

COASTAL ZONE
INFORMATION CENTER

ACTIVITY NUMBER 7

Analysis of Natural Resources

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New York State Coastal Zone Management Program

ACTIVITY NO. 7 - ANALYSIS OF NATURAL RESOURCES

General Description

The purpose of this program activity is to continue the first year's work of providing basic and essential resource data as input for determining management programs and legislation and, particularly, for defining permissible land and water uses and for designating geographic areas of particular concern.

TASK 7.1

STATEMENT OF TASK

Mapping and Analysis of Wetlands

Products Expected

1. Maps of freshwater and tidal wetlands for the entire coastal zone.

DEC

Progress and Prognosis

70% complete. a. Tidal wetland mapping is 95% complete.* A problem exists in obtaining prints of these photomaps from the contractor and a court action will determine when the remaining maps will be available. However, DEC possesses proof sets of all tidal wetland photomaps in appropriate regional offices and makes this information available to local planning agencies and others. b. Freshwater wetland mapping is running several weeks behind schedule due to personnel changes and computer digitizer problems. It is expected that all work will be completed by the end of May, 1977.* Completed maps have been made available to CZM participants and other local planning and environmental agencies. The following have taken advantage of available maps: SLEOC; NYC Department of City Planning; Black River-St. Lawrence RPB; Erie and Niagara Counties RPB; and Wayne, Ulster, Rensselaer and Nassau Counties.

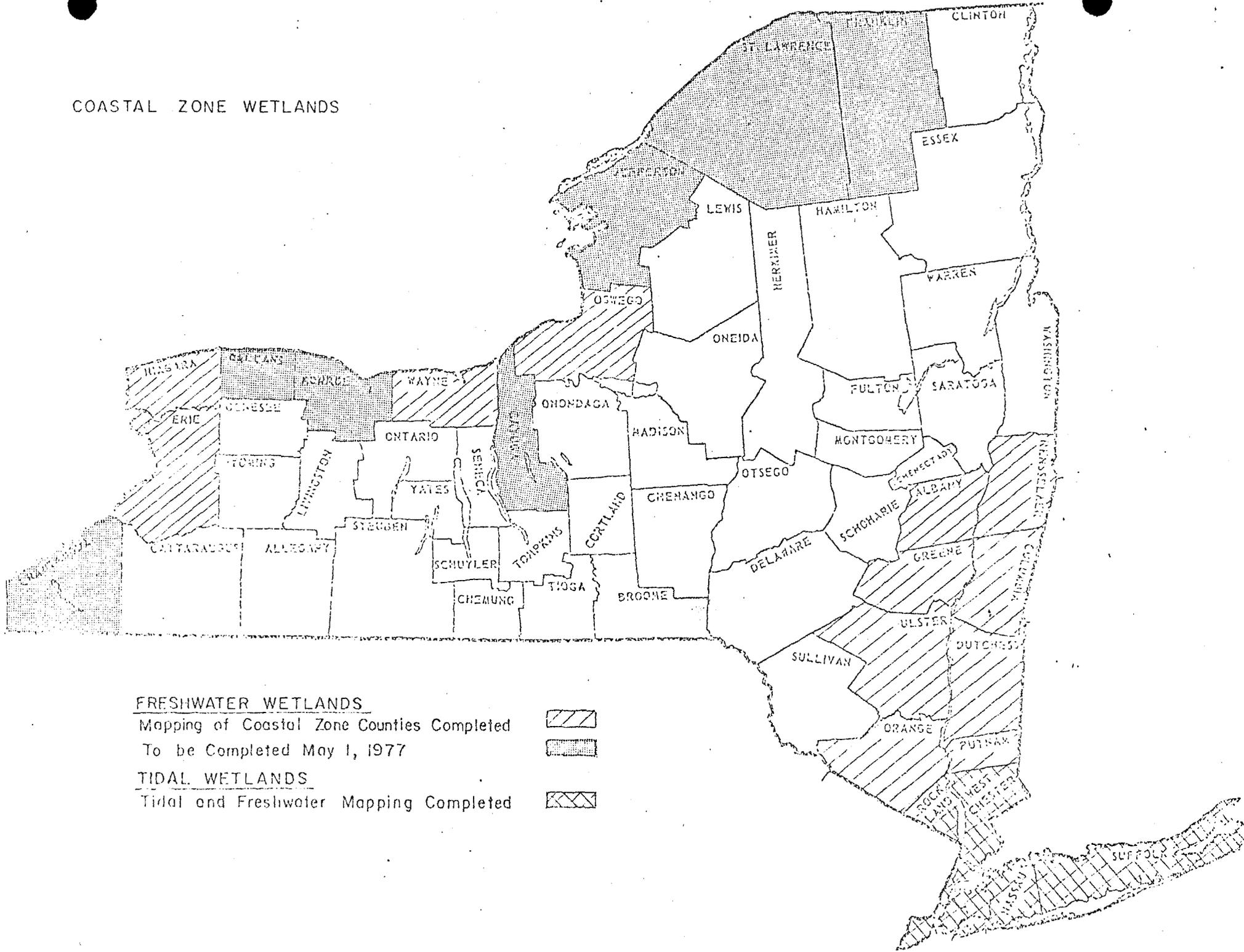
*See attached progress map.

2. Technical report containing data and information on permissible uses with wetland areas.

Progress and Prognosis

60% complete. Sections covering permissible and priority uses for the wetlands of Long Island and the Hudson River were prepared as part of the first year report, "An Assessment of Categories Used to Inventory Areas of Particular Concern to the Preservation and Maintenance of Fish and Wildlife Populations in the Coastal Zone of Long Island and the Hudson River", released in July, 1976. Similar sections will be included in fish and wildlife habitat reports prepared for the Great Lakes as part of Task 7.3. In addition, under NYS Environmental Conservation Law, Article 25, the State has recently adopted tidal wetland development regulations which explicitly define incompatible uses and uses for which permits may be required in various types of tidal-related wetlands. A similar approach is being considered to implement the State's freshwater wetlands law (Environment Conservation Law, Article 24) and final regulations are currently being drafted. (Granting of permits under present freshwater wetland interim regulations is based on proof of hardship). A brief summary report of this progress in identification of permissible and priority uses in wetlands will be included as part of this task at the end of the program year.

COASTAL ZONE WETLANDS



FRESHWATER WETLANDS

Mapping of Coastal Zone Counties Completed 
 To be Completed May 1, 1977 

TIDAL WETLANDS

Tidal and Freshwater Mapping Completed 

TASK 7.2

STATEMENT OF TASK

Flood Plain Management and Erosion Control Programs in the Coastal Zone

Products Expected

1. Report setting forth flood plain management and erosion control program requirements for the State's coastal zone. The document will contain information identifying flooding and erosion problems in each of the various major shore segments of the State. It will also examine various alternatives for controlling or managing these problems and recommend certain implementation measures.

DEC

Progress and Prognosis

50% complete - See attached report outline. As part of * the first year work, an interim report was completed on erosion, flooding and hurricane damage problems on Long Island's * south shore; consideration of management alternatives for this area is part of the second year work. In addition, work continues on schedule for the Great Lakes, Long Island Sound and the Hudson. Recent emphasis has been on detailing the findings of this year's work on the flooding and erosion problems of * Lakes Erie and Ontario (west of Cayuga County) and the Niagara River. While some elevation information on flood prone areas for the Great Lakes is available, it is not final. The Corps of Engineers is currently developing both open coast and embayment flood level information for all of the Great Lakes in a study being done for the Federal Insurance Administration (HUD). Products of this study will not be available until the third year State CZM Program is under way and modifications of present flood prone areas will be made at that time. Work is also being carried out on the Hudson River coastal area. Work is also under way on the Hudson River area and available flood hazard information from FIA will be utilized. River bank and shoreline erosion is not a particular program along the Hudson but sheet erosion on upstream tributaries results in sedimentation problems in the coastal zone portions of the Hudson. Work there is focusing on sedimentation and the resultant need for dredging and disposal of spoil. Some information on dredge spoil disposal and sedimentation has been obtained from a report prepared for the Corps of Engineers, "New York City and Hudson River Water Use Study." Other sources are being investigated.

2. Mapped data identifying flood plain management and erosion control management areas at the designated scale of 1:24,000.

DEC

Progress and Prognosis

15% complete. Information for flood hazard mapping is based on FIA (HUD) maps. Where more detailed surveys have been made for FIA, in some cases the maps must be reduced to the 1:24,000 scale for CZMP critical areas mapping. Most of this information is available with the exception of revisions which may be necessary as a result of further specific FIA studies such as the work noted above on the Great Lakes. To date, flood data have been collected for about 70% of the coast but have yet to be transferred to the CZM base map series. *

A greater problem exists with erosion control in that data at an acceptable scale is not available. Information from the Corps of Engineers National Shoreline Survey is available by reach and has been plotted at 1:24,000. However, better information is being investigated and if available will provide more exact maps. Over the next few years, it is expected that FIA will develop much improved erosion hazard information. *

In the program year final report, recommendations will be made as to how the State should go about deriving more specific erosion control information for use in the third year.

NOTE: While other program participants were not assigned specifically to this Task, flood plain and erosion control problems are being covered in their other work tasks including permissible uses and GAPC's.

OPERATIONAL DEFINITION
OF
"DIRECT AND SIGNIFICANT IMPACT"

The result of an action which is imposed on a coastal resource in such a way that the primary causal action can be determined to originate, or where the medium through which the impact is conveyed is, within the State's coastal waters and adjacent shorelands and which by itself, or cumulatively by repetition, imposes changes in the character of the resource or on its availability for other uses, which are not reversible or reversible only at a high economic, social, or environmental cost, which are of relatively long duration, or which generate social, economic and/or environmental conflicts sufficient to arouse substantial controversy.

December 20, 1976

Mr. David Kinsey
Chief, Office of Coastal Zone Management
Department of Environmental Protection
Trenton, New Jersey 08625

Dear David:

In response to your letter of October 20, I would like to reiterate the discussion we had regarding GAPC's in Trenton on November 19. We hope that this letter provides adequate response to the issues you have raised.

First, the entire coastal zone does not need to be divided into discrete or overlapping GAPC's. GAPC's may be designated either site specifically, or generically, or a combination of the two can be used. We agree with your assessment of this point cited in your letter to David Hoag on November 24.

With regard to permissible uses and priority uses within the coastal zone, there is a distinction to be made here. The permissible uses requirement refers to the state having made a determination regarding the ability of a particular area or resource unit to support a particular use or activity. This requirement relates to the physical capabilities of a site. The priority use determination is a policy matter which calls for the state to make a judgement as to how its land is to be used. A 306 program needs to identify permitted uses throughout the coastal zone, whether within GAPC's or outside GAPC areas. Priority uses need to be established within all designated GAPC's. However, generally it is the state's option whether they wish to designate priority uses outside GAPC areas. There may be instances where a state may wish to establish priority uses outside GAPC areas based on an examination of the state's policies and guidelines.

It should be noted that our overriding concern is the establishment of solid coastal zone programs. The importance of GAPC's in obtaining this goal will depend somewhat on the degree of comprehensive state control employed elsewhere within the coastal zone.



I hope this letter has adequately addressed the questions raised in your October 20 letter and I feel that this confirms the conclusions reached in your November 25 letter to David Hough.

If I can be of further assistance on this point or others, please feel free to contact me.

Sincerely,

Kathryn Cousins

Kathryn Cousins
North Atlantic Regional Coordinator
Office of Coastal Zone Management

W. Dan et al?

Terry Williams

NOV 26 1976
3466

November 24, 1976

Mr. David Hough
Delaware State Planning Office
530 South duPont Highway
Dover, Delaware 19901

ORIGINAL FILED BY
18/11/76

Dear David,

Thanks for sending me the copies of your boundary paper. They are very helpful in our work, including the question of the lateral seaward boundary.

Last week we met with Kathy Cousins, John Milholland, Robert Keifer and Richard O'Connor from NOAA to review our progress to date. We were able partially to clarify the NOAA interpretation of geographic areas of particular concern. Here is my current understanding of this issue.

First, the entire coastal zone does not have to be lopped up into discrete GAPC's. Permissible uses are required to be identified for the GAPC and non-GAPC parts of the coastal zone. Priority uses are only essential for GAPC's.

Another interesting evolving interpretation concerns the definition of "direct and significant" impacts. As I understand the interpretation, the phrase "direct and sufficient" could be used as a tool to define the boundary of the coastal zone. The statutory intent of the Federal Coastal Zone Management Act, as articulated in Section 102, should then be used to define the uses subject to coastal management within the designated coastal zone. My notes show that Robert Keifer indicated "direct and sufficient" should be defined around the problems and values of a particular state's coast.

I believe this is the beginning of clarification of issues we discussed at our Cape Charles meeting. I requested that NOAA staff prepare a written document indicating this interpretation of the definition of direct and

Mr. David Hough

-2-

November 24, 1976

sufficient as well as the interpretation of the requirements for CAPC's.

If you have any questions on this, please call. If not, I look forward to seeing you again at Airlie House.

Sincerely yours,

David N. Kinsey, Chief
Office of Coastal Zone Management

DNK/baa

cc: Mr. Ken Perkins, Maryland
Mr. Michael Wolfe, Delaware Valley Regional Planning
Commission
Mr. Henry Williams, New York State
Ms. Kathryn Cousins, NOAA-CCZM
Mr. John Weingart
Mr. Steward Houghen

original letter
filed 112.23 NJ

October 20, 1976

Ms. Katherine Cousins
Northeast Regional Coordinator
National Oceanic and Atmospheric
Administration
Office of Coastal Zone Management
2001 Wisconsin Avenue, N.W.
Washington, D.D. 20035

Dear Kathy:

At the Mid-Atlantic Regional Program Managers meeting held at Cape Charles, Virginia, on Friday, October 15th, we discussed geographic areas of particular concern and land and water uses in some detail. The discussion left several unanswered questions that Gerry Bachman suggested be stated in writing and directed to NOAA for a response. While you were not privy to the discussion, I am certain that Gerry Bachman and John Phillips will fill you in on the gist of the discussion.

Here are the questions that I need answers to in order to prepare the CAPC element of New Jersey's management program.

- (1) Must the entire coastal zone be divided into discrete and or overlapping CAPCs?
- (2) Must CAPCs be site - specific, such as "the City of Atlantic City or Barnegat Light State Park," or may CAPCs be generic, such as, "a tidal wetlands or all state parks in the coastal zone?"
- (3) Are priority and permissible land and water uses to be defined only within designated CAPCs?

- (1) If parts of the coastal zone need not be designated as GAFCS, then to what degree must permissible and priority land and water uses need to be defined for non-GAFCS parts of the coastal zone?

Thank you for your assistance in clarifying these points.

Sincerely yours,

ORIGINAL SIGNED BY
/S/ DAVID N. KINSEY

David N. Kinsey, Chief
Office of Coastal Zone Management

DNK:cpp

cc: Ms. Gerry Sachman
Mr. Henry William, New York
Mr. Michael Wolfe, DVRPC
Mr. David Hough, Delaware
Mr. Kenneth Perkins, Maryland
Mr. Don Budlong, Virginia
Mr. John Weingart
Mr. Stewart Houghton

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Geographic Areas of Particular Concern

FEB 4 1977

Introduction

The purpose of this paper is to describe GAPC requirements and to establish procedures for DEC's role in the identification, mapping, designation, and management of Geographic Areas of Particular Concern in New York State's coastal zone. Topics covered include:

- GAPC Identification and Designation Requirements of the CZM Act, Rules and Regulations, and Threshold Papers
- Determining Acceptable and Priority Uses for GAPC's
- Developing a Management Program for GAPC's
- DEC Contract Requirements for GAPC Work
- Status of DEC GAPC Work
- Schedule for Second and Third Year DEC GAPC work

Note is made here that not all GAPC's are the responsibility of DEC to identify. Such areas eligible for possible GAPC designation; and not falling within DEC's functional areas of concern, include recreational areas such as beaches; areas where development and facilities are dependent upon a coastal location; areas of unique geologic or topographic significance to industrial or commercial development; and areas of urban concentration. While CZM contractors at the regional and local level are identifying and recommending these types of areas for GAPC's, they are also identifying GAPC types falling within DEC's functional areas of concern. It is extremely important, therefore, that DEC coordinate its GAPC efforts. With local contractors to ensure that their natural resource-related GAPC work serves as input to DEC work and that their recommendations for development-related GAPC's are available for the identification and resolution of conflicts that may occur with DEC-recommended GAPC's.

The absence of expected guidelines from the Department of State on identifying

and evaluating GAPC's, determining acceptable and priority uses, and identifying and analyzing potential conflict areas also makes it imperative that DEC and the local contractors integrate and coordinate their GAPC efforts. The necessity for this is reflected in the attached schedule for second and third year DEC GAPC work.

GAPC Identification and Designation Requirements of the CZM Act, Rules and Regulations, and Threshold Papers

Geographic Areas of Particular Concern (GAPC) are defined and discussed in the Coastal Zone Management Act, the Rules and Regulations (Parts 920 and 923) and, in particular, Threshold Paper # 3 - Geographic Areas. Threshold Paper # 2: Land and Water Uses also discusses the requirements for development of use priorities or policies for GAPC's.

The Act states that, as a prerequisite to Section 306 approval, each State must provide for "an inventory and designation of areas of particular concern within the coastal zone" (see 305(b)(3)). The Rules and Regulations (Part 920.13) and Threshold Paper # 3 specify broad types of areas that may be considered for designation as GAPC's including:

1. Areas of unique, scarce, fragile, or vulnerable natural habitats, physical features, historical significance, cultural values, and scenic importance;
2. Areas of high natural productivity or essential habitat for living resources, including fish, wildlife, and the various trophic levels in the food web critical to their well being;
3. Areas of substantial recreational value and/or opportunity;
4. Areas where developments and facilities are dependent upon the utilization of, or access to, coastal waters;
5. Areas of unique geologic or topographic significance to industrial or commercial development;

6. Areas of urban concentration where shoreline utilization and water uses are highly competitive;
7. Areas of significant hazard if developed, due to storms, slides, floods, erosion, settlement, etc.; and
8. Areas needed to protect, maintain or replenish coastal lands or resources, such areas including coastal flood plains, aquifer recharge areas, sand dunes, coral and other reefs, beaches, offshore sand deposits, and mangrove stands.

There is a further requirement in the Act that "the management program makes provisions for procedures whereby specific areas may be designated for the purpose of preserving or restoring them for their conservation, recreational, ecological, or aesthetic values" (Section 306(c)(9)). The threshold paper views these areas for preservation or restoration as subcategories of GAPC's. It is emphasized that they do not have to be actually designated prior to management program approval but merely have procedures developed by which designation may eventually be made.

The threshold paper (#3) emphasizes that "mere designation of GAPC's is not adequate; the process of designation must lead to specific recognition and action within the framework of the management program." Accordingly, to achieve OCZM management program approval (306), the process used for the identification and designation of GAPC's must be described and include at least the following steps:

1. Identification of the criteria used for identifying GAPC's including consideration of the broad types of areas listed in one to eight above.
2. A review of the characteristics of the state's entire coastal zone and application of the selected criteria to indicate candidate sites for designation.

3. A description of the characteristics of each area selected which are indicative of the need for special management techniques. Interpretative note: This should not be interpreted as requiring that each GAPC area selected must be so described. Rather, it should be interpreted such that only unique, significant or fragile type GAPC's require site-specific descriptions. Specific coastal resource-type GAPC's (wetlands, dunes, shellfish beds, etc.) would require only general, non-site specific descriptions.
4. A description of the boundaries of each GAPC, with the degree of detail and preciseness varying according to the special management techniques proposed. Where regulatory authority is relied upon, for example, precise boundaries are essential. With other management tools, such as resource management activities to improve shellfish beds, a more general description may be sufficient.
5. A description of the GAPC designation procedure to include:
 - a. identification of the agency or agencies empowered to make such designations.
 - b. actual written designation of the GAPC for specified purposes (does not apply to areas for preservation or restoration).
Interpretative note: This refers to the acceptable land and water uses determined as appropriate for each type of GAPC.
 - c. identification of the agency or agencies empowered to formulate policy and implement management techniques for the GAPC's.
6. A description of the procedures by which specific GAPC's may be designated as areas for preservation or restoration.

Threshold Paper #3 suggests two basic acceptable ways for selecting GAPC's which could be used singly or in combination:

1. Qualification: Qualifying criteria could be developed and applied to the entire coastal zone, resulting in the possible designation as GAPC's of all areas of a single resource, such as sand dunes adjoining beaches. No further designation of such areas would be required to fulfill this threshold. More selective criteria could also be developed and applied for designating more unique type areas where special management techniques may be important, e.g. habitat of a rare and endangered animal species, a particularly significant wetland, or an area with an especially scenic vista. Note - It is important to reiterate that GAPC's may be of two types, either specific resource areas within the coastal zone (beaches, wetlands, shellfish beds, etc.) or unique or especially significant areas where special management techniques are required to control uses. An example of such techniques would be direct land or easement purchase by a unit of government to ensure that acceptable uses are controlled.
2. Nomination: Local governments, other state agencies and the public could be involved in GAPC selection. For this procedure to be acceptable, guidelines are required which reflect state concerns around which such nominations can be submitted and reviewed.

Determining Acceptable and Priority Uses For GAPC's

"Threshold Paper #2: Land and Water Uses" describes the processes to be used for the determination of acceptable (acceptable and permissible are interchangeable terms) land and water uses within the coastal zone. There are two major requirements that apply with respect to GAPC's:

1. A rationale must be developed for the determination of acceptable land and water uses in designated GAPC's. This rationale is to form the basis for regulating and/or managing these uses for GAPC's. For developing a rationale, the threshold paper states that an analysis should be undertaken of (a) the impact of each use (or the effects of such use or class of uses) upon the GAPC; and (b) the compatibility, or suitability of each use with other uses in close proximity.
2. Policies or priorities for uses in GAPC's must be developed and incorporated into the management program.

Developing a Management Program for GAPC's

There are two types of management categories applicable, depending upon the nature of the GAPC. As noted under "(1) Qualification" above, GAPC's may be either designated from specific resource areas (beaches, wetlands, shellfish beds, etc.) or from unique or especially significant areas (habitat of a rare and endangered animal species, a scenic vista, etc.). The first management category consists of those GAPC's designated from specific resource areas. According to Threshold Paper #3, policies or priorities developed for this category of GAPC's "must form the basis for the preparation of rules and regulations or other implementing guidance which uses legal authority over land and water uses".

On the other hand, for the second category of GAPC's no such requirement exists, although regulatory authority can be used. More often, Threshold Paper #3 suggests, special management techniques or tools would be used, such as "creative use of A-95 reviews, direct land or easement purchase, etc.". For these types of GAPC's the final step of identifying and applying specific management tools for each GAPC is not required at the time of management program approval but can be "scheduled for completion within a reasonable time after approval, say one year". Requirements for this final step are:

1. a description of how special management policies and techniques will apply to each GAPC, to include:
 - a. objectives and policies for management of each area consistent with area characteristics.
 - b. specific management tools which will be applied to GAPC's above and beyond the basic authorities needed to carry out the management program throughout the coastal zone.

DEC Contract Requirements for GAPC Work

The second year CZM contract calls for DEC to map and analyze GAPC's to include:

- inventory and analyses of significant fish and wildlife habitats
 - identification and analyses of other possible GAPC's such as agricultural areas, forest lands, aquifers, and mineral deposits.
 - designation of areas for preservation or restoration
 - assist in determining acceptable and priority uses in identified GAPC's
- (This was to be carried out in accordance with guidelines developed by DOS. These have not been promulgated).

Status of DEC GAPC Work

Based on inventory work accomplished to date, DEC has identified the following types of areas that may be considered for designation as GAPC's, although other types may be considered as work progresses:

1. Tidal wetlands
2. Freshwater wetlands
3. Estuaries and embayments
4. Coastal ponds
5. Tidal mudflats

- 8-
6. Littoral zones
 7. Deepwater habitats
 8. Shellfish beds
 9. Tributary streams
 10. Fish and wildlife concentration areas
 11. Rare, threatened and endangered species habitat
 12. Lake Trout spawning grounds
 13. Unique ecological areas
 14. Barrier beaches/sand dunes
 15. Agricultural lands of significance
 16. Forest land suitable for forest management
 17. Prime groundwater aquifers and/or sources of public water supply
 18. 100 year flood plains
 19. Steep slopes
 20. Highly erodible areas
 21. Urban open space suitable as wildlife habitat
 22. Public boating and fishing access sites
 23. Non-renewable resource areas
 24. Water quality limiting segments

Mapping of GAPC boundaries will be accomplished, where feasible, by March 31, 1977.

The mapping will be done on the coastal zone base maps prepared by DEC.

SCHEDULE FOR SECOND AND THIRD YEAR DEC GAPC WORK

The following is a detailed work schedule indicating the task sequence for completion of DEC's GAPC work early in the third year CZM program. An interim second year report to be completed and submitted to the Department of State before March 31, 1977 will consist of those products scheduled for completion before that date, as indicated below.

<u>TASK</u>	<u>Draft Product Completion</u>
1. Revise GAPC concepts paper	January 13
2. Prepare tentative outline of report to be submitted on March 31	January 13
3. Prepare flow chart of GAPC tasks	January 13
4. Prepare final list of types of DEC-recommended GAPC's	January 13
5. Develop preliminary brief descriptions of GAPC types indicating criteria for identification, boundaries, statewide distribution, rationale for GAPC designation, acceptable and priority uses, regulatory and/or management techniques, data sources and inventory status	January 14
6. Detail and refine, in consultation with program divisions, the initial criteria developed in #5 for the identification of possible GAPC's	January 21
7. Review during on-site visits, preliminary GAPC descriptions (#5) and detailed criteria (#6) with local contractors; obtain and review their GAPC recommendations	Three weeks following January 31
8. Using detailed criteria (#6) and input from local contractors (#7), determine specific locations of and make final recommendations for GAPC status of areas that are ecologically unique, significant, or fragile; review locations of and make final recommendations for GAPC status of broad coastal resource types (wetlands, dunes, shellfish beds, etc.)	February 15

TASK

Draft Product Completion

- | | |
|---|------------------|
| 9. In order to meet OCZM Threshold requirements, describe, in greater detail than in # 5, characteristics for the two categories of DEC recommended GAPC's: (a) site specific descriptions for each unique, significant or fragile type GAPC; and (b) general, non-site specific descriptions for the broad coastal resource type GAPC's. | March 4 |
| 10. Describe and map boundaries, where feasible, for recommended GAPC's. | March 31 |
| 11. Review GAPC recommendations with DEC divisions and local contractors | Week of March 14 |
| 12. Develop criteria for and recommend GAPC's suitable for preservation or restoration. | April 1 |
| 13. Develop a rationale for the determination of acceptable and priority uses for DEC-recommended GAPC's; include analysis of the impacts or effects of each use or class of uses upon the GAPC and the compatibility or suitability of each use with other uses in close proximity. | April 8 |
| 14. Determine and recommend, in conjunction with DEC divisions and local contractors, acceptable and priority uses for DEC-recommended GAPC's. | April 15 |
| 15. Develop recommendations on management policies and techniques for controlling uses in DEC-recommended GAPC's | May 15 |
| 16. Identify and resolve conflicts between DEC-recommended GAPC's and development-related GAPC's recommended by local contractors. | June 15 |

Outline of DEC GAPC Report to be Submitted
To DOS By March 31, 1977

The following is an outline of the interim report on Geographic Areas of Particular Concern to be submitted to DOS by March 31, 1977 in order to meet contract requirements under Task 7.3 of the 2nd year CZM work program. This report will describe second year DEC work on the inventory of natural resource areas and the identification and recommendation of areas for GAPC status. It will not be a complete report on GAPC's since the work related to determining acceptable and priority uses plus the identification and resolution of conflicts between DEC-recommended GAPC's and development-related DEC's will be carried on into the first three months of the third year program. Accompanying the report will be maps identifying GAPC locations and boundaries, throughout the State's coastal zone. There will be several other attachments: a GAPC Concept Paper which describes GAPC requirements and establishes procedures for DEC's role in the identification, mapping, designation and management of GAPC's; a flow chart depicting GAPC 2nd and 3rd year work tasks; and Technical Assessments of the fish and wildlife resources inventoried in the Long Island, New York City, Hudson River and Great Lakes CZ areas.

I. Introduction

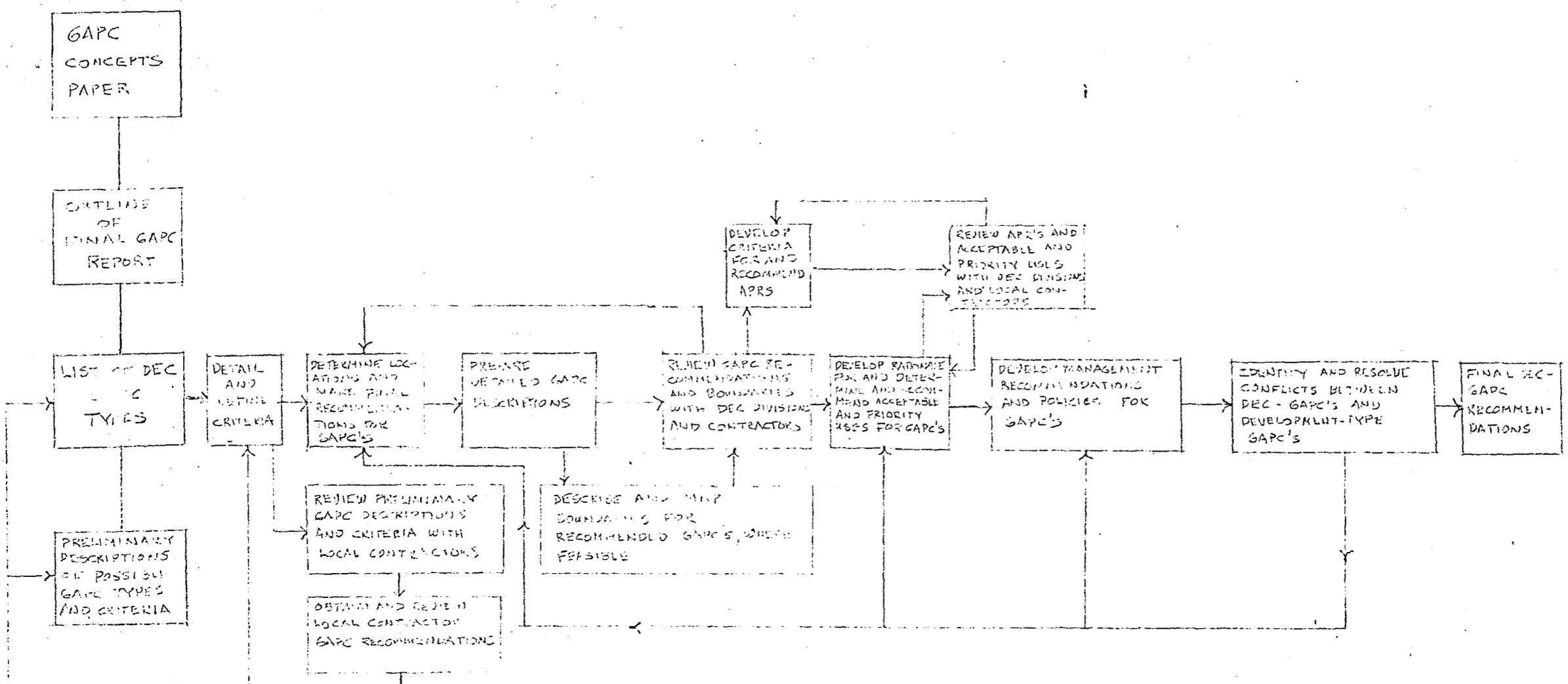
- A. Purpose of report
- B. Summary of findings

II. Description of DEC's CZM first and second year CZM resource inventory process as it relates to GAPC recommendations

- A. Significant fish and wildlife habitats
- B. Tidal and freshwater wetlands
- C. Water supply
- D. Flood plain management and erosion control
- E. Water quality

- F. Soils and slopes
- G. Non-renewable resources
- III. Determination, listing, and descriptions of types of natural resource areas proposed for DEC-recommended GAPC's.
- IV. Determination of criteria for GAPC identification
 - A. Description of criteria development process
 - B. Refinement of criteria
 - 1. Review with DEC program divisions
 - 2. Review with local CZM contractors
- V. Identification of and recommendations for DEC-related GAPC's
 - A. Input from local contractors
 - B. Specific locations for GAPC status of areas that are ecologically unique, significant, or fragile.
 - C. Specific locations of and final DEC recommendations for GAPC status of broad coastal resource types (Wetlands, dunes, shellfish, beds, etc.)
- VI. Detailed descriptions of DEC-recommended GAPC's
 - A. Site-specific descriptions for each unique, significant or fragile type GAPC including boundary descriptions.
 - B. General, non-site specific descriptions for broad coastal resource type GAPC's, including discussion of boundaries.
- VII. Reviews of GAPC recommendations with DEC divisions and local contractors.
- VIII. Recommendations for GAPC's suitable for preservation or restoration (APR's)

JAN 14 FEB 1 MARCH APR 1 MAY 1 JUNE 1 JULY 1



NOTE: THIS REPRESENTS THE GENERAL IDENTIFICATION PROCESS FOR ALL GAPC'S. THE TIME SEQUENCE FOR EACH TYPE OF GAPC MAY VARY SOMEWHAT FROM THIS.

