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State, Dept. of Environmental Conservation

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Interim Report
on

(TASK 7.2)

Flood Plain Management

Beach Erosion and Hurricane Damage Reduction
South Shore Long Island

Prepared by

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Forward

This preliminary report is intended only as a starting point for an interchange with land use planners engaged in the Coastal Zone Management Program. It is hoped that the report, together with more detailed and additional information as may be required, will assist in the delineation of land use plans for the coastal zone. Such a land use plan would permit detailed recommendations for an erosion and hurricane damage reduction management program to be developed in the next phase of the study.

Introduction

Erosion of beaches and flooding of low lying coastal areas are natural phenomena. Man, at least at present, has little control on the enormous forces of wind and tide that form and shape and alter coastlines. Man can, however, have great influence on how and where damages occur to the environment of the shore and to his pursuits and occupation of flood and erosion prone areas. Management of shore areas consists of planned actions, or inactions, that preserve or enhance the value of the coastal zone. The difficulty, of course, lies in first, the present development and use of the coastal zone area, particularly those uses subject to large potential damages, second, in determining the value (including any resultant damages) resulting from a given use and, third, determining the best way to preserve or enhance coastal zone values.

Existing Development

Present development patterns range from the Fire Island National Seashore to very intensive commercial harbor development. Exposure to potential damage ranges from very low to enormous. Where large potential damages are present, the traditional response has been to provide protection for the fixed and committed investment. Such a policy may cause many problems. Protection works are expensive, and may produce adverse effects to adjoining areas. Protection facilities may work to perpetrate unwise development patterns and even encourage further unwise development. However, the danger to life and property, damage to public facilities and dislocation to area economies, especially from occurrence of a major hurricane, fully justifies current Federal and State policies providing for assistance to local governments in protecting existing developments. The difficulty of the problem dictates that consideration be given to all possible methods of reducing damages including purchase, relocation and land use controls to try to provide better solutions.

Value

The problem in determining value lies in the impossibility of assigning a common system of measurement, such as dollars, to all values. It is exceedingly difficult to compare the value of a salt marsh to a commercial harbor. This question is important to a discussion of erosion and flood damage reduction because the type of land use determines the methods available and the costs of damage reduction methods (including environmental and other damages caused by protection methods) must be included in the costs of utilizing a site for a specific purpose.

This "endless rope" problem requires estimating costs of alternative uses of coastal areas for the land use planner for his use in the designation of land use areas. The land use plans are then used to prepare a detailed plan for beach erosion and hurricane damage prevention.

Preserving and Enhancing Coastal Zone Uses

Methods of preserving and enhancing coastal zone values range from protecting and preserving areas by limiting use to transitory visits, through land use controls establishing set backs and construction standards, to sand nourishment schemes and culminating in vast engineered structures such as those used in the Netherlands to reclaim and hold land from the bed of the sea. Quite obviously methods used for a national seashore are unsuitable for a commercial harbor. Equally obvious is that the more intensive the use for a specific area, the more expensive the construction operation and maintenance of a damage reduction program, the more the environment may be affected and the more risk of catastrophic loss should protective works fail.

The general process of erosion and flooding are well established and reasonably well understood along the south shore of Long Island. The process that cause changes in limited shore sections or during intense storms is much less understood. Neither does the state of scientific knowledge permit a vigorous analysis or prediction of the exact action of protective devices. Design of shore protection systems is therefore subject to substantial uncertainty and professional disagreement. This situation dictates that planning and management should be done on

broad reach basis, with sufficient flexibility to deal with specific problems as they arise.

Methods of Shore Protection

The natural defense against the destructive forces of waves and flooding are the beaches and dunes along any coastline. The wide gently sloped beaches dissipate wave energy and reduce erosion forces while the dune at the back of the beach acts as a barrier or natural levee to protect against flooding. In general, shore protection facilities are designed to stabilize, restore, replace or supplement the natural beaches and dunes.

Beach Protection Projects

Sandfill, the most commonly used method of beach protection or restoration, is the placement of beach fill by artificial means. The sand for the beach fill is obtained from offshore sources, back bays or navigation inlets, and pumped hydraulically to the beach site. Other mechanical means are also used, such as trucking or barging the material to or near the fill site and rehandling to build the desired beach slope.

Groins are often used to maintain and stablize an existing beach or to build new beaches by trapping sand which moves in the long-shore current. Groins are constructed of timber, rock or concrete and depending on the design purpose, can be classed as high or low, long or short and permeable or impermeable. They are usually constructed perpendicular to the beach, running from the back shore to some predetermined distance into the littoral zone of sand movement, depending upon the purpose of the structure. Groins which are designed to interrupt the sand movement do so at the

expense of the adjacent downdrift shore until equilibrium is reached. Down-drift effects must be considered and accommodated by allowing for some method of sand bypassing or downdrift protection.

Jetties

A jetty is a similar structure to a groin which also interrupts the alongshore movement of sand. The construction is similar but usually larger and longer and used to eliminate or control sand deposition in a navigation inlet or channel by stopping the movement of sand updrift from the navigation facility. The same downdrift effect on sand movement occurs as with groins. To eliminate undesirable down-drift erosion, the entrapped sand may be bypassed around the inlet to allow for the continuation of natural nourishment of the beach areas. Various methods of sand bypassing are employed.

Others

Other structures for beach protection, such as offshore breakwaters, or floodwalls, are considered but usually have limited applicability on Long Island's south shore, primarily because of the relatively large costs associated with such facilities.

Flood Protection Projects

Flood protection methods employed are designed to protect, restore, supplement or replace the natural dune line behind the beaches. Dune restoration is generally accomplished by hydraulically pumping the sand to the site and shaping the structure by mechanical means. Dune stabliza-tion is accomplished by various means, to prevent against wind destruction,

such as planting beach grasses and shrubbery and installation of sand fencing. Protection of the dune base or toe is sometimes required by construction of an armoring device such as a seawall or revetment. Where a dune line is non-existant or lost due to development, floodwalls and levees are utilized. Artifial barriers which either partially or completely close an inlet may be constructed to insure continuous protection from flooding for low lying backshore or back bay areas within a specific geographic area or reach.

Existing Beach Erosion Control and Hurricane Protection Programs

Structural Protection

The State-Local Program

The State and local government program was initiated in 1945 by State statute. This authority provides for construction of shore protection facilities by the State, and requires local participation. Projects are constructed by the Department of Environmental Conservation on lands owned by a municipality (or beach erosion control district). The municipality must repay 30 percent of the construction cost and maintain the project after completion. Because of current Federal involvement in this program area, the State-local program is currently limited to providing interim protection in Federal study areas or in areas where Federal involvement is not warranted.

The Federal Programs

The Federal government, through the U. S. Corps of Engineers, participates in several beach erosion control and hurricane protection programs. In general, the projects are constructed by the Federal government, with non-

Federal interests providing lands needed for the project, a portion of construction costs and maintaining the project after completion. The State contributes 70% of the non-Federal construction costs and the remainder of non-Federal costs, lands and maintenance are furnished by the participating local government.

Hurricane Protection projects are funded 70% by the Federal government. Beach erosion control projects are funded from 0 - 75% by the Federal government depending on land use and ownership. Combined projects are cost-shared using both programs and in New York average 50 to 60% Federal.

Land Use and Development Controls

Land use and development controls are designed (1) to preserve natural features that tend to provide protection, (2) regulate development in hazard areas, and (3) to provide that structures in flood hazard areas are constructed to be reasonably safe from flood damage. A number of land use control mechanisms are in use or have been proposed for this purpose.

Preservation and Protection

Along most of the south shore of Long Island, nature will provide a beach-dune configuration that provides substantial protection. If the dunes and nature are damaged or destroyed, this protection is lost. Most areas on Long Island have ordinances limiting construction and traffic on beaches and dunes and protecting dune vegetation. These ordinances are very effective when rigorously enforced.

Regulation of Development in Hazard Areas

Zoning and sub-division ordinances regulate the uses for which land can be used and the manner of its use. These ordinances can provide for limiting development in flood hazard areas and proscribe minimum elevations and setback distances to provide reasonable protection. These controls are most useful for new construction or reconstruction and are of limited value for existing development.

Regulation of Building Construction

Building codes can provide for the use of construction methods and materials that resist flood damages.

Other Methods

A number of other methods such as development easement, relocation of structures and tax policies are of value in specific cases.

The Federal Flood Insurance Program

Flood insurance provides no reduction in damages, but does provide a means for recovering losses by property owners. However, the Federal Flood Insurance Program requires land use control measures from a local community as a condition of eligibility. New York City and almost all Long Island communities have joined the Federal program and agreed to adopt and enforce the required land use controls.

Other Non-Structural Measures

Non-structural measures such as hurricane preparedness plans, improved hurricane forecasting and the Federal Flood Insurance Program can be useful in reducing damages from tidal flooding during severe storms and hurricanes. These measures are largely dependent on local authorities' effective implementation.

a. Hurricane Preparedness Plans

Areas such as the flood-prone areas of New York City should have contingency plans for warning the public of approaching storms and for evacuating residents of low-lying areas to higher ground. In areas that are densely developed, evacuation plans are complex and adequate advanced warning is necessary. For example, time is needed to notify the public; to call in extra police, firemen, etc., and to explain evacuation routes. Goods and equipment must be moved to upper flors and windows and doors sandbagged.

b. Improved Hurricane Forecasts

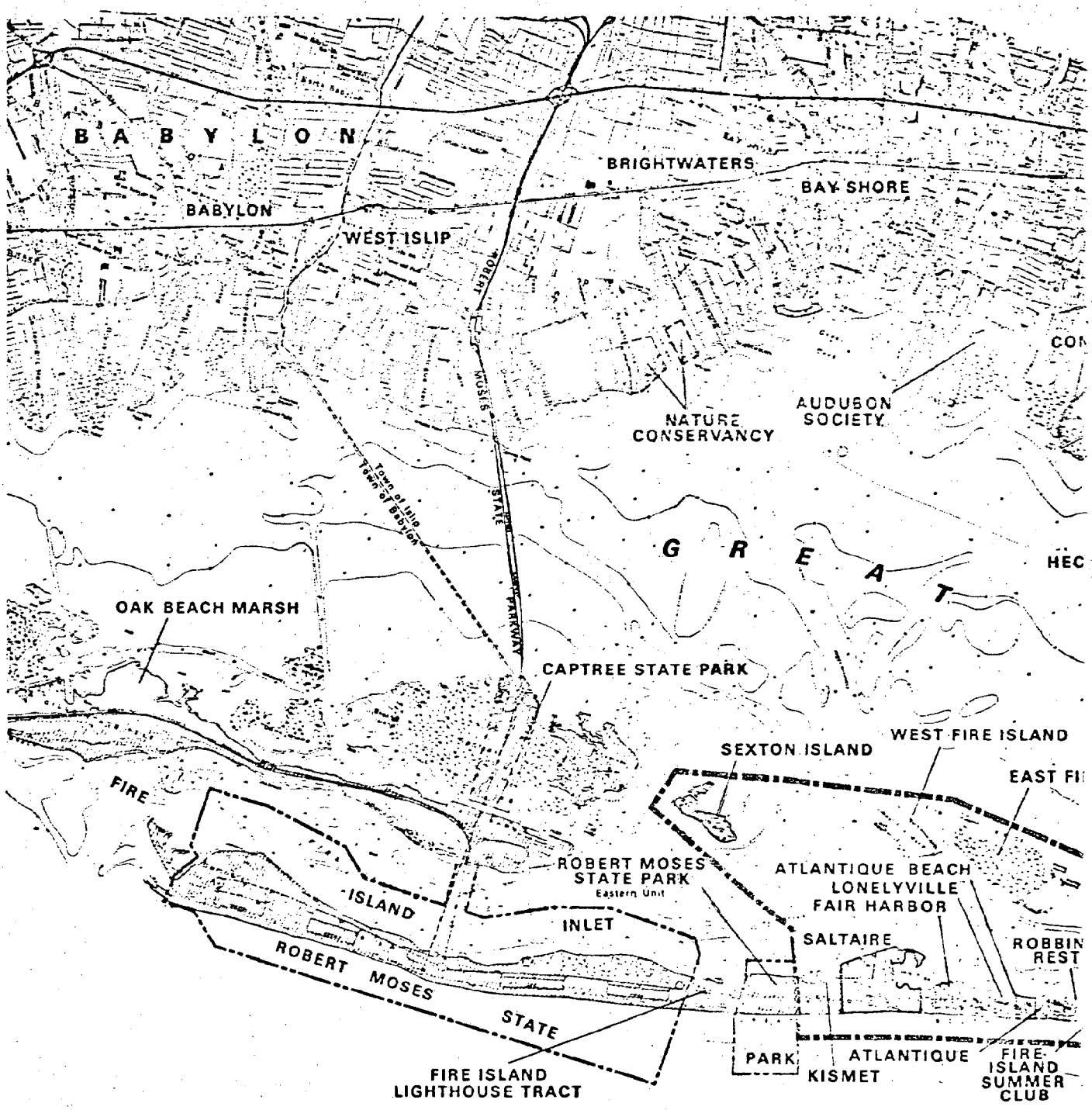
The National Weather Service as part of its responsibility for improved weather services in connection with major storms and hurricanes, has established a "severe weather" network along the Atlantic Coast, utilizing powerful radarscopes. Radar installations at Nantucket, Atlantic City and Cape Hatteras are part of the network linked to the Weather Service Office in New York City by means of teletype communication. During periods of hurricane threat, the New York City Office issues warnings to the public over several powerful radio and television stations in the metropolitan area. Tidal gages at the Battery and Willetts Point have been remoted to the Weather Service Office in New York City, providing continuous data on tida levels.

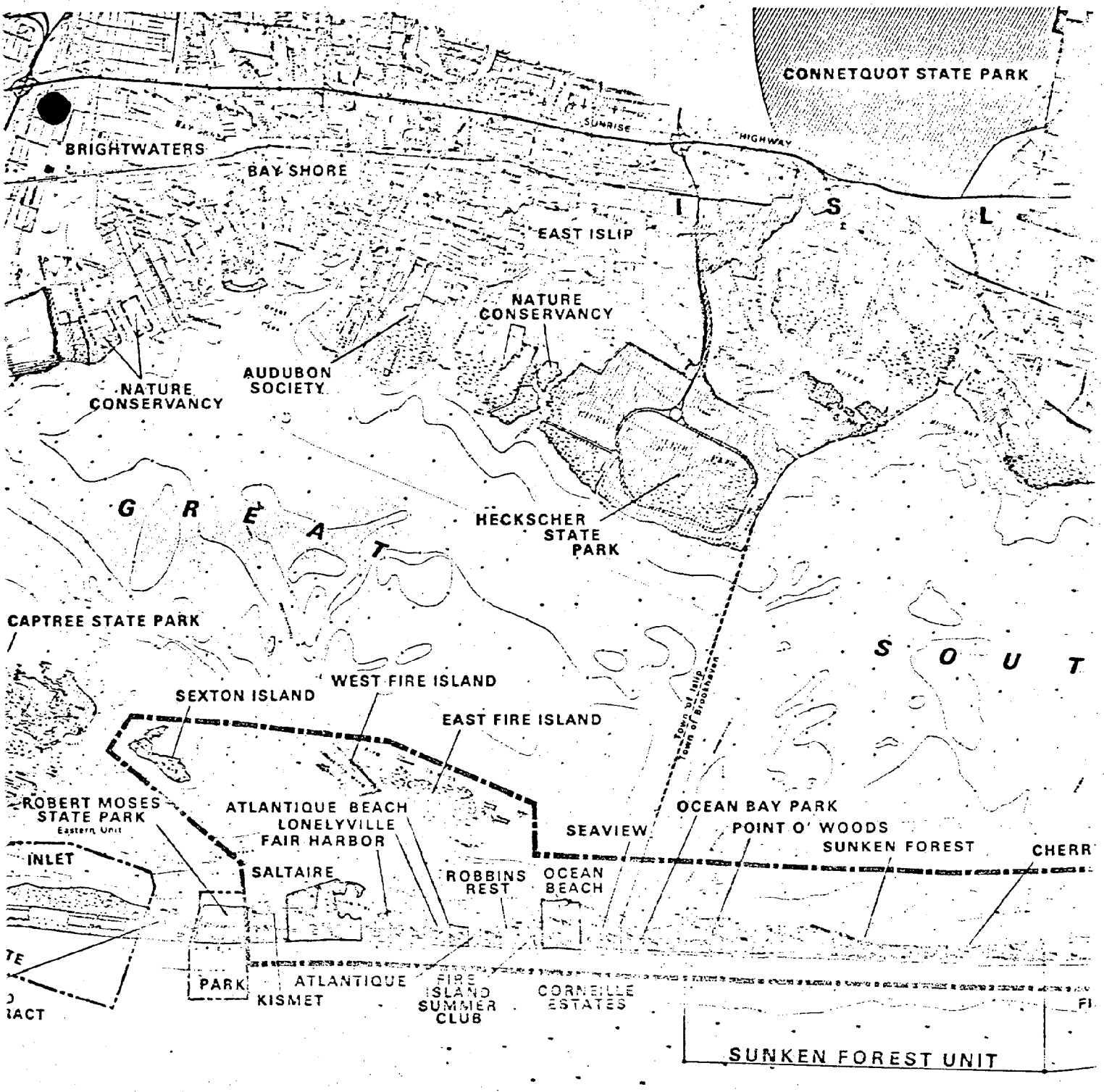
Fire Island National Seashore

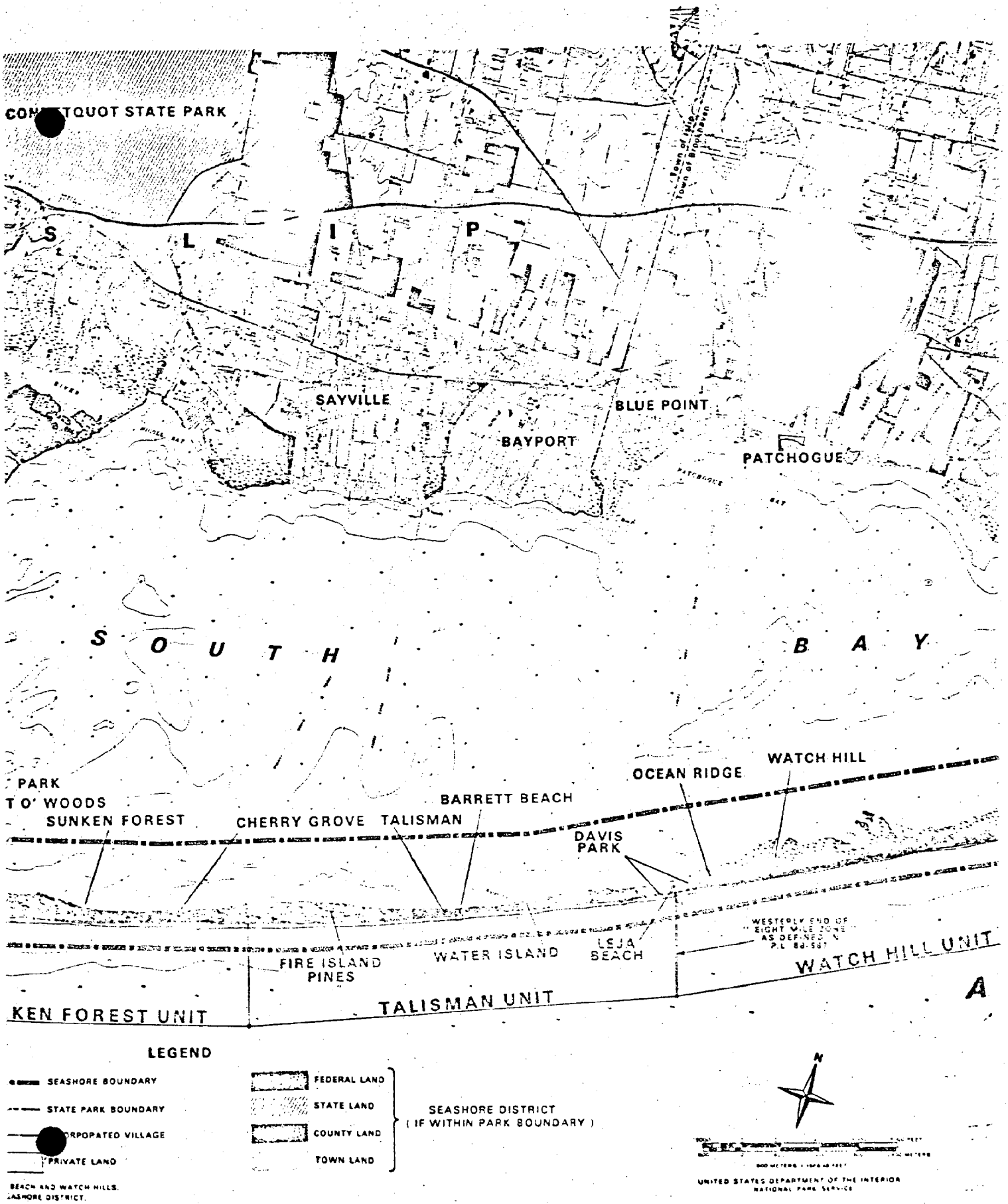
Fire Island is considered a prime natural resource. Much of it remains undisturbed by man, in spite of its location less than 60 miles east of New York City. Because of the Island's extensive unspoiled natural landscapes and the unique recreational opportunities they accommodate, Congress authorized the Secretary of the Interior to establish a national seashore on Fire Island in 1964.

The enabling legislation (PL 88-587) defines the boundaries of the national seashore to include the area "from the easterly boundary of Robert Moses State Park wastward to Moriches Inlet, a distance of about 26 miles, as well as various nearby islands in adjacent bays, and the waters surrounding said area to distances of 1,000 feet in the Atlantic Ocean and up to 4,000 feet in Great South Bay and Moriches Bay." (see Figure __) The Seashore is divided into a seashore and a development district. Twenty communities on the western end of the Island (referred to as exempted communities) constitute the development district. The exempted communities are: Atlantique, Cherry Grove, Corneille Estates, Davis Park west of Brookhaven Town Park, Dunewood, Fair Harbor, Fire Island Pines, Fire Island Summer Club, Kismet (Lighthouse Shores, Kismet Park, Seabay Beach), Lonelyville, Ocean Beach, Ocean Beach Park, Point O'Woods, Robbins Rest, Saltaire, Seaview and Water Island.

