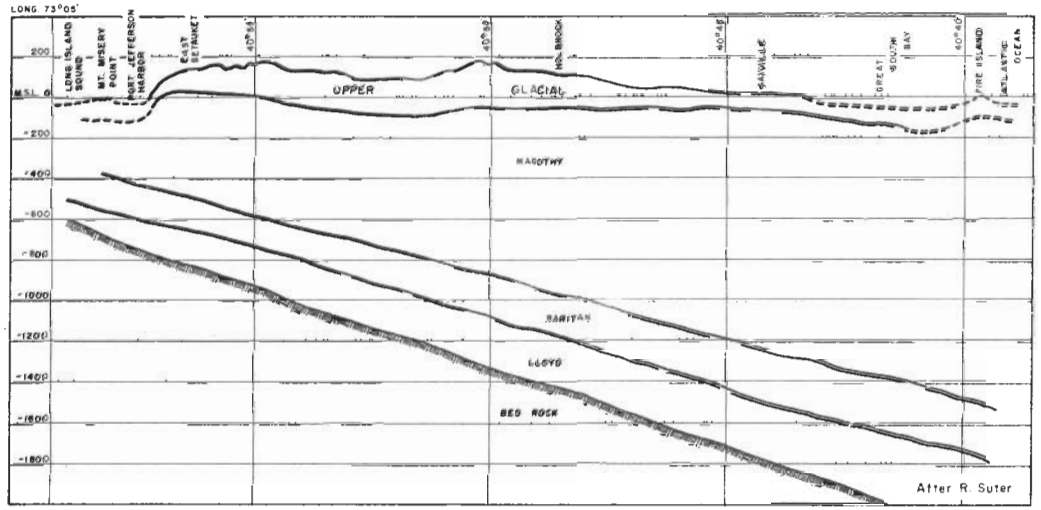
VERTICAL SECTION — LONGITUDE 73° 55' W.
FIGURE 4.



VERTICAL SECTION — LONGITUDE 73° 35' W.
FIGURE 5.



VERTICAL SECTION — LONGITUDE 73°25' W.
FIGURE 6.



VERTICAL SECTION — LONGITUDE 73°05' W.
FIGURE 7.

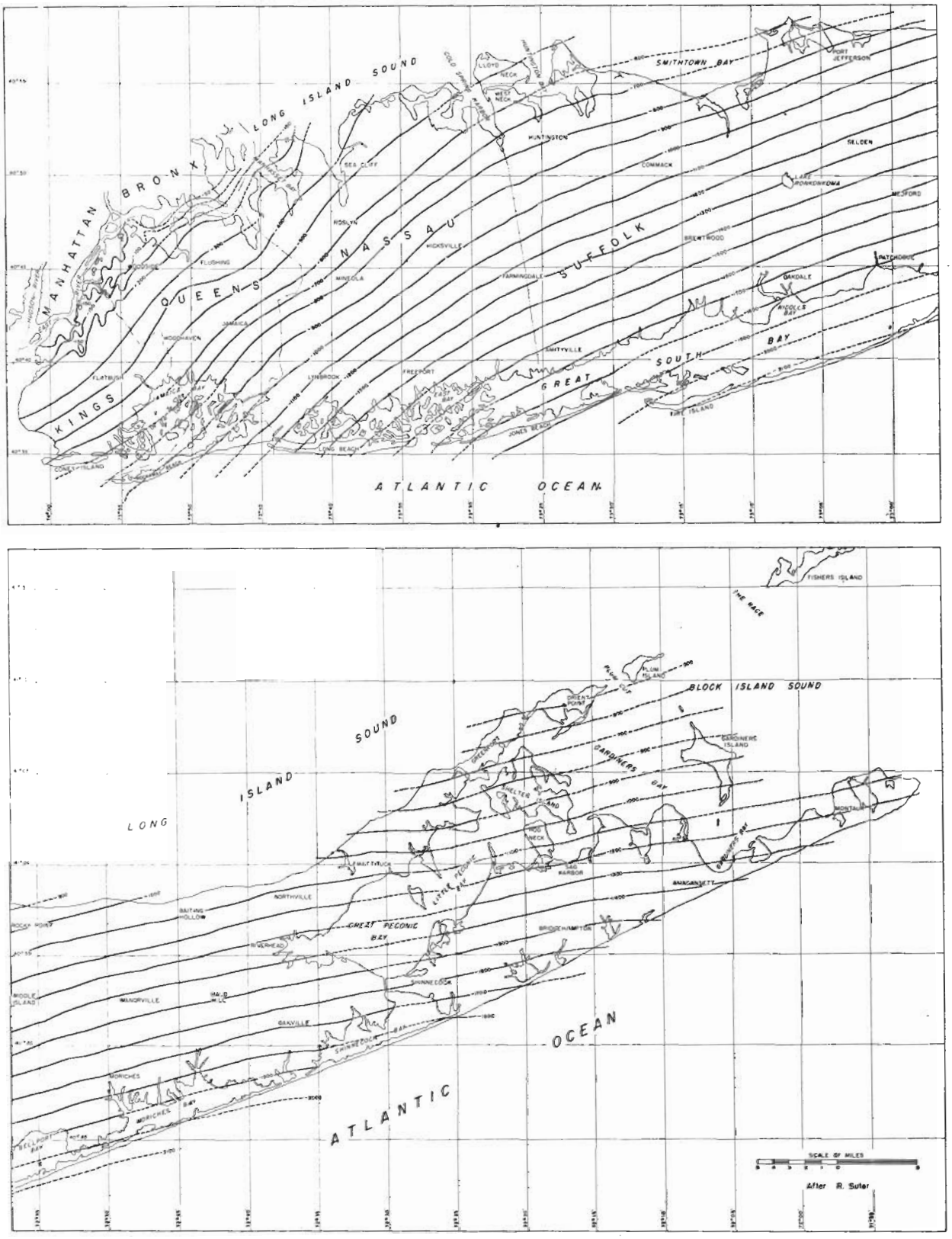


FIGURE 8. STRUCTURE CONTOUR MAP ON TOP OF THE BASEMENT COMPLEX

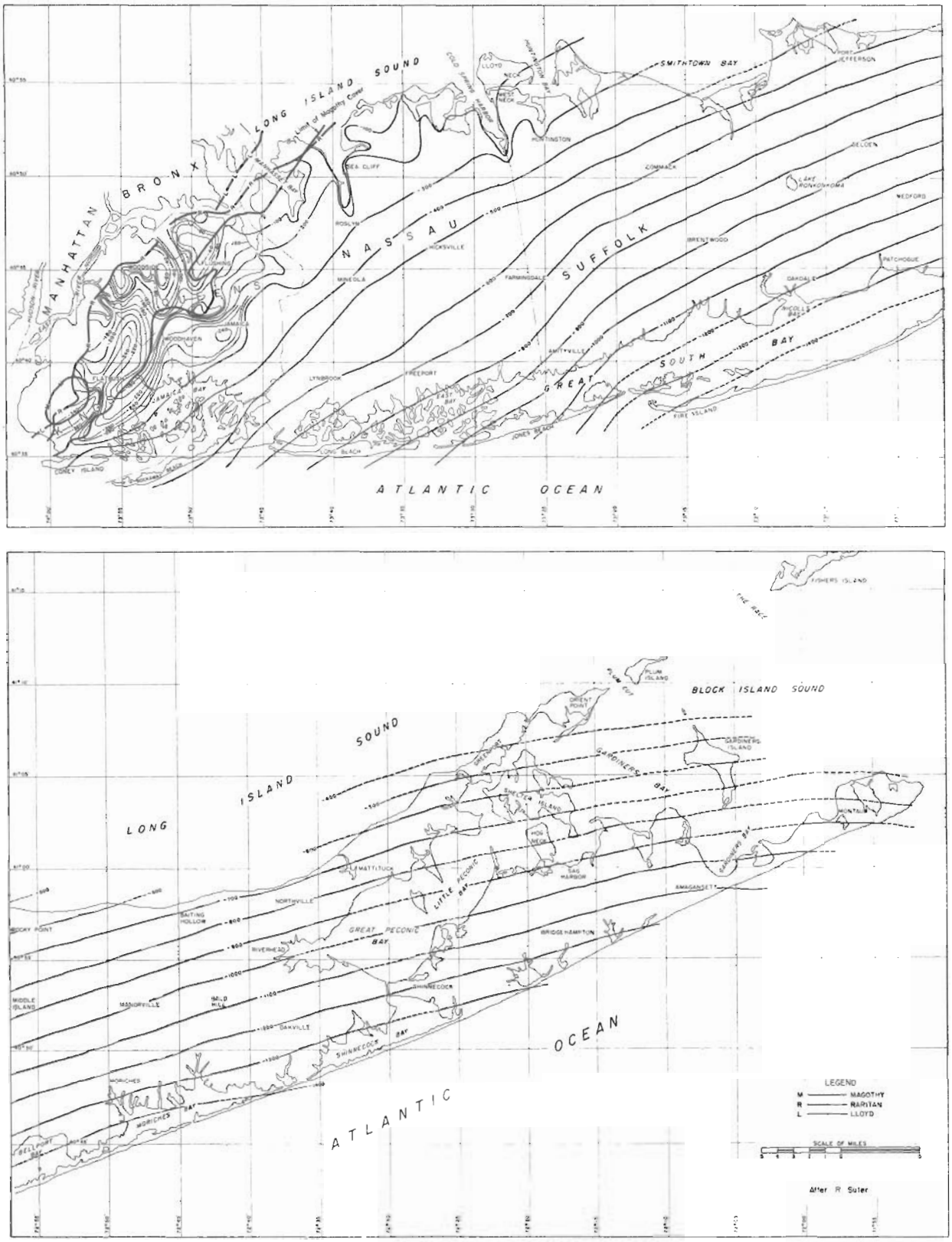


FIGURE 9 STRUCTURE CONTOUR MAP ON TOP OF THE RARITAN

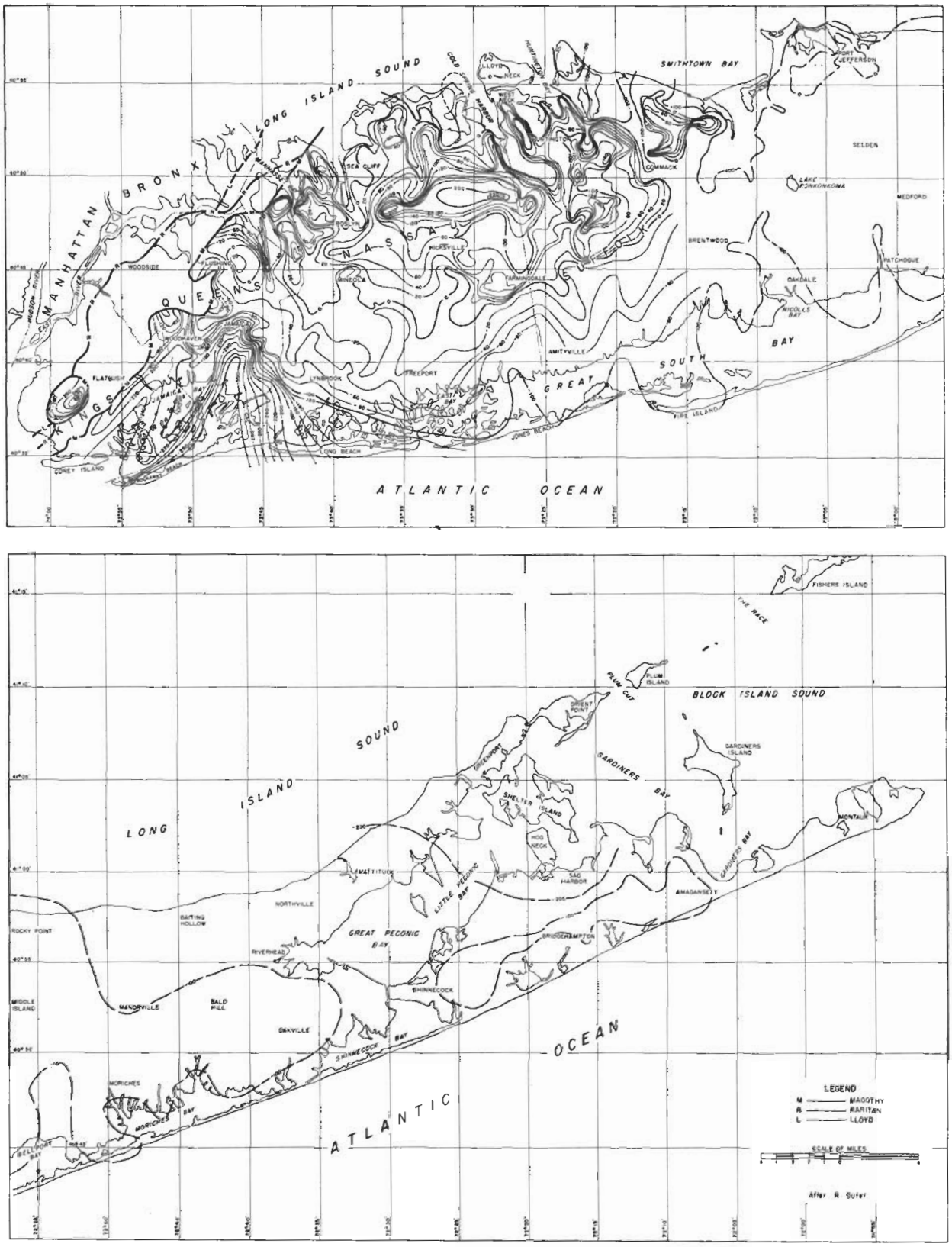


FIGURE 10 STRUCTURE CONTOUR MAP ON TOP OF THE MAGOTHY

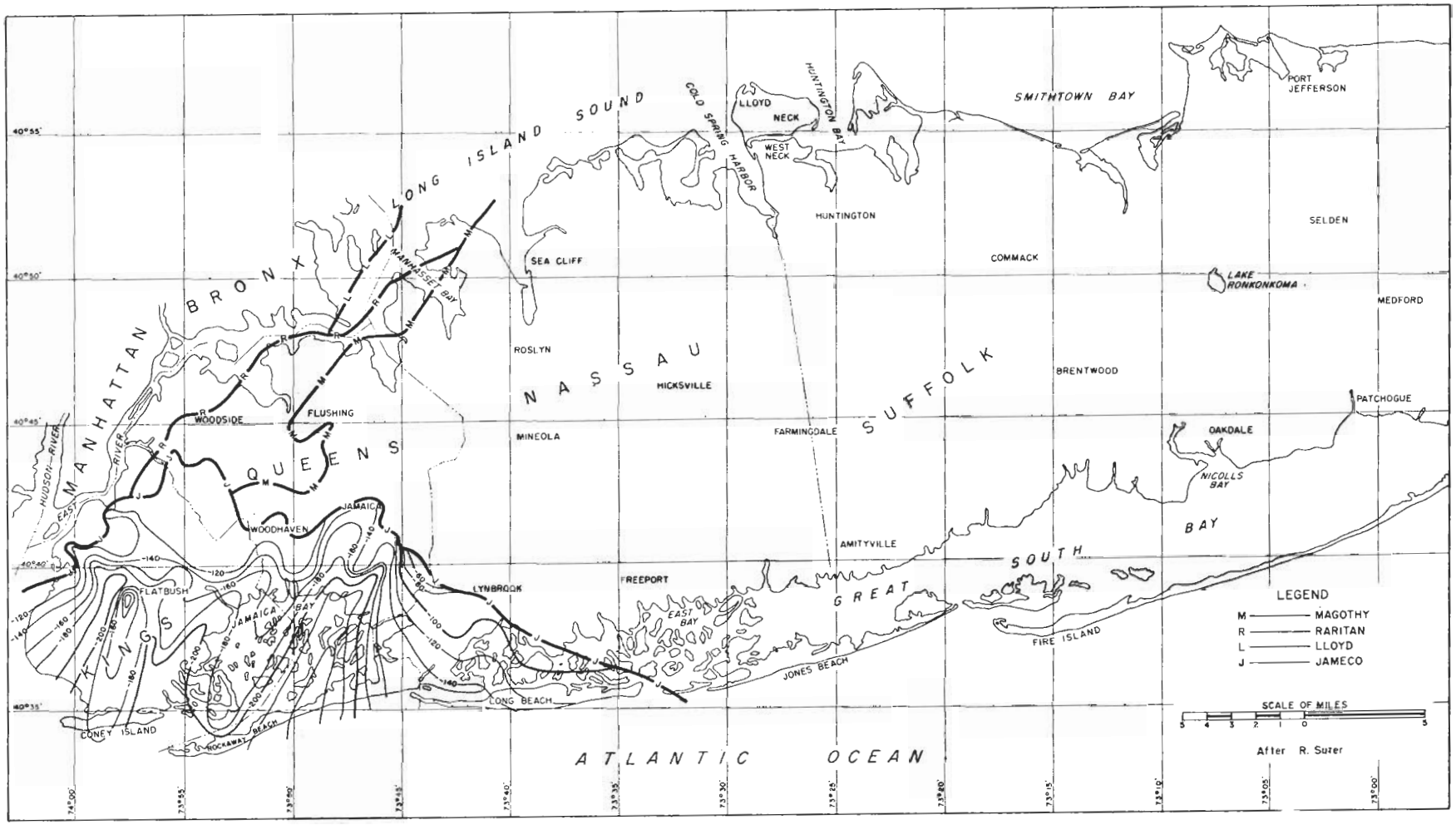


FIGURE 11. STRUCTURE CONTOUR MAP ON TOP OF THE JAMECO

After the erosion period the Raritan formation was deeply buried by the clayey sands, fine sands, silts, solid clays, and several strata of sand and gravel of the Magothy. The formation is widespread and is found as far away as Connecticut. The water-laid deposits were then subjected to a long period of erosion and the resulting land mass was much similar to the present day Long Island but without its glaciated cover and without the north fluke. The remains of the Magothy now extend nearly to the westerly limit of the Lloyd with the thickness varying from 50 to 1,000 feet and the surface, shown on figure 10, probably having greater relief than at present.

Tertiary deposition either never occurred in this area or the deposits have been removed and Quaternary sediments now rest unconformably on the Cretaceous or on the basement. The first of the Pleistocene deposits was the Mannetto gravel, much of which has subsequently been eroded, Fuller (1914). The earliest Pleistocene deposit still found along the south shore is the Jameco gravel. This formation is present in Kings, southern Queens, and southwestern Nassau Counties, while its extent, if any, in Suffolk County has not been determined. Figure 11 depicts the surface of the Jameco. Typically it is either dark gray or brown coarse sand and gravel with some cobbles and boulders of granite, gneiss, and other rock, and several scattered strata of silt and clay. Such evidence would point to glacial origin while rounding of the pebbles and stratification would indicate water-laid deposits. Fuller (1914) thought that the ice sheet was close to Long Island and deposited the gravel possibly as outwash while Suter, de Laguna and Perlmutter (1949), suggest outwash material from the north which was carried by the Hudson River to its present position. The formation varies in thickness from 0 to 150 feet.

Overlying the Jameco and extending further to the east, such as at Gardiners Island, is the marine interglacial Gardiners clay. This formation consists of dark to greenish-gray silty clay with scattered lenses of sandy clay, fine sand, and coarse sand. Thickness ranges from 10 to 150 feet. Many warm water fauna are found and probably were deposited under conditions similar to those found along the south shore at present. The presence of the fossils and the character of the sediments are symptomatic of a warm climate with marshy lagoons changing to deeper marine conditions from west to east.

A re-advance of the glacial ice caused a change in the character of the sediments during the deposition of the Jacobs sand. The fossil entourage indicates decreasing water temperatures while the absence of ripple marks and the considerable areal extent of the formation points to marine conditions of deeper water than during the Gardiners time. The Jacob formation, fine and silty sands, is a transition from the clay of the Gardiners to the sand and gravel of the overlying Herod. It lies conformably on the Gardiners and has an average thickness of 30 feet.

The silty sands of the Jacob give way to the coarser sand of the lower Herod which in turn grades into the gravel of the upper Herod. The Herod

is the lowest member of the Manhasset formation. Wind-faceted pebbles of the upper Herod indicate a lowered sea level and subaerial deposition, probably caused by glacial control of sea level. Folding and faulting of the upper Herod by ice shoving causes the next member, the Montauk till, to rest either conformably or unconformably on the Herod. One, two, or three boulder beds mark the heterogeneous mixture of all sizes of material found in the till member. Crude banding found in the till member has been interpreted as stratification and entails glacial deposition on a submerged surface. The uppermost member of the Manhasset formation, the Hempstead gravel, rests on top of the till. This member is a stratified coarse sand and gravel, a typical outwash deposit.

Along the south shore the Manhasset formation is most important. Locally, in small but widely separated areas, it is the surface formation. For much of the remaining area the Manhasset is mantled by a relatively thin veneer of outwash material from the most recent glacial advance, and thus, as discussed later, exerts a very strong influence on surface drainage and topography. Only where the Recent deposits, the barrier bars and the marshes, and the moraine at the eastern end of the south fluke, are present is the Manhasset unimportant in this respect.

Surface Formations. Three types of deposits may be differentiated along the south shore. The easternmost 10 miles, the bluff section of the headlands, is composed of the Ronkonkoma moraine. To the west inland from the beaches and along the northern shores of the bays are the stratified outwash plains. Fronting the ocean from Napeague Beach westward are the beaches and barrier islands of marine origin. In addition, marshes are common adjacent to the bay and stream shores. Figure 12 illustrates the geology of southern Long Island.

The clays, silts, sands, and gravels making up the Ronkonkoma moraine occupy nearly all of the easternmost 10 miles of the south fluke of Long Island. The hills of coarse material are overlain by small to large boulders and some of the larger pebbles and cobbles are mixed throughout the mass. The ice front remained static along the line of the present morainal ridge which developed as more or less detached gravel fans that were later joined into a nearly continuous feature. A morainal ridge would be made from a heterogeneous mixture of very fine to very coarse material jumbled together. Fleming (1935) argues that the Ronkonkoma moraine is composed of stratified material veneered with a boulder till. This would postulate a later advance of the ice front to further south than the present shoreline and the deposition of boulders, as the ice retreated to the north.

West of Napeague Beach but inland from the ocean beach and along the north shores of the tidal bays are the outwash plains south from the moraines. In places the outwash is less than 5 feet thick and the topography and drainage are controlled by the underlying Manhasset formation. In other areas the outwash is thicker and fills former channels. These deposits are generally yellow stained and clear quartz with some fine silts and, at times, coarser material.