List of DEC Natural Resource Type GAPC's

The list at the end of this paper represents the types of natural resource areas which will be recommended by DEC for GAPC status at certain locations in coastal areas. The areas listed reflect the requirements of the CZM rules and regulations (Part 920.13) and OCZM Threshold Paper #3 which specify eight broad types of areas that may be considered for designation as GAPC's. Seven of these types of areas form the basis for DEC's list. These seven are as follows:

1. Areas of unique, scarce, fragile, or vulnerable natural habitats, physical features, historical significance, cultural values, and scenic importance;
2. Areas of high natural productivity or essential habitat for living resources, including fish, wildlife, and the various trophic levels in the food web critical to their well-being;
3. Areas of substantial recreational value and/or opportunity;
4. Areas of significant hazard if developed, due to storms, slides, floods, erosion, settlement, etc.;
5. Areas needed to protect, maintain or replenish coastal lands or resources, such areas including coastal flood plains, aquifer recharge areas, sand dunes, coral and other reefs, beaches, offshore sand deposits, and mangrove stands;
6. Areas where developments and facilities are dependent upon the utilization of, or access to, coastal waters;
7. Areas of unique geologic or topographic significance to industrial or commercial development.

The following ten types of areas being considered for GAPC status by DEC contain different sub-area types within them. For example, an area recommended for GAPC

FEB 4 1977

status because it is an essential and productive natural habitat may have been so recommended because it is valuable underwater habitat for shellfish, or because it is a coastal freshwater wetland, or a tributary stream valuable for spawning purposes. In some cases, the GAPC may contain two or more different sub-areas. These different sub-area types will be shown on maps depicting GAPC's throughout the state. The ten GAPC types are:

1. Essential or productive natural habitats
2. Special ecological areas
3. Agricultural lands of significance
4. Significant forest lands
5. Prime groundwater aquifers and/or sources of public water supply
6. Natural hazard areas
7. Urban open space suitable as wildlife habitat
8. Public boating and fishing access sites
9. Non-renewable resource areas
10. Water quality limiting segments

In addition to these ten GAPC types, there are two additional type areas in which DEC has an interest, but only limited management responsibilities. These are "areas of scenic importance" and "areas of historical or cultural significance". The former is of interest because of DEC's statutory concern for natural beauty and the latter because of DEC's participation in the State Nature and Historic Preserve.

1. GAPC Type

Essential or productive natural habitats

Criteria for Identification

Essential or productive natural habitats comprise only those embayments, tributary streams, littoral zones, coastal wetlands including mudflats and swamps, adjacent upland habitats, or remote habitats used by coastal populations which support:

- a. Substantial numbers of a species possessing important recreational, cultural or commercial value.
- b. A species which would be seriously diminished within the immediate physiographic region if the area were lost as habitat.
- c. A species maintaining an important food chain relationship with such species classed above.

Boundaries

Generally speaking, the minimum peripheral boundaries should include those buffer areas which are essential for the maintenance and protection of the viability of the area of concern. For example, an estuarine area might include adjacent tidal wetlands, tidal mudflats, littoral zones, tributary streams, etc.

Statewide Distribution of Possible Areas

Statewide

Rationale for GAPC Designation

"Areas of high natural productivity or essential habitat for living resources."
(CZM Rules and Regulations Part 920.13)

Acceptable Uses

Resource management and recreation would be acceptable uses throughout the entire area of concern. However, in especially ecologically fragile areas recreation should be limited to more passive forms such as nature study, photography, non-motorized boating, etc. Aquaculture would be a permissible use as well as an activity of tremendous commercial importance in certain areas.

Priority Uses

Uses should preserve or enhance the primary ecological functions of each particular area.

Possible Regulatory and Management Techniques

- a. Tidal wetlands
- b. Freshwater wetlands
- c. Wild, scenic and recreational rivers
- d. SPDES
- e. Marine and coastal resources
- f. National Flood Insurance Program

- g. Wetland acquisition and restoration
- h. Fish propagation and management
- i. Approval of new solid waste management facilities
- j. Waste collection registration program
- k. Oil spill contingencies and liabilities
- l. Protection of waters
- m. Fish and wildlife management act
- n. State nature and historical preserve trust
- o. Parks and recreation
- p. Local zoning

Data Sources

- a. DEC fish and wildlife
- b. Local, regional or county planning boards
- c. Private individuals and groups

Status of Inventory

DEC's work on the Long Island/NYC/Hudson River area is nearly complete, Great Lakes to be finished by March 31, 1977.

2. GAPC Type

Special ecological areas.

Criteria for Identification

Special ecological areas shall include:

- a. Lake trout spawning sites
- b. Wildlife or fish concentration areas
- c. Habitats for rare, threatened, endangered or diminishing species
- d. Scarce, unique or fragile ecological areas
- e. Vulnerable habitats

Boundaries

Boundaries must include enough buffer area to insure the integrity of the ecological area.

Statewide Distribution of Possible Areas

Statewide

Rationale for GAPC Designation:

"Areas of unique scarce, fragile, or vulnerable natural habitats, or physical feature." (CZM Rules and Regulations Part 920.13)

Acceptable Uses

Varies, however uses should be limited to ones which will not diminish the quality which makes each particular area special.

Priority Use

Preservation or enhancement of each areas special qualities.

Possible Regulatory and Management Techniques

- a. Tidal wetlands
- b. Freshwater wetlands
- c. Wetland acquisition and restoration
- d. Protection of waters
- e. Marine and coastal resources
- f. Fish and wildlife management act
- g. Wild scenic and recreational rivers
- h. Parks and recreation
- i. State nature and historical preserve trust
- j. Endangered plant species protection
- k. Local zoning

Data Sources

- a. DEC fish and wildlife
- b. Local, county and regional planning agencies
- c. Private individuals and groups

Status of Inventory

Long Island and Hudson River complete; Great Lakes to be done by March 31, 1977.

3. GAPC Type

Agricultural lands of significance

Criteria for Identification

Criteria pertaining to soil characteristics and physical features are defined in: "Technical Report on the Identification and Mapping of Prime Farmland in the Coastal Zone Management Area of New York." Social and economic factors developed by Conklin and Linton in "The Nature and Distribution of Farming in New York State" are also considered.

Boundaries

Varies

Statewide Distribution of Possible Areas

Much significant agricultural land exists along Lakes Ontario and Erie except close to urban areas. Some significant farmlands are scattered along the Hudson River and eastern Long Island.

Rationale for GAPC Distribution

"Areas needed to protect, maintain, or replenish coastal lands or resources." (CZM Rules and Regulations Part 920.13)

Acceptable Uses

Resource management, agriculture, agriculture related commercial and residential, non-intensive recreation (hunting, field activities, etc.)

Priority Use

Agriculture

Possible Regulatory and Management Techniques

- a. Freshwater wetlands
- b. National flood insurance program
- c. Waste collection registration program
- d. Mined land reclamation
- e. Wild, scenic and recreational rivers program
- f. Agricultural districting
- g. Local zoning

Data Sources

- a. "Nature and Distribution of Farming in New York State," Conklin, 1969.
- b. Technical Report on the Identification and Mapping of Prime Farmland in the Coastal Zone Management Area of New York."
- c. SCS
- d. Local, county or regional planning boards.

Status of Inventory

Mapping of prime agricultural soils is approximately 1/3 complete. Mapping of prime farmland (socio-economic, soil and physical factors) has not been started.

4. GAPC Type

Significant Forest Lands

Criteria for Identification

Forest lands must be of sufficient quality and size to possess natural and/or economic value.

Boundaries

Varies with each location

Statewide Distribution of Possible Areas

Inventory not started by CZM staff.

Rationale for GAPC Designation

"Areas of essential habitat for living resources" and "areas needed to protect, maintain or replenish coastal lands or resources." (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Resource management, nature study, recreation and limited transportation.

Priority Use

Forest Management

Possible Regulatory and Management Techniques

- a. State nature and historical reserve trust
- b. Land and forest resources
- c. Forest Practice Act
- d. Revised forest tax law
- e. 1980 "Farm" plans (including forest lands)
- f. Wild, scenic and recreational rivers
- g. Protection of Natural and man-made beauty
- h. Parks and recreation
- i. Local zoning

Data Sources

- a. DEC lands and forests
- b. Local, county or regional planning boards
- c. LUNR maps

Status of Inventory

Not started by CZM staff.

5. GAPC Type

Prime groundwater aquifers and/or sources of public water supply.

Criteria for Designation

Those areas delineated in "Report on Water Supply Studies for Coastal Zone Management Program."

Boundaries

Varies

Statewide Distribution of Possible Areas

All CZ Subareas except L.I. Most of the major aquifers are located along the Hudson River. All major aquifers identified except two are used as sources of public water supply several other aquifers of importance can be found along the south shore of Lake Ontario. These are municipal intakes of water from Lakes Erie and Ontario plus the Hudson and St. Lawrence Rivers. Long Island Subarea. All public water supply of Nassau and Suffolk counties is derived from three major aquifers. There are five municipal and two private suppliers of public water supply.

Rationale for GAPC Designation

"Areas needed to protect, maintain or replenish coastal lands or resources..." (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Any use which does not preclude the water from being a present or potential source of public water supply.

Priority Use

Public water supply

Possible Regulatory and Management Techniques

- a. Realty subdivisions: Sewerage Service and water supply
- b. SPDES
- c. Protection of waters
- d. water supply approval
- e. River improvement program
- f. Siting of major stream electric generating facilities
- g. Approval of new solid waste management facilities
- h. Waste collection registration program
- i. Local zoning

Data Sources

- a. "Report on Water Supply Studies for Coastal Zone Management Program."
- b. "5a" county water supply reports.

Status of Inventory

Complete

6. GAPC Type

Natural Hazard Areas

Criteria for Identification

Such areas will include 100 year flood plains, areas of steep slopes (greater than 15%), highly erodible areas or other areas that would be a hazard if developed.

Boundaries

Varies with each category and location.

Statewide Distribution of Possible Areas

Statewide

Rationale for GAPC Designation

"Areas of significant hazard if developed, due to storms, slides, floods, erosion, settlement, etc." (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Flood plains - recreation, agriculture, resource management, open space, limited transportation.

Steep slopes - Forestry, watershed management, recreation.

Highly erodible areas - resource management

Priority Use

Flood plains - varies with location

Steep slopes - Forestry

Highly erodible areas - propagation of permanent vegetation to stabilize soils.

Possible Regulatory and Management Techniques

- a. Tidal wetlands
- b. Freshwater wetlands
- c. Protection of waters
- d. National flood insurance program
- e. River improvement program
- f. Wild, scenic and recreational rivers program
- g. Local zoning

Data Sources

- a. Official HUD flood hazard boundary maps
- b. Local, county or regional planning boards
- c. DEC

Status of Inventory

100 year flood plains - completely mapped; steep slopes - mapping completed by some contractors; shoreline erosion - mapping completed by at least 3 local contractors.

7 GAPC Type

Urban open space suitable as wildlife habitat

Criteria for Identification

Suitable open space may consist of uplands with a minimum of shrubs and grasses as vegetation, on banks or shorelands of wetlands, ponds, lakes, or streams. Total acreage must be at least 5 acres and shall be located with the confines of an urban area with a population of at least 10,000.

Boundaries

Generally, cultural features such as roads, rail lines or easily identifiable property boundaries should be used in urban areas.

Statewide Distribution of Possible Areas

Statewide

Rationale for GAPC Designation

"Areas of unique, scarce, fragile or vulnerable natural habitats...cultural values and scenic importance." (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Uses that would not interfere with the nesting, feeding, reproduction, migration, movement or other natural processes necessary to support present or potential wildlife populations. Resource management, nature study, and limited recreation would be permissible.

Priority Use

Management for propagation of wildlife populations. Establishment of nature trails or study areas to provide a wildlife or nature study experience for urban dwellers.

Possible Regulatory and Management Techniques

- a. Freshwater wetlands
- b. Tidal wetlands
- c. Wetland acquisition and restoration
- d. Fish and wildlife management act
- e. Land and forest resources
- f. Parks and recreation (state or local)
- g. Wild, scenic and recreational rivers
- h. State nature and historical preserve trust
- i. Gas pipeline and electric transmission certification
- j. Waste collection registration program.
- k. Local zoning

Data Sources

- a. Local planning boards
- b. Regional/county planning boards
- c. DEC fish and wildlife

Inventory Status

Hudson River, NYC, Long Island completed. Great Lakes area to be completed by March 31, 1977.

8. GACP Type

Public boating and fishing access sites

Criteria for Identification

Such areas shall be at least of local interest or importance and provide parking, facilities or areas for boat launching and access to fish.

Boundaries

Varies

Statewide Distribution of Possible Areas

There are 32 such areas existing throughout the state as recognized by DEC Fish and Wildlife and OPR. 23 areas are located in the Erie/Ontario/St. Lawrence Region and 9 in the Hudson/Long Island Region.

There are 75 areas identified as being potential access sites statewide.

Rationale for GACP Designation

"Areas where developments and facilities are dependent upon the utilization of, or access to, coastal waters". (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Any use which would not preclude the area from being a present or potential access site for boating, fishing, or other water sport activity.

Priority Use

Public boating and fishing access site.

Possible Regulatory and Management Techniques

- a. Tidal wetlands
- b. Freshwater wetlands
- c. National Flood Insurance Program
- d. Shore erosion control program
- e. Public access to fishing areas
- f. River improvement program
- g. Local zoning

Data Sources

- a. DEC
- b. OPR

Status of Inventory

Complete

9. GAPC Type

Nonrenewable resource areas

Criteria for Identification

Areas containing commercially important reserves of nonrenewable resources.

Boundaries

Varies

Statewide Distribution of Possible Areas

Along the Hudson River important deposits of high quality marble, granite, sand gravel, clay and other minerals can be commercially excavated. Lake Erie, Lake Ontario and especially Long Island all contain deposits of sand and gravel. Lake Erie also has a good potential for natural gas production.

Rationale for GAPC Designation

"Areas of unique geologic or topographic significance to industrial or commercial development." (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Any uses which don't economically or physically preclude the future use of the resource.

Priority Use

Possible Regulatory and Management Techniques

- a. Oil spill contingencies and liabilities
- b. Mined land reclamation
- c. Oil and gas well spacing, pooling and utilization
- d. Oil and gas leases on state lands
- e. Plugging oil and gas wells
- f. Protection of waters
- g. Tidal wetlands
- h. Freshwater wetlands
- i. Public lands law

Data Sources

- a. State geological survey

Status of Inventory

Much available data. CZM staff has not yet started to gather data.

10. GAPC Type

Water quality limiting segments

Criteria for Designation

Any water segment for which it is deemed that more stringent requirements beyond "Best Practicable Treatment" are necessary to maintain applicable water quality stream standards.

Boundaries

As delineated by the N.Y.S. Water Quality Management Plan.

Statewide Distribution of Possible Areas

The majority of water classified water quality limiting are located in the Long Island-NYC region. All Long Island ground water is classified water quality limiting. Other segments include several tributaries of Lakes Erie and Ontario and a portion of the Hudson River below Troy.

Rationale for GAPC Designation

"Areas needed to protect, maintain or replenish coastal lands or resources" and "essential habitat for living resources, including fish..." (CZM Rules and Regulations Part 920.13).

Acceptable Uses

Any uses which are compatible with the assigned best usage classifications.

Priority Use

Fishing, swimming

Possible Regulatory and Management Techniques

- a. SPDES
- b. Tidal wetlands
- c. Freshwater wetlands
- d. River improvement program
- e. Siting of major stream electric generating facilities
- f. Approval of new solid waste management facilities
- g. Waste collection registration program
- h. Fish propagation and management
- i. Marine and coastal resources
- j. Oil spill contingencies and liabilities
- k. Plugging oil and gas wells
- l.

Data Sources

- a. NYS Water Quality Management Plans
- b. "NYS Continuing Planning Process-1973."

Inventory Status

Classification of water bodies as water quality limiting segments is a continuing process, with additional redesignations probable. The "N.Y.S. Continuing Planning Process-1973 has completed a preliminary inventory

of New York State. In the development of the N.Y.S. Water Quality Management Plans more detailed segment evaluations' were made. The Coastal Zone is located within 11 sub-basins of which 6 have water quality management plans completed.

II. GAPC Type

Areas of historical or cultural significance.

Criteria for Designation

- a. National historic register and/or
- b. State list of historical sites and/or
- c. State nature and historical reserve trust - designated lands and nominations

Boundaries

Varies

Statewide Distribution of Possible Areas

Statewide

Rationale for GAPC Designation

"Areas of unique, scarce, fragile or vulnerable... historical significance, cultural values and scenic importance."

Acceptable Uses

Varies

Priority Uses

To preserve or enhance the qualities that make each area historically or cultural significant.

Possible Regulatory and Management Techniques

- a. State Nature and historical preserve trust.
- b. Wild, scenic and recreational rivers program
- c. Protection of natural and man-made beauty
- d. Parks and recreation

Data Sources

- a. OPR
- b. HRVC (Hudson River Valley Commission)
- c. Subcontractors

Status of Inventory

DEC has mapped historical sites along the Hudson River. Other contractors have started and completed similar mapping.

12. GACP Type

Areas of scenic importance

Criteria for Identification

LISS Criteria

Topographic complexity
Shoreline complexity
Vegetative integrity
Vegetative diversity
Color (Hue) ingredients
Pictorial composition
Vividness
Shore dynamics
Ecosystem continuity
Near/far contrast
Uniqueness (scarcity)
Endangerment
True-to-form rurality
True-to-form townscapes
Human dynamics
Absence of detractions
Instructive qualities
Soil/island horizons
Sensitivity to change

Boundaries

Varies

Statewide Distribution of Possible Areas

Statewide

Rationale for GACP Designation

"Areas of unique, scarce, fragile or vulnerable...scenic importance."

Acceptable Uses

Any uses which would not diminish an areas scenic quality.

Priority Uses

Any uses which would enhance or preserve an areas scenic qualities.

Possible Regulatory and Management Techniques

- a. Protection of Natural and Man-Made Beauty
- b. Tidal wetlands
- c. Freshwater wetlands
- d. Protection of waters
- e. Gas pipeline and electric transmission line certification
- f. Approval of new solid waste management facilities
- g. Land and forest resources
- h. Wild scenic and recreational rivers
- i. State nature and historical preserve
- j. Agricultural districting
- k. Parks and recreation (local or state)
- l. Transportation.

AN ASSESSMENT OF CATEGORIES USED TO INVENTORY
AREAS OF PARTICULAR CONCERN TO THE PRESERVATION
AND MAINTENANCE OF FISH AND WILDLIFE POPULATIONS
IN THE COASTAL ZONE OF LONG ISLAND
AND THE HUDSON RIVER

Prepared by

New York State Department of Environmental Conservation
Division of Fish and Wildlife
50 Wolf Road
Albany, New York 12233

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Category - Tributary streams

Definition - Tributary streams in the coastal zone are those flowing waters of natural origin which empty into a larger estuary or inland sea (Great Lakes). They will be managed upstream from the mouth to the first impassable gradient or barrier to fish migration.

Description - Depending on the location of the first impassable gradient or barrier to fish migration, the coastal zone portion of such streams may include only estuarine water as a "backwater" or cove, or it may extend upstream into fast running water.

Fast streams - flow rate of at least fifty cm. per second, bottom consists of gravel and rubble. Fast streams are cold and saturated with oxygen. They typically consist of riffles or rapids alternating with pools.

Slow streams - with decreasing gradient, velocities fall, temperature increases, oxygen decreases. Small particles of organic matter, silt and sand accumulate on the bottom. Rooted aquatic plants grow in the shallows.

Extent and Distribution (Long Island) Because the sandy coarse soils of Long Island are excessively drained, most water flow is subsurface. The surface streams on Long Island are short and characterized by low flow at all seasons. Only five consistently release more than 20 cubic feet of water into tidewater per second. These are the Nissequogue, the Peconic River, Beaverdam Creek, The Connetquot and the Carmans River.

Extent and Distribution (Hudson River) - The Hudson flows almost unvaryingly due south from Troy dam. The study area is contained in 15 sets of 7½ min U.S.G.S. topographic quadrangle sheets, arranged from north to south. Each of the 15 comprises one or more quadrangles arranged from west to east. There are 24 different quadrangles described in 18 separate map reports. The distributions are referenced to the North-South sets and each is considered a separate reach of the river. The distribution and amount of tributary streams accessible to migrating fish per reach is:

3.7 mi, 4.1 mi, 0 mi, 12.4 mi, 13.3 mi, 7.0 mi, 5 mi, 19.2 mi, 0 mi, 1.3 mi, 5.4 mi, 0 mi, 5.5 mi, 6.5 mi, 4.1 mi, 10.2 mi, and one mile.

Ecological Significance - Function - Except where rejuvenated by uplift, tributaries approaching confluence with an estuary are nearly at base level. With reduced gradient, these waters become torpid and, in terms of life forms and abundance, serve as fingerlike nontidal extensions of the estuary. A littoral zone is developed and, because the land is poorly drained for lack of gradient, marshes and wooded swamps form on the frequently flooded bottomlands. These areas provide haven for various waterfowl, deer, small mammals, songbirds, woodcock, kingfisher, coot, herons, osprey, and various reptiles and amphibians.

The shallow waters are used for spawning by several fish indigenous to the estuary including yellow perch, white perch, large and smallmouth bass, sunfish and pickerel.

As gradient increases upstream, mud and silt give way to sand and gravel then to gravel and rubble. To cope with the increased current, fish of the coldwater upstream have highly streamlined bodies and strong lateral muscles. Vegetation is reduced to algae and water moss attached to rocks with strong holdfasts. Insects are confined to riffles on the sheltered undersides of gravel and rubble. Exceptional species are the waterstriders, nymphs of dragonflies, damselflies and some mayflies found in pools. Cyprinid minnows, important as forage fish and suckers, salmonids, herring and smelt require the current and stony bottoms for spawning grounds.

Values. The values of tributary streams to estuarine fish and wildlife hinge on human impacts, principally shoreline alteration, pollution, and barriers to fish migration. Streams allowed to flow unimpeded and unpolluted to the estuary support an anadromous fishery commensurate with their size. These fisheries include smelt, herring, alewife and, in larger tributaries, shad and striped bass. The shallows just above tidewater may be potential spawning sites for sturgeon. These large fish, valued for their roe (from which caviar is made), have become rare. Pollution and overfishing are cited as reasons for the decline. (LaBastille, 1973)

The striped bass fishery is of enormous recreational importance. In New York, the Hudson River fishery is but a small part of the total resource which is most valuable in terms of angler success on Long Island. The shad fishery has great potential as a recreational resource. It is unique to a limited number of north central Atlantic coastal rivers which are ascended yearly by hundreds of thousands of these three to eight pound fish. Both the roe and the flesh of the adult fish are epicurean delights. The fish, an eager biter when approached by the proper lure is a game fighter. Smelt, herring and alewife are commercial or potentially commercial resources which should be enhanced by stream management designed to provide access to spawning grounds.

If left in natural vegetation, the seasonally flooded rich bottomlands provide fine hunting for ruffed grouse, woodcock, squirrel, deer, blackduck, mallards and woodducks. The amateur naturalist as well as the research ecologist values these areas for the diverse avifauna which includes not only the cosmopolitan species, but also birds such as the Louisiana Waterthrush, Cerulean Warbler, Hooded Warbler, Swamp Sparrow, Snipe and Solitary Sandpiper, which are specific to this habitat. The bottoms are also valued for their reptilian and amphibian populations. Furbearing mammals such as fox, muskrat and weasel provide additional resource values which can be subject to management for sustained yield.

Permissible Uses- To maintain the varied resources of the estuary, tributary streams should be managed in two zones. The primary zone, a land use control zone should include river or stream and associated bottomlands to the first impassable gradient or barrier to fish migration. The secondary zone, a pollution control zone, would reach to the sources of all secondary tributaries. This pollution control would be tailored to prevent accumulating pollutants from compromising the quality of primary zone resources. This does not proscribe use of these waters as a vehicle for waste removal, but it will limit that use to levels which will not impair valued downstream resources. In each individual case diminution of the natural

of the natural resource base should be weighed against the value to society of the expedience of discharging various increments of pollution overload.

In the primary zone, waste discharge should be limited to amounts the stream can process without causing conditions which would inhibit or prevent use of these waters by anadromous species. Land uses other than those which would leave the bottom lands in their natural state, hunting, fishing, trapping, nature walks, backpacking trails and other extensive uses, should be limited to those requiring water access such as power plants. These water requiring developments should be located where natural resources values are lowest to avoid unnecessary losses.

Category. Wetlands with associated upland buffer zone

Definition. Wetlands are lands where the water table is at or near the surface. This may be a seasonal or permanent condition.

Description. Coastal wetlands are marshes or swamps (wooded wetlands) flooded periodically by estuarine waters with the tides. These wetlands are classified according to frequency of tidal flooding and salinity.

Intertidal Marsh - flooded twice daily by marine waters, vegetation is predominantly Spartina alterniflora (low marsh cord grass).

Coastal Fresh Marsh - flooded twice daily by low salinity water or fresh water of the upper tidal limits of an estuary.

Vegetation is predominantly Typha angustifolia (narrow leaved cattail) and various fresh water emergents.

High Marsh or Salt Meadow - flooded periodically on "spring" tides which occur during the two periods of each month when solar tides and lunar tides are mutually reinforcing.

Vegetation is predominantly Spartina patens (salt hay) and Distichlis spicata (spike grass).

Extent and Distribution (Long Island). As of 1971 some 21,000 acres of salt marsh remained in the Long Island counties Nassau and Suffolk. Nine thousand acres are in Nassau, 12,000 are left in Suffolk. Few marshes remain on the North Shore west of Dosoris Pond, but from there to Crab Meadow close to nine hundred acres are distributed in 24 sites. Sunken meadow, the Nissequoque, Stony Brook Harbor contain large marsh lands. Port Jefferson Harbor and Mt. Sinai Harbors have small remnants of good wetlands. The 184 acre marsh at Wading River is the last North Shore marsh before Orient.

From Orient to Montauk around the waters separating the two forks, 55 marsh sites comprise most of the 3600 acres of wetland remaining in the towns of Riverhead, Southold, Shelter Island, Southampton and Easthampton. Few of the former wetlands remain that once graced Mecox Bay, the coastal ponds or Shinnecock Bay, but many marshes remain along Moriches and Great South Bays and the wetlands from Captree Island to the Lawrence Marshes remain. These wetlands comprise about 15,000 acres in 60 sites.

(Hudson River) Few wetlands exist in the northern fifth of the study area. The four sections from Schodock light to Barrytown have several wetlands of importance. Reaches eight through eleven are barren of wetlands, but twelve through fourteen possess major wetland areas. The southernmost section has no wetlands.

Ecological Significance - Function. Coastal wetlands serve as essential habitat for various marine and coastal species. They clean certain pollutants from estuarine waters and they provide the base of the estuarine food chain.

Coastal marshes and estuarine food chains

Smith (1966:217) regards "the estuary, its creeks, sounds, marshes and mudflats as...one production unit. "Coastal fresh and marine intertidal marshes are the most productive of the wetlands." (Draft for Public Hearing Purposes, 1976). Tidal action deposits silt, organic and inorganic wastes and dissolved solids from various sources on the marsh. Plant detritus is carried out on the outgoing tide to form the base of the estuarine food chain. Because of the richness of this productive environment, "The marine flora and fauna...of the estuary...display a greater density of individuals...than are found in the open sea." (New England River Basins Commission, 1975). But wide extremes of salt content limit the estuarine habitat to relatively few species.

In addition to the role of food factory for the estuary, the intertidal marsh and coastal fresh marsh tend to purge the estuarine water of nutrient-pollutants such as sewage and fertilizers in run-off. This action is most effective in removal of particulate carbons which contribute to the marsh productivity after being broken (by microorganisms) into assimilable forms for plant uptake.

These marshes also serve as spawning areas and nurseries for marine fishes. Other animals, especially birds, have evolved to exploit these populations of small fish. Waterfowl, herons, egrets, bitterns and others use the marsh as feeding habitat. Some waterfowl nest, all find shelter in the dense marsh grasses.

The high marsh or salt meadow, while slightly less effective than marshes flooded twice daily, also serves to clean estuarine waters and is regarded as critically important for estuarine food production (Draft for Public Hearing Purposes, 1975).

Because they are drier, high marshes are the preferred nesting habitat for most waterfowl remaining in New York's coastal zone to breed. The high marsh also supports a greater diversity of mammals and so serves as good hunting habitat for such raptors as the Marsh Hawk and Roughlegged Hawk.

The predators form the top of the food chains. At this trophic level the high marsh and intertidal marsh are inseparable because of movements of prey species. Predators common to the coastal zone are Osprey, Horned Owl, Marsh Hawk, Roughlegged Hawk, Short Eared Owl, Fox, Weasel, and Snapping Turtle.

The upland-wetland interface

Both the intertidal marsh and the high marsh buffer adjacent uplands from the energy of coastal storms. They diminish the extent of flooding and the force of waves. They may absorb some wind energy also.

Depending on land use, adjacent uplands input to the wetland estuarine system may be positive or negative. Land in an urbanized state or cultivated may provide undesirable nutrient loads. Woodlands provide nesting habitat and roosting habitat for Herons, Egrets, Horned Owls, Osprey and other frequenters of the marsh.

Cultivated land may also provide additional and at times crucial feeding areas for geese, ducks and shorebirds.

Values. Coastal Marshes are essential to the productivity of estuarine waters including coastal ponds and embayments. Calories produced on the marsh as plant material are harvested in the estuary as Scallops, Oysters, Hardclams, Softclams, Scup, Striped Bass, "Snapper" bluefish or flounder. Those calories may even be harvested in the open sea as biomass of still larger fish. Marine productivity is critically dependant on the wetland estuarine systme, for this reason alone coastal wetlands comprise a critical resource which cannot be allowed to diminish by a process of slow attrition without resulting in an untenable social loss.

In addition to the values derived from primary production (plant material), intertidal marshes comprise essential habitat for wildlife. Of obvious value is habitat for waterfowl, but other wildlife values related to non-consumptive recreational use may exceed the values which are readily identified by the hunter in monetary outlays or even in terms of "willingness to pay." According to the New England River Basins Commission (1975), the nonconsumptive users of wildlife along the Long Island Shore "far outnumber" the consumptive users. But the value upheld if these users were charged for this experience is presently inaccessible. There is no market for the resource. It is a public good, therefore values attributed to the production of this resource, while real, cannot be readily identified. Expressions of these values often occur as demands for political action to preserve these wetlands. Most highly prized are marshes which support a great diversity of wading birds: Herons, Egrets, Bitterns and Shorebirds; Plover, Sandpipers, Turnstones, knots and Oyster Catchers as well as waterfowl.

Wetlands comprise "natural" open space which, when allowed to exist, enhances the value of adjacent residential land. This is an important value in highly urbanized regions and regions under development pressure. Open space enhances habitat for human dwelling. The costs and benefits ofent, however, don't fall equitably.

Those who live adjacent to the open space derive benefits for which they don't pay. This results in impetus for the owner to develop his land. The values of open space, hence of wetlands as open space, vary with the degree of existing development and of anticipated development. Some effort should be made to appraise these values. Such values may elude being adequately translated into dollars before they have been identified in terms of amenities affecting human behavior. A congenial environment is conducive to socially responsible behavior. A discordant environment is disruptive of social behavior.

Permissible Uses-Wetlands. "...whatever the present existing values of a particular wetland are, the ability of that wetland to serve these values can be substantially increased if it is allowed to function in a substantially natural and undisturbed state." (Draft for Public Hearing Purposes, 1975)

Competing land use needs in the coastal zone constitute enormous pressure for development which would destroy these food production ecosystems. But some of these needs must be accommodated while others can be satisfied by development

of land removed from the tide water-land interface. To minimize the impact of development on the wetland-estuary ecosystem, those land uses which do not require access to tidal waters (such as residential development) should be prohibited in the near vicinity of coastal wetlands (from 300 feet to 500 feet of high tide). Other uses, requiring development of the land-water interface, should be located to avoid impairment of wetland values.

In general, dredging and filling should be avoided. Where it is necessary for such critical needs as sewage outfall pipelines and underground power transmission lines, etc., such operations should be accomplished with mitigation of damages provided on site as well as off site. Spoil, properly managed, can provide wildlife values such as nest areas for colonially breeding birds, especially terns and skimmers, and as general habitat for shorebirds. It can be employed as water control structures to revitalize previously ditched marshes or those dominated by phragmites.

Wetland areas should not be traversed by high tension lines because of the hazard to avifauna including some rare and endangered species.

Extensive uses such as hunting waterfowl from punts or blinds, trapping furbearers, harvest of shellfish, crustaceans, and finfish are benign uses of wetlands. Properly managed, these activities crop the surplus populations without impairing the production of the resource.

Priority Uses - Wetlands.

Wetlands should be regarded as production centers of a food crop harvested off site. They are as intolerant of human activity as a farm field full of tomatoes. It is this use, the production of the base of estuarine food chains, which is the priority use of coastal wetlands. Requiring no input from human sources, wetlands seem to function best when left entirely alone, although restoration efforts such as those being explored by Carbridge on Chesapeake Bay, may yield positive results.

Other uses of wetlands should be gauged carefully to avoid lowering the vegetative productivity of the wetland.

Category Estuaries and Embayments

Definition. An estuary is the region of a river near the mouth, of varying salinity, affected by the tides. The uppermost reaches may be entirely fresh. Embayments are estuarine waters of broad extent which cannot be traced to a single fresh water source.

Description, Extent and Distribution (Long Island only) Estuaries are usually thought of as the tidal portions of rivers. Other definitions (Green, 1968) Day, 1951) omit reference to tides and rely on the concept of varying salinity. This practice includes as estuaries those bodies of water occasionally shut off from the sea by longshore drift (considered in this report under the heading coastal ponds with nonrhythmic salt connection) and bays, which cannot be associated with any particular river.

Estuaries vary in size and shape with the age and size of the river, with the quantity of longshore drift, and with local geology. Long estuaries develop in submerged river valleys. Embayments such as Great South Bay may result from the action of long shore drift merging several estuaries at their mouths.