Total acreage within the boundary is 19,311, with about 5,278 being above mean high tide. There are four landowning interests within the Seashore boundaries: the National Park Service (2,692 acres); Suffolk County (about 1,212 acres); private landowners in 20 exempted communities (1,113 acres) and private inholders with existing Federal tracts (40 acres) and local municipalities on Long Island (about 166


B A B Y L O N
BABYLON
WEST ISLIP
BRIGHTWATERS
BAY SHORE
NATURE CONSERVANCY
AUDUBON SOCIETY
MOSES
STATE PARKWAY
Town of Islip
Town of Babylon
G R E A T
OAK BEACH MARSH
CAPTREE STATE PARK
SEXTON ISLAND
WEST FIRE ISLAND
FIRE
ISLAND
INLET
ROBERT MOSES STATE PARK
Eastern Unit
ATLANTIQUE BEACH
LONELYVILLE
FAIR HARBOR
SALTAIRE
ROBERT MOSES STATE
PARK
KISMET
ATLANTIQUE
FIRE ISLAND LIGHTHOUSE TRACT
FIRE ISLAND SUMMER CLUB


CONNETQUOT STATE PARK
SUNRISE
HIGHWAY
BRIGHTWATERS
BAY SHORE
EAST ISLIP
NATURE CONSERVANCY
AUDUBON SOCIETY
NATURE CONSERVANCY
G R E A T
HECKSCHER STATE PARK
CAPTREE STATE PARK
S O U T
WEST FIRE ISLAND
SEXTON ISLAND
EAST FIRE ISLAND
Town of Islip
Town of Brookhaven
ROBERT MOSES STATE PARK
Eastern Unit
INLET
ATLANTIQUE BEACH
LONELYVILLE
FAIR HARBOR
SALTAIRE
ROBBINS REST
OCEAN BEACH
SEAVIEW
OCEAN BAY PARK
POINT O' WOODS
SUNKEN FOREST
CHERR
PARK
ATLANTIQUE
KISMET
FIRE ISLAND SUMMER CLUB
CORNEILLE ESTATES
SUNKEN FOREST UNIT
LEGEND
SEASHORE BOUNDARY
STATE PARK BOUNDARY
INCORPORATED VILLAGE
PRIVATE LAND
DEVELOPMENT DISTRICT *
(IF WITHIN PARK BOUNDARY)
* EXCEPT PRIVATE LANDS BETWEEN LEJA BEACH AND WATCH HILLS, WHICH ARE PRESENTLY PART OF THE SEASHORE DISTRICT


CONNETQUOT STATE PARK
S L I P
SAYVILLE
BAYPORT
BLUE POINT
PATCHOGUE
S O U T H
B A Y
PARK
T O' WOODS
SUNKEN FOREST
CHERRY GROVE
TALISMAN
BARRETT BEACH
DAVIS PARK
OCEAN RIDGE
WATCH HILL
FIRE ISLAND PINES
WATER ISLAND
LEJA BEACH
WESTERLY END OF EIGHT MILE ZONE AS DEFINED IN P.L. 88-587
KEN FOREST UNIT
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WATCH HILL UNIT
A
LEGEND
SEASHORE BOUNDARY
STATE PARK BOUNDARY
INCORPOATED VILLAGE
PRIVATE LAND
FEDERAL LAND
STATE LAND
COUNTY LAND
TOWN LAND
SEASHORE DISTRICT
(IF WITHIN PARK BOUNDARY)
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NATIONAL PARK SERVICE

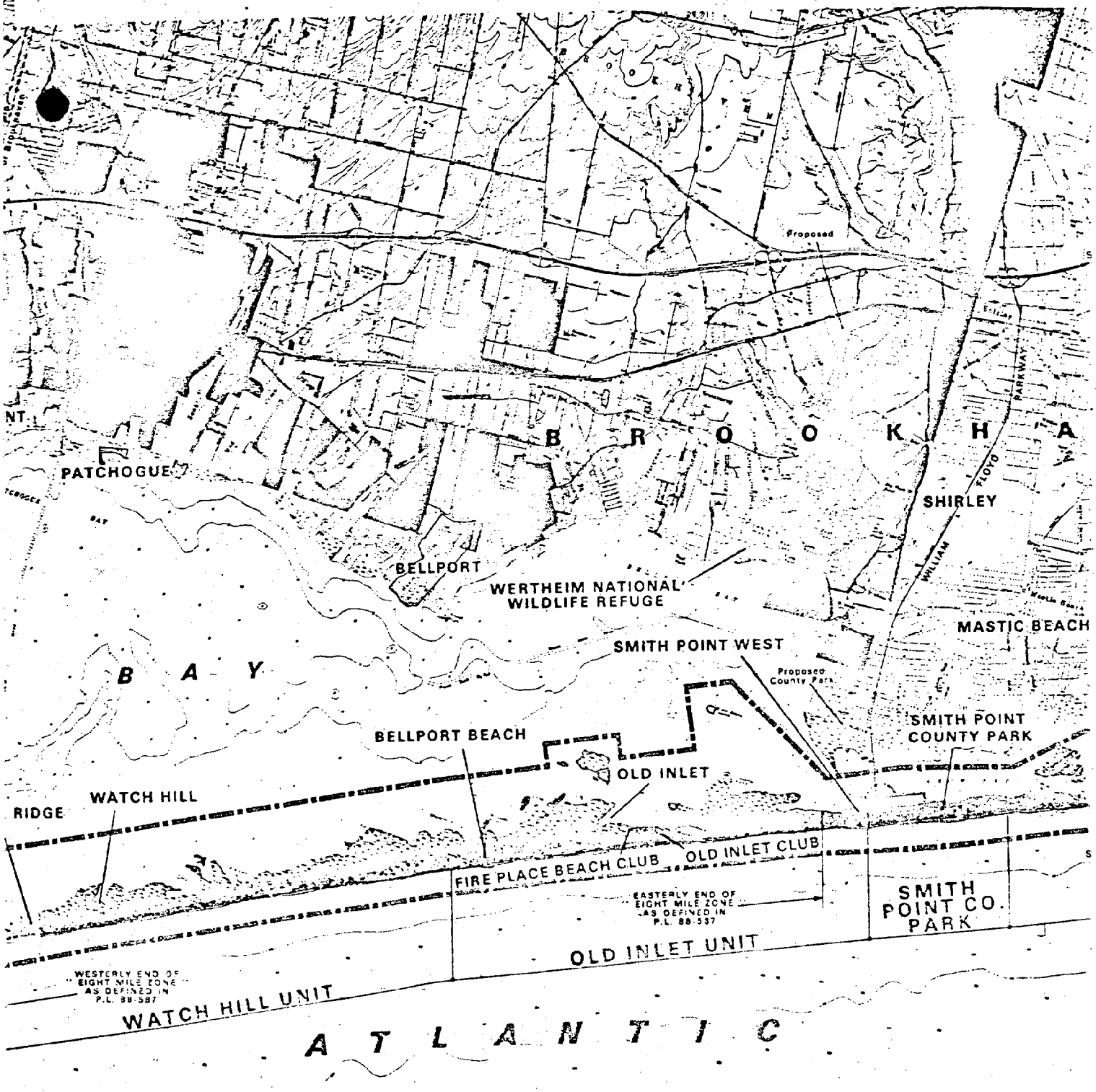

Figure 1

Vicinity Map

Fire Island National Seashore

NEW YORK

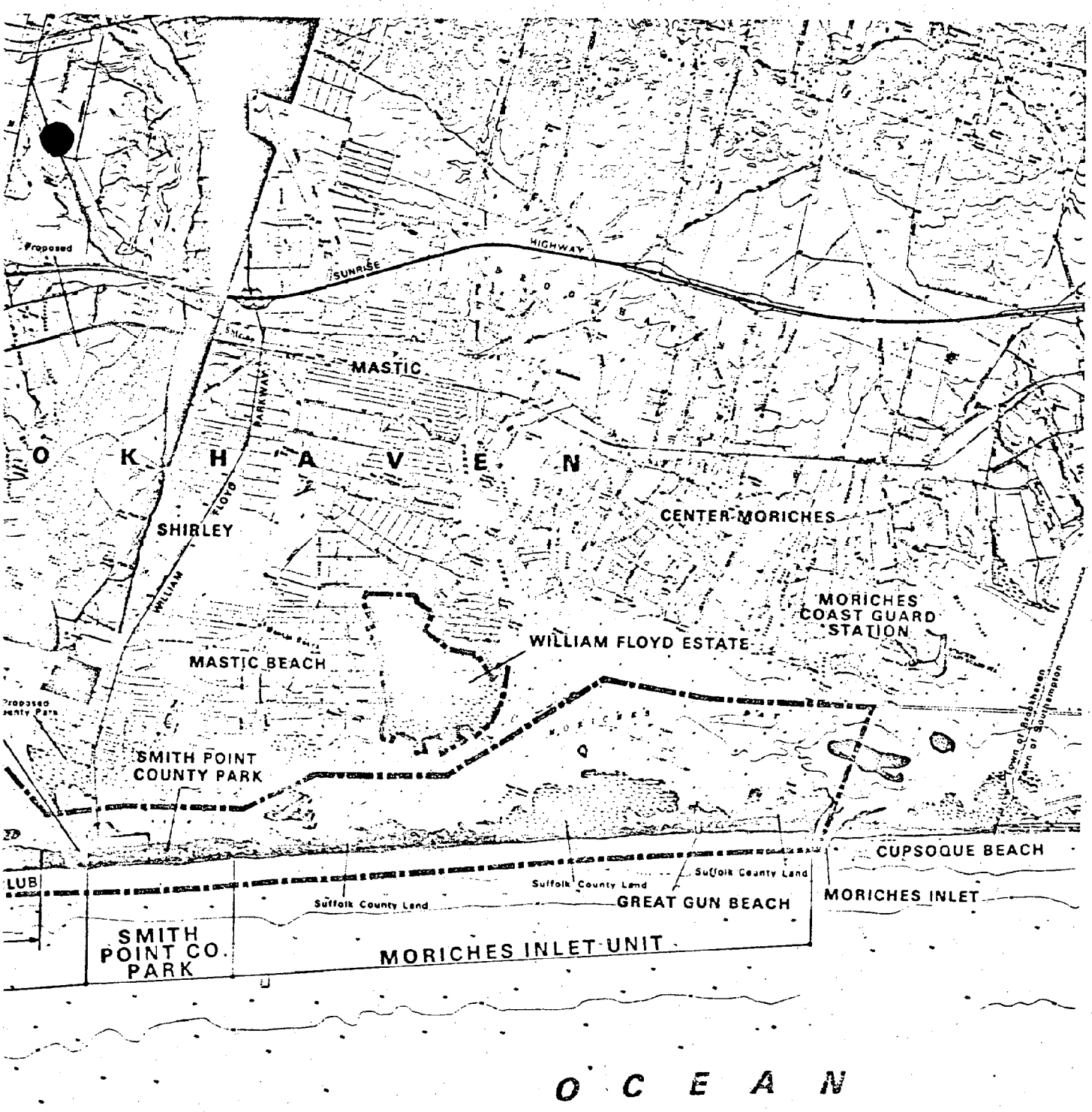

Figure 1

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nd National Seashore

NEW YORK

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acres) and Fire Island (55 acres). The National Park Service lands have been acquired since the enabling legislation was passed, principally through direct negotiations with private landowners. Congress appropriated $16 million for this purpose. The Act also provides for transfer, exchange and donations of land. The Park Service may acquire certain lands through condemnation.

The Secretary may acquire, without consent of the owners, such lands as are necessary for public access to the beach, but may not acquire other lands, without consent, where compliance with "a duly adopted, valid, zoning ordinance that is satisfactory to the Secretary" has been demonstrated. The Secretary is authorized to "issue regulations, which may be amended from time to time, specifying standards that are consistent with the purposes of this Act for zoning ordinances which must meet his approval." Such standards may prohibit certain "new commercial or industrial uses" and promote "the protection and development...of land within the national seashore by means of acreage, frontage and setback requirements." A copy of these standards is appended to this report. The Act states that such regulations must be incorporated into provisions of local zoning ordinances, which will not be approved by the Secretary if they contain "any provision that he considers adverse to the protection and development...of the area comprising the national seashore." These provisions give the Federal Government considerable authority to regulate land use and development on lands within the boundaries of the Seashore that have not yet been acquired. Only Islip has complied with the law and formally submitted its zoning regulations for adoption.

The Act specifically authorizes the Secretary of the Interior to acquire property by condemnation in an approximately eight-mile area

from the easterly boundary of Davis Park to the westerly boundary of the Smith Point County Park. Owners of property in this zone, on July 1, 1963, were given the option of life tenancy or up to a 25-year tenancy, with appropriate compensation, in lieu of vacating the property and selling it to the Federal Government. This zone and the Sunken Forest area are accorded special protection from the incursion of roads and ecologically incompatible uses.

As of November 1974, the National Park Service owned 2,692 acres of the fast lands within the Seashore boundary. This figure represents about 51 percent of the land acreage, but only about 14 percent of the total acreage of land and water (19,311 acres). Most Federally-owned lands were acquired during a six-year period following passage of the enabling act in 1964. The National Park Service holdings on Fire Island consist of four large bay-to-ocean strips totaling 1,639 acres and six smaller bay-to-ocean strips totaling 183 acres. All of East Fire Island and its satellite islands (156 acres), as well as most of West Fire Island (102 acres), are also Federal lands. In addition to these lands, which were included within the originally legislated boundary, the Seashore also includes the 612-acre William Floyd Estate (added to the Seashore by an act of Congress in 1965), a historic mainland property north of Moriches Bay near the eastern end of Fire Island.

The Department of the Interior has spent almost 99 percent of the $16 million originally authorized for land acquisition and purchases of interests in land. No additional funds have been authorized for these purposes since the enabling act.

Except for a few residences that remain occupied under tenancy options, residential structures and associated developments on Federally-acquired lands are slowly being removed, and the lands either developed for public recreational use or allowed to revegetate naturally.

The State of New York owns all lands and waters within the authorized seashore boundary that are seaward of mean high tide. The National Park Service has a use-and-occupancy indenture agreement with the State of New York, to include the lands and waters extending 1,000 feet into the Atlantic Ocean from the mean high-water line between the eastern boundary of Robert Moses State Park and Moriches Inlet, subject to prior rights of ownership on adjacent uplands. The Federal Government does not own the beach, the primary dune line, the marshlands, or other unimproved lands on Fire Island that are outside the boundaries of its existing holdings, and has no bay-bottom acreage, except for a small tract at Sunken Forest. There are only two Federal areas on Fire Island developed for recreation--Sunken Forest and Watch Hill--and four additional tracts that are large enough to be developed--Talisman, the Federal lands between Water Island and Davis Park, the Federal lands between Watch Hill and Smith Point West, and the lands east of Smith Point County Park that are proposed for acquisition by the Federal Government.

The National Park Service has recently issued a revised master plan and an accompanying environmental impact statement for the Seashore. The object of the master plan is to develop an environmentally sound resource-management plan for Fire Island. A major proposal of the plan is that the western boundary of the Seashore be redrawn along the western edge of the community of Point O'Woods. Fourteen of Fire Island's 20 exampted communities would be excluded. Since the Seashore's authorization in 1964, the relationship between the National Park Service and the 20 exempted communities has remained ill-defined. Community zoning regulations have been formulated, and reviewed by the Federal Government, but variences have been created by the governing municipalities, leaving the Government no recourse but condemnation--for which no funds are

available. (Reportedly, this boundary adjustment has been dropped from consideration due to local community opposition)

Among other items proposed in the draft master plan are:

-- Installation of the already authorized sand-bypass systems at Moriches and Fire Island Inlets, and authorization and installation of a sand-bypass at Shinnecock Inlet.
-- Sand nourishment of eroding beaches throughout the Seashore.
-- Prohibition of all groins, bulkheads, revetments, and other artificial beach-stablizing devices, and removal of all such existing structures (except for inlet jetties) within the boundaries of the Seashore prior to implementation of the above two proposals.
-- Restoration or repair of the ocean-facing dunes as needed in front of communities, and planting with native, perennial dune-stablizing species to encourage revegetation.

The Department of the Interior has announced that it is considering purchasing 500 acres of vacant, privately-owned land within the Seashore boundary. The proposed Federal budget for Fiscal Year 1977 includes money for this purpose.

Gateway National Recreation Area

The Gateway National Recreation Area was established by Congress in 1972 for the purpose of preserving and protecting, for the use and enjoyment of present and future generations, an area possessing outstanding natural and recreational features.

Four management units, three in New York State, have been designated which correspond to the geographically separated land areas that are joined by New York Bay (see Gateway map). The three units in New York are:

The Jamaica Bay Unit, encompassing approximately 16,000 acres of drylands, marshlands, and waters in and adjacent to Jamaica

Bay, includes the lands and facilities of the former naval air station at Floyd Bennett Field (the present park headquarters site), the existing parklands at Dead Horse Bay, Frank Charles Memorial Park, Plumb Beach, and Canarsie Beach Park, and the Jamaica Bay Wildlife Refuge.

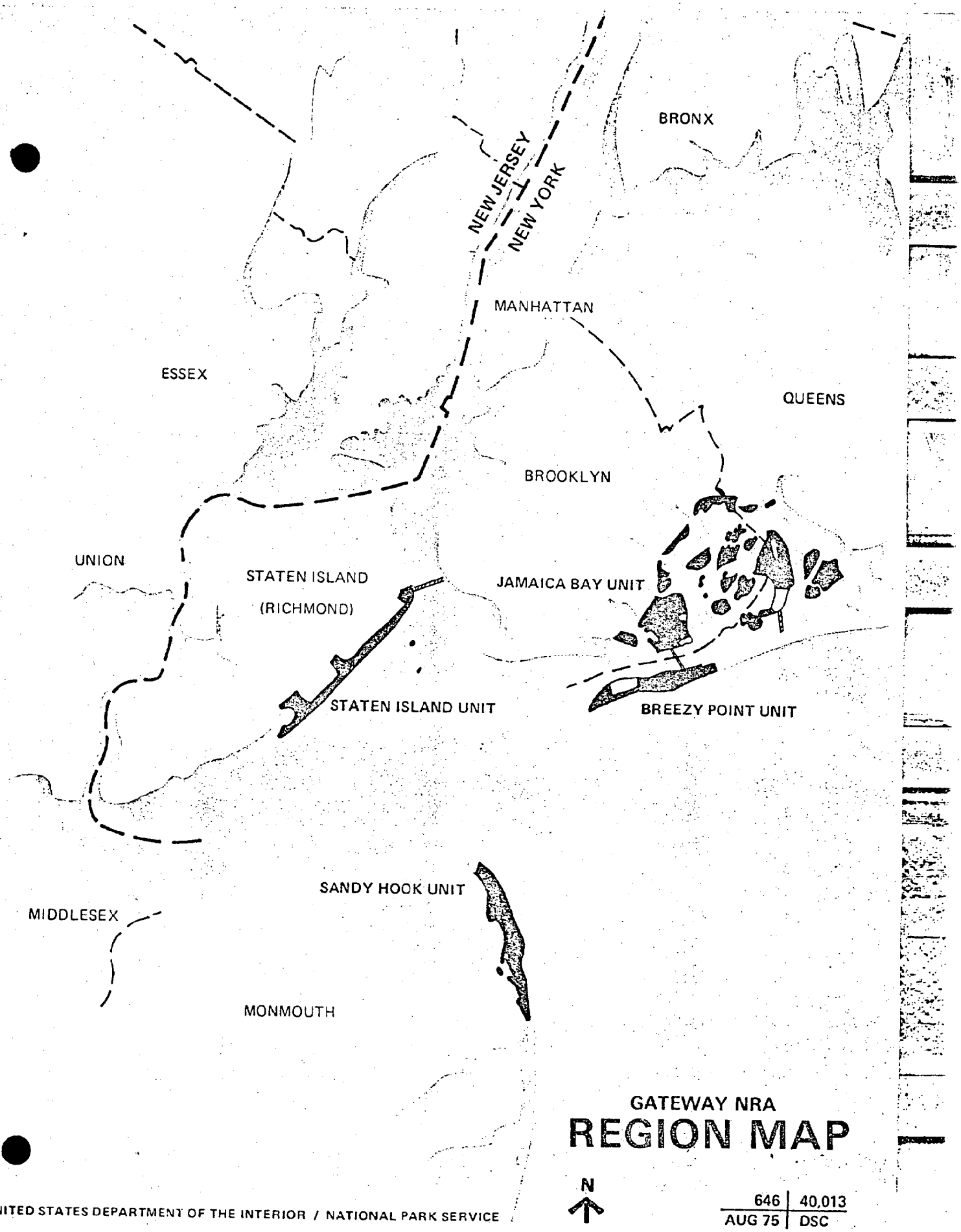
The Breezy Point Unit, south of Jamaica Bay on the western end of Rockaway Peninsula, contains about 1,600 acres and 4½ miles of ocean beaches, including Jacob Riis Park, the lands and facilities at Fort Tilden, and the shoreline abutting the Breezy Point Cooperative.

The Staten Island Unit, extending along the eastern shore of Staten Island, includes Great Kills Park, Miller Field, and a portion of Fort Wadsworth, as well as two small man-made islands, Hoffman and Swineburne--a total of more than 2,900 acres.

The fourth unit is located at Sandy Hook in New Jersey.

The Recreation Area is under the jurisdiction of the Department of the Interior and is operated by the National Park Service. Land acquisition for the Park has not been completed, particularly in the Staten Island Unit. The Park Service has operated some four miles of ocean beaches in the Breezy Point, Staten Island and Sandy Hook Units the past two years.

An environmental assessment of the Park lands is currently being prepared. It is expected to be completed in the spring of 1976. No master plan has yet been prepared, but a draft alternatives report is available.



GATEWAY NRA
REGION MAP

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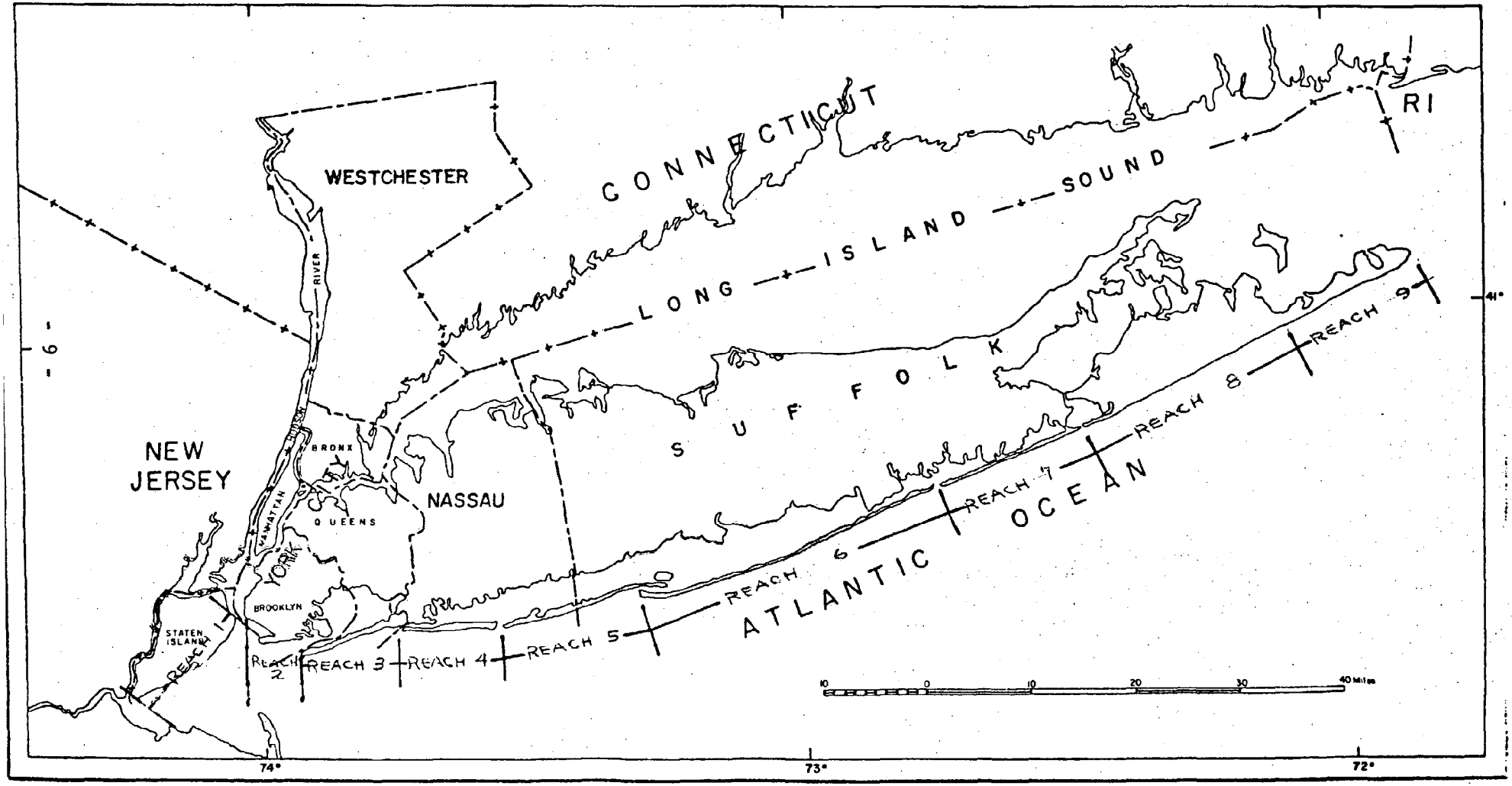


Coastal Zone Management
Location at Reaches

Long Island-South Shore
(including Staten Island)

Evaluation of Reaches

Reach 1

Staten Island
Fort Wadsworth to Arthur Kill

REACH 1

Staten Island-Fort Wadsworth to Arthur Kill

I. General Description:

This reach covers the 13-mile southeastern shore of Staten Island, New York City. It extends along the lower New York and Raritan Bays from Fort Wadsworth at the Narrows to Tottenville at the mouth of the Arthur Kill.

The terrain along the shore ranges from high bluffs near the west and east ends of the reach to low marshlands. Low, narrow beaches front most of the area. Several tidal creeks, some of which discharge through gated flumes, intersect the shoreline.

Land use is primarily for recreational and residential purposes. The City of New York owns about fifty percent of the shoreline in this reach and maintains extensive bathing facilities and parkland. Population growth on Staten Island has been substantial in recent years, in large part due to the improved access to Long Island provided by the Verrazano Narrows Bridge.

II. The Problem:

The problem along the southeastern shore of Staten Island is a combination of shore erosion from wave attack and inundation from storm tides. This has resulted in loss of life, displacement of families and considerable property damage. The hardest hit areas are between South Beach and Miller Field, and Great Kills and Tottenville (see Figure 3).