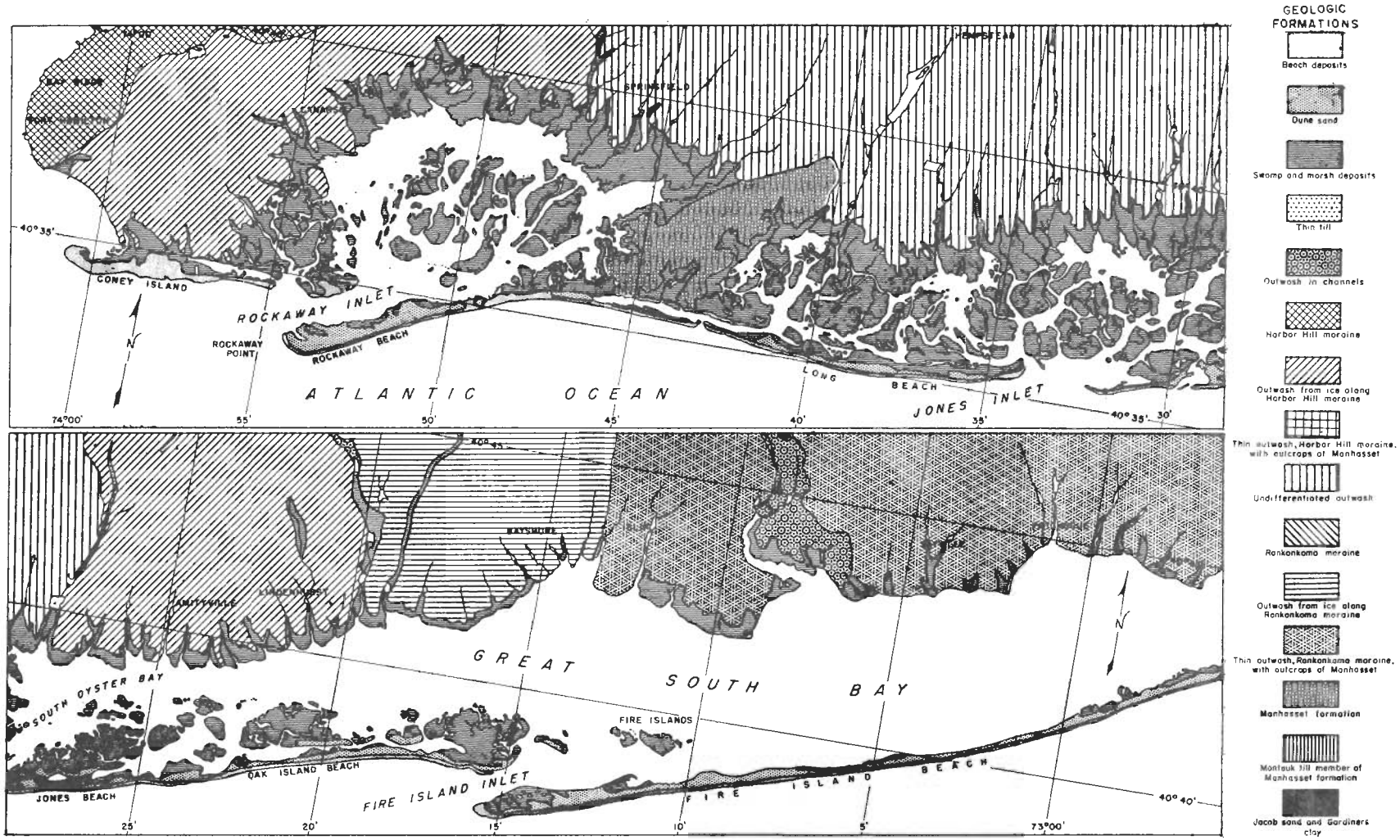


FIGURE 12a. GEOLOGY OF SOUTHERN LONG ISLAND

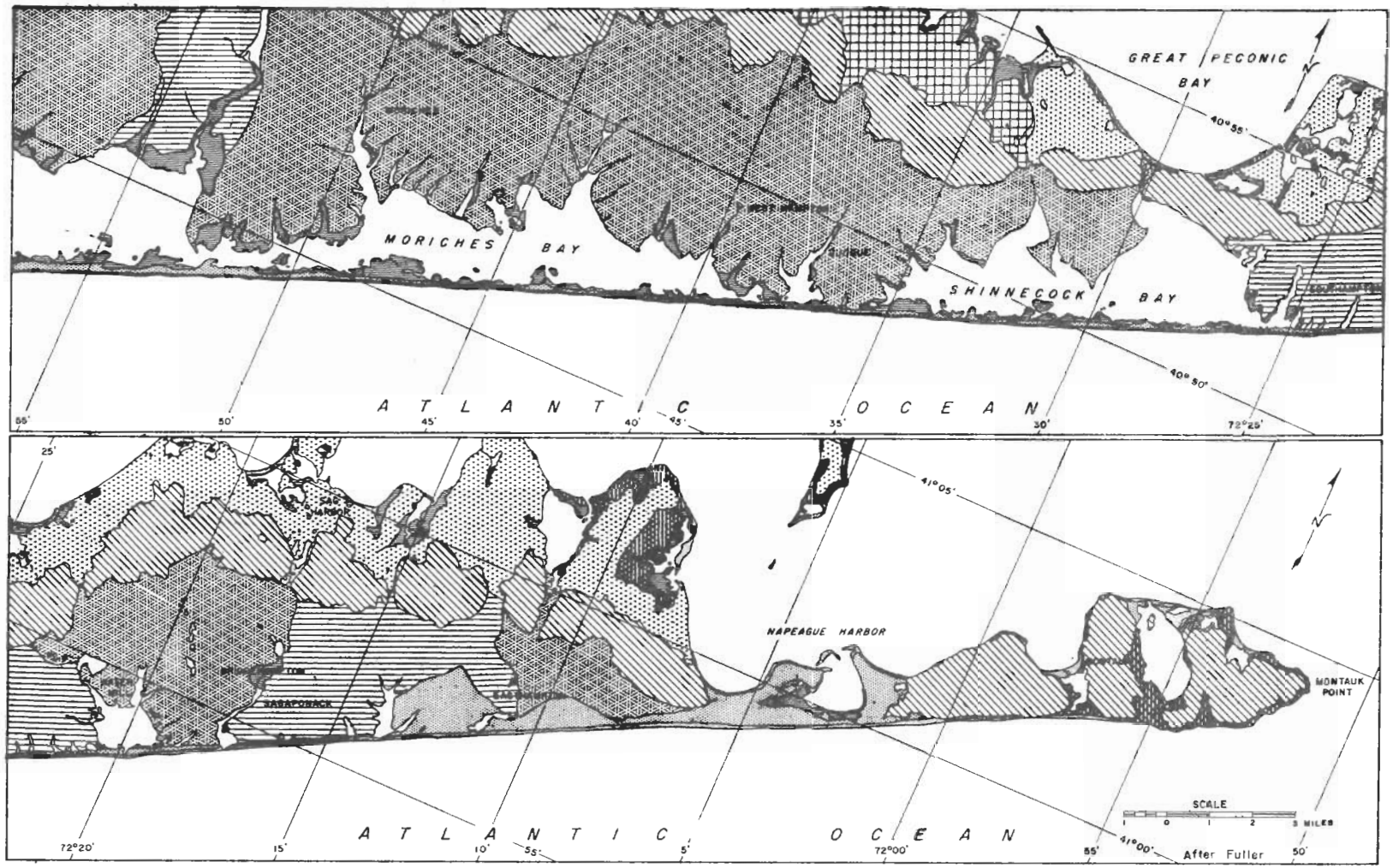


FIGURE 12b. GEOLOGY OF SOUTHERN LONG ISLAND

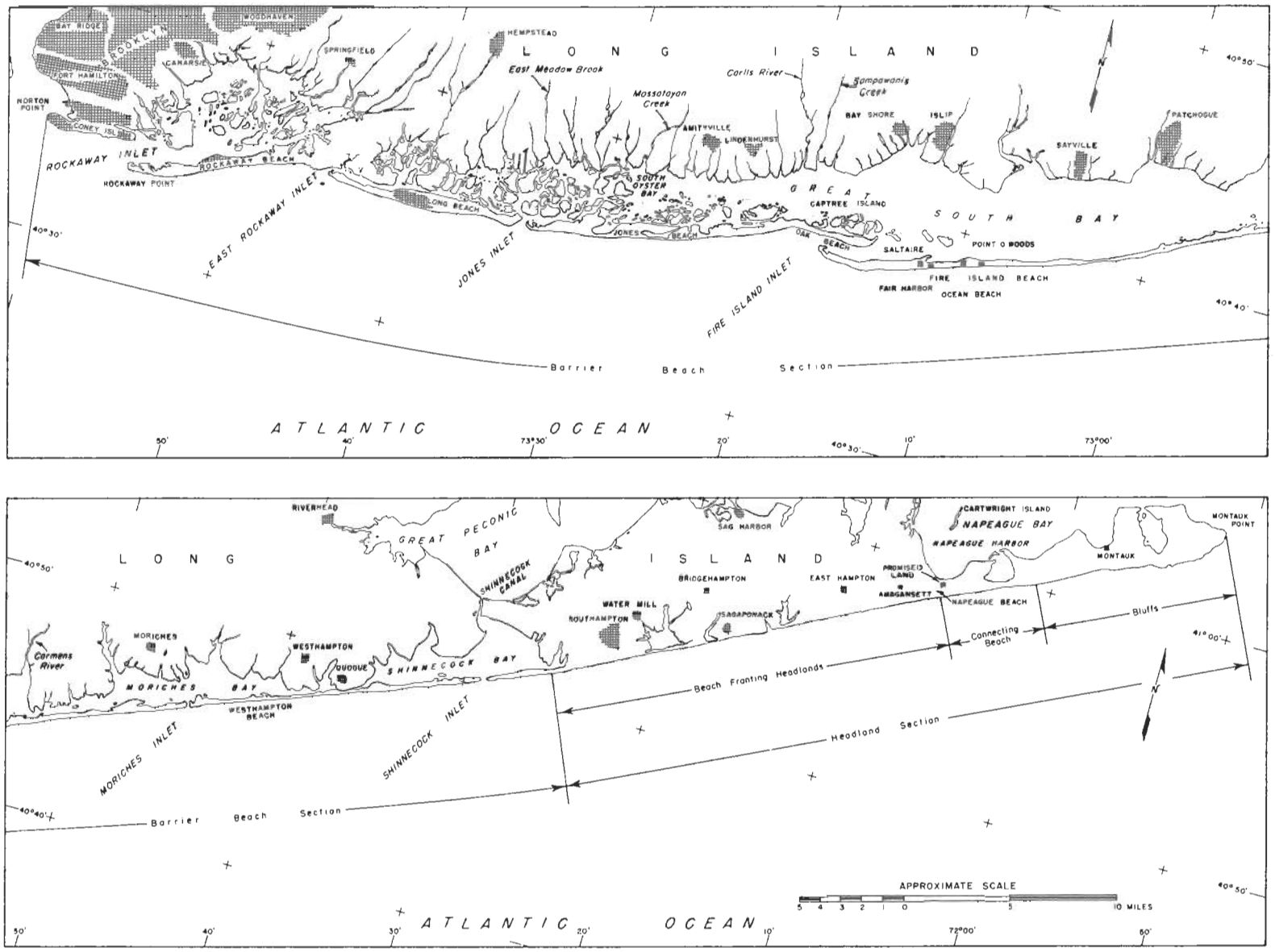


FIGURE 13. PHYSIOGRAPHIC DIVISIONS OF THE SOUTH SHORE

The deposits of marine origin front the Atlantic Ocean from Napeague Beach west to and including Coney Island. Waves, tides, and littoral currents have truncated the headlands at the eastern end of the island and moved the sediments to the west. The erosion has continued until a beach now intervenes between the older headlands and the sea; the present high water line is nearly straight. The westward moving littoral materials and possibly the nearshore bottom materials have contributed to the formation of a spit or an offshore bar or a combination thereof. These features are composed mainly of quartz sand with small quantities of magnetite and garnet being found on Fire Island. Some small rock pebbles are visible where the beach is part of or is connected with the main island, but pebbles are very scarce otherwise. The median diameter, measured at mid-tide and at 12 feet below mean low water, of the beach sand decreases from east to west.

DRAINAGE

Because most of Long Island is mantled with glacial material, rainfall sinks rapidly into the porous surface and does not appear again until near sea level. As a consequence, most of the surface streams are relatively short and show simple dendritic patterns. A good many are intermittent, not flowing during dry seasons, and most usually end in a marshy area at the mouth. Several streams or dry drainage channels do not have surface outlets. This type of drainage ends in a kettle lake or exists in a kettle valley.

Along the south shore the streams rise along the foot of the nearest moraine, flow southward across the glacial outwash plain, and empty into the bays along the south shore. In the vicinity of Jamaica Bay, the streams flow toward that body of water while to the east of Jamaica Bay the stream flow is generally southerly. The mouths of the streams lie in the drowned indented bay shore and fresh grading into salt water marshes are common. Intermittent lakes are found just landward of the mouths of many of the streams.

Several of the larger streams rise at the foot of the northern moraine and flow southward through gaps in the older, southernmost moraine in outwash channels formed while the most recent ice was still present. The old channels are still active and contain mixtures of outwash materials from both moraines. Several of the streams now flowing in these channels from west to east are:

a. East Meadow Brook
b. Massatayan Creek
c. Carlls River
d. Sampawanis Creek
e. Carmans River

PHYSIOGRAPHIC SECTIONS

The south shore of Long Island is divided into two sections, as shown on figure 13. The easternmost 33 miles, from Montauk Point to Southampton, is the headlands section. This section has suffered very severe erosion.

The remaining 87 miles, from Southampton to and including Coney Island, is the barrier beach section which is broken at present by six inlets. Landward from the barrier beach are a series of connected tidal lagoons or bays which contain many marshes and marsh islands. The lagoons in turn front on the embayed shore of the island, and many of the small streams entering the bays pass through drowned valleys at their mouths.

Headlands Section. This reach of coast once extended for several miles to the southeast to the area of Montauk Shoals and to the east possibly to Endeavor Shoals. The last 5,000 years, while sea level has remained essentially stable (only minor variations as compared to the changes which occurred during the glacial epoch) has seen the culmination of shore recession of the order of 10 to 15 thousand feet. The shoreline at Montauk Point and for 10 miles to the west is now characterized by bluffs rising abruptly for 60 or more feet above sea level and scanty beaches of coarse sand and gravel.

To the west for 4 miles in the reach which includes Napeague Harbor and Beach is the next unit of the headland section which appears to be a connecting link between two areas of deposition of the Ronkonkoma moraine. The bluff unit to the east, discussed in the preceding paragraphs, contains only morainal deposits. The unit to the west will be discussed shortly.

The connecting unit is a low sandy beach, and north from the beach are sand dunes. Fringing south and west sides of Napeague Harbor are low lying marshes. During periods of high storm tide the beach is frequently awash and on occasion the area to the east has been isolated by hurricane induced tides and waves inundating this low neck.

The third unit of the headland section is 19 miles long and extends from just west of Promised Land (in second unit) to Southampton. This unit is characterized by sandy beaches and continuous dunes behind the beach. Just inland from the shore are several small ponds or bays which have been cut off from the ocean by baymouth bars which later became part of the beach. To the north lies the morainal ridge which forms the dominant topographic relief of the area.

Long continuous sand dunes, cresting well above elevation +20 feet in many areas, are present immediately to the north of the beach. Landward from the dunes a thin mantle of outwash from the Ronkonkoma Moraine rises to the north until it reaches the foot of the moraine. The outwash plain surface is pockmarked with kettles and similar features due to glacial conditions. The ponds and small bays, separated from each other by promontories of greater elevation, have been sealed off from the ocean by the stream of littoral material moving to the west which has built the present beach. These bodies of water are not influenced by oceanic tides, but during severe storm conditions waves and high tides have caused breaches and temporarily connected the smaller bodies of water with the ocean.

Barrier Beach Section. The long reach between Southampton and Coney Island exhibits characteristics of both a spit and an offshore bar. At present six inlets break the continuity of the reach into different lengths, but the position and number of inlets have not been constant. The interconnected tidal lagoons to the north are separated from each other by projecting peninsulas at Quogue-Westhampton Beach and at Mastic Beach. Jamaica Bay, the westernmost lagoon, is not joined to any of the lagoons to the east. Many marsh islands and tidal deltas are present west of Fire Island Inlet so that only narrow shallow tidal streams and small bays remain.

The present barrier beach is made up of four islands, two peninsulas, and Coney Island which has been joined to the larger land body of the main island by fill operations. All are long but comparatively narrow, varying from less than a quarter mile to more than a mile in width. The ocean beach varies in width from zero along the bluffs of the eastern end to over 500 feet in localized areas; and the average width lies between 100 and 200 feet. North from the beach is a belt of sand dunes which crest between 10 and 30 feet above mean sea level for most of the reach between Jones Inlet and Southampton. From Jones Inlet to Coney Island the natural physiography has been greatly altered by many shore structures and extensive development. North from the dunes the barrier slopes downward gently to the north and to meet the waters of the bay. Fresh and salt water marshes are found along the shoreline. Across the bays, which vary from several hundred feet to 5 miles in width, are more marshes and then the northward rising plain of the main island.

The inlets separating the islands have not been stable during the recent past. Moriches Inlet, for instance, existed in the general vicinity of its present site early in the seventeenth century. A survey made in 1829 showed two inlets to Moriches Bay, while a subsequent survey made 10 years later showed no inlets to the bay. For some 90 years Moriches Bay remained essentially landlocked until a storm in March 1931 breached the barrier island about one mile to the east of the present location of the inlet. The inlet gradually migrated to the west and enlarged and in 1938 was widened enormously as the result of an extremely severe hurricane. Despite efforts to stabilize the inlet, the channel was closed by natural forces in May 1951. In 1952 and 1953 two jetties were constructed at the site of the former inlet and a channel was dredged from the bay southward toward the ocean. In September 1953, before the channel was completed, storm waves breached the barrier island at the channel and the inlet has remained open since then.

Another form of instability is illustrated at Fire Island and Rockaway Inlets. The westward moving stream of littoral sediments has caused rapid westward elongation of Democrat and Rockaway Points until they are now south of and overlap Captree Island and Coney Island, respectively. This in effect results in channels flowing along an east-west rather than a north-south axis as at Moriches Inlet. Prior to stabilization of these inlets by jetties, the rates of movement for Democrat and Rockaway Points were respectively 201 and 222 feet per year averaged over approximately the past 100 years. Such migration points up the rapid movement of very large volumes of littoral sediments

from the east to the west and the shore line changes which follow such movement. Figures 19 - 24 show inlet migration and figures 14 - 18 portray shore line changes from 1835 to 1940 or 1956.

SHORE LINE HISTORY

The location of the Long Island shore line has not been constant throughout the past geologic ages. The island as it appears today is not old in terms of geologic time and has been subject to radical change with the passing of time. It is thought, however, that as long ago as the Cretaceous period the island was generally similar in appearance to its present form but with the exception that the north fluke was missing (see Geologic Formations). More recently, during an interglacial stage of the Wisconsin age of the Pleistocene epoch, sea level had risen until only the highest portions of the island were above water. As the interglacial stage waned and sea level began to lower again, slightly more of the island was exposed, see figure 3.

The island has attained much of its present peripheral form in the recent epoch, in the past 10,000 years while sea level has remained essentially constant. The fringe of barrier islands and spits along the south shore has been formed subsequent to the end of the Pleistocene epoch, but no direct evidence is available to determine whether the barrier islands originated as offshore bars or as spits. It would appear, however, that the headland section has suffered severe continuing erosion with local deposition, while the barrier beach section has been built since the end of the last glacial advance of the Pleistocene. In the recent or historic past, since 1834-38, the shore line has undergone relatively minor changes in terms of the geologic past. It is the historic past, however, which is symptomatic of the stage of development of the present coast and which furnishes measurements upon which predictions may be based (see figures 14 - 18).

Headland Section. Marine erosion of the headland section most probably began during an interglacial age of the Pleistocene and has been continuous to the present. The former high lobes which projected seaward have been eroded and the shore line retreated to the north until the present straight shore line has been achieved. The conspicuous gap in the terminal moraine in the vicinity of Napeague Beach has been filled with sand derived from the high bluffs to the east. The westward moving littoral sediments have also sealed off from the ocean the small bays (Mecox, Sagaponack, etc.) lying between the high truncated lobes or tongues of glacial material by building a straight continuous beach from the eastern end of the connecting beach to Southampton.

In the past 120 years, from 1838 to 1956, the entire reach has undergone erosion except for two limited areas in the vicinity of Napeague Harbor. The smaller area, approximately 3 miles long, lies between the east end of Hither Hills State Park and Fort Pond, while the larger area, about 7.3 miles long, starts opposite the western end of Napeague Harbor and stretches to East Hampton. While erosion may have been dominant over the past 120 years for a given reach of coast, during a shorter time interval the high water shore line may have moved seaward due to local accretion. In other words, while

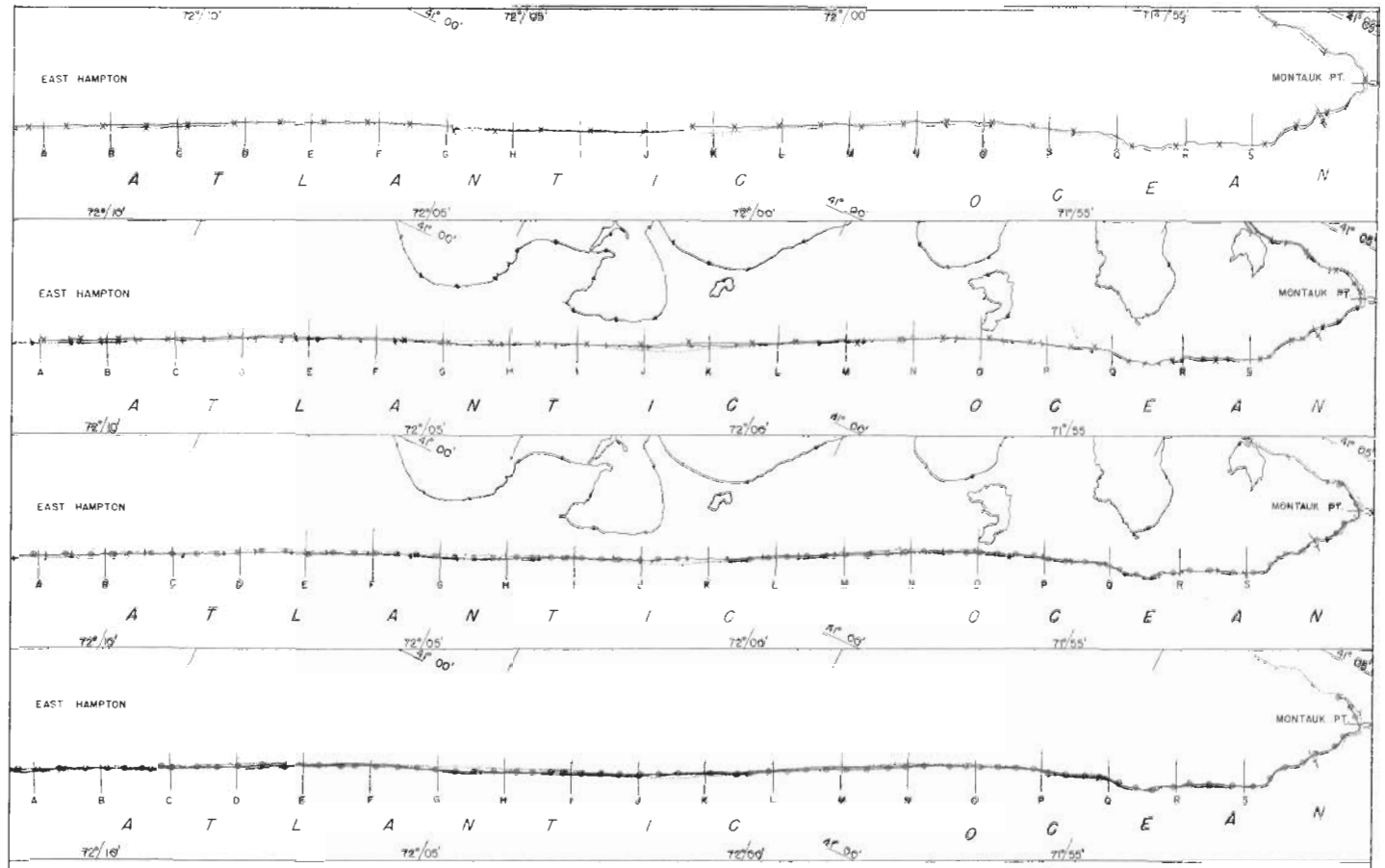
during a short time interval the high water shore line may have aggraded or degraded, the net result for 65 percent of the headland section has been degradation. Figures 14 and 15 illustrate the short and long-term fluctuations of the shore line.

Barrier Beach Section. The complex sequence of events at a migrating inlet are quite different from the shore line history along much of the barrier islands; consequently, the long reach, the barrier beach section from Southampton to and including Coney Island, may best be described if the shore line changes of areas contiguous to inlets are discussed separately. This arrangement has been followed and inlets are described in the next section of the report.

In general, the barrier beach section has undergone degradation along nearly all of its length in varying degrees of severity during the past 120 years. The exceptions to the general condition of high water shore line recession along the entire length of this reach are very briefly noted below. Starting approximately 2 miles west of the present location of Shinnecock Inlet and continuing for about 1 mile further to the west is a reach of very minor change from the earliest to the latest surveys. The island from Jones Beach to east of Oak Beach has undergone enormous changes during the past 120 years due primarily to the former presence of four inlets, the last of which (Cedar Island Inlet) was closed in 1930. The magnitude of the high water shore line movement has been recession of more than 2,000 feet in the vicinity of Gilgo State Park and Cedar Island Beach and an advance of more than 1,000 feet at Tobay Beach. Along Rockaway Peninsula, some 1.7 miles west of the jetty at East Rockaway Inlet, is a small area approximately 1.6 miles long which has undergone accretion from 1834 to 1934. Coney Island has also undergone relatively rapid adjustments of the high water shoreline. Figures 16, 17, and 18 illustrate the short and long-term fluctuations of the high water shore line.

Inlets. There are at present six inlets which break the continuity of the barrier beach, all of which have migrated from east to west in the historic past. That the position, size, and number of inlets have not remained constant since 1834 may be seen readily from inspection of figures 19 to 24.

The mechanism by which inlets migrate and naturally bypass material is not completely understood. It is generally believed, however, that the simple case of an inlet moving downdrift along an offshore bar or barrier island involves the deposition of littoral sediments on the updrift side and the depletion of sediment supply to the downdrift side. Not all of the drift, however, is deposited at the updrift side. Some of the sediments are drawn through the inlet and form the inner bar or shoal and thus are removed from the littoral stream entirely. Another portion of the drifting sediments forms the outer bar or shoal. The remainder finds its way across the inlet either by littoral transport across the outer bar or by gradual transfer from the updrift to the downdrift bank as a consequence of transport effected by the ebb and flow of tidal currents. A sudden updrift shift in position of the tidal channel through the outer bar, such as may occur at the time of a



AVERAGE HIGH WATER SHORE LINE
CHANGE (IN FEET)

RANGES

INTERVAL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	MEAN
1838-1891	-160	0	-50	+150	+100	+20	+110	+90	+50	-370	-450	-120	+40	+100	+80	-160	-400	—	—	0	-300	-60
1891-1933	0	+100	+150	0	+100	+150	+150	0	0	+200	+200	0	+180	0	0	0	0	+100	0	0	-100	+59
1933-1949	0	0	0	0	+30	+30	+30	+80	+130	0	0	+120	0	+50	+100	+130	+200	0	0	-20	+100	+50
1949-1956	+200	0	+80	+80	0	-170	+80	+100	+100	0	-50	-60	-250	+50	0	-100	-50	0	+20	+20	0	-1
NET CHANGE	+40	+100	+180	+210	+230	+30	+370	+270	+280	-170	-300	-120	-30	+200	+80	-70	-250	+100	+20	0	-300	

+ADVANCING SHORE LINE
-RETREATING " "
MEAN— AVERAGE OF ALL PROFILES

LEGEND

HIGH WATER SHORE LINE 1956 — CORPS OF ENGRS
" " 1940 — " " "
" " 1933 — U.S.C. & G.S.
" " 1891 — " " "
" " 1845 — " " "
" " 1838 — " " "

POLYCONIC PROJECTION DATUM N.A. 1927
SCALE IN FEET
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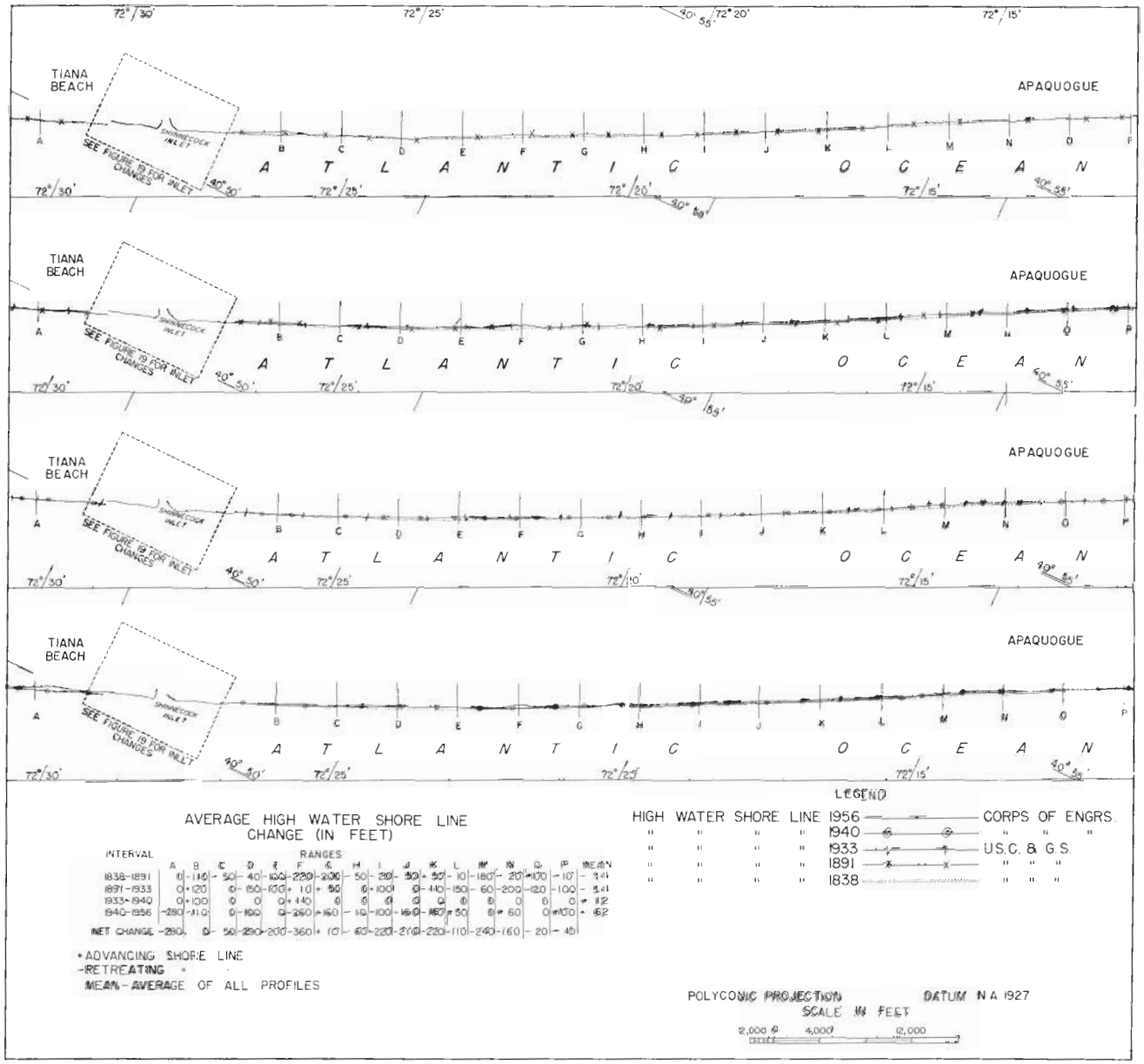
FIGURE 14 HIGH WATER SHORE LINE CHANGES FROM MONTAUK POINT TO EAST HAMPTON, 1838-1956

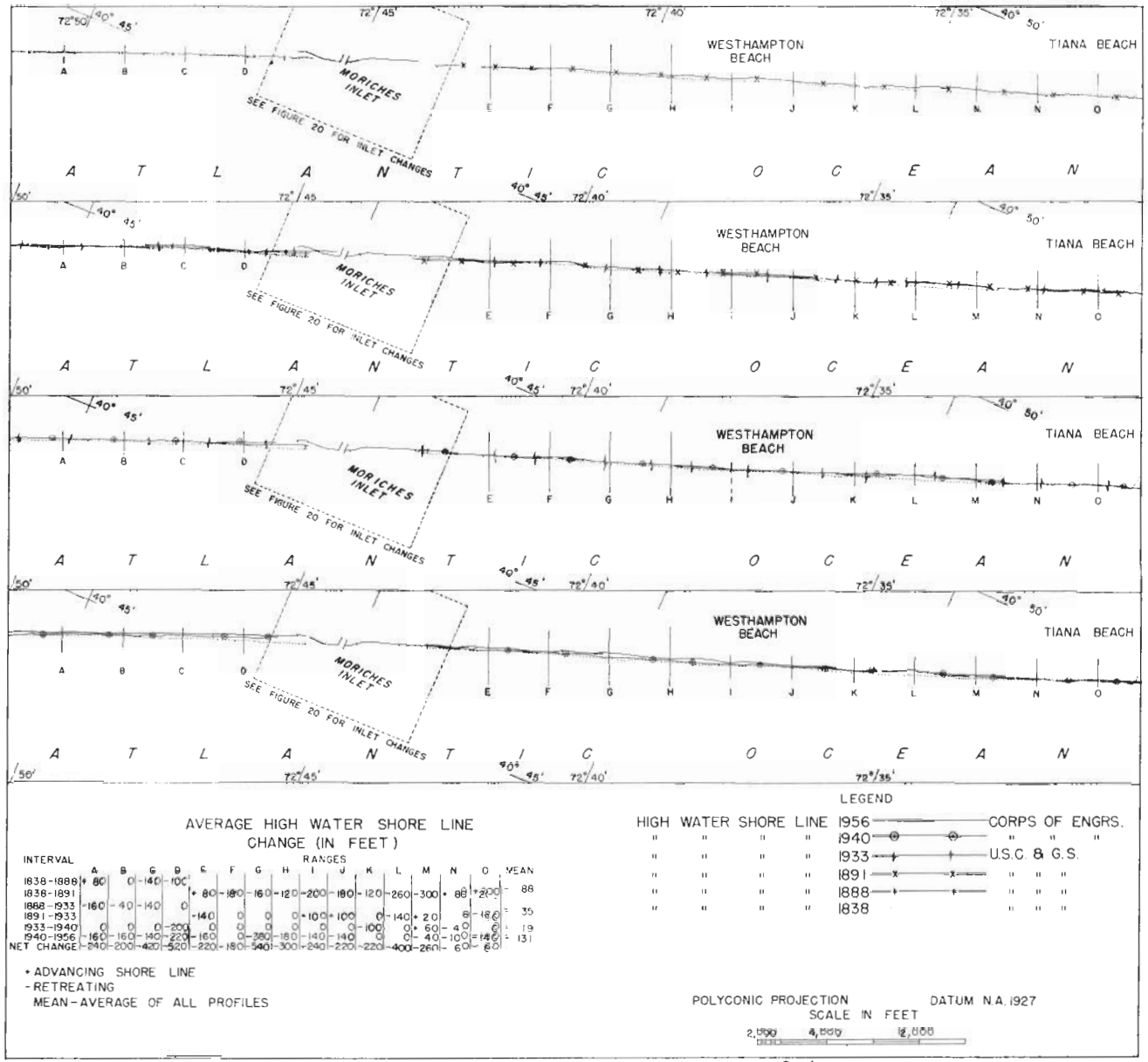


AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

INTERVAL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	MEAN
	RANGES																
1838-1891	0	-110	-50	-40	-100	-220	-200	-50	-280	-50	+50	-10	-180	-20	+100	-10	-74
1891-1933	0	+120	0	-150	-100	+10	+50	0	+100	0	-110	-150	-60	-200	-120	-100	-54
1933-1940	0	+100	0	0	0	+110	0	0	0	0	0	0	0	0	0	0	+12
1940-1956	-280	-110	0	-100	0	-260	+160	-10	-100	-160	-160	+50	0	+60	0	+100	-62
NET CHANGE	-280	0	-50	-290	-200	-360	+10	-60	-220	-270	-220	-110	-240	-160	-20	-40	