Long Island's Estuaries can be separated into four major groups, (1) the North Shore harbors from Little Neck Bay to Mt. Sinai Harbor, (2) the Peconic Bays, (3) the Coastal Ponds from Mecox Bay to Fort Pond and (4) the South Shore Bays from East Bay to Shinnecock. Each of these groups is characterized by different geology, size and orientation.

The North Shore harbors and the Nissequoque River are located East of Miller Place. They are three to ten miles apart, up to five miles long, about one mile wide, and penetrate southward into the island. West of Miller's Place (about the midpoint of the North Shore) the bays cease and the coast becomes an unbroken line except for Mattituck Harbor halfway between Miller Place and Orient.

The Peconic Bays, including Noyack Bay, Gardners Bay and the waters surrounding Shelter Island comprise a large estuary which splits eastern Long Island lengthwise from east to west for about thirty miles. This is Long Island's largest estuary and second in importance only to the Great South Bay. These waters are Long Island's chief source of Bay Scallops.

The Coastal Ponds are on the south shore of the South Fork. They begin at Water Mill with Mecox Bay, include Sagaponack Pond, Wainscott Pond, Georgica Pond and Hook Pond. These are relatively small bodies of water about a mile long and one quarter mile or less wide. They are centers of waterfowl concentration.

The South Shore Bays beginning with Middle Bay extending through South Oyster Bay, Great South Bay, and Moriches Bay to Shinnecock Bay comprise a system almost 70 miles long ranging from one to five miles wide. This is the chief Hard Clam producing area of the world.

Ecological Function. The extremes in salt content typical of estuaries serve to reduce fish species diversity. Productivity, however, is very high. The estuary is the second link in the rich salt marsh-marine food chain. Detritus from the marsh is the fuel for the estuarine food factory. Particles are colonized by bacteria and fungi, ingested by amphipods, shrimp, copepods, etc., stripped of microflora, recolonized, ingested again until after five to seven such cycles the particle is completely digested (Massman, 1970). The motile organisms of the estuary are essentially marine, able to withstand full seawater. But with exception of anadromous species they have limited tolerance of freshwater and they are distributed along a salinity gradient with younger, smaller fishes inhabiting increasingly fresher water. Toward freshwater, marine species drop out but are not replaced by freshwater forms. "Thus the estuary serves as a sort of marine nursery, a place where young fish and other organisms such as the blue crab are protected from predators and competing species unable to enter low salinity water." (Smith, 1966: 213)

The estuarine waters, especially shallows are, in conjunction with their associated wetlands, essential habitat, providing food, cover and resting space for waterfowl. On an international scale, such water bodies as Great South Bay are also properly described by Massmann's (1970) description of Chesapeake Bay as a "great winter pasture" for ducks, geese, herons, egrets, loons, grebes and others.

Values. Estuarine values are manifold. Some are derived from resource congeries unrelated to biological outputs. Other values derive from an aesthetic regime which, while not dependent on the biological resource or on natural settings, is enhanced by those settings in a state of ecological health. Other values hinge directly on biological outputs of the wetland-estuary ecosystem. These outputs are the flora and fauna which provide recreational experience and marketable or potentially marketable food resources.

The values expressed in markets are commercial values. Markets exist for certain finfish and shellfish. Other fish not now marketed may be needed in the future and should be regarded as potential food resources. Certain elements of the recreational experiences drawn from the fishery are also marketable. These include fishing "party" boats put out for charter or hire.

Much of the value of the recreational experience is not reflected in markets. The methodology to evaluate this experience is inchoate. Knetsh and Davis (1966) Krutilla (1967) and Clawson (1959) among others do not attribute to the value of the recreational resource, expenditures such as purchase of boats, guns, meals, etc. They maintain that the value of the resource is only equal to the sum of individuals willingness to pay to experience that recreation or to preserve the option of experiencing it. Others, represented by Steinhoff (1971) reject this notion and include expenditures for specialized equipment and clothing, meals, lodging, etc. purchased to facilitate participation, as part of the cost of participating and they attribute these expenses to the value of the resource.

Added to that confusion is the incommensurable nature of the value gained from the recreational experience. Market values and those drawn from inferentially drawn demand curves Clawson (1959) Knetsch and Davis (1966) reflect a summation of individuals beliefs concerning maximization of utility. These beliefs are estimates, attended by a large risk of uncertainty, formed from imperfect knowledge by elements of a broad population, many of whom seem to exhibit varying degrees of a desire for self annihilation. Other factors which bias these market values away from a true estimate of welfare maximization are the efforts of some to create demand for commodities which, measured against the yardsticks of either public health or long-run economic stability possess little or negative utility. More important are short run gains accomplished at long run expense by economically irreversible resource allocations predicated on these contrived markets. Social evolution, subject to this pressure tends to generate secondary needs which conflict with basic needs yet are essential to obtaining those basic needs. (e.g. The preponderant development of single family housing and the dispersal of industry and commerce made possible by the automobile have resulted in reliance on that mode of transportation which wastes enormous quantities of energy and constitutes a major source of air pollution.)

The estuary, its wetlands, mudflats and tributaries form a unit which processes light and chemical nutrients to produce a set of biological outputs. These outputs have intrinsic value to the preservation and maintenance of human health. But these values are not adequately expressed in markets nor in inferentially drawn demand curves. These outputs include the protein resource of estuarine fish including oceanic species which use the estuary for spawning or as a nursery. They include the shellfish resource and the scenic vegetation, water and open space. The finfish are an exceptionally healthy source of protein when uncontaminated by toxic wastes. They are also an important recreational resource. Their value for recreation is enhanced when they are pursued in a "natural setting." Steinhoff (1971) describes the individual seeking recreational experience in natural landscapes "as one who scarcely distinguishes re-creation of mind, spirit and body from the beauty of wildlife and environment which stimulates pleasure and satisfies artistic hunger." The natural setting of an undisturbed estuary with its associated wetlands, etc. provides diverse and numerous flora and fauna with high aesthetic qualities.

Permissible Uses. Estuaries are subject to a variety of conflicting uses. They are the locus of industrial and commercial activities because of their accessibility to transport. They are a source of aesthetic/re-creational experience and a source of protein with low fatty acid content. The value of these resources is often if not universally degraded by the presence of commercial-industrial activities. Sewage effluents and runoff from urban and agricultural areas also degrade the natural values of the estuary. Use of estuarine waters to cool power plants causes thermal loading. These uses of the estuary are necessary to our present economy but they should be limited to estuaries where natural values are already severely degraded. They should not be expanded into areas retaining an aesthetic character and good biological productivity. The permissible

uses for such natural and semi-natural areas are sport and commercial harvest of fish, hunting, sailing, swimming and other boating activities. Priority among these uses should be given to uses which do not degrade the aesthetic environment or the sustained yield of the fishery.

Category Coastal Ponds with nonrhythmic salt connection

Definition. Coastal Ponds with nonrhythmic salt connection, differentiated from salt pannes, are embayments with a fresh water source and an intermittent salt water exchange which occurs nonperiodically. Technically, these coastal ponds are estuaries (Green, 1968:4).

Description. These ponds lie very close to tidal waters. They are separated from them only by a narrow beach. The fresh source dominates the landward portion of such waters. Toward the beach, the water becomes brackish. There is no natural permanent connection to salt water, but occasionally, especially following periods of heavy rain, the pond will break through the beach, establishing a link with tidal salt water. These temporary links may also result from wave action during coastal storms. Unless artificially maintained these breaches will soon be mended by longshore transport of sand. Then the pond begins to freshen again.

Ecological relationships. As in estuaries, the vegetation stratifies according to salinity. Fresh water emergents dominate the landward shores. But in the seaward portions, those areas of estuaries normally occupied by halophytes, only euryhaline species are found. The halophytes cannot withstand the reduced salinity accompanying the loss of the tidal connection. The few species such as Oysters, widgeon grass, silver sides and white perch which do occur here thrive with the lack of competition and parasitism.

The widgeon grass is particularly attractive to waterfowl, especially redheads, canvasbacks and other divers.

Values. The coastal ponds are among the most important winter haven's for waterfowl on Long Island. They are preferred because of the thick crop of Ruppia maritima or Widgeon grass supported by these waters of variable salinity. They are also producers of oysters and forage fish. They constitute an esthetic resource and provide sport hunting and fishing and harvest of shellfish. The large ponds are suitable for dinghy class sailing craft and hand powered small boats.

Permissible uses. The Littoral Zone and the marsh are as important to these coastal ponds as they are to estuaries. Whatever use is made of these areas, it should never compromise the plant species which are responsible for the considerable fish and wildlife values realized in these ponds. Land use controls in adjacent areas should prevent contamination of these waters with toxic substances and microorganisms or nutrient overloads. It should preserve areas of Spartina marsh and protect the littoral zone from dredging and spoil deposition. Suggested uses are non-motorized recreational boating, fishing, hunting, trapping and nature study. Commercial harvest of shellfish is also practicable.

Category Tidal Mudflats

Definition Mudflats are shoal areas of muck bottom periodically covered and uncovered by tidal action.

Description Mudflats are unvegetated muck bottom areas exposed at low tides.

Extent and Distribution (Long Island) Mudflats known to be important to wildlife are found in nine locations on the North Shore. Two are in Bayville, one in Lloyd Harbor, one in Huntington. There is one associated with the Nissequoque and one area in Stony Brook Harbor. All of Conscience Bay is a mudflat. The forks are rather devoid of mudflats, although some are present in the Mattituck Quadrangles, they are not of known significance to wildlife. Important areas are found at Moriches Inlet, and along Shinnecock Bay. The western part of Great South Bay to Lawrence is the area where most of the important mudflats are located.

Hudson River - Extensive mudflats occur in reaches four through six. There are almost no mudflats in the first three reaches below Troy Dam. The remaining reaches each have a few which range from very important (reach 14) to fringe areas.

Ecological Function - Mudflats are areas inhabited by mollusks and worms. They are extensively used for feeding by birds and fish. In some areas mudflats may be critical to the continued presence of wildlife in an area because they provide the major food resources for the animals.

Value - Mudflats are valued as essential habitat for migrating and indigeous avifauna. They may also be important feeding areas for fish when flooded by the tide.

Permissible Uses - Any use which doesn't destroy the shallow area, change the bottom or cause such pollution of the water that results in death of the organisms that live in the mud, is permissible.

Priority use - food source for fish and wildlife species.

Category Littoral zones

Definition The littoral zone extends from the intersection of the compensation layer (the depth at which respiration equals photosynthesis) and the bottom to the shore. The actual depth of the compensation layer is determined by turbidity of the water; however the New York Tidal Wetlands Law only recognizes littoral zones in less than 12 feet of water.

Description Littoral zones are the shallow waters in which rooted plants can live. The width depends on slope of the bottom and water turbidity.

Extent and distributions Long Island. Littoral zones fringe all but bulkheaded shorelines where the fill extends below the compensation layer. On the north shore, littoral zones extend to one quarter mile from the shore into Long Island Sound. The landward half of each harbor is almost entirely littoral. Extensive littoral zones are found in the bays separating the east-end forks. Flanders Bay is entirely littoral and large extents of littoral zone are found at Shelter Island and Gardiner's Island. On the south shore, the bays separating the barrier beach and the mainland comprise the largest littoral zones of Long Island.

Hudson River Only small amounts of littoral zone are present in the northern three reaches. Reaches five through eight have extensive littoral zones as do reaches eleven, twelve and fourteen.

Ecological Function "Some ... littoral zones are areas of extremely high biological productivity and are nearly or equally as important in this regard as intertidal marshes and coastal fresh marshes. Even in relatively unproductive areas other values are often present and these areas often have the potential to become more biologically productive in the future." Draft for Public Hearing Purposes 1976 . Littoral zones provide shelter, food, and spawning areas for fish. They provide food for waterfowl and a nutrient trap for polluted water.

Values In value, the littoral zone is a submerged equivalent of the low marsh. It is an essential habitat for several fish species. It is said to be important in buffering the land against the energy of storm waves (Draft for Public Hearing Purposes 1976: 4). The biota tends to clean pollutants from the waters and channel excess nutrients into aquatic food chains.

Permissible uses. Littoral zones may be used for fish harvest, aquaculture and recreation. Any use of littoral zones should avoid dredging or shading. Effluents should not be dumped directly into littoral zones without high levels of treatment.

Priority Use - wildlife - as natural habitat for fish.

Category Deep Water Habitats

Definition waters in excess of 50 foot deep

Description, Ecological Function and Extent This is an inventory item not used on Long Island. It is habitat for sturgeon in the Hudson River. The major deep-water habitats are found in reaches six through eight and in reach thirteen. The northern most three reaches have no deepwater habitat. Small areas are found in reaches twelve, fourteen and fifteen.

Value Habitat for an endangered species. This species has commercial value.

Permissible Uses Transportation and recreational uses are permissible but strong effort should be made to avoid pollution of the habitat. If the species can be restored there is a commercial market for the roe.

Category Shellfish Beds

Definition Shellfish beds are submerged or intertidal areas inhabited by commercially important shellfish. Some areas are now closed to harvest because of pollution.

Description The principle shellfish of commercial importance are Hard Clams, Soft Clams, Bay Scallops and Oysters. They are found from the intertidal zone to depths of forty feet. Some species survive below this depth but their growth is severely inhibited.

Extent and distribution (Long Island only) The north shore harbors, especially Oyster Bay, are particularly noted for Oyster production. Oysters are also produced near Greenport and to a lesser extent in some of the other waters separating the two "forks." In these waters, from Flanders Bay to Block Island sound the primary resource is the Bay Scallop, although both hard and soft clams are also produced. Oysters and clams are found in the "coastal ponds" of the south fork. The waters separating the south shore from the barrier beach are known as the "worlds outstanding hard clam factory" (A.S. Taormina, pers com). Here, in scattered mud flats, soft clams are also found.

Ecological Function Shellfish are members of the benthic community but the four species considered here each function differently. Scallops and oysters are members of the epibenthos. The clams are part of the infauna. (Green, 1968:153) Smith (1966:214) regards "the oyster bed and the oyster reef" as the "outstanding communities of the estuary. Oysters may be attached on every hard object in the intertidal zone or they may form reefs, areas where clusters of living-oysters grow cemented to the almost burried shells of past generations. Oyster reefs usually lie at right angles to tidal currents which bring planktonic food, carry away wastes, and sweep the oysters clean of sediment and debris." He lists several associated organisms including "sponges barnacles, bryozans oyster crabs, snails, polychaete worms, decapods and pelecypods. Some people believe that oysters are responsible for limited purification of polluted waters. Oysters seem to utilize some bacteria as food and they collect heavy metals in their tissues. Oysters functioning in such a role must be regarded as unfit for human consumption.

Clams are also filter filters. They are known to use flagellates and other planktonic forms including various larvae. But unlike oysters, clams burrow into mud. Soft shell clams may burrow two feet. Hard clams to four inches.

Values Shellfish are an important commercial resource on Long Island. The market for these meats is expanding. This is a source of protein which although amenable to cultivation can be harvested directly - it is available at the lowering of a dredge. Far less resources need be expended to put an ounce of shell fish protein on the table than to produce an ounce of beef protein.

Permissible uses Shellfish beds should be regarded as valuable resources and treated accordingly. Markets should be developed to support maximum sustainable harvest. Although shellfish removed from polluted waters seem able to purge themselves of some disease organisms; viruses, heavy metals and organic toxicants remain a problem. Uses which cause pollution should be carefully controlled to prevent uptake of toxicants or disease organisms which can not be purged by the shellfish upon transplant to clean water or which might result in the death of the shellfish. Many such uses occur in sites well removed from the coast on fresh water streams.

Priority Use Harvest of the protein resource.

Category Fish and Wildlife concentration areas

Definition Concentration areas are geographic areas in which wildlife or fish aggregate for some resource or purpose during some period each year.

Description Concentration areas can only be described according to the species and purpose which promulgates the concentrations. On Long Island eight types of concentration areas included two types of waterfowl areas, diving duck and puddle duck, Tern and Hern rookeries, fish concentrations, shorebird concentrations, Bank Swallow colonies and gull colonies. Geese were included with puddle ducks.

Extent and distribution

1. Diving Duck concentrations are found on the waters of the North Shore harbors to Stony Brook. They are particularly notable from Little Neck Bay to Hempstead Harbor. Other concentrations occur in Long Island Sound from Rocky Point east to Jacobs Point and from Horton Point to Orient. Concentrations of Diving Ducks are also found on both sides of Fire Island Barrier Beach, in Moriches Bay, in Shinnecock Bay and in the Peconic Bays. But the north shore concentrations are the most notable.

2. Puddle ducks tend to concentrate at sources of fresh water or in and along marshes where salinity is down. Spectacular concentrations of geese and puddle ducks occur on several city park ponds. Six of these occur on the north shore from Flushing and Shoreham. Ten occur on the north fork, twenty on the south fork on the Coastal Ponds and in marshes, and eleven are on the South shore from Lynbrook to Bellport.

3. Eleven fish concentration areas were reported for all of Long Island. The completeness of this information is questionable. The eleven areas are almost uniformly distributed.

4. Tern rookeries Seven major tern rookeries are found from Lloyd Harbor to Port Jefferson. Five are on the North fork adjacent to the waters of the Peconic Bays. Two are on Plum Island, Five are on Gardiners Island. Two are on Shinnecock Bay, one is on Moriches Bay and three are near Bay Shore on Great South Bay. Terns are a threatened species.

5. Shore bird concentrations The only concentration area of shorebirds on the north shore is in the St. James quadrangle. On the north fork, one is found in Southold and two are in Orient. Two very good areas, farmers fields used for feeding are in the town of Easthampton. On the south shore, west of Moriches, shore bird concentrations occur on Cedar Island, on Oak Beach Marsh, and on North, Middle and South Line Islands. South Line Island is reputed to have the most diverse and plentiful shorebird concentrations on Long Island.

6. Wading Bird Concentrations (Heron Rookeries) Herons concentrate in the same marshes and mudflats that produce concentrations of terns, shorebirds and waterfowl. Separate aggregations of these birds occur on Plum Island, Gardiners Island and Robins Island, and on the Lawrence marshes, in the marshes near Jones Inlet and on Seganic Island. The largest concentrations in 1975 occurred in the Lawrence Marshes.

7. Hawk Migrations The barrier beach and south shore of the south fork are a concentration area of migrating hawks in the fall.

8. Gulls Large gull concentrations occur at Jones Beach, on Gardiners Island and on Plum Island.

Hudson River Wildlife concentrations occur in each of the fifteen reaches, but the south most five (the lower third of the study area) seems to have the greatest number of all types.

1. Waterfowl concentrations occur in reaches one, three, five, six, seven, nine through eleven and most notably in reaches thirteen and fourteen.
2. Fish concentrations occur in each reach but the ninth.
3. Shorebird concentration is found only in reach three.
4. A hawk migration crossing point is in reach twelve.

Ecological Function Seasonal migrations funnel large numbers of animals from diverse regions into relatively small areas. Concentrations occur where the habitat requirements of a gregarious species are easily met within the confines of a small area. But concentrations also occur where an area of limited extent is one of few or the sole source of a necessary resource. Concentrations of wildlife and fish should be seen as resource bottlenecks and regarded as critical resource areas for the species involved except as may be proven otherwise on a case by case basis. eg some species behavior is largely influenced by tradition, (Hochbaum, 1955) and loss of a single resource area used by such animals may be ameliorated by providing a like resource base in another locale close by.

Values The values of concentration areas derive from their innate ability to concentrate wildlife, making the resource accessible to people and more importantly from the value of such areas to each species concerned. To the degree that the species involved depend on the area, the area value equals the value of the species or the numbers of individuals supported.

Permissible Uses Concentration areas should be managed to continue to provide the resources for which wildlife or fish concentrate there to find. Within that stricture, they may also be managed to provide levels of recreational use of the wildlife resource which will not compromise the quality of the environment during the season(s) of concentration.

Category: (locally) Unique Ecological Areas

Definition: Unique ecological areas are those especially valued for some quality of uniqueness, for the presence of unusual flora or fauna or for a quality of wildness representative of the area prior to the impact of mechanized man.

Description: varies with site.

Ecological Function: varies with site.

Extent and Distribution: (Long Island) There are 25 separate areas on Long Island, which for various reasons merit use of the term unique. Three are on the North Shore. Nine including Gardiners Island and Plum Island on the forks or the waters near them. Ten such areas are found along the barrier beach and three are city parks between Bellmore and Babylon.

Index to unique ecological areas mapped in Areas of particular concern to the preservation and maintenance of fish and wildlife populations in the coastal zone of Long Island:

<u>Name, or description of area</u>	<u>Page</u>	<u>Includes areas numbered</u>
Caumsett State Park and Target Rock Refuge	49	4a, 5, 6, 8, 18a, 18, 19, 10, 11, 20
Ravine and ponds south of Cold Spring Harbor	53	3, 6-9
Hissequoque River	81	1a, 1b, 3
Mattituck Hills	129,131	1
Bluffs southwest Mattituck Hills	133	9
Flanders Marshes and associated uplands to water divide	137,139	1,2
Moore's drain	151	2
Dune Community	153	3
Robins Island Marsh and Ponds	157	1,2
Long Beach	183	1, 1a, 2, 3
Mashamack	187	1,2,6
Plum Island	199	1-4
Gardiners Island	205,219,233	Entire Island
Migrating Sand Dunes	225	24
Hither Hills	225,235	23 8(on page 235)
Dune community	227	2
Montauk Point	237,239	8
Marshes east of Lawrence to Jones Inlet	249,251, 261,263,265,267	All marshes islands between Barrier Beach and South Shore
Connetquot St. Park	299	1-9
Sunken Forest	321	5a
Moriches Flats	347	1,2,4a

Hudson River Unique Ecological Areas are recognized in all reaches but the northernmost. Several reaches are cited with at least two such areas. In every instance but one, areas were cited either because of or as having at least one rare, threatened or endangered species present.

Values Although each exceptional community or unique area will probably possess unique values, certain generalizations are appropriate. Unusual and disappearing representative habitats possess a museum value that increases with rarity. This is analogous to some values associated with rare, threatened and endangered species habitats. These values are different from, but related to what Weisbrod 1964 terms "option demand." Essentially these values consist of the collective willingness to pay for preservation of the option of having what is rare, available for use. This almost always entails non-consumptive use and often the "use" consists of nothing more than knowledge of the items continued existence.

Productive habitats are valued also according to the consumable resource produced as well as the aesthetic or non-consumable aspects of the habitat.

Further values relate to the contribution each area makes toward biological integrity or ecological stability. Individually each area is small in this regard but cumulative values are very high. Human survival may ultimately hinge on efforts to maintain ecological stability. Odum (1969) suggested partitioning the landscape into environmental classes including a maintenance or "protection" class. The unique community would be a logical first candidate for such protection.

Permissible Uses Any use commensurate with the resource values involved is permissible. Planners involved in development of areas containing exceptional biological communities should consult with the appropriate Department of Environmental Conservation Resource Managers to determine the degree of fragility of such environments and develop their plan accordingly. In general, only extensive uses such as nature trails, hunting and fishing should be permitted in such areas and such use should always be directed around fragile areas.

Fragile or key areas of exceptional communities may require some effort on the part of planners to discover. The information required should be obtainable from the Department of Environmental Conservation from the local Audubon Societies or from the Nature Conservancy.

Category Rare, Threatened and Endangered Species Habitats

Definition Habitats for rare, threatened or endangered species are the geographic areas in which such animals are now located and satisfactorily sustaining themselves. This may also include areas where species are declining if the decline is due to external influences and not to natural successional changes. Even those areas may be included if they are amenable to management to maintain the species in question. The concepts of rare or threatened and endangered is applied to the local and regional level.

Description, Extent and Distribution - Habitats were identified for Osprey, Terns, Piping Plover, Black Rail, Oyster catcher, Bald Eagle, Snowy Owl, Bank Swallows, Golden Plover, Wood Frogs, and Salamanders.

Osprey Habitats are associated with nest sites. The osprey requires a source of fish uncontaminated by halogenated hydrocarbons. The nest site and the waters near it comprise the habitat. Osprey nests have not been found west of the single nest in Connetquot State Park. Nests are found on Robins Island, on the Peconic shores of the South fork, on Gardiners Island and on Plum Island. Five nests on Fishers Island indicate a tolerance of human proximity. The critical factor for Osprey is an uncontaminated and sufficient food source.

Terns require a sandy beach isolated from sources of nest depredations by human traffic, rats and dogs. They are colonial ground nesters and fish eaters. Piping Plover also require a sandy nest area, and are often found with terns but they are not colonial. The entire barrier beach and south shore of the south fork are potential Piping Plover nesting habitat. Seven tern colonies are distributed from Lloyd Point to Conscience Bay on the north shore and 5 along the shores of the Peconic Bays on the north fork. There are two tern rookeries on Plum Island, five on Gardiners Island, two on Shinnecock Bay, one on Moriches Bay and three near Bay Shore on Great South Bay. To maintain tern populations, unvegetated sandy areas protected from trampling and depredations must be provided. Existing rookery sites need not be inviolably preserved but equivalent sites should be located close by prior to nesting season before development intrudes on a tern rookery.

Black Rails are very uncommon on Long Island. The only known nest site is in Oak Beach Marsh.

King Rail is also limited to one site on Long Island. This is on the Lawrence Marshes.

Oyster catchers, unusual on Long Island, are not an endangered species. They are expanding their range. Oyster catchers are found at Lloyd Point, on the north shore, along the Flanders marshes near Riverhead, along Shinnecock Bay, Long Beach at Orient State Park on Gardiners Island on Three Mile Harbor in Easthampton, and at Accohonack Harbor. Gardiner's Island with some six pairs is the center for Oyster Catchers on Long Island.

Bald Eagle - One Bald Eagle wintering area is known at Hecksher State Park; occasionally an eagle may be seen at Connetquot State Park.

Snowy Owls use the South Shore Barrier Beaches in winter.

Bank Swallows occur in colonies in high bluffs. They are found only on Eastern Long Island. Colonies exist near Mattituck inlet on Long Island Sound, Gardiners Island, Robins Island and on Montauk Point.

Golden Plover are unusual migrants found around shorekind concentrations at Orient, East Hampton Sag Harbor and on the Barris Beach near Moriches inlet. Other shorebirds also seen less regularly at these and other shorebird locations (see index) L.I, report) are willet, black bellied plover and yellow legs.

Herps are scarce but coming back on Long Island following the cessation of spraying of DDT for mosquito control. Salamanders and wood frogs, Fowlers Toad and others are maintaining or slowly expanding populations.

Salamanders are found at one location in Glen Cove, one at Cove neck, two south of Cold Spring Harbor, several locations near Riverhead, and near the Maple Swamp-Sears Bellows Pond area north of Flanders Marshes South East of Riverhead. They are found in Moores Drain in Southold and on Gardiners Island, on Shelter Island and in an area north of Yaphank west of Wm. Floyd Parkway and south of Long Wood road.

Wood frogs were reported only near Oyster Bay Cove and Cove Neck.

Areas containing rare, endangered or threatened species were lumped under the ageis of Unique Ecological Areas in the Hudson River study.

Ecological Function Varies with species but in general, this relates to species diversity and maintenance of balanced stable populations. The more diverse the pathways through which energy can be funneled, the more stable the biological system.

Values The value of habitat supporting rare or endangered species is enhanced by the willingness of people to pay for support of such species. No market for this exists; but the values are expressed as political action protecting such habitats, and by purchase of such areas by interest groups dedicated to saving such species.

This value is added to values of compatible uses of these areas such as open space preservation, general wildlife habitat, over extensive areas, hunting, nature interpretation, selective timber cutting, etc.

Permissible Uses Use varies with the species concerned. These habitats should not be disturbed during breeding season. Animals upset by human presence such as bald eagle require isolation while habitats for salamanders, wood frogs and bog turtles require only management to prevent predation or loss of habitat. Other animals such as terns and piping plover are more amenable to mitigation. Dredge spoil islands create excellent nesting habitat for terns.

Category Urban Open Space suitable as wildlife habitat

Definition Wetlands, Lakes, Streams their banks and shorelands or uplands vegetated at least by shrubs and grasses and no smaller than five acres; within the confines of an urban area with population at least 10,000.

Description, Extent and Distribution - Long Island These are green areas within the expanse of brick, concrete and macadam which constitute the urban habitat of man. Wildlife habitat requires some minimum of an unbroken vegetated area. Feral animals and animals thriving in the presence of human commerce and dwelling such as pigeons, rats, starlings and cockroaches are not considered wildlife in the context of this report. The urban area of Long Island extends on the north shore, east to Northport and on the south shore, east to Patchogue. On the south shore the open areas suitable as wildlife habitat are usually town parks, and on the edge of residential areas, the bays and marshes between the barrier beach and the mainland. On the North shore a more affluent population has created large estates from Little Neck Bay to San Remo on the Nissequoque. These estates contribute significantly to wildlife habitats.

Hudson River Reaches one and two, six through eight, ten and eleven and thirteen have some areas designated as urban open space suitable as wildlife habitat.

Ecological Function The North Shore area of large estates provides large areas of low human density which support various levels of wildlife populations according to the vegetation allowed to grow. Managed for optimum wildlife support with coexisting human settlement, these areas could sustain a rich and varied wildlife resource. The south shore areas function as concentration areas for waterfowl in winter.

Values Aldo Leopold (1943) asserted: "... by common consent of thinking people, there are cultural values in experiences which renew contacts with wild things." He identifies three of these values:

- "1. split rail value - historical appreciation"
- "2. testimony to human dependance on food chains"
- "3. advancement toward a conservation ethic"

Cultures, like species, evolve and survive or they become ill-fitted to the environment from which they draw operational resources. Ill-fitted cultures, unable to interact effectively with the resource base fail to sustain themselves and they disappear.

Leopold in 1943, sensed that mans ignorant use of machinery was modifying the environment toward irreversible depletions of resources critical to our well-being. He stated (1943) "We shall achieve conservation when and only when the destructive use of land becomes unethical-punishible by social ostracism. Any experience that stimulates this extension of ethics is culturally valuable."

Leopold saw the wildlife experience as adding survival value to our culture through an educative process. He perceived that an individual accrues values from an interaction with wildlife which stimulate a desire to preserve the opportunity to enjoy similar experiences in the future. He obviously felt that once developed, this "conservation ethic" would logically extend to promote careful use of land, soil, water, air and non-renewable fuel sources.

The values gained by the individual from such aesthetic experiences are held to be self-renewal, a withdrawal from the tensions inherent in the day to day existence of urban dwellers, resulting in increased competency or ability to cope. This adds further survival value to the culture which preserves and encourages these opportunities.

Permissible Uses

Urban open space is an increasingly precious commodity. It is desired for playgrounds, ball parks, commercial and residential development. Areas that sustain wildlife populations should be held in land uses which can provide wildlife experiences to urban people. Nature trails through appropriately managed preserves is the priority use. On Long Islands north shore large estates now holding substantial wildlife populations may be taxed out of existence. These areas could be managed to hold even more diverse and plentiful fauna. Regional government should seek to alleviate the tax burdens of these estates in exchange for certain of the property rights. Development rights and certain trespass rights should be acquired by government in exchange for lowered taxes.

PART 661

TIDAL WETLANDS - LAND USE REGULATIONS
(Statutory authority: Environmental Conservation Law
§§1-0101, 3-0301 and 25-0302)

Sec.	
661.1	Purpose of this Part
661.2	Findings
661.3	Applicability
661.4	Definitions
661.5	Use guidelines
661.6	Development restrictions
661.7	Uses not requiring a permit or notification letter approval
661.8	Notification letter requirements
661.9	Permit requirements
661.10	Standards for issuance of permits
661.11	Conditions to a permit
661.12	Existing land use and development
661.13	Variances
661.14	Notification letter procedures
661.15	Application for a permit
661.16	Notice of hearing
661.17	Statements by public
661.18	Public hearing; decisions after public hearing; decisions without public hearings
661.19	Notice of decision to grant or deny permit application
661.20	Relationship to SEQR and the Freshwater Wetlands Act
661.21	Pending moratorium permit applications
661.22	Duration of permits
661.23	Bond
661.24	Modification of permits and decisions
661.25	Revocation or suspension of permit
661.26	Determination that lands do not involve littoral zone or coastal shoals, bars or flats
661.27	Inventory map: maintenance and amendments
661.28	Measurement
661.29	Tax assessment
661.30	Joint proceedings under other laws and regulations
661.31	Other laws and regulations; other permits or approvals
661.32	Emergency activities
661.33	Jurisdictional inquiries
661.34	Violations; penalties
661.35	Enforcement
661.36	Judicial review

6 NYCRR 661
November 10, 1976

COASTAL ZONE
INFORMATION CENTER

Section 661.1 Purpose of this Part. It is the public policy of the State, as set forth in the Tidal Wetlands Act, to preserve and protect tidal wetlands, and to prevent their despoliation and destruction, giving due consideration to the reasonable economic and social development of the State. It is the purpose of this Part to implement that policy by establishing regulations that allow only those uses of tidal wetlands and areas adjacent thereto that are compatible with the preservation, protection and enhancement of the present and potential values of tidal wetlands, (including but not limited to their value for marine food production, wildlife habitat, flood and hurricane and storm control, recreation, cleansing ecosystems, absorption of silt and organic material, education and research, and open space and aesthetic appreciation), that will protect the public health and welfare, and that will be consistent with the reasonable economic and social development of the state.

Section 661.2 Findings.

Tidal wetlands constitute one of the most vital and productive areas of the natural world and collectively have many values. These values include, but are not limited to, marine food production, wildlife habitat, flood and storm and hurricane control, recreation, cleansing ecosystems, sedimentation control, education and research, and open

space and aesthetic appreciation, as set forth in the legislative findings contained in section one of chapter 790 of the laws of 1973. Therefore, the protection and preservation of tidal wetlands are essential.