A. Erosion

The shoreline of this reach has been generally stable

in recent years. However, large storms have caused severe erosion. This has resulted in a reduced beach width, exposing waterfront property to wave attack and reducing the area useful for recreation.

Over the years, improvements for beach erosion control and hurricane protection have been undertaken by the Federal, State and local governments and private interests. Protective works have consisted of artificial beaches built from sand dredged from the bay, a number of groins, and a few walls, bulkheads, dikes and revetments. The structures have been largely effective in holding the shore and reducing the erosive effect of the littoral currents. Yet, considerable sections of the beach area, located seaward of the bulkhead and seawall structures, have been lost to erosion.

The stability of the beach depends primarily on the quantity of sand available to replenish losses from erosion and the sand-transporting forces which act along the beach. The quantity of littoral drift available is not great and consequently the beach at a number of locations has been unstable.

B. Flooding

The flooding problem is caused by hurricanes and large, usually slow-moving extra-tropical storms which create tidal flooding. Storm tides created by high winds and low barometric pressure accompanied by wave action inundate large developed areas with resultant property damage and dangers to health and safety. Severe storms occur at a frequency of about twenty every one hundred years and unusually severe storms have a

frequency of occurrence of five per one hundred years.

Hurricane Donna, which struck the New York City area on September 12, 1960, produced the maximum flood height of record. Damages on Staten Island from this storm were about $3,160,000 (October 1960 prices).

An extra-tropical storm which occurred on March 6-8, 1972, produced damages of a lower dollar value than Donna. However, damages to beaches and shore protection structures were greater. The damage consisted mainly of beach and bluff erosion, and damage to bulkheads, seawalls, groins, jetties, piers and marinas. Buildings also were damaged by wave action and by flooding. There was considerable residential and public damage east of Oakwood Beach, including damage to beaches and shore protection structures. A dike at Oakwood Beach broke and caused inundation of a large residential area. In the area from Great Kills to Tottenville Beach, the predominant damage was to public facilities and from shore erosion. Total damages from this storm were approximately $1 million.

Federal, State, local and private interests have built protective works over the years which have offered a measure of protection. However, the area is still subject to damages from flooding which averaged one-half million dollars per year in 1963. This would be equivalent to average annual damages of about $1,280,000, December 1975 prices.

III. Protection Alternatives

The Corps of Engineers conducted a beach erosion control and hurricane protection study[1] in 1964 of this reach. The study

NOTE: References are listed on Page 89.

disclosed that the following improvements are economically feasible: (a) combined shore and hurricane protection between Graham Beach and Oakwood Beach and at Tottenville Beach; and (b) shore protection at Great Kills Park and between Arbutus Lake and Sequine Point (see Figure 3). Congress authorized this project in 1975.

Since the authorization, two modification alternatives to the project were developed by the Corps of Engineers at the request of the City of New York. The purpose of these alternatives is to provide hurricane protection between Graham Beach and Fort Wadsworth.

The City of New York has indicated a preference for one of the two modification alternatives and the Corps of Engineers is currently revising the project design accordingly. The project under design (including the City-favored modification alternative) generally consists of:

-- Great Kills Park - 5,200 feet of beach fill
-- Oakwood Beach to Graham Beach - 11,200 feet of beach fill and 8,500 feet of backshore dune with a closure levee at Oakwood Beach, pump stations.
-- Graham Beach to Fort Wadsworth - 14,300 feet of concrete I-wall, pump stations, ponding areas.
-- Arbutus Lake to Sequine Point - 6,200 feet of beach fill and a groin at Sequine Point.
-- Tottenville Beach - 3,300 feet of dune and beach fill, one groin.

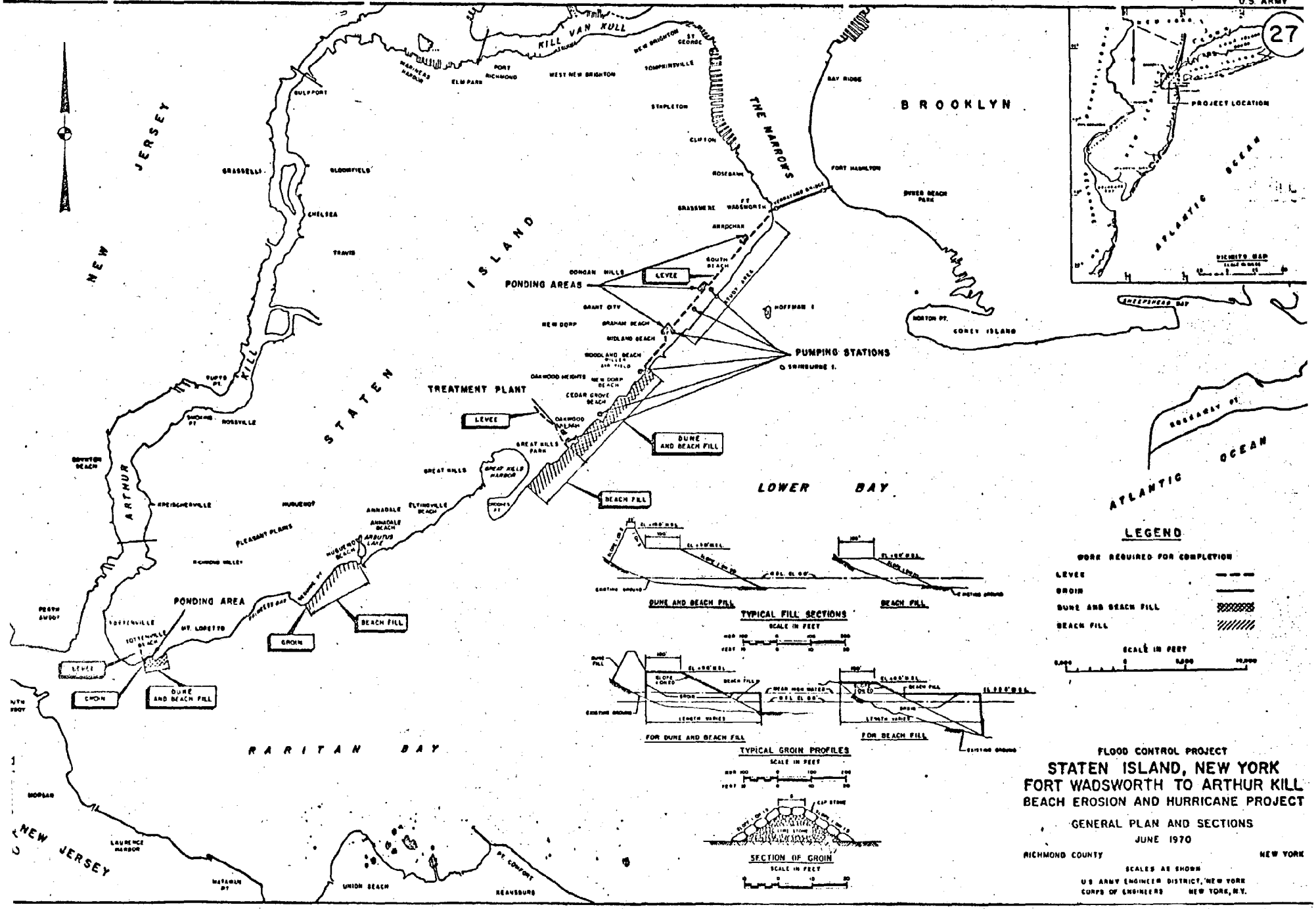
To date, construction has not commenced on any part of this project.

A major portion of this reach, from Fort Wadsworth to Great Kills Park, is located within the boundaries of the Staten Island Unit of the Gateway National Recreation Area. The National Park Service, Department of the Interior, which manages the park, is still in the process of acquiring lands within this unit. They are currently formulating a general management plan for the park. The plan is scheduled for completion in September 1976.

The National Park Service has not yet commented on the proposed beach erosion control and hurricane protection project. Since a major portion of the project area will likely be soon under their jurisdiction, their concurrence and cooperation is necessary for implementation of any project.

CORPS OF ENGINEERS

U.S. ARMY



FLOOD CONTROL PROJECT

STATEN ISLAND, NEW YORK
FORT WADSWORTH TO ARTHUR KILL
BEACH EROSION AND HURRICANE PROJECT

GENERAL PLAN AND SECTIONS

JUNE 1970

RICHMOND COUNTY NEW YORK

SCALES AS SHOWN

U.S. ARMY ENGINEER DISTRICT, NEW YORK
CORPS OF ENGINEERS NEW YORK, N.Y.

REACH 2

Norton Point to Rockaway Inlet
(Coney Island Area)

REACH 2

Verrazano Bridge to Rockaway Inlet (Coney Island Area)

I. General Description:

This reach covers a six-mile length of the south shore of Brooklyn, including the communities of Sea Gate, Coney Island, Brighton Beach and Manhattan Beach. It extends along the lower New York Bay from Rockaway Inlet to Norton Point.

The terrain of the Coney Island area which lies to the south of the Shore Parkway is relatively flat with ground elevations generally less than 10 feet above sea level. North of the Shore Parkway, ground elevations rise gently towards the north central part of Brooklyn. The offshore water depths are shallow, less than 20 feet below sea level, except for navigation channels and dredged areas. There are several sandy beaches along the shore, including Plumb Beach, Manhattan Beach Park, Brighton Beach, Coney Island Beach and Sea Gate Beach. Most of the remaining portion of the shore is either riprapped or bulkheaded. Rockaway Point provides a considerable amount of protection against wave attack to the shore of the Plumb Beach-Manhattan Beach area. The East Bank shoal offshore of Coney Island also provides a limited measure of protection to the western part of this reach.

Land use is primarily for recreational and residential use. Three-fourths of the shorefront facing the Atlantic Ocean is owned by New York City. At the west end of the reach, along Gravesend Bay and Coney Island Creek, land use is mixed and includes residential and commercial development, educational facilities, public utilities, parkland and industry.

Continuing around the west end of Coney Island, land

use is primarily residential in the community of Sea Gate, with the exception of Lindbergh Park and Norton Point Lighthouse. Along the south shore of Sea Gate is a private beach owned by the residents.

On the south side of the communities of Coney Island and Brighton Beach is the most important recreational development, the City-owned Coney Island beach and amusement area. The beach, which includes a boardwalk and fishing pier, accommodates a peak day attendance of over 400,000. Considerable areas of the Coney Island community are undergoing redevelopment. The older tenements are being replaced by high-rise apartment houses financed by the Federal Government under its urban renewal program.

East of Coney Island Beach along the shore, is Manhattan Beach Park, also a public bathing beach. Between the two beaches is a concrete esplanade in deteriorated condition. Continuing eastward the shorefront development includes Kingsborough Community College. On the north side of Manhattan Beach is Sheepshead Bay, a renowned commercial fishing harbor. East of Sheepshead Bay is the Plumb Beach portion of the City-owned Marine Park. This area is generally undeveloped except for a marina on the north side of Shore Parkway. A part of Plumb Beach south of Shore Parkway is included in the Jamaica Bay unit of the Gateway National Recreation area (see Figure 2).

II. The Problem:

The problem in this reach is a combination of erosion and flooding. Shore erosion by wave attack causes damages to shore structures and loss of protective beaches including the loss of highly used recreational beach area. Tidal inundation occurs

during severe storms and hurricanes which results in considerable property damage and hardships to hundreds of families located in low-lying areas.

A. Erosion

The history of the Coney Island shoreline has shown many advances and recessions over the last 140 years. The general movement has been seaward with a migration of Norton Point to the west. Between 1961 and 1970, the shoreline along Coney Island and Brighton Beaches receded about nine feet annually. This was primarily due to wave attack during severe storms and inadequate nourishment available at the Coney Island shorefront.

Several shorefront structures, including groins, bulkheads, breakwaters and revetments, have been constructed by public and private interests over the years to protect the shoreline. Artificial nourishment in the amount of approximately 3,800,000 cubic yards of sand fill has been placed along Brighton Beach and Coney Island Beach since 1921. Recent beach fill operations done by the City and the State in this area have greatly widened the beach and provided a considerable increase in the recreational beach area.

B. Flooding

Hurricane Donna which occurred on September 12, 1960, resulted in the maximum flood height of record, 8.6 feet above sea level. It caused significant flooding at Coney Island, Brighton Beach, Manhattan Beach and along the Belt Parkway. Damages were estimated at more than $1,3 million (1960 prices). A recurrence of flood heights of the magnitude of Hurricane

Donna would cause an estimated $20 million in damages (July 1971 price levels). The extreme difference in the 1971 and 1960 figures is due to increased costs and the 1960 figure is based on general damage estimates.

The storm of March 6-8, 1962, although of lesser intensity than Donna, caused severe erosional problems. Losses of more than $2.5 million (1962 prices) were recorded from damage to shore protection structures and from beach erosion.

The community of Coney Island suffered the greatest residential and commercial damages in this reach. The entire area between West 12th and West 37th Streets, with the exception of a few isolated areas, was completely inundated, with ocean and bay waters meeting at depths of one to two feet over the pavement. At the foot of streets abutting Coney Island Beach, floodwaters left heavy depositions of sand up to two feet deep from the eroded berm and shore of the beach.

In the community of Sea Gate, timber bulkheads were overtopped with considerable damage to piling and sheeting, as well as erosion of land fill. Landscaped areas were inundated by storm water and there was flooding of basements and walks. The Norton Point Lighthouse at the western end of Sea Gate was subjected to loss of riprap and damage to landscaping.

In the Manhattan Beach area, the houses fronting the southern shoreline were subjected to both wave attack and tidal inundation. The wave attack caused great damage to brick walls, porches and windows, and additional damage was inflicted to the riprap revetment and concrete slab walkway

of the Esplanade. The ends of streets were flooded with waves breaking over the Esplanade, and there was a significant loss of land due to sand erosion.

Damage was slight in the vicinity of Sheepshead Bay and along Gravesend Bay. However, at Plumb Beach in Brooklyn Marine Park, storm damage consisted of shoreline erosion.

III. Protection Alternatives:

The Corps of Engineers in its Survey[3] Study, examined several alternatives of flood protection and beach erosion control, including both structural and non-structural methods. In order to provide total protection against shore erosion and/or tidal inundation, alternative systems of structural works were formulated, including single-purpose plans of protection providing beach erosion control only, and hurricane protection only, and a multiple-purpose plan of shore and hurricane protection. The single-purpose structural plan of protection against hurricane tidal flooding could not be economically justified.

Several multiple-purpose schemes of providing protection were examined by the Corps. It was found that protection against hurricane tidal flooding could be economically justified by a multiple-purpose plan which would include floodwalls, levees, dikes, surge control and closure structures, interior drainage works, beach restoration and terminal groins. During the plan formulation, strong support for hurricane protection works was expressed by local authorities. However, at a public meeting held at Coney Island in March 1972, a significant number of interested parties voiced opposition to the considered multiple-purpose plan. The basis of the opposition was that the structures would cause

impacts on aesthetic values and possible degradation of water quality and ecology.

Local participants in the 1972 public meeting generally indicated a strong desire for the alternative single-purpose plan providing only beach erosion control measures, which would significantly reduce the existing overcrowded condition that occurs at Coney Island and Brighton beaches during the recreational beach season.

The Corps of Engineers has developed several alternative plans for beach erosion control based on varying the beach berm width and alignment along Coney Island and Brighton beaches. The alternative single-purpose plans for beach erosion control would all provide adequate beach widths for shore protection (see Table 1). Each plan consists of beach restoration between two terminal groins to be constructed at the western end of Manhattan Beach and West 37th Street (see Figure 4). There is also provision for annual beach replenishment in each plan. Plan II would provide the greatest quantity of additional beach area, resulting in an increase of 87 percent over the existing daily beach capacity. This would significantly reduce the overcrowding that frequently occurs during the bathing season. In addition, Plan II would provide the greatest net benefits of the alternative plans considered.

The Corps of Engineers contends that, based on the current provisions contained in Public Law 84-826, as amended, Federal participation in the cost of beach erosion control projects is limited to restoration of the beach to the maximum seaward historic shoreline, which, at Coney Island, is 60 feet beyond the

TABLE 1 - SUMMARY OF INFORMATION ON THE ALTERNATIVE
SINGLE-PURPOSE SHORE PROTECTION PLANS
(January 1973 price levels)

Item	Existing	Plan I	Plan II	Plan III	Plan IV
Beach Width (feet)					
Brighton Beach	370	480	560	510	460
Steeplechase Pier	430	510	760	710	660
West 37th Street	130	210	460	410	360
Average increase in beach width (ft)	---	80	300	250	200
Beach Area (sq. ft.)					
Restored (a)	---	880,000	1,573,000	1,358,000	1,119,000
New (b)	---	---	2,765,000	2,304,000	1,868,000
Total beach area	4,980,000	5,860,000	9,318,000	8,642,000	7,967,000
First Cost (Dollars) (c)					
Restored (a)	---	3,206,000	4,710,000	4,248,000	3,803,000
New (b)	---	---	4,946,000	3,920,000	3,019,000
Total First Cost	---	3,206,000	9,656,000	8,168,000	6,822,000
Annual Cost (Dollars)					
Interest and Amortization (d)					
Restored (a)	---	189,300	278,200	250,900	224,600
New (b)	---	---	292,200	231,500	178,300
Total	---	189,300	570,400	482,400	402,900
Periodic nourishment	---	335,000	335,000	335,000	335,000
Maintenance	---	9,600	25,900	22,500	19,100
Total Average Annual Cost (e)	---	533,900	931,300	839,900	757,000
Beach Use					
Additional Daily Beach Capacity (f)					
Restored (a)	---	23,500	42,000	36,200	29,800
New (b)	---	---	73,700	61,400	49,800
Total	132,800	23,500	115,700	97,600	79,600
Percent increase in daily beach capacity	---	17	87	74	60
Average annual benefits (Dollars)					
Recreational beach use	---	342,200	1,345,000	1,172,400	985,100
Recreational fishing	---	21,000	21,000	21,000	21,000
Reduction in shorefront damages	---	162,800	162,800	162,800	162,800
Reduction in local maintenance	---	98,000	98,000	98,000	98,000
Total Average Annual Benefits	---	624,000	1,626,800	1,454,200	1,266,900
Economics					
Net benefits (g)	---	89,700	695,100	613,900	509,500
Benefit/Cost Ratio (g)	---	1.2	1.7	1.7	1.7

(a) Beach area located within the maximum seaward historic shoreline.
(b) Beach area located beyond the maximum seaward historic shoreline.
(c) Excludes first cost for aids to navigation estimated at $5,000.
(d) Based on an interest rate of 5⅛ percent and an economic life of 50 years.
(e) Excludes annual cost for aides to navigation estimated at $400.
(f) Based on 75 square feet per beach visitor and a turnover factor of two.
(g) Includes annual cost for aides to navigation.

Table 1

Source: Corps of Engineers

present shoreline. Accordingly, those costs associated with contract work 60 feet beyond the present shoreline would be non-Federal and must be absorbed by State and local interests.

New York State and the City of New York strongly support Plan II and firmly believe that Federal participation in the full project cost is warranted, and that limiting Federal participation to the restoration of the Coney Island historic shoreline will not accomplish this purpose. Accordingly, the State and City have asked Congress to examine this problem and to provide means for full Federal participation in the cost of the project, including those works associated with extending the beach seaward of the historic shoreline. Local interests have also strongly expressed their desire and support for Plan II, which is considered to be the best plan, based on providing the greatest net benefits, and satisfying the needs and desires of local interests by significantly enhancing the social well-being of the Coney Island Beach visitor during the frequent periods of intense recreational beach demand. Their support for Plan II is subject to Federal participation in 50 percent of the total cost of the project.

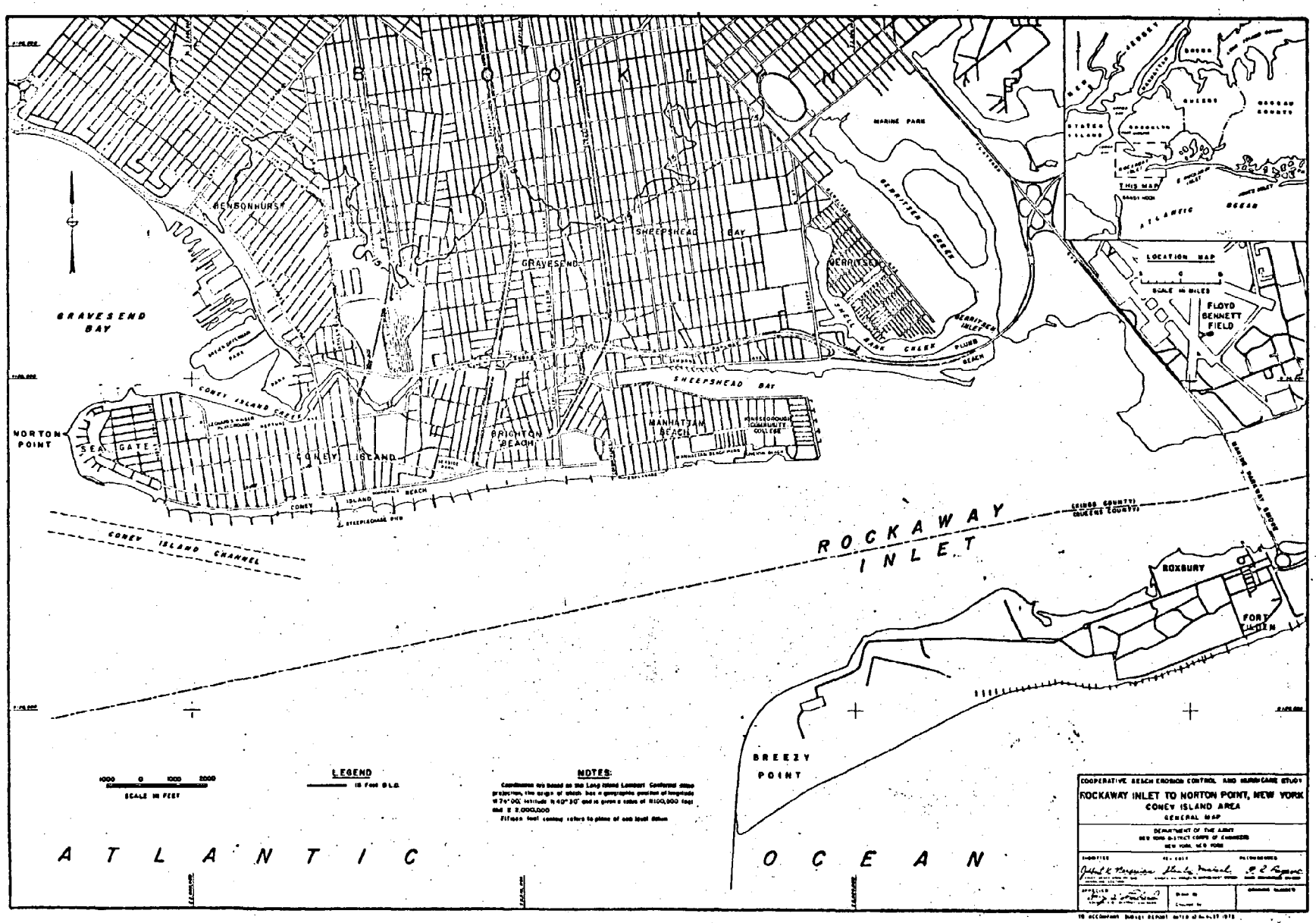
An exception to local support for the project is the objections presented by the Sea Gate Association, a group consisting of residents of the community of Sea Gate. The Association has expressed fear that the terminal groin to be located at West 37th Street at the west end of the project would cause erosion of the privately-owned Sea Gate beach area to the west and would trap pollutants from the Hudson River. All of the alternative beach erosion control plans include the construction of a fillet of beach on the west side of the West 37th Street groin. Authoriza-

tion of the project will permit examination of these allegations in greater detail.

The Corps of Engineers, through the Secretary of the Army, will recommend to Congress the authorization of Plan I, based on the interpretation of Public Law 84-826 that limits their participation in cost-sharing to the maximum seaward historic shoreline. While this plan does not provide any significant alleviation of the beach overcrowding, it does provide for: (a) restoration of the recreational beach; (b) adequate protective beaches; and (c) stablilization of the restored protective and recreational beaches. The Corps will present information to Congress on both Plans I and II.

It should be noted that neither Plan I nor II provides any significant protection to the coastal areas within this reach both east and west of the Coney Island-Brighton Beach area. The local opposition to a multiple-purpose hurricane protection and beach erosion control project precludes any structural solutions at this time.

The effectiveness of non-structural measures such as zoning and building codes are limited because the area is highly developed. The Coney Island area, as part of New York City, is participating in the Federal Flood Insurance Program. The area undergoing urban renewal is subject to City zoning and building codes which meet the requirements of the Flood Insurance Law. Non-structural measures cannot prevent the loss of valuable beach area during severe storms and replacement of sand is vital to this already overcrowded beach.