+ ADVANCING SHORE LINE
- RETREATING "
MEAN - AVERAGE OF ALL PROFILES

FIGURE 15. HIGH WATER SHORE LINE CHANGES FROM APAQUOGUE TO TIANA BEACH, 1838-1956

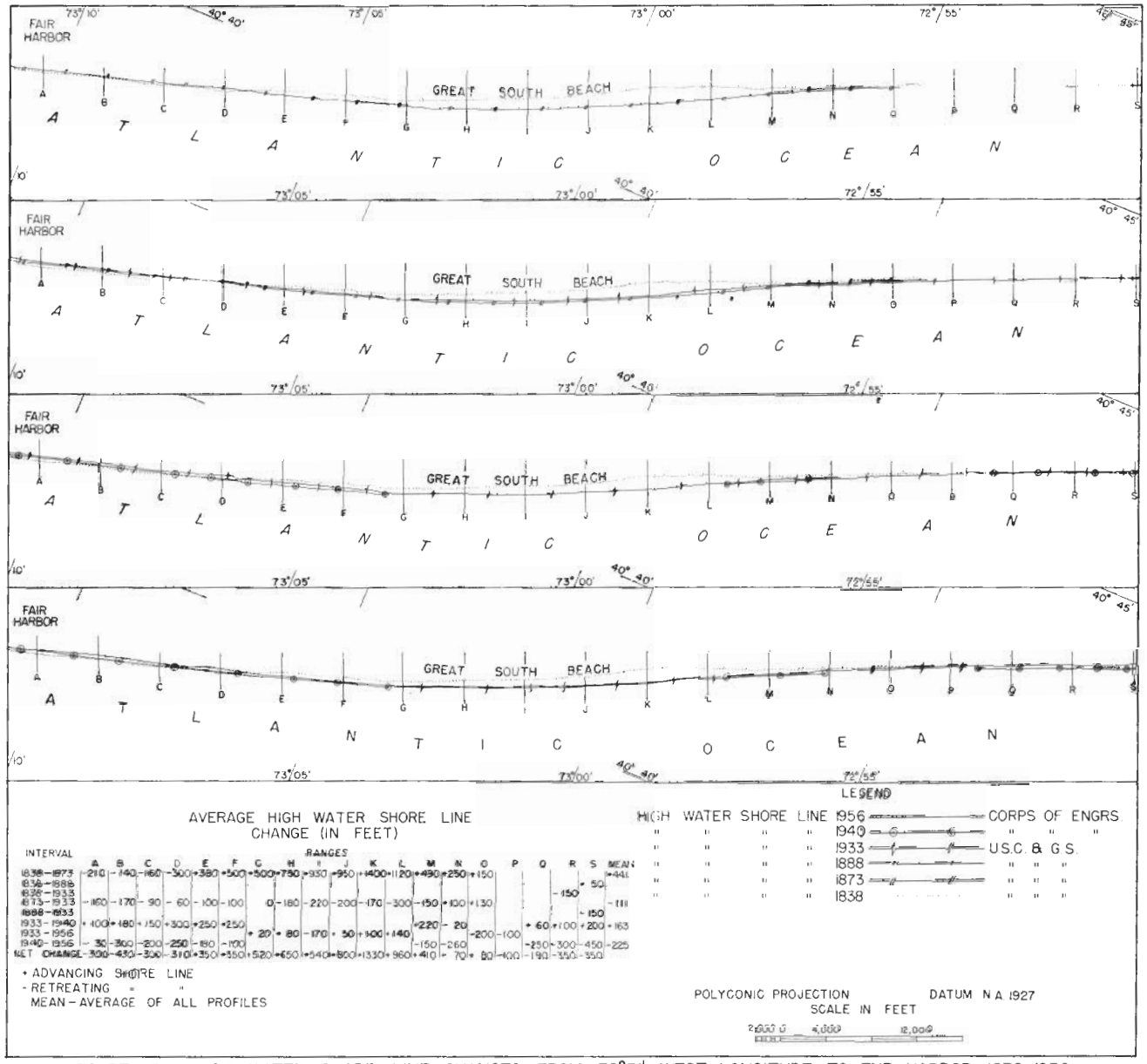


AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

INTERVAL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	MEAN
	RANGES															
1838-1888	+ 80	0	-140	-100												
1838-1891					+ 80	-180	-160	-120	-200	-180	-120	-260	-300	+ 88	+200	- 88
1888-1933	-160	- 40	-140	0												
1891-1933					-140	0	0	0	+100	+100	0	-140	+ 20	8	-180	- 35
1933-1940	0	0	0	-200	0	0	0	0	0	0	-100	0	+ 60	- 40	0	- 19
1940-1956	-160	-160	-140	-220	-160	0	-360	-180	-140	-140	0	0	- 40	-100	-140	- 131
NET CHANGE	-240	-200	-420	-520	-220	-180	-540	-300	-240	-220	-220	-400	-260	- 60	- 60	

+ ADVANCING SHORE LINE
- RETREATING
MEAN - AVERAGE OF ALL PROFILES

FIGURE 16. HIGH WATER SHORE LINE CHANGES FROM TIANA BEACH TO 72° 51' WEST LONGITUDE, 1838-1956

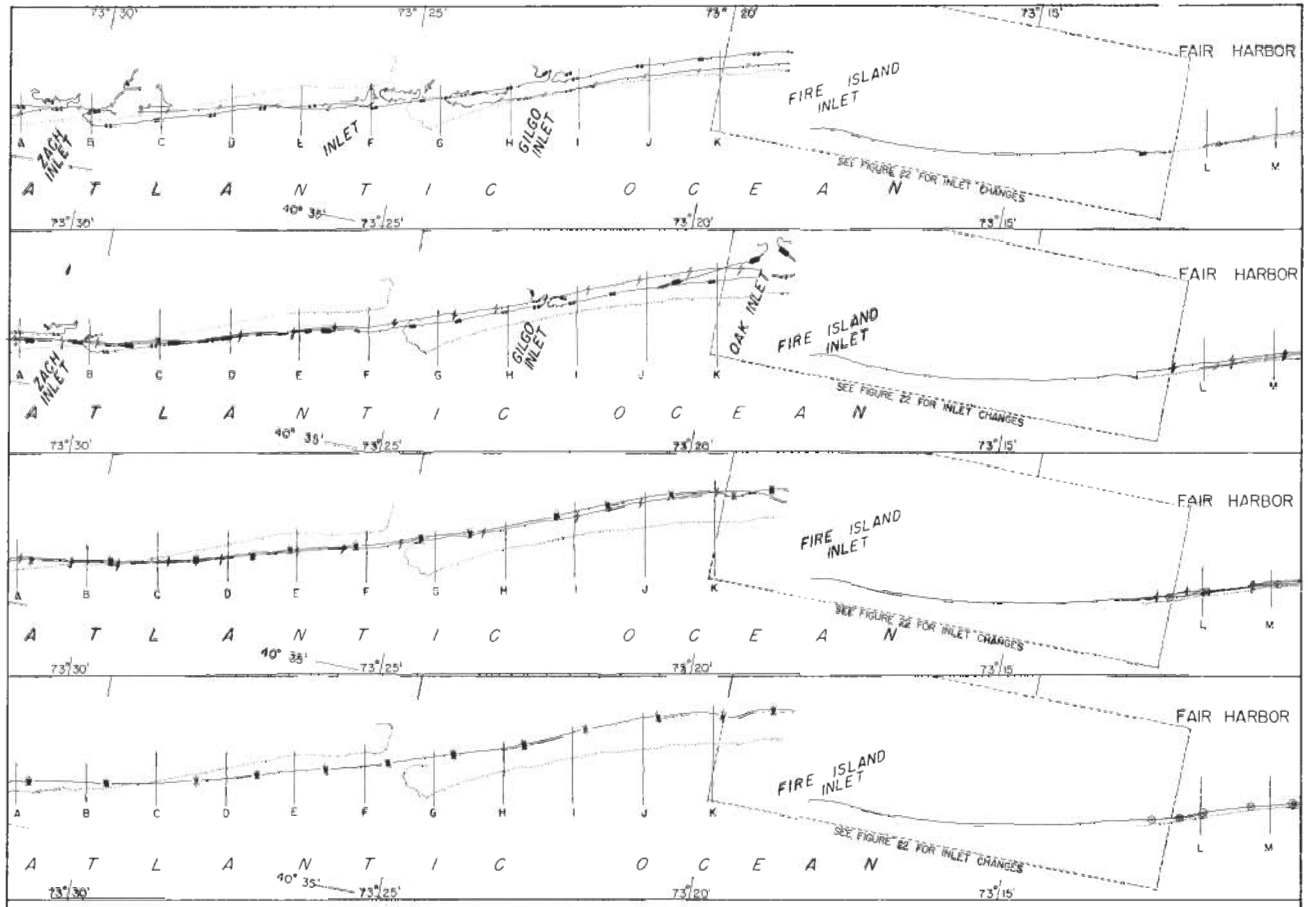


AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

INTERVAL	RANGES A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	MEAN
1838–1873	-210	-140	-160	-300	+380	+500	+500	+750	+930	+950	+1400	+1120	+490	+250	+150					+441
1838–1888																			+50	
1838–1933																		-150		
1873–1933	-160	-170	-90	-60	-100	-100	0	-180	-220	-200	-170	-300	-150	+100	+130					-111
1888–1933																			-150	
1933–1940	+100	+180	+150	+300	+250	+250							+220	-20			+60	+100	+200	+163
1933–1956							+20	+80	-170	+50	+100	+140			-200	-100				
1940–1956	-30	-300	-200	-250	-180	-100							-150	-260			-250	-300	-450	-225
NET CHANGE	-300	-430	-300	-310	+350	+550	+520	+650	+540	+800	+1330	+960	+410	-70	+80	-100	-190	-350	-350	

+ ADVANCING SHORE LINE
- RETREATING " "
MEAN – AVERAGE OF ALL PROFILES

FIGURE 17. HIGH WATER SHORE LINE CHANGES FROM 72°51' WEST LONGITUDE TO FAIR HARBOR, 1838-1956



AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

INTERVAL	RANGES A	B	C	D	E	F	G	H	I	J	K	L	M	MEAN
1835-1873-78	-860	-80	+20	+600	+840	+1300	-2000	-100	-60	-340	-430	-110	-200	+60
1835-1909														
1873-78-1909	-660	+100	+500	+280	-220	+300		-900	-740	-800	-850			-193
1873-78-1933												-330	-220	
1909-1927	+500	-600	-160	0							-800			
1909-1933					-60	-380	-560	-400	-700	-770				
1927-1933	-20	-120	-180	-60							-160			
1933-1940												+140	+200	
1933-1951	+260	-40	+40	+20	-140	-240	-240	-200	-400	-380	0			-125
1940-1956												0	0	
NET CHANGE	-720	-460	+220	+940	-220	-980	-2800	-600	-900	-2290	-2240	-300	-220	

+ ADVANCING SHORE LINE
- RETREATING " "
MEAN - AVERAGE OF ALL PROFILES

LEGEND

HIGH WATER SHORE LINE 1956	CORPS OF ENGRS.	
" " " " 1951	" " "	
" " " " 1940	U.S.C. & G.S.	
" " " " 1933	" " "	
" " " " 1927	" " "	
" " " " 1909	" " "	
" " " " 1873-78	" " "	
" " " " 1835	" " "	

POLYCONIC PROJECTION DATUM N.A. 1927

SCALE IN FEET

8,000 4,000 12,000

FIGURE 18. HIGH WATER SHORE LINE CHANGES FROM FAIR HARBOR TO 73° 31' WEST LONGITUDE, 1835-1956

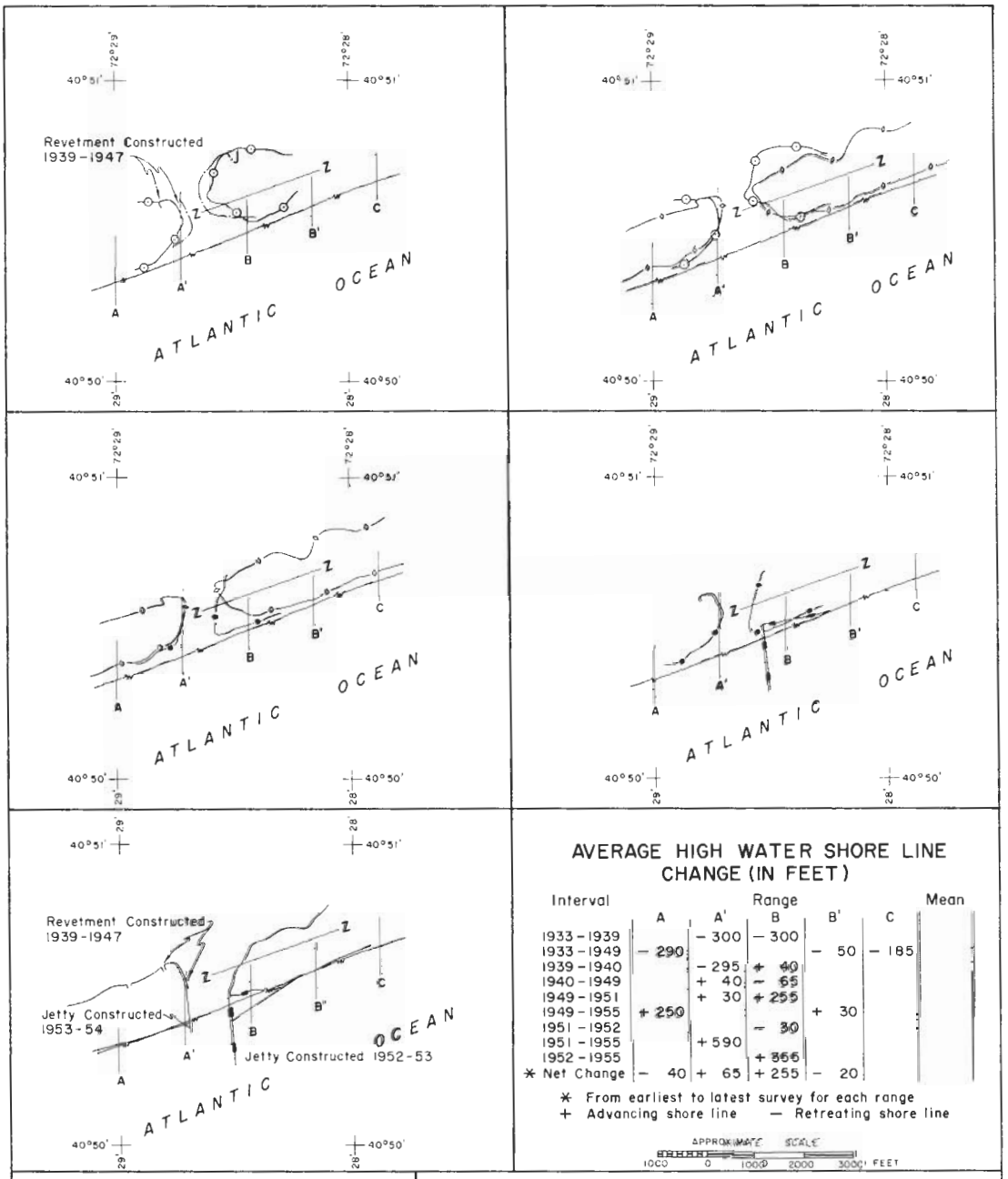
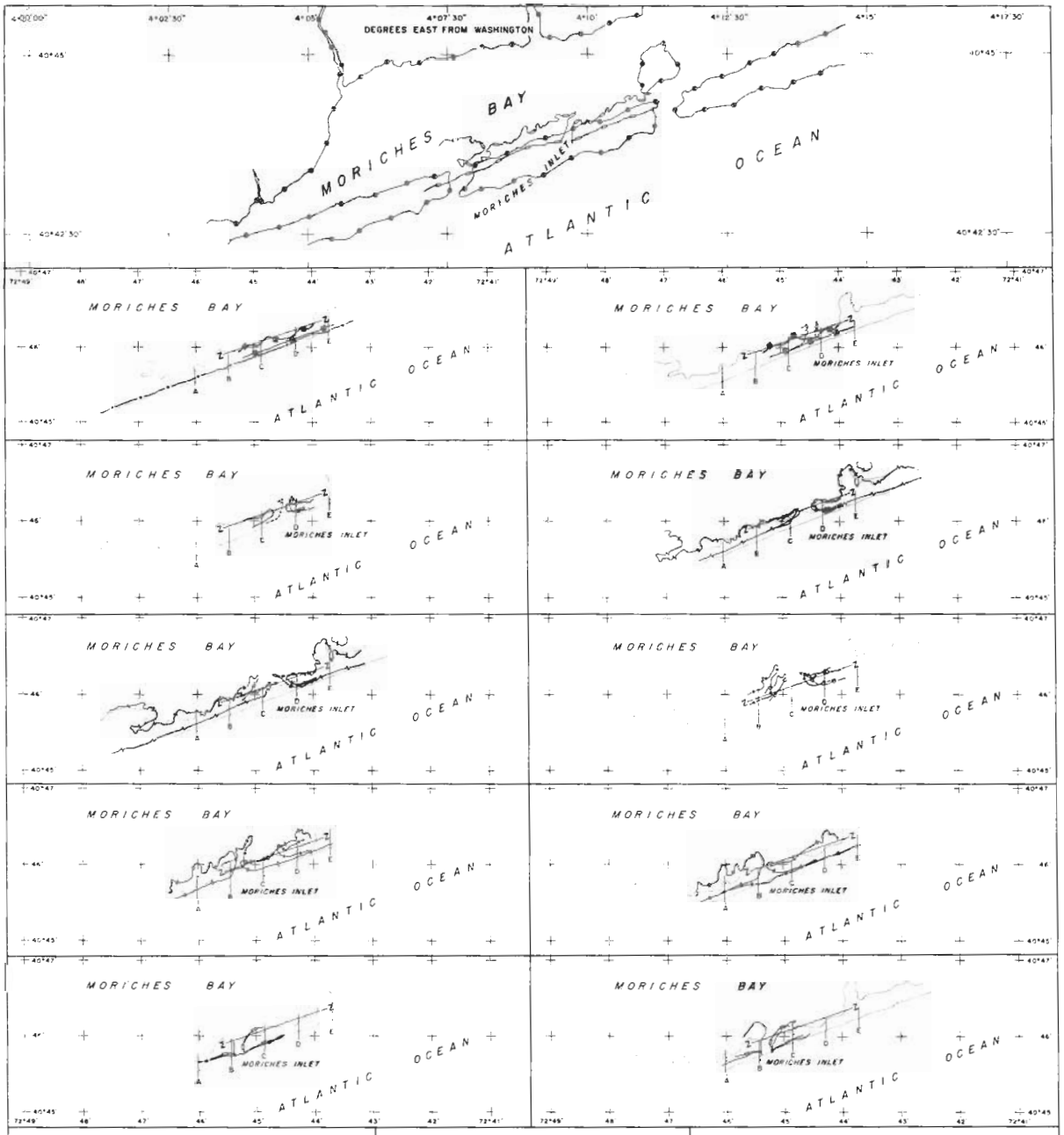


FIGURE 19. MIGRATION OF SHINNECOCK INLET, LONG ISLAND, NEW YORK AS SHOWN BY HIGH WATER SHORE LINE CHANGES 1938 – 1955



AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

Interval	Ranges A	B	C	D	E	Mean
1838 - 1888	- 350	- 100	- 100	- 140	+ 20	- 134
1888 - 1930			- 220	- 210	- 300	
1888 - 1933	0	- 360				
1930 - 1933			- 80	- 110	- 10	
1933 - 1949	- 400	- 200	+ 80	+ 120	+ 60	- 68
1949 - 1951	- 50	+ 420	+ 180			
1951 - 1953		- 180	- 150			
1953 - 1955		+ 100	0			
* Net Change	- 800	- 320	- 290	- 340	- 230	

* From earliest to latest survey for each range
\+ Advancing shore line
\- Retreating shore line
Mean — Average of all profiles

LEGEND
HIGH WATER SHORE LINE

1955	C of E
1953	"
1951	"
1949	"
1939	"
1937	"
1933	U.S.C. & G.S.
1932	C of E
1931	"
1930	L.I.S.P. COMM.
1888	U.S.C. & G.S.
1838	"
1829	N.Y. STATE

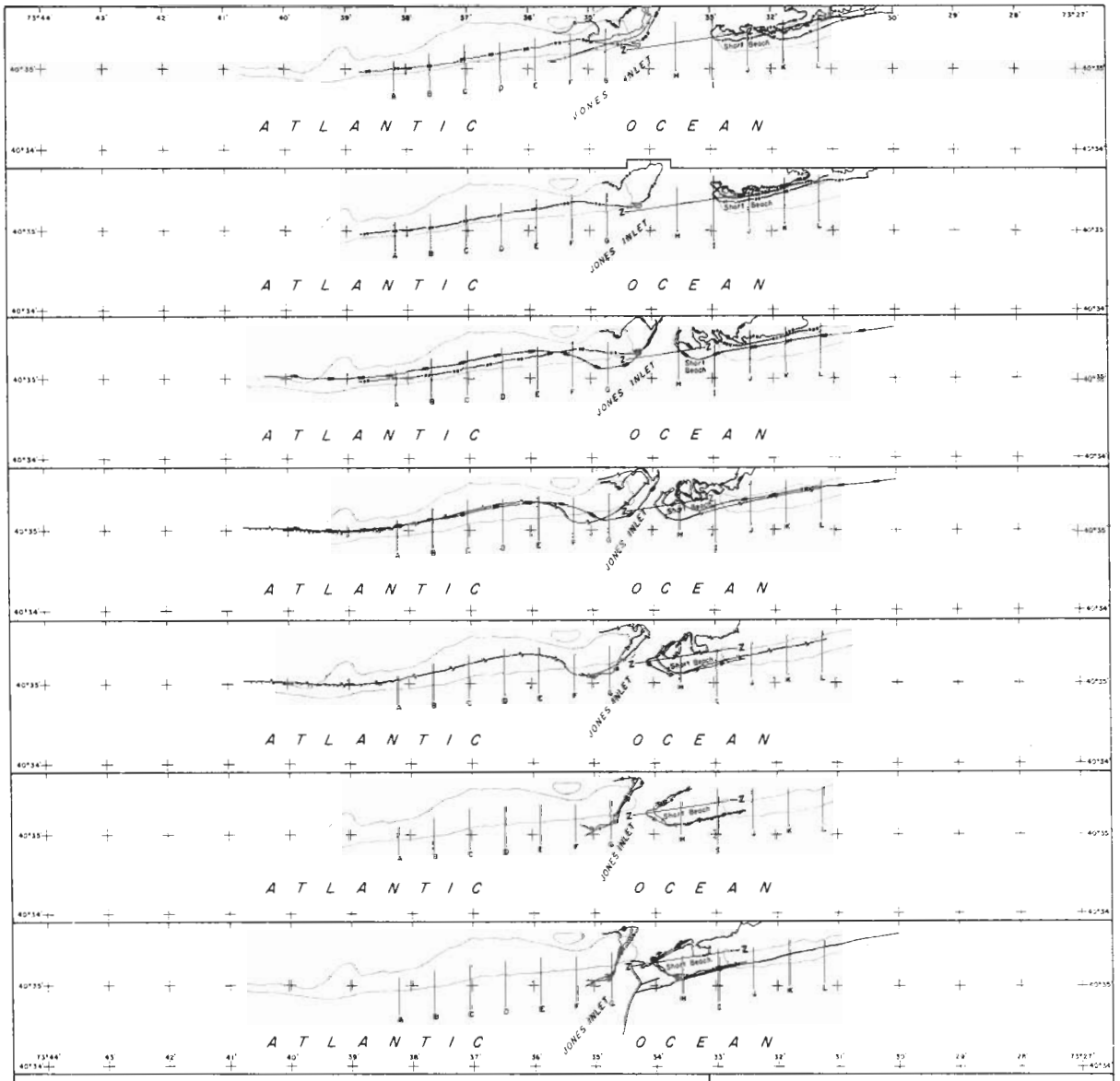
POLYCONIC PROJECTION DATUM N.A. 1927
SCALE IN FEET
2000 0 2000 4000 6000 8000

AVERAGE GROWTH PER YEAR OF MORICHES INLET (LINE ZZ)

Interval	Growth in Feet	Average Growth Per Year in Feet
* 1953 - 1955	- 40	- 20
1951 - 1953		
1949 - 1951		
1939 - 1949	3, 150	315
* 1937 - 1939	- 250	- 125
1933 - 1937	1, 000	250
* 1932 - 1933	- 120	- 120
1931 - 1932	320	320
1931 - 1955	4, 230	177

* Minus denotes retreat of point during interval
Inlet Opened 4 March 1931
Inlet Closed May 1951 to September 1953

FIGURE 20 MIGRATION OF MORICHES INLET, LONG ISLAND, NEW YORK AS SHOWN BY HIGH WATER SHORE LINE CHANGES 1829-1955



AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

Interval	Ranges A	B	C	D	E	F	G	H	I	J	K	L	Mean
1835-1880						+ 195	- 380				- 610	- 820	
1835-1909	- 460	- 380	- 310	- 460	- 650					- 850			- 577
1880-1909						- 1180	- 1120				- 610	- 750	
1909-1914										- 300	- 350	- 100	
1909-1926	- 310	- 570	- 520	- 590	- 460	+ 180	+ 1050						
1914-1926										+ 230	+ 420	+ 520	
1926-1933	+ 80	- 20	- 160	- 180	- 30	+ 1310	- 1150	+ 1650	+ 260	+ 240	+ 110	+ 90	+ 266
1933-1938							+ 320	- 50	+ 160				
1933-1955										+ 380	+ 380	+ 320	
1938-1939							- 100	+ 10	+ 80				
1939 1940							+ 260	+ 200	+ 110				
1940 1955							- 300	+ 200	+ 100				
* Net Change	- 590	- 970	- 990	- 1230	- 1140	+ 500	+ 580	+ 2010	+ 710	- 300	- 660	- 740	

* From earliest to latest survey for each range + Advancing shore line − Retreating shore line
Mean — Average of all profiles

AVERAGE GROWTH PER YEAR OF SHORT BEACH (LINE ZZ)

Interval	Growth in Feet	Average Growth Per Year in Feet
1940 - 1955	1,560	104
1939 - 1940	310	310
* 1938 - 1939	- 680	- 680
1933 - 1938	780	156
1926 - 1933	1,680	240
1914 - 1926	2,930	244
* 1909 - 1914	- 30	- 6
1880 - 1909	3,450	118
* 1835 - 1880	- 2,950	- 65
1835 - 1955	7,050	58