Several ecological zones exist in tidal wetlands. These several zones are as follows: coastal fresh marsh; intertidal marsh; coastal shoals, bars and flats; littoral zone; high marsh or salt meadow; and formerly connected tidal wetlands. In addition, adjacent areas, which are important to the protection of tidal wetlands values, adjoin these tidal wetlands zones.

These tidal wetlands zones collectively serve all of the tidal wetland values set forth in chapter 790 of the laws of 1973. However, because of their different natural characteristics, each zone may serve any particular value to a greater or lesser degree than other zones. The varied natural characteristics of the several tidal wetlands zones, including their functions, contour, biota, tidal action, water quality and in particular their respective contributions to the marine food chain, cause certain zones to be relatively more sensitive to the adverse impacts caused by land use and development. Similarly, these varied natural characteristics make it important to more stringently protect and preserve certain tidal wetlands zones relative to other zones. However, any ranking of the value of dif-

ferent tidal wetland zones is general in nature, and specific exceptions to such a ranking do occur.

Intertidal marsh and coastal fresh marsh tidal wetlands are the most biologically productive of all tidal wetlands areas. Furthermore, since they receive twice-daily tidal flushing, the products of vegetative photosynthetic activity and decomposition in these zones are readily transported to adjacent waters for use in the estuarine food chain. Their intertidal location also makes them among the most effective wetland zones for flood and hurricane and storm protection. Both their intertidal location and their highly productive nature makes them among the most effective wetland zones for cleansing ecosystems and for absorbing silt and organic material. Because of these high values and their sensitive location at the land-water interface, intertidal and coastal fresh marshes must be the most stringently protected and preserved tidal wetlands zones. Even small portions of these zones are critically important resources. Consequently, only very limited types of land use and development are compatible with the values of these areas.

Coastal shoals, bars, and flats and littoral zones include areas of extreme variability in their contributions to marine food production and other tidal wetland values, and each such area requires a specific assessment of tidal wetland values. Some coastal shoals, bars and flats and

some littoral zones are areas of extremely high biological productivity and are nearly or equally as important in this respect as intertidal marshes and coastal fresh marshes. Other areas are of little biological significance. Even in these relatively unproductive areas, however, values other than marine food production are often present, and these areas often have the potential to become more biologically productive in the future. Because of their location at the land-water interface, coastal shoals, bars and flats and littoral zones play an important role in flood and hurricane and storm control, although they are less important in this regard than coastal fresh marshes, intertidal marshes and high marshes or salt meadows. Similarly, because of their location at the land-water interface and because of their generally high levels of productivity, these areas have an important function in cleansing ecosystems and absorbing silt and organic materials, but they are also less critical in these ways than coastal fresh marshes, intertidal marshes and high marshes or salt meadows. Where tidal wetlands values, particularly biologic productivity, are high, only limited types of land use and development are compatible with the values of these areas. Where tidal wetland values are relatively lower, more extensive and intensive uses may be compatible with the wetland values of these areas.

Some areas possess the physical characteristics of littoral zones or coastal shoals, bars or flats but do not function biologically as tidal wetlands. Such areas have generally been heavily impacted by pollution, sedimentation or other artificial disturbance, exhibit little primary productivity, and are populated by few benthic organisms. Such areas require identification on a case-by-case basis and when so identified should no longer be treated as tidal wetlands under this Part.

High marsh or salt meadow tidal wetlands constitute an extensive zone of the salt marshes that receives only occasional tidal flooding coincident with extreme lunar tides and occasional storms. Since their photosynthetic productivity is lower than coastal fresh marshes and intertidal marshes and since flushing of the biological products of the high marsh or salt meadow to the estuary is less efficient than in coastal fresh marshes and intertidal marshes, salt meadows or high marshes, while critically important for marine food production, are slightly less important in this regard than coastal fresh marshes or intertidal marshes. Because of their size and location salt meadows or high marshes are as important for absorption of silt and organic material and flood and hurricane and storm control as coastal fresh marshes and intertidal marshes. Furthermore, because they are located generally in such a way that they are the

first tidal wetland area to receive run-off and other materials from the land, they have an important role in cleansing ecosystems, but their value in this respect is generally slightly less than in coastal fresh marshes and intertidal marshes because of the lower level of direct tidal influence in high marshes or salt meadows. Because these wetlands are usually located adjacent to intertidal marshes and because their values are similar, these wetland areas must be stringently protected and preserved. Even small portions of these areas are critically important resources, although slightly less so than intertidal marshes and coastal fresh marshes. Consequently, only very limited types of land use and development are compatible with the value of these areas.

All of the above-described tidal wetland zones may occur behind shifting natural barriers that are breached by intermittent tidal inlets which allow tidal action to affect such wetlands.

Formerly connected tidal wetlands are lowland areas whose connections to tidal waters are restricted by road fills, dikes, or other man-made facilities. The nature and value of these tidal wetland areas are widely variable and are a function of the extent of the tidal restriction and the time which has passed since the restriction occurred. Therefore, a case-by-case analysis of these wetlands is

required. Each of these tidal wetland areas closely resembles another type of wetland zone. Those uses compatible with the type of wetland zone which a particular formerly connected tidal wetland most closely resembles will be generally compatible with that formerly connected wetland.

Adjacent areas make insignificant contributions to marine food production. Tidal wetland values for cleansing ecosystems, flood and hurricane and storm control, and absorbing silt and organic material may be served to varying degrees by these areas, but these values are not as critically served in adjacent areas as in the tidal wetland zones. The most important function of adjacent areas is to serve as buffers to protect the character, quality and values of tidal wetlands that adjoin or lie near these areas. Consequently, a wide variety of uses may be compatible with these areas, provided such uses do not adversely affect adjacent and nearby tidal wetlands.

All of the tidal wetland zones and adjacent areas generally serve to an approximately equal degree the wildlife habitat, recreation, education and research, and open space and aesthetic appreciation values of tidal wetlands. Variations do occur in the values served from, for example, a particular intertidal marsh to another or from a particular high marsh or salt meadow to another. Furthermore, one type of tidal wetland or an adjacent area may serve a particular

wildlife habitat, recreation, education and research, or open space and aesthetic appreciation value. These variations depend on a wide variety of factors, including the particular value sought to be served, the quality and diversity of the natural resources of a particular area, the size and location of the area, the natural features and land uses surrounding the particular area, and the time of year. Generally, tidal wetlands and adjacent areas are the habitat for a large number of wildlife species, provide large expanses for a variety of recreational purposes, offer conditions useful for many education and research purposes and satisfy a broad spectrum of aesthetic appreciation and open space needs.

The productivity and variability of tidal wetlands and their location in a constantly changing environment mean that whatever the present existing values of a particular tidal wetland are, the ability of that wetland to serve these values generally continues provided it is allowed to function in a substantially natural and undisturbed state. Furthermore certain human-induced modifications of tidal wetlands can increase tidal wetland values when carefully designed and undertaken. Consequently, land use and development in or near tidal wetlands must be compatible with the present and potential values of tidal wetlands.

Tidal wetlands are located at the critical interface between land and tidal waters, and the amount of this land-water boundary is limited. Certain types of land use and development require access to tidal waters, while others do not. Given the critical values served by tidal wetlands, the limited extent of the land-water boundary, and the many types of land use and development that require water access and should be located where they will not substantially impair tidal wetland values, land use and development that does not require water access generally should not be located in tidal wetlands or adjacent areas.

While tidal wetlands and adjacent areas contain distinct zones, as set forth in these findings, these areas are essentially an integrated natural system. The resources in one area utilize and depend on the resources in other areas. The tidal wetland benefits produced in one area benefit nearby areas, and the negative impacts imposed on the natural values of one area are transferred to other nearby tidal wetland areas. Consequently, land use and development occurring in any particular tidal wetland or adjacent area may cause impacts on nearby areas and should be compatible with the values of the particular area on which it is located as well as with the values of nearby tidal wetlands.

Section 661.3 Applicability

This Part shall apply to any tidal wetland the final bounds of which have been established by an order of the commissioner pursuant to section 25-0201 of the Act and to any adjacent area. Any such order shall become effective on the date it is filed in the office of the clerk of the county in which such wetland is located. These regulations shall be applicable in the following areas: Suffolk county, Nassau county, all boroughs of the city of New York, Westchester county and Rockland county.

Section 661.4 Definitions. The following terms when used in this Part shall have the following meanings:

(a) "Act" shall mean the Tidal Wetlands Act (Article 25 of the environmental conservation law as from time to time amended).

(b) "Adjacent area" shall mean any land immediately adjacent to a tidal wetland within whichever of the following limits is closest to the most landward tidal wetland boundary, as such most landward tidal wetlands boundary is shown on an inventory map (see explanatory figures 1-6):

(1) 300 feet landward of said most landward boundary of a tidal wetland, provided, however, that within the boundaries of the city of New York this distance shall be 150 feet (see figure 1); or

-11-

(2) to the seaward edge of the closest lawfully and presently existing (i.e., as of the effective date of this Part), functional and substantial man-made structure (including, but not limited to, paved streets and highways, railroads, bulkheads and sea walls, and rip-rap walls) which lies generally parallel to said most landward tidal wetland boundary and which is a minimum of 100 feet in length as measured generally parallel to such most landward boundary, but not including individual buildings (see figure 2); or

(3) to the elevation contour of 10 feet above mean sea level, except when such contour crosses the seaward face of a bluff or cliff, or crosses a hill on which the slope equals or exceeds the natural angle of repose of the soil, then to the topographic crest of such bluff, cliff, or hill (see figures 3 and 4). Pending the determination by the commissioner in a particular case, the most recent, as of the effective date of this Part, topographical maps published by the United States geological survey, department of the interior, having a scale of 1:24,000, shall be rebuttable presumptive evidence of such 10 foot elevation.

Adjacent area shall not include any area lying landward of an imaginary line drawn between the seaward edges of two existing substantial man-made structures which constitute the landward limit of an adjacent area, as provided in paragraph (2) of this subdivision, where the area landward

of such imaginary line does not have located thereon any such man-made structures and where such imaginary line is less than than 100 feet in length, as measured generally parallel to the most landward limit of the tidal wetland involved (see figure 5).

Where land lies within the boundaries of an adjacent area defined by paragraph (1) or paragraph (3) of this subdivision but appears to be excluded from an adjacent area by paragraph (2) or the immediately preceding paragraph of this subdivision, such land shall be deemed to be part of an adjacent area (see figure 6). Provided, however, that in such instances of overlap between the various provisions of this subdivision the regional permit administrator may in his discretion determine that said land is not an adjacent area for the purposes of this Part if factors are present which in his opinion justify treating such land as non-adjacent area in light of the provisions in paragraph (2) or the immediately preceding paragraph of this subdivision.

The construction of a new substantial man-made structure described in paragraph (2) of this subdivision after the effective date of this Part shall not be deemed to limit the extent of an adjacent area.

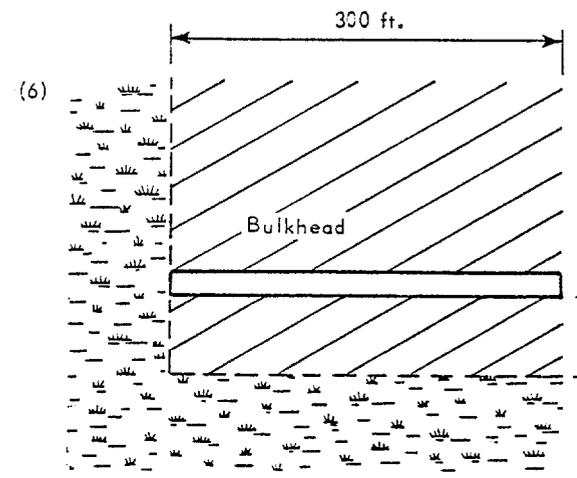
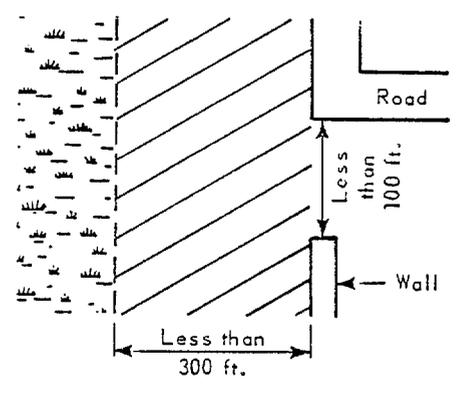
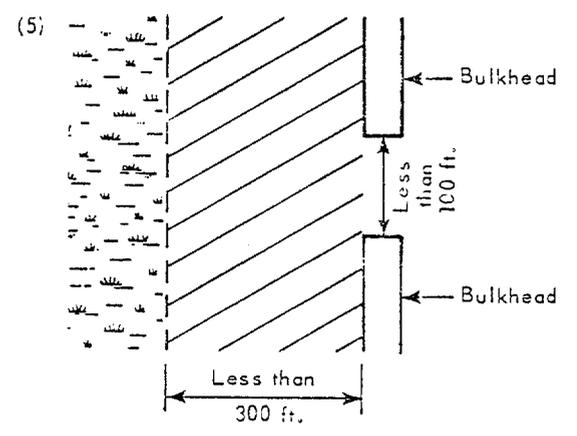
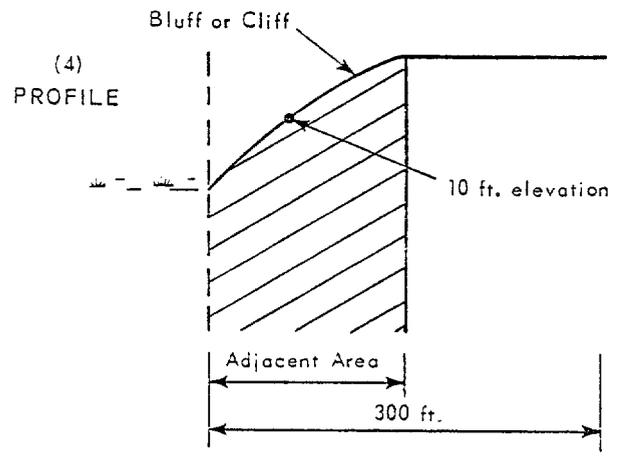
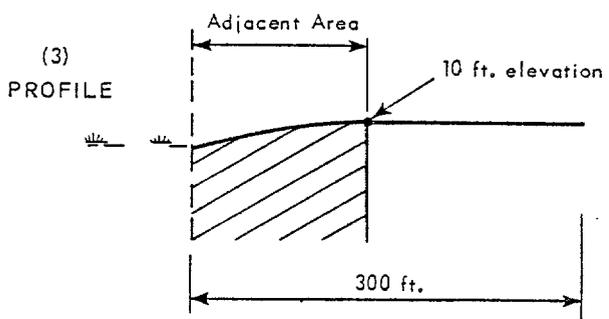
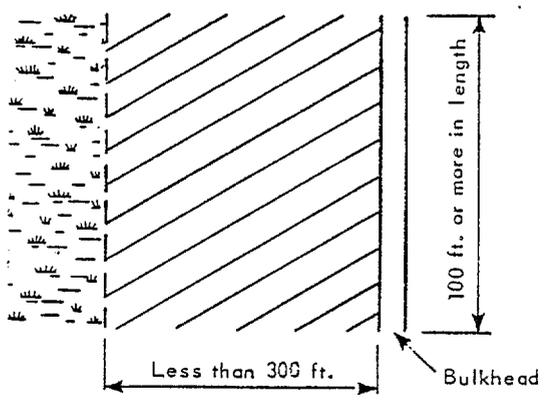
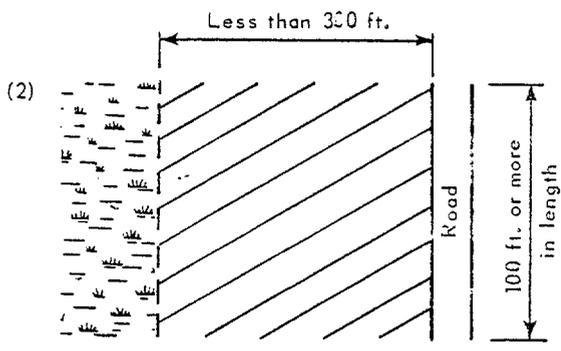
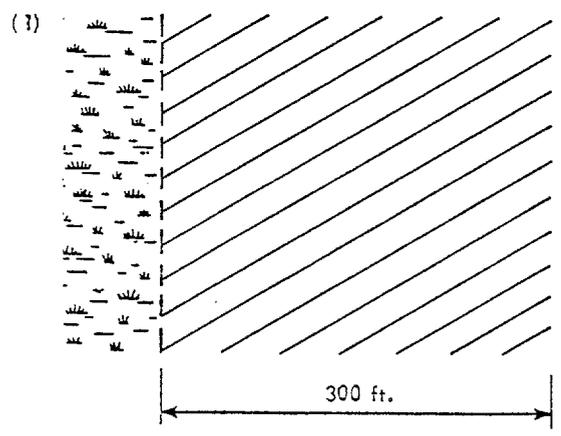
Adjacent area shall also include any extended adjacent area identified during the moratorium period, as established by section 25-0202 of the act, pursuant to the provisions of 6 NYCRR 660.1(c).

ADJACENT AREAS

061.4

 Adjacent area on upland

 Wetland



(c) "Applicant" shall mean a person who files an application for a permit issued by the department pursuant to this Part and who is either the owner of the land on which the proposed regulated activity will be located, a contract vendee of such owner, a lessee of such owner, or the person who will actually control and direct the undertaking of the proposed activity.

(d) "Aquaculture" shall mean the cultivation and harvesting of products that naturally are produced in the marine environment, including fish, shellfish, crustaceans and seaweed, and the installation of cribs, racks and in-water structures for cultivating such products, but shall not mean the construction of any building, any filling or dredging or the construction of any water regulating structures.

(e) "Chief administrative officer" shall mean in the case of a city or a village, the mayor thereof, in the case of a town, the supervisor thereof, and, in the case of a county not wholly within a city, the county executive or county legislative body.

(f) "Chief permit administrator" shall mean any employee of the department who is designated by the commissioner to act in such capacity.

(g) "Commercial use" shall mean any use involving the sale, rental or distribution of facilities (including but not limited to tourist accommodations and storage facilities),

goods, services or commodities, either retail or wholesale, or the provision of recreational facilities for a fee.

(h) "Commercial use building" shall mean any building in excess of 100 square feet associated with a commercial use.

(i) "Commissioner" shall mean the commissioner of environmental conservation or his duly authorized representative.

(j) "Department" shall mean the department of environmental conservation.

(k) "Dredging" shall mean the excavation or removal of sediment, soil, mud, sand, shells, gravel or other aggregate from any tidal wetland or adjacent area for the direct or indirect purpose of establishing or increasing water depth, increasing the surface or cross-sectional area of a waterway, or obtaining such sediment, soil, mud, sand, gravel, shells or other aggregate. Provided however, such term shall not include acquiring samples of sediment, soil, mud, sand, shells, gravel or other aggregate; acquiring the natural products of tidal wetlands by recreational or commercial fishing, shellfishing, aquaculture, hunting or trapping where otherwise legally permitted; or maintenance dredging as defined in subdivision (r) below.

(l) "In existence" or "existing" shall mean, with respect to any land use and development (except a subdivi-

sion), that such land use and development has been substantially commenced or completed, and with respect to any subdivision of land, or portion thereof, shall mean that such subdivision, or portion, has been substantially commenced or completed and that substantial expenditures have been made for structures or improvements directly related thereto.

(m) "Industrial use" shall mean any manufacturing, production or assembly of goods or materials and any mineral extraction operation.

(n) "Industrial use building" shall mean any building in excess of 100 square feet associated with an industrial use.

(o) "Inventory map" shall mean a final tidal wetlands boundary map established by the commissioner pursuant to subdivision four of section 25-0201 of the Act depicting the boundary lines of tidal wetlands and filed in the office of the county clerk in the county in which such wetlands are located.

(p) "Land use and development" or "use" shall mean any construction or other activity which materially changes the use or appearance of land or a structure or the intensity of use of land or a structure, including but not limited to any regulated activity.

(q) "Lawfully" shall mean in full compliance with all applicable statutes, rules and regulations.

(r) "Maintenance dredging" shall mean dredging to maintain or restore water depth to a depth which can be proved to have existed on or after January 1, 1965, in a location actually being specifically and lawfully utilized as of the effective date of this Part, and as of the date of the proposed maintenance dredging, for (1) moving or mooring vessels or machinery or (2) as a water intake or discharge channel or zone.

(s) "Mineral extraction" shall mean any extraction (not including the taking of specimens, dredging, or maintenance dredging) from any tidal wetland or adjacent area of stone, coal, salt, ore, talc, granite, petroleum products, sand and gravel or other materials, including the construction, alteration or maintenance of mine roads, mine tailing piles or dumps and mine drainage.

(t) "Multiple family dwelling" shall mean any apartment, town house, condominium or similar building, including the conversion of an existing single family dwelling to a structure designed for occupancy in separate living quarters by more than one family.

(u) "Municipality" shall mean a village, town or city or a county in the case of a county not wholly included within a city.

(v) "Permit" shall mean that form of departmental approval required by this Part for the carrying on of a regulated activity.

(w) "Person" shall mean any individual, public or private corporation, political subdivision, government agency, department or bureau of the state, bi-state authority, municipality, industry, co-partnership, association, firm, trust, estate or any other legal entity whatsoever.

(x) "Pollutant" shall mean any form of pollution.

(y) "Pollution" shall mean the presence in the environment of conditions or contaminants in quantities or characteristics which are or may be injurious to human, plant, or marine life, wildlife, or other animal life, or to property, or which unreasonably interfere with the comfortable enjoyment of life and property throughout such tidal wetlands as may be affected thereby.

(z) "Principal building" shall mean any one of the following: single family dwelling; each two units of a multiple family dwelling; any other type of building, including but not limited to any commercial or industrial use building or public or semi-public building, that exceeds 1,000 square feet in area and each additional 1,000 square feet of floor space of such a building in excess of 3,000 square feet. In addition, each commercial or industrial use building or public or semi-public building less than 1,000 square feet in area shall count as one-quarter of a principal building.

(aa) "Project" shall mean any action which may result in direct or indirect physical impact on a tidal wetland, including, but not limited to, any regulated activity.

(bb) "Public or community sewage disposal system" shall mean any sewage disposal system for which the discharge to such system has been authorized by a SPDES permit issued pursuant to Article 17 of the environmental conservation law.

(cc) "Public or semi-public building" shall mean any municipal building, library building, school or college building, hospital building, building used as a place of worship, museum building, research center building, rehabilitation center building or any similar building.

(dd) "Regional permit administrator" shall mean an employee of the department designated by the commissioner to act in such capacity within the jurisdiction of a regional office of the department.

(ee) "Regulated activity" shall mean:

(1) any form of draining, dredging, excavation or removal, either directly or indirectly, of soil, mud, sand, shells, gravel or other aggregate;

(2) any form of dumping, filling or depositing, either directly or indirectly, of any soil, stones, sand, gravel, mud, rubbish or fill of any kind;

(3) the erection of any structures or construction of any facilities or roads, the driving of any pilings or placing of any other obstructions, whether or not changing the ebb and flow of the tide;

(4) any form of pollution;

(5) any portion of a subdivision of land located in any tidal wetland or adjacent area;

(6) any other new activity within a tidal wetland or on an adjacent area which directly or indirectly may substantially alter or impair the natural condition or function of any tidal wetland.

Regulated activity shall include, but not be limited to, any activity listed in section 661.5(b) as a generally compatible use - permit required (GCp), presumptively incompatible use - permit required (PIp), incompatible use (I) or permit required (P) for the applicable area. Regulated activity shall not include any activity listed in section 661.5 of this Part as a use not requiring a permit or notification letter approval (NPN) for the applicable area. Regulated activity may include any activity listed in section 661.5 as a generally compatible use - notification letter required (GCn) for the applicable area.

(ff) "Single family dwelling" shall mean any detached building containing one dwelling unit, including any mobile home.

(gg) "Subdivision of land" or "subdivision" shall mean any division of land into two or more lots, parcels or sites, whether adjoining or not, for the purpose of sale, lease, license or any form of separate ownership or occupancy (including any grading, road construction, installation of utilities or other improvements or any other land use and development preparatory or incidental to any such division) by any person or by any other person controlled by, under common control with or controlling such person or by any group of persons acting in concert as part of a common scheme or plan. Subdivision of land shall not include the lease of land for hunting and fishing and other open space recreation uses and shall not include the division of land by bona fide gift, devise or inheritance by and from natural persons.

(hh) "Tidal wetlands" or "wetlands" shall mean any lands delineated as tidal wetlands on an inventory map and shall comprise the following classifications as delineated on such map:

(1) coastal fresh marsh - The tidal wetland zone, designated FM on an inventory map, found primarily in the upper tidal limits of riverine systems where significant fresh water inflow dominates the tidal zone. Species normally associated with this zone include narrow leaved cattail, Typha angustifolia; the tall brackish water cord-

grasses, Spartina pectinata and/or S. cynosuroides; and the more typically emergent fresh water species such as arrow arum, Peltandra; pickerel weed, Pondederia; and cutgrass, Leersia.

(2) intertidal marsh - The vegetated tidal wetland zone, designated IM on an inventory map, lying generally between average high and low tidal elevation. The predominant vegetation in this zone is low marsh cordgrass, Spartina alterniflora.

(3) coastal shoals, bars and flats - The tidal wetland zone, designated SM on an inventory map, that (i) at high tide is covered by water, (ii) at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and (iii) is not vegetated by low marsh cordgrass, Spartina alterniflora, except as otherwise determined in a specific case as provided in section 661.26.

(4) littoral zone - The tidal wetlands zone, designated LZ on an inventory map, that includes all lands under tidal waters which are not included in any other category, except as otherwise determined in a specific case as provided in section 661.26. Provided, there shall be no littoral zone under waters deeper than six feet at mean low water. Pending determination by the commissioner in a particular case, the most recent, as of the effective date of this Part, national ocean survey maps published by the

national ocean survey, national oceanic and atmospheric administration shall be rebuttable presumptive evidence of such six foot depth.

(5) high marsh or salt meadow - The normal uppermost tidal wetland zone, designated HM on an inventory map, usually dominated by salt meadow grass, Spartina patens; and spike grass, Distichlis spicata. This zone is periodically flooded by spring and storm tides and is often vegetated by low vigor, Spartina alterniflora and Seaside lavender, Limonium carolinianum. Upper limits of this zone often include black grass, Juncus Gerardi; chairmaker's rush, Scirpus sp; marsh elder, Iva frutescens; and groundsel bush, Baccharis halimifolia.

(6) formerly connected tidal wetlands - The tidal wetlands zone, designated FC on an inventory map, in which normal tidal flow is restricted by man-made causes. Typical tidal wetland plant species may exist in such areas although they may be infiltrated with common reed, Phragmites sp.

Section 661.5 Use Guidelines.

(a) (1) Any type of use designated in this section as a use not requiring a permit or notification letter approval for the type of area involved is not subject to the permit or notification letter requirements of this Part.

(2) Any type of use designated in this section as a generally compatible use for the type of area involved is generally compatible with that type of area and with the preservation, protection and enhancement of the present and potential value of tidal wetlands if undertaken in that area. The compatibility of a particular use depends on the particular location, design and probable impact of the proposed use. Generally compatible uses are subject to either the notification letter requirements or permit requirements of this Part.

(3) Any type of use designated in this section as a presumptively incompatible use for the type of area involved shall be presumed not to be compatible with the type of area involved or with the preservation, protection or enhancement of the present and potential values of tidal wetlands if undertaken in that area. Any such use is subject to the permit requirements of this Part.

(4) Any type of use designated in this section as an incompatible use is not compatible with the type of area involved or with the preservation, protection or enhancement of the present and potential values of tidal wetlands if undertaken in that area. Any such use is subject to the permit requirements of this Part.

Nothing in this subdivision shall be deemed to remove any burden of proof imposed on an applicant by section 661.10 of this Part.

(b) The classification of uses in coastal fresh marshes, intertidal marshes, coastal shoals, bars and flats, high marshes or salt meadows, littoral zones, and adjacent areas, shall be as respectively indicated in the following chart:

ABBREVIATIONS

Area Categories

FM = Coastal Fresh Marsh
 IM = Intertidal Marsh
 SM = Coastal Shoals, Bars and Flats
 LZ = Littoral Zone
 HM = High Marsh or Salt Meadow
 AA = Adjacent Area

Use Categories

NPN = Uses Not Requiring a Permit or Notification Letter Approval
 GCn = Generally Compatible Use - Notification Letter Required
 GCP = Generally Compatible Use - Permit Required
 PIP = Presumptively Incompatible Use - Permit Required
 I = Incompatible Use
 P = Permit Required
 NA = Not Applicable

Uses	Area and Use Categories				
	FM, IM, HM	SM, LZ	AA		
1. The continuance of lawfully existing uses (including but not limited to residential, commercial, industrial, agricultural, recreational, and public uses) and the continuance of all activities normally and directly associated with any such use, where such continuance does not involve expansion or significant alteration of the existing use.	NPN	NPN	NPN		
2. Activities of the department of health or of units of local government with respect to public health, when conducted in conformance with section 25-0-01 of the Act.	NPN	NPN	NPN		
3. Activities subject to the review jurisdiction of the public service commission or the state board on electric generation siting and the environment under article seven or article eight of the public service law, respectively. The standards and restrictions of this Part will be applied by said bodies in determining whether to issue a certificate of environmental compatibility and public need under such articles.	NPN	NPN	NPN		
4. Establishing scenic, historic, wildlife and scientific preserves, without any material alteration of the area involved.	NPN	NPN	NPN		
5. Boating, hiking, swimming, camping, picnicking and other similar non-motorized forms of outdoor activity.	NPN	NPN	NPN		
6. Depositing or removing the natural products of a tidal wetland (or adjacent area) in the process of recreational or commercial fishing, shellfishing, aquaculture, hunting or trapping, including the erection and maintenance of temporary aids or blinds.	NPN	NPN	NPN		
7. Conducting educational and research activities not involving any material alteration of the area involved.	NPN	NPN	NPN		
8. Establishing walking trails without material alteration of the area involved.	NPN	NPN	NPN		
9. Establishing plantings.	GCn	GCn	NPN		
10. Establishing recreational moorings.	NPN	NPN	NPN		
11. Operation of motor vehicles, including but not limited to air boats and other all-terrain vehicles, for educational or scientific research purposes (provided this item shall not include operation of aircraft or mechanically propelled vessel; other than air boats).	GCn	GCn	NPN		
12. Operation of motor vehicles, including but not limited to air boats and other all-terrain vehicles, for other than educational or scientific purposes (provided this item shall not include the use of aircraft or mechanically propelled vessels other than air boats).	PIP	GCp	NPN		
13. Operation of aircraft or mechanically propelled vessels other than air boats.	NPN	NPN	NPN		
14. Constructing one open pile catwalk and/or dock not greater than four feet in width for any principal building.	GCn	GCn	GCn		
15. Constructing open pile catwalks and docks more than four feet in width; or constructing more than one open pile catwalk and/or dock not greater than four feet in width for any principal building.	PIP	GCp	GCp		
16. Installing a floating dock(s) totalling less than 200 square feet in area.	GCn	NPN	NPN		
17. Installing a floating dock(s) totalling 200 square feet or more in area.	PIP	GCn	GCn		
18. Relocation and/or rearrangement of floating docks, open pile docks, and similar structures within an established marina or boat basin where such activities involve no disturbance of a tidal wetland other than removing and relocating anchors or pilings.	PIP	NPN	NPN		
19. Constructing solid fill docks.	PIP	PIP	GCn		
20. Permanent or seasonal mooring of any vessel or structure to be used as a single family dwelling, multiple family dwelling, commercial use building, industrial use building or public or semi-public building.	PIP	GCp	GCp		
21. Ordinary maintenance and repair (not involving expansion or substantial restoration, reconstruction or modification) of existing functional structures, facilities or improved areas, including but not limited to bridges, roads, highways, railroad beds, bulkheads, docks, beaches, piers, wharves, pilings, dolphins, buildings, landscaped or paved areas, lawns, and agricultural and mosquito control ditches. -- Including for example, replacing broken boards in docks, repainting structures, re-driving pilings, resurfacing paved areas, installing and removing lawful structures on a seasonal basis.	NPN	NPN	NPN		
22. In-kind and in-place replacement of existing functional bulkheads and similar structures.	NPN	NPN	NPN		
23. Routine beach regrading and cleaning, both above and below mean high water mark.	PIP	NPN	NPN		
24. Substantial restoration or reconstruction, of existing functional structures or facilities of any kind, except for those covered by items 22 and 26, (provided, where the installation of a new structure or facility is listed in this subdivision as GCn or NPN for a particular type of area, the substantial restoration or reconstruction of such a structure or facility on that area shall be treated in the same manner as the installation of such a new structure or facility).	GCp	GCp	GCn		
25. Expansion or substantial modification of existing functional facilities and structures, except for those actions covered by items 26, 33, 34 or 38 (provided where the installation of a new structure or facility is listed in this subdivision as NPN, GCn or GCP, the expansion or substantial modification of such a structure or facility shall be treated in the same manner in that area).	PIP	GCp	GCn		
26. Substantial restoration, reconstruction, modification or expansion of existing functional residential structures which are and will continue to be located 75 feet or more (or 30 feet or more in New York City) from the most landward edge of any tidal wetland.	NA	NA	NPN		
27. Dredging.	PIP	PIP	PIP		
28. Maintenance dredging.	GCn	GCn	GCn		
29. Construction of groins, bulkheads, and other shoreline stabilization structures.	PIP	GCp	GCp		
30. Filling.	PIP	PIP	GCp		
31. Disposal of dredged material.	I	PIP	GCp		
32. Construction of berms.	PIP	PIP	GCp		
33. Construction or substantial modification of mosquito control ditches.	GCp	GCp	GCn		
34. Construction or substantial modification of drainage ditches for other than agricultural or mosquito control purposes.	PIP	PIP	GCp		

Uses	Area and Use Categories		
	FM, IM, MM	SM, LZ	AA
35. Cultivating and harvesting naturally occurring agricultural and horticultural products, other than activities covered by items 36 and 37 below.	NPN	NPN	NPN
36. Manual harvesting of salt hay.	NPN	NA	NA
37. Harvesting of salt hay by mechanical equipment.	GCn	NA	NA
38. Substantial modification of agricultural ditches lawfully existing on the effective date of this Part.	GCp	GCp	GCn
39. New agricultural activities not covered by items 35-38.	PIp	PIp	GCp
40. Connection of electric, gas, sewer, water, telephone or other utilities from an existing distribution utility facility to an existing structure.	GCn	GCn	NPN
41. Installation of underground electric, sewer, water or other utilities where such installation will involve restoration of existing ground elevation, other than activities covered by item 40.	GCp	GCp	GCp
42. Installation of electric, gas, sewer, water or other utilities, other than activities covered by item 40 or 41.	PIp	PIp	GCp
43. Installation of a dry well, retention basin, filter, open swale or pond.	PIp	PIp	GCp
44. New discharge of any pollutant requiring a SPDES permit pursuant to the environmental conservation law and complying with the requirements for the issuance of such a permit.	P	P	P
45. Installation of a sewage disposal septic tank, cesspool, leach field, or seepage pit and discharge of any pollutant into such facilities not requiring a SPDES permit pursuant to article 17 of the environmental conservation law.	PIp	PIp	GCp
46. Construction of single family dwellings and multiple family dwellings.	PIp	PIp	GCp
47. Construction of commercial and industrial use facilities requiring water access and public and semi-public buildings requiring water access; and undertaking commercial and industrial use activities requiring water access.	PIp	PIp	GCp
48. Construction of commercial and industrial use facilities not requiring water access and public or semi-public buildings not requiring water access; and undertaking commercial and industrial use activities not requiring water access.	PIp	PIp	PIp
49. Construction of accessory structures or facilities for any use listed in items 46 and 47, other than accessory structures or facilities covered by item 50 or covered specifically in this list.	PIp	PIp	GCp
50. Construction of accessory structures or facilities for existing residential structures where such accessory structures or facilities are and will continue to be located 75 feet or more (or 30 feet or more in the City of New York) from the most landward edge of any tidal wetland.	NA	NA	NPN
51. Construction of accessory structures or facilities for any use listed in item 48.	PIp	PIp	PIp
52. Disposal of any chemical, petrochemical or other toxic material, including any pesticide.	I	I	I
53. The use or application of any chemical, petrochemical, or other toxic material, including any pesticide, where not authorized by law.	I	I	I
54. The storage of any chemical, petrochemical, or other toxic material, including any pesticide, for wholesale purposes or for purposes of distribution to persons other than the ultimate user of such materials.	I	I	PIp
55. The use or application of any chemical, petrochemical, or other toxic material, including any pesticide, where otherwise authorized by law, or the storage of any such material for purposes other than wholesaling or distribution to persons other than the ultimate users of such materials.	NPN	NPN	NPN
56. Disposal of solid wastes as defined in section 27-0501 of the environmental conservation law.	I	I	PIp
57. Any type of regulated activity not specifically listed in this chart and any subdivision of land.	P	P	P

(c) Formerly connected tidal wetlands.