BENSONHURST
GRAVESEND
SHEEPSHEAD BAY
MARINE PARK
GERRITSEN CREEK
GERRITSEN INLET
GRAVESEND BAY
SHELL BANK CREEK
PLUMB BEACH
CONEY ISLAND CREEK
NORTON POINT
SEA GATE
CONEY ISLAND
BRIGHTON BEACH
MANHATTAN BEACH
HOMECROUGH COMMUNITY COLLEGE
CONEY ISLAND HOSPITAL
STEEPLECHASE PIER
CONEY ISLAND CHANNEL
ROCKAWAY INLET
(KINGS COUNTY)
(QUEENS COUNTY)
ROXBURY
FORT TILDEN
BREEZY POINT
ATLANTIC OCEAN
THIS MAP
LOCATION MAP
SCALE IN MILES
FLOYD BENNETT FIELD
ATLANTIC OCEAN
1000 0 1000 2000
SCALE IN FEET
LEGEND
10 Foot M.L.G.
NOTES:
Coordinates are based on the Long Island Lambert Conformal cone projection, the origin of which has a geographic position of longitude W 74° 00' latitude N 40° 30' and is given a value of 81,000,000 feet and E 2,000,000
Fifteen foot contour refers to plane of mean low tide
COOPERATIVE BEACH EROSION CONTROL AND HURRICANE STUDY
ROCKAWAY INLET TO NORTON POINT, NEW YORK
CONEY ISLAND AREA
GENERAL MAP
DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, N.Y. 10014

REACH 3

Rockaway Inlet to East Rockaway Inlet

REACH 3

Rockaway Inlet to East Rockaway Inlet

I. General Description

This reach is about 10 miles long and includes the Atlantic Ocean shoreline of Long Island and between Rockaway and East Rockaway Inlets and Jamaica Bay. It is located entirely within the City of New York except for about two miles of the easterly shoreline of Jamaica Bay, which is located in Nassau County.

The Rockaway Peninsula terrain is low and flat, with elevations less than 10 feet above sea level at the western end, rising to gently rolling hills between 20 and 25 feet above sea level at East Rockaway. The Atlantic beach of the peninsula is used entensively for recreation. The City of New York owns all of the Atlantic shoreline from the Gateway National Recreation Area boundary. Attendance at Rockaway Beach, owned by the City of New York, was 21,000,000 in 1970. There is also a lengthy boardwalk, amusement facilities and numerous private summer homes. The Gateway National Recreation Area, Breezy Point Unit occupies the western four and one-half miles of the peninsula.

Jamaica Bay is a large marshy area located north of the Rockaway Peninsula. The bay is eight miles long and four miles wide and covers an area of approximately 26 square miles. Large portions of the north and east shores are bordered by marshlands with small tidal creeks running through them. There has been extensive development pressure on the fringes of Jamaica Bay and over the years large areas have been filled and developed with

private homes. John F. Kennedy International Airport is located on the northeast fringe of the Bay. A portion of the Bay wetland has been established as a wildlife refuge. A larger part of the Bay is navigable. The Federal Government maintains channels along the west, north and south perimeters of the Bay. Entrance to the Bay is attained through Rockaway Inlet. The Inlet channel is protected by a stone jetty extending seaward into the Atlantic off Rockaway Point.

Jamaica Bay has become a unit of the Gateway National Recreation Area, under the jurisdiction of the Department of Interior, National Park Service. A management plan is being developed by the Park Service. The estimated completion date of the plan is the fall of 1976.

The mainland coastal area surrounding Jamaica Bay is generally a low-lying level area. Several tidal creeks extend into the interior from the Bay. The entire area is extensively developed with private residences.

II. The Problem

The problem in this section is a combination of shore erosion from wave attack along the Atlantic coast of the Rockaways, and inundation from storm tides from both the ocean and Jamaica Bay.

A. Erosion

The entire ocean shoreline of Rockaway Peninsula is a critical erosion area. A serious erosion problem has resulted from storms of unusually severe intensity in recent years. These storms seriously reduce the width of portions of the beach along the peninsula, thereby exposing existing

waterfront development to wave attack and causing a loss of the beach area available for recreational use. The bulkheads, seawalls, groins and jetties which have been constructed in the area have been largely effective in holding the shore and reducing the erosive effect of the littoral currents. Yet, sizeable sections of the beach area, located seaward of the bulkhead and seawall structures, have been lost by erosion.

B. Flooding

Hurricane Donna, which occurred on September 12, 1960 caused the maximum recorded water levels in this reach of 8.6 feet above mean sea level. Over 3,500 acres of developed land were inundated during this storm. Large sections of the Rockaway peninsula and other communities fronting on Jamaica Bay were affected by the flooding. Many streets on the low-lying Rockaway Peninsula were flooded with three to four feet of water. Large developed areas around Kennedy International Airport were likewise inundated with three feet of water. Although no lives were lost during this storm, hundreds of families had to be evacuated from low-lying areas. Transportation, including use of the airport, was disrupted, and utility service was disrupted. The storm caused an estimated $15 million (1960 prices) of primary physical and non-physical damage to the area.

Destructive storms are not atypical to the south shore of Long Island. Research of the period between 1701 and 1962 reveals that severe storms have occurred in this reach at a frequency of about 20 times in a 100-year period and unusually severe storms at a frequency of about three times per hundred years.

III. Protection Alternatives

The first significant attempt to protect the shoreline in the reach dates back to 1926, although some isolated groins were constructed as early as 1910. Between 1926 and 1930 a considerable number of groins were built along the ocean front, with the exception of the Rockaway Park area between Beach 109th and Beach 126th Streets. After 1930, the major work has consisted of the placement of a total of 6,625,000 cubic yards of sand along the shore, and twenty more groins were constructed between 1943 and 1962. The result is that, between Jacob Riss Park and East Rockaway Inlet, there are few gaps in the groin system.

Approximately 25 percent of the shoreline surrounding Jamaica Bay, including its tributary basins and branches, presently contains waterfront bulkhead structures. Since the early 1920's about 150 million cubic yards of material have been dredged from Jamaica Bay, chiefly for the purposes of land reclamation, beach nourishment along the ocean front, deepening and widening of navigation channels, the manufacture of construction materials, and the creation of a bird and wildlife sanctuary.

The Corps of Engineers conducted a "Cooperative Beach Erosion Control Study and Interim Hurricane Study" of the area in 1964. It was recommended that a combined hurricane and beach erosion control project be adopted for the reach. Specific recommendations included:

-- a 4,530 foot hurricane barrier across the entrance to Jamaica Bay with a top elevation of 18 feet above mean sea level and with a navigation opening of 600 feet to a depth of 42.5 feet below mean sea level which can be partially closed by gates to 300 feet.

-- about 1.2 miles of closure levees and dikes north of the barrier at an elevation of 15 feet above mean sea level.

-- about 0.6 mile of dike and levee and about 7.1 miles of floodwall extending easterly along the Rockaway Peninsula to tie in with high ground at the eastern end of the peninsula (see figure 5).

-- artificial placement of about 4,000,000 cubic yards of beach fill along the ocean shore between Jacob Riis Park and East Rockaway Inlet.

-- periodic beach nourishment, with Federal Government participation in the cost for the first 10 years after completion of the beach fill.

The cost of the project is estimated to be between $150 and $160 million.

The project was authorized by Congress in 1965, with the proviso that field studies and hydraulic model investigations would be made in connection with the final design of the project to determine the specific effects of the proposed hurricane barrier on water quality, salinity and temperature patterns and currents in Jamaica Bay and consequent effects on fish and wildlife, sewage requirements and bottom scouring. Local interests also expressed concern about the environmental effects that a hurricane barrier would have on the ecology of the Bay.

Since numerous questions were raised regarding the effects of the hurricane protection portion of the plan and because of severe erosion of the ocean beach of Rockaway Peninsula by storms in the late 1960's and early 1970's, the beach erosion control part of the plan was separated from the hurricane portion.

Work is currently underway on the placement of hydraulic sand fill of the ocean beach of the Rockaway Peninsula. In the first increment of work, 3.0 miles of the 6.2 mile length of shoreline in the project, between B110th Street and B46th Street was completed in December 1975. The next increment is along 1.2 miles of shorefront from B146th Street to the easterly terminus of the project at B19th Street. A contract is expected to be awarded for this work in the spring of 1976. Total first costs of the beach erosion control project are currently estimated to be between 19 and 24 million dollars.

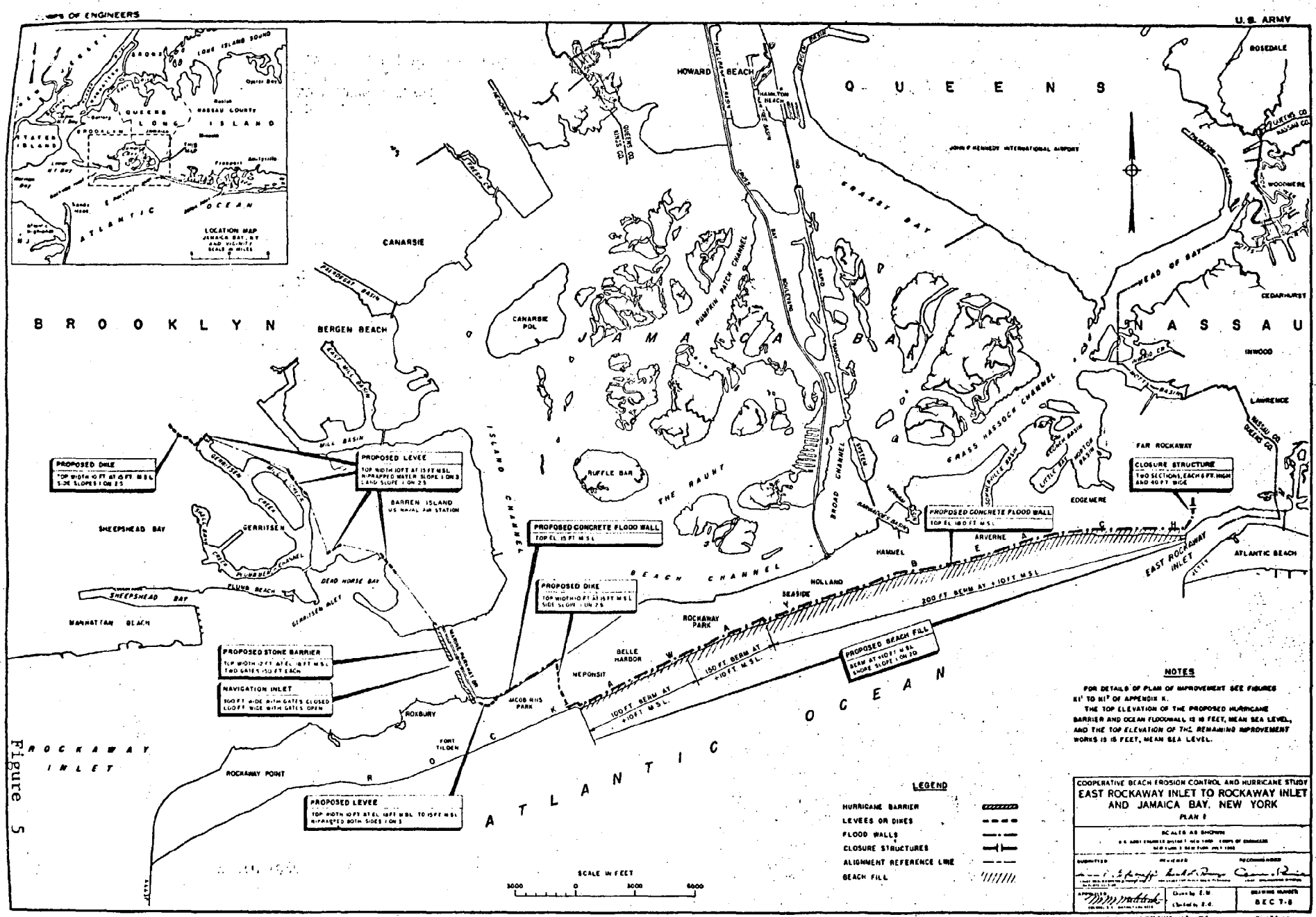

...ers OF ENGINEERS
U.S. ARMY
LOCATION MAP
JAMAICA BAY, NY
AND VICINITY
SCALE IN MILES
QUEENS
NASSAU COUNTY
LONG ISLAND
BROOKLYN
OCEAN
ATLANTIC
LONG ISLAND SOUND
STATEN ISLAND
HOWARD BEACH
QUEENS
BROOKLYN
CANARSIE
BERGEN BEACH
CANARSIE POL
JAMAICA BAY
PUMPKIN PATCH CHANNEL
BELT PARKWAY
GRASSY BAY
JOHN F KENNEDY INTERNATIONAL AIRPORT
ROSEDALE
WOODMERE
CEDARHURST
NASSAU
INWOOD
LAWRENCE
HEAD OF BAY
MILL BASIN
GERRITSEN CREEK
GERRITSEN
SHEEPSHEAD BAY
PLUMB BEACH
DEAD HORSE BAY
GERRITSEN INLET
MANHATTAN BEACH
BARREN ISLAND
U.S. NAVAL AIR STATION
ISLAND CHANNEL
RUFFLE BAR
THE RAUNT
GRASS HASSOCK CHANNEL
BROAD CHANNEL
EDGEMERE
FAR ROCKAWAY
ARVERNE
HAMMEL
BEACH CHANNEL
HOLLAND
BEASIDE
ROCKAWAY PARK
BELLE HARBOR
NEPONSIT
JACOB RIIS PARK
ROXBURY
FORT TILDEN
ROCKAWAY POINT
ROCKAWAY INLET
EAST ROCKAWAY INLET
ATLANTIC BEACH
ATLANTIC OCEAN
PROPOSED DIKE
TOP WIDTH 10 FT AT +15 FT M.S.L.
SIDE SLOPES 1 ON 25
PROPOSED LEVEE
TOP WIDTH 10 FT AT +15 FT M.S.L.
RIPRAPPED WATER SLOPE 1 ON 3
LAND SLOPE 1 ON 25
PROPOSED CONCRETE FLOOD WALL
TOP EL 15 FT M.S.L.
PROPOSED DIKE
TOP WIDTH 10 FT AT +15 FT M.S.L.
SIDE SLOPE 1 ON 25
PROPOSED STONE BARRIER
TOP WIDTH 10 FT AT EL +15 FT M.S.L.
TWO GATES 150 FT EACH
NAVIGATION INLET
300 FT WIDE WITH GATES CLOSED
1000 FT WIDE WITH GATES OPEN
PROPOSED LEVEE
TOP WIDTH 10 FT AT EL +15 FT M.S.L. TO +15 FT M.S.L.
RIPRAPPED BOTH SIDES 1 ON 3
PROPOSED CONCRETE FLOOD WALL
TOP EL 18.0 FT M.S.L.
CLOSURE STRUCTURE
TWO SECTIONS, EACH 6 FT. HIGH
AND 40 FT WIDE
200 FT BERM AT +10 FT M.S.L.
PROPOSED BEACH FILL
BERM AT +10 FT M.S.L.
SHORE SLOPE 1 ON 20
100 FT BERM AT +10 FT M.S.L.
150 FT BERM AT +10 FT M.S.L.
SCALE IN FEET
3000 0 3000 6000
LEGEND
HURRICANE BARRIER
LEVEES OR DIKES
FLOOD WALLS
CLOSURE STRUCTURES
ALIGNMENT REFERENCE LINE
BEACH FILL
NOTES
FOR DETAILS OF PLAN OF IMPROVEMENT SEE FIGURES
K1 TO K17 OF APPENDIX K.
THE TOP ELEVATION OF THE PROPOSED HURRICANE
BARRIER AND OCEAN FLOODWALL IS 18 FEET, MEAN SEA LEVEL,
AND THE TOP ELEVATION OF THE REMAINING IMPROVEMENT
WORKS IS 15 FEET, MEAN SEA LEVEL.
COOPERATIVE BEACH EROSION CONTROL AND HURRICANE STUDY
EAST ROCKAWAY INLET TO ROCKAWAY INLET
AND JAMAICA BAY, NEW YORK
PLAN 8
SCALES AS SHOWN
DRAWING NUMBER
B E C T-8
PLATE 16

Figure 5

REACH 4

East Rockaway Inlet to Jones Inlet

Reach 4

East Rockaway Inlet to Jones Inlet

I. General Description

This reach covers Long Beach Island and the mainland coastal zone of Hempstead Bay to the north. Long Beach Island is about 10 miles long and varies in width from 1,500 feet to 4,000 feet. It is bounded on the west by East Rockaway Inlet, the north by Reynolds Channel, the south by the Atlantic Ocean and the east by Jones Inlet. The terrain is low-lying and flat, with elevations generally less than 10 feet above mean sea level. The depth of water fringing the ocean shore and on the channel side is less than 20 feet, with isolated spots in Reynolds Channel dropping off to greater depths. The ocean shoreline consists of a continuous beach strip. Except at the extreme western end and in the Lido Beach area, a series of groins have been constructed along the beach. The development on Long Beach Island is primarily residential with extensive recreational facilities. Beach clubs, apartment houses, and hotels predominate along the ocean shore. The bay shore of Long Beach Island is predominantly occupied by private homes and some publicly owned facilities. The Town of Hempstead maintains park facilities on the ocean side of the island at the eastern end.

The mainland portion of this reach is limited to the strip of land within the tidal flood plain bordering the north shore of Hempstead Bay from Far Rockaway on the west to the Hempstead Town Line on the east. Residential development pressure has increased greatly in this area in the last 30 years. Much of this develop-

ment has been on reclaimed marshland along the bay shore. The shores from East Rockaway to Seaford are commercially developed with boat repair and storage yards, boat basins and fishing stations. Island Park is the location of the Barrett Power Station ofthe Long Island Lighting Company. Freeport is a well known center for fishing and boating.

II. The Problem

The problem in this reach is a combination of shore erosion from wave attack along the ocean coast of Long Beach Island and tidal inundation from both the ocean and Hempstead Bay due to severe storms and hurricanes causing considerable flood damages, loss of life, and hardships to hundreds of families located in the low lying areas.

A. Erosion

Beach erosion in this reach had been partially minimized by artificial nourishment and groin construction. However, an erosion problem has resulted from storms of unusually severe intensity which have struck this area. These storms have seriously reduced the width along many portions of the beach, thereby exposing existing waterfront development to wave attack and causing a loss of the beach area available for recreational use.

B. Flooding

The tidal flooding affects both the ocean side of Long Beach Island and the coastal area of Hempstead Bay. Storm tides created by high winds and low barometric pressure have overtopped the relatively low beach causing backshore flooding and inundating large developed areas.

The extensive damages experienced during the extra-tropical storms of November 25, 1950, November 6-7, 1953, the hurricane of September 12, 1960 (Donna) and the extra-tropical storm of March 6-8, 1962 are indicative of the severity of losses in this reach. During the storm of November 25, 1950, the area suffered the loss of one life due to flooding, approximately one million dollars in known damages, and severe beach erosion along the Atlantic Coast of Long Beach Island. The storm of November 6-7, 1953 caused known damages of about one and a half million dollars in the area.

Hurricane Donna on September 12, 1960, produced the maximum tide of record, 8.6 feet above mean sea level on the ocean side of Long Beach and up to 7.3 feet in Hempstead Bay. Known damages were estimated at over four million dollars. On Long Beach Island approximately two-thirds of the total damage was sustained by private beach clubs, a major hotel, many stores, and other commercial concerns. The remaining one-third of the damage was residential. Many areas were inundated by three to four feet of water and over 300 families had to be evacuated from their homes. In the communities fringing the bay, almost all of the damage resulted from the flooding of older dwellings and businesses which support the extensive small craft activity in the area.

The storm of March 6-8, 1962 caused over $3.75 million in known damages in this reach. The greatest damage to Long Beach Island consisted of beach and dune erosion, damage to structures related to marine activity was also experienced during this storm.

III. Protection Alternatives

The Corps of Engineers, in response to expressed local interest, examined the feasibility of providing beach erosion control and hurricane protection for this reach. The Corps examined both structural and non-structural alternatives to arrive at a plan which responded to problems and needs of the area. Alternative structural measures of protection, including multi-purpose plans providing beach erosion control and hurricane protection, including multi-purpose plans providing beach erosion control and hurricane protection and a single purpose plan providing only beach erosion control were formulated.

The multiple purpose beach erosion control and hurricane protection plan featured: hurricane barriers at four locations, reconstruction of twenty existing groins, construction of three new groins, closure levees and periodic beach nourishment (see Figure 7). The total first cost of this plan was estimated at $45 million, based on October 1964 price levels, and had a benefit-cost ratio of 1.1 to 1.0.

The structural plan was presented to the public at hearings in 1965. Local interests voiced strong objection. Their major concerns were with navigation safety at the East Rockaway Inlet hurricane barrier, the dune height along Long Beach Island which would inhibit the view of the ocean, adequacy of protection from flooding from the east along Meadowbrook Parkway into the protected area and conservation of adjacent wetlands. Despite modifications to the multiple purpose structural plan by the Corps and consider-

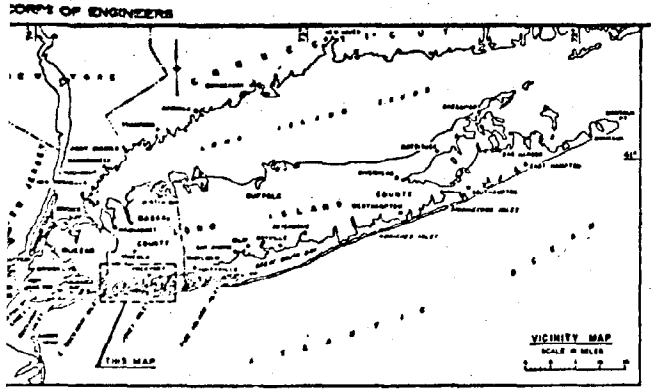
ation of a single purpose beach erosion control plan, the local opposition continued. The Corps of Engineers, the State Department of Environmental Conservation and Nassau County officials decided in 1972 that there was insufficient support for a structural project for this reach and work on planning was terminated.

Non-structural measures considered during the study included zoning regulations, hurricane forecasts, hurricane preparedness plans and flood insurance programs. Regulative zoning measures would have limited effectiveness in reducing damages in this reach because of the high degree of existing development.

The Corps, in its report on the project in 1973, suggested local action in adopting struct zoning ordinances and building codes to regulate construction and development of hurricane preparedness and evacuation plans.

CORPS OF ENGINEERS

U.S. ARMY



REPRODUCED FROM THE LATEST U.S. GEOLOGICAL SURVEY QUADRANGLES, WITH MODIFICATIONS.

BEACH EROSION CONTROL AND HURRICANE STUDY

ATLANTIC COAST OF LONG ISLAND, N.Y.