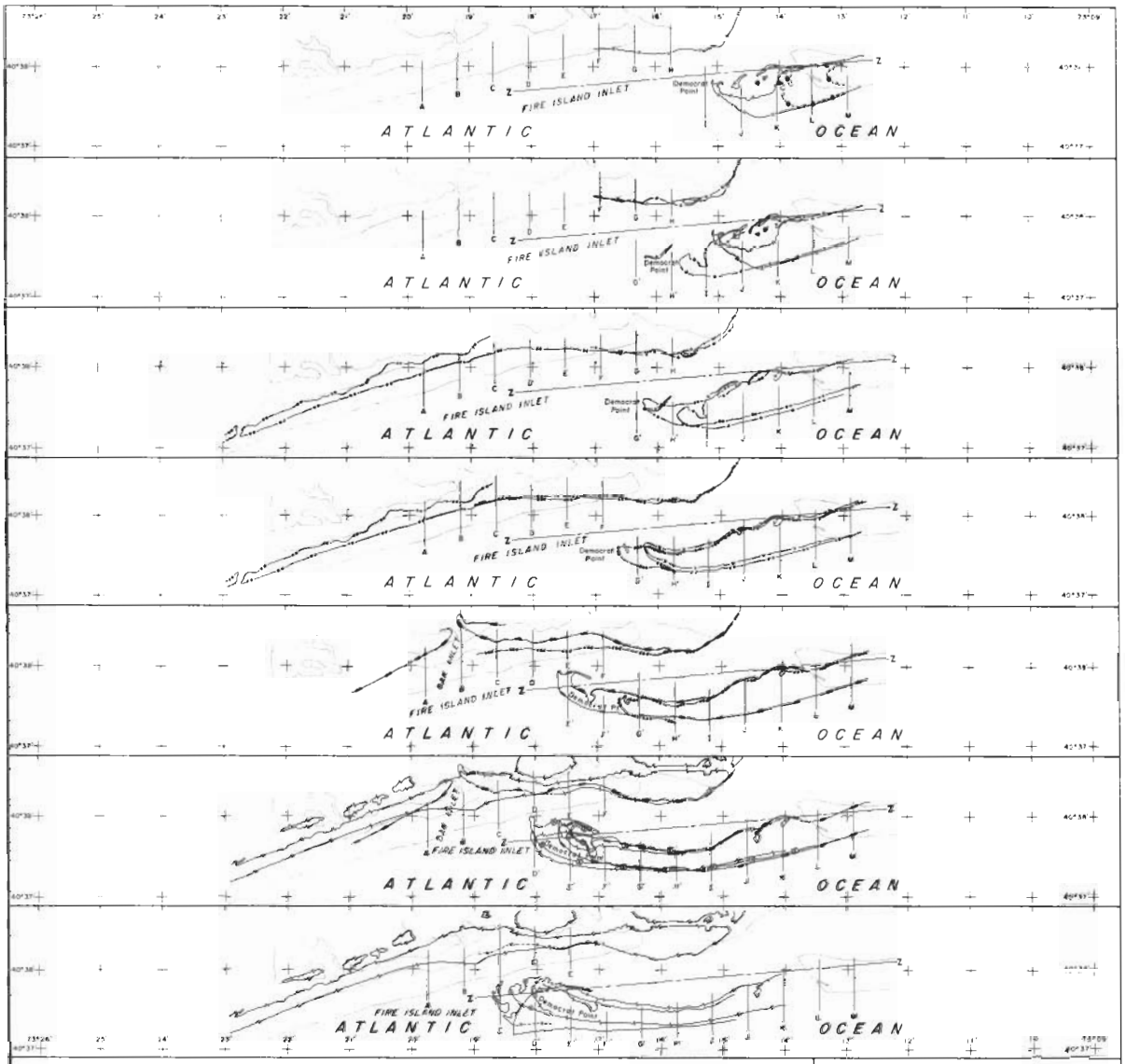
* Minus denotes retreat of point during interval

LEGEND - HIGH WATER SHORE LINE

1955	U.S.C.&G.S.	1926	U.S.C.&G.S.
1940	"	1914	"
1939	"	1909	"
1938	"	1880	"
1933	"	1835	"

POLYCONIC PROJECTION DATUM N.A. 1927
SCALE IN FEET
4000' 0' 2000 4000 6000 8000

FIGURE 21. MIGRATION OF JONES INLET, LONG ISLAND, NEW YORK AS SHOWN BY HIGH WATER SHORE LINE CHANGES 1835-1955



AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

Interval	A	B	C	D	D'	E	E'	F	F'	G'	H'	I	J	K	L	M	Mean
1834-1873															+1400	+250	
1834-1909	-1550	-1450	-1750	-1150		-830		0									-1122
1873-1887													+590	-190	-180		
1873-1909																-280	
1887-1909												-300	-300	-250	-270		
1909-1911											-340	-210	-300	-310	-210		
1909-1924	-1150	-2100	-470	-230		-630		-630								-80	
1911-1924											+50	+100	+160	+250	+180		-396
1924-1930							+620		-50	+80	+200	-110	-230	-140	+20		+49
1924-1934	+400	+2190	+590	0		+300		+220									+617
1930-1934					+530		+280		+430	+190	0	-120	-210	-220			+110
1934-1946			-480	-280		-20											
1934-1955					+2320		+750		+650	+480	+190	+250					+773
* Net Change	-2300	-1360	-2110	-1660	+2850	-1180	+1650	-610	+1030	+750	+100	-390	-290	-860	+940	-110	

* From earliest to latest survey for each range + Advancing shore line − Retreating shore line
Mean — Average of all profiles

AVERAGE GROWTH PER YEAR OF DEMOCRAT POINT (LINE ZZ)

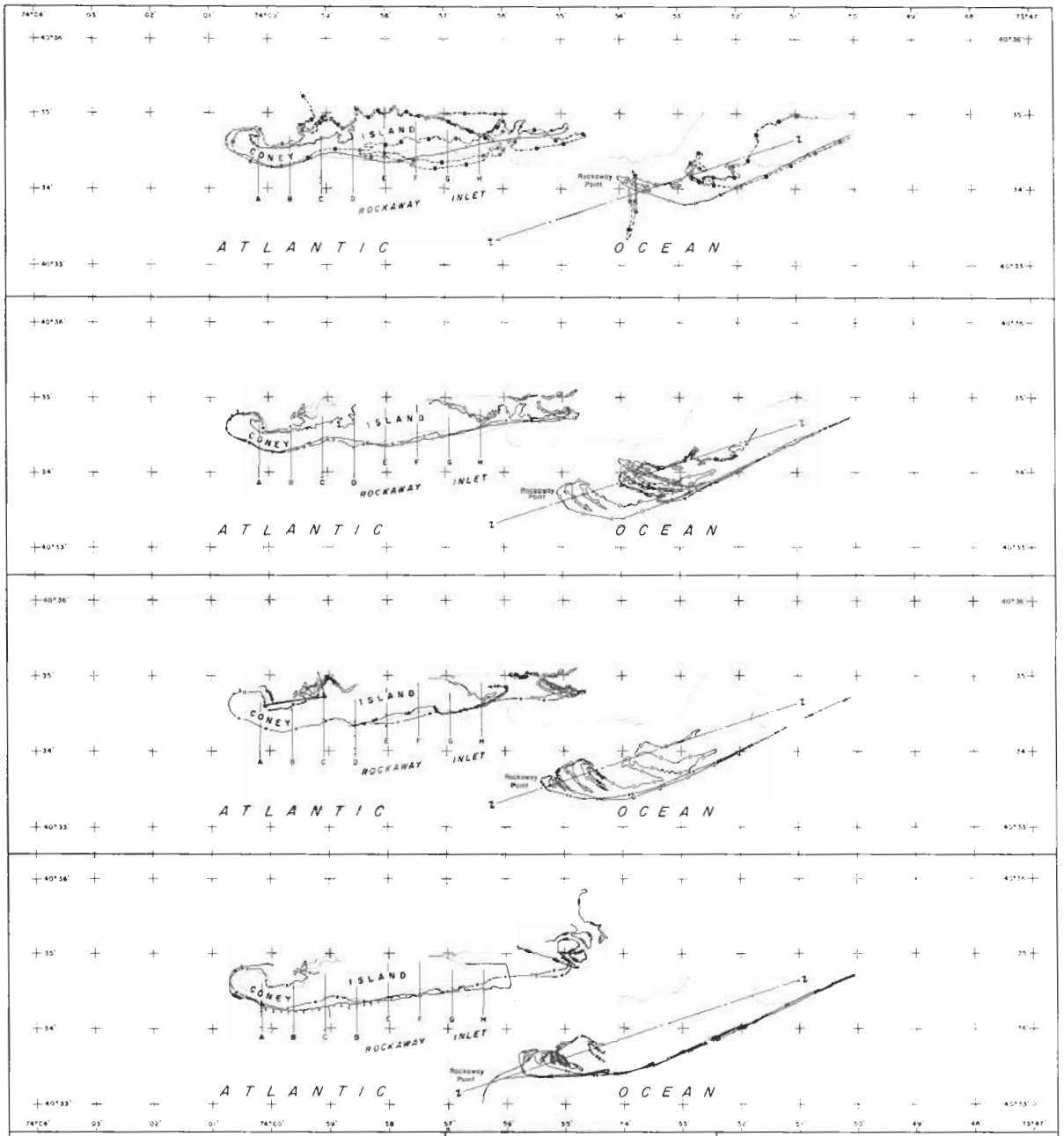
Interval	Growth in Feet	Average Growth Per Year in Feet
1945-1955	750	75
*1940-1945	-140	-28
1934-1940	1,680	280
1930-1934	0	0
1924-1930	2,000	333
1914-1924	4,700	470
1911-1914	1,910	636
1909-1911	60	30
1887-1909	2,570	117
1873-1887	2,700	193
1867-1873	5,000	833
1834-1867	1,100	33
1834-1955	21,880	182

LEGEND - HIGH WATER SHORE LINE

1955	U S C & G S	1911	C of E
1945	C of E	1909	U S C & G S
1940	"	1887	"
1934	U S C & G S	1873	"
1930	L I S P COMM	1867	C of E
1924	U S C & G S	1834	U S C & G S
1914	"		

POLYCONIC PROJECTION DATUM N A 1927
SCALE IN FEET

FIGURE 22. MIGRATION OF FIRE ISLAND INLET, LONG ISLAND, NEW YORK AS SHOWN BY HIGH WATER SHORE LINE CHANGES 1834-1955



AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

Interval	Ranges A	B	C	D	E	F	G	H	Mean
1835 to 1855-56			-600						
1855-56 to 1876	-140	+100	+380						+165
1835 to 1876				-160	+550	+680	+300	-390	
1876 to 1885	+30	+110	+230	+250	-180	-370	-100	-100	-16
1885 to 1902								-140	
1885 to 1908				+70	-720	-580	-110		
1902 to 1908								-60	
1908 to 1914								-80	
1908 to 1934				+140	+420	+760			
1885 to 1934	+50	+400	+680						
1914 to 1934								+600	
* Net Change	-60	+610	+690	+300	+70	+490	+90	-170	

* From earliest to latest survey for each range
\+ Advancing shore line
— Retreating shore line
Mean — Average of all profiles

LEGEND
HIGH WATER SHORE LINE

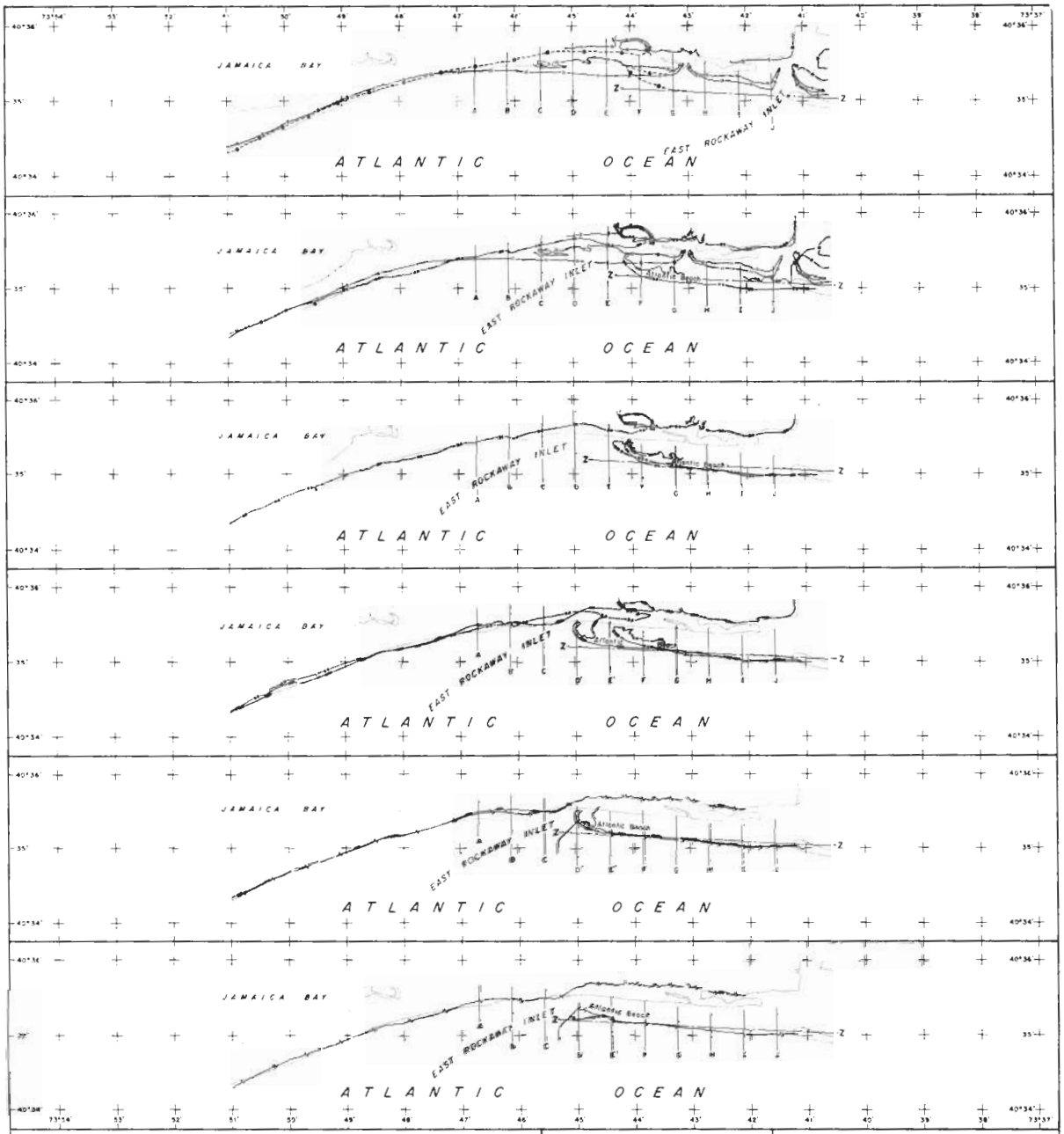
1933-1934	U.S.C.&G.S
1928	"
1919	"
1914	"
1908	"
1902	"
1885	"
1876	"
1855-1856	"
1835	"

POLYCONIC PROJECTION DATUM N.A. 1927
SCALE IN FEET
2000 0 2000 4000 6000 8000

AVERAGE GROWTH PER YEAR OF ROCKAWAY POINT (LINE ZZ)

Interval	Growth in Feet	Average Growth Per Year in Feet
1928-1934	2,750	458
1908-1928	1,770	88
1902-1908	1,520	253
1885-1902	5,100	300
1876-1885	600	75
1856-1876	5,280	251
1835-1856	4,960	236
1835-1934	21,980	222

FIGURE 23. MIGRATION OF ROCKAWAY INLET, LONG ISLAND, NEW YORK AS SHOWN BY HIGH WATER SHORE LINE CHANGES 1835-1934



AVERAGE HIGH WATER SHORE LINE CHANGE (IN FEET)

Interval	Ranges A	B	C	D	O'	E'	F	G	H	I	J	Mean
1835-1855	-320	-350	-690	-700								
1855-1879	+320	+730										
1855-1909	+60	+50	+180	-150			+700	+340				
1879-1909	-280	-670										
1909-1914							-260	-190	-70	-150	-60	
1909-1927	-270	0	+580	+230								
1914-1927							+350	-100	-120	-90	-180	
1927-1934	+160	+240	-100		-50	0	+40	+40	+100	+120	+60	+61
1934-1937					+780							
* Net Change	-330	0	-30	-620	+730	0	+830	+90	-90	-120	-180	

* From earliest to latest survey for each range
\+ Advancing shore line
\- Retreating shore line
Mean — Average of all profiles

LEGEND
HIGH WATER SHORE LINE

1937	U.S.C.&G.S.
1936	"
1934	"
1927	"
1914	"
1909	"
1879	"
1855	"
1835	"

POLYCONIC PROJECTION DATUM N.A. 1927
SCALE IN FEET
2000 0 2000 4000 6000 8000

AVERAGE GROWTH PER YEAR OF ATLANTIC BEACH (LINE ZZ)

Interval	Growth in Feet	Average Growth Per Year in Feet
1936-1937	240	240
1934-1936	590	295
*1927-1934	- 90	- 12
1914-1927	3,270	251
1909-1914	930	186
1879-1909	5,250	175
*1855-1879	-4,910	- 204
1835-1855	13,000	650
1835-1937	18,300	179

* Minus denotes retreat of point during interval

FIGURE 24. MIGRATION OF EAST ROCKAWAY INLET, LONG ISLAND, NEW YORK AS SHOWN BY HIGH WATER SHORE LINE CHANGES 1835-1937

major storm, has the effect of transferring a large volume of material across the inlet. The result of such a regimen is the growth of the updrift side in the downdrift direction and the retreat of the downdrift side in the same direction. If the volume of the littoral drift is sufficiently great so that the updrift side grows more rapidly than the downdrift side retreats, then the inlet closes naturally. Shinnecock, Moriches, and Jones Inlets appear to be representative of this relatively simple case. The more complex cases, Fire Island, East Rockaway, and Rockaway Inlets, involve the continued growth of the updrift side until that side overlaps the downdrift side while the inlet remains open. Such cases are complicated by such factors as the tidal prism passing through the inlet, the volume of littoral drift at the inlet, and the natural bypassing of the sediments. While these explanations are overly brief, they will be of some help in understanding the development of the present inlets.

An inlet existed some 2 miles west from the present location of Shinnecock Inlet at the time the first U. S. Coast and Geodetic Survey map was made in 1834-38. By 1891, when another survey was made by the U. S. Coast and Geodetic Survey, the inlet had closed and Shinnecock Bay remained essentially landlocked until it was reopened during the severe hurricane of September 1938. The inlet has remained open since then in essentially the same position due to the construction of stabilizing structures. Figure 19 illustrates the history of Shinnecock Inlet.

The next inlet to the west, Moriches Inlet, (shown on figure 20) has a history similar to that of Shinnecock Inlet. There were two inlets to Moriches Bay in the general vicinity of the present inlet in 1829 and by 1838, the year of first survey by the U. S. Coast and Geodetic Survey, both inlets had been closed by natural forces. For 93 years subsequent to 1838 Moriches Bay was not connected directly with the Atlantic Ocean; however, in March 1931 the inlet was reopened as the result of high tides and wave action. By 1949 the inlet had migrated over 4,000 feet to the west notwithstanding the construction of a stabilizing structure in 1947 and in May 1951 the inlet was sealed naturally. In 1952-53 two rubble jetties were constructed at the position of the former inlet and dredging for a channel was started from the bay southward toward the ocean. Before the dredging was completed, however, the inlet reopened during a minor storm and has remained open at its present location.

The last of the simple cases, Jones Inlet, figure 21, has been open for all of the historic past, since before 1835, and has been moving to the west at an average rate of 58 feet per year. The behavior of this inlet has been erratic, being complicated by the presence of other inlets through the barrier islands to the east and the west. While the net movement from 1835 to 1955 has been to the west, shorter time intervals reveal wide variations in the rate of growth and also movement opposite to the direction of littoral drift. The most recent development has been the construction of a rubble-mound jetty on the east side of the inlet and the accretion of a fillet to the east of the jetty. The area immediately to the east of this inlet will be discussed at greater length later.

The histories of Rockaway and Fire Island Inlets are very similar in that both have been open continuously since the 1830's and that the east side of both have been displaced to the south and continued to grow until now they overlap Coney Island and Oak Beach, respectively. At both locations the inlets trend in an east-west direction rather than the north-south direction of the first three inlets described. Since construction of the jetties at the east side of each of the inlets the accretion of large fillets to the east of the jetties has added new land to the islands. The jetty at Democrat Point, in fact, has reached its impoundment capacity and the sediments of the littoral stream have built an extension of Democrat Point for over ½ mile to the west of the jetty. Figures 22 and 23 illustrate Fire Island and Rockaway inlets respectively.

The last of the present inlets, East Rockaway Inlet, figure 24, also trends in an east-west direction. However, this inlet is unique in that during its migration to the west the west side has been joined to the projecting headland to the north. At the time of the 1835 survey the inlet was located about 3 miles east of its present location and the west arm was attached to the headland. By 1855 the inlet had assumed the form it now possesses with the exception that the mouth of the inlet was about 1 mile to the east of its present location. In 1879 the configuration had changed completely again. The west side was again attached to the headland and two inlets were present. The major opening was 3.5 miles to the east of the present inlet and a minor opening through the chain of barrier islands was approximately 2 miles to the east of the present ocean end of the inlet. By the time of the 1909-survey the inlet had once again assumed its present form and has maintained this form until the present. The only change has been the continued growth of the east side to the west. This growth was arrested by the construction of a jetty at the west end of the south side of the inlet in 1933-34.

Two other reaches which are at present continuous barriers have, in the very recent past, been strongly influenced by inlets which are no longer present. The two areas are Coney Island and the present barrier island between Jones Inlet and Fire Island Inlet. The former of these areas is no longer an island as its name implies but has been joined to the main body of Long Island by fill operations. In places along this reach the fluctuation of the high water shore line has approached 1,000 feet while the average annual seaward advance during the 100 years of measurement since 1834 has been as little as 7 feet. To the east the latter area has been broken by four inlets in addition to Jones and Fire Island Inlets which are the present limits of the area. This reach has also undergone violent changes and major rapid adjustments of the high water shore line. The violent changes have resulted either partially or wholly from the presence of inlets within or immediately adjacent to the reach.

Works of Man. Parts of the shore have been influenced by the works of man such as stabilizing measures, structures for navigation purposes, and modification of shore features for housing construction. Of equal importance has been the placement of sand upon the beach and upon the dunes landward

from the beach. In most instances the sand was obtained by hydraulic pipeline dredges from the lagoon to the north of the barrier islands. Table 4 lists some of the larger and more important construction works.

TABLE 4

MORE PROMINENT PROTECTIVE MEASURES
ALONG THE SOUTH SHORE OF LONG ISLAND

LOCATION	DATE OF COMPLETION	TYPE OF CONSTRUCTION
Montauk Point to Fire Island Inlet	1938	10 miles of dune restoration and 68 miles of sand fence
Camp Hero, Montauk Point	1944	Seawall
Montauk Point	1946	Seawall
Amagansett	1953	Beach fill
Town of East Hampton	1948	Beach fill and sand fencing
Southampton	before 1938	Groins and bulkhead
	1938-39	Beach fill and dune restoration
	1947	Groin field
Town of Southampton	1947	Beach fill and sand fences
	1948	Beach fill and sand fences
Shinnecock Inlet	1939	Rock-filled cribs and bulkhead
	1954	Jetties
Westhampton Beach	before 1938	Groins and bulkhead
	1938	Beach fill, dune restoration and sand fences
	1952	Beach fill
East of Moriches Inlet	1953	Beach fill
Moriches Inlet	1948	Rubble revetment
	1953	Jetties
West of Moriches Inlet	1947	Beach fill
	1948	Dune restoration and sand fences
Smith Point Park	1956	Beach fill

TABLE 4
(Continued)

LOCATION	DATE OF COMPLETION	TYPE OF CONSTRUCTION
Point O'Woods	1957	Beach Fill
Ocean Bay Park	1957	Beach Fill
Ocean Beach	1952	Groins, beach fill and sand fencing
Fire Island Inlet	1941	Jetty
Fire Island Inlet to Jones Inlet	1927	Dune restoration and road
Oak Beach	1932	Groins
	before 1935	Protective barges sunk
	1938	Sand bags placed between chain link fences
	1946	Beach fill
	1959	Beach fill
Cedar Island Beach	1931	Beach fill
Jones Inlet	1958	Jetty
Point Lookout	1940	Groins and bulkhead
Lido Beach	1930	Groins and bulkhead
Long Beach	1927	Groins and bulkhead
	1937	Groins
	1947	Groins
Atlantic Beach	Before 1928	Groins and bulkhead
East Rockaway Inlet	1934	Jetty
East Rockaway	1956	Groins
East Rockaway Inlet Area	1958	Beach fill
Edgemere	Before 1928	Groins
Arverne	Before 1930	Groins
Seaside	Before 1930	Groins

TABLE 4
(Continued)

LOCATION	DATE OF COMPLETION	TYPE OF CONSTRUCTION
Rockaway Park	before 1930	Groins
Rockaway Beach	1930	Groins and bulkhead
East of Jacob Riis State Park	1927	Beach fill and groins
Jacob Riis State Park	1923 1927	Groins and bulkhead Groins
Fort Tilden to Rockaway Point	1927	Groins and bulkhead
Rockaway Point	1933	Jetty
Coney Island	1923	Beach fill, groins and bulkhead.

In addition to the construction which has been accomplished along the shore, much data have been gathered along this reach concerning the surface elevation of the beach, foreshore and nearshore zones. Since the mid 1920's in excess of 500 ranges have been surveyed by various agencies. The surveys started at elevations of 10 feet or more above mean low water and extended to depths of approximately 30 feet below mean low water. Many surveys were not as extensive, however, while a few were longer, extending to depths of 60 feet below mean low water. The results of the terrestrial and hydrographic surveys were combined as profile plots. Exceptions to the above procedure occurred at a number of locations where sufficient hydrographic data existed. In such areas profiles were compiled from the existing hydrographic data and plotted. Appendix A lists the various ranges in increasing numerical order from east to west. The easternmost range at Montauk Point is number 1 and the westernmost range at Rockaway Point is number 516. The Appendix also contains the date the range was surveyed, the former designation of the range and the depth below mean low water to which the survey was accomplished.

It is interesting to note that if the 516 ranges had been spaced equally along the length of the south shore, 120 miles, there would have been a range every 1,230 feet. Unfortunately, however, there has been concentration of effort in limited areas such as near inlets or the Jones Beach area; therefore many of the ranges are confined within these areas leaving much space between adjacent ranges along other reaches of the shore.

Of the 516 ranges located and identified in Appendix A, some 178 of these have been surveyed more than once since 1927. In fact, there are in excess of 1,000 profiles available for the 500 ranges discussed above. These ranges which have been surveyed on more than one occasion are of course subject to comparison in order to determine either accretion or erosion along some limited reach of shore. If the comparative profiles had been equally spaced along the 120 miles of coast, there would have been a profile every 3,600 feet. Again because of the concentration of ranges in limited areas, the same relationship as above exists with the comparative profiles. Some profiles are closely spaced in limited areas while in many cases adjacent comparative profiles are 1 mile or more apart. This circumstance effectively prevents the utilization of the comparative profiles to determine volumetric accretion or erosion along a given reach. Beach Erosion Board Technical Memorandum No. 32 (Accuracy of Hydrographic Surveying in and Near the Surf Zone) indicates that the order of magnitude of error in computing volumetric changes increases rapidly as the spacing between profiles becomes greater. Appendix B identifies those ranges which have been surveyed more than once and presents quantitative data portraying changes along those ranges for a shore width of 1 foot. The vertical limits of the comparison are also given in the tables in Appendix B.

Not all of the comparative profiles close. That is to say the elevation of either the seaward or landward extension of one of the profiles may be significantly above that of the other profile at the same distance from mean low water. When such a condition existed, careful judgment was used to close the two comparative profiles with horizontal lines at what appeared to be the most appropriate elevation. The use of this technique creates inherent inaccuracies in that unrecorded deposition or erosion may have occurred beyond the limits of horizontal closure of the profiles. It was thought better, however, to use this technique and increase the number of comparative profiles than to record only those profiles which closed at each end.

LITTORAL DRIFT

The presence of littoral barriers and the history of continued migration of inlets have been used to determine the direction and to estimate the rate of littoral sediment transport. Many observers have stated the direction of movement; however, estimates of the rates of transport have varied widely.

Direction. Fuller (1914) stated that the transport of littoral sediments generally was from east to west and later authors have agreed with this premise. Verification of this general statement may be developed at each of the present inlets inasmuch as all of the inlets have migrated from the east to the west, the east side advancing and the west side retreating. In addition, accretion fillets have formed to the east of the east jetty at each of the present inlets also indicating movement from east to west. The smaller accretion fillets immediately to the west of the west jetties at Shinnecock and Moriches Inlets have been brought about by the entrapment of

sand in the protective lee of the jetty. The material in the lee of the west jetties was emplaced via short-term easterly drift or as the result of wave diffraction in the vicinity of the outer bar and jetty, or possibly as the result of storm conditions.

The orientation of the island and of the New Jersey shore is such that the western two-thirds is exposed only to those waves from the south through the east-northeast directions. The fetch length west of south and the near-shore hydrography act to preclude the generation of sizable waves from that direction. Consequently, while reversal of the direction of littoral drift is possible anywhere along the shore, reversal of sizable quantities of drift should be found only along the eastern one-third of the island and in the vicinity of inlets. There are two exceptions, however, in the westerly two-thirds of the island where the drift direction is to the east. The first of these regions is immediately to the west of Fire Island Inlet where the drift moves to the east as a result of the proximity of the inlet. The combination of tidal currents and wave refraction over the shoal at the mouth of the inlet result in easterly drift. Farley (1923) discusses the second region of reversal of drift, Coney Island, at the extreme western end of the area. The period of observation is short, approximately one year. From just to the west of the midpoint of the island, the nodal point, the drift is to the west and east of the node the drift is to the east. The positions of The Narrows, Rockaway Inlet, and Rockaway Point make the theoretical determination of littoral drift direction most complicated; therefore, the observational data described by Farley are the most reliable evidence available.