For formerly connected tidal wetlands, uses not requiring a permit or notification letter approval, generally compatible uses, presumptively incompatible uses and incompatible uses shall be deemed to be the same respectively as the type of wetland which a particular formerly connected tidal wetland most closely resembles.

(d) Uses not specifically listed in subdivision (b).

For any regulated activity covered by item 57 in subdivision (b) of this section, the regional permit administrator shall on a case-by-case basis classify such cases as GCp, PIp, or I under subdivision (b), utilizing the listed items as a guideline for such classification.

Section 661.6 Development restrictions.

(a) No person shall undertake any new regulated activity on any tidal wetland or on any adjacent area except in compliance with the following development restrictions:

(1) The minimum setback of all principal buildings and all other structures that are in excess of 100 square feet (other than boardwalks, shoreline promenades, docks, bulkheads, piers, wharves, pilings, dolphins, or boathouses and structures typically located on docks, piers or wharves) shall be seventy-five feet landward from the most landward edge of any tidal wetland. Provided, however, within the

boundaries of the city of New York the minimum setback required by this paragraph shall be thirty feet. Further provided, where numerous and substantially all structures which are, (i) of the type proposed by the applicant, (ii) lawfully existing on the effective date of this Part and (iii) within 500 feet of the subject property, are located closer to the subject tidal wetland than the minimum setback required by this paragraph, placement of a structure as close as the average setback of these existing structures from the subject tidal wetland shall fulfill the requirements of this paragraph.

(2) The minimum setback of any on-site sewage disposal septic tank, cesspool, leach field or seepage pit shall be 100 feet landward from the most landward edge of any tidal wetland.

(3) For any on-site sewage disposal cesspool, septic tank, leach field or seepage pit there shall be a minimum of two feet of soil between the bottom of such pool, tank, field or pit and the seasonal high ground water level, rock, hardpan, or other impermeable materials.

(4) Not more than twenty percent of the adjacent area, as such term is defined in this Part, on any lot shall be covered by existing and new structures and other impervious surfaces. Provided, however, this paragraph shall not be deemed to prohibit the coverage of 3,000 square feet or less

of adjacent area on any individual lot lawfully existing on the effective date of this Part by existing and new structures and other impervious surfaces.

(5) The minimum lot area for any principal building constructed within the area regulated by this Part, which minimum lot area shall include any wetland portion and any adjacent area portion of such lot, shall be as follows:

(i) 20,000 square feet where such principal building will be served by a public or community sewage disposal system;

(ii) 40,000 square feet where such principal building will not be served by a public or community sewage disposal system.

Notwithstanding any other provision of this Part, the requirements of this paragraph for buildings to be served by a public or community sewage disposal system shall not be applicable within the boundaries of the city of New York.

(6) Notwithstanding the minimum lot size provisions contained in paragraph five of this section, the clustering of principal buildings utilized for residential purposes, including multiple family dwellings, shall be permitted at the request of an applicant for a permit under this Part in order to encourage the maintenance of undeveloped areas in or adjoining tidal wetlands. Provided, such clustering procedure shall in no case result in more prin-

cipal buildings on the area regulated by this Part than would be permitted by the application of the minimum lot size criteria in paragraph five of this subdivision.

(7) The minimum setback of all hard surface driveways, roads and parking lots and similar impervious surfaces exceeding 500 square feet in size on the property involved, overhead utility line poles and railroads shall be seventy-five feet from any tidal wetland. Provided, within the boundaries of the city of New York the minimum setback required by this paragraph shall be thirty feet. Further provided, this provision shall not be applicable to any portion of a regulated activity that involves a crossing or direct access to a tidal wetland on the subject property.

(8) Any substantial increase in surface water run-off to tidal waters classified SA, as defined in 6 NYCRR §701.5, or to any other surface waters which are within 1,000 feet of any SA waters and are adjacent or tributary to such SA waters, shall be prevented from directly running into any such waters by the utilization of sufficient run-off control measures, including but not limited to, the installation of dry wells, retention basins, filters, open swales or ponds. Any such dry well, retention basin, filter, open swale or pond to be constructed in order to prevent direct surface water run-off to said SA and other surface waters shall be designed and constructed to handle

the water run-off produced on the project site by a five year storm.

(b) The minimum lot size or average lot size provisions contained in paragraphs five and six of subdivision (a) of this section shall not be applicable to any vacant lot in a subdivision lawfully in existence on the effective date of this Part, or in a subdivision which received all required state, regional and local approvals prior to the effective date of this Part, for the purposes of placing one single family dwelling on such lot. Furthermore, such provisions shall not be applicable to any single vacant lot which was on record on the effective date of this Part for the purpose of placing one single family dwelling thereon, provided such lot does not adjoin other lots in the same ownership, except that all such lots in the same ownership may be treated together as one lot.

Section 661.7 Uses not requiring a permit or notification letter approval.

(a) Any use, where otherwise legally permitted, listed in section 661.5 of this Part as a use not requiring a permit or notification letter approval (NPN) for a particular tidal wetland zone or for an adjacent area may be undertaken in such tidal wetland zone or adjacent area without a permit or a notification letter approval under

this Part, provided such activity does not involve a regulated activity.

(b) Any alteration of a tidal wetland or adjacent area with respect to which a moratorium permit has been issued pursuant to 6 NYCRR Part 660, or with respect to which a permit pursuant to 6 NYCRR Part 608 shall have been issued prior to September 1, 1973, may be undertaken or continued pursuant to the terms of such permit without a permit or a notification letter under this Part; provided, however, that any such alteration that is defined in this Part as a regulated activity or an activity requiring a notification letter shall be treated for all purposes as a new activity under the provisions of this Part as of June 1, 1977, if such activity has not been substantially commenced as of that date. The department may extend the exemption herein provided for an alteration covered by a moratorium permit or Part 608 permit beyond June 1, 1977 if in the department's judgment the pertinent natural or man-made conditions which existed at and adjacent to the site at the time such permit was issued have not substantially changed and the site is still suitable for the permitted activity. Notwithstanding the foregoing, no alteration of a tidal wetland zone or adjacent area authorized by a permit pursuant to Part 660 or Part 608 that is treated as an incompatible use for such zone or area under section 661.5 of this Part shall be

undertaken or continued in that zone or area after the effective date of this Part except in compliance with the provisions of this Part.

Section 661.8 Notification letter requirements.

No person shall conduct any new use listed in section 661.5 of this Part as a generally compatible use - notification letter required (GCn) for a particular tidal wetland or adjacent area on that wetland or adjacent area on or after the effective date of this Part unless such person has first submitted a notification letter stating his intent to conduct such activity to the regional permit administrator and has received the written approval of such administrator, pursuant to the provisions of section 661.14 of this Part.

Section 661.9 Permit requirements.

(a) No person shall conduct a new regulated activity on or after the effective date of this Part on any tidal wetland or any adjacent area unless such person has first obtained a permit pursuant to this Part. Regulated activities for each type of tidal wetland zone and for adjacent areas include, but are not limited to, all types of uses specifically listed in section 661.5 of this Part as generally compatible use - permit required (GCp), presumptively incompatible use (PIp), and incompatible use (I) for the

type of area involved.

(b) Notwithstanding the provisions of subdivision (a) of this section, where a regulated activity is proposed for an adjacent area, where such activity is not a presumptively incompatible use or incompatible use for adjacent areas under section 661.5 of this Part, and where the regional permit administrator determines that such regulated activity will meet all of the development restrictions contained in section 661.6 of this Part and that such activity will not directly or indirectly substantially alter or impair the natural condition, function or values of any tidal wetland, the regional permit administrator shall treat the proposed activity as an activity requiring a notification letter under sections 661.8 and 661.14 of this Part; and such activity shall not require a permit under this Part.

Section 661.10 Standards for issuance of permits.

(a) Burden of proof. The applicant shall have the burden of establishing that the applicable standards of this section will be met.

(b) Standards for permits on any tidal wetland.

(1) Overall standards. The department shall issue a permit for a proposed regulated activity on any tidal wetland only if it is determined that the proposed activity:

(i) is compatible with the policy of the Act to preserve and protect tidal wetlands and to prevent their despoliation and destruction in that such regulated activity will not have an undue adverse impact on the present or potential value of the affected tidal wetland area or adjoining or nearby tidal wetland areas for marine food production, wildlife habitat, flood and hurricane and storm control, cleansing ecosystems, absorption of silt and organic material, recreation, education, research, or open space and aesthetic appreciation, as more particularly set forth in the findings in section 661.2 of this Part, taking into account the social and economic benefits which may be derived from the proposed activity;

(ii) is compatible with the public health and welfare;

(iii) is reasonable and necessary, taking into account such factors as reasonable alternatives to the proposed regulated activity and the degree to which the activity requires water access or is water dependent;

(iv) complies with the development restrictions contained in section 661.6 of this Part; and

(v) complies with the use guidelines contained in section 661.5 of this Part. If a proposed regulated activity is a presumptively incompatible use under such section, there shall be a presumption that the proposed

regulated activity may not be undertaken in the subject area because it is not compatible with the area involved or with the preservation, protection or enhancement of the present or potential values of tidal wetlands if undertaken in that area. The applicant shall have the burden of overcoming such presumption and demonstrating that the proposed activity will be compatible with the area involved and with the preservation, protection and enhancement of the present and potential values of tidal wetlands. If a use is a type of use listed as an incompatible use in the use guidelines for the area involved, it shall not be undertaken on that area.

(2) Formerly connected tidal wetland. In addition to the standards contained in paragraph one of this subdivision, the department shall issue a permit for a regulated activity on a formerly connected tidal wetland only if it is determined that the proposed activity will be consistent with the possible future restoration of any portion of the tidal wetland adjoining or surrounding the project site to its original condition.

(c) Standards for permits on adjacent areas. The department shall issue a permit for a proposed regulated activity on an adjacent area only if it is determined that the proposed regulated activity:

(1) is compatible with the public health and welfare;

(2) complies with the development restrictions contained in section 661.6 of this Part;

(3) will not have an undue adverse impact on the present or potential value of any adjacent or nearby tidal wetland for marine food production, wildlife habitat, flood and hurricane and storm control, cleansing ecosystems, absorption of silt and organic material, recreation, education, research or open space and aesthetic appreciation, taking into account the social and economic benefits which may be derived from the proposed activity; and

(4) complies with the use guidelines contained in section 661.5 of this Part. If a proposed activity is a presumptively incompatible use for adjacent areas under such section, there shall be a presumption that the proposed activity may not be undertaken on the adjacent area because it is not compatible with the preservation, protection, or enhancement of the present and potential values of tidal wetlands if undertaken in that area. The applicant shall have the burden of overcoming such presumption and demonstrating that the proposed regulated activity will be compatible with the preservation, protection and enhancement of the present and potential values of tidal wetlands. If a use is a type of use listed as an incompatible use, it shall not be undertaken on such adjacent area.

(d) Notice of acquisition. Written notice by the department to an applicant proposing a regulated activity, or written notice to the department from the state or any agency or subdivision thereof, that the state or any such agency or subdivision is in the process of acquiring the tidal wetland or adjacent area on which the proposed regulated activity would be located by negotiation or condemnation shall be sufficient basis for denial of a permit for such regulated activity. Such notice may be provided at any time prior to the department's decision to issue or deny a permit for a regulated activity.

(e) In determining whether the standards contained in subdivisions (b) and (c) of this section will be fulfilled by a proposed regulated activity, the department may in its discretion consider any proposal made by the applicant in his application to enhance the existing values served by a wetland on or in the vicinity of the site of the proposed regulated activity or to create and sustain new wetland values in or in the vicinity of the site of the proposed regulated activity, provided such proposal relates to an area that is or will be regulated under this Part.

(f) In any case in which an activity is specified as a use not requiring a permit or notification letter approval (NPN) or a generally compatible use - notification letter required (GCn) under section 661.5 but requires a permit

pursuant to title 5 of article 15 of the environmental conservation law, the standards of this Part will be applied in the department's review of such activity under article 15.

Section 661.11 Conditions to a permit.

(a) Any permit issued pursuant to this Part may be issued with conditions. Such conditions may be attached as are necessary to assure the preservation and protection of affected tidal wetlands and to assure compliance with the policy and provisions of the Act and the standards and provisions of this Part.

(b) Every permit issued pursuant to this Part shall contain the following conditions:

(1) the department shall have the right to inspect the project from time to time;

(2) the permit shall expire on a date certain;
and

(3) the permit holder shall notify the regional permit administrator of the date on which project construction is to begin, at least five days in advance of such date.

(c) Any permit issued pursuant to this Part may authorize the undertaking of the authorized regulated activity on a periodic basis, as specified in the permit, over a period of time not exceeding ten years from the date

of issuance of the permit. Such permit shall contain a condition requiring the permittee to notify the regional permit administrator at least fourteen days in advance of each occasion upon which the permitted activity will be conducted.

Section 661.12 Existing land use and development.

(a) No provision of this Part shall be deemed to prohibit or require the removal of any land use and development, including any structure, lawfully in existence on the effective date of this Part.

(b) The development restrictions in section 661.6 shall not be deemed to require a variance for the repair, restoration or rebuilding, in whole or in part, of any structure or facility lawfully in existence on or after the effective date of this Part, although such repair, restoration or rebuilding activities may be subject to the notification letter or permit requirements of this Part; provided, no such repair, restoration, or rebuilding shall increase any existing non-compliance with the provisions of that section.

Section 661.13 Variances.

Where there are practical difficulties in the way of carrying out of any of the provisions of section 661.6 of

this Part or where in the department's judgment the strict application of the provisions of section 661.6 would be contrary to the purposes of this Part, the department shall have authority in connection with its review of an application for a permit under this Part to vary or modify the application of any of such provisions in such a manner that the spirit and intent of the pertinent provisions shall be observed, that public safety and welfare are secured and substantial justice done and that action pursuant to the variance will not have an undue adverse impact on the present or potential value of any tidal wetland for marine food production, wildlife habitat, flood and hurricane and storm control, cleansing ecosystems, absorption of silt and organic material, recreation, education, research, or open space and aesthetic appreciation. Any person wishing to make application for such a variance shall do so in writing in conjunction with his application for a permit under this Part and shall specify the proposed variance, the facts which support the granting of the variance and the minimum variance necessary to alleviate the alleged difficulty. The burden of showing that a variance to such provisions should be granted shall rest entirely on the applicant.

The regional permit administrator may on his own motion treat an application for a permit under this Part as a request for a variance and may request from the applicant the information required by this section.

Section 661.14 Notification letter procedures.

(a) A notification letter required to be submitted pursuant to section 661.8 shall be filed with the regional permit administrator and shall contain such information as the regional permit administrator may require in order to ascertain whether the proposed activity may constitute a regulated activity. Either a letter, a form prepared by the department, or the application form for a permit prescribed under section 661.15 shall be an acceptable form of notification letter. Any activity proposed pursuant to this section shall be subject to the permit requirements of this Part where the regional permit administrator determines such activity may directly or indirectly substantially alter or impair the natural condition or function of any tidal wetland.

(b) Within fifteen days after receipt of a properly completed notification letter, the regional permit administrator shall inform in writing the person filing such notification letter whether the proposed activity may proceed in accordance with the notification letter or whether such activity constitutes a regulated activity. If in the judgment of such administrator the proposed activity may involve a regulated activity, the notification letter may be treated as an application for a permit under section

661.15 if it contains the information required for receipt of an application under that section.

(c) The regional permit administrator may impose such conditions in a written approval made in response to a notification letter as may be necessary to insure that no regulated activity will occur, that the unobstructed ebb and flow of the tides and the natural contour, vegetation and function of the wetland and nearby wetlands are preserved, and that the development restrictions contained in section 661.6 are satisfied.

(d) Upon his issuance of an approval letter in response to a notification letter, the regional permit administrator shall cause a notice regarding such approval letter to be made available for public inspection in the department's regional office. Such notice shall briefly describe the activity proposed in the notification letter, and approved by the department, including the name of the person undertaking the activity, the location, nature and scope of the activity, and any conditions placed by the department on the undertaking of such activity.

(e) An approval letter issued in response to a notification letter may authorize the subject activity to be undertaken once or more than once, as the regional permit administrator shall specify in the approval letter; provided, however, that no approval letter shall authorize an approved

activity for a period of time exceeding ten years from the date of issuance of the approval letter.

Section 661.15 Application for a permit.

(a) (1) An application for a permit shall be filed by the applicant with the regional permit administrator on a form prescribed by the department. Such application shall set forth the purpose, character and extent of the proposed regulated activity and shall set forth with particularity the reasons the applicant seeks a permit. The application shall include a detailed description of the regulated activity; a map showing the area of tidal wetland or adjacent area directly affected, with the location of the proposed regulated activity thereon; a statement as to feasible alternatives to the proposed activity on a site that is not a tidal wetland or adjacent area or by means that do not affect tidal wetlands; a statement identifying the owner of the subject property and, where applicable, written permission of said owner for the applicant to seek permission for, and to carry out, the proposed activity; a description of the planned use of the subject property once the proposed regulated activity is completed; and such additional information as the regional permit administrator deems sufficient to enable the department to make the findings and determinations required under this Part.

(2) The application shall be accompanied by a list of the names of the owners of record of lands adjacent to the tidal wetland or adjacent area upon which the regulated activity is to be undertaken and the names of known claimants of water rights, of whom the applicant has notice, which relate to any land within, or within three hundred feet of the boundary of, the property on which the proposed regulated activity is located.

(3) An application shall not be deemed to be received until the regional permit administrator determines that all such information, including any additional information requested, has been supplied in a complete and satisfactory form.

(4) The department shall mail a copy of the application to the chief administrative officer, or his designee, of each municipality in which the affected tidal wetland or adjacent area, or portion thereof, is located.

(5) The department shall make the application, including all documents and maps associated with it, available for public inspection at the regional office within whose jurisdiction the affected tidal wetland or adjacent area is located and at such other locations as may be designated in the notice of hearing required by section 661.16. The department may require the applicant to provide a reasonable number of copies of the application, including associated documents and maps, for this purpose.

(b) The regional permit administrator may, on request of the applicant or on his own motion, treat the application as a request for a determination that the proposed project is an action which does not require a permit under this Part or requires only a notification letter approval. If he so determines, the regional permit administrator shall so notify the applicant in writing. Such notice shall be made available for public inspection in the department's regional office. Any person may petition the commissioner for review of such determination. The commissioner may hold a public hearing on any such petition following the procedures prescribed in this Part insofar as applicable and shall make a written determination of his disposition of such petition, stating his reasons therefor.

Section 661.16 Notice of hearing.

(a) The regional permit administrator shall as soon as practicable after receipt of a completed application provide the applicant with a notice of hearing. As the regional permit administrator shall direct, the applicant shall publish the notice of hearing at least 15 days prior to the date set for the hearing, at his expense, at least once in each of at least two newspapers of general circulation in the county where the affected tidal wetland or adjacent area is located.

(b) The department may direct the applicant to post copies of such notice conspicuously about the site of the proposed project. Such postings shall be made at the beginning of the period of newspaper notice made pursuant to subdivision (a).

(c) At least 30 days prior to the date set for the hearing the applicant shall send by mail a copy of the notice of hearing to the chief administrative officer, or his designee, of each municipality within whose boundaries the affected tidal wetland or adjacent area or portion thereof is located, to all owners of record of land adjacent to the affected tidal wetland or adjacent area, and to all known claimants of water rights, of whom the applicant has notice, which relate to any land within, or within three hundred feet of the boundary of, the property on which the proposed regulated activity is located.

(d) At least fifteen days prior to the date set for the hearing the department shall publish in the publication required by section 3-0306(4) of the environmental conservation law a notice of the hearing.

(e) The notice of hearing required by subdivisions (a), (b) and (c) of this section shall be in a form prescribed by the department and shall:

- (1) state the name of the applicant;
- (2) specify the location and outline the scope of the proposed regulated activity;

(3) specify the date, time, place and nature of the public hearing on the proposed regulated activity;

(4) specify the legal authority and jurisdiction under which the hearing is to be held, with reference to the applicable statutory sections involved;

(5) specify that the department will hold the hearing for the purpose of receiving evidence and arguments from all persons that may be affected by the proposed regulated activity and have filed timely notices of appearance;

(6) specify that persons wishing to be parties-in-interest (other than the applicant, the department and each municipality in which the affected tidal wetland or adjacent area or any portion thereof is located) and eligible to be heard at such public hearing must file a notice of appearance with the regional permit administrator by 4:45 p.m. of the third business day next preceding the date of the public hearing; specify that filing for this purpose shall require actual receipt in the office of the regional permit administrator; specify that such notice of appearance must state the interest of such person in the project and specific grounds in support of or opposition to, or a position neither expressly supporting or opposing, the proposed project; and specify that such statement must be relevant to the findings and determinations required of the department under this Part;

(7) specify that if no notices of appearance stating specific grounds of objection to the project relevant to the findings and determinations required of the department under this part are timely filed by any person and if the applicant waives any public hearing, then the public hearing may be cancelled by the regional permit administrator and the department may proceed to review the proposed regulated activity;

(8) specify where the application, including all documents and maps therewith, is available for public inspection; and

(9) specify the name and telephone number of a department employee who can provide information regarding the application.

Section 661.17 Statements by public.

Any person whether or not wishing to be a party-in-interest may file a written statement relating to the project with the department at any time before or during the hearing. Such statements may favor, oppose or state any interest in the proposed project. Amendments to the statements may be permitted by the department at any time, but in no event later than the close of the last day of the hearing. Such statements shall become part of the record of the hearing unless proper objection shall be made thereto. If

no hearing is held, such statements shall become part of the department's official file.

Section 661.18 Public Hearings; decisions after public hearing; decisions without public hearings.

(a) (1) A public hearing shall be commenced not less than thirty and not more than sixty days after the receipt of a complete permit application by the regional permit administrator.

(2) The public hearing shall be conducted by a hearing officer designated by the commissioner. The hearing officer shall have full authority to control the conduct and procedure of the hearing, including but not limited to the power to provide for the taking of testimony by deposition, to admit or exclude testimony or other evidence, to rule on all motions and objections, to require and fix the time for filing of briefs and other documents as to facts and law, to direct the parties-in-interest to appear and confer to consider the simplification of the issues by the consent of the parties-in-interest, to set the time and place for continued hearings, and to administer oaths and affirmations. Furthermore, the hearing officer shall have the authority to sign and issue subpoenas in the name of the department, requiring attendance and giving of testimony by witnesses and the production of books, papers and other

-52-

documentary evidence. Said subpoenas shall be regulated by the civil practice law and rules.

(3) The hearing officer shall be responsible for maintaining a complete record of the hearing. The department may use recording devices to keep such record.

(4) The hearing shall be conducted expeditiously and shall, insofar as practicable, continue from day to day exclusive of holidays and weekends.

(5) The public hearing shall be held in the county where the affected wetland or adjacent area is located. Insofar as practicable, the public hearing shall be held in the municipality where the affected tidal wetland or adjacent area is located.

(b) (1) The parties-in-interest to the hearing shall be the applicant, the department, each municipality in which the affected tidal wetland or adjacent area or any portion thereof is located, those persons who file timely notices of appearance as required by the hearing notice, as specified in section 661.16, and any person who does not file such a notice of appearance but appears at the hearing and states a significant interest in the proposed project which should in the hearing officer's opinion be represented in the hearing in spite of such person's failure to file a timely notice of appearance.

(2) Persons who are not parties-in-interest may be allowed to participate in the hearing where the hearing officer finds that such participation would be in the public interest. In the hearing officer's discretion any person may make an oral statement at the hearing in favor of, in opposition to or expressing an interest in the proposed project.

(3) All parties-in-interest shall be afforded an opportunity to present oral and written arguments on issues of law and policy and to present oral and written evidence and argument on issues of fact; provided, however, the hearing officer may exclude any such evidence as he determines will be irrelevant or unduly repetitious.

(4) All testimony at the hearing shall be sworn under oath or affirmed under penalty of perjury.

(5) The hearing officer shall permit the parties-in-interest to cross examine witnesses but may limit such cross examination to avoid the introduction of irrelevant or unduly repetitious material in the record of the hearing.

(6) The strict rules of evidence shall not apply to such a hearing; provided, however, that all privileges provided by the law and constitutions of the state of New York and the United States shall be given affect.

(7) Objections to evidentiary offers may be made and shall be noted in the record of the hearing.

-54-

(8) All evidence, including records and documents, in the possession of the department of which it desires to avail itself shall be offered and made a part of the record, and all such documentary evidence may be received in the form of copies or excerpts or by incorporation by reference. In case of incorporation by reference, the materials so incorporated shall be available for examination by the parties-in-interest before being received in evidence.

(9) The hearing officer may take official notice of all facts in which judicial notice could be taken and of other facts within the specialized knowledge of the department. When official notice is taken of a material fact not appearing in the evidence in the record and in which judicial notice cannot be taken, every party shall be given notice thereof and shall on timely request be afforded an opportunity prior to decision to dispute the fact or its materiality.

(c) The end of the hearing shall be the end of the last day of the hearing; provided, the hearing officer may extend the end of the hearing to allow parties to submit such briefs and memoranda as he may direct.

(d) The hearing record shall include: all notices, pleadings, motions and intermediate rulings; evidence presented; a statement of matters officially noticed except matters so obvious that a statement of them would serve no useful purpose; questions and offers of proof, objections

-55-

thereto and rulings thereon; proposed findings and exceptions if any; and any decision, determination, opinion, order or report which may eventually be rendered by the hearing officer or the commissioner as a result of the hearing.

(e) Within thirty days after receipt of the transcript of the hearing and all briefs and memoranda which were timely filed as directed by the hearing officer, the hearing officer shall make a written recommendation based on the hearing record and supported by substantial evidence as to whether the application filed by the applicant should be granted, denied, or granted with conditions. In making such recommendations, the hearing officer shall recommend relevant findings of fact and conclusions of law and shall recommend which conditions, if any, be attached to a permit, if granted. Findings of fact, if set forth in statutory language, shall be accompanied by a concise explicit statement of the underlying facts supporting the findings. If, as requested by the hearing officer in accordance with the provisions of this part, a party-in-interest submitted proposed findings of fact, the hearing officer's written recommendations shall include a recommendation with regard to each proposed finding. The findings, conclusions and recommendations of the hearing officer shall comprise the hearing officer's report. Immediately upon completion of such report, such report and the remainder of the hearing record shall be forwarded to the commissioner.

-56-

(f) After receiving the hearing officer's report and the remainder of the hearing record, the commissioner may require further information from any of the parties-in-interest. In any case where such additional information is so required, all parties-in-interest shall be afforded an opportunity to review such additional information and respond thereto within not more than thirty days of receipt of written notice that the department has received such information. Any party-in-interest may request that the hearing be reopened for the purpose of examining such information; and upon such request the hearing may be reopened and shall be conducted as set forth in this Part. The commissioner shall either: grant the permit requested, with or without conditions, deny the application, or order the hearing to be reopened.

(g) The decision by the commissioner to issue or deny a permit or to order the hearing to be reopened shall be made in writing within thirty days of his receipt of the hearing officer's report and the remainder of the hearing record; provided, however, in the event the commissioner requests additional information pursuant to subdivision (f) above, such thirty day period shall begin on the last day set for responses to the additional information by parties-in-interest or, in the event of a reopened hearing, after receipt of the hearing officer's report and the remainder of

the hearing record following the reopened hearing. Such decision shall be based on the hearing record and shall be supported by substantial evidence. Such decision shall state the findings and reasons on which it is based and shall contain findings of fact and conclusions of law. Findings of fact, if set forth in statutory language, shall be accompanied by a concise and explicit statement of the underlying facts supporting the findings. If a party-in-interest submitted proposed findings of fact as requested by the hearing officer, the commissioner's decision shall include a ruling upon each proposed finding.

(h) The applicant shall pay the costs of the public hearing, including the following costs:

- (1) a stenographer;
- (2) one or more copies of the record of the hearing for the use of the department;
- (3) costs of required publication; and
- (4) rental of physical accommodations for the holding of the hearing, if not held in department facilities.

(i) (1) If no timely notice of appearance stating specific grounds of objection to the proposed regulated activity relevant to the findings and determinations required of the department under this Part has been filed as provided in the notice of hearing and the applicant waives in writing

-58-

any public hearing on his application, the regional permit administrator may dispense with and cancel the public hearing. In such event, an official file shall be compiled by the regional permit administrator consisting of documents submitted by the applicant and any additional documents relied on by the department with respect to the application. The department may also utilize its own experience, technical competence, resources and specialized knowledge and any resources available to it and may take notice of general, technical or scientific facts within the specialized knowledge of the department. Any document made part of such official file shall be available for inspection by the applicant and any interested member of the public.

(2) The regional permit administrator shall grant the permit requested, with or without conditions, deny the application, or order a hearing to be held pursuant to this Part.

(3) The decision by the regional permit administrator to issue or deny a permit or to order a hearing shall be made in writing within thirty days of the complete compilation of the official file and in any event within ninety days of his receipt of a completed application. Such decision shall state the findings and reasons on which such decision is based and shall be filed in the official file.

Section 661.19 Notice of decision to grant or deny permit application.

(a) A copy of the decision of the department to grant or deny an application for a permit under this Part, and any permit granted, shall be mailed or delivered immediately following such decision to the applicant and to his attorney of record, to the chief administrative officer of each municipality which the affected tidal wetland or adjacent area or any portion thereof is located, or his designee, and, if a public hearing has been held regarding the application, to each party-in-interest and to the attorney of record of each such party.

(b) A notice of such decision shall be published in the publication required pursuant to section 3-0306(4) of the environmental conservation law.

Section 661.20 Relationship to SEQR and the Freshwater Wetlands Act.

(a) The review procedures required pursuant to the state environmental quality review act (SEQR), article eight of the environmental conservation law, will apply as of September 1, 1977 to certain activities subject to the permit requirements and notification letter provisions of this Part. With regard to any permit application or notification letter under this Part, the applicant may be

required to submit information necessary for compliance with SEQR in addition to that information required under this Part.

(b) In the event any area regulated under this Part is also subject to regulation pursuant to the freshwater wetlands act (article 24 of the environmental conservation law) such area shall be subject to the provisions of this Part and of the freshwater wetlands act and rules and regulations and local ordinances and laws adopted pursuant thereto. Provided, no area which is treated as a tidal wetland pursuant to this Part shall be deemed to be a freshwater wetland under the freshwater wetlands act.

Section 661.21 Pending moratorium permit applications.