JONES INLET TO EAST ROCKAWAY INLET

GENERAL MAP

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

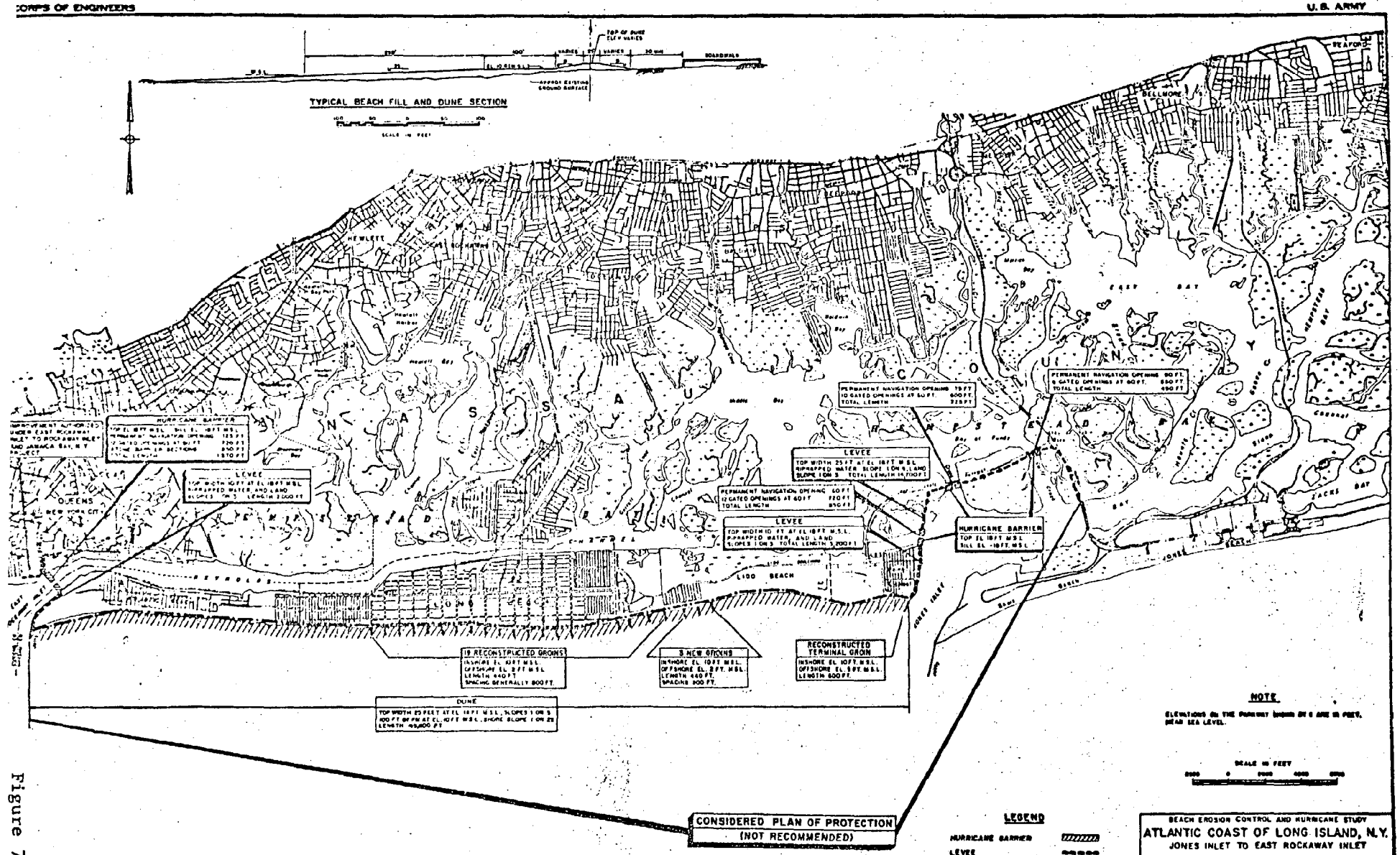
SUBMITTED | RECOMMENDED | RECOMMENDED

APPROVED | Drawn by FB / Checked by K Fink | DRAWING NUMBER BEC 10-1

TO ACCOMPANY SURVEY REPORT DATED 10 JANUARY 1970

PLATE 1

Figure 6



BEACH EROSION CONTROL AND HURRICANE STUDY
ATLANTIC COAST OF LONG ISLAND, N.Y.
JONES INLET TO EAST ROCKAWAY INLET
CONSIDERED PLAN OF PROTECTION
DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, NEW YORK

B.E.C. 10-2.

TO ACCOMPANY SURVEY REPORT DATED 10 JANUARY 1958

PLATE 2

Figure 7

REACH 5

Jones Inlet to Fire Island Inlet

REACH 5

Jones Inlet to Fire Island Inlet

I. General Description

This section is about fifteen miles in length and consists of the mainland coastal area and a barrier beach located about three miles southerly of and running parallel to the mainland shore. Hempstead, South Oyster and Great South Bays separate the barrier beach from the mainland. The westerly eight miles of the reach are located in Nassau County and the remainder is in Suffolk County.

The barrier beach varies in width from 1500 to 3500 feet and is entirely publicly-owned and developed for recreational purposes. Ocean Parkway, which runs for practically the entire length between Jones Inlet and Fire Island Inlet, is at an elevation of about 14 feet above mean sea level. The westerly six miles is occupied by Jones Beach State Park, developed by the Long Island State Park Commission. Tobay Beach, owned by the Town of Oyster Bay, occupies the remaining two miles in Nassau County. In Suffolk County, Gilgo State Park is under the jurisdiction of the Long Island State Park Commission and Gilgo Beach, Cedar Island Beach and Oak Beach are owned by the Town of Babylon. Gilgo State Park is largely undeveloped. Oak Beach is a residential development of privately owned homes constructed on town-owned land.

Much of the mainland along the bays is fringed by marshes and a shallow water shelf having depths less than three feet below mean low water. The topography of the mainland is generally gently sloping and is intersected by drowned valleys of numerous streams that drain into the bays. The shore is principally developed for residential use with some commercial fishing and recreational usage.

II. The Problem

The problem consists of three parts: (1) the erosion of the barrier beach, (2) tidal flooding of the mainland coastal area as a result of large storms and hurricanes, and (3) the need for an adequate channel at Fire Island Inlet.

A. Erosion

The barrier beach erosion problem is attributed to the limited natural supply of beach material and to storm damage. Except for the westerly three miles where there has been accretion since the construction of the Jones Inlet jetty in 1955, the remaining shore has experienced general erosion. Shorefront areas developed for recreation have been damaged by storms and although there is a great demand for additional recreational facilities in the area, much of the frontage has been left undeveloped because of the unstable condition of the shore. The State and Federal Governments have placed fill along the shoreline on many occasions over the years to maintain the beaches and to protect Ocean Parkway and recreational and residential structures.

Serious erosion also occurs at Oak Beach on the north side of Fire Island Inlet. Prior to construction of a jetty, the Oak Beach shore receded to the north as Democrat Point, the westerly end of Fire Island, migrated to the west, with maximum erosion occurring directly opposite the Point. The jetty, constructed in 1940, arrested the westward migration of the Point and checked the westward littoral drift from entering the inlet for about ten years. Since then, the littoral drift has bypassed the jetty and the result has been

considerable shoaling and shifting of the navigation channel to the north. This caused swift tidal currents and the formation of a gorge channel along the Oak Beach shore. The erosion caused by the tidal currents, along with erosion during storms, has resulted in the destruction of several houses and the relocation of others to avoid destruction.

B. Flooding

The Corps of Engineers has examined the tidal flooding problem in this reach.[7] It finds that the problem of potential flooding is not of great magnitude for the barrier beach between Jones Inlet and Fire Island Inlet, since adequate protection is afforded by Ocean Parkway, which runs practically the entire length of the beach. However, the mainland communities along the inner bays have experienced considerable tidal flood damage and loss of life during recent hurricanes and other great storms. The low-lying areas are subject to inundation by high stages in the bays resulting from flow through the inlets, wind set-up and wave run-up.

C. Navigation

The problem of navigation in Fire Island Inlet arises from the westerly movement of littoral drift into the inlet which results in shoaling and shifting of the channel. This causes a migration of the channel to the west with an alignment broadside to the direction of approaching waves, creating a hazard to navigation as well as the possibility of closure of the inlet.

III. Protection Alternatives

The Corps of Engineers conducted a beach erosion control study[5], completed in 1955, of the barrier beach between Jones Inlet and Fire Island Inlet. The purpose of the study was to determine the most practicable and economic method of providing adequate material to maintain the barrier beach shore in a suitably stable condition and providing an adequate navigation channel at Fire Island Inlet.

The plan developed by the Corps included: (1) excavation of a 2,000,000 cubic yard littoral reservoir and bypassing of the excavated material to a feeder beach and to Oak Beach. (When sand is moved across the inlet to a feeder beach, it is then available, under natural littoral processes, to nourish the beach to the west), (2) a model study to determine the most effective and economic method of inlet channel and shore stabilization, (3) construction of works for channel and shore stabilization, and (4) subsequent sand bypassing operations on three occasions. The plan was authorized by Congress in 1958.

The first increment of work under this project was performed in 1959. Two million cubic yards of sand were placed on a feeder beach west of the inlet. Sand was also placed on Oak Beach and a dike was constructed across the gorge channel along Oak Beach.

The Rivers and Harbors Act of 1962 authorized modification of the project to include a sand bypassing system which was to be developed by the Corps of Engineers.

The Corps conducted a review[6] of the entire project. Revisions were made to the project plan based on completed model studies and review comments. The revised project consisted of: (1) dredging a littoral reservoir at the inlet entrance, (2) a re-

handling basin for rehandling of dredged material inside the inlet and a connecting channel between them, (3) constructing a revetted sand dike and extending the jetty at Democrat Point, and (4) nourishing the shore west of the inlet with 1,200,000 cubic yards to a feeder beach on the average of once every two years. The extension of the jetty and construction of the dike would be deferred until the need was indicated by actual operating experience.

The sand bypassing system and rehandling basin are no longer considered part of the project. Since 1973, two dredging contracts have been completed in which sand has been removed from the channel and littoral reservoir and deposited on the feeder beach. A third contract has been awarded and work is expected to commence in the spring of 1976. This contract calls for removal of 1,800,000 cubic yards of sand by February 1978, which may be sufficient to complete the channel and littoral reservoir to required dimensions. After completion of the project, sand deposited in the littoral reservoir will be bypassed to the feeder beach on an average of once every two years. Total project cost exclusive of the periodic dredging, is estimated to be $19,000,000, with the State share being $7,699,000. All benefits are to State-owned lands; thus, there is no local share.

The Corps of Engineers conducted a survey study[7] of the tidal flooding of the barrier beach between Jones Inlet and Fire Island Inlet and the mainland coastal area along Great South, Moriches and Shinnecock Bays. The Corps found that the problem of flooding is not great for the barrier beach. However, the mainland communities bordering Great South Bay are subject to flooding during high stages in the bay. The high stages are the result of flow through the inlets, wind set-up, and overtopping and breaks in the

barrier beach east of Fire Island Inlet. There is an authorized Federal project for beach erosion control and hurricane protection of the Atlantic Coast of Long Island from Fire Island Inlet to Montauk Point which provides for the raising of the dunes along the barrier beach east of Fire Island Inlet. This project, when built, will result in reducing flood stages in the bay and will eliminate most of the mainland flood damages.

The study determined that construction of additional works to protect the mainland coastal area against the residual tidal flood damages after completion of the authorized beach erosion-hurricane protection project along the ocean front is economically not justified.

The timetable has not been established for construction of the beach erosion control and hurricane protection project between Fire Island Inlet and Montauk Point. The protection that would be afforded by this project to the mainland areas of this reach is an indeterminate time in the future. Emphasis must be placed by the mainland communities on non-structural measures of flood plain management.

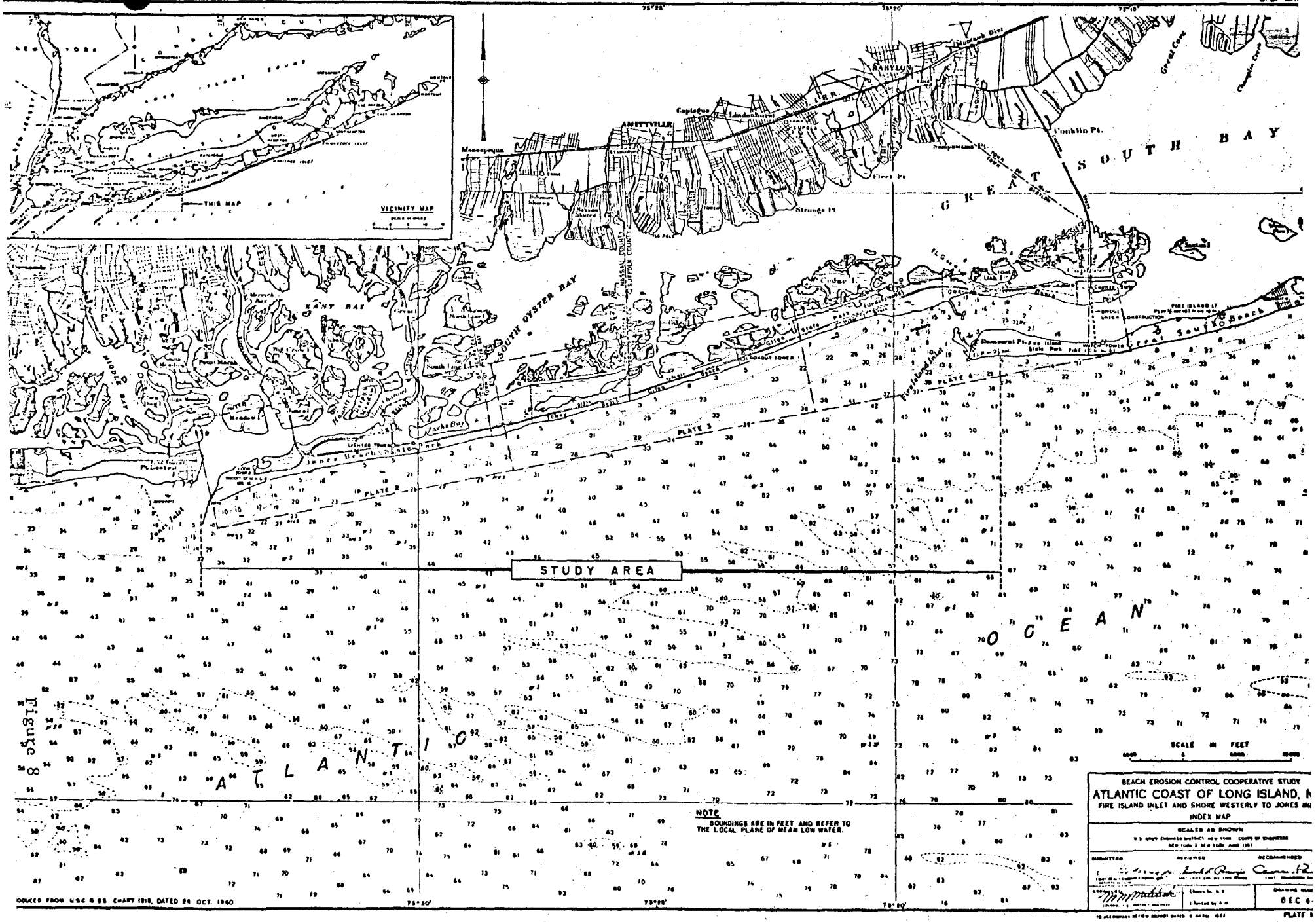


Figure 8

BEACH EROSION CONTROL COOPERATIVE STUDY

ATLANTIC COAST OF LONG ISLAND, N

FIRE ISLAND INLET AND SHORE WESTERLY TO JONES IN

INDEX MAP

SCALE AS SHOWN

U.S. ARMY ENGINEER DISTRICT, NEW YORK — CORPS OF ENGINEERS

NEW YORK 3, N.Y. — NEW YORK — JUNE 1961

SUBMITTED — APPROVED — RECOMMENDED

DRAWING NUMBER B.E.C. 6-

PLATE 8

REACH 6

Fire Island Inlet to Moriches Inlet

REACH 6

Fire Island Inlet to Moriches Inlet

I. General Description

This reach consists of the portion of the south shore of Long Island and the Fire Island barrier beach between Fire Island Inlet on the west and Moriches Inlet on the east. The reach is 30 miles long in a general east to west direction and lies within the Towns of Islip and Brookhaven, Suffolk County. Included in the reach are the Villages of Brightwaters, Patchogue, Bellport, Saltaire and Ocean Beach.

The Long Island mainland shore and the Fire Island barrier beach are separated by Great South Bay and Moriches Bay. Both are shallow bodies of water with depths of four to ten feet and with a number of large shallow flats. Bay widths range up to five miles. Several channels have been dredged within the Bays for both commercial and recreational boating. The Bays are important commercial shellfish and finfishing areas and the extensive marshes, mudflats and tidal shallows are important waterfowl habitats.

The coastal area of the mainland along the Bays is fringed by marshlands and a shallow water shelf. The topography of the land is gently sloping with an irregular shoreline.

The barrier beach is generally less than 2,500 feet wide, with irregular sand dunes up to about 30 feet. The ocean faces of the dunes are characterized by steep slopes carved by the wind, while the inshore faces slope back gradually and are usually covered with beach grass or other vegetation. In some

localities the dune ridges have been partially removed or leveled, and residences have been constructed along the dune lines.

Robert Moses State Park is located at the western end of Fire Island. Twenty summer residential communities, including the Villages of Saltaire and Ocean Beach, occupy the two miles of barrier beach east of the State Park. Suffolk County has developed a park in the vicinity of Smith Point. All of Fire Island between the easterly end of Robert Moses State Park and Moriches Inlet is within the boundaries of the Fire Island National Seashore. The National Park Service of the Department of the Interior is charged with its management. The Park Service is presently revising its master plan for the preservation and development of the Seashore. (see Chapter I, Fire Island National Seashore).

II. The Problem

The primary problem in the reach is the erosion of the barrier beach. Additional problems are the flooding of the coastal areas along the bays and the maintenance of a navigation channel through Moriches Inlet.

A. Erosion

The erosion of the barrier beach is severe in this reach. Losses occur from both the natural westward littoral drift, which carries beach material westerly along the shore, and from large storms. Studies conducted between 1940 and 1956 indicate that the Fire Island Inlet to Moriches Inlet area lost an average of 270,000 cubic yards of beach annually. This resulted in an average recession of six feet in beach width per year. Lossof beach area not only diminishes the area's recreational value, but increases the danger of a breach in the barrier beach during a large storm.

B. Flooding

Developed areas of the barrier beach are quite vulnerable to damages from flooding during large storms. The mainland areas bordering the bays are also affected by high tidal levels.

During the hurricane of September 1938, the maximum of record, ocean levels rose to about 10 feet above sea level excluding wave run-up. The ocean overtopped the dunes on the barrier beach at several locations, exposing the mainland to direct wave attack and causing severe damages. Generally the dunes with a crest height of 18 feet or more withstood attacks of the sea and protected leeward areas. Those areas in which the dune crest height was less than 16 to 18 feet were generally damaged by wave overwash or breached.

C. Navigation

Navigation problems of Fire Island Inlet are discussed under Reach 5. Moriches Inlet, which connects the Atlantic Ocean with Moriches Bay, was opened as a result of tides and waves of abnormal height in March, 1931. It migrated westward about 3,500 feet during the period 1931 to 1947. In 1947, an attempt at its stabilization was made by local interests by construction of a stone revetment on the west side. However, storm conditions resulted in closure of the inlet in 1951. During 1952-53 local interests constructed stone jetties on both sides of the inlet and performed dredging on the bayward side. It was while this work was going on that the inlet reopened as a result of a storm in September, 1953. The inlet is continually subject to filling and shoaling and periodic dredging is necessary to maintain navigation.

III. Protection Alternatives

Over the years, New York State and local interests have made numerous attempts to restore and stabilize damaged beaches. These efforts have taken the form of beach fill, dune construction and construction of groins. Results have been variable, but generally they have provided only temporary relief.

The Corps of Engineers conducted a Cooperative Beach Erosion Control and Interim Hurricane Study[8] in 1958 of the Atlantic Coast of Long Island from Fire Island Inlet to Montauk Point. The purpose of the study was to determine the most practicable and economic method of restoring and stabilizing the beaches and to develop an adequate plan of protection against hurricane tidal flooding.

The recommended plan includes widening the beach along developed areas from Kismet through the east end of the reach to a minimum width of 100 feet at an elevation of 14 feet above mean sea level and raising of dunes along the entire reach to an elevation of 20 feet above mean sea level. Also included is a provision to construct up to 50 groins along the entire project length from Fire Island Inlet to Montauk Point. Construction of the groins would be contingent upon demonstration of actual need, based on experience. The plan also calls for periodic beach nourishment if needed.

Congress authorized the project in 1960 and the Corps of Engineers commenced detailed planning for the area east of Moriches Inlet.

Detailed design of the project for the Fire Island Inlet to Moriches Inlet reach has been delayed by several factors,

including the establishment of the Fire Island National Seashore.

Another problem delaying progress has been the determining of a fair apportionment of the local share of the project cost.

In 1962, the area suffered $6.6 million in damages as a result of a severe northeast storm combined with flood tides. Following the declaration of a natural disaster area, the Corps of Engineers constructed a "ten year" temporary berm to provide protection against all but major hurricanes. Maintenance was to have been provided by local interests.

A series of storms in 1965-1967 severely damaged this berm. At the same time, owing to an unusual combination of natural forces, the normal summer replenishment of the beach and berm did not take place. Because of the severe erosion, the developed areas in the western part of the reach were extremely vulnerable to damage from future storms. During 1967, the State constructed two emergency beach fill projects--at Davis Park and Point O'Wood-Ocean Beach. These projects were small, intended to strengthen the beach and dunes until more permanent repairs could be effected. Another, large project consisting of a beach and dune fill of 309,000 cubic yards was constructed by the State at Davis Park in the fall of 1967. The project was designed to provide protection for the interim preceding construction of the Federally authorized project.

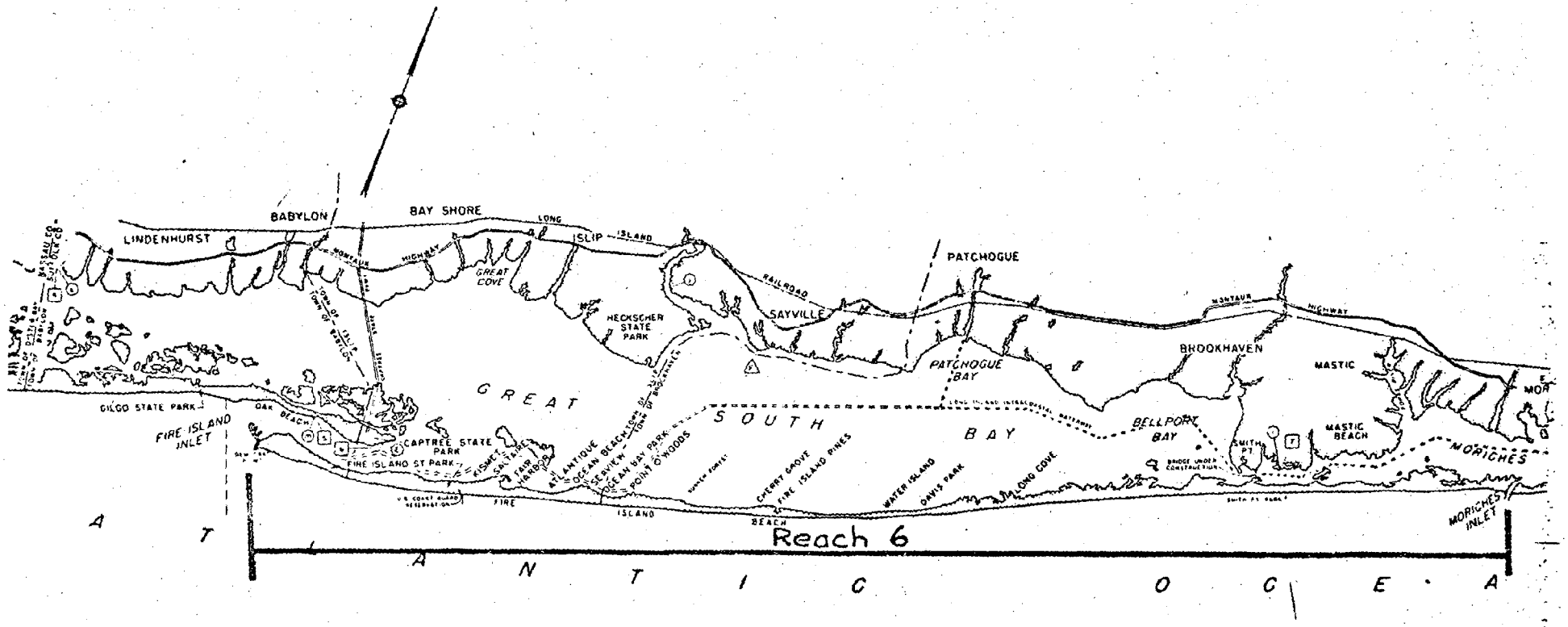
Recently, a State law was passed allowing the formation of special taxing districts to participate in the cost of hurricane and beach erosion control projects. The Suffolk County government has been reluctant to burden its entire constituency with the cost of a project that benefits only some of them. A Suffolk County hurricane protection, flood and shoreline erosion control district is currently in the formation process. The district would include the area bounded by the easterly boundary of Robert Moses State Park on the west and the westerly boundary of the Fire Island National Seashore property at Watch Hill on the east, essentially all of the communities on Fire Island. Formation of the district would presumably facilitate county participation in the construction of the authorized project.

The formation of the Fire Island National Seashore has raised some questions in connection with the authorized federal projects. Since the Seashore includes considerable tracts of land within the proposed project boundaries, it must be determined how their plans for managing and developing the property relate to the project plans. The National Park Service has recently completed revising their master plan for Fire Island and this should provide some of the answers. A correlative to this is the question of how the Park Service would finance its share of project costs.

At the present time, there is considerable local feeling against construction of any groins within the reach. Those against groin construction contend that beach and dune construction by sand fill is more desirable. However, without groins, the erosion rate of the beaches and dunes may prove to be undesirably high.