Estimated Rate of Transport. As has been stated earlier, a number of estimates of the rate of transport of the littoral drift have been made and there is wide variation among the estimates. Much of the diversity has resulted from calculations based upon different methods or upon different areas. It is quite apparent that the drift rate is different along different sections of the shore. Examples of variations of total annual littoral drift reaching a given point may be visualized from the growth rate of the shore of the updrift side of an inlet. Fire Island Inlet, for instance, has been strongly influenced by the presence of inlets to the east such that the fluctuations in growth rate of the east side of the inlet reflects, in some measure, the quantity of littoral drift reaching the inlet area. In other words, the rate of migration of Democrat Point, the east side of Fire Island Inlet, from east to west has been controlled directly by the quantity of littoral sediments available. The quantity of sediments available is affected by inlets or an effective updrift littoral barrier. The 1930-34 period is one of no advancement of Democrat Point which coincides with the reopening of Moriches Inlet. It may be argued that Moriches Inlet is too far updrift to have influenced the growth rate of Democrat Point because the sediment deficiency caused by the inlet would have been eliminated by the available sand over the long reach of Fire Island. On the other hand, the 1930-34 period is the only epoch in the historic past (since 1834) but prior to the construction of the jetty during which there has been no advance of Democrat Point.

Two methods have been used to compute the littoral transport rate:

a. The accretion rate updrift from a substantially complete littoral barrier, usually a long jetty, is determined by periodic surveys. The surveys are continued until the impoundment capacity of the structure has been reduced sufficiently to allow the natural bypassing of an appreciable portion of the drift. This method is the most accurate means of computing the littoral drift rate.

b. The second method is less accurate but may be used when no littoral barrier is present. The area of growth of the end of the updrift shore of an inlet is determined on an average annual basis and multiplied by the average depth of the inlet. The product is a measure of the littoral transport rate, but this method cannot evaluate the quantity of sediments which bypass the inlet nor the volume of material drawn from the littoral stream through the inlet to form the inner shoal or bar.

Based upon these two methods the following table gives the most acceptable estimates of the littoral transport rate and the range of rates for three locations along the south shore of Long Island.

TABLE 5

ANNUAL LITTORAL TRANSPORT RATE,
SOUTH SHORE OF LONG ISLAND

Location	Range of Estimate (cubic yards)	Most Acceptable Estimate (cubic yards)
Moriches Inlet		300,000
Fire Island Inlet	160,000 to 600,000	450,000
Rockaway Inlet		450,000

SOURCES OF BEACH MATERIAL

The existing sand beaches and barrier islands fronting the south shore of Long Island have been formed by wave and littoral forces. The possible sources of this material are the headlands at the eastern end of the island, the nearshore bottom sediments and stream sediments.

Headlands Section. The extensive erosion which has occurred to this section (see section on physiography) has supplied enormous volumes of sediment that have been moved to the west. The amount of material of beach size supplied to the littoral current by the bluff unit of the headlands section has been estimated as slightly less than 100,000 cubic yards annually. It may be that in the relatively recent geologic past, before

the headlands were so severely truncated, the volume of material supplied to the littoral current by the headlands section was considerably greater in magnitude. Petrographic study of the beach sands, Colony (1932), points to the headlands section as the source of material.

Streams. Another possible source of material are the fine-grained sediments of the southward flowing streams of the main island. The flat gradient and the presence of marshes would indicate that deposition of the sediments has occurred near the stream mouths. Studies of the inlets by Lucke (1934) and others indicate that the material is generally medium to fine sand with very little silt or clay. It is probably true, therefore, that very little if any stream sediments reach the ocean shores.

Nearshore Bottom. The mechanism by which offshore bottom material is moved inshore is not fully understood; rather, it is believed that waves finally shift nearshore bottom material seaward into deeper water. Investigations of bottom sediments, however, show that this material is similar to that found on the present beaches and it may be possible that the material is moved inshore or alongshore. It is known that seasonal accretion takes place at many beaches. In an experiment in 1948 about 600,000 cubic yards of sand were deposited in 38 feet of water about ½ mile off Long Branch, New Jersey, but no appreciable onshore movement has been determined. Similar experiments were attempted at Atlantic City, New Jersey and Santa Barbara, California with the same results; therefore the continued onshore movement of bottom sediments is questionable.

Summary. Under present conditions the bluff unit of the headland section appears to be the only source of additional beach-size sediments to the foreshore and nearshore bottom; however it is believed that the present rate of littoral drift is much greater than could be derived from this source. The amount of littoral drift has been estimated for the Fire Island Inlet area to be on the order of 450,000 cubic yards per year (table 5). It is apparent that streams do not contribute any sediments to the alongshore current. Further the shoreward movement of the nearshore bottom sediments is questionable. Therefore, the great difference between the estimates of the amount of sediments moving and that supplied by the bluff unit of the headlands section would indicate that a source of beach material in addition to the bluffs is required. It appears that the only remaining sources of supply of littoral materials are the existing beaches, and possibly a small portion of the nearshore bottom.

ACKNOWLEDGEMENTS

The author is indebted to Jay V. Hall, Jr. for critical reading of the report and to Leslie Durloo and Mrs. Ebba Everett for acquiring needed data. The author is also indebted to Verner E. Dahlin, Herbert J. Bruder, and John S. Woodson for drafting of figures and to Mrs. J. S. Rowzie for careful preparation of the manuscript.

BIBLIOGRAPHY

The following is not intended as a complete bibliography for this report because such a list might well include very many entries, rather the following references include the specific works most used for this report.

Beach Erosion Board, U. S. Army Corps of Engineers, "Beach Erosion Study, South Shore of Long Island, New York", unpublished report, 1946.

--- "Test of Nourishment of the Shore by Offshore Deposition of Sand", Technical Memorandum No. 17, 1950.

--- "Accuracy of Hydrographic Surveying in and Near the Surf Zone", Technical Memorandum No. 32, 1953.

Case, Gerald O., "Coast Erosion and Protection on Long Island and New Jersey" series of three articles, Engineering News, Vol. 74, No. 8-10, Aug. 19,26, Sept. 2, 1915

Colony, R. J., "Sources of the Sands on the South Shore of Long Island and the Coast of New Jersey", Journal of Sedimentary Petrology, Vol. 2, No. 3, pp. 150-159, December 1932.

Corps of Engineers, "Beach Erosion at Jacob Riis Park, Long Island, New York", House Document 397, 74th Congress, 1935.

--- "Cooperative Beach Erosion Control Study, Fire Island Inlet to Jones Inlet, Long Island, New York", House Document 411, 84th Congress, 1957.

--- "Cooperative Beach Erosion Control and Interim Hurricane Study, Atlantic Coast of Long Island, Fire Island Inlet to Montauk Point, New York", House Document 425, 86th Congress, 1960.

Crosby, W. O., "Outline of the Geology of Long Island, N. Y. " , Annals New York Academy of Science, Vol. XVIII, No. 10, Part III, 1908.

Farley, P. P., "Coney Island Public Beach and Boardwalk Improvement", The Municipal Engineers Journal, Fourth Quarterly Issue, 1923.

Fenneman, N. M., "Physiography of the Eastern United States", McGraw-Hill Book Co., 1938.

Fleming, W.L.S., "Glacial Geology of Central Long Island", American Journal of Science, Vol. 30, 1935.

Flint, R. F. "Glacial Geology and the Pleistocene Epoch", Wiley, 1947.

Fuller, M. L., "The Geology of Long Island, N. Y.", U. S. Geological Survey Professional Paper 82, 1914.

Geological Society of America, "Pleistocene and Recent Changes of Sea Level along the North Atlantic Coast", abstracts of papers at symposium, Bulletin 44, 1933.

Gofseyeff, S., "History of Fire Island Inlet, N. Y." Proceedings of Third Conference on Coastal Engineering, Oct. 1952.

Hobbs, W. H., "The Configuration of the Rock Floor of Greater New York," U. S. Geological Survey Bulletin 270, 1905.

Johnson, D. W., "Shore Processes and Shoreline Development", Wiley, 1919.

Knight, J. B., "A Salt Marsh Study", American Journal of Science, fifth series, Vol. 28, No. 165, Sept. 1934.

Lucke, J. B., "A Theory of Evolution of Lagoon Deposits on Shore Lines of Emergence", Journal of Geology, Vol. 42, No. 6, 1934.

MacClintock, P. and H. R. Richards, "Correlation of Lake Pleistocene Marine and Glacial Deposits of New Jersey and New York", Geological Society of America Bulletin, Vol. 47, 1936. A discussion of this article by M. L. Fuller with a reply by MacClintock and Richards appears in Geological Society of America Bulletin, Vol. 47, supplement, 1937.

Mather, W. W., "Geology of New York", Part 1, 1843.

Oliver, J. E. and C. L. Drake, "Geophysical Investigations in the Emerged and Submerged Atlantic Coastal Plain", Geological Society of America Bulletin, Vol. 62, No. 11, 1951.

Roberts, C. M., "Petrography of a Sample of Bedrock from a Deep Well at Rockaway Park, Long Island, N. Y.", American Mineralogist, Vol. 33, No. 3-4, 1948.

Shepard, F. P. and G. V. Cohee, "Continental Shelf Sediments off the Mid-Atlantic States", Geological Society of America Bulletin, Vol. 47, 1936.

Stetson, H. C., "The Sediments of the Continental Shelf of the Eastern Coast of the United States", Papers in Physical Oceanography and Meteorology, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, Vol. 5, No. 4, 1938.

--- "The Sediments and Stratigraphy of the East Coast Continental Margin; Georges Bank to Norfolk Canyon", Papers in Physical Oceanography and Meteorology, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, Vol. 11, No. 2, 1949.

Suter, R., W. de Laguna, and N. M. Perlmutter, "Mapping of Geologic Formations and Aquifers of Long Island, New York", New York State Water Power and Control Commission Bulletin GW 18, 1949.

Veatch, A. C. and others, "Underground Water Resources of Long Island, N. Y.", U. S. Geological Survey Professional Paper 44, 1906.

Veatch, A. C. and P. A. Smith, "Atlantic Submarine Valleys of the United States and the Congo Submarine Valley", Geological Society of America Special Paper 7, 1939.

Weiss, L., "Foraminifera and the Origin of the Gardiners Clay (Pleistocene), Eastern Long Island, New York", U. S. Geological Survey Professional Paper 254-G, 1954.

Wells, F. G., "Reconsideration of the Pleistocene Geology of Long Island", Geological Society of America Proceedings, 1934.

APPENDIX A

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND

The table which comprises the body of this appendix is a compilation of all readily available data concerning those ranges which have been established and surveyed along the south shore of Long Island to determine the elevation of the beach, foreshore and nearshore zones about the mean low water datum. The more than 500 ranges listed in the table were surveyed by various agencies during the past approximately 30 years.

Listed in the table in increasing numerical order from east to west are the ranges and their former designations. The extent of each survey is specified by indicating the depth below mean low water to which the range was surveyed. Generally the landward and seaward limits are 10 or 12 feet above and 30 feet below mean low water respectively. While some of the surveys are less extensive, some were extended to depths as great as 60 feet below mean low water. The date of each survey is also given.

In some areas ranges were not surveyed but rather were compiled and plotted from existing hydrographic data. These ranges have been identified with an asterisk.

All of the ranges are located on figure A-1. While the locations and orientation of the ranges are correct, the landward and seaward limits are not drawn to scale. The lines on the maps are extended sufficiently to allow differentiation and identification of the ranges rather than to establish the limits of each survey.

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
1	NE 2	Montauk Point	10/1936	28.0
	"	" "	9/1937	29.0
	"	" "	8/1938	35.0
	1	" "	11/1941	34.0
2	1	" "	1839	62.0
	1	" "	1933	62.0
	NE 1	" "	10/1936	31.0
	"	" "	8/1938	35.0
	4300 + 50.56	" "	7-8/1940	29.8
	58	" "	1956	30.0
3	57	" "	1933	28.0
	NE	" "	10/1936	29.0
	"	" "	9/1937	34.0
	"	" "	8/1938	36.0
	4286 + 94	" "	7-8/1940	35.0
	57	" "	1956	42.1
4	2	" "	1839	73.0
	2	" "	1933	70.0
	SE	" "	10/1936	32.7
	"	" "	9/1937	33.0
	"	" "	8/1938	40.0
	2	" "	11/1941	38.0
5	SE 1	" "	10/1936	35.1
6	SE 2	" "	10/1936	35.4
	"	" "	9/1937	40.0
	"	" "	8/1938	41.0
7	SE 3	" "	10/1936	32.6
	4273 + 29.2	" "	7-8/1940	31.0
8	4264 + 00	" "	7-8/1940	32.1
9	4255 + 00	" "	7-8/1940	35.8
10	4244 + 00	" "	7-8/1940	31.9
11	4228 + 50	" "	7-8/1940	31.8
12	4223 + 50	" "	7-8/1940	35.0
13	4210 + 00	" "	7-8/1940	32.6
14	4199 + 00	" "	7-8/1940	33.0
15	4190 + 00	" "	7-8/1940	36.9
16	4181 + 00	East of Pond Bluff	7-8/1940	41.8
17	4171 + 00	West of Pond Bluff	7-8/1940	34.2
18	4162 + 00	Town of Montauk	7-8/1940	35.9
19	4155 + 75	" "	7-8/1940	34.7
20	56	" "	1933	31.0
	4143 + 00	" "	7-8/1940	32.6
	56	" "	1956	47.0
21	4136 + 70	" "	7-8/1940	31.7
22	4125 + 50	" "	7-8/1940	32.2

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
23	4113 + 50	Town of Montauk	7-8/1940	33.9
24	4109 + 50	" "	7-8/1940	33.0
25	4100 + 09.44	" "	7-8/1940	32.5
26	4087 + 05	" "	7-8/1940	30.6
27	55	Ditch Plains CGS	1933	28.0
	4076 + 00	" "	7-8/1940	32.6
	55	" "	1956	34.8
28	4069 + 00	" "	7-8/1940	31.7
29	4058 + 00	West of Ditch Plains CGS	7-8/1940	30.6
30	4045 + 75	Montauk	7-8/1940	31.2
31	4037 + 00	"	7-8/1940	33.0
32	4027 + 00	"	7-8/1940	32.0
33	4015 + 00	"	7-8/1940	31.0
34	4006 + 00	"	7-8/1940	32.3
35	3997 + 00	Fort Pond	7-8/1940	30.3
36	3985 + 00	" "	7-8/1940	36.2
37	3973 + 00	" "	7-8/1940	31.4
38	3961 + 00	" "	7-8/1940	32.4
39	3923 + 00	Montauk Beach	7-8/1940	31.0
40	3911 + 00	" "	7-8/1940	31.1
41	3899 + 00	Hither Plain	7-8/1940	30.1
	54	" "	1956	33.8
42	3886 + 00	West of Hither Plain	7-8/1940	35.9
43	3874 + 00	" " "	7-8/1940	38.8
44	3862 + 00	" " "	7-8/1940	31.9
45	3850 + 00	" " "	7-8/1940	31.0
46	3838 + 00	" " "	7-8/1940	33.1
47	3826 + 00	" " "	7-8/1940	37.0
48	3814 + 00	" " "	7-8/1940	34.0
49	3802 + 00	" " "	7-8/1940	35.9
50	3790 + 00	" " "	7-8/1940	33.3
51	53	Hither Hills S.P.	1933	29.0
	3778 + 00	" "	7-8/1940	34.1
	53	" "	1956	32.9
52	R-1	" "	8/1936	30.0
	"	" "	10/1936	32.0
	"	" "	9/1937	33.0
	"	" "	8/1938	38.0
53	3766 + 00	" "	7-8/1940	33.0
54	R-2	" "	8/1936	30.0
	"	" "	10/1936	35.0
	"	" "	9/1937	38.0
	"	" "	8/1938	37.0

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
55	R-3	Hither Hills S.P.	8/1936	26.8
	"	" "	10/1936	33.0
	"	" "	9/1937	34.0
	"	" "	8/1938	35.0
56	3754 + 00	" "	7-8/1940	32.2
57	R-4	" "	8/1936	30.0
	"	" "	10/1936	31.0
	"	" "	9/1937	36.0
	"	" "	8/1938	34.0
58	3742 + 00	" "	7-8/1940	35.0
59	3	" "	1838	82.0
	3	" "	1933-38	90.0
	R-5	" "	8/1936	29.0
	"	" "	10/1936	31.6
	"	" "	9/1937	33.0
	"	" "	8/1938	37.0
	3	" "	1941	38.0
60	R-6	" "	8/1936	30.0
	"	" "	10/1936	31.5
61	3730 + 00	" "	7-8/1940	32.4
62	3718 + 00	" "	7-8/1940	30.1
63	3706 + 00	" "	7-8/1940	33.0
64	3700 + 00	West of Hither Hills S.P.	7-8/1940	34.0
65	3689 + 00	Napeague	7-8/1940	31.5
66	3677 + 00	"	7-8/1940	34.9
67	3665 + 00	"	7-8/1940	32.8
68	3653 + 00	Napeague CGS	7-8/1940	35.8
69	3641 + 00	West of Napeague CGS	7-8/1940	34.0
70	3629 + 00	East Hampton Beach	7-8/1940	32.6
71	3617 + 00	" " "	7-8/1940	32.6
72	3605 + 00	" " "	7-8/1940	34.4
73	3593 + 00	" " "	7-8/1940	30.7
74	3581 + 00	" " "	7-8/1940	32.7
75	52	West of E. Hampton Beach	1933	25.0
	3569 + 00	" " "	7-8/1940	34.3
	52	" " "	1956	34.3
76	3557 + 00	" " "	7-8/1940	31.6
77	3545 + 00	" " "	7-8/1940	33.9
78	3533 + 00	" " "	7-8/1940	31.9
79	3521 + 00	" " "	7-8/1940	34.4
80	3509 + 00	" " "	7-8/1940	32.2
81	3497 + 00	" " "	7-8/1940	35.5
82	3485 + 00	" " "	7-8/1940	32.3

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
83	3473 + 00	Hampton Beach	7-8/1940	30.1
84	3461 + 00	" "	7-8/1940	30.3
85	3450 + 00	West of Hampton Beach	7-8/1940	33.3
86	3438 + 00	East of Amagansett	7-8/1940	34.2
87	3426 + 00	Amagansett	7-8/1940	30.1
88	2A	Amagansett CGS	8/1936	32.0
	2A	" "	8/1938	35.0
89	3414 + 00	" "	7-8/1940	33.4
90	2B	" "	8/1936	34.0
91	4	" "	1838	92.0
	4	" "	1933-38	98.0
	2C	" "	8/1936	32.4
	2C	" "	8/1938	35.0
92	3402 + 00	" "	7-8/1940	31.0
93	3390 + 00	Amagansett	7-8/1940	32.4
94	3378 + 00	"	7-8/1940	33.8
95	3332 + 00	West of Amagansett	7-8/1940	32.9
96	3320 + 00	" "	7-8/1940	32.1
	51	" "	1956	36.3
97	3308 + 00	" "	7-8/1940	36.4
98	3296 + 00	" "	7-8/1940	32.2
99	3284 + 00	" "	7-8/1940	34.2
100	3272 + 00	" "	7-8/1940	31.8
101	3260 + 00	" "	7-8/1940	35.5
102	3248 + 00	" "	7-8/1940	32.6
103	3236 + 00	East Hampton	7-8/1940	32.0
104	3224 + 00	" "	7-8/1940	32.4
105	3212 + 00	" "	7-8/1940	31.5
106	3200 + 00	" "	7-8/1940	35.7
107	3188 + 00	" "	7-8/1940	34.5
108	3176 + 00	" "	7-8/1940	34.7
109	3164 + 00	" "	7-8/1940	34.8
110	50	" "	1933	28.0
	3152 + 00	" "	7-8/1940	33.1
	50	" "	1956	40.0
111	3140 + 00	" "	7-8/1940	33.3
112	3128 + 00	" "	7-8/1940	36.9
113	3116 + 00	" "	7-8/1940	34.4
114	3104 + 00	Georgica Pond CGS	7-8/1940	31.7
115	3092 + 00	Georgica Cove	7-8/1940	31.2
116	3080 + 00	" "	7-8/1940	30.2
117	3068 + 00	East of Georgica Pond Inlet	7-8/1940	30.4
118	3056 + 00	East of Georgica Pond Inlet	7-8/1940	31.0

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
119	3044 + 00	West of Georgica Pond Inlet	7-8/1940	33.9
120	49	Wainscott Pond	1933	23.0
	3032 + 00	" "	7-8/1940	31.3
	49	" "	7-8/1940	37.9
121	3020 + 00	" "	7-8/1940	30.3
122	3008 + 00	" "	7-8/1940	30.5
123	2996 + 00	Southampton	7-8/1940	32.9
124	2984 + 00	"	7-8/1940	31.0
125	2972 + 00	"	7-8/1940	34.5
126	2960 + 00	"	7-8/1940	33.4
127	2948 + 00	"	7-8/1940	33.0
128	2936 + 00	"	7-8/1940	31.9
129	2924 + 00	"	7-8/1940	32.9
130	48	"	1933	24.0
	2912 + 00	"	7-8/1940	31.4
	48	"	1956	35.4
131	2900 + 00	"	7-8/1940	33.3
132	2888 + 00	"	7-8/1940	31.3
133	2876 + 00	East side of Sagaponack Inlet	7-8/1940	34.3
134	2864 + 00	West side of Sagaponack Inlet	7-8/1940	31.3
135	2852 + 00	West of Sagaponack Inlet	7-8/1940	34.2
136	2840 + 00	" " "	7-8/1940	31.5
137	2828 + 00	East of Mecox Bay	7-8/1940	30.3
138	2816 + 00	" "	7-8/1940	32.6
139	2800 + 00	" "	7-8/1940	31.1
140	2792 + 000	Mecox Bay	7-8/1940	30.6
141	2780 + 00	"	7-8/1940	31.0
142	2768 + 00	"	7-8/1940	33.0
143	2756 + 00	East Side of Mecox Inlet	7-8/1940	30.8
144	2742 + 00	West Side of Mecox Inlet	7-8/1940	30.7
145	2730 + 00	Mecox Bay	7-8/1940	30.9
146	47	Flying Point Road	1933	28.0
	2718 + 00	" "	7-8/1940	30.4
	47	" "	1956	34.3
147	2706 + 00	Channel Pond	7-8/1940	31.9
148	2694 + 00	West of Channel Pond	7-8/1940	33.6
149	2682 + 00	Julie Pond	7-8/1940	31.5
150	2670 + 00	Phillips Pond	7-8/1940	30.4
151	2658 + 00	" "	7-8/1940	30.8
152	2646 + 00	West of Phillips Pond	7-8/1940	31.5
153	2634 + 00	Wickapogue Pond	7-8/1940	30.6

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
154	2628 + 00	Old Town Road	7-8/1940	31.6
155	46	Southampton CGS	1933	24.0
	R-1-B	" "	8/1936	29.0
	" "	" "	9/1937	33.0
	" "	" "	8/1938	32.0
	2610 + 00	" "	7-8/1940	31.7
	46	" "	1956	33.5
156	5	" "	1838	87.0
	5	" "	1933-38	93.0
	R-1-A	" "	9/1936	27.6
	"	" "	9/1937	27.0
	"	" "	8/1938	34.0
157	2598 + 00	" "	7-8/1940	32.1
158	2586 + 00	Southampton	7-8/1940	31.2
159	2574 + 00	"	7-8/1940	30.3
160	2562 + 00	"	7-8/1940	30.3
161	2550 + 00	"	7-8/1940	31.9
162	2538 + 00	"	7-8/1940	30.4
163	2526 + 00	"	7-8/1940	30.6
164	2514 + 00	Southampton	7-8/1940	30.1
165	2501 + 00	"	7-8/1940	31.5
166	45	"	1933	26.0
	2489 + 00	"	7-8/1940	30.6
	45	"	1956	33.8
167	2477 + 00	"	7-8/1940	34.0
168	2465 + 00	Shinnecock Bay	7-8/1940	30.7
169	2453 + 00	" "	7-8/1940	36.1
170	2441 + 00	" "	7-8/1940	30.1
171	2429 + 00	" "	7-8/1940	30.2
172	2418 + 00	" "	7-8/1940	30.4
173	2406 + 00	" "	7-8/1940	30.8
174	2394 + 00	" "	7-8/1940	30.3
175	2382 + 00	" "	7-8/1940	32.3
176	2370 + 00	" "	7-8/1940	32.6
177	2358 + 00	East of Shinnecock Inlet	7-8/1940	31.4
178	2346 + 00	" " "	7-8/1940	30.9
179	2334 + 00	" " "	7-8/1940	30.7
180	2322 + 00	" " "	7-8/1940	31.0
	E*	" " "	8/1940	20.5
	E*	" " "	8/1949	20.5
181	D	" " "	9/1940	18.0
	D	" " "	8/1949	18.0
182	44	" " "	1933	27.0
	2310 + 00	" " "	7-8/1940	31.3
	44	" " "	1956	33.0

(*) Star indicates Ranges established by BEB from Sounding Sheets

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
183	C *	East of Shinnecock Inlet	9/1940	18.0
	C *	" " "	8/1949	18.0
184	43	West of Shinnecock Inlet	1933	24.0
	2295 + 00	" " "	7-8/1940	31.6
	43	" " "	1956	32.5
185	2292 + 00	" " "	7-8/1940	6.2
186	B *	" " "	9/1940	23.0
	B *	" " "	8/1949	23.0
187	2280 + 00	" " "	7-8/1940	30.7
188	2268 + 00	" " "	7-8/1940	32.0
189	2256 + 00	" " "	7-8/1940	32.1
	A *	" " "	8/1940	20.5
	A *	" " "	9/1949	20.5
190	2244 + 00	" " "	7-8/1940	33.6
191	2232 + 00	Tiana Beach	7-8/1940	31.7
192	2220 + 00	" "	7-8/1940	31.6
193	6	" "	1838	92.0
	6	" "	1933-38	95.0
194	2208 + 00	" "	7-8/1940	31.2
195	2173 + 00	" "	7-8/1940	31.6
196	2161 + 00	" "	7-8/1940	31.8
197	42	" "	1933	24.0
	2149 + 00	" "	7-8/1940	34.6
	42	" "	1956	30.9
198	2137 + 00	" "	7-8/1940	33.7
199	2125 + 00	" "	7-8/1940	32.8
200	2113 + 00	Tiana CGS	7-8/1940	32.6
201	2101 + 00	" "	7-8/1940	32.4
202	2089 + 00	" "	7-8/1940	37.2
203	2077 + 00	West of Tiana CGS	7-8/1940	33.9
204	2065 + 00	" " "	7-8/1940	32.1
205	2053 + 00	" " "	7-8/1940	33.6
206	2041 + 00	" " "	7-8/1940	30.3
207	41	" " "	1933	32.0
	2029 + 00	" " "	7-8/1940	33.6
	41	" " "	1956	32.4
208	2017 + 00	East of Quogue	7-8/1940	30.4
209	2005 + 00	" "	7-8/1940	33.8
210	1993 + 00	" "	7-8/1940	32.1
211	1981 + 00	" "	7-8/1940	33.0
212	1969 + 00	" "	7-8/1940	31.9
213	1957 + 00	" "	7-8/1940	33.7
214	1945 + 00	" "	7-8/1940	32.4
215	1933 + 00	" "	7-8/1940	30.7

(*) Star indicates Ranges established by BEB from Sounding Sheets

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
216	1921 + 00	Quogue CGS	7-8/1940	31.2
217	R-1-C	" "	8/1936	28.0
	R-1-C	" "	8/1938	33.0
218	R-1-B	" "	8/1936	29.0
219	1909 + 00	" "	7-8/1940	36.2
220	R-1-A	" "	8/1936	29.1
	R-1-A	" "	8/1938	33.0
221	1897 + 00	West of Quogue CGS	7-8/1940	31.7
222	399 + 00	" " "	7-8/1940	34.9
223	387 + 00	" " "	7-8/1940	32.5
224	375 + 00	Quantuck Bay	7-8/1940	35.0
225	363 + 00	" "	7-8/1940	32.9
226	351 + 00	" "	7-8/1940	34.2
227	339 + 00	" "	7-8/1940	33.1
228	7	" "	1838	90.0
	7	" "	1933-38	95.0
	327 + 00	" "	7-8/1940	37.7
229	40	West Hampton	1933	20.0
	315 + 00	" "	7-8/1940	33.4
	40	" "	1956	33.2
230	303 + 00	" "	7-8/1940	33.3
231	291 + 00	" "	7-8/1940	30.6
232	279 + 00	" "	7-8/1940	31.1
233	263 + 00	" "	7-8/1940	30.5
234	39	East of Pond Point	1933	19.0
	255 + 00	" " "	7-8/1940	30.5
	39	" " "	1956	34.8
235	242 + 75	" " "	7-8/1940	31.3
236	231 + 00	Pond Point	7-8/1940	34.0
237	219 + 00	West of Pond Point	7-8/1940	31.2
238	207 + 00	" " "	7-8/1940	34.2
239	195 + 00	" " "	7-8/1940	31.9
240	183 + 00	" " "	7-8/1940	30.8
241	171 + 00	" " "	7-8/1940	33.2
242	159 + 00	" " "	7-8/1940	31.6
243	147 + 00	Town Beach	7-8/1940	32.5
244	38	" "	1933	18.0
	135 + 00	" "	7-8/1940	30.4
	38	" "	1956	33.0
245	123 + 00	" "	7-8/1940	32.7
246	111 + 00	" "	7-8/1940	30.4
247	99 + 00	" "	7-8/1940	33.7
248	87 + 00	East of Moriches CGS	7-8/1940	31.7
249	75 + 00	Moriches CGS	7-8/1940	34.2