(a) Notwithstanding any other provisions of this Part, the following shall apply in those instances in which a petition for a moratorium permit under 6 NYCRR Part 660 was received by the department prior to the effective date of this Part, which petition proposes an activity subject to the permit provisions of this Part, and regarding which petition the department did not issue a final decision prior to the effective date of this Part:

(1) If a public hearing pursuant to Part 660 regarding such petition has not or will not be held, such petition shall be treated in all respects, including but not

-61-

limited to the filing of a new application, or where appropriate the submission of only additional necessary information as determined by the regional permit administrator, as an application for a permit authorizing a regulated activity under this Part.

(2) If a public hearing pursuant to Part 660 regarding such petition has been commenced or completed prior to the effective date of this Part, such petition shall be reviewed and a decision shall be made by the department pursuant to all of the criteria for review of petitions under Part 660, including but not limited to the petitioner's showing of hardship as of the completion of the hearing. Provided, however, upon submission of an application under this Part, or where appropriate the submission of only additional necessary information as determined by the regional permit administrator, the activity proposed by the petitioner may be treated in all respects as a regulated activity under this Part.

(3) If a moratorium permit is granted under this subdivision, it shall be treated under this Part in all respects as a moratorium permit issued pursuant to Part 660.

(b) Notwithstanding any other provisions of this Part, in those instances in which a petition for a moratorium permit under 6 NYCRR Part 660 was received by the department prior to the effective date of this Part which proposes an

activity subject to the notification letter provisions of this Part and regarding which petition the department did not issue a final decision prior to the effective date of this Part, such petition shall be treated in all respects as a notification letter under this Part.

(c) Notwithstanding any other provisions of this Part, in those instances in which a petition for a moratorium permit under 6 NYCRR Part 660 was received by the department prior to the effective date of this Part which proposes an activity which is an incompatible use under section 661.5 of this Part for the area involved and regarding which petition the department did not issue a final decision prior to the effective date of this Part, such proposed activity shall be treated in all respects as a new regulated activity under this Part.

Section 661.22 Duration of permits.

(a) The date of expiration of any permit issued pursuant to this Part shall be not more than ten years from the date such permit was issued.

(b) The expiration date of any permit issued pursuant to this Part may be extended by the chief permit administrator for good cause shown upon a written request to him filed prior to the expiration date. Any such extension may not exceed one year in duration.

(c) In accordance with section 661.11(c) any permit issued pursuant to this Part may authorize the undertaking of a regulated activity on a periodic basis, but the duration of any such permit shall not exceed the period of time allowed by subdivisions (a) and (b) of this section.

Section 661.23 Bond.

In any case the commissioner may, upon written findings and reasons, require that prior to commencement of work under any permit issued pursuant to this Part the permittee shall post a bond with the department in an amount determined by the commissioner, conditioned upon the faithful compliance with the terms of such permit and for the indemnification of the state for restoration costs resulting from failure to so comply. Such a bond shall be issued by a corporate surety authorized to do business in the state of New York and shall be in favor of the department. Such bond shall remain in effect until the department certifies that the work has been completed in compliance with the terms of the permit or the bond is released by the department.

Section 661.24 Modification of permit and decisions.

(a) Following the issuance of a permit, minor modifications of such permit may be made by the chief permit administrator where:

-64-

(1) additional pertinent facts, circumstances, or conditions not considered in the department's decision to issue the permit are made known to the department, or the applicant requests minor modifications in the department's permit and/or decision,

(2) a written request justifying such modifications is submitted to the chief permit administrator, and

(3) such modification will not be contrary to the policy or provisions of the act or of this Part.

In considering whether to make such requested modifications, the chief permit administrator, where appropriate in light of the request, may provide notice of such request and opportunity to comment to the chief administrative officer, or his designee, of each local government in which the affected tidal wetland or adjacent area or any portion thereof is located and to all other parties-in-interest, may order the reopening of a hearing, if held, or may order the scheduling of a hearing pursuant to this Part.

In cases where the chief permit administrator doubts that proposed modifications are minor or that such modifications are consistent with the policy and provisions of the act or of this Part, he shall either, as appropriate in light of the request, order the permittee to file a new application pursuant to this Part, schedule a public hearing pursuant to this Part, or reopen a public hearing held

regarding the permit involved.

(b) Within thirty days following a decision by the department to deny a permit under this Part, the applicant may request the commissioner to reconsider the decision. Until such time as the commissioner makes a final disposition of the request for reconsideration, such a request for reconsideration shall be deemed to stay the time specified by the act for a person to seek review of, or make an appeal from, a determination by the department pursuant to the act. The commissioner may reconsider such a decision where:

(1) additional pertinent facts, circumstances, conditions or arguments not considered in the department's decision to deny the permit are made known to the department; and

(2) a written request justifying such reconsideration is submitted to the department.

Prior to the commissioner's reconsideration of such decision, the commissioner shall order that the public hearing held on the subject permit application be reopened. If no hearing was held on said application, the commissioner may, prior to his reconsideration of the decision, order that a public hearing be scheduled on the subject application pursuant to this Part.

Section 661.25 Revocation or suspension of permits.

(a) A permit may be suspended or revoked by the commissioner at any time upon one or more of the following grounds:

(1) materially false or inaccurate statements were made in the application or supporting papers; or

(2) the permittee has failed to comply with the terms of the permit or the scope of work set forth in his application.

(b) The commissioner shall send a notice of intent to suspend or revoke a permit to the permittee by mail or shall cause such notice to be delivered in person by a duly authorized representative of the commissioner. Such notice of intent to suspend or revoke a permit shall state the findings and reasons which would warrant such intended actions.

(c) (1) The permittee may, within ten days of receiving the notice of intent to suspend or revoke his permit, submit a written statement to the commissioner setting forth the reasons why the permit should not be suspended or revoked. Failure to submit such a timely statement shall result in the automatic suspension of the permit, effective on a date specified in said notice of intent. Upon receipt of the permittee's statement, the commissioner may rescind the notice of intent to suspend or revoke the permit if he so

determines based on the information provided by the permittee, or he may suspend such permit effective upon delivery of a notice of suspension to the permittee by mail or by personal service, which notice of suspension shall state the commissioner's reasons and findings for such suspension.

(2) The permittee may be required, at his own expense, to serve the parties-in-interest with copies of his statement as to the reasons why the permit should not be suspended or revoked.

(d) If the commissioner has not rescinded the notice of intent to suspend or revoke pursuant to paragraph (1) of subdivision (c) of this section, the commissioner shall within thirty days of issuing said notice of intent cause an administrative hearing to be held regarding the issues raised by such notice. The procedures by which the administrative hearing is held shall be governed by section 661.18 of this Part relating to public hearings, except that only fifteen days notice prior to the hearing need be given and except that the hearing officer's report shall include written recommendations as to whether the permit should be suspended or revoked or reinstated with or without changes in conditions.

(e) Within ten days of his receipt of the hearing officer's report and the hearing record, the commissioner shall:

-68-

(1) reinstate the permit, with or without changes and conditions;

(2) suspend or revoke the permit, including where the commissioner determines appropriate an order to remove or modify all or any portion of a project, whether completed or not;

(3) continue the suspension already in effect by operation of paragraph (1) of subdivision (c) of this section; or

(4) in lieu of suspension or revocation, reinstate the permit, with or without changes in conditions, where the applicant as a condition precedent to the reinstatement of the permit, removes or modifies those portions of the project whether completed or not which were not carried out in conformity with the originally-issued permit and which the commissioner deems necessary to remove or modify.

Notice of such decision, stating the findings and reasons therefor, shall be provided in the same manner as a notice of decision pursuant to section 661.19(a).

(f) If the commissioner finds that the public health, safety or welfare imperatively requires emergency action, and incorporates such finding in an order to the permittee, the commissioner may order summary suspension of a permit, effective on the date specified in such order or upon

service of a certified copy of such order on the permittee, whichever shall be later, pending proceedings for suspension or revocation as set forth in subdivisions (a) through (e) of this section.

Section 661.26 Determination that lands do not involve littoral zone or coastal shoals, bars or flats.

The commissioner may amend an inventory map pursuant to the procedures set forth in section 661.27 where he determines that certain lands under tidal waters, while possessing the physical characteristics of littoral zone or coastal shoals, bars or flats, are not littoral zone or coastal shoals, bars or flats or any other type of tidal wetlands because such lands do not function biologically as tidal wetlands, exhibit little primary productivity and are populated by few benthic organisms, due to such factors as pollution, sedimentation or other physical disturbances. The commissioner may take such action on his own motion or at the request of any person. Such a request shall set forth the specific boundaries of the proposed amendment and the necessary information on which a decision on the request may be made.

Section 661.27 Inventory map: maintenance and amendments.

(a) The commissioner shall supervise the maintenance

-70-

of each inventory map, and all such maps shall be available at the appropriate regional office of the department for public inspection and examination.

(b) Upon request by any person or upon his own initiative, the commissioner may amend any inventory map or maps under the following circumstances and in the following manner:

(1) after public hearing, any amendment to add a new tidal wetland to an inventory map, to significantly expand or detract from the boundaries of a tidal wetland shown on such map, to delete a wetland from such map or to alter the classification of a wetland shown on such map as may be necessary to conform such maps to actual on-site conditions;

(2) notwithstanding paragraph one of this subdivision, any amendment as may be necessary to reflect such natural changes as have occurred since the effective date of the inventory map, as originally established or as amended, through erosion, accretion or otherwise or to reflect such other changes as have occurred since such effective date as a result of granting permits under this Part; any amendment to clarify the boundaries of any tidal wetland shown on an inventory map, to correct any minor errors on the map or to effect other technical changes on the map; or any amendment to affect minor changes pursuant to section 661.26, without

-71-

a public hearing unless the commissioner determines that a public hearing is appropriate;

(c) Any public hearing held pursuant to subdivision (b) of this section shall provide any person an opportunity to support, oppose or make a statement of interest in the proposed amendment of an inventory map and shall be held in the following manner:

(1) The department shall prepare a proposed amended inventory map for each area in which the commissioner is considering amending an inventory map. Such map shall be made available for public inspection at the appropriate regional offices of the department at the time the hearing notice provided for in paragraph two below is given.

(2) The commissioner shall give notice of such hearing to each owner of record of all lands designated on the proposed amended inventory map as a new tidal wetland which may be added or a tidal wetland whose boundaries may be amended and also to the chief administrative officer, or his designee, of each municipality within whose boundary any such wetland or portion thereof is located, by mail not less than thirty days prior to the date set for such hearing. The commissioner shall also cause notice of such hearing to be published at least once, not more than thirty days nor fewer than ten days before the date set for such hearing, in at least two newspapers having a general circulation in the

area where such wetland is located.

(d) After considering any facts which may be deemed pertinent and the testimony given at the public hearing, if a hearing is held, and after considering the rights of affected property owners and the policy and purposes of the Act, the commissioner shall establish by order the final bounds of each tidal wetland that will be added or whose boundary will be amended on an inventory map. A copy of the order, together with a copy of the inventory map depicting such final boundary lines, shall be filed in the office of the clerk of the county in which is located all or any portion of such wetland. The commissioner shall simultaneously give notice of such order to each owner of all lands designated in the order as a tidal wetland which has been added or whose boundary has been amended by mailing a copy of such order to such owner. The commissioner shall also simultaneously give notice of such order by mail to the chief administrative officer, or his designee, of each municipality within whose boundary any such wetland or portion thereof is located. The commissioner shall also cause a notice of such order to be published in at least two newspapers having a general circulation in the area where any such wetland is located.

(c) All actions taken pursuant to this section shall conform to the requirements of section 202 of the state administrative procedure act.

Section 661.28 Measurement.

Any measurement required in this Part shall be measured horizontally unless otherwise specified.

Section 661.29 Tax assessment.

As soon as practicable following the effective date of this Part the department shall file with the tax assessment office of each municipality in which any tidal wetlands are located a copy of the provisions of this Part, a copy of each inventory map that includes any area within the boundaries of such municipality, and a copy of the following notice:

"Section 25-0302(2) of Article 25 of the Environmental Conservation Law, which article is known as the Tidal Wetlands Act, requires that the placing of any tidal wetlands under a land use regulation which restricts its use be deemed a limitation on the use of such wetlands for the purpose of property tax valuation in the same manner as if an easement or right had been acquired under the general municipal law and that assessment be based on present use under the restricting regulation. The enclosed land use regulations were promulgated by the department of environmental conservation pursuant to section 25-0302(1) of the Tidal Wetlands Act."

As soon as practicable following any amendment to the provisions of this Part, the department shall file a copy of such amended provisions with the tax assessment office in each municipality in which any tidal wetlands are located. As soon as practicable following any amendment to an inventory map, the department shall file a copy of such amended map with the tax assessment office of each municipality within whose boundaries the amended map applies.

Section 661.30 Joint proceedings under other laws and regulations.

(a) In the event that an applicant for a permit issued pursuant to this Part is also required to apply for a permit pursuant to any other Part of Title 6 NYCRR, the regional permit administrator, the chief permit administrator or other official before whom such application is pending shall insofar as possible process any or all such applications in the same proceeding as is held pursuant to this Part. In the event of any procedural inconsistencies between this Part and such other Part, he may insofar as permitted by statute follow the procedures of either Part for any and all such applications.

(b) The commissioner may, by mutual agreement with any municipality within whose boundary the affected tidal wetland or adjacent area or portion thereof is located or

any other federal, state or local body having jurisdiction over the subject matter of the application for a permit or any work related to such subject matter, provide for joint processing of any application under this Part with any application for a permit or other processing required by such municipality or body, including provisions for joint notices and hearings.

Section 661.31 Other laws and regulations; other permits or approvals.

No provision of this Part shall relieve any person from his obligation to comply in all respects with the provisions of any other federal, state or local law or regulation, including but not limited to acquisition of any other required permit or approval.

Section 661.32 Emergency activities.

Notwithstanding any other provisions of this Part, this Part shall not apply except as provided in this section to any actual and ongoing emergency activity which is immediately necessary for the protection and preservation of life or property or the protection or preservation of intrinsic resource values. Such emergency activities include, for example: search and rescue operations; and preventive or remedial activities related to large-scale contamination of

streams or other bodies of water, floods, hurricanes and other storms, and public health concerns. Within ten days of the end of such an emergency involving the undertaking of any activity which otherwise would be treated as a regulated activity or an activity requiring a notification letter under this Part, the person chiefly responsible for undertaking such emergency activity shall send a written statement to the regional permit administrator setting forth the pertinent facts regarding such emergency, including an explanation of the life, property or resource values such activity was designed to protect or preserve.

Section 661.33 Jurisdictional inquiries.

(a) If a person is uncertain whether a proposed activity is subject to the provisions of this Part, he may request the regional permit administrator to make a determination as to whether the permit or notification letter provisions of this Part apply to such activity.

(b) If a person desires the determination requested in (a) to be made in writing, such request shall be made in writing and shall contain all information deemed necessary and appropriate by the regional permit administrator to make such determination. Within fifteen days after receipt by said administrator of such written request and all such information, he shall notify such person by letter whether

his activity is subject to the permit or notification letter provisions of this Part.

Section 661.34 Violations; penalties.

(a) Administrative sanctions. Any person who violates, disobeys or disregards any provision of the Act, including but not limited to any provisions of this Part or any permit issued pursuant to this Part, shall be liable to the people of the state for a civil penalty of not to exceed three thousand dollars for every such violation, to be assessed, after a hearing or opportunity to be heard, by the commissioner. The penalty may be recovered in an action brought by the commissioner in any court of competent jurisdiction. Such civil penalty may be released or compromised by the commissioner before the matter has been referred to the attorney general; and where such matter has been referred to the attorney general, any such penalty may be released or compromised and any action commenced to recover the same may be settled and discontinued by the attorney general with the consent of the commissioner. In addition, the commissioner shall have power, following a hearing held pursuant to section 71-1709 of the environmental conservation law, to direct the violator to cease his violation and to restore the affected tidal wetland or area immediately adjacent thereto to its condition prior to the violation, insofar as

-78-

that is possible within a reasonable time and under the supervision of the commissioner. Any such order of the commissioner shall be enforceable in an action brought by the commissioner in any court of competent jurisdiction. Any civil penalty or order issued by the commissioner under this subdivision shall be reviewable in a proceeding under article seventy-eight of the civil practice law and rules.

(b) Criminal sanctions. Any person who violates any provision of the Act, including but not limited to any provision of this Part or any permit issued pursuant to this Part, shall, in addition, for the first offense, be guilty of a violation punishable by a fine of not less than five hundred nor more than one thousand dollars; for a second and each subsequent offense he shall be guilty of a misdemeanor punishable by a fine of not less than one thousand nor more than two thousand dollars or a term of imprisonment of not less than fifteen days nor more than six months or both. In addition to or instead of these punishments, any offender shall be punishable by being ordered by the court to restore the affected tidal wetland or area immediately adjacent thereto to its condition prior to the offense, insofar as that is possible. The court shall specify a reasonable time for the completion of the restoration, which shall be effected under the supervision of the commissioner. Each offense shall be a separate and distinct offense and, in the

case of a continuing offense, each day's continuance thereof shall be deemed a separate and distinct offense.

Section 661. 35 Enforcement.

The attorney general, on his own initiative or at the request of the commissioner, shall prosecute persons who violate the Act, including but not limited to any provisions of this Part or any permit issued pursuant to this Part. In addition the attorney general, on his own initiative or at the request of the commissioner, shall have the right to recover a civil penalty of not to exceed three thousand dollars for every violation of any of these provisions of this Part, and to seek equitable relief to restrain any violation or threatened violation of these provisions and to require the restoration of any affected tidal wetland or area immediately adjacent thereto to its condition prior to the violation, insofar as that is possible, within a reasonable time and under the supervision of the commissioner.

Section 661.36 Judicial review.

Any person aggrieved by the issuance, denial, suspension, or revocation of a permit may within thirty days from the date of the commissioner's order seek judicial review pursuant to article seventy-eight of the civil practice law and rules in the supreme court for the county in which the tidal wetlands or adjacent areas affected are located.

MEMORANDUM

on

THE FRESHWATER WETLANDS INVENTORY
(Task 7.1)

Prepared by

New York State Department of Environmental Conservation
Office of Program Development, Planning and Research
50 Wolf Road
Albany, New York 12233

The preparation of this report plus accompanying maps was financially aided through a Federal Grant from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972.

This report plus accompanying maps was prepared under the Coastal Zone Management Act of 1972 for the Division of State Planning, Department of State.

May 12, 1976

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FRESHWATER WETLANDS INVENTORY

Introduction

The following is a summary of the wetlands inventory being undertaken by DEC pursuant to the State's Freshwater Wetlands Act of 1975 and with the incorporation of the Coastal Zone Management Program into the inventory process.

The effect of the CZM program's involvement with the inventory (Task 7.1 of the 1st year CZM program) has been to alter the priorities for mapping and data interpretation. The goal is now to concentrate on completing all coastal zone county U.S.G.S quads by the end of the second year of the CZM program. As of May 1, 1976 the U.S.G.S. quads listed following this summary have had transparent overlays prepared. The Data-Take-Off process, which essentially is responsible for producing items # 2, 3 and 4 under "Inventory Products" is just getting underway for the Tug Hill region, part of which contains several coastal zone counties.

Reasons for Concern Over the Preservation of Wetlands

Ecological transition zones such as wetlands are often of value to living things, because of the relatively easy availability of food and cover within a relatively limited area. Wetlands are especially productive of living things because needed nutrients, water and light are usually present in high quantities. Very few habitat types - even including intensively cultivated crop lands - can match the biological productivity of wetlands. This combination of conditions makes wetlands of unparalleled value as a habitat type for fish and wildlife.

Two-thirds of the marine fish and shellfish commercially harvested are said to depend upon the marsh-estuarine system of the tidal wetlands at some point in their life cycle. Many fresh water fish are similarly dependent. Wetlands provide the spawning ground for pike, pickerel and muskellunge. They are the nurseries for young largemouth bass, and are important throughout this species' life cycle. Sunfish, perch, bullheads, carp, minnows and other species use the wetland habitat.

No habitat type provides the variety, visibility, and density of wildlife that wetlands provide. Many species are directly dependent upon wetlands, while others are associated with wetlands to varying degrees. Over two dozen amphibians, including salamanders, frogs, and toads, are found in New York State. Some ten species of turtles in New York use wetlands. These include the endangered bog turtle which is found only in certain specialized wetland habitats. Several species of snakes are also dependent upon wetlands. Scores of water birds including loons, grebes, herons, rails, plovers, sandpipers and other shore birds, would not be found in New York in the absence of wetlands. Raptors are common in wetlands and three species - the bald eagle, the osprey and the peregrine falcon - which are rare or endangered are almost directly dependent upon wetlands. It hardly needs stating that without wetlands there would be no waterfowl. Less often realized is the dependence of most of the furbearers on wetlands. Muskrat, beaver, mink, and otter are directly dependent while raccoon and red fox are closely associated. Wetlands also provide critical winter cover for pheasants. Both big game species in New York State - the white-tailed deer and especially the black bear - are associated with wetlands to a degree often overlooked.

When these enormous fish and wildlife values of wetlands are compared to the relative rarity of wetlands in New York State (one to two percent of the state's

surface is wetlands) and to the vulnerability and fragility of wetlands (enormous losses of wetlands have occurred on Long Island, along the Hudson River, along the lake plains from Syracuse to Buffalo, and elsewhere), the reason for the Department of Environmental Conservation's concern becomes obvious.

Reasons for the Wetlands Inventory

The Freshwater Wetlands Act calls for the study and mapping of freshwater wetlands throughout the State, a prime reason for continuing the inventory which actually began before passage of the act.

Fortunately, the wetland habitat type is highly amenable to a management program such as called for in the Wetlands Act or other legislation relating to land use, the environment, etc. (i.e., the Coastal Zone Act). "Management program" here is intended in its broadest sense, to include land use planning, environmental impact analysis, protective and other legislation, acquisition, education, land-owner contacts, cooperation with local planning, governing and environmental agencies, evaluation and measurement of changes, research, and habitat restoration, enhancement and manipulation practices. Such a program must have an adequate data base: an inventory of the wetlands of the State. An inventory of land resources such as wetlands is needed to plan land use. Detailed inventory information is needed to analyze environmental impacts. An inventory will guide the drawing up of protective legislation and regulations such as those to be formulated as part of a coastal zone management program. It will help to assure that wetlands acquisition is done in the most systematic and efficient way. It will aid enforcement. It will provide data needed for research. When repeated periodically it will measure changes in quality and quantity of wetlands and will identify critical problems.

Who is Doing the Inventory

The Bureau of Wildlife in the Division of Fish and Wildlife (New York State Department of Environmental Conservation) is the agency responsible for the inventory, with considerable financial assistance being provided by the Federally - funded coastal zone management program. The general design of the inventory is by the Bureau of Wildlife, with cooperation and participation in design and/or implementation by the following: in airphoto interpretation, which is the comprehensive and most systematic phase of the inventory, and the phase that will be most useful to other agencies, by the Resource Information Laboratory, Department of Natural Resources, New York State College of Agricultural and Life Sciences, Cornell University; in field data collection for the large wetlands, various agencies and especially the regional field staffs in the Department of Environmental Conservation; in soils interpretation (still in the planning stages), the Soil Conservation Service, U.S. Department of Agriculture.

Information Being Collected

All wetlands 1/5 hectare or larger are being mapped. Wetlands 2½ hectares and larger are being located according to a modified universal transverse mercator grid system, and being assigned to county, town, city or village. Association with a lake, watershed or estuary is being measured in both spring and summer. Perimeter measurements and measurements of length of contact with rivers, streams, lakes and land are being made. Beaver activity, surrounding land use, human influences, are a few, among other, types of information being recorded for all wetlands 2½ hectares and larger.

On still larger wetlands (approximately 20 hectares or more) additional information is being collected, including suitability for acquisition, soils interpretation,

vegetative classification, water alkalinity, known vegetation, fish and wildlife, and enhancement potential.

Inventory Products

1. Transparent overlays of U.S.G.S. 7½' topographic sheets on which wetlands 1/5 hectare or more will be mapped by cover type through airphoto interpretation.
2. An area-by-area paper file which will include airphoto, field, land use, and soils data. An airphoto data sheet is being prepared for each wetland 2½ hectares or larger. Other data will be incorporated for wetlands of larger size or higher priority.
3. A computer file in which much of the data in the paper file will be stored. All of the airphoto interpretation information and most of the other information will be in numerical form so that it can be stored in computer.
4. A summary, on a topo-sheet-by-topo sheet basis, of the areas under 2½ hectares. These wetlands will not have separate data sheets for each of them.

Quads Completed

As of May 1, 1976, the following U.S.G.S. quads for the coastal zone counties have had transparent overlays prepared on which wetlands 1/5 hectare or larger have been mapped by cover type (i.e. wet meadow, flooded deciduous trees, etc.). These sheets are available for reproduction.

Hudson River Coastal Zone Counties

Rensselaerville 1944	Cementon 1963	Claverack 1945-60
Durham 1943	Hudson South 1963	Napanoch 1942-56
Greenville 1945	Shandaken 1945-60	Canaan 1946-59
Prattsville 1945	Phoenicia 1945-60	Bearsville 1945

Ashland 1945	Woodstock 1945	Arena 1945
Hensonville 1945	Willowemoc 1966	Seager 1945
Freehold 1945	Claryville 1966	Hyde Park 1963
Leeds 1953	Peekamoose Mtn. 1943-69	Woodridge 1966
Fleischmanns 1945	West Shokan 1942-69	Ellenville 1942-69
West Kill 1945-60	Ashokan 1964	Gardiner 1942-57
Lexington 1945-60	Kingston West 1964	Wurtsboro 1943-69
Hunter 1945	Kingston East 1963	Kerhonkson 1942-69
Kaaterskill 1943	Grahamsville 1966	Mohonk Lake 1964
Lawbeach 1945	Rondout Reservoir 1942-69	Rosendale 1964

Eastern Lake Ontario Coastal Zone Counties (Oswego and Jefferson)

Central Square 1966	Copenhagen 1942	Ellisburg 1958
Sandy Creek 1958	Mallory 1957	Adams 1959
Boylston Center 1953	Mexico 1956	Sackets Harbor 1959
Worth Center 1966	Dugway 1957	Watertown 1959
Rodman 1959	Pulaski 1956	Carthage 1943
Barnes Corners 1959	Richland 1958	Deferiet 1949
Rutland Center 1959	Redfield 1960	Black River 1958

Other Lake Erie and Lake Ontario Coastal Zone Counties

All quads in Wayne and Ontario Counties are mapped.

5 MEMORANDUM

on

TIDAL WETLANDS INVENTORY
(Task 7.1)

Prepared by

New York State Department of Environmental Conservation
Office of Program Development, Planning and Research
50 Wolf Road
Albany, New York 12233

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TIDAL WETLANDS INVENTORY

Background

New York State undertook an inventory of its tidal wetlands after the 1973 State Legislature added a new article to the Environmental Conservation Law (Article 25), the Tidal Wetlands Act. The Act was effective September 1, 1973.

In acting to preserve the tidal wetlands, the State acknowledged the vital part wetlands play in the coastal ecosystem. Among the contributions of wetlands are the following:

Food Production - At some point in their life cycle, two-thirds of the commercially harvested fish and shellfish and two-thirds of sport fish depend on the marsh estuarine system of the tidal wetlands.

Wildlife Habitat - Tidal wetlands are essential breeding, nesting, and feeding grounds for many forms of wildlife, waterfowl and shore birds.

Flood and Storm Control - The hydrologic water absorption and storage capacity of wetlands minimize erosion and flooding damage. Wetlands serve as a natural buffers protecting upland and developed areas from storm tides and waves.

Recreation - Wetlands provide hundreds of square miles for hunting, fishing, boating, hiking, birdwatching, photography and camping. Wetlands comprise a large part of the remaining natural and unspoiled areas along the crowded coastal reaches of the State and provide unique open space and esthetic qualities.

Natural Waste Disposal - Wetlands are valuable and irreplaceable biological and chemical oxidation basins in which organic runoff and organic pollution are oxidized, metabolized and converted into useful nutrients. Wetlands are essential settling and filtering basins absorbing silt and organic matter

which otherwise would obstruct channels and harbors to the detriment of navigation.

Education and Research - Wetlands afford a wide range of opportunity for scientific research and outdoor laboratories and serve as a living educational classroom.

Economic Benefits - Wetlands also provide direct economic benefits. For example, Great South Bay alone creates direct economic benefits of an estimated \$152,000,000 per year from sale of clams, boats, marine equipment, and fishing equipment.

The State's basic policy in the Act was to preserve this valuable resource and allow for the maximum use of the remaining wetlands along New York's coastline. In order to effectuate this policy, the Act provided for an inventory showing the location, extent, and categories of tidal wetlands so that effective planning for their protection could begin. The need for the inventory and protection of wetlands was apparent from the fact that in the past twenty years, more than 12,000 acres of Long Island wetlands were lost to bulkheading, dredging, filling, dumping, excavating, and similar operations. Continued losses on this scale would soon have resulted in the disappearance of much of the remaining wetlands.

Performance of the Inventory

The Department elected to obtain the services of a private contractor to conduct the inventory. Earth Satellite Corporation was awarded the contract. Mark Hurd, Aerial Surveys, Earth Sat's subcontractor, was responsible for aerial photo acquisition and base map production.

The principal tasks involved in implementing the inventory were the following: acquisition of aerial photography (color infra-red transparencies) for New York City, all of Long Island, and parts of Westchester and Rockland Counties; preparation of photobase maps through enlargement and rectification of the aerial photographs; delineation of wetland boundaries and categories on the photobase maps through analysis of aerial photographs and field verification; acquisition

of property ownership information from examination of tax maps, and notification of owners of lands delineated as within the wetlands; public hearings to allow review of the maps by affected landowners; revision of maps as necessary from the comments at the public hearings; and preparation of final map products.

The aerial photographs were acquired by Mark Hurd, Aerial Surveys, and were designed to serve as: (a) a photobase upon which the wetland boundaries would be displayed, and (b) the primary information source for the identification and delineation of the tidal wetlands.

The photographs were analyzed by natural scientists from the staff of Earth Satellite Corporation. These scientists have extensive experience in the application of aerial photographs to wetland identification and mapping. Wetland categories identified on the photography were delineated on the photobase maps and labeled with appropriate symbols.

Following the initial wetland delineation, owners of property mapped as tidal wetlands were identified from review of county and municipal tax records. The Department will notify owners of record that their land has been mapped as wetland as required by the Act. Property owners are given the opportunity to examine the wetland maps and review the placement of the boundary lines at a public hearing. Final map products are prepared and filed with the appropriate Department of Conservation Regional Office subsequent to the public hearings and will be used as a primary information source in implementing the permanent rules and regulations formulated to protect and preserve the State's coastal resources.

The Area Inventoried

The area to be covered by the New York Tidal Wetland Inventory was determined by DEC to be those wetlands which receive regular and identifiable tidal flows, excepting those areas identified as being formerly connected tidal wetlands. This

includes all of Long Island and the neighboring islands off the eastern tip, Staten Island, Manhattan Island, the mainland of Westchester County along the northwestern shore of the Long Island Sound, and that portion of the Hudson River lying within the State of New York as far north as the Tappan Zee Bridge. The project area includes the counties of Suffolk, Nassau, Westchester, Rockland, Kings, Queens, Richmond, New York and the Bronx.

Information Being Collected

All tidal wetlands inventoried were categorized as follows based on vegetative cover and/or tidal flow: intertidal marsh, high marsh in salt meadow, coastal fresh marsh, coastal shoals, bars and mudflats, formerly connected tidal wetlands and a littoral zone.

The minimum required mapping of a category within a wetland was five acres.

Inventory Products

- (1) Color IR photography of the inventory area
- (2) A reproducible screened Cronaflex photo base map which is a composite of the image photo base and inked on wetland delineations at a scale of 1" =200'
- (3) A plasticized photographic print of the above Cronaflex
- (4) Lists of landowners of wetlands

As of this writing, all but 35 maps of a subsequent order have been received. With this exception, the entire inventory has been completed.