The Corps of Engineers completed a report on Moriches and Shinnecock Inlets in 1959[9]. It was found that the existing works at Moriches Inlet, constructed by local interests, are not adequate to maintain a navigable channel through the inlet and that without improvements, the inlet could eventually close.

Recommendations in the report call for a channel 10 feet deep and 200 feet wide from that depth in the Atlantic Ocean through the inlet, thence a channel six feet deep and 100 feet wide to connect with the Long Island Intracoastal Waterway, rehabilitation of the existing jetties and revetments, seaward extension of the east and west jetties and construction of a sand-bypassing facility. Project costs were estimated at $3,331,000, 1957 price levels. Congress authorized the project in 1960, but no work has been accomplished to date.


BABYLON
BAY SHORE
LONG ISLAND
LINDENHURST
MONTAUK HIGHWAY
GREAT COVE
HECKSCHER STATE PARK
SAYVILLE
RAILROAD
PATCHOGUE
PATCHOGUE BAY
BROOKHAVEN
MASTIC
MASTIC BEACH
MORICHES
GILGO STATE PARK
FIRE ISLAND INLET
OAK BEACH
CAPTREE STATE PARK
FIRE ISLAND ST PARK
GREAT SOUTH BAY
BELLPORT BAY
SMITH PT
ATLANTIQUE
OCEAN BEACH
SEAVIEW
OCEAN WAY PARK
POINT O'WOODS
CHERRY GROVE
FIRE ISLAND PINES
WATER ISLAND
DAVIS PARK
LONG COVE
FIRE ISLAND BEACH
MORICHES INLET
Reach 6
ATLANTIC OCEAN

REACH 7

Moriches Inlet to Shinnecock Inlet

REACH 7

Moriches Inlet to Shinnecock Inlet

I. General Description

This section is a little over fifteen miles long in a generally east to west direction and consists of the mainland coastal area fronted by a barrier beach. Portions of Moriches and Shinnecock Bays separate the mainland and barrier beach along the western and eastern thirds of the reach, respectively. In the Westhampton Beach-Quogue area the mainland is separated from the barrier beach by the Quantuck and Quogue Canals, parts of the Long Island Intercoastal Waterway. The reach lies within the Towns of Brookhaven and Southhampton, Suffolk County. The Incorporated Villages of Westhampton Beach and Quogue are located in the middle of the reach.

The barrier beach is quite narrow, generally less than 2,500 feet wide, with dunes up to 30 feet in height. In some localities the dunes have been removed and residences constructed. A road runs nearly the entire length of the barrier beach and there are four bridge connections to the mainland. There is extensive residential development from near Moriches Inlet to the easterly boundary of the Village of Quogue.

Moriches and Shinnecock Bays are shallow bodies of water, averaging four to five feet in depth. Both support large finfish and shellfish populations. The mainland shoreline bordering the bays is quite irregular, being indented in several places by drowned valleys. The Shinnecock Canal connects Shinnecock and Peconic Bays.

Shinnecock Inlet connecting the Atlantic Ocean with Shinnecock Bay, formed as a result of the hurricane of September 1938, is 1,500 feet long and 800 feet wide. Tidal flow passing through the inlet is estimated to average 300 million cubic feet per tide.

II. The Problem

The primary problem is the vulnerability of the barrier beach to direct ocean wave attack. This has resulted in reduction in the width of protective beaches and destruction of dunes fronting the shore. During severe storms the ocean has broken through the barrier beach into the bays and inundated developed areas on the barrier beach and on the mainland, causing loss of life and severe property damage. Additional problems are the flooding of mainland areas and maintenance of navigation in Shinnecock Inlet. Moriches Inlet is discussed in Reach 6.

A. Erosion

The barrier beach erosion problem is attributed to two sources, lack of a natural supply of beach material and storm damage. A comparison of shorelines during the 1940 to 1956 period showed that the average recession between Moriches and Shinnecock Inlets was around ten feet per year.

B. Flooding

This reach has been severely damaged during large storms and hurricanes. During the hurricane of September 1938, maximum of record, practically the entire barrier beach was inundated. Ocean levels rose to about ten feet above sea level excluding wave run-up. In the Westhampton Beach area,

several large, opulent summer residences were either severely damaged or destroyed. Over the entire Fire Island Inlet to Montauk Point reach, damages were estimated to be over $6,000,000 (1938 prices). Of this amount, almost 80 percent occurred along the barrier beach from Fire Island Inlet to Southampton. Forty-five persons lost their lives or were reported as missing and over 1,000 houses were destroyed or damaged.

C. Navigation

Shinnecock Inlet was formed by wave action and extremely high tides during the September 1938 hurricane. The inlet is 1,500 feet long and 800 feet wide with a controlling navigable depth of about seven feet at mean low water. The inlet is used by both commercial and recreational boating. The principal problem is that there is a continual shifting of the channel in the inlet and the formation of bars at both ends. This inhibits the use of the channel under normal conditions and makes access to the harbor extremely hazardous or impossible under stormy conditions. Tidal exchange of bay waters is needed at each inlet to reduce pollution and to improve salinity and temperature.

III. Protection Alternatives

Extensive repair work was necessary on the dunes following the 1938 hurricane. Suffolk County, with the aid of WPA funds, carried out extensive dune rehabilitation work. Snow fencing, brush and heavy wire barriers were erected over extensive areas of the barrier beach to trap sand and to hasten the natural dune building process. A bulkhead was constructed on the west side of Shinnecock Inlet to stabilize the newly formed inlet.

In 1945, a State law was passed permitting State involvement in erosion control projects on Long Island to the extent of 50 percent of the cost of planning and construction. In succeeding years, several beach and dune restoration projects were completed and additional jetty construction was undertaken at Shinnecock Inlet.

In 1958, the Corps of Engineers completed a Cooperative Beach Erosion Control and Interim Hurricane Study[8] of the Atlantic Coast of Long Island from Fire Island Inlet to Montauk Point. For this reach, the recommended plan consisted of widening of the barrier beach to a minimum width of 100 feet at an elevation of 14 feet above mean sea level and raising dunes to an elevation of 20 feet above mean seal level, grass planting on the dunes and construction of up to 23 groins, if needed. Project costs for the reach were estimated at $13,627,000 in 1958. The project was authorized by Congress in 1960.

The first construction under the project was accomplished in 1966 with the placement of eleven groins at Westhampton Beach (see Figure). Four more groins were added to the immediate west of the original eleven in 1970. Subsequent to construction of the groins, intensified erosion occurred downdrift, westerly, of the groin field.

In 1973, the Suffolk County Legislature passed a resolution over the veto of the County Executive authorizing construction of six additional groins at Westhampton. These six groins would have extended from the existing groin field westerly to the vicinity of Moriches Inlet and would have protected the highly developed area now suffering serious erosion. Subsequent to this, Suffolk

County was asked to sign a contract of local cooperation, a requirement for State participation under the Beach Erosion Control Law. The Suffolk County Legislature did not authorize the project.

Two basic problem exist. Are groins the answer to the erosion problem at Westhampton Beach? The existing groin field was constructed in the middle of the reach and it was expected that more would be constructed westerly to Moriches Inlet shortly thereafter. Also, the decision was made at the time of construction of the first eleven groins, not to fill the area between them with sand. The result has been the interception of the littoral drift of sand by the eastern end of the groin field to the detriment of the beach west of the groin field.

There is substantial disagreement within the local community about the effectiveness and desirability of the groin concept of treating beach erosion. This has made it difficult to get support from local units of government of any project involving the construction of groins.

Subsequent to the County's most recent rejection of the groin project, the County Legislature passed a resolution supporting a project to consist of sandfill without groins and sand by-passing systems at Moriches and Shinnecock Inlets. This would involve a massive amount of sandfill. The closest source of sand in Moriches Bay and Moriches Inlet. However, some local groups oppose taking sandfill from these locations because they fear that it would upset the ecological balance of the bay.

The only other likely source of the vast quantity of sand needed for the project is the open ocean. However, the technical feasibility of mining sand in the open ocean, miles from shore, has not been sufficiently established to date. Additionally, there must be reasonable conviction that the sandfill once placed will be reasonably stable. The Corps of Engineers estimated that it will take two years to complete feasibility and technical studies on this proposal. Project costs could be in

the vicinity of $25,000,000.

The Corps of Engineers completed a report on Moriches and Shinnecock Inlets in 1959.[9] Existing works at Shinnecock Inlet, constructed by local interests, were found to be inadequate to maintain a navigable channel through the inlet and it was found that without improvements, the inlet would eventually close.

Recommendations in the report called for provision of a channel 10 feet deep and 200 feet wide from the depth in the Atlantic Ocean through the inlet, thence a channel 6 feet deep and 100 feet wide to connect with the Long Island Intracoastal Waterway, rehabilitation of the existing jetties and construction of a sandy by-passing facility. Project costs were estimated at $3,527,000, 1957 price levels. Congress authorized the project in 1960, but no work has been accomplished to date.

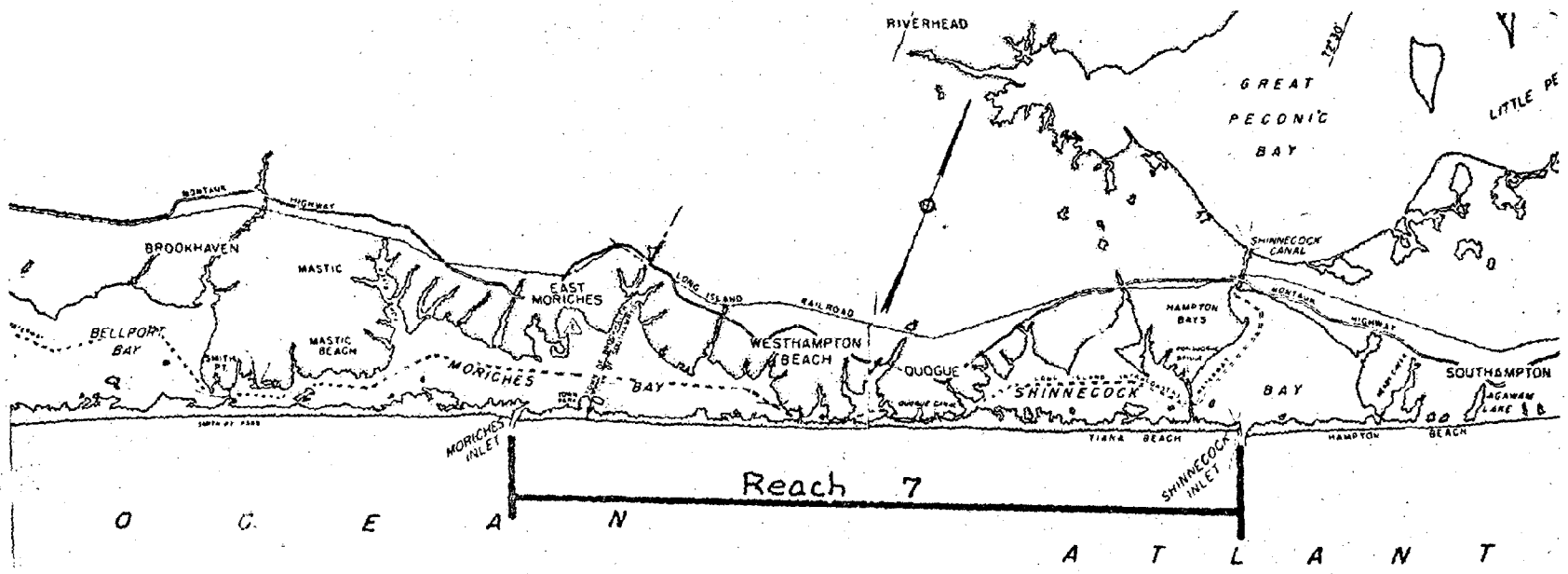

RIVERHEAD
GREAT
PECONIC
BAY
LITTLE PE
SHINNECOCK
CANAL
MONTAUK
HIGHWAY
BROOKHAVEN
MASTIC
EAST
MORICHES
LONG ISLAND
RAILROAD
BELLPORT
BAY
MASTIC
BEACH
MORICHES
BAY
WESTHAMPTON
BEACH
QUOGUE
HAMPTON
BAYS
SHINNECOCK
BAY
SOUTHAMPTON
AGAWAM
LAKE
MORICHES
INLET
SHINNECOCK
INLET
TIANA
BEACH
HAMPTON
BEACH
Reach 7
O C E A N
A T L A N T

Figure 10

REACH 8

Shinnecock Inlet to Beach Hampton

REACH 8

Shinnecock Inlet to Beach Hampton

I. General Description

This reach covers about 22 miles of the south shore of Long Island. From Shinnecock Inlet to Southampton, a distance of about three and one-half miles, it consists of a barrier beach separated from the mainland by Shinnecock Bay. The beach is generally less than 2,500 feet wide, with irregular sand dunes up to 30 feet in height. There is a road along the reach behind the dune line but development is sparse.

From Southampton to Beach Hampton the Long Island mainland directly fronts the ocean, unprotected by a barrier beach. The shoreline here consists of a rather narrow beach. Dune formations are not as extensive as along the barrier beach further west. In the area between Southampton and East Hampton there are a number of landlocked bodies of water just shoreward of the ocean front. The largest of these are Agawam Lake, Mecox Bay, Sagaponack Lake, Georgica Pond and Hook Pond. There is a considerable amount of residential development along ocean shoreline at the Village of East Hampton and at Beach Hampton.

II. The Problem

The problems in this reach of Long Island's south shore are the same as in other reaches; that is, a combination of erosion of the shoreline and flooding from severe storms.

A. Erosion

Erosion of the shoreline in this reach has been moderate over the years. The Corps of Engineers estimated that the average annual shoreline recession between 1940 and

1956 was 2.1 feet per year. The few groins and bulkheads constructed by private interests have been ineffective in providing erosion protection during large storms.

B. Flooding

Flooding is a serious problem in this reach as it has been along all of Long Island's south shore. The hurricanes and northeasters which sweep up the Atlantic Coast of the United States push high tides and large waves directly on the exposed shores of this reach and all along the coast.

The September 1938 hurricane was the most devastating storm in this area. Tides ranged up to 10 feet above sea level and wave run-up on the shore reached even greater heights. The flat shoreline of the mainland along the northside of Shinnecock Bay received extensive flooding from high bay levels. Damages from this storm were well over $6,000,000 (1938 prices) in the area between Fire Island Inlet and Montauk Point.

III. Protection Alternatives

As previously noted, local attempts to stop erosion of the shoreline have not been effective. The Corps of Engineers conducted a Cooperative Beach Erosion Control and Interim Hurricane Survey Study[8] in 1958 for the Atlantic Coast of Long Island from Fire Island Inlet to Montauk Point. The purpose of the plan was to determine the most practicable and economical method of restoring and preserving the beaches and to develop an adequate plan of protection against hurricane tidal flooding.

The study disclosed that the most practicable plan of improvement to serve the dual purpose of beach erosion control and hurricane protection for the area between Shinnecock Inlet and

Beach Hampton involved widening the beach along developed areas as far east as Mecox Bay to a minimum width of 100 feet at 14 feet above sea level and raising dunes to an elevation of 20 feet above sea level the entire length of the reach. This would be supplemented by grass planting on the dunes, interior drainage structures at Mecox Bay, Sagaponack Lake, and Georgica Pond. Also included in the plan, which covered the entire south shore from Fire Island Inlet to Montauk Point, was the possible construction of 50 groins, if needed, and the placement of approximately 34,000,000 cubic yards of sand. The beach would receive periodic nourishment, with Federal participation in sharing the cost for the first 10 years.

Progress in constructing beach erosion and hurricane protection in this reach has been slow. Because of the eroded condition of the shore between Georgica and Hook Ponds, New York State, with Suffolk County participating in the cost, constructed two groins and placed 450,000 cubic yards of sand in 1959 at a cost of $615,700.

Two more groins were constructed as part of the Corps' project on the ocean shore immediately east of Georgica Pond. The groins were constructed in 1965 at a cost of $721,000. No further construction of the Corps' project proposals has taken place since this time.

The part of the proposed Corps of Engineers' project covering Georgica Pond has become a controversial issue. The Pond presently is somewhat saline; not freshwater but not as salty as the ocean. It is cut off from the ocean by a low narrow dune. Approximately twice a year from the Town of East Hampton Trustees, owners of the

Pond bed, order a channel dug across the dune, lowering the Pond level. This custom,[10] called "letting out" the Pond, is at least three centuries old. Some property owners dislike it because the Pond sometimes floods cellars when it is fullest, before it is let out, and, is ugly, smelly and not good for boating for a while afterwards. Some landowners and the East Hampton Village Board have wanted this Pond level stabilized. Other landowners and the East Hampton Town Trustees would prefer to continue the present operation

The Village Board believes that Georgica Pond should be permamently sealed off against the sea and thus become a freshwater reservoir. This could potentially aid in meeting projected municipal water supply needs. Water supply could be withdrawn directly from the Pond. However, storage capability is limited due to the possibility of increasing the flood hazard at the upper range. A two foot drawdown would reduce Pond depth to two or three feet over most of its area. The Department of Environmental Conservation estimates the yield for a two foot drawdown would not exceed 1.8 million gallons per day. An additional restraint against using the Pond water for municipal water supply is that the water receives pollution from the surrounding residential development. Complete treatment of the water would be necessary before use.

Changing the Pond to a freshwater body would probably affect the groundwater by displacing the fresh-saltwater interface seaward. This would allow greater groundwater withdrawal for water supply.

The effects of instal ling an interior drainage structure at Georgica Pond are still quite conjectural. The Corps of Engineers is presently preparing an environmental impact statement for

the entire Fire Island Inlet to Montauk Point Project, including Georgica Pond. It is expected to be completed sometime in 1976. No further construction will begin on the project until then.

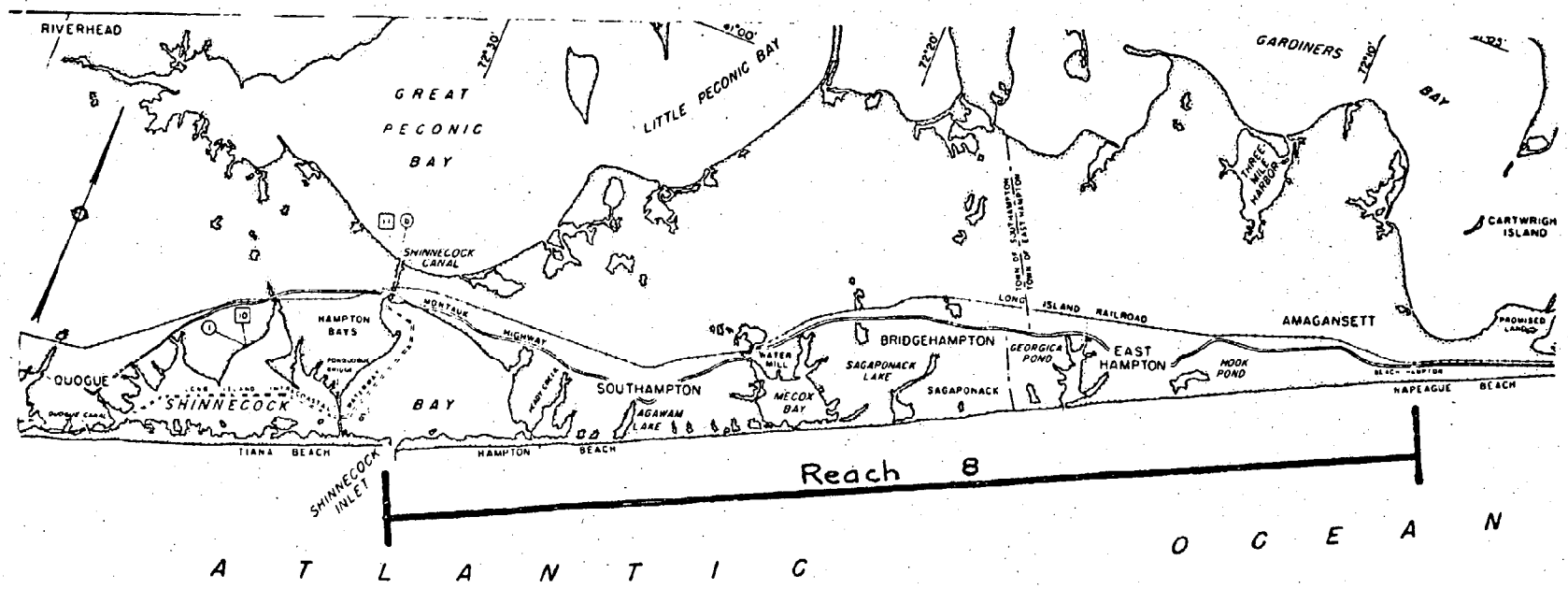

RIVERHEAD
GREAT PECONIC BAY
LITTLE PECONIC BAY
GARDINERS BAY
SHINNECOCK CANAL
HAMPTON BAYS
MONTAUK HIGHWAY
LONG ISLAND RAILROAD
TOWN OF SOUTHAMPTON
TOWN OF EAST HAMPTON
THREE MILE HARBOR
CARTWRIGHT ISLAND
AMAGANSETT
PROMISED LAND
QUOGUE
SHINNECOCK BAY
SOUTHAMPTON
WATER MILL
BRIDGEHAMPTON
SAGAPONACK LAKE
GEORGICA POND
EAST HAMPTON
HOOK POND
MECOX BAY
SAGAPONACK
AGAWAM LAKE
NAPEAGUE
BEACH
TIANA BEACH
HAMPTON BEACH
SHINNECOCK INLET
Reach 8
ATLANTIC OCEAN

Figure 11

REACH 9

Beach Hampton to Montauk Point

REACH 9

Beach Hampton to Montauk Point

I. General Description

This most easterly reach of the south shore of Long Island is slightly more than 14 miles long. The land form is quite narrow and could be characterized as a peninsula, jutting out in an easterly direction from the Long Island mainland, into the Atlantic Ocean.

The beach along the Atlantic Ocean is generally narrow in this section. Dune formations are not as extensive as those along the barrier beaches to the west, although a well-defined dune area exists in the vicinity of Napeague Harbor. In the easterly ten miles of this section, there is a series of bluffed headlands rising over 50 feet above the ocean level.

Shore development along this reach is not as extensive as in the reaches to the west. With the narrow beach, much of residential development is up out of the flood plain. Recreation is the principal land use of the coastal area. Hither Hills State Park is located on the easterly side of Napeague Harbor (see Figure __).

II. The Problem

The problems in this reach, as in the reaches to the west, continue to be erosion and flooding, with the emphasis more on flooding.

A. Erosion

Shoreline erosion is less of a problem, generally, in this reach than in reaches to the west. The Corps of Engineers estimates that the average annual shoreline recession in the 1940 to 1956 period was 1.0 feet per year, excluding

erosion of the cliffs near Montauk Point. A seawall has been constructed to protect the U.S. Government property at Montauk Point.

B. Flooding

This reach is subject to tidal flooding from both the Atlantic Ocean and Block Island Sound. Little has been documented on damages during past storms. However, newspaper reports note that parts of the reach have been isolated when Montauk Highway and the Long Island Railroad have been flooded.

III. Protection Alternatives

The Corps of Engineers, in their Survey Study[8] covering this area, recommended that the beach dunes be raised to an elevation of 20 feet above mean sea level as far east as Hither Hills State Park and at Montauk and opposite Lake Montauk Harbor by the placement of sand fill. Included in the project is a provision for periodic beach nourishment for the life of the project, about 50 years subsequent to construction. The Federal Government would participate in the cost of nourishment for the first 10 years. This project was authorized in 1960, but no construction has been accomplished.