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
250	63 + 00	West of Moriches CGS	7-8/1940	31.7
251	51 + 00	" " "	7-8/1940	36.1
252	1525 + 00	East of Moriches Inlet	7-8/1940	32.1
253	A *	" " "	9/1937	24.5
	A *	" " "	5/1938	24.5
	A *	" " "	6/1939	24.5
254	B *	" " "	5/1937	19.0
	B *	" " "	9/1937	24.5
	B *	" " "	5/1938	24.5
	B *	" " "	6/1939	24.5
255	C *	" " "	5/1937	24.5
	C *	" " "	9/1937	24.5
	C *	" " "	5/1938	24.5
	C *	" " "	6/1939	24.5
256	2	" " "	1936	30.0
257	2A	" " "	1936	28.5
258	E *	" " "	9/1937	24.5
	E *	" " "	5/1938	24.5
259	R-11	" " "	11/1953	31.0
	R-11	" " "	3/1954	35.8
	R-11	" " "	7/1954	31.8
260	F *	" " "	5/1938	24.0
	F *	" " "	6/1939	24.0
	F *	" " "	7/1949	24.0
261	H *	" " "	5/1938	24.0
	H *	" " "	7/1949	24.0
262	10 A	East Side of Moriches Inlet	3/1954	30.4
	10 A	" " "	7/1954	36.0
263	I *	" " "	9/1937	24.5
	I *	" " "	5/1938	24.5
	I *	" " "	6/1939	24.5
264	10	" " "	11/1953	30.0
	10	" " "	3/1954	33.2
	10	" " "	7/1954	31.7
265	J *	" " "	9/1937	24.0
	J *	" " "	5/1938	24.0
	J *	" " "	6/1939	24.0
266	9	" " "	11/1953	30.1
	9	" " "	3/1954	33.3
	9	" " "	7/1954	31.8
267	1 A	" " "	1936	30.5
268	K *	" " "	5/1938	24.0
	K *	" " "	6/1939	24.0
269	K1 *	" " "	5/1937	24.0
	K1 *	" " "	9/1937	24.0

(*) Star indicates Ranges established by BEB from Sounding Charts

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
270	37	East Side of Moriches Inlet	1933	29.0
	1436 + 00	" " "	7-8/1940	34.5
	37	" " "	1956	29.0
271	8	" " "	11/1953	29.8
	8	" " "	3/1954	33.0
	8	" " "	7/1954	32.0
272	L *	" " "	5/1938	24.0
	L *	" " "	6/1939	24.0
	L *	" " "	7/1949	24.0
273	R-1	" " "	1936	27.5
274	7	Center of Moriches Inlet	11/1953	29.3
	7	" " "	3/1954	30.7
	7	" " "	7/1954	34.2
275	L 3 *	" " "	6/1939	24.0
	L 3 *	" " "	7/1949	24.0
276	AA *	" " "	7/1949	21.0
	AA *	" " "	6/1951	21.0
277	6	" " "	11/1953	28.0
	6	" " "	3/1954	30.7
	6	" " "	7/1954	26.8
278	BB *	" " "	7/1949	21.0
	BB *	" " "	6/1951	21.0
279	5	West Side Moriches Inlet	11/1953	26.9
	5	" " "	3/1954	31.0
	5	" " "	7/1954	30.0
280	36	" " "	1933	28.0
	1416 + 00	" " "	7-8/1940	18.0
	36	" " "	1956	28.0
281	CC *	West Side of Moriches Inlet	7/1949	21.0
	CC *	" " "	6/1951	21.0
282	4	" " "	11/1953	29.1
	4	" " "	3/1954	31.5
	4	" " "	7/1954	32.5
283	DD *	" " "	7/1949	21.0
	DD *	" " "	6/1951	21.0
284	EE *	" " "	7/1949	21.0
	EE *	" " "	6/1951	21.0
285	3	" " "	11/1953	30.5
	3	" " "	3/1954	30.8
	3	" " "	7/1954	34.2
286	2	" " "	11/1953	29.7
	2	" " "	3/1954	31.0
	2	" " "	7/1954	33.8
287	1403 + 00	" " "	7-8/1940	34.1

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RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
288	FF *	West Side of Moriches Inlet	7/1949	21.0
	FF *	" " "	6/1951	21.0
289	1 A	" " "	3/1954	32.0
	1 A	" " "	7/1954	34.7
290	1392 + 00	" " "	7-8/1940	33.1
291	8	" " "	1838	87.0
	8	" " "	1933-38	87.0
292	1	" " "	11/1953	27.6
	1	" " "	3/1954	30.9
	1	" " "	7/1954	33.4
293	1378 + 00	" " "	7-8/1940	32.4
294	1366 + 00	" " "	7-8/1940	31.1
295	1354 + 00	" " "	7-8/1940	34.7
296	1342 + 00	" " "	7-8/1940	30.4
297	1330 + 00	" " "	7-8/1940	31.3
298	1318 + 00	" " "	7-8/1940	34.3
299	35	East of Forge River CGS	1933	18.0
	1306 + 00	" " "	7-8/1940	31.0
	35	" " "	1956	32.1
300	1294 + 00	" " "	7-8/1940	30.2
301	1282 + 00	" " "	7-8/1940	31.0
302	1270 + 00	" " "	7-8/1940	33.2
303	1258 + 00	West of Forge River CGS	7-8/1940	31.4
304	1246 + 00	" " "	7-8/1940	33.0
305	1234 + 00	" " "	7-8/1940	34.9
306	1222 + 00	" " "	7-8/1940	32.6
307	1210 + 00	" " "	7-8/1940	33.6
308	1198 + 00	" " "	7-8/1940	32.4
309	1186 + 00	" " "	7-8/1940	33.2
310	34	" " "	1933	22.0
	1174 + 00	" " "	7-8/1940	31.9
	34	" " "	1956	33.7
311	1162 + 00	" " "	7-8/1940	31.6
312	1150 + 00	Smith Point Park	7-8/1940	31.4
313	1138 + 00	" " "	7-8/1940	34.4
314	1126 + 00	" " "	7-8/1940	31.4
315	1114 + 00	" " "	7-8/1940	32.3
316	1102 + 00	" " "	7-8/1940	30.9
317	1090 + 00	" " "	7-8/1940	31.7
318	1078 + 00	Smith Point CGS	7-8/1940	30.7
319	1066 + 00	West of Smith Point CGS	7-8/1940	31.5
320	1054 + 00	" " "	7-8/1940	30.9
321	1042 + 00	" " "	7-8/1940	31.8
322	1030 + 00	Bellport Bay	7-8/1940	31.1
323	1018 + 00	" "	7-8/1940	32.1

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RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
324	1006 + 00	Old Bellport Inlet	7-8/1940	30.8
325	33	West of Old Bellport Inlet	1933	23.0
	994 + 00	" " "	7-8/1940	35.1
	33	" " "	1956	33.5
326	982 + 00	" " "	7-8/1940	33.2
327	969 + 00	" " "	7-8/1940	32.6
328	9	" " "	1839	84.0
	9	" " "	1933-38	89.0
329	957 + 00	" " "	7-8/1940	31.1
330	945 + 00	East of Bellport CGS	7-8/1940	36.6
331	933 + 00	" "	7-8/1940	32.1
332	921 + 00	" "	7-8/1940	33.8
333	32	" "	1933	23.0
	909 + 00	" "	7-8/1940	32.9
	32	" "	1956	30.2
334	897 + 00	West of Bellport CGS	7-8/1940	31.1
335	885 + 00	" "	7-8/1940	32.3
336	873 + 00	" "	7-8/1940	30.0
337	861 + 00	" "	7-8/1940	32.2
338	849 + 00	" "	7-8/1940	31.2
339	746 + 00	" "	7-8/1940	32.0
340	734 + 00	East of Long Cove	7-8/1940	32.4
341	722 + 00	" "	7-8/1940	31.2
342	710 + 00	" "	7-8/1940	35.5
343	698 + 00	" "	7-8/1940	31.0
344	686 + 00	" "	7-8/1940	39.3
345	674 + 00	" "	7-8/1940	35.9
346	31	" "	1933	22.0
	662 + 00	" "	7-8/1940	36.9
	31	" "	1956	30.5
347	650 + 00	West of Long Cove	7-8/1940	35.9
348	638 + 00	" "	7-8/1940	36.4
349	626 + 00	" "	7-8/1940	35.4
350	614 + 00	" "	7-8/1940	36.3
351	602 + 00	" "	7-8/1940	36.8
352	590 + 00	" "	7-8/1940	36.2
353	578 + 00	East of Davis Park	7-8/1940	35.7
354	566 + 00	Davis Park	7-8/1940	32.1
355	554 + 00	West of Davis Park	7-8/1940	33.8
356	542 + 00	East of Blue Point CGS	7-8/1940	34.5
357	30	Blue Point CGS	1933	23.0
	531 + 00	" "	7-8/1940	33.9
	30	" "	1956	30.9
358	519 + 00	West of Blue Point CGS	7-8/1940	35.4
359	507 + 00	Water Island	7-8/1940	33.5

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
360	495 + 00	West of Water Island	7-8/1940	37.5
361	483 + 00	" " "	7-8/1940	36.5
362	471 + 00	" " "	7-8/1940	35.9
363	459 + 00	" " "	7-8/1940	35.2
364	447 + 00	" " "	7-8/1940	35.5
365	435 + 00	East of Fire Island Pines	7-8/1940	35.1
366	423 + 00	" " "	7-8/1940	35.7
367	411 + 00	" " "	7-8/1940	35.5
368	29	" " "	1933	28.0
	399 + 00	" " "	7-8/1940	36.5
	29	" " "	1956	31.0
369	387 + 00	Fire Island Pines	7-8/1940	35.3
370	SE 1	Lone Hill CGS	7/1936	26.0
	SE 1	" "	8/1937	33.0
	SE 1	" "	8/1938	34.0
	SE 1	" "	1939	33.0
371	375 + 00	" "	7-8/1940	37.2
372	SE 2	" "	7/1936	34.0
373	SE 3	" "	7/1936	30.1
	SE 3	" "	8/1937	31.0
	SE 3	" "	8/1938	37.0
	SE 3	" "	1939	32.0
374	363 + 00	West of Lone Hill CGS	7-8/1940	37.5
375	351 + 00	" " "	7-8/1940	36.4
376	339 + 00	East of Cherry Grove	7-8/1940	35.6
377	327 + 00	Cherry Grove	7-8/1940	33.0
378	315 + 00	West of Cherry Grove	7-8/1940	31.1
379	303 + 00	" " "	7-8/1940	31.0
380	291 + 00	" " "	7-8/1940	35.8
381	279 + 00	" " "	7-8/1940	32.4
382	267 + 00	East of Point of Woods	7-8/1940	30.9
383	10	" " "	1838	83.0
	10	" " "	1933-38	80.0
384	255 + 00	" " "	7-8/1940	32.6
385	243 + 00	" " "	7-8/1940	31.5
386	231 + 00	" " "	7-8/1940	32.6
387	219 + 00	" " "	7-8/1940	31.9
388	207 + 00	" " "	7-8/1940	33.3
	28	" " "	1956	33.4
389	195 + 00	Point of Woods	7-8/1940	36.1
390	183 + 00	Ocean Bay Park	7-8/1940	32.7
391	171 + 00	" "	7-8/1940	36.7
392	159 + 00	Sea View	7-8/1940	36.0
393	147 + 00	" "	7-8/1940	34.1
394	135 + 00	Ocean Beach	7-8/1940	33.7
	27	" "	1956	30.2

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
395	123 + 00	West of Ocean Beach	7-8/1940	33.0
396	111 + 00	" " "	7-8/1940	31.9
397	99 + 00	Atlantique	7-8/1940	33.3
398	87 + 00	West of Atlantique	7-8/1940	32.9
399	75 + 00	East of Fair Harbor	7-8/1940	32.6
400	63 + 00	Fair Harbor	7-8/1940	32.6
401	51 + 00	" "	7-8/1940	33.7
402	39 + 00	West of Fair Harbor	7-8/1940	34.6
403	27 + 00	Saltaire	7-8/1940	32.1
404	15 + 00	East of Kismet	7-8/1940	32.4
405	3 + 00	Kismet	7-8/1940	30.8
	26	"	1956	27.4
406	E 18 + 00	"	7-8/1940	34.4
407	SW 3	Old Fire Island S.P.	5/1936	30.0
	SW 3	" "	7/1936	33.6
408	SW 2	" "	5/1936	30.5
	SW 2	" "	7/1936	34.0
	SW 2	" "	8/1937	33.0
	SW 2	" "	8/1938	34.0
	SW 2	" "	1939	33.0
409	0 + 00	" "	7-8/1940	32.0
410	SW-1	" "	5/1936	31.0
	SW-1	" "	7/1936	33.0
	SW-1	" "	8/1938	36.0
411	SW	" "	5/1936	32.0
	SW	" "	7/1936	30.5
	SW	" "	8/1937	30.8
	SW	" "	8/1938	30.0
	SW	" "	1939	32.0
412	25	Fire Island CGS	6/1950	35.0
	25	" "	8/1950	28.5
	25	" "	10/1950	33.0
	25	" "	12/1950	29.5
	25	" "	2/1951	32.0
	25	" "	4/1951	32.0
	25	" "	6/1951	34.0
413	24	Fire Island S.P.	6/1950	36.0
	24	" "	8/1950	33.0
	24	" "	8/1950	29.0
	24	" "	10/1950	31.5
	24	" "	12/1950	29.5
	24	" "	12/1950	33.0
	24	" "	2/1951	31.0
	24	" "	4/1951	31.0
	24	" "	6/1951	31.5
	24	" "	1956	30.8

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
414	3 + 00	Fire Island S.P.	11/1939	34.0
	3 + 00	" "	8/1940	32.0
	23	" "	1951	35.4
	23	" "	6/1950	36.0
	23	" "	8/1950	33.0
	23	" "	10/1950	31.5
	23	" "	12/1950	33.0
	23	" "	2/1951	31.0
	23	" "	4/1951	31.0
	23	" "	6/1951	31.5
415	8 + 00	" "	11/1939	32.0
	8 + 00	" "	8/1940	31.0
416	22	" "	6/1950	32.0
	22	" "	8/1950	33.0
	22	" "	10/1950	32.0
	22	" "	12/1950	32.5
	22	" "	2/1951	34.5
	22	" "	4/1951	32.0
	22	" "	6/1951	31.0
417	III *	" "	11/1938	24.5
	III *	" "	6/1940	31.5
418	21 C	" "	1954	32.0
419	21 B	" "	7-8/1940	30.0
	21 B	" "	1954	34.1
420	IV *	" "	10/1934	25.0
	IV *	" "	5/1937	27.5
	IV *	" "	10/1937	25.0
	IV *	" "	5/1938	25.0
	IV *	" "	11/1938	33.3
	IV *	" "	7/1939	25.0
	IV *	" "	6/1940	32.3
421	21 A	" "	7-8/1940	30.0
	21 A	" "	1954	31.7
422	V *	Democrat Point	5/1937	25.5
	V *	" "	10/1937	22.0
	V *	" "	5/1938	28.0
	V *	" "	11/1938	31.3
	V *	" "	7/1939	26.0
423	R2 - D1	" "	6/1936	31.5
	21	" "	7-8/1940	30.0
	21	" "	6/1950	31.0
	21	" "	8/1950	37.0
	21	" "	10/1950	36.0
	21	" "	12/1950	30.0
	21	" "	2/1951	36.5

(*) Star indicates Ranges established by BEB from Sounding Charts

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
423	21	Democrat Point	4/1951	32.0
	21	" "	6/1951	32.0
	21	" "	1954	30.0
424	VI *	" "	10/1934	24.0
	VI *	" "	5/1937	27.5
	VI *	" "	10/1937	31.5
	VI *	" "	5/1938	33.5
	VI *	" "	11/1938	32.0
	VI *	" "	7/1939	27.0
425	VII *	" "	10/1934	22.5
	VII *	" "	5/1937	23.5
	VII *	" "	5/1938	19.0
	VII *	" "	11/1938	31.5
	VII *	" "	7/1939	26.0
426	R2 - D2	" "	6/1936	38.5
	17	" "	4/1937	30.0
	17	" "	10/1937	30.0
	17	" "	4/1938	30.0
	17	" "	6/1939	31.0
	20 C	" "	7-8/1940	33.2
	20 C	" "	1954	30.0
427	VIII *	" "	10/1934	33.0
	VIII *	" "	5/1937	24.5
	VIII *	" "	5/1938	21.0
	VIII *	" "	7/1939	27.0
	VIII *	" "	6/1940	32.0
428	IX *	" "	5/1938	23.0
	IX *	" "	11/1938	33.0
	IX *	" "	7/1939	24.5
	IX *	" "	6/1940	33.5
429	20 B	" "	7-8/1940	30.0
	20 B	" "	1954	31.2
430	X *	" "	11/1938	30.5
	X *	" "	6/1940	33.0
431	XI *	" "	11/1938	34.5
	XI *	" "	6/1940	33.1
432	20 A	" "	7-8/1940	30.0
	20 A	" "	1954	34.0
	20 A	" "	1956	31.4
433	R-7	West Side Fire Island Inlet	4/1937	27.0
	R-7	" " "	10/1937	27.0
	R-7	" " "	4/1938	27.00
	R-7	" " "	6/1939	27.0
	20	" " "	6/1950	34.0
	20	" " "	8/1950	27.5

(*) Star indicates Ranges established by BEB from Sounding Charts

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
433	20	West Side Fire Island Inlet	10/1950	38.0
	20	" " "	12/1950	29.0
	20	" " "	2/1951	30.5
	20	" " "	4/1951	32.5
	20	" " "	6/1951	31.0
434	19	" " "	6/1950	31.0
	19	" " "	8/1950	31.0
	19	" " "	10/1950	31.0
	19	" " "	12/1950	26.0
	19	" " "	2/1951	31.0
	19	" " "	4/1951	32.5
	19	" " "	6/1951	31.0
435	18	" " "	6/1950	35.0
	18	" " "	8/1950	30.0
	18	" " "	10/1950	34.0
	18	" " "	12/1950	28.0
	18	" " "	2/1951	33.5
	18	" " "	4/1951	32.5
	18	" " "	6/1951	32.0
436	17	" " "	1933	30.0
	17	" " "	6/1950	35.5
	17	" " "	8/1950	36.5
	17	" " "	10/1950	34.0
	17	" " "	12/1950	28.0
	17	" " "	2/1951	33.5
	17	" " "	4/1951	32.0
	17	" " "	6/1951	32.5
437	16	" " "	6/1950	32.5
	16	" " "	8/1950	32.5
	16	" " "	10/1950	31.0
	16	" " "	12/1950	34.0
	16	" " "	2/1951	32.5
	16	" " "	4/1951	31.0
	16	" " "	6/1951	32.0
438	500 + 00	Gilgo State Park	5/1936	27.8
	500 + 00	" "	6/1936	25.0
	500 + 00	" "	7/1937	23.0
	500 + 00	" "	7/1938	29.0
	500 + 00	" "	10/1938	28.4
	500 + 00	" "	10/1939	30.0
	500 + 00	" "	9/1940	29.0
	500 + 00	" "	9/1941	30.0
439	494 + 0975	" "	5/1936	29.6
	494 + 0975	" "	6/1936	25.6
	494 + 0975	" "	7/1937	31.0
	494 + 0975	" "	7/1938	28.0

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
439	494 + 0975	Gilgo State Park	10/1938	28.0
	494 + 0975	" "	10/1939	32.0
	494 + 0975	" "	9/1940	32.0
	494 + 0975	" "	9/1941	31.0
440	15	" "	1933	30.0
	15	" "	6/1950	34.0
	15	" "	8/1950	28.0
	15	" "	10/1950	34.0
	15	" "	12/1950	34.0
	15	" "	2/1951	35.0
	15	" "	4/1951	32.0
	15	" "	6/1951	33.0
441	14	" "	6/1950	35.5
	14	" "	8/1950	31.5
	14	" "	10/1950	33.0
	14	" "	12/1950	33.5
	14	" "	2/1951	34.0
	14	" "	4/1951	32.0
	14	" "	6/1951	34.0
442	13	Tobay Beach	1933	30.0
	13	" "	6/1950	32.0
	13	" "	8/1950	29.0
	13	" "	10/1950	34.5
	13	" "	12/1950	33.0
	13	" "	2/1951	36.0
	13	" "	4/1951	29.0
	13	" "	6/1951	33.0
443	12	" "	6/1950	33.0
	12	" "	8/1950	32.0
	12	" "	10/1950	32.0
	12	" "	12/1950	33.0
	12	" "	2/1951	32.0
	12	" "	4/1951	33.5
	12	" "	6/1951	32.0
444	250 + 65	East Overlook	5/1936	27.6
	250 + 65	" "	6/1936	27.6
	250 + 65	" "	7/1937	30.0
	250 + 65	" "	7/1938	30.0
	250 + 65	" "	10/1938	30.0
	250 + 65	" "	10/1939	32.0
	250 + 65	" "	9/1940	32.0
	250 + 65	" "	9/1941	34.8
445	243 + 63	" "	5/1936	30.5
	243 + 63	" "	6/1936	31.0
	243 + 63	" "	7/1937	32.4

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
445	243 + 63	East Overlook	7/1938	32.0
	243 + 63	" "	10/1938	33.0
	243 + 63	" "	10/1939	33.6
	243 + 63	" "	9/1940	34.0
	243 + 63	" "	9/1941	34.0
446	11	Jones Beach S. P.	6/1950	34.0
	11	" "	8/1950	30.5
	11	" "	10/1950	32.5
	11	" "	12/1950	33.0
	11	" "	2/1951	33.5
	11	" "	4/1951	31.5
	11	" "	6/1951	30.0
447	Old 10	" "	1933	30.0
	Old 10	" "	6/1950	33.0
	Old 10	" "	8/1950	29.5
448	175 + 00	" "	10/1939	30.0
	175 + 00	" "	10/1940	30.0
449	New 10	" "	8/1950	30.0
	New 10	" "	10/1950	32.5
	New 10	" "	12/1950	34.5
	New 10	" "	2/1951	33.5
	New 10	" "	4/1951	33.0
	New 10	" "	6/1951	31.0
450	165 + 00	" "	4/1936	30.9
	165 + 00	" "	7/1936	28.0
	165 + 00	" "	7/1937	26.0
	165 + 00	" "	7/1938	28.0
	165 + 00	" "	10/1938	28.0
	165 + 00	" "	10/1939	36.0
	165 + 00	" "	10/1940	36.0
	165 + 00	" "	8/1941	34.0
451	155 + 00	" "	4/1936	26.0
	155 + 00	" "	7/1936	26.0
	155 + 00	" "	7/1937	25.0
	155 + 00	" "	7/1938	28.0
	155 + 00	" "	10/1938	28.0
	155 + 00	" "	10/1939	35.0
	155 + 00	" "	10/1940	35.0
	155 + 00	" "	8/1941	34.0
452	150 + 00	" "	4/1936	27.0
	150 + 00	" "	7/1936	27.0
453	145 + 00	Jones Beach	11/1935	30.0
	145 + 00	" "	4/1936	30.0
	145 + 00	" "	7/1936	26.0
	145 + 00	" "	7/1937	28.0
	145 + 00	" "	7/1938	28.0

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
453	145 + 00	Jones Beach	10/1938	27.0
	145 + 00	" "	10/1939	33.0
	145 + 00	" "	10/1940	35.0
	145 + 00	" "	8/1941	34.0
454	140 + 00	" "	11/1935	30.0
	140 + 00	" "	4/1936	29.0
	140 + 00	" "	7/1936	28.0
455	9	" "	6/1950	33.0
	9	" "	8/1950	33.0
	9	" "	10/1950	34.5
	9	" "	12/1950	34.0
	9	" "	2/1951	31.5
	9	" "	4/1951	32.0
	9	" "	6/1951	31.5
456	135 + 00	" "	11/1935	31.2
	135 + 00	" "	4/1936	28.8
	135 + 00	" "	6/1936	29.0
	135 + 00	" "	7/1937	30.0
	135 + 00	" "	7/1938	31.0
	135 + 00	" "	10/1938	29.0
	135 + 00	" "	10/1939	33.0
	135 + 00	" "	10/1940	33.6
	135 + 00	" "	8/1941	35.0
457	130 + 00	" "	11/1935	30.0
	130 + 00	" "	4/1936	28.0
	130 + 00	" "	7/1936	28.0
458	125 + 00	" "	11/1935	30.1
	125 + 00	" "	4/1936	30.0
	125 + 00	" "	6/1936	27.0
	125 + 00	" "	7/1937	26.8
	125 + 00	" "	7/1938	29.0
	125 + 00	" "	10/1938	31.0
	125 + 00	" "	10/1939	32.0
	125 + 00	" "	10/1940	34.0
	125 + 00	" "	8/1941	35.0
459	120 + 00	" "	11/1935	30.0
	120 + 00	" "	4/1936	28.0
	120 + 00	" "	6/1936	28.0
460	115 + 00	" "	11/1935	31.9
	115 + 00	" "	4/1936	28.0
	115 + 00	" "	6/1936	28.0
	115 + 00	" "	7/1937	34.5
	115 + 00	" "	7/1938	36.0
	115 + 00	" "	10/1938	29.6
	115 + 00	" "	10/1939	31.0
	115 + 00	" "	10/1940	33.0
	115 + 00	" "	8/1941	35.0

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
461	110 + 00	Jones Beach	11/1935	27.0
	110 + 00	" "	6/1936	27.0
462	8	" "	6/1950	31.5
	8	" "	8/1950	28.5
	8	" "	10/1950	31.5
	8	" "	12/1950	31.5
	8	" "	2/1951	29.5
	8	" "	4/1951	30.0
	8	" "	6/1951	31.5
463	105 + 00	" "	6/1936	30.1
	105 + 00	" "	7/1937	30.0
	105 + 00	" "	7/1938	30.0
	105 + 00	" "	10/1938	30.0
	105 + 00	" "	10/1939	31.0
	105 + 00	" "	10/1940	30.0
	105 + 00	" "	8/1941	33.0
464	95 + 00	" "	6/1936	31.7
	95 + 00	" "	7/1937	33.0
	95 + 00	" "	7/1938	33.0
	95 + 00	" "	10/1938	29.0
	95 + 00	" "	10/1939	31.0
	95 + 00	" "	10/1940	32.0
	95 + 00	" "	8/1941	32.0
465	85 + 00	" "	6/1936	31.7
	85 + 00	" "	7/1937	31.0
	85 + 00	" "	7/1938	31.0
	85 + 00	" "	10/1938	30.0
	85 + 00	" "	10/1939	31.0
	85 + 00	" "	10/1940	33.0
	85 + 00	" "	8/1941	34.0
466	7	" "	6/1950	33.5
	7	" "	10/1950	33.0
	7	" "	2/1951	32.5
	7	" "	4/1951	31.5
	7	" "	6/1951	31.5
467	6	" "	6/1950	34.0
	6	" "	8/1950	30.5
	6	" "	10/1950	31.0
	6	" "	12/1950	31.5
	6	" "	2/1951	31.5
	6	" "	4/1951	30.5
	6	" "	6/1951	30.0
468	5	" "	6/1950	33.0
	5	" "	8/1950	28.0
	5	" "	10/1950	32.5
	5	" "	12/1950	32.5

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
468	5	Jones Beach	2/1951	33.0
	5	" "	4/1951	31.0
	5	" "	6/1951	31.0
469	20 *	Shortbeach CGS	4/1937	30.0
	20 *	" "	9/1937	30.0
	20 *	" "	4/1938	30.0
	20 *	" "	6/1939	30.0
	20 *	" "	6/1940	30.0
470	10 *	" "	4/1937	30.0
	10 *	" "	9/1937	30.0
	10 *	" "	4/1938	30.0
	10 *	" "	6/1939	30.0
	10 *	" "	6/1940	30.0
471	4	East Side Jones Inlet	6/1950	32.0
	4	" " "	8/1950	30.0
	4	" " "	10/1950	29.5
	4	" " "	12/1950	27.5
	4	" " "	2/1951	30.5
	4	" " "	4/1951	32.0
	4	" " "	6/1951	31.0
472	3	West Side of Jones Inlet	6/1950	
	3	" " "	8/1950	
	3	" " "	10/1950	
	3	" " "	12/1950	
	3	" " "	2/1951	
	3	" " "	4/1951	
	3	" " "	6/1951	
473	H-J	" " "	3/1937	30.0
	H-J	" " "	9/1937	30.0
	I-I	" " "	4/1938	30.0
	H-3	" " "	6/1939	30.0
	H-3	" " "	6/1940	30.0
474	H-2	" " "	3/1937	30.0
	H-2	" " "	9/1937	30.0
	H-2	" " "	4/1938	30.0
	H-2	" " "	6/1939	30.0
	H-2	" " "	6/1940	30.0
475	H-1	" " "	3/1937	30.0
	H-1	" " "	9/1937	30.0
	H-1	" " "	4/1938	30.0
	H-1	" " "	6/1939	30.0
	H-1	" " "	6/1940	30.0
476	2	" " "	6/1950	32.0
	2	" " "	8/1950	29.8

(*) Star - indicates ranges established by BEB from sounding sheets

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
476	2	West Side of Jones Inlet	10/1950	31.0
	2	" " "	12/1950	30.5
	2	" " "	2/1951	30.5
	2	" " "	4/1951	31.5
	2	" " "	6/1951	31.5
477	1	" " "	6/1950	34.0
	1	" " "	8/1950	29.5
	1	" " "	10/1950	31.8
	1	" " "	12/1950	31.0
	1	" " "	2/1951	32.0
	1	" " "	4/1951	30.5
	1	" " "	6/1951	32.0
478	A *	East Side of Rockaway Inlet	11/1933	30.0
	A *	" " "	5/1934	30.0
	A *	" " "	9/1936	30.0
479	B *	" " "	7/1932	14.5
	B *	" " "	8/1932	18.0
	B *	" " "	11/1933	27.5
	B *	" " "	5/1934	30.0
480	C *	" " "	11/1933	30.0
	C *	" " "	5/1934	30.0
481	D *	" " "	11/1933	28.0
	D *	" " "	5/1934	30.0
482	G *	" " "	5/1927	30.0
	G *	" " "	9/1936	28.0
483	H *	" " "	11/1933	29.0
	H *	" " "	5/1934	30.0
484	I *	" " "	11/1933	31.0
	I *	" " "	9/1936	28.0
485	P *	West Side of Rockaway Inlet	7/1932	26.5
	P *	" " "	5/1934	30.0
486	Q *	" " "	7/1932	26.5
	Q *	" " "	5/1934	30.0
487	R *	" " "	7/1932	26.5
	R *	" " "	5/1934	30.0
488	S *	" " "	7/1932	27.0
	S *	" " "	5/1934	30.0
489	T *	" " "	7/1932	27.0
	T *	" " "	5/1934	29.5
490	U *	" " "	7/1932	26.0
	U *	" " "	5/1934	30.5
	U *	" " "	9/1936	27.0
491	V *	" " "	7/1932	27.5
	V *	" " "	5/1934	30.0
	V *	" " "	9/1936	26.5

(*) Star indicates ranges estsblished by BEB from sounding sheets.