Interim Report
on

(TASK 7.2)

Flood Plain Management

19 Beach Erosion and Hurricane Damage Reduction
10 South Shore Long Island

Prepared by

New York State Department of Environmental Conservation
Office of Program Development, Planning and Research
50 Wolf Road
Albany, New York 12233

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TABLE OF CONTENTS

	<u>Page</u>
Forward	1
Introduction	1
Existing Development	2
Value.....	2
Preserving and Enhancing Coastal Zone Uses.....	3
Methods of Shore Protection.....	4
Beach Protection Projects.....	4
Jetties.....	5
Others.....	5
Flood Protection Projects.....	5
Existing Beach Erosion Control and Hurricane Protection Programs.....	6
Structural Protection.....	6
The State-Local Programs.....	6
The Federal Programs.....	6
Land Use and Development Controls.....	7
Preservation and Protection.....	7
Regulation of Development in Hazard Areas.....	8
Regulation of Building Construction.....	8
Other Methods.....	8
The Federal Flood Insurance Program.....	8
Other Non-Structural Measures.....	9
Hurricane Preparedness Plans.....	9
Improved Hurricane Forecasts.....	9
Fire Island National Seashore.....	10
Gateway National Recreation Area.....	14
Evaluation of Reaches.....	
Reach 1 - Staten Island: Fort Wadsworth - Arthur Kill.....	16
Reach 2 - Nerton Point to Rockaway Inlet (Coney Island Area).....	21
Reach 3 - Rockaway Inlet to East Rockaway Inlet.....	29
Reach 4 - East Rockaway Inlet to Jones Inlet.....	35
Reach 5 - Jones Inlet to Fire Island Inlet.....	40
Reach 6 - Fire Island to Moriches Inlet.....	46
Reach 7 - Moriches Inlet to Shinnecock Inlet.....	53
Reach 8 - Shinnecock Inlet to Beach Hampton.....	59
Reach 9 - Beach Hampton to Montauk Point.....	64
References.....	66
Appendix.....	67

Interim Report
on
Flood Plain Management
Beach Erosion and Hurricane Damage Reduction
South Shore - Long Island

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 stabilize 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 downdrift 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 stabilization 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-existent or lost due to development, floodwalls and levees are utilized. Artificial 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 floors 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 tidal 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 westward 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



Figure 1
Locality Map
and National Seashore
NEW YORK

615 | 40,000 S
 JAN 75 | GSC

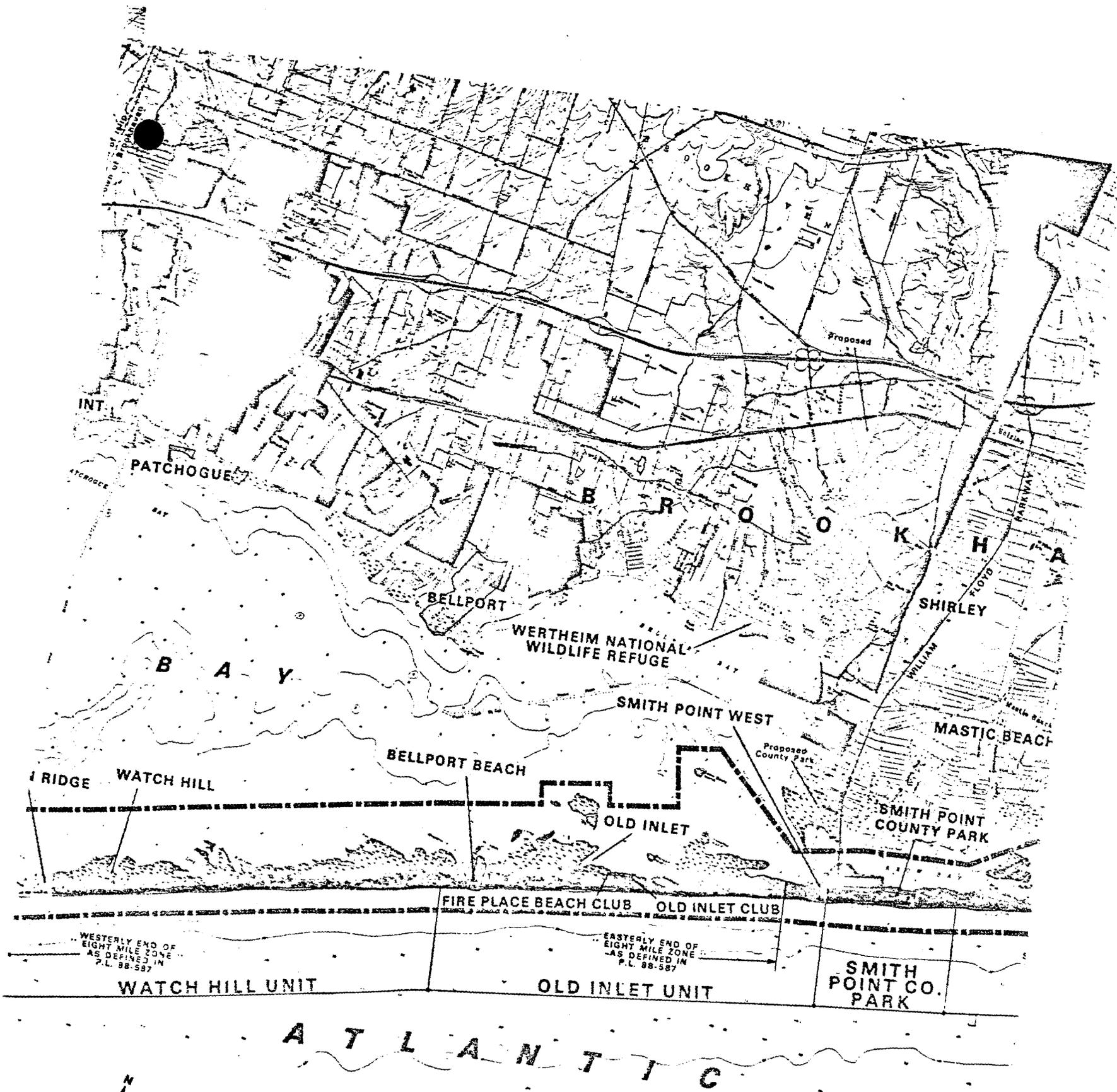
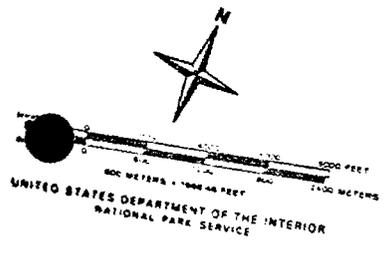
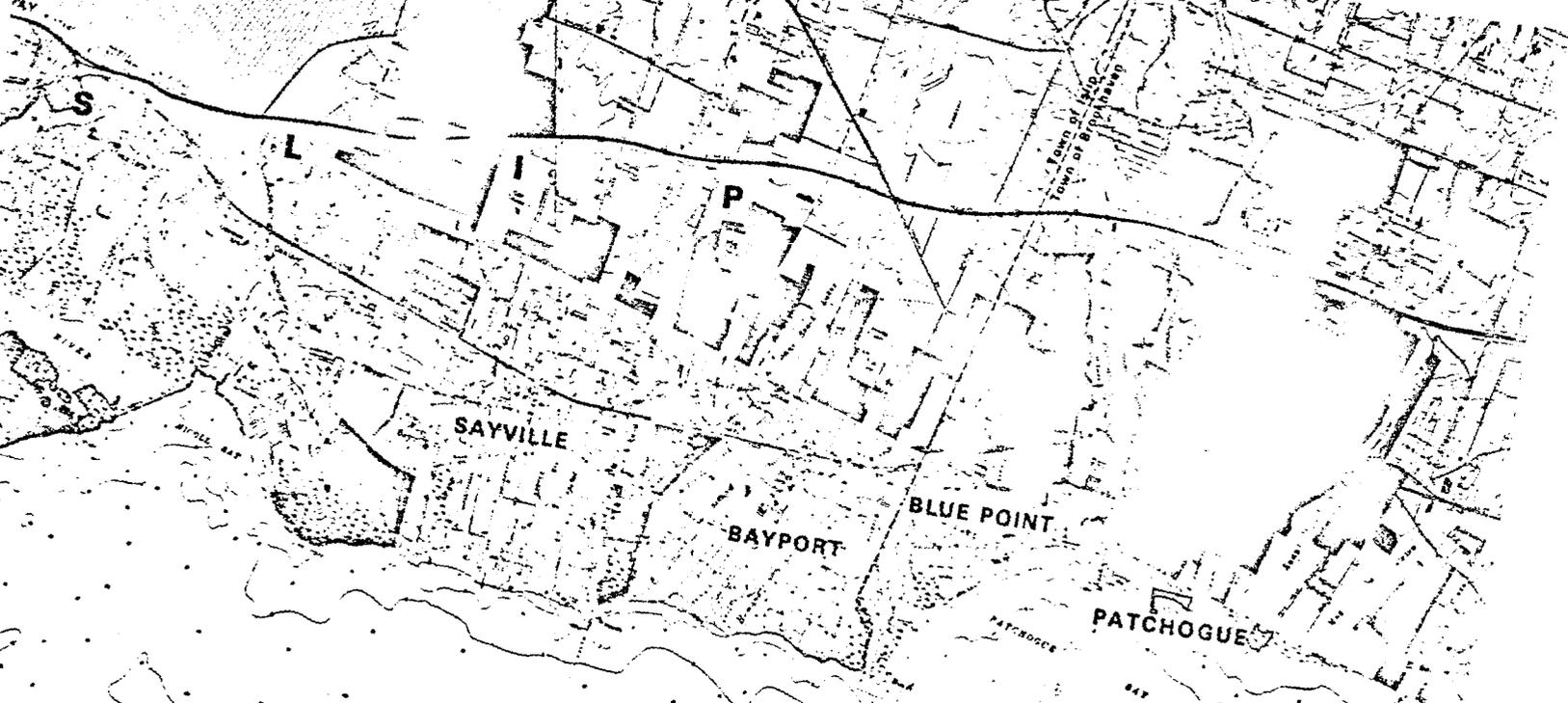


Figure 1
Vicinity Map
 Fire Island National Seashore
 NEW YORK



CONNETQUOT STATE PARK



S O U T H B A Y

Y PARK
IT O' WOODS
SUNKEN FOREST

CHERRY GROVE TALISMAN BARRETT BEACH OCEAN RIDGE WATCH HILL

DAVIS PARK

SUNKEN FOREST UNIT

FIRE ISLAND PINES

WATER ISLAND

LEJA BEACH

TALISMAN UNIT

WESTERLY END OF EIGHT MILE ZONE AS DEFINED IN P.L. 88-587

WATCH HILL UNIT

LEGEND

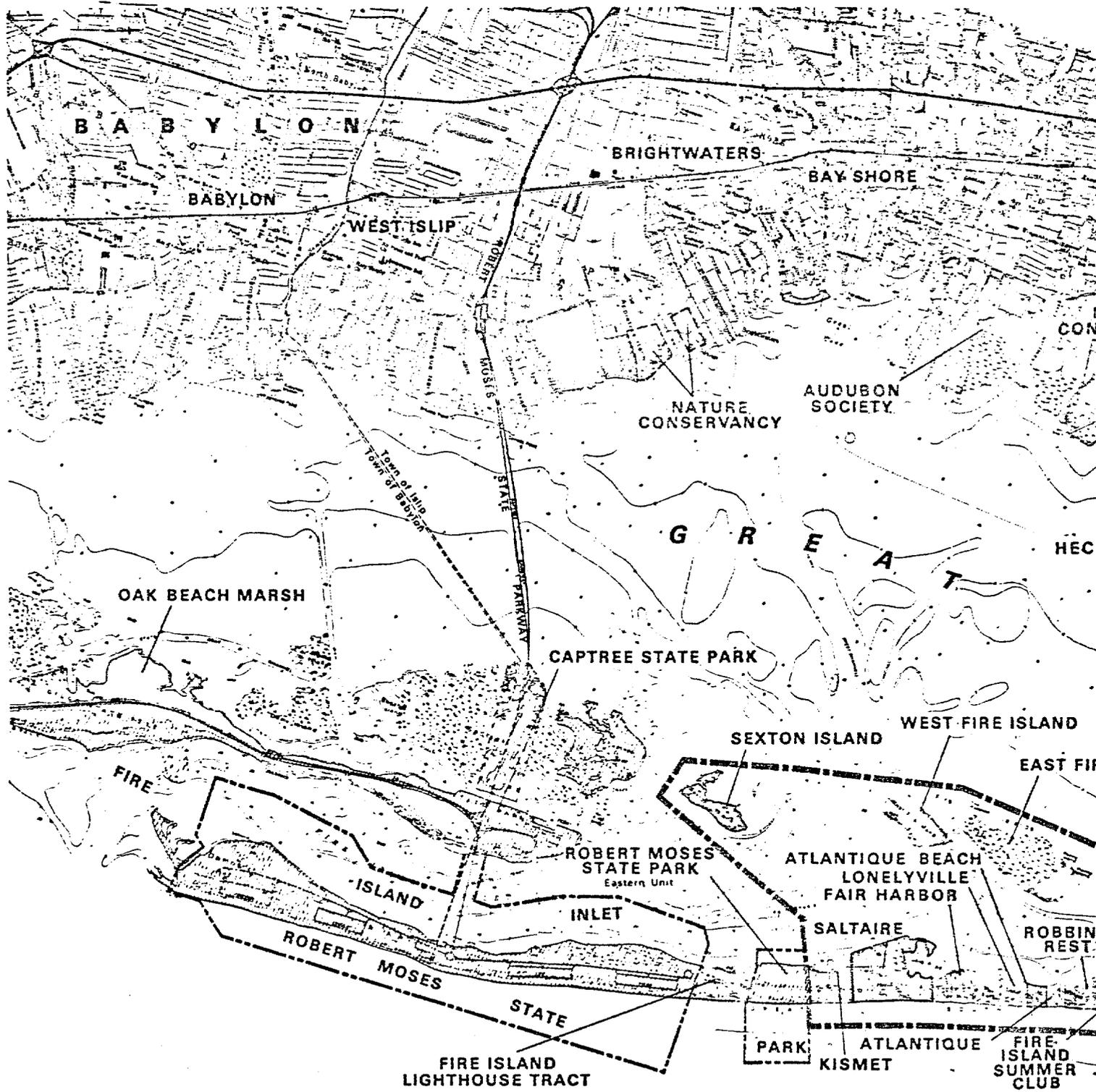
- SEASHORE BOUNDARY
- STATE PARK BOUNDARY
- INCORPORATED VILLAGE
- PRIVATE LAND
- BEACH AND WATCH HILLS SEASHORE DISTRICT

- FEDERAL LAND
- STATE LAND
- COUNTY LAND
- TOWN LAND

SEASHORE DISTRICT (IF WITHIN PARK BOUNDARY)



UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE



B A B Y L O N

BABYLON

WEST ISLIP

BRIGHTWATERS

BAY SHORE

NATURE
CONSERVANCY

AUDUBON
SOCIETY

G R E A T N E C K

OAK BEACH MARSH

CAPTREE STATE PARK

SEXTON ISLAND

WEST FIRE ISLAND

EAST FIRE ISLAND

FIRE ISLAND

ROBERT MOSES
STATE PARK
Eastern Unit

ATLANTIQUE BEACH
LONELYVILLE
FAIR HARBOR

ISLAND

INLET

SALTAIRE

ROBBIN REST

ROBERT MOSES

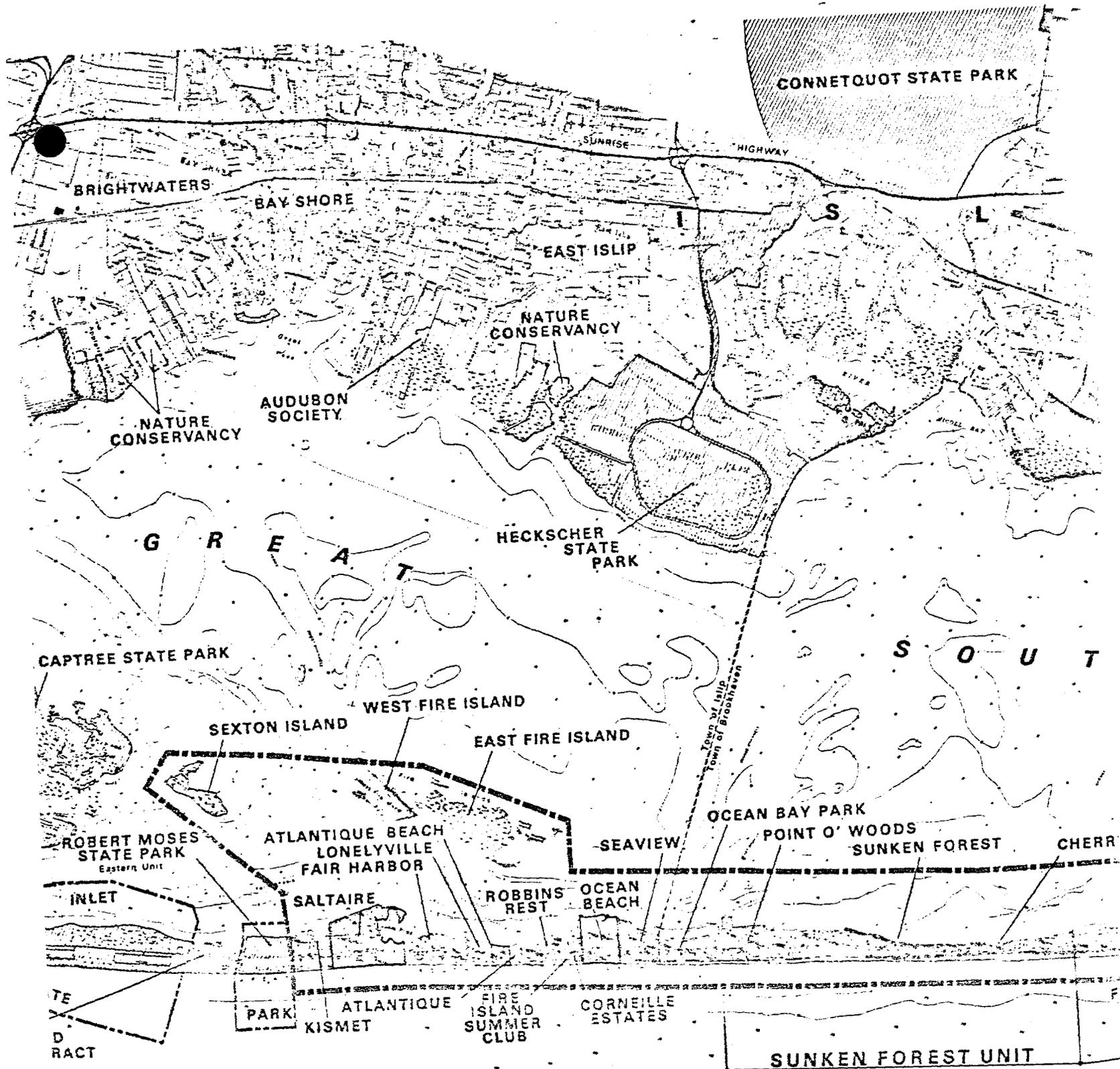
STATE

PARK

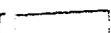
ATLANTIQUE
KISMET

FIRE ISLAND
SUMMER CLUB

FIRE ISLAND
LIGHTHOUSE TRACT



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.

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 exempted 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 variances 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.

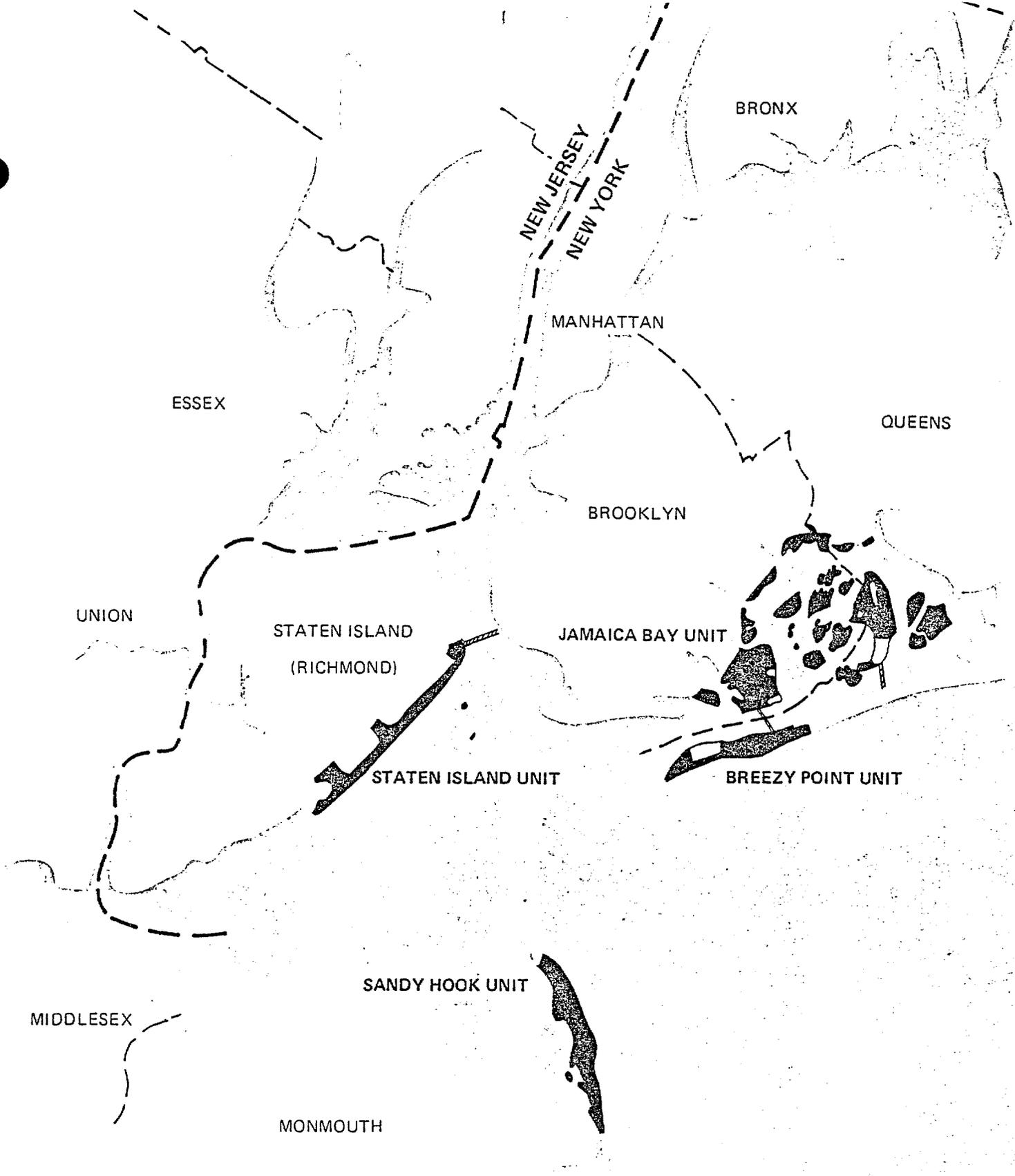
The Breezy Point Unit, south of Jamaica Bay on the western end of Rockaway Peninsula, contains about 1,600 acres and 4½ miles of ocean beaches, including Jacob Riis Park, the lands and facilities at Fort Tilden, and the shoreline abutting the Breezy Point Cooperative.

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.

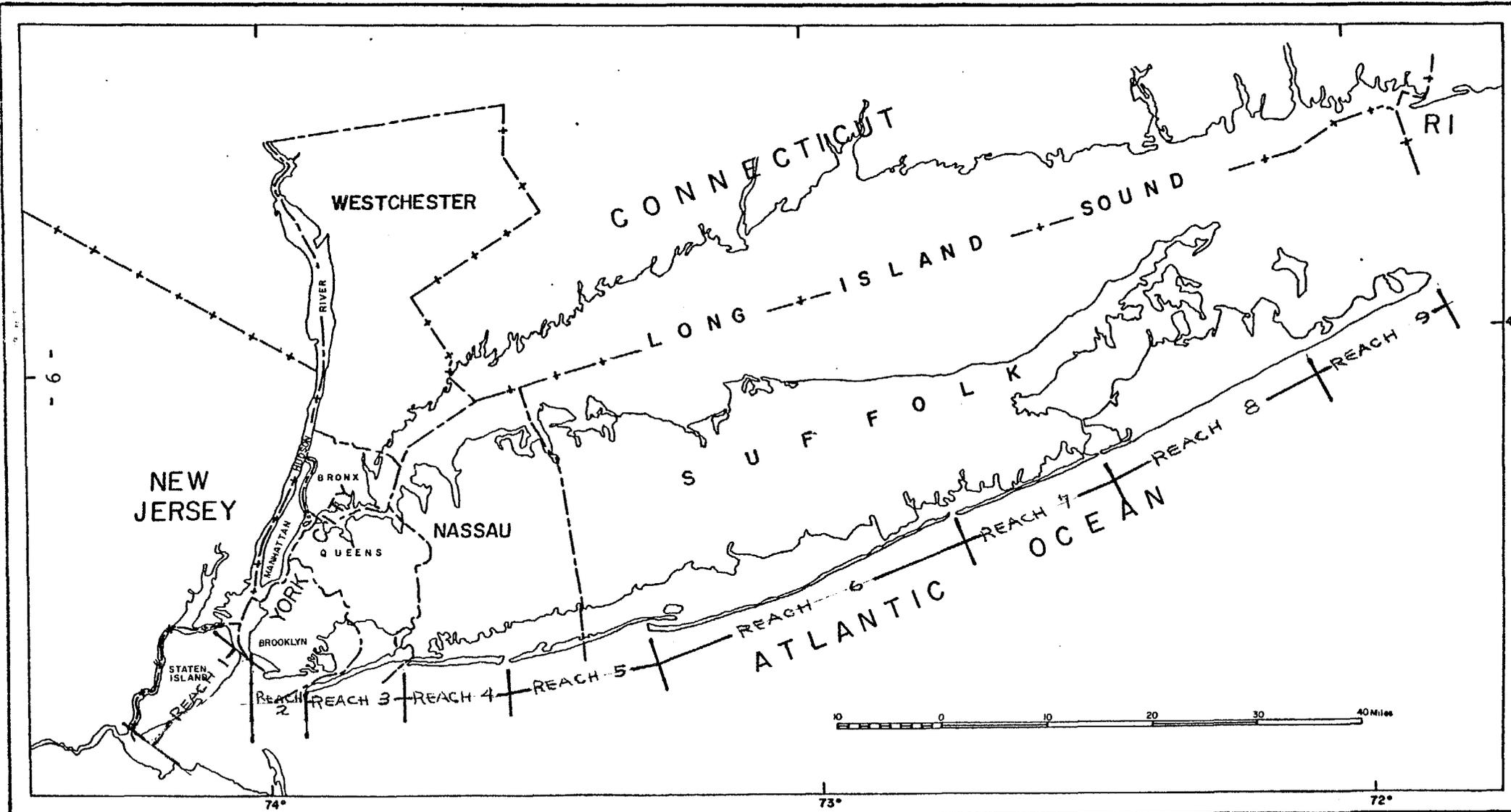
The Recreation Area is under the jurisdiction of the Department of the Interior and is operated by the National Park Service. Land acquisition for the Park has not been completed, particularly in the Staten Island Unit. The Park Service has operated some four miles of ocean beaches in the Breezy Point,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





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 study¹ in 1964 of this reach. The study

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.

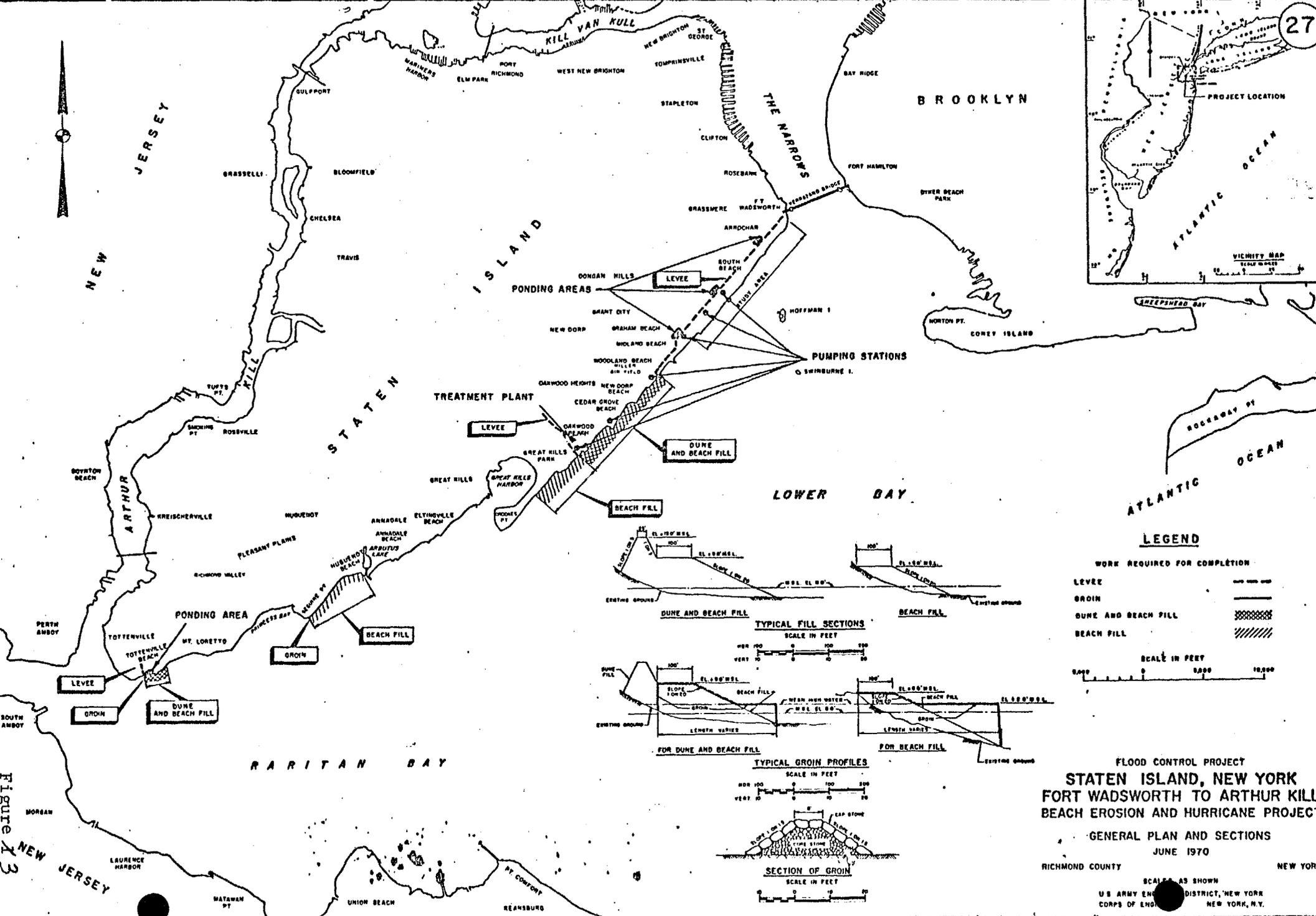
The City of New York has indicated a preference for one of the two modification alternatives and the Corps of Engineers is currently revising the project design accordingly. The project under design (including the City-favored modification alternative) generally consists of:

- 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.



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

SCALE AS SHOWN
 U.S. ARMY ENGINEERING DISTRICT, NEW YORK
 CORPS OF ENGINEERS NEW YORK, N.Y.

Figure 13

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 Survey³ 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 Widths (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)	---	60	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	4,218,000	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	911,300	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 5 1/2 percent and an economic life of 50 years.
 (e) Excludes annual cost for aids 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 aids to navigation.

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) stabilization 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.

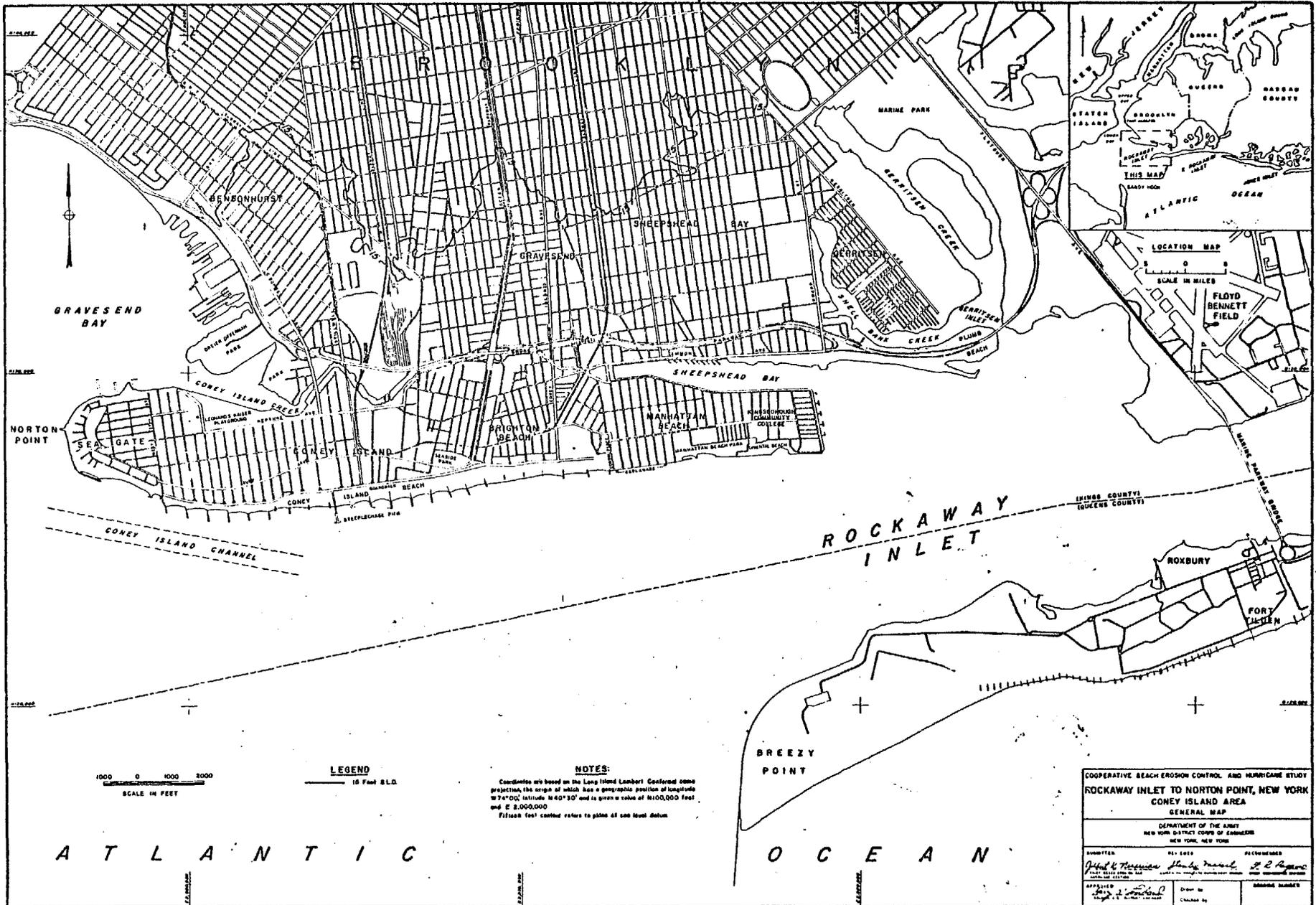


Figure 4

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 extensively 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 flood-wall 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.