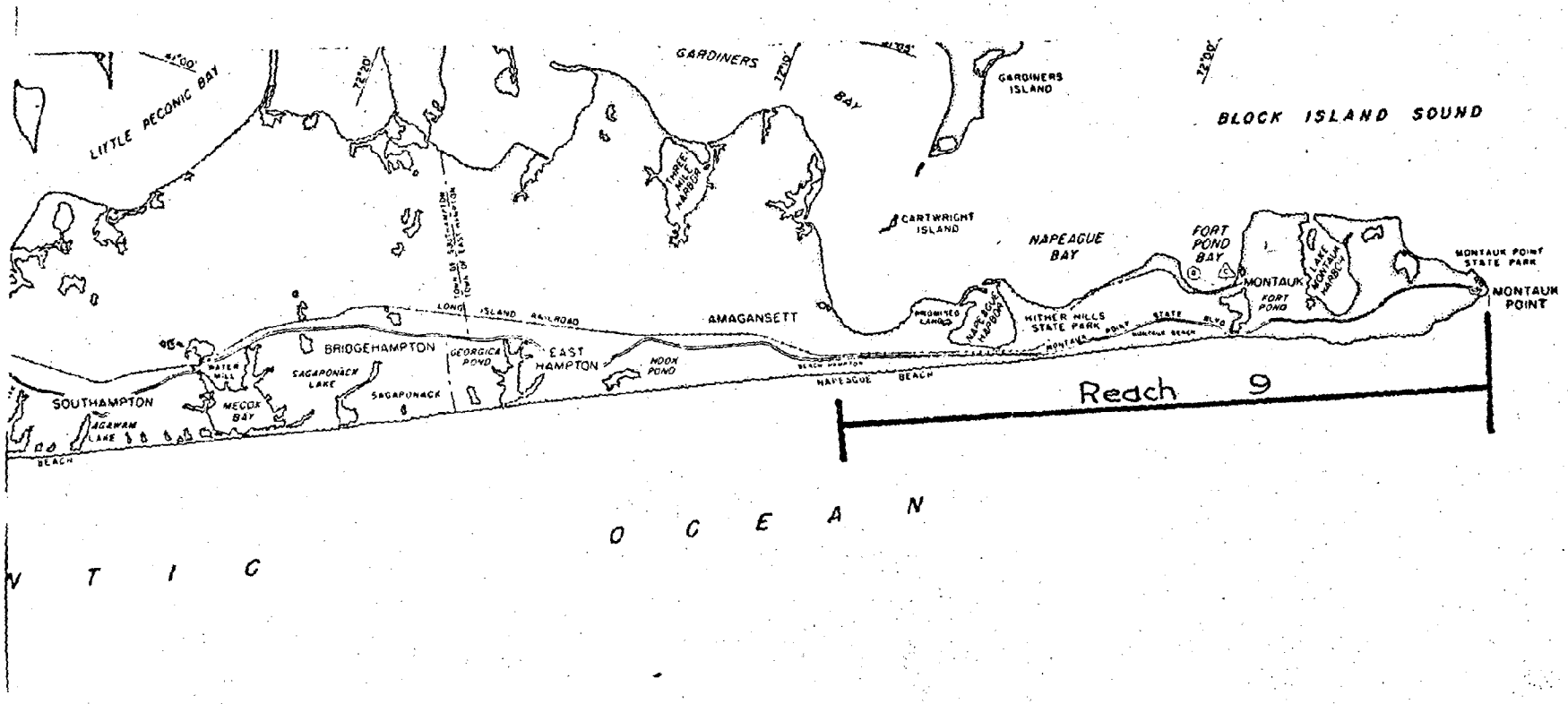

LITTLE PECONIC BAY
GARDINERS BAY
GARDINERS ISLAND
BLOCK ISLAND SOUND
CARTWRIGHT ISLAND
NAPEAGUE BAY
FORT POND BAY
MONTAUK
MONTAUK POINT STATE PARK
MONTAUK POINT
LONG ISLAND RAILROAD
AMAGANSETT
HITHER HILLS STATE PARK
BRIDGEHAMPTON
EAST HAMPTON
SOUTHAMPTON
SAGAPONACK LAKE
GEORGICA POND
NOYAC BAY
NAPEAGUE BEACH
Reach 9
O C E A N

Figure 12

References

1. "Cooperative Beach Erosion Control and Interim Hurricane Study (Survey), Staten Island, New York, Fort Wadsworth to Arthur Kill", U. S. Army Corps of Engineers, March 1964.

2. "Report on Beach Erosion Control and Interim Hurricane Study of the Atlantic Coast of Long Island, New York, Jones Inlet to East Rockaway Inlet", U. S. Army Corps of Engineers, January 1973.

3. "Cooperative Beach Erosion Control and Interim Hurricane Study (Survey) Atlantic Coast of New York City from Rockaway Inlet to Norton Point, New York (Coney Island Area)", U. S. Army Corps of Engineers, August 1973, Revised December 1974.

4. "Tidal Flood Plain Information, South Shore of Nassau County, Long Island, New York", prepared by Corps of Engineers for County of Nassau County Planning Commission, June 1971.

5. "Beach Erosion Control Report on Cooperative Study (Survey), Atlantic Coast of Long Island, New York, Fire Island Inlet and Shore Westerly to Jones Inlet", U. S. Army Corps of Engineers, September 1955.

6. "Review Report on Beach Erosion Control Cooperative Study of Atlantic Coast of Long Island, New York, Fire Island Inlet and the Shore Westerly to Jones Inlet", U. S. Army Corps of Engineers, March 1965.

7. "Interim Hurricane Study of the Atlantic Coast of Long Island, New York, Jones Inlet to Montauk Point (Remaining Areas), U. S. Army Corps of Engineers, November 1967.

8. "Cooperative Beach Erosion Control and Interim Hurricane Study (Survey), Atlantic Coast of Long Island, N.Y., Fire Island Inlet to Montauk Point", U. S. Army Corps of Engineers, July 1958.

9. "Survey Report on Moriches and Shinnecock Inlets, Long Island, New York", U. S. Army Corps of Engineers, 1959.

10. East Hampton Star Newspaper story "Georgica Pond 'Stabilization' Becomes an Issue Once Again", February 6, 1975.

11. "Cooperative Beach Erosion Control and Interim Hurricane Study (Survey), Atlantic Coast of New York City from East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York", U. S. Army Corps of Engineers, April 1964.

12. "Fire Island National Seashore Master Plan Draft", March 1975, U. S. Department of the Interior, National Park Service.

13. Gateway National Recreation Area, Basic Information, September 1975, U. S. Department of the Interior.

APPENDIX

II. Legislation

A. P.L. 88-587

Public Law 88-587
88th Congress, S. 1365
September 11, 1964

An Act

To establish the Fire Island National Seashore, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) for the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population, the Secretary of the Interior is authorized to establish an area to be known as the "Fire Island National Seashore". Fire Island National Seashore. Establishment.

(b) The boundaries of the national seashore shall extend from the easterly boundary of Robert Moses State Park eastward to Moriches Inlet and shall include not only Fire Island proper, but also such islands and marshlands in the Great South Bay, Bellport Bay, and Moriches Bay adjacent to Fire Island as Sexton Island, West Island, Hollins Island, Ridge Island, Pelican Island, Pattersquash Island, and Reeves Island and such other small and adjacent islands, marshlands, and wet lands as would lend themselves to contiguity and reasonable administration within the national seashore and, in addition, the waters surrounding said area to distances of one thousand feet in the Atlantic Ocean and up to four thousand feet in Great South Bay and Moriches Bay, all as delineated on a map identified as "Fire Island National Seashore No. OGP-0002", dated June 1964. The Secretary shall file said map with the Federal Register, and it may also be examined in the offices of the Department of the Interior. Boundaries.

SEC. 2. (a) The Secretary is authorized to acquire, and it is the intent of Congress that he shall acquire as appropriated funds become available for the purpose or as such acquisition can be accomplished by donation or with donated funds or by transfer, exchange, or otherwise, the lands, waters, and other property, and improvements thereon and any interest therein, within the boundaries of the seashore as established under section 1 of this Act. Any property or interest therein owned by the State of New York, by Suffolk County, or by any other political subdivision of said State may be acquired only with the concurrence of such owner. Notwithstanding any other provision of law, any Federal property located within such area may, with the concurrence of the agency having custody thereof, be transferred without consideration to the administrative jurisdiction of the Secretary for use by him in carrying out the provisions of this Act. In exercising his authority to acquire property in accordance with the provisions of this subsection, the Secretary may enter into contracts requiring the expenditure, when appropriated, of funds authorized by this Act, but the liability of the United States under any such contract shall be contingent on the appropriation of funds sufficient to fulfill the obligations thereby incurred. Acquisition of land. 73 STAT. 928. 78 STAT. 929.

(b) When the Secretary determines that lands and waters or interests therein have been acquired by the United States in sufficient quantity to provide an administrative unit, he shall declare the establishment of the Fire Island National Seashore by publication of notice in the Federal Register. Publication in Federal Register.

(c) The Secretary shall pay not more than the fair market value, as determined by him, for any land or interest therein acquired by purchase.

(d) When acquiring land by exchange the Secretary may accept title to any nonfederally owned land located within the boundaries of the national seashore and convey to the grantor any federally

owned land under the jurisdiction of the Secretary. The lands so exchanged shall be approximately equal in fair market value, but the Secretary may accept cash from or pay cash to the grantor in order to equalize the values of the lands exchanged.

(e) With one exception the Secretary shall not acquire any privately owned improved property or interests therein within the boundaries of the seashore or any property or interests therein within the communities delineated on the boundary map mentioned in section 1, except beach or waters and adjoining land within such communities which the Secretary determines are needed for public access to the beach, without the consent of the owners so long as the appropriate local zoning agency shall have in force and applicable to such property a duly adopted, valid, zoning ordinance that is satisfactory to the Secretary. The sole exception to this limitation on the power of the Secretary to condemn improved property where appropriate zoning ordinances exist shall be in the approximately eight-mile area from the easterly boundary of the Brookhaven town park at Davis Park, in the town of Brookhaven, to the westerly boundary of the Smith Point County Park. In this area only, when the Secretary deems it advisable for carrying out the purposes of this Act or to improve the contiguity of the park land and ease its administration, the Secretary may acquire any land or improvements therein by condemnation. In every case in which the Secretary exercises this right of condemnation of improved property the beneficial owner or owners (not being a corporation) of any improved property so condemned, provided he, she, or they held the same or a greater estate in the property on July 1, 1963, may elect as a condition of such acquisition by the Secretary any one of the following three alternatives:

76 STAT. 929.
76 STAT. 930.

(1) that the Secretary shall take the said property in fee simple absolute and pay the fair market value thereof as of the date of such taking;

(2) that the owner or owners shall retain a life estate in said property, measured on the life of the sole owner or on the life of any one person among multiple owners (notice of the person so designated to be filed in writing with the Secretary within six months after the taking) or on the life of the survivor in title of any estate held on July 1, 1963, as a tenancy by the entirety. The price in such case shall be diminished by the actuarial fair market value of the life estate retained, determined on the basis of standard actuarial methods;

(3) that the owner or owners shall retain an estate for twenty-five years. The price in this case shall likewise be diminished by the value of the estate retained.

"Improved property."

(f) The term "improved property" as used in this Act shall mean any building, the construction of which was begun before July 1, 1963, and such amount of land, not in excess of two acres in the case of a residence or ten acres in the case of a commercial or industrial use, on which the building is situated as the Secretary considers reasonably necessary to the use of the building: *Provided*, That the Secretary may exclude from improved properties any beach or waters, together with so much of the land adjoining such beach or waters as he deems necessary for public access thereto.

Regulations.

SEC. 3. (a) In order to carry out the provisions of section 2, the Secretary shall issue regulations, which may be amended from time to time, specifying standards that are consistent with the purposes of this Act for zoning ordinances which must meet his approval.

(b) The standards specified in such regulations shall have the object of (1) prohibiting new commercial or industrial uses, other than commercial or industrial uses which the Secretary considers are con-

sistent with the purposes of this Act, of all property within the national seashore, and (2) promoting the protection and development for purposes of this Act of the land within the national seashore by means of acreage, frontage, and setback requirements.

(c) Following issuance of such regulations the Secretary shall approve any zoning ordinance or any amendment to any approved zoning ordinance submitted to him that conforms to the standards contained in the regulations in effect at the time of adoption of the ordinance or amendment. Such approval shall remain effective for so long as such ordinance or amendment remains in effect as approved.

(d) No zoning ordinance or amendment thereof shall be approved by the Secretary which (1) contains any provisions that he considers adverse to the protection and development, in accordance with the purposes of this Act, of the area comprising the national seashore; or (2) fails to have the effect of providing that the Secretary shall receive notice of any variance granted under, or any exception made to, the application of such ordinance or amendment.

(e) If any improved property, with respect to which the Secretary's authority to acquire by condemnation has been suspended according to the provisions of this Act, is made the subject of a variance under, or becomes for any reason an exception to, such zoning ordinance, or is subject to any variance, exception, or use that fails to conform to any applicable standard contained in regulations of the Secretary issued pursuant to this section and in effect at the time of passage of such ordinance, the suspension of the Secretary's authority to acquire such improved property by condemnation shall automatically cease. 78 STAT. 930.

(f) The Secretary shall furnish to any party in interest upon request 78 STAT. 931.
a certificate indicating the property with respect to which the Secretary's authority to acquire by condemnation is suspended.

Owners' use of property.

SEC. 4. (a) Owners of improved property acquired by the Secretary may reserve for themselves and their successors or assigns a right of use and occupancy of the improved property for noncommercial residential purposes for a term that is not more than twenty-five years. The value of the reserved right shall be deducted from the fair market value paid for the property.

(b) A right of use and occupancy reserved pursuant to this section shall be subject to termination by the Secretary upon his determination that the use and occupancy is not consistent with an applicable zoning ordinance approved by the Secretary in accordance with the provisions of section 3 of this Act, and upon tender to the owner of the right an amount equal to the fair market value of that portion of the right which remains unexpired on the date of termination.

Hunting and fishing.

SEC. 5. The Secretary shall permit hunting, fishing, and shellfishing on lands and waters under his administrative jurisdiction within the Fire Island National Seashore in accordance with the laws of New York and the United States of America, except that the Secretary may designate zones where, and establish periods when, no hunting shall be permitted for reasons of public safety, administration, or public use and enjoyment. Any regulations of the Secretary under this section shall be issued after consultation with the Conservation Department of the State of New York.

SEC. 6. The Secretary may accept and use for purposes of this Act any real or personal property or moneys that may be donated for such purposes.

Sunken Forest Preserve.

SEC. 7. (a) The Secretary shall administer and protect the Fire Island National Seashore with the primary aim of conserving the natural resources located there. The area known as the Sunken Forest Preserve shall be preserved from bay to ocean in as nearly its present state as possible, without developing roads therein, but con-

tinuing the present access by those trails already existing and limiting new access to similar trails limited in number to those necessary to allow visitors to explore and appreciate this section of the seashore.

(b) Access to that section of the seashore lying between the easterly boundary of the Brookhaven town park at Davis Park and the westerly boundary of the Smith Point County Park shall be provided by ferries and footpaths only, and no roads shall be constructed in this section except such minimum roads as may be necessary for park maintenance vehicles. No development or plan for the convenience of visitors shall be undertaken therein which would be incompatible with the preservation of the flora and fauna or the physiographic conditions now prevailing, and every effort shall be exerted to maintain and preserve this section of the seashore as well as that set forth in the preceding paragraph in as nearly their present state and condition as possible.

(c) In administering, protecting, and developing the entire Fire Island National Seashore, the Secretary shall be guided by the provisions of this Act and the applicable provisions of the laws relating to the national park system, and the Secretary may utilize any other statutory authority available to him for the conservation and development of natural resources to the extent he finds that such authority will further the purposes of this Act. Appropriate user fees may be collected notwithstanding any limitation on such authority by any provision of law.

Shore erosion control.
78 STAT. 931.
78 STAT. 932.

SEC. 8. (a) The authority of the Chief of Engineers, Department of the Army, to undertake or contribute to shore erosion control or beach protection measures on lands within the Fire Island National Seashore shall be exercised in accordance with a plan that is mutually acceptable to the Secretary of the Interior and the Secretary of the Army and that is consistent with the purposes of this Act.

(b) The Secretary shall also contribute the necessary land which may be required at any future date for the construction of one new inlet across Fire Island in such location as may be feasible in accordance with plans for such an inlet which are mutually acceptable to the Secretary of the Interior and the Secretary of the Army and that is consistent with the purposes of this Act.

Fire Island National Advisory Commission. Establishment.

SEC. 9. (a) There is hereby established a Fire Island National Seashore Advisory Commission (hereinafter referred to as the Commission). The Commission shall terminate on the tenth anniversary of the date of this Act or on the declaration, pursuant to section 2(b) of this Act, of the establishment of the Fire Island National Seashore, whichever occurs first. The Commission shall consist of fifteen members, each appointed for a term of two years by the Secretary, as follows:

(1) Ten members to be appointed from recommendations made by each of the town boards of Suffolk County, New York, one member from the recommendations made by each such board;

(2) Two additional members to be appointed from recommendations of the town boards of the towns of Islip and Brookhaven, Suffolk County, New York;

(3) One member to be appointed from the recommendation of the Governor of the State of New York;

(4) One member to be appointed from the recommendation of the county executive of Suffolk County, New York;

(5) One member to be designated by the Secretary.

(b) The Secretary shall designate one member to be Chairman.

(c) A member of the Commission shall serve without compensation.

(d) The Commission established by this section shall act and advise by affirmative vote of a majority of the members thereof.

(e) The Secretary or his designee shall, from time to time, consult with the members of the Commission with respect to matters relating to the development of Fire Island National Seashore and shall consult with the members with respect to carrying out the provisions of sections 2, 3, and 4 of this Act.

(f)(1) Any member of the Advisory Commission appointed under this Act shall be exempted, with respect to such appointment, from the operation of sections 281, 283, 284, and 1914 of title 18 of the United States Code and section 190 of the Revised Statutes (5 U.S.C. 99) except as otherwise specified in paragraph (2) of this subsection. Conflict of interest. 76 Stat. 1126.

(2) The exemption granted by paragraph (1) of this subsection shall not extend—

(i) to the receipt of payment of salary in connection with the appointee's Government service from any sources other than the private employer of the appointee at the time of his appointment; or

(ii) during the period of such appointment, and the further period of two years after the termination thereof, to the prosecution or participation in the prosecution, by any person so appointed, of any claim against the Government involving any matter concerning which the appointee had any responsibility arising out of his appointment during the period of such appointment. 78 STAT. 932. 78 STAT. 933.

SEC. 10. There is hereby authorized to be appropriated not more than $16,000,000 for the acquisition of lands and interests in land pursuant to this Act. Appropriation.

Approved September 11, 1964.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 1638 accompanying H. R. 7107 (Comm. on Interior & Insular Affairs).
SENATE REPORT No. 1300 (Comm. on Interior & Insular Affairs).
CONGRESSIONAL RECORD, Vol. 110 (1964):
Aug. 6: Considered and passed Senate.
Aug. 20: Considered and passed House, amended, in lieu of H. R. 7107.
Aug. 21: Senate concurred in House amendments.

GPO 35-139

B. P.L. 89-244

Public Law 89-244
89th Congress, H. R. 8035
October 9, 1965

An Act

79 STAT. 967

To authorize the Secretary of the Interior to accept a donation of property in the county of Suffolk, State of New York, known as the William Floyd Estate, for addition to the Fire Island National Seashore, and for other purposes.

Fire Island National Seashore, N. Y. Additional land.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is authorized to accept the donation of approximately six hundred and eleven acres of lands, submerged lands, islands, and marshlands or interests therein, known as the William Floyd Estate, located in the town of Brookhaven, county of Suffolk, and State of New York, delineated on a certain map entitled "Map of the Fire Island National Seashore, Including the William Floyd Estate", numbered OGP-0003, dated May 1965, which map or a true copy thereof shall be filed with the Federal Register and may be examined in the offices of the Department of the Interior. Such donation may be accepted subject to such terms, covenants, and conditions as the Secretary finds will be in the public interest.

Filing with Federal Register.

SEC. 2. The Secretary is also authorized to accept the donation of the main dwelling on said lands, which was the birthplace and residence of General William Floyd (a signer of the Declaration of Independence) and the furnishings therein and any outbuildings, subject to like terms, covenants, and conditions. The Secretary is authorized to lease said lands, dwellings, and outbuildings to the grantors thereof for a term of not more than twenty-five years, at $1 per annum, and during the period of the leasehold the Secretary may provide protective custody for such property.

Lease of lands, dwellings, etc.

SEC. 3. Upon expiration or surrender of the aforesaid lease the property shall become a detached unit of the Fire Island National Seashore, and shall be administered, protected, and developed in accordance with the laws applicable thereto subject, with respect to said main dwelling and the furnishings therein, to such terms, covenants, and conditions which the Secretary shall have accepted and approved upon the donation thereof as in the public interest.

Approved October 9, 1965, 6:30 a.m.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 980 (Comm. on Interior & Insular Affairs).
SENATE REPORT No. 763 (Comm. on Interior & Insular Affairs).
CONGRESSIONAL RECORD, Vol. 111 (1965):
Sept. 20: Passed House.
Sept. 23: Considered and passed Senate.

GPO 50-139

III. Regulations

A. Fire Island National Seashore Zoning Standards

PART 28—FIRE ISLAND NATIONAL SEASHORE; ZONING STANDARDS

Sec.
28.1 Introduction.
28.2 General provisions.
28.3 Seashore district.
28.4 Developed areas district.
28.5 Variances and exceptions.

AUTHORITY: The provisions of this Part 28 issued under Sec. 3, 78 Stat. 930, and Sec. 3, 39 Stat. 535.

SOURCE: The provisions of this Part 28 appear at 31 F.R. 5289, April 2, 1966, unless otherwise noted.

§ 28.1 Introduction.

(a) In administering, protecting, and developing the Fire Island National Seashore (hereinafter also referred to as the Seashore), the Secretary of the Interior (hereinafter referred to as the Secretary), is required to be guided by the provisions of the Act of September 11, 1964 (78 Stat. 928), and the applicable provisions of the laws relating to the National Park System. The Secretary, further, may utilize any other statutory authority available to him for the conservation and development of natural resources to the extent he finds that such authority will further the purposes of the said Act of September 11, 1964.

(b) To the extent consistent with the aforesaid Act of September 11, 1964, development and management of the Fire Island National Seashore will be conducted in a manner to assure the conservation of its natural resources and the widest possible public use, understanding, and enjoyment of its natural and scientific features. This contemplates a broad range of outdoor recreational activities, including, but not limited to, hiking, boating, swimming, fishing, picnicking, nature study, water skiing, or beachcombing, but any such activities shall be compatible with wise resource management and the physical capabilities of the Seashore.

(c) With one exception, the Secretary may not acquire by condemnation any privately owned "improved property" (defined in paragraph (d) of this section), or interests therein within the boundaries of the Seashore, or any property or interests therein within the communities delineated on the boundary map of the Seashore, for so long as the appropriate local zoning agency shall have in force and applicable to such property a duly adopted, valid zoning ordinance that is satisfactory to the Secretary. The sole exception to this limitation on the power of the Secretary to condemn improved property shall be in the approximately 8-mile area from the easterly boundary of the Brookhaven town park at Davis Park, in the town of Brookhaven, to the westerly boundary of the Smith Point County Park, where the Secretary may acquire land or improvements by this means if he deems it advisable for carrying out the terms of the Act of September 11, 1964, or to improve the contiguity of park land and ease its administration. Improved property owners within such 8-mile area have certain elections under section 3(e) of that act if their property is taken for these purposes. The Secretary may acquire, by condemnation or other means, any beach or waters and such adjoining land as he determines is necessary for access to the beach or waters.

(d) As used herein, "improved property" means any building, the construction of which was begun prior to July 1, 1963, together with such amount of land on which said building is situated as the Secretary considers reasonably necessary to the use of said building not, however, to exceed 2 acres in the case of a residence or 10 acres in the case of a commercial or industrial use. The Secretary may exclude from such "improved property" any beach or waters, as well as land adjoining such beach or waters, which he deems necessary for public access thereto.

(e) The regulations in this part are designed to establish minimal standards to which local zoning ordinances for the Fire Island National Seashore must conform if certain improved properties and properties within the delineated communities are to be exempt from acquisition by condemnation. These standards are intended: (1) To prohibit new commercial or industrial uses of all property within the Seashore, other than uses which the Secretary considers are consistent with the purposes of the act establishing the Seashore; and (2) to promote the protection and development of the land within the Seashore in keeping with the purposes of that act by means of acreage, frontage and setback requirements.

(f) Following promulgation of the regulations in this part in final form, the Secretary is required to approve any zoning ordinances or amendments to approved zoning ordinances submitted to him which conform to the standards herein set forth. He may not, however, approve any ordinance or amendment thereto which: (1) Contains any provisions that he considers adverse to the protection and development of the area comprising the Seashore; or (2) fails to provide that the Secretary shall receive notice of any variance granted under, or any exception made to, the application of such ordinance or amendment.

(g) Nothing contained in the regulations in this part or in the zoning ordinances or amendments adopted pursuant to such regulations for the area within the Seashore shall preclude the Secretary from exercising his power of condemnation with respect to: (1) Any

property not within the definition of "improved property;" (2) property within the 8-mile area between Davis Park and the westerly boundary of the Smith Point County Park; or (3) any other property—including "impoved property" and property within the delineated communities—if the appropriate local zoning agency does not have in force and applicable to such property, zoning ordinances that are satisfactory to the Secretary, or if a property owner fails to comply with the conditions, requirements, and restrictions contained in the regulations in this part and in zoning ordinances approved by the Secretary. Nor shall these regulations preclude the Secretary from otherwise fulfilling the responsibilities vested in him by the act authorizing establishment of the Seashore or by the Act of August 25, 1916 (39 Stat. 535), as amended and supplemented.