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
492	49 + 00	Jacob Riis S.P.	8/1935	15.0
493	42 + 80	" "	8/1935	16.0
494	37 + 00	" "	8/1935	16.0
495	33 + 00	" "	8/1935	17.0
496	28 + 00	" "	8/1935	16.0
497	21 + 10	" "	8/1935	16.0
498	2 *	" "	9/1933	30.0
	2 *	" "	9/1936	30.0
499	15 + 00	" "	8/1935	16.0
500	10 + 30	" "	8/1935	16.0
501	4 *	" "	9/1935	30.0
	4 *	" "	9/1936	30.0
502	5 + 00	" "	8/1935	17.0
503	0 + 30	" "	8/1935	16.5
504	8 *	Fort Tilden	9/1933	30.0
	8 *	" "	9/1937	30.0
505	10 *	" "	9/1933	30.0
	10 *	" "	9/1937	30.0
506	17 *	" "	9/1936	30.0
	17 *	" "	9/1937	30.0
507	30 *	Rockaway Point	7/1931	31.0
	30 *	" "	9/1937	30.0
508	31 *	" "	9/1933	30.0
	31 *	" "	7/1934	30.0
	31 *	" "	9/1935	30.0
509	32 *	" "	7/1931	30.5
	32 *	" "	9/1936	30.0
	32 *	" "	9/1937	30.0
510	36 *	" "	7/1931	30.0
	36 *	" "	9/1933	30.0
	36 *	" "	9/1935	30.0
	36 *	" "	9/1936	30.0
	36 *	" "	9/1937	30.0
511	38 *	" "	9/1933	30.0
	38 *	" "	9/1936	30.0
	38 *	" "	9/1937	30.0
512	39 *	" "	9/1934	30.5
	39 *	" "	9/1935	30.5
513	40 *	" "	9/1935	30.0
	40 *	" "	9/1936	30.5
	40 *	" "	9/1937	30.5
514	43 *	" "	9/1934	29.5
	43 *	" "	9/1935	29.5
515	42 *	" "	9/1936	30.0
	42 *	" "	9/1937	30.0

(*) Star indicates ranges established by BEB from sounding sheets.

RANGES ALONG THE SOUTH SHORE OF LONG ISLAND (Continued)

Range Number	Former Designation	Location	Time of Survey	Seaward Extent of Survey (Feet below MLW)
516	44 *	Rockaway Point	9/1933	29.5
	44 *	" "	9/1937	29.0
517	M *	Manhattan Beach	1932	30.0
	M *	" "	1934	30.0
518	L *	Coney Island Beach	1932	30.0
	L *	" "	1934	30.0
519	K *	" "	1927	30.0
	K *	" "	1932	30.0
	K *	" "	1934	30.0
520	G *	Gravesend Bay	1931	30.0
	G *	" "	1932	30.0
521	F *	" "	1931	30.0
	F *	" "	1932	30.0
522	E *	" "	1931	30.0
	E *	" "	1932	30.0
523	D *	" "	1931	30.0
	D *	" "	1932	30.0
524	C *	" "	1931	30.0
	C *	" "	1932	30.0
525	B *	Dyker Beach Park	1931	30.0
	B *	" "	1932	30.0

(*) Indicates ranges established by BEB from sounding sheets.

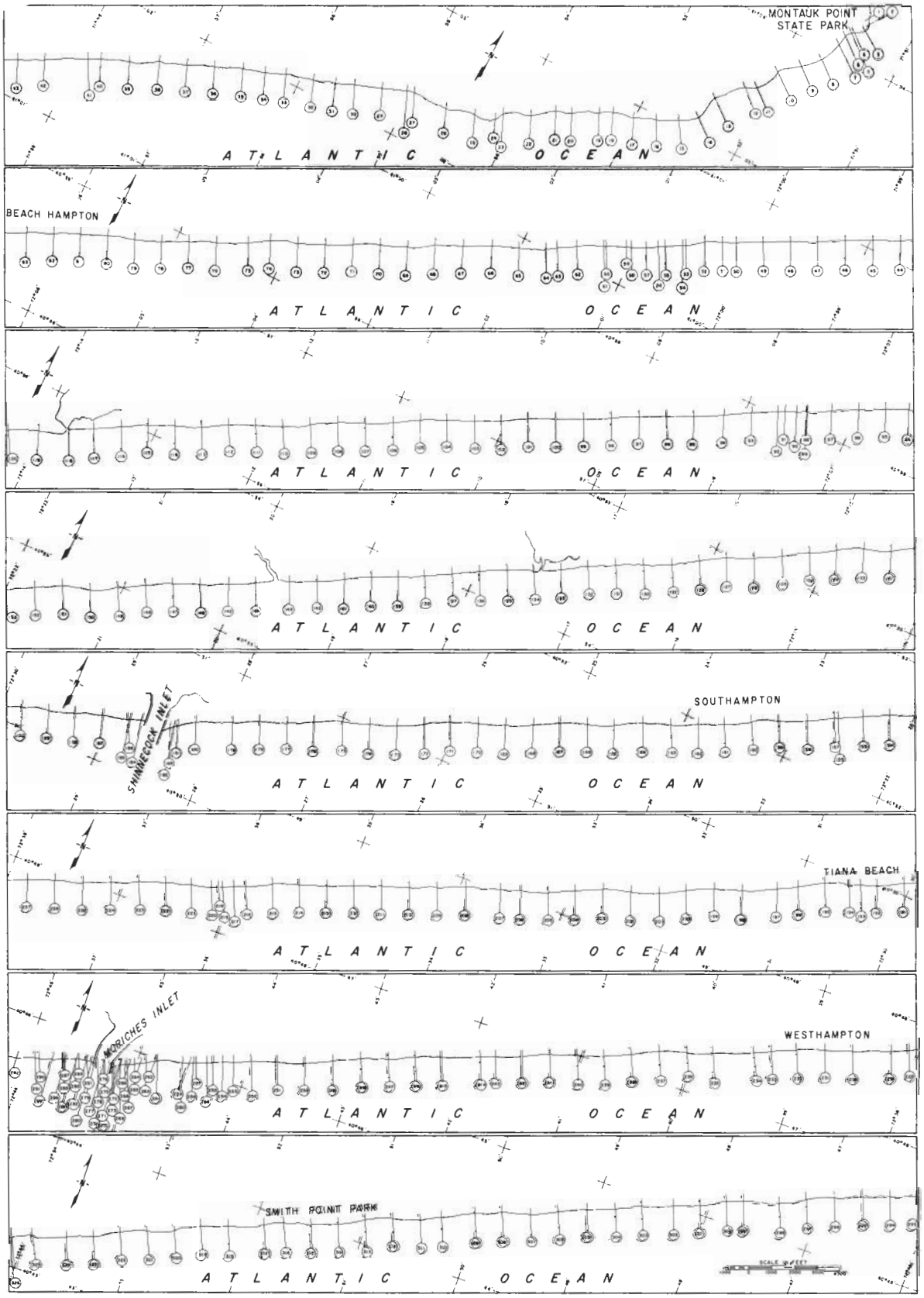

FIGURE A-1a. LOCATION OF RANGES ALONG SOUTH SHORE OF LONG ISLAND

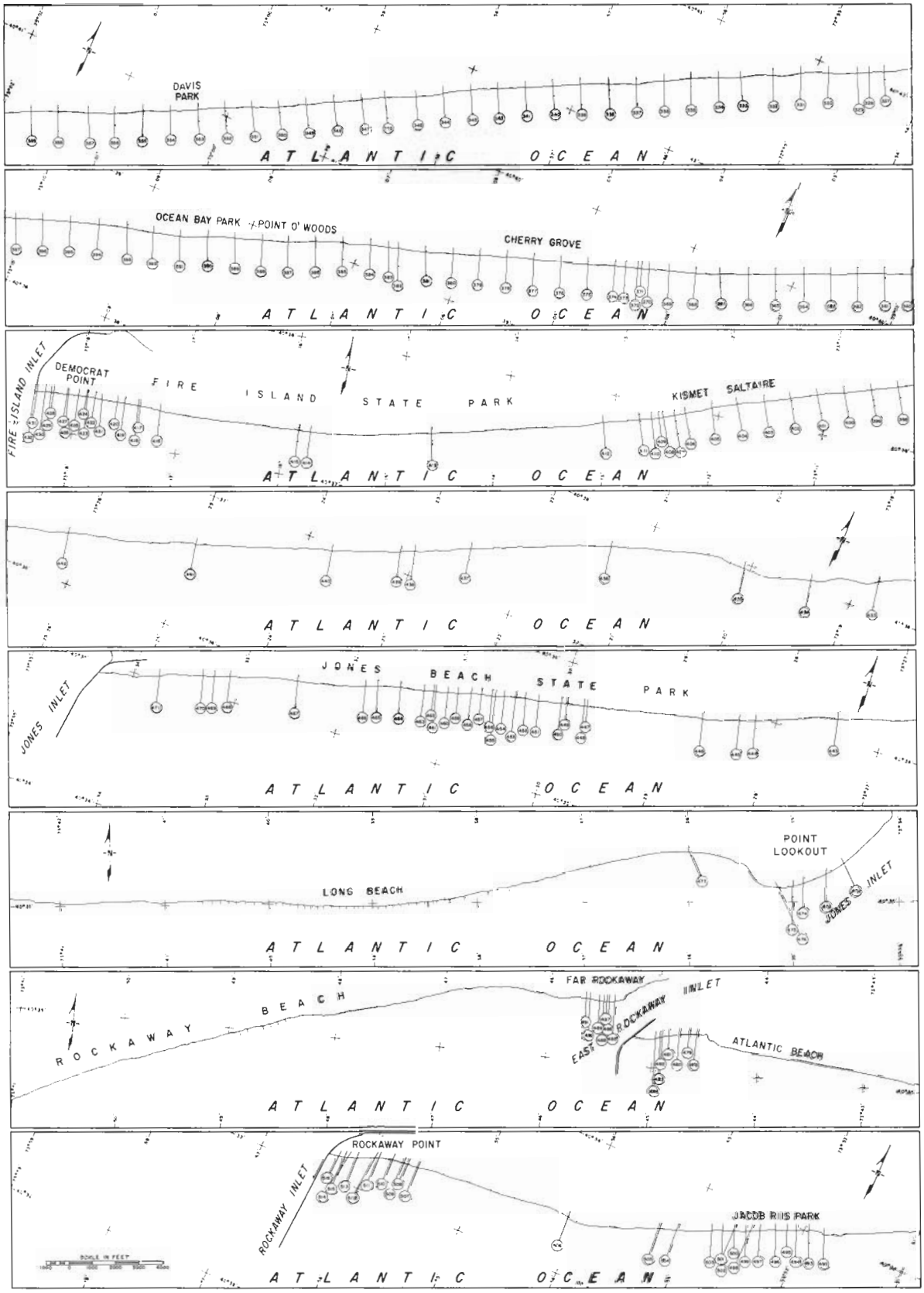

FIGURE A-1b. LOCATION OF RANGES ALONG SOUTH SHORE OF LONG ISLAND

APPENDIX B

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Approximately one-third of the more than 500 ranges along the south shore of Long Island have been surveyed at least twice. Several of the ranges have been surveyed as frequently as bimonthly while others were not repeated for 16 years. Nevertheless any range which has been subject to repetitive surveys is subject to comparison to determine accretion or erosion along the length of the profile. Such a comparison has been made by planimetering the areal difference between the profiles. Erosion, indicated by a negative sign, signifies a net deepening of the profile between the earlier and the later surveys. Accretion, indicated by the positive sign, has the opposite meaning. The difference has been converted to cubic yards per linear foot of beach (parallel to the mean low water shore line) by dividing the measured difference by 27. The figure given in the table under "Volume of Change" has been derived as described above.

Other data given in the table are the dates of the repetitive surveys and the time interval, in months or years, between the surveys. Because the actual dates of the field work are not available, it has been assumed that all surveys were completed on the first day of the month. This assumption permits the computation of the monthly time interval, but inherent in such a system is a potential error of two months (plus or minus one month). The time interval for some of the comparisons is given in years because more precise data are unavailable. In these instances the time interval was determined by subtraction. While it is felt that the error is less than one year, the inherent error is two years (plus or minus one year).

The two columns, Vertical and Horizontal Extent of Comparison, define the limits of the comparisons. The vertical limits are based upon elevations above and below the mean low water datum at which the profiles cross or close on each other. In some instances, however, the profiles do not cross. In other words, the elevation of one of the profiles, at either the seaward or landward limit of the comparison, is significantly above that of the other profile. Under these conditions careful judgment was exercised and the profiles were closed with a horizontal line at what appeared to be the most appropriate elevation. The magnitude of the potential error is unknown. Finally the horizontal extent of the comparison was determined by measuring the plan or map length of the comparable portions of the surveys.

The range numbers are the same as those used in Appendix A.

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
1	10/36-9/37	11 Mos.	MLW to -19.0	1490	+ 44.4
	9/37-8/38	11 Mos.	" " -19.0	1580	- 32.2
	8/38-11/41	39 Mos.	" " -19.0	1580	- 136.6
2	1933-1940	7 Yrs.	-5 " -21.0	990	+ 9.6
	10/36-8/38	22 Mos.	MLW to -28.0	1590	+ 29.6
	1940-1956	16 Yrs.	" " -22.0	1100	- 47.4
3	1933-1940	7 Yrs.	" " -28.0	1300	- 134.8
	10/36-9/37	11 Mos.	" " -29.0	1320	+ 51.1
	9/37-8/38	11 Mos.	" " -26.0	1150	+ 162.9
	1940-1956	16 Yrs.	" " -30.0	1500	+ 162.9
4	10/36-9/37	11 Mos.	" " -31.0	1520	- 17.0
	9/37-8/38	11 Mos.	" " -31.0	1890	+ 169.6
	8/38-11/41	39 Mos.	" " -31.0	1890	- 388.1
6	10/36-9/37	11 Mos.	" " -35.0	1730	+ 235.5
	9/37-8/38	11 Mos.	" " -34.0	1650	- 288.8
20	1933-1940	7 Yrs.	" " -31.0	1150	- 6.6
	1940-1956	16 Yrs.	" " -31.0	1150	+ 31.1
27	1933-1940	7 Yrs.	" " -28.0	1620	+ 1.4
41	1940-1956	16 Yrs.	" " -25.0	1170	+ 17.7
51	1933-1940	7 Yrs.	" " -29.0	1510	- 112.5
	1940-1956	16 Yrs.	" " -29.0	1510	+ 102.2
52	8/36-10/36	2 Mos.	" " -30.0	1570	- 108.1
	10/36-9/37	11 Mos.	" " -30.0	1590	+ 107.4
	9/37-8/38	11 Mos.	" " -25.0	1490	- 136.6
54	8/36-10/36	2 Mos.	" " -30.0	1720	- 88.8
	10/36-9/37	11 Mos.	" " -30.0	1940	+ 251.4
	9/37-8/38	11 Mos.	" " -30.0	1970	- 434.4
55	8/36-10/36	2 Mos.	" " -26.0	1740	+ 25.0
	10/36-9/37	11 Mos.	" " -30.0	2120	+ 222.9
	9/37-8/38	11 Mos.	" " -30.0	2150	- 75.9
57	8/36-10/36	2 Mos.	" " -30.0	1820	- 107.7
	10/36-9/37	11 Mos.	" " -30.0	1730	+ 200.0
	9/37-8/38	11 Mos.	" " -30.0	1750	- 394.4
59	8/36-10/36	2 Mos.	" " -30.0	1660	- 118.8
	10/36-9/37	11 Mos.	" " -30.0	1530	+ 170.7
	9/37-8/38	11 Mos.	" " -27.0	1420	- 155.1
60	8/36-10/36	2 Mos.	" " -30.0	1750	- 133.7
75	1933-1940	7 Yrs.	" " -25.0	1520	+ 37.0
	1940-1956	16 Yrs.	" " -25.0	1420	+ 49.6
88	8/36-8/38	24 Mos.	" " -31.0	1870	- 141.8
91	8/36-8/38	24 Mos.	" " -30.0	1850	- 18.1
96	1940-1956	16 Yrs.	" " -30.0	1660	+ 151.8
110	1933-1940	7 Yrs.	" " -28.0	1750	- 72.5
	1940-1956	16 Yrs.	" " -28.0	1810	+ 31.1

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
120	1933-1940	7 Yrs.	MLW to -23.0	1450	- 103.7
	1940-1956	16 Yrs.	" " -23.0	1450	+ 1.4
130	1933-1940	7 Yrs.	" " -24.0	1580	- 62.2
	1940-1956	16 Yrs.	" " -24.0	1580	- 11.8
146	1933-1940	7 Yrs.	" " -28.0	1940	- 16.2
155	1933-1940	7 Yrs.	" " -24.0	1660	- 71.1
	8/36-9/37	13 Mos.	" " -29.0	2420	+ 161.4
	9/37-8/38	11 Mos.	" " -27.0	2600	+ 215.9
	1940-1956	16 Yrs.	" " -24.0	1660	- 23.7
156	8/36-9/37	13 Mos.	" " -21.0	1550	- 66.2
	9/37-8/38	11 Mos.	" " -27.0	2660	+ 273.7
166	1933-1940	7 Yrs.	" " -26.0	1850	- 60.7
	1940-1956	16 Yrs.	" " -26.0	1830	- 86.6
180	8/40-8/49	108 Mos.	" " -20.5	1800	+ 218.5
181	9/40-8/49	107 Mos.	" " -18.0	1375	+ 259.2
182	1933-1940	7 Yrs.	" " -27.0	2250	+ 244.4
	1940-1956	16 Yrs.	" " -27.0	2470	+ 82.2
183	9/40-8/49	107 Mos.	" " -18.0	1530	+ 144.4
184	1933-1940	7 Yrs.	" " -24.0	1950	+ 387.4
	1940-1956	16 Yrs.	" " -24.0	2030	+ 188.8
186	9/40-8/49	107 Mos.	" " -23.0	2050	- 154.0
189	8/40-9/49	109 Mos.	" " -20.5	1670	+ 370.3
197	1940-1956	16 Yrs.	" " -24.0	1950	+ 42.9
207	1933-1940	7 Yrs.	" " -32.0	2800	- 311.1
	1940-1956	16 Yrs.	" " -32.0	2800	+ 173.3
217	8/36-8/38	24 Mos.	" " -23.0	1760	+ 66.6
220	8/36-8/38	24 Mos.	" " -27.0	2300	+ 35.5
229	1933-1940	7 Yrs.	" " -20.0	1640	+ 15.5
	1940-1956	16 Yrs.	" " -24.0	1940	- 72.5
234	1933-1940	7 Yrs.	" " -19.0	1620	+ 219.2
244	1933-1940	7 Yrs.	" " -18.0	1260	+ 26.6
	1940-1956	16 Yrs.	" " -18.0	1410	- 20.0
253	9/37-5/38	8 Mos.	" " -24.5	2120	+ 71.1
	5/38-6/39	13 Mos.	" " -24.5	2350	- 25.1
254	5/37-9/37	4 Mos.	" " -19.0	1730	- 32.5
	9/37-5/38	8 Mos.	" " -24.5	1675	- 53.3
	5/38-6/39	13 Mos.	" " -24.5	1690	+ 47.4
255	5/37-9/37	4 Mos.	" " -24.5	2040	- 11.8
	9/37-5/38	8 Mos.	" " -24.5	2150	- 51.8
	5/38-6/39	13 Mos.	" " -24.5	2375	+ 103.7
258	9/37-5/38	8 Mos.	" " -24.5	3350	+ 10.3
259	11/53-3/54	4 Mos.	" " -30.0	3005	- 444.4
	3/54-7/54	4 Mos.	" " -30.0	2745	+ 193.3
260	5/38/6/39	13 Mos.	" " -24.0	2910	+ 60.7
	6/39/7/49	121 Mos.	" " -24.0	2830	- 77.0

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
261	5/38-7/49	134 Mos.	MLW to -24.0	4500	+ 202.9
262	3/54-7/54	4 Mos.	" " -30.0	3290	+ 113.3
263	9/37-5/38	8 Mos.	" " -24.0	3460	- 25.1
	5/38-6/39	13 Mos.	" " -24.0	3900	- 185.1
264	11/53-3/54	4 Mos.	" " -30.0	3370	- 114.0
	3/54-7/54	4 Mos.	" " -30.0	3530	+ 105.9
265	9/37-5/38	8 Mos.	" " -24.0	2850	- 183.7
	5/38-6/39	13 Mos.	" " -24.0	3500	+ 136.2
266	11/53-3/54	4 Mos.	" " -30.0	3470	- 129.6
	3/54-7/54	4 Mos.	" " -30.0	3470	+ 39.2
268	5/38-6/39	13 Mos.	" " -24.0	3260	+ 23.7
269	5/37-9/37	4 Mos.	" " -24.0	2340	- 11.8
271	11/53-3/54	4 Mos.	" " -30.0	3610	- 42.9
	3/54-7/54	4 Mos.	" " -30.0	3570	+ 55.5
272	5/38-6/39	13 Mos.	" " -24.0	2440	+ 66.6
	6/39-7/49	121 Mos.	" " -24.0	2860	+ 145.1
275	6/39-7/49	121 Mos.	" " -24.0	3180	+ 182.2
276	7/49-6/51	23 Mos.	" " -21.0	2630	+ 80.0
278	7/49-6/51	23 Mos.	" " -21.0	2350	+ 77.0
279	11/53-3/54	4 Mos.	" " -30.0	3220	- 36.2
	3/54-7/54	4 Mos.	" " -30.0	3500	+ 98.5
281	7/49-6/51	23 Mos.	" " -21.0	2630	+ 80.0
282	11/53-3/54	4 Mos.	" " -30.0	3430	+ 93.3
	3/54-7/54	4 Mos.	" " -30.0	3730	+ 156.2
283	7/49-6/51	23 Mos.	" " -21.0	1725	+ 48.8
284	7/49-6/51	23 Mos.	" " -21.0	1800	+ 34.0
285	11/53-3/54	4 Mos.	" " -30.0	3500	- 90.3
	3/54-7/54	4 Mos.	" " -30.0	3780	+ 391.8
286	11/53-3/54	4 Mos.	" " -30.0	3600	- 7.4
	3/54-7/54	4 Mos.	" " -30.0	3670	+ 147.4
288	7/49-6/51	23 Mos.	" " -21.0	1850	- 222.2
289	3/54-7/54	4 Mos.	" " -30.0	3860	+ 276.2
292	11/53-3/54	4 Mos.	" " -30.0	3480	- 149.6
	3/54-7/54	4 Mos.	" " -30.0	3670	+ 232.5
299	1933-1940	7 Yrs.	" " -21.0	1530	- 4.4
	1940-1956	16 Yrs.	" " -21.0	1770	- 136.2
310	1933-1940	7 Yrs.	" " -22.0	1670	- 22.9
	1940-1956	16 Yrs.	" " -22.0	1670	+ 94.0
325	1933-1940	7 Yrs.	" " -23.0	1640	- 2.9
	1940-1956	16 Yrs.	" " -23.0	1840	+ 51.8
333	1933-1940	7 Yrs.	" " -23.0	1620	- 134.8
	1940-1956	16 Yrs.	" " -23.0	1700	+ 197.0
346	1940-1956	16 Yrs.	" " -23.0	1460	+ 124.0
357	1933-1940	7 Yrs.	" " -23.0	1630	+ 50.3

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
368	1933-1940	7 Yrs.	MLW to -28.0	2110	+ 7.4
	1940-1956	16 Yrs.	" " -28.0	1950	- 121.4
370	7/37-8/37	13 Mos.	" " -27.0	2010	- 178.8
	8/37-8/38	12 Mos.	" " -27.0	2010	+ 198.5
373	7/36-8/37	13 Mos.	" " -26.0	2050	- 236.2
	8/37-8/38	12 Mos.	" " -26.0	2030	+ 130.0
388	1940-1956	16 Yrs.	" " -20.0	1280	4.4
394	1940-1956	16 Yrs.	" " -17.0	1220	+ 74.0
407	5/36-7/36	2 Mos.	" " -29.0	2110	- 57.4
408	5/36-7/36	2 Mos.	" " -26.0	1940	- 70.7
	7/36-8/37	13 Mos.	" " -30.0	2330	+ 230.3
	8/37-8/38	12 Mos.	" " -27.0	2010	- 50.7
410	5/36-7/36	2 Mos.	" " -25.0	1820	- 64.8
411	5/36-7/36	2 Mos.	" " -32.0	2550	- 69.2
	7/36-8/37	13 Mos.	" " -27.0	1830	+ 75.1
	8/37-8/38	12 Mos.	" " -30.0	2300	+ 1.8
412	6/50-8/50	2 Mos.	+ 9.8 " -29.8	2700	- 22.3
	8/50-10/50	2 Mos.	+10.0 " -29.2	2600	+ 26.9
	10/50-12/50	2 Mos.	+ 9.3 " -31.0	2900	- 62.0
	12/50-2/51	2 Mos.	+10.0 " -29.0	2550	- 14.7
	2/51-4/51	2 Mos.	+ 9.8 " -32.0	3000	+ 16.5
	4/51-6/51	2 Mos.	+ 9.5 " -31.0	2870	+ 14.4
	6/50-6/51	12 Mos.	+ 9.7 " -31.0		- 41.1
413	6/50-8/50	2 Mos.	+11.5 " -33.0	4000	+ 120.7
	8/50-10/50	2 Mos.	+11.5 " -33.5	4000	- 151.7
	8/50-12/50	2 Mos.	MLW " -23.0	2030	+ 26.6
	10/50-12/50	2 Mos.	+10.2 " -30.0	3250	+ 48.0
	12/50-1956	5 Yrs.	MLW " -23.0	1960	- 13.3
	12/50-2/51	2 Mos.	+11.0 " -31.0	3500	- 95.5
	2/51-4/51	2 Mos.	+11.0 " -31.5	3600	+ 64.3
	4/51-6/51	2 Mos.	+11.2 " -31.8	3610	- 50.4
	6/50-6/51	12 Mos.	+11.1 " -31.6		- 69.5
414	11/39-8/40	9 Mos.	MLW " -30.0	2740	- 84.4
	6/50-8/50	2 Mos.	+12.0 " -30.0	3740	+ 42.9
	8/50-10/50	2 Mos.	+10.8 " -30.5	3760	+ 3.1
	10/50-12/50	2 Mos.	+10.5 " -30.0	3750	- 1.5
	12/50-2/51	2 Mos.	+20.0 " -26.0	3150	- 79.5
	2/51-4/51	2 Mos.	+17.0 " -35.0	4310	+ 70.4
	4/51-6/51	2 Mos.	+19.5 " -35.0	4300	- 46.8
	6/50-6/51	12 Mos.	+14.9 " -31.5		- 11.4
415	11/39-8/40	9 Mos.	MLW " -30.0	3410	+ 157.0
416	6/50-8/50	2 Mos.	+ 8.5 " -33.0	3200	+ 4.5
	8/50-10/50	2 Mos.	+ 8.8 " -30.0	2880	+ 37.5
	10/50-12/50	2 Mos.	+11.5 " -32.5	3230	- 87.1

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
416	12/50-2/51	2 Mos.	+11.5 to -28.0	2580	- 84.7
	2/51-4/51	2 Mos.	+11.0 " -32.0	3400	+ 183.5
	4/51-6/51	2 Mos.	+10.0 " -29.5	2950	+ 197.6
	6/50-6/51	12 Mos.	+10.2 " -32.4		+ 75.9
417	11/38-6/40	19 Mos.	MLW " -24.5	1560	- 186.6
419	1940-1954	14 Yrs.	" " -30.0	2550	+ 767.4
420	10/34-5/37	31 Mos.	" " -25.0	2920	- 551.1
	5/37-10/37	5 Mos.	" " -25.0	2260	- 97.7
	10/37-5/38	7 Mos.	" " -25.0	2120	- 146.6
	5/38-11/38	6 Mos.	" " -25.0	2100	+ 37.0
	11/38-7/39	8 Mos.	" " -25.0	2190	- 57.5
	7/39-6/40	11 Mos.	" " -25.0	2170	- 124.4
421	1940-1954	14 Yrs.	" " -30.0	2580	+ 794.0
422	5/37-10/37	5 Mos.	" " -24.0	2400	- 158.5
	10/37-5/38	7 Mos.	" " -24.0	2150	- 151.1
	5/38-11/38	6 Mos.	" " -24.0	2060	+ 35.5
	11/38-7/39	8 Mos.	" " -24.0	2130	- 47.4
423	1940-1954	14 Yrs.	" " -30.0	2940	+ 792.5
	6/50-8/50	2 Mos.	+12.0 " -32.5	2900	+ 94.3
	8/50-10/50	2 Mos.	+ 9.0 " -37.5	3600	- 1.0
	10/50-12/50	2 Mos.	+12.0 " -28.5	2530	+ 26.7
	12/50-2/51	2 Mos.	+12.0 " -30.0	2610	- 49.8
	2/51-4/51	2 Mos.	+12.0 " -32.0	2800	+ 22.4
	4/51-6/51	2 Mos.	+11.0 " -31.5	2710	+ 8.3
	6/50-6/51	12 Mos.	+11.3 " -31.6		+ 101.0
424	10/34-5/37	31 Mos.	MLW " -24.0	3240	- 108.1
	5/37-10/37	5 Mos.	" " -24.0	2480	- 122.9
	10/37-5/38	7 Mos.	" " -24.0	2440	- 232.5
	5/38-11/38	6 Mos.	" " -24.0	2220	+ 28.1
	11/38-7/39	8 Mos.	" " -24.0	2210	- 10.3
425	10/34-5/37	31 Mos.	" " -23.0	2690	- 20.7
	5/37-5/38	12 Mos.	" " -23.0	2540	- 217.7
	5/38-11/38	6 Mos.	" " -23.0	2300	- 91.8
	11/38-7/39	8 Mos.	" " -23.0	2120	+ 14.8
426	4/37-10/37	6 Mos.	" " -27.0	2775	- 94.4
	10/37-4/38	6 Mos.	" " -27.0	3000	- 125.9
	4/38-6/39	14 Mos.	" " -27.0	2400	+ 9.2
	1940-1954	14 Yrs.	" " -30.0	3190	+ 945.1
427	10/34-5/37	31 Mos.	" " -24.5	3010	+ 57.7
	5/37-5/38	12 Mos.	" " -24.5	2780	- 210.3
	5/38-7/39	14 Mos.	" " -24.5	2730	- 103.7
	7/39-6/40	11 Mos.	" " -24.5	2420	- 118.5
428	5/38-11/38	6 Mos.	" " -24.5	2850	+ 94.8
	11/38-7/39	8 Mos.	" " -24.5	2550	- 32.5
	7/39-6/40	11 Mos.	" " -24.5	2430	- 148.1

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
429	1940-1954	14 Yrs.	MLW to -30.0	3240	+ 957.0
430	11/38-6/40	19 Mos.	" " -25.0	3680	- 121.4
431	11/38-6/40	19 Mos.	" " -25.0	4130	+ 47.4
432	1940-1954	14 Yrs.	- 6.0 " -30.0	2300	+ 536.2
433	4/37-10/37	6 Mos.	MLW " -27.0	6500	- 322.2
	10/37-4/38	6 Mos.	" " -27.0	6500	- 183.3
	4/38-6/38	2 Mos.	" " -27.0	6390	+ 16.6
	6/50-8/50	2 Mos.	+10.5 " -31.5	7850	+ 118.6
	8/50-10/50	2 Mos.	+ 7.0 " -33.0	8130	+ 45.0
	10/50-12/50	2 Mos.	+16.0 " -30.0	7840	+ 274.4
	12/50-2/51	2 Mos.	+10.5 " -31.0	7920	- 657.3
	2/51-4/51	2 Mos.	+16.0 " -30.5	7750	+ 62.1
	4/51-6/51	2 Mos.	+10.5 " -31.0	7870	+ 294.3
	6/50-6/51	12 Mos.	+11.8 " -30.6		+ 137.2
434	6/50-8/50	2 Mos.	+15.0 " -30.0	6550	+ 19.5
	8/50-10/50	2 Mos.	+ 9.0 " -29.0	6920	+ 25.1
	10/50-12/50	2 Mos.	+12.0 " -32.5	7050	+ 91.7
	12/50-2/51	2 Mos.	+10.5 " -33.0	7050	- 302.7
	2/51-4/51	2 Mos.	+13.5 " -33.0	6930	+ 57.4
	4/51-6/51	2 Mos.	+16.0 " -32.0	6970	+ 114.0
	6/50-6/51	12 Mos.	+12.7 " -31.0		+ 5.1
435	6/50-8/50	2 Mos.	+10.0 " -28.4	4870	+ 186.8
	8/50-10/50	2 Mos.	+ 9.8 " -27.5	4740	- 162.9
	10/50-12/50	2 Mos.	+10.0 " -29.2	4850	- 27.5
	12/50-2/51	2 Mos.	+10.8 " -30.0	5290	- 136.7
	2/51-4/51	2 Mos.	+10.0 " -32.0	6070	+ 88.2
	4/51-6/51	2 Mos.	+10.0 " -31.0	5800	- 33.7
	6/50-6/51	12 Mos.	+10.1 " -29.7		- 85.8
436	6/50-8/50	2 Mos.	+16.5 " -35.0	6690	+ 249.5
	8/50-10/50	2 Mos.	+13.4 " -29.5	4920	- 182.2
	10/50-12/50	2 Mos.	+16.0 " -30.0	5100	- 97.9
	12/50-2/51	2 Mos.	+16.0 " -30.6	5250	- 54.2
	2/51-4/51	2 Mos.	+15.0 " -31.0	5310	+ 79.1
	4/51-6/51	2 Mos.	+14.0 " -32.0	5570	+ 73.4
	6/50-6/51	12 Mos.	+15.2 " -32.0		+ 142.1
437	6/50-8/50	2 Mos.	+16.0 " -32.0	5500	+ 148.5
	8/50-10/50	2 Mos.	+16.0 " -32.0	4400	- 20.3
	10/50-12/50	2 Mos.	+16.0 " -31.0	4680	+ 11.4
	12/50-2/51	2 Mos.	+16.0 " -32.0	4980	- 209.4
	2/51-4/51	2 Mos.	+16.0 " -32.0	4880	+ 190.1
	4/51-6/51	2 Mos.	+16.0 " -31.5	4400	+ 63.5
	6/50-6/51	12 Mos.	+16.0 " -31.5		+ 183.8
438	5/36-6/36	1 Mo.	MLW " -26.0	3555	+ 64.0

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
438	6/36-7/37	13 Mos.	MLW to -26.0	3580	+ 645.5
	7/37-7/38	12 Mos.	" " -26.0	3580	- 768.1
	7/38-10/38	3 Mos.	" " -26.0	2820	- 64.8
	10/38-10/39	12 Mos.	" " -26.0	2900	- 221.8
	10/39-9/40	11 Mos.	" " -26.0	2710	- 114.8
	9/40-9/41	12 Mos.	" " -26.0	2830	+ 92.5
439	5/36-6/36	13 Mos.	" " -28.0	3210	+ 113.7
	6/36-7/37	13 Mos.	" " -28.0	3510	- 160.0
	7/37-7/38	12 Mos.	" " -28.0	3520	- 43.3
	7/38-10/38	3 Mos.	" " -28.0	3025	+ 96.6
	10/38-10/39	12 Mos.	" " -28.0	3025	- 221.8
	10/39-9/40	11 Mos.	" " -28.0	2920	+ 85.5
	9/40-9/41	12 Mos.	" " -28.0	3220	- 1.8
440	6/50-8/50	2 Mos.	+14.0 " -31.0	4000	+ 38.8
	8/50-10/50	2 Mos.	+14.2 " -30.0	4100	- 59.6
	10/50-12/50	2 Mos.	+14.0 " -34.0	5400	- 38.2
	12/50-2/51	2 Mos.	+13.0 " -34.0	5470	- 97.2
	2/51-4/51	2 Mos.	+13.0 " -32.0	4810	+ 213.7
	4/51-6/51	2 Mos.	+13.5 " -31.0	4650	+ 11.2
	6/50-6/51	12 Mos.	+13.7 " -32.0		+ 68.7
441	6/50-8/50	2 Mos.	+14.0 " -26.8	3600	+ 98.1
	8/50-10/50	2 Mos.	+15.0 " -26.6	3400	- 72.5
	10/50-12/50	2 Mos.	+11.6 " -33.2	5280	+ 66.7
	12/50-2/51	2 Mos.	+15.6 " -33.2	5410	- 124.5
	2/51-4/51	2 Mos.	+15.5 " -32.0	4510	+ 109.7
	4/51-6/51	2 Mos.	+ 9.2 " -31.6	4470	+ 1.8
	6/50-6/51	12 Mos.	+13.4 " -30.6		+ 79.4
442	6/50-8/50	2 Mos.	+21.0 " -29.0	4100	- 27.1
	8/50-10/50	2 Mos.	+13.0 " -29.0	4000	+ 61.4
	10/50-12/50	2 Mos.	+21.0 " -32.4	4680	+ 5.2
	12/50-2/51	2 Mos.	+20.0 " -33.0	5270	- 173.6
	2/51-4/51	2 Mos.	+10.0 " -29.0	3890	+ 62.1
	4/51-6/51	2 Mos.	+17.0 " -29.0	4060	- 142.2
	6/50-6/51	12 Mos.	+17.0 " -30.2		- 214.1
443	6/50-8/50	2 Mos.	+14.0 " -32.0	4990	+ 78.3
	8/50-10/50	2 Mos.	+13.0 " -32.0	4880	- 49.4
	10/50-12/50	2 Mos.	+13.0 " -31.0	4770	+ 15.1
	12/50-2/51	2 Mos.	+14.6 " -31.6	4790	- 122.2
	2/51-4/51	2 Mos.	+12.0 " -31.0	4720	+ 205.0
	4/51-6/51	2 Mos.	+10.0 " -32.0	4700	- 86.1
	6/50-6/51	12 Mos.	+12.8 " -31.6		+ 40.7
444	5/36-6/36	1 Mo.	MLW " -28.0	3100	+ 99.6
	6/36-7/37	13 Mos.	" " -28.0	3235	- 11.1
	7/37-7/38	12 Mos.	" " -28.0	3270	- 291.4

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
444	7/38-10/38	3 Mos.	MLW to -28.0	2670	+ 127.0
	10/38-10/39	12 Mos.	" " -28.0	2725	- 280.3
	10/39-9/40	11 Mos.	" " -28.0	2275	- 27.7
	9/40-9/41	12 Mos.	" " -28.0	2270	+ 6.2
445	5/36-6/36	1 Mo.	" " -30.0	3905	+ 164.8
	6/36-7/37	13 Mos.	" " -30.0	3905	- 306.2
	7/37-7/38	12 Mos.	" " -30.0	3725	- 178.1
	7/38-10/38	3 Mos.	" " -30.0	2925	+ 245.5
	10/38-10/39	12 Mos.	" " -30.0	2960	- 345.9
	10/39-9/40	11 Mos.	" " -30.0	2590	+ 31.8
	9/40-9/41	12 Mos.	" " -30.0	2720	+ 90.7
446	6/50-8/50	2 Mos.	+12.5 " -32.0	5010	+ 141.4
	8/50-10/50	2 Mos.	+11.4 " -30.0	5000	- 209.8
	10/50-12/50	2 Mos.	+15.0 " -32.0	4660	- 88.6
	12/50-2/51	2 Mos.	+ 9.8 " -31.8	4720	- 48.4
	2/51-4/51	2 Mos.	+ 8.8 " -33.0	5600	+ 238.2
	4/51-6/51	2 Mos.	+11.0 " -29.8	4400	+ 98.8
	6/50-6/51	12 Mos.	+11.4 " -31.6		+ 131.6
447	6/50-8/50	2 Mos.	+14.5 " -29.0	4430	+ 43.3
448	10/39-10/40	12 Mos.	MLW " -30.5	2820	- 350.0
449	8/50-10/50	2 Mos.	+13.0 " -30.0	4440	+ 18.2
	10/50-12/50	2 Mos.	+14.0 " -32.5	5690	+ 122.9
	12/50-2/51	2 Mos.	+13.4 " -33.2	5680	- 62.0
	2/51-4/51	2 Mos.	+13.0 " -33.4	6090	+ 71.1
	4/51-6/51	2 Mos.	+13.4 " -31.0	5200	- 93.1
450	7/36-7/37	12 Mos.	MLW " -27.0	4525	+ 304.8
	7/37-7/38	12 Mos.	" " -27.0	4525	- 428.5
	7/38-10/38	3 Mos.	" " -27.0	3595	+ 104.4
	10/38-10/39	12 Mos.	" " -27.0	3595	- 428.8
	10/39-10/40	12 Mos.	" " -27.0	2080	- 247.0
	10/40-8/41	10 Mos.	" " -27.0	2240	- 42.5
451	7/36-7/37	12 Mos.	" " -27.0	4125	+ 66.6
	7/37-7/38	12 Mos.	" " -27.0	4125	- 294.4
	7/38-10/38	3 Mos.	" " -27.0	3365	+ 170.0
	10/38-10/39	12 Mos.	" " -27.0	3365	- 446.2
	10/39-10/40	12 Mos.	" " -27.0	2280	- 99.2
	10/40-8/41	8 Mos.	" " -27.0	1580	- 118.1
452	4/36-7/36	3 Mos.	" " -27.0	4270	- 88.5
453	11/35-4/36	5 Mos.	" " -27.0	4000	+ 232.9
	4/36-7/36	3 Mos.	" " -27.0	4000	- 85.1
	7/36-7/37	12 Mos.	" " -27.0	3530	- 131.1
	7/37-7/38	12 Mos.	" " -27.0	3250	- 78.5
	7/38-10/38	3 Mos.	" " -27.0	2685	- 237.7
	10/38-10/39	12 Mos.	" " -27.0	2685	- 53.3

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
453	10/39-10/40	12 Mos.	MLW to -27.0	1890	- 216.2
	10/40-8/41	8 Mos.	" " -27.0	1450	+ 57.7
454	11/35-4/36	5 Mos.	" " -27.0	2930	- 30.0
	4/36-7/36	3 Mos.	" " -27.0	3600	+ 310.3
455	6/50-8/50	2 Mos.	+14.0 " -33.0	6300	+ 198.7
	8/50-10/50	2 Mos.	+10.2 " -33.0	6280	- 103.1
	10/50-12/50	2 Mos.	+13.0 " -34.0	6820	+ 6.7
	12/50-2/51	2 Mos.	+16.5 " -31.0	5350	- 158.8
	2/51-4/51	2 Mos.	+16.5 " -31.0	5450	+ 75.8
	4/51-6/51	2 Mos.	+14.0 " -31.0	5400	- 57.0
	6/50-6/51	12 Mos.	+14.0 " -32.0		- 37.6
456	11/35-4/36	5 Mos.	MLW " -27.0	3470	- 72.9
	4/36-6/36	2 Mos.	" " -27.0	3620	+ 190.3
	6/36-7/37	13 Mos.	" " -27.0	3620	- 240.7
	7/37-7/38	12 Mos.	" " -27.0	3690	+ 294.8
	7/38-10/38	3 Mos.	" " -27.0	3690	+ 32.5
	10/38-10/39	12 Mos.	" " -27.0	3645	- 610.0
	10/39-10/40	12 Mos.	" " -27.0	1955	- 6.6
	10/40-8/41	8 Mos.	" " -27.0	1325	- 133.7
457	11/35-4/36	5 Mos.	" " -27.0	3640	+ 232.2
	4/36-7/36	3 Mos.	" " -27.0	3640	- 225.5
458	11/35-4/36	5 Mos.	" " -27.0	4370	+ 766.6
	4/36-6/36	2 Mos.	" " -27.0	4370	- 702.5
	6/36-7/37	13 Mos.	" " -27.0	3930	- 199.6
	7/37-7/38	12 Mos.	" " -27.0	3930	- 222.5
	7/38-10/38	3 Mos.	" " -27.0	3450	- 38.8
	10/38-10/39	12 Mos.	" " -27.0	3420	- 277.4
	10/39-10/40	12 Mos.	" " -27.0	2770	- 163.7
	10/40-8/41	10 Mos.	" " -27.0	1540	- 137.7
459	11/35-6/36	7 Mos.	" " -30.0	4170	+ 134.8
460	11/35-6/36	7 Mos.	" " -30.0	5150	+ 298.8
	6/36-7/37	13 Mos.	" " -30.0	5220	- 297.4
	7/37-7/38	12 Mos.	" " -30.0	5220	+ 331.1
	7/38-10/38	3 Mos.	" " -30.0	5230	- 16.6
	10/38-10/39	12 Mos.	" " -30.0	5230	- 677.4
	10/39-10/40	12 Mos.	" " -30.0	2865	- 135.1
	10/40-8/41	10 Mos.	" " -30.0	1500	- 571.1
461	11/35-6/36	7 Mos.	+ 8.0 " -27.0	4700	+ 58.7
462	6/50-8/50	2 Mos.	+14.0 " -30.0	6290	+ 246.0
	8/50-10/50	2 Mos.	+10.5 " -28.4	5940	- 35.2
	10/50-12/50	2 Mos.	+14.0 " -31.0	6850	- 158.6
	12/50-2/51	2 Mos.	+14.0 " -30.0	6210	+ 23.7
	2/51-4/51	2 Mos.	+14.0 " -29.6	6250	- 1.2
	4/51-6/51	2 Mos.	+14.0 " -31.0	6580	- 112.8
	6/50-6/51	12 Mos.	+13.4 " -29.8		- 38.2

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
463	6/36-7/37	13 Mos.	+ 7.0 to -30.0	5930	- 94.3
	7/37-7/38	12 Mos.	+ 7.0 " -29.0	5030	+ 82.1
	7/38-10/38	3 Mos.	+ 7.0 " -29.0	5460	+ 171.1
	10/38-10/39	12 Mos.	+ 5.0 " -29.0	5290	- 884.7
	10/39-10/40	12 Mos.	+11.0 " -30.0	3150	+ 87.4
	10/40-8/41	10 Mos.	+12.5 " -30.0	3100	- 655.1
464	6/36-7/37	13 Mos.	+ 7.0 " -28.0	5010	- 591.5
	7/37-7/38	12 Mos.	+ 9.0 " -28.0	4610	+ 365.1
	7/38-10/38	3 Mos.	+ 8.8 " -29.0	4760	- 142.2
	10/38-10/39	12 Mos.	+12.0 " -29.0	4960	- 467.1
	10/39-10/40	12 Mos.	+12.0 " -29.6	3200	+ 24.8
	10/40-8/41	10 Mos.	+13.0 " -30.0	3100	- 97.7
465	6/36-7/37	13 Mos.	+ 8.0 " -28.0	5390	- 371.2
	7/37-7/38	12 Mos.	+ 8.0 " -29.0	5120	+ 218.4
	7/38-10/38	3 Mos.	+ 8.5 " -29.0	5120	- 181.0
	10/38-10/39	12 Mos.	+ 7.0 " -30.0	4830	- 542.4
	10/39-10/40	12 Mos.	+12.0 " -31.0	3920	- 25.0
	10/40-8/41	10 Mos.	+ 8.0 " -30.0	3330	+ 54.4
466	6/50-10/50	4 Mos.	+12.0 " -32.6	6690	+ 98.8
	10/50-2/51	4 Mos.	+14.5 " -32.0	6140	- 170.7
	2/51-4/51	2 Mos.	+14.0 " -31.5	6410	+ 74.9
	4/51-6/51	2 Mos.	+12.0 " -31.5	5020	+ 34.7
	6/50-6/51	12 Mos.	+13.1 " -31.7		+ 37.6
467	6/50-8/50	2 Mos.	+10.0 " -29.6	6400	+ 124.2
	8/50-10/50	2 Mos.	+ 9.8 " -29.5	6320	- 96.2
	10/50-12/50	2 Mos.	+11.0 " -29.5	6320	+ 70.9
	12/50-2/51	2 Mos.	+11.0 " -30.5	6510	- 18.6
	2/51-4/51	2 Mos.	+ 9.6 " -31.2	6760	+ 86.6
	4/51-6/51	2 Mos.	+10.0 " -30.0	6310	+ 81.7
	6/50-6/51	12 Mos.	+10.2 " -30.4		+ 248.7
468	6/50-8/50	2 Mos.	+10.0 " -27.6	5440	+ 172.1
	8/50-10/50	2 Mos.	+11.0 " -27.6	5600	+ 120.1
	10/50-12/50	2 Mos.	+11.0 " -32.3	6840	- 218.5
	12/50-2/51	2 Mos.	+ 9.5 " -32.4	6880	- 11.0
	2/51-4/51	2 Mos.	+ 9.6 " -29.0	5750	+ 148.1
	4/51-6/51	2 Mos.	+ 9.6 " -31.0	6920	- 123.8
	6/50-6/51	12 Mos.	+10.1 " -30.3		+ 86.8
469	4/37-9/37	5 Mos.	MLW " -30.0	5925	+ 251.8
	9/37-4/38	7 Mos.	" " -30.0	5925	- 314.8
	4/38-6/39	14 Mos.	" " -30.0	5350	+ 92.5
	6/39-6/40	12 Mos.	" " -30.0	5350	+ 225.9
	4/37-6/40	38 Mos.	" " -30.0		+ 255.5
470	4/37-9/37	5 Mos.	" " -30.0	6000	+ 55.5
	9/37-4/38	7 Mos.	" " -30.0	5225	- 262.9
	4/38-6/39	14 Mos.	" " -30.0	5575	+ 322.2

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
470	6/39-6/40	12 Mos.	MLW to -30.0	4500	+ 144.4
	4/37-6/40	38 Mos.	" " -30.0		+ 259.2
471	6/50-8/50	2 Mos.	+ 8.0 " -29.5	6250	+ 81.3
	8/50-10/50	2 Mos.	+11.5 " -29.3	6280	- 114.8
	10/50-12/50	2 Mos.	+11.0 " -28.0	5580	+ 158.9
	12/50-2/51	2 Mos.	+11.5 " -27.5	5370	- 160.0
	2/51-4/51	2 Mos.	+11.5 " -30.0	6390	- 24.3
	4/51-6/51	2 Mos.	+10.8 " -29.2	5990	- 60.6
	6/50-6/51	12 Mos.	+10.7 " -29.2		- 119.5
473	3/37-9/37	6 Mos.	MLW " -30.0	6100	- 74.0
	9/37-4/38	7 Mos.	" " -30.0	6200	- 198.1
	4/38-6/39	14 Mos.	" " -30.0	6200	+ 11.1
	6/39-6/40	12 Mos.	" " -30.0	6400	+ 125.9
	3/37-6/40	39 Mos.	" " -30.0		- 133.3
474	3/37-9/37	6 Mos.	" " -30.0	5200	- 270.3
	9/37-4/38	7 Mos.	" " -30.0	5500	+ 25.9
	4/38-6/39	14 Mos.	" " -30.0	5500	- 27.2
	6/39-6/40	12 Mos.	" " -30.0	5350	+ 414.8
	3/37-6/40	39 Mos.	" " -30.0		- 101.8
475	3/37-9/37	6 Mos.	" " -30.0	5350	- 42.5
	9/37-4/38	7 Mos.	" " -30.0	5650	- 353.7
	4/38-6/39	14 Mos.	" " -30.0	5450	- 135.1
	6/39-6/40	12 Mos.	" " -30.0	5300	+ 259.2
	3/37-6/40	39 Mos.	" " -30.0		- 272.2
476	6/50-8/50	2 Mos.	+11.2 " -30.0	7600	+ 203.3
	8/50-10/50	2 Mos.	+11.4 " -29.8	7600	- 160.9
	10/50-12/50	2 Mos.	+12.0 " -29.4	7200	- 8.3
	12/50-2/51	2 Mos.	+12.0 " -30.0	7180	+ 51.8
	2/51-4/51	2 Mos.	+14.0 " -29.5	7200	- 6.0
	4/51-6/51	2 Mos.	+11.6 " -30.8	7770	- 61.5
	6/50-6/51	12 Mos.	+12.0 " -30.0		+ 18.3
477	6/50-8/50	2 Mos.	+18.0 " -30.6	8400	+ 97.2
	8/50-10/50	2 Mos.	+17.5 " -30.5	8700	+ 75.0
	10/50-12/50	2 Mos.	+13.0 " -31.0	8870	- 64.8
	12/50-2/51	2 Mos.	+17.0 " -30.6	8640	+ 19.7
	2/51-4/51	2 Mos.	+17.0 " -31.5	8480	+ 83.7
	4/51-6/51	2 Mos.	+16.5 " -31.2	8780	+ 52.5
	6/50-6/51	12 Mos.	+16.5 " -30.5		+ 263.3
478	11/33-5/34	6 Mos.	MLW " -30.0	3880	- 118.5
	5/34-9/36	28 Mos.	" " -20.0	2120	- 91.1
479	7/32-8/32	1 Mo.	" " -14.5	1440	+ 0.7
	8/32-11/33	15 Mos.	" " -18.0	1880	+ 28.1
	11/33-5/34	6 Mos.	" " -27.5	3340	- 93.3
480	11/33-5/34	6 Mos.	" " -24.0	2820	- 63.7
481	11/33-5/34	6 Mos.	" " -28.0	3560	- 51.8

COMPARATIVE PROFILE DATA FOR THE SOUTH SHORE OF LONG ISLAND

Range No.	Dates of Comparison	Time of Comparison	Vertical Extent of Comparison	Horizontal Extent of Comparison (Feet)	Volume of Change (Cu Yds/Lin Ft)
482	5/27-9/36	112 Mos.	MLW to -28.0	3540	- 670.3
483	11/33-5/34	6 Mos.	" " -28.0	3340	- 145.9
484	11/33-9/36	34 Mos.	" " -22.0	2940	- 15.5
485	7/32-5/34	22 Mos.	" " -26.0	4300	+ 71.8
486	7/32-5/34	22 Mos.	" " -26.0	3910	+ 29.6
487	7/32-5/34	22 Mos.	" " -26.0	4100	+ 59.2
488	7/32-5/34	22 Mos.	" " -27.0	3890	+ 151.8
489	7/32-5/34	22 Mos.	" " -25.0	3840	+ 125.9
490	7/32-5/34	22 Mos.	" " -26.0	3940	+ 316.2
	5/34-9/36	28 Mos.	" " -26.0	4150	- 144.4
491	7/32-5/34	22 Mos.	" " -26.0	3880	+ 254.0
	5/34-9/36	28 Mos.	" " -26.0	3880	- 162.9
498	9/33-9/36	36 Mos.	" " -30.0	7420	+ 265.3
501	9/35-9/36	12 Mos.	" " -30.0	7500	- 379.4
504	9/33-9/37	48 Mos.	" " -30.0	7125	+ 52.4
505	9/33-9/37	48 Mos.	" " -30.0	6750	+ 132.6
506	9/36-9/37	12 Mos.	" " -28.5	5160	- 3.0
507	7/31-9/37	74 Mos.	" " -28.5	10190	- 86.3
508	9/33-7/34	10 Mos.	" " -30.0	9875	+ 46.2
	7/34-9/35	14 Mos.	" " -30.0	10065	- 360.9
509	7/31-9/36	62 Mos.	" " -30.0	10815	+ 169.7
	9/36-9/39	36 Mos.	" " -30.0	9750	+ 475.1
510	7/31-9/33	26 Mos.	" " -30.0	10375	+ 40.1
	9/33-9/35	24 Mos.	" " -30.0	9435	- 43.1
	9/35-9/36	12 Mos.	" " -30.0	10500	+ 256.0
	9/36-9/37	12 Mos.	" " -30.0	10560	+ 604.7
511	9/33-9/36	36 Mos.	" " -30.0	8875	+ 502.8
	9/36-9/37	12 Mos.	" " -30.0	8376	- 40.1
512	9/34-9/35	12 Mos.	" " -30.0	9940	- 431.9
513	9/35-9/36	12 Mos.	" " -30.0	9417	- 277.6
	9/36-9/37	12 Mos.	" " -30.0	8685	+ 253.0
514	9/34-9/35	12 Mos.	" " -29.5	10000	+ 518.2
515	9/36-9/37	12 Mos.	" " -30.0	9900	+ 697.2
516	9/33-9/37	48 Mos.	" " -29.0	9650	-1049.3
517	1932-1934	2 Yrs.	- 6.0 " -30.0	26000	-1368.5
518	1932-1934	2 Yrs.	- 6.0 " -30.0	24100	- 657.4
519	1927-1932	5 Yrs.	-12.0 " -30.0	18250	+ 492.5
	1932-1934	2 Yrs.	-12.0 " -30.0	18300	-1294.4

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