§ 28.2 General provisions.

Following issuance of the regulations in this part, the towns and villages wholly or partially within the Seashore boundaries shall submit to the Secretary for his approval, all zoning ordinances and amendments thereto which are in force and applicable to property within the Seashore and which demonstrate conformity with the standards in the regulations in this part. The submissions shall include any ordinances and amendments in effect prior to the issuance of these regulations which demonstrate such conformity and any that have been adopted to implement the regulations in this part.

§ 28.3 Seashore district.

(a) Definition: This district shall comprise all those portions of the Seashore within the towns of Brookhaven and Islip which lie outside the communities delineated on the official map of the Fire Island National Seashore, numbered OGP–0002, and dated June 1964.

(b) Zoning ordinances in effect or adopted for this district shall conform to the general and specific standards prescribed in the regulations in this part for such district and shall be consistent with the objectives and purposes of the Act of September 11, 1964 (78 Stat. 928), so that—to the extent possible under New York State law—natural resources and values will be preserved and protected and any uses within such district will be compatible with preservation of the flora and fauna and the physiographic conditions now prevailing. In keeping with these objectives and purposes, additional or increased commercial or industrial uses are prohibited within the Seashore District.

(c) No moving, alteration, or improvement of existing residential dwellings or structures appurtenant thereto or beach clubs shall be permitted within this district unless there is compliance with the acreage, frontage, and setback requirements, the height limitations and maximum plot occupancy requirements contained in a zoning ordinance, or amendment thereto, which is acceptable to the Secretary. If through natural phenomena or causes a lot or lots are so diminished in size that an owner of property within this district would be unable to comply with the requirements prescribed in this paragraph, for moves, alterations, or improvements, such owner or the zoning authorities of the towns of Brookhaven or Islip may, as provided in § 28.5, request the Secretary of the Interior to determine whether the proposed move of an existing structure to a location on the same or another lot would subject the property to acquisition by condemnation.

(d) Those provisions relating to acreage, frontage and setback requirements, height limitations, and maximium plot occupancy requirements contained in zoning ordinances of the towns of Brookhaven and Islip which are in effect in the Seashore District on the date of issuance of the regulations in this part are hereby adopted as the acreage, frontage, setback, height, and maximum plot occupancy standards for such district. From time to time these standards will be reviewed and, if necessary, revised through the issuance of amended regulations. It is the clear intention of the act authorizing establishment of this Seashore that all land within its boundaries—except certain "improved property" and property within delineated communities—be acquired by the United States as rapidly as appropriated funds are made available therefor and before future development occurs. Accordingly, unimproved property situated within the Seashore District will be subject to acquisition by the Secretary by condemnation in the event it is developed by the owner for any purpose.

(e) There shall be in effect in this district appropriate limitations, requirements, or restrictions upon the burning of cover, the filling or clearing of land, the cutting of trees or removal of brush, undergrowth, and shrubbery, the removal of sand and the dumping, storing, or piling of refuse, materials, equipment, or other unsightly objects which would detract from the natural scene.

(f) Signs within this district shall not be illuminated and shall be limited to one square foot in area, including signs advertising the sale or rental of property which may be placed only on the property advertised for sale or rental. No other advertising displays or signs shall be permitted. Nonconforming signs may continue such nonconformity until they are destroyed, structurally altered, reconstructed, changed,

or moved, but the period of such nonconformity may not exceed 2 years from the date the zoning ordinance imposing the restrictions contained in this paragraph is approved by the town.

§ 28.4 Developed areas district.

(a) Definition: This district shall include all those portions of the Seashore within the towns of Brookhaven and Islip and the villages of Ocean Beach and Saltaire, which are identified as communities on a map of the Fire Island National Seashore, numbered OGP-0002, and dated June 1964.

(b) Zoning ordinances in effect or adopted for this district shall conform to the general and specific standards prescribed in the regulations in this part and shall be consistent with the objectives and purposes of the Act of September 11, 1964 (78 Stat. 928), so that—to the extent possible under New York State law—the natural resources and cultural values of the Seashore will be preserved and protected, and any developments or uses within such district will be in accord with the purposes of the Seashore.

(c) Those provisions relating to acreage, frontage and setback requirements, height limitations, and maximum plot occupancy requirements contained in zoning ordinances of the towns of Brookhaven and Islip and of the villages of Ocean Beach and Saltaire, which are in effect in the Developed Areas District on the date of issuance of these regulations are hereby adopted as the acreage, frontage, setback, height, and maximum plot occupancy standards for such district. From time to time these standards will be reviewed and, if necessary, revised through the issuance of amended regulations. Within the scope of the standards herein prescribed or as hereafter amended, existing undeveloped properties within this district may be utilized for the construction of detached, single-family dwellings and any such existing dwellings may be altered, moved, or enlarged. Except through adoption of an amendment to the town or village zoning ordinance that is satisfactory to the Secretary, property within this district may not be utilized for: (1) The establishment or expansion of commercial or industrial uses; or (2) the establishment or expansion of apartment facilities or any other multiple-unit dwellings. In reviewing amendments proposing the establishment of these uses the Secretary shall take into account the consistency of the proposed use with the purposes of the Fire Island establishment act.

(d) There shall be in effect in this district appropriate limitations, requirements, or restrictions upon the burning of cover and trash, the removal of sand and the dumping, storing, or piling of refuse, materials, equipment, or other unsightly objects which would detract from the cultural and natural scene.

(e) Signs within this district shall not be illuminated and shall be limited in size to 1 square foot in area, including signs utilized for advertising the sale or rental of property which may be placed only on the property advertised for sale or rental. This size limitation shall not apply to existing commercial or industrial uses for which the signs may not exceed 4 square feet in area and may be placed only on the property on which the commercial or industrial use occurs. Advertising displays or commercial signs for new or expanded commercial or industrial uses which are acceptable to the Secretary may not exceed 4 square feet in area and may be placed on only the property on which such commercial or industrial use occurs. Nonconforming signs may continue such nonconformity until they are destroyed, structurally altered, reconstructed, changed, or moved, but the period of such nonconformity may not exceed 2 years from the date the zoning ordinance imposing the restrictions contained in this paragraph is approved by the town or village.

§ 28.5 Variances and exceptions.

(a) Zoning ordinances or amendments thereto, for the districts comprising the Fire Island National Seashore may provide for the granting of variances and exceptions.

(b) Zoning ordinances for each of the districts established by the regulations in this part shall contain provisions which constitute notice to applicants for variances and exceptions that, under section 3(e) of the Act of September 11, 1964, the authority of the Secretary of the Interior to acquire "improved property" by condemnation would be reinstated if such property is made the subject of a variance, exception, or use which, in his opinion, fails to conform to the standards contained in the regulations in this part or to the zoning ordinances subsequently approved by the Secretary. Zoning authorities or owners of "improved property" may consult the Secretary as to whether any proposed variance or exception would terminate the suspension of his authority to acquire the affected property by condemnation. The Secretary, within 60 days of the receipt of a request for such determination, or as soon thereafter as is reasonably possible, will advise the owner or zoning authorities whether or not the intended use will subject the property to acquisition by condemnation.

(c) Pursuant to section 3(d) of the Act of September 11, 1964, every zoning ordinance or amendment thereof, for the districts comprising the Fire Island National Seashore shall have the effect of providing that the Secretary of the Interior be given notice of any variance granted under, or any exception made to, the application of such ordinance or amendment.

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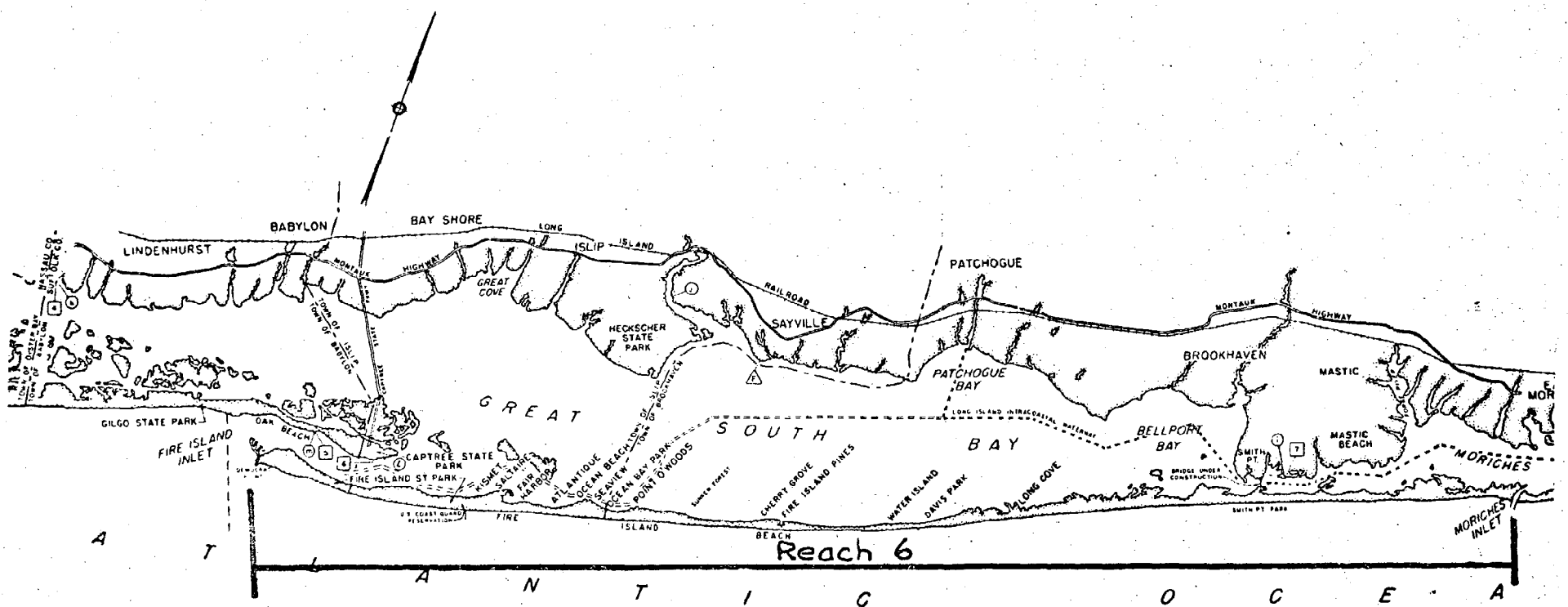
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MONTAUK HIGHWAY
MASTIC
GILGO STATE PARK
FIRE ISLAND INLET
OAK BEACH
CAPTREE STATE PARK
FIRE ISLAND ST PARK
KISMET
SAILFISH
FAIR HARBOR
ATLANTIQUE
OCEAN BEACH
SEAVIEW
OCEAN BAY PARK
POINT O'WOODS
GREAT SOUTH BAY
LONG ISLAND INTRACOASTAL WATERWAY
BELLPORT BAY
CHERRY GROVE
FIRE ISLAND PINES
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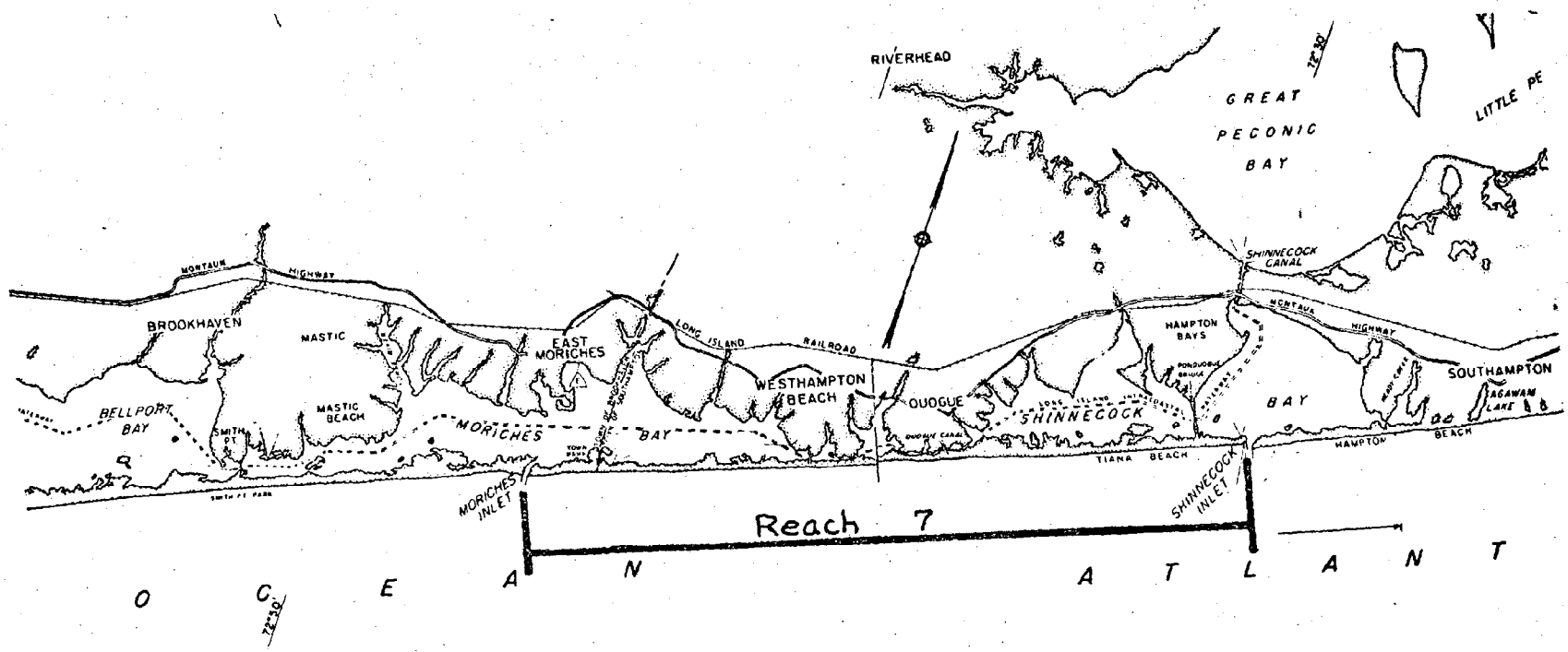
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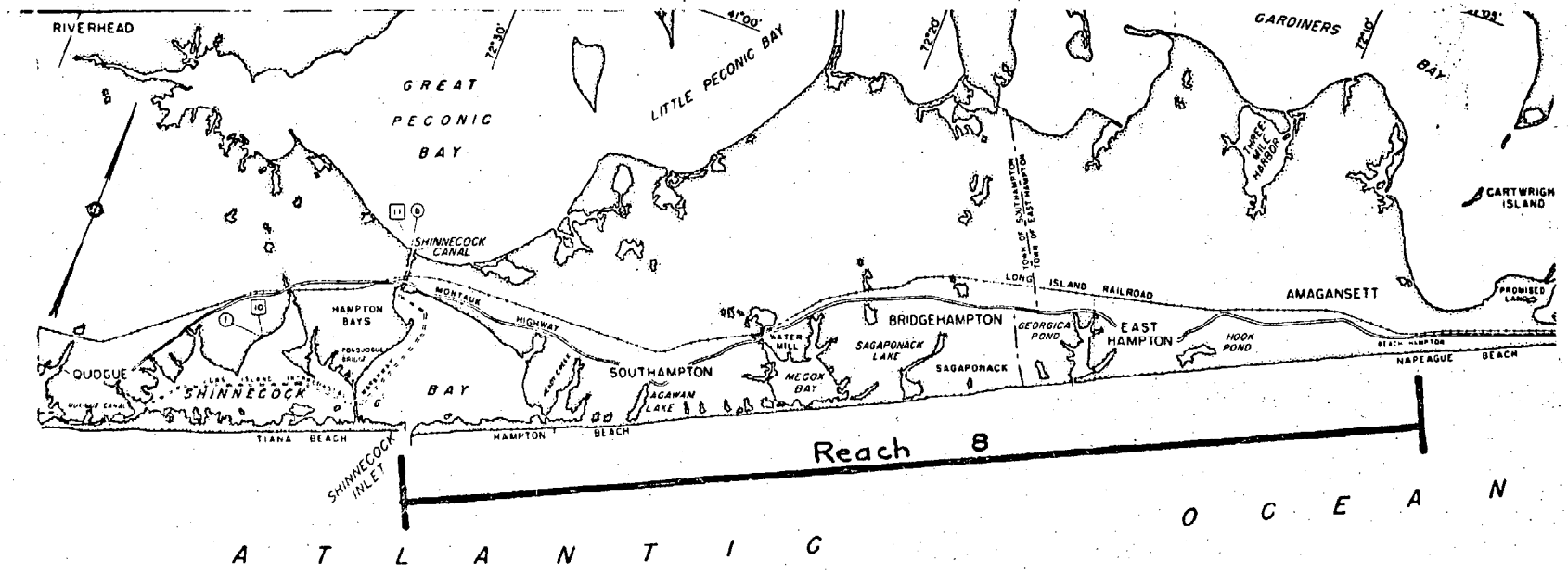
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MECOX BAY
WATER MILL
BRIDGEHAMPTON
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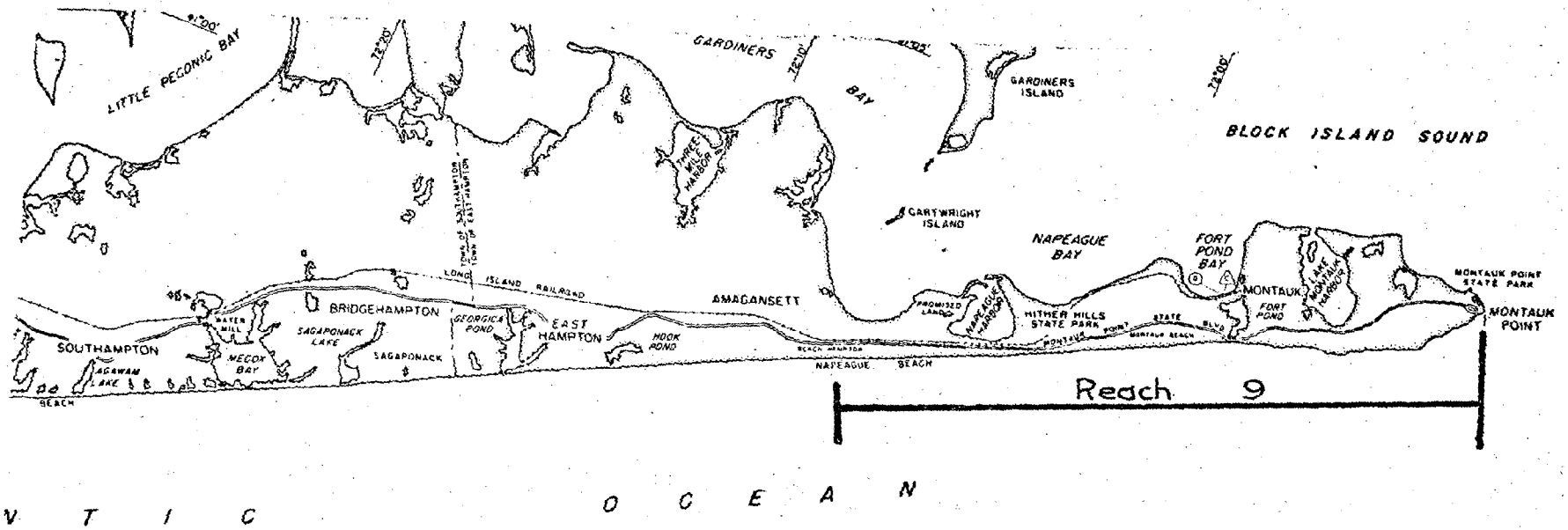
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MONTAUK POINT STATE PARK
MONTAUK POINT
LONG ISLAND RAILROAD
AMAGANSETT
SOUTHAMPTON
BRIDGEHAMPTON
SAGAPONACK LAKE
SAGAPONACK
GEORGICA POND
EAST HAMPTON
HOOK POND
PROMISED LAND
HITHER HILLS STATE PARK
FORT POND
NAPEAGUE BEACH
Reach 9
O C E A N

Outline for Second Phase

I. Literature Search

- A. State
- B. Federal
- C. Local
- D. Other

II. Coordination with Local Interests

- A. Land Use Planners
- B. Private Interests

III. Coordination with Federal Interests

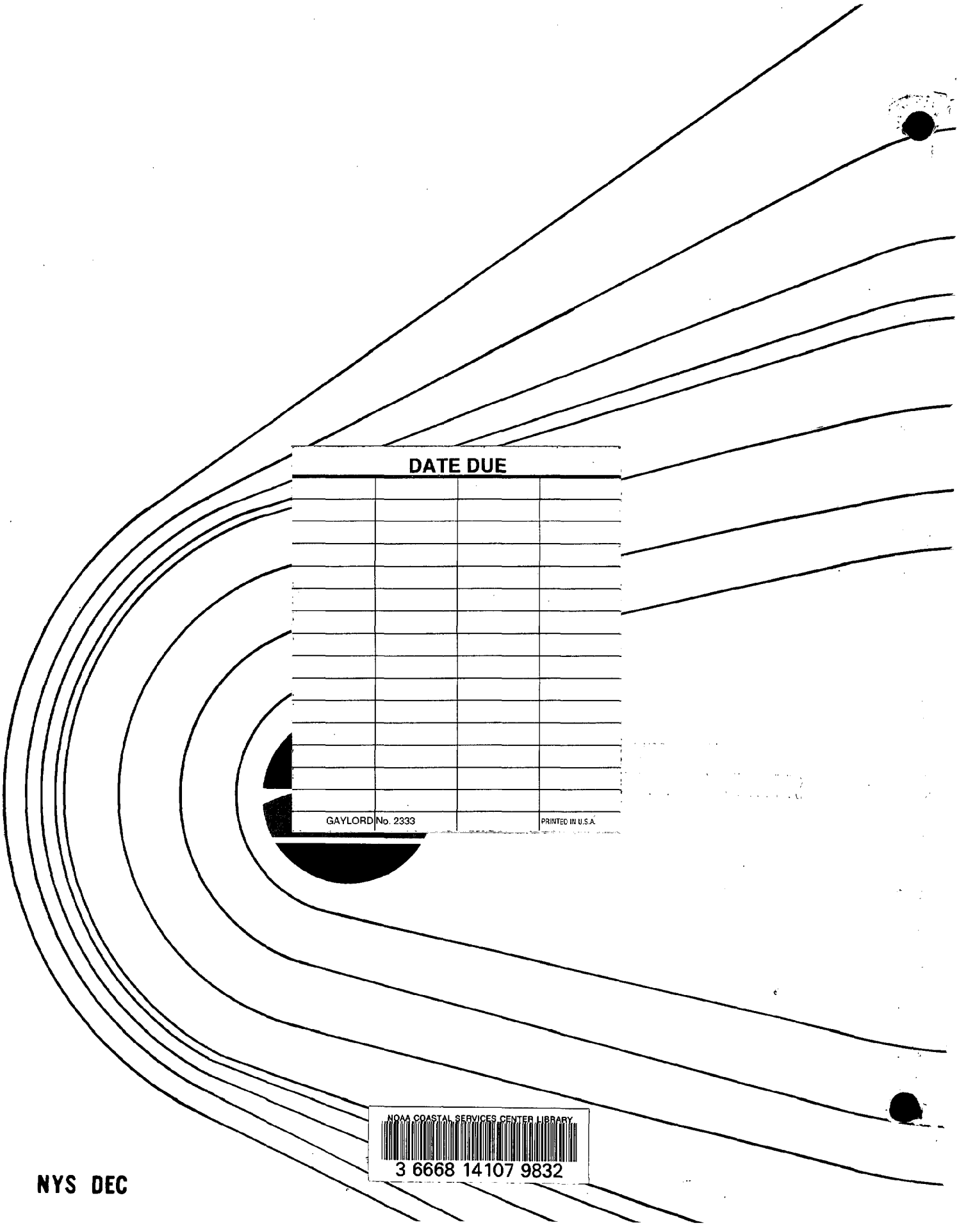
IV. Preparation of Alternative Plans

V. Coordination and Participation

- A. Local Government
- B. Federal Government
- C. General Public

VI. Preparation of Preliminary Reach Plans

- A. Methods
- B. Costs
- C. Responsibility of Local, State and Federal Governments
- D. Changes Needed in Existing Policies, Regulations, or Legislation



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