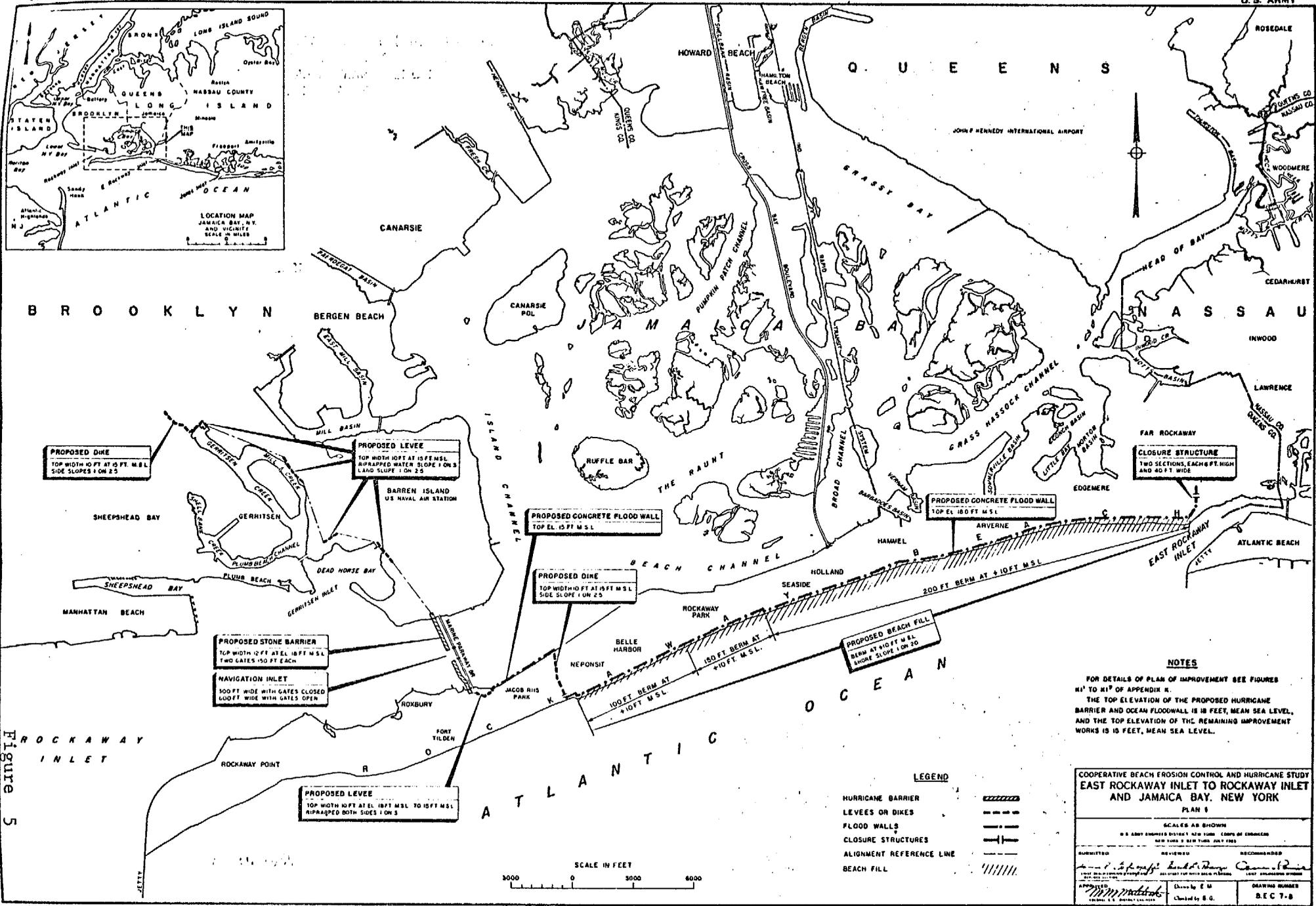


Figure 5

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 of the 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.

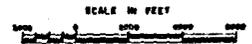
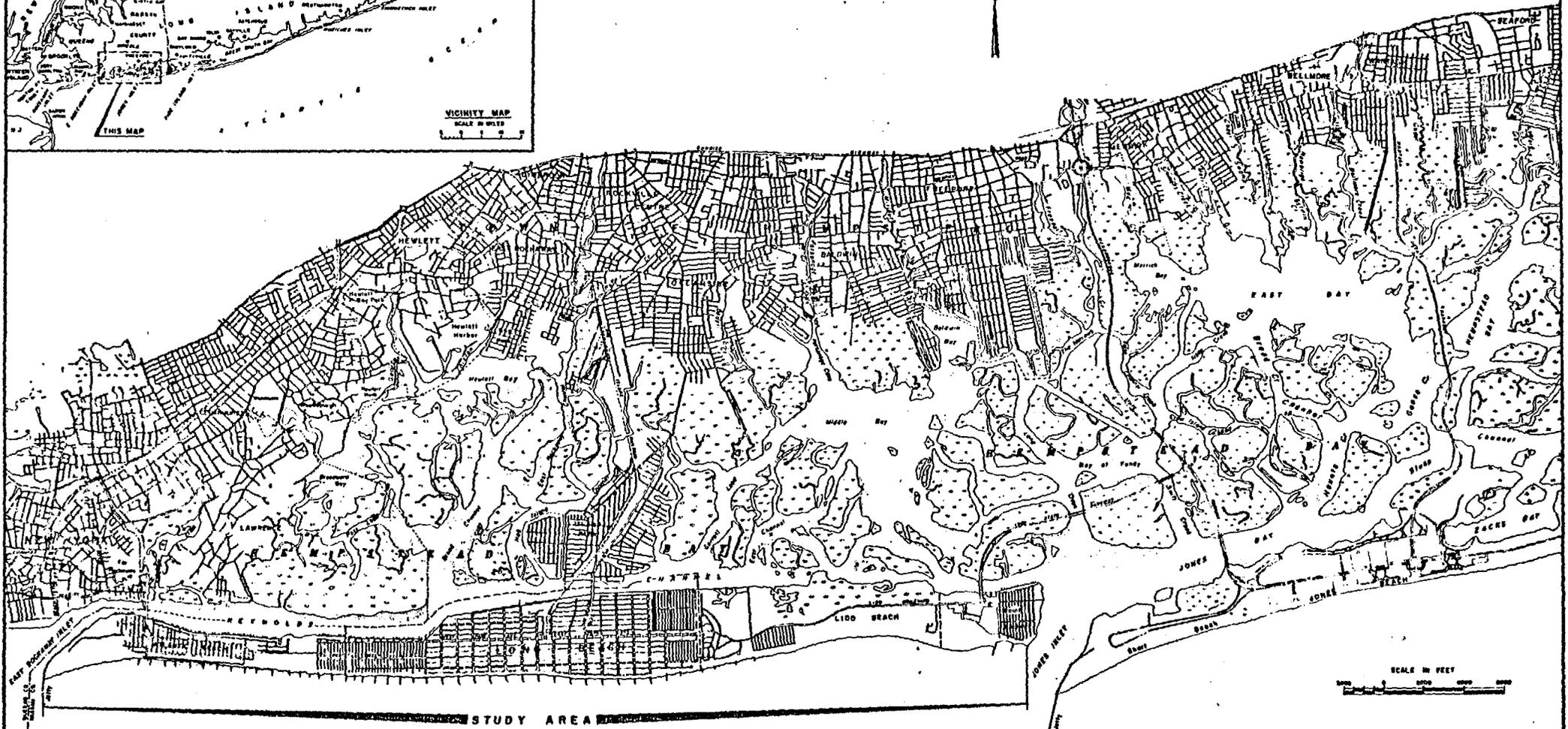
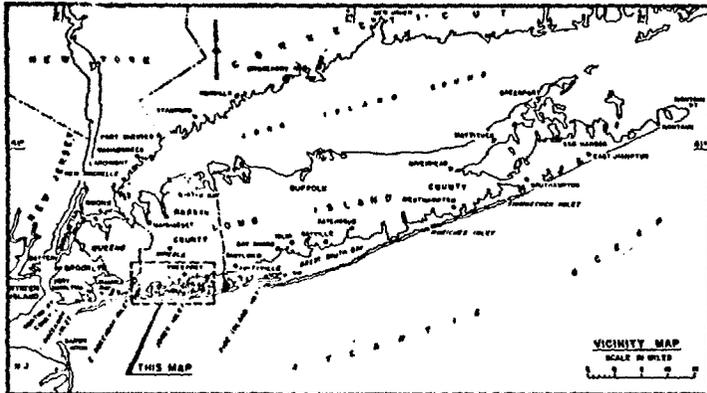


Figure 6

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 <i>John H. ...</i>	REVIEWED <i>Wm. J. ...</i>	RECOMMENDED <i>F. R. ...</i>
DATE 1918	SCALE 1" = 1000'	DRAWING NUMBER BEC 10-1

A T L A N T I C

O C E A N

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

TO ACCOMPANY SURVEY REPORT NO. 10 JANUARY 1918

PLATE

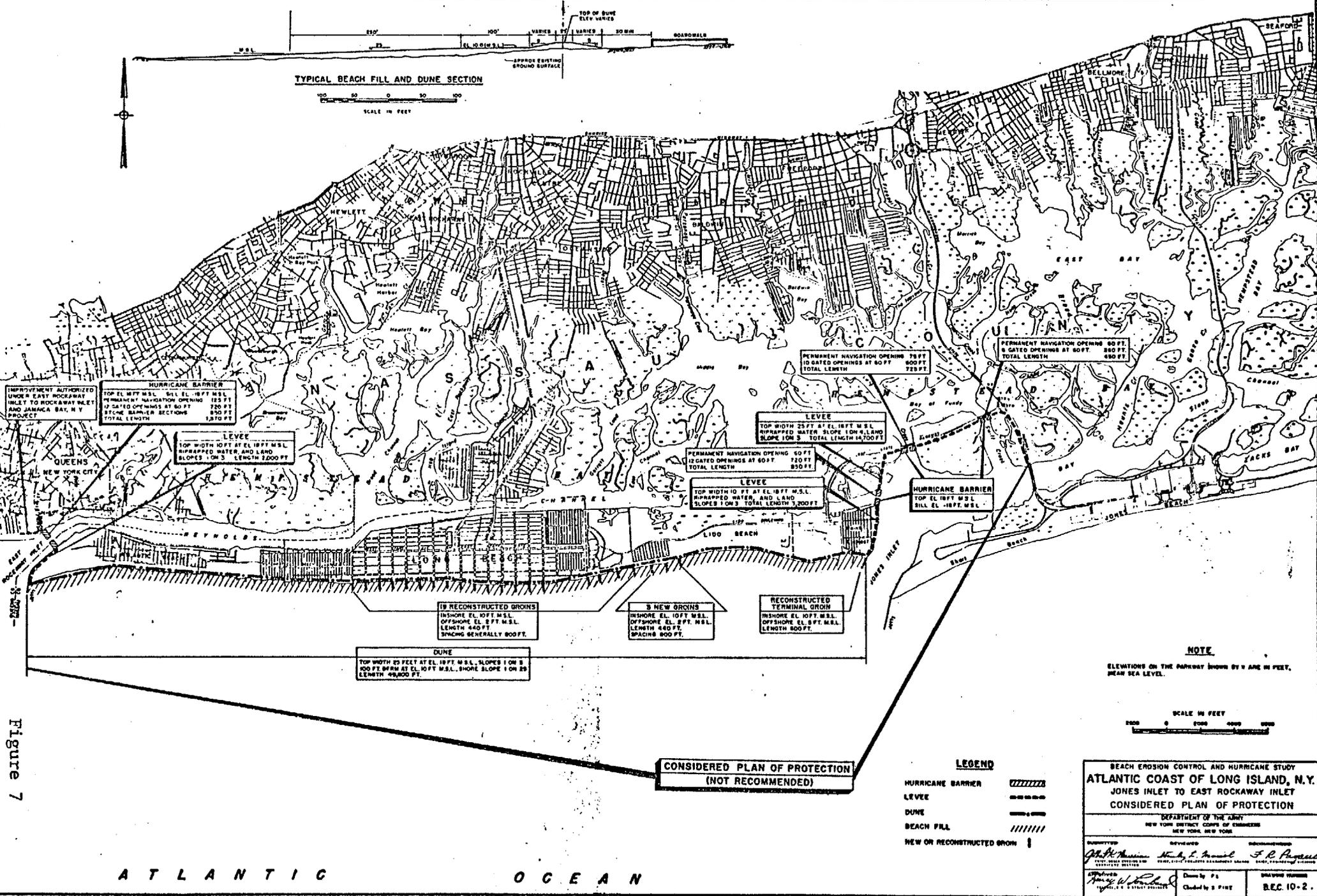


Figure 7

AT L A N T I C O C E A N

NOTE
ELEVATIONS ON THE PLAN ARE IN FEET, MEAN SEA LEVEL.

SCALE IN FEET
0 100 200 300

LEGEND

- HURRICANE BARRIER
- LEVEE
- DUNE
- BEACH FILL
- NEW OR RECONSTRUCTED GROIN

CONSIDERED PLAN OF PROTECTION (NOT RECOMMENDED)

**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

SUBMITTED: *John H. Morrison* REVIEWED: *W. L. L. ...* *F. R. ...*
APPROVED: *...* CHECKED BY: *...* DRAWING NUMBER: **B.C. 10-2**

TO ACCOMPANY SURVEY REPORT OF ... JANUARY 1971

PLATE 2

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 reach⁷. 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 review⁶ 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 study⁷ 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.

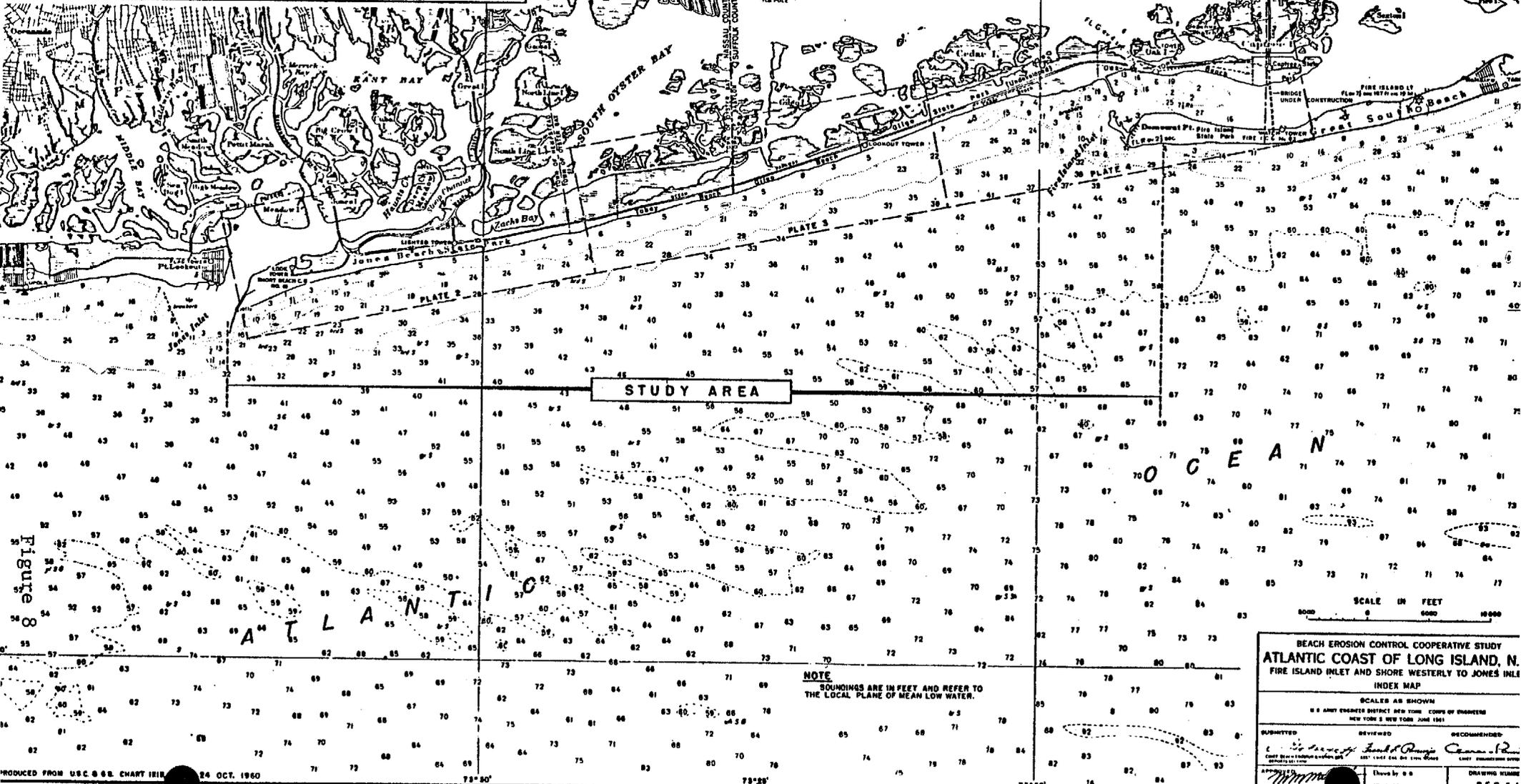
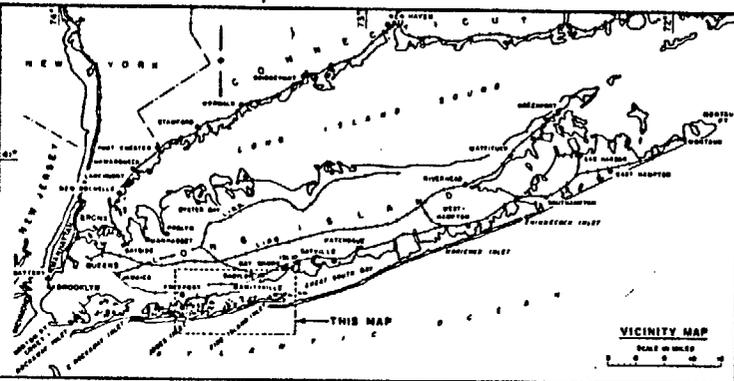


Figure 8

BEACH EROSION CONTROL COOPERATIVE STUDY
ATLANTIC COAST OF LONG ISLAND, N.
FIRE ISLAND INLET AND SHORE WESTERLY TO JONES INLET
INDEX MAP

SCALE AS SHOWN
U.S. ARMY ENGINEER DISTRICT NEW YORK, CORPS OF ENGINEERS
NEW YORK 2 NEW YORK, JUNE 1961

SUBMITTED: [Signature]
REVIEWED: [Signature]
RECOMMENDED: [Signature]

APPROVED: [Signature]
Checked by: [Signature]
DRAWING NUMBER: B.E.C. 6-1

1961

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. Loss of 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 Study⁸ 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 1959⁹. 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.

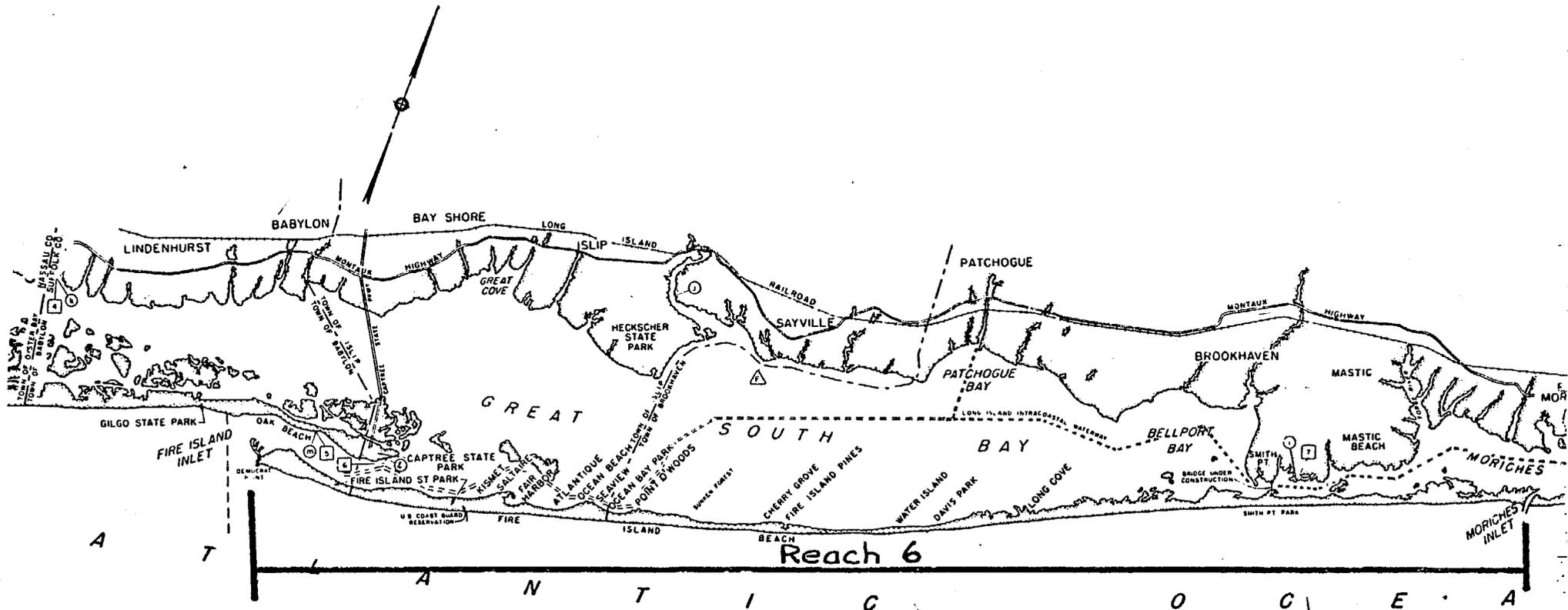


Figure 9

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 Southampton, 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 Study⁸ 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.

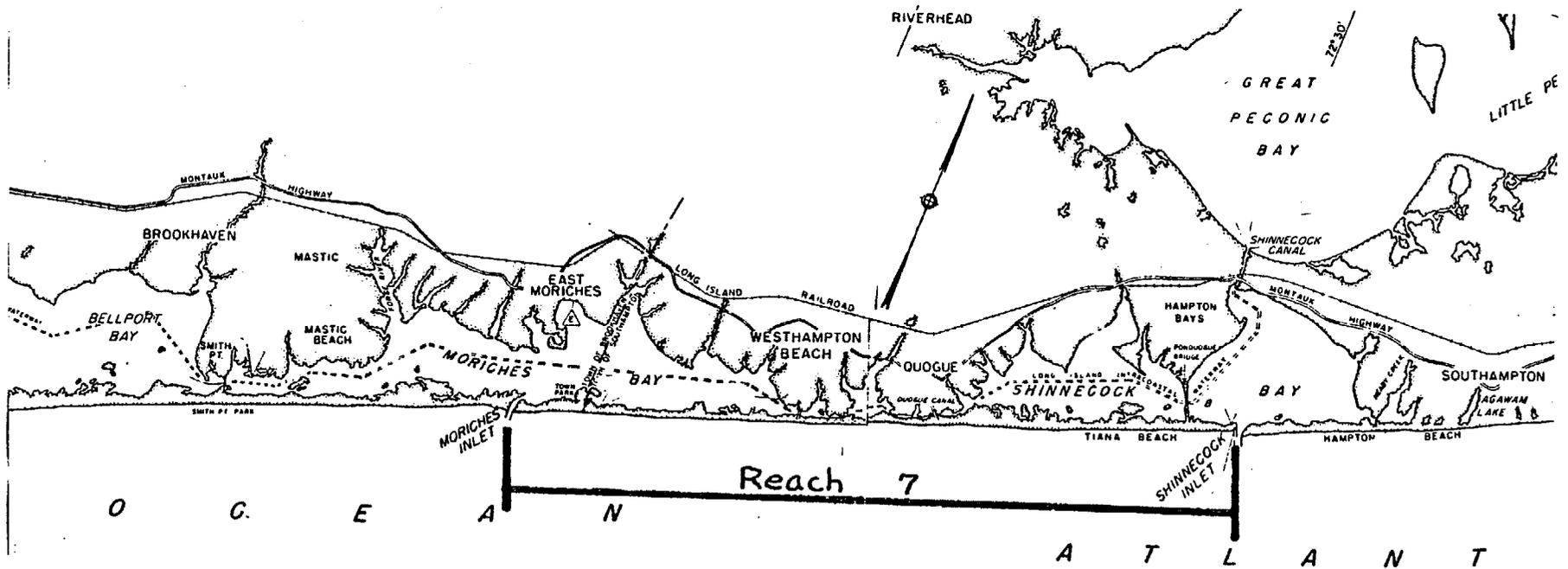


Figure 10

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 Study⁸ 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 permanently 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 installing 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.

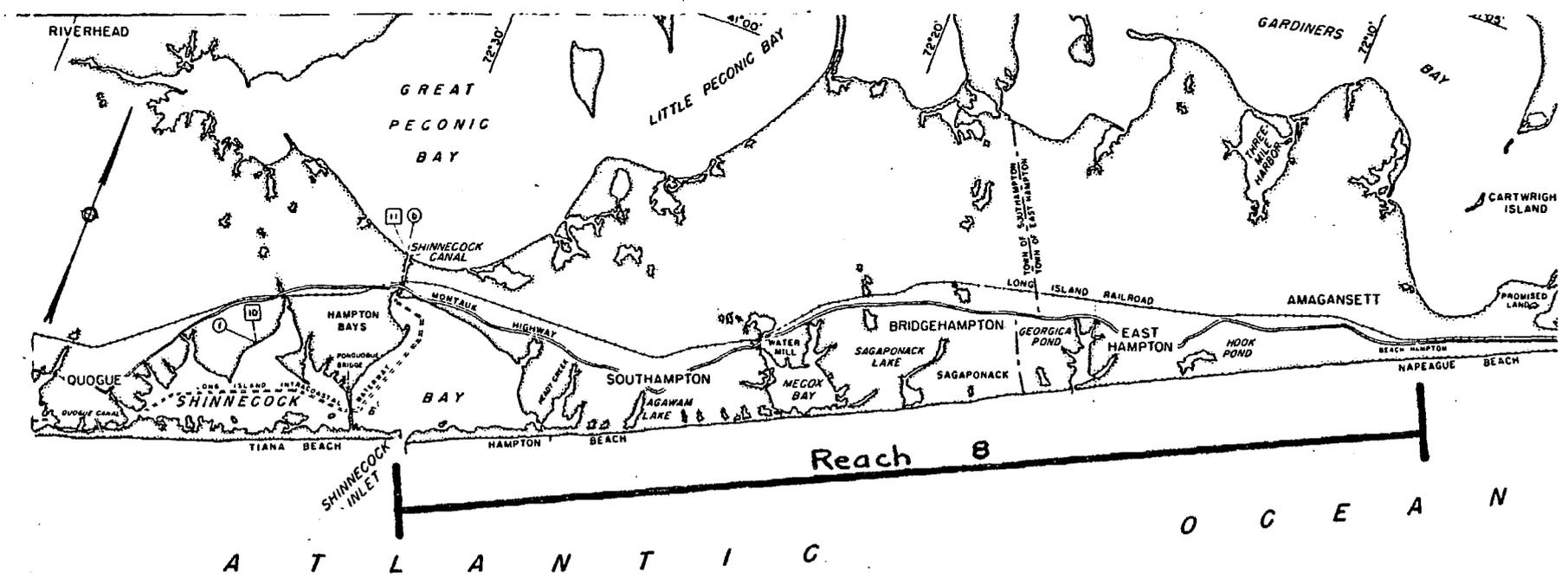


Figure 11

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 Study⁸ 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.

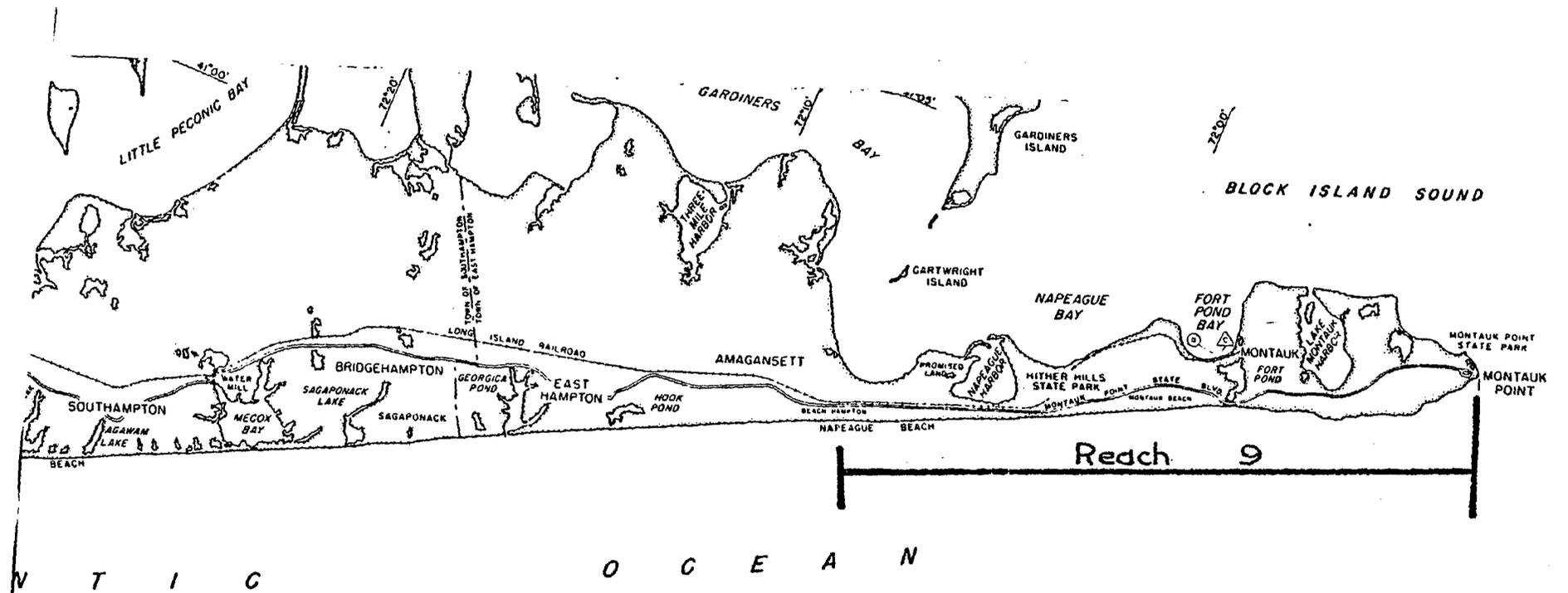


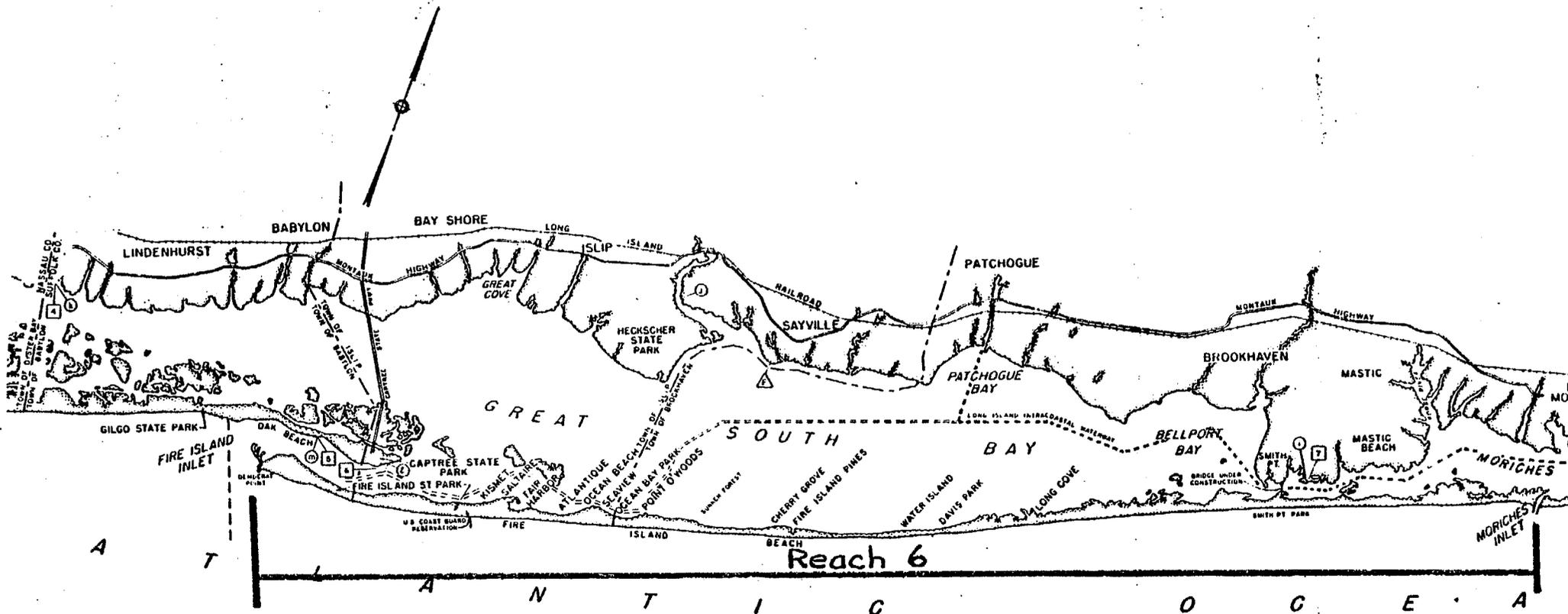
Figure 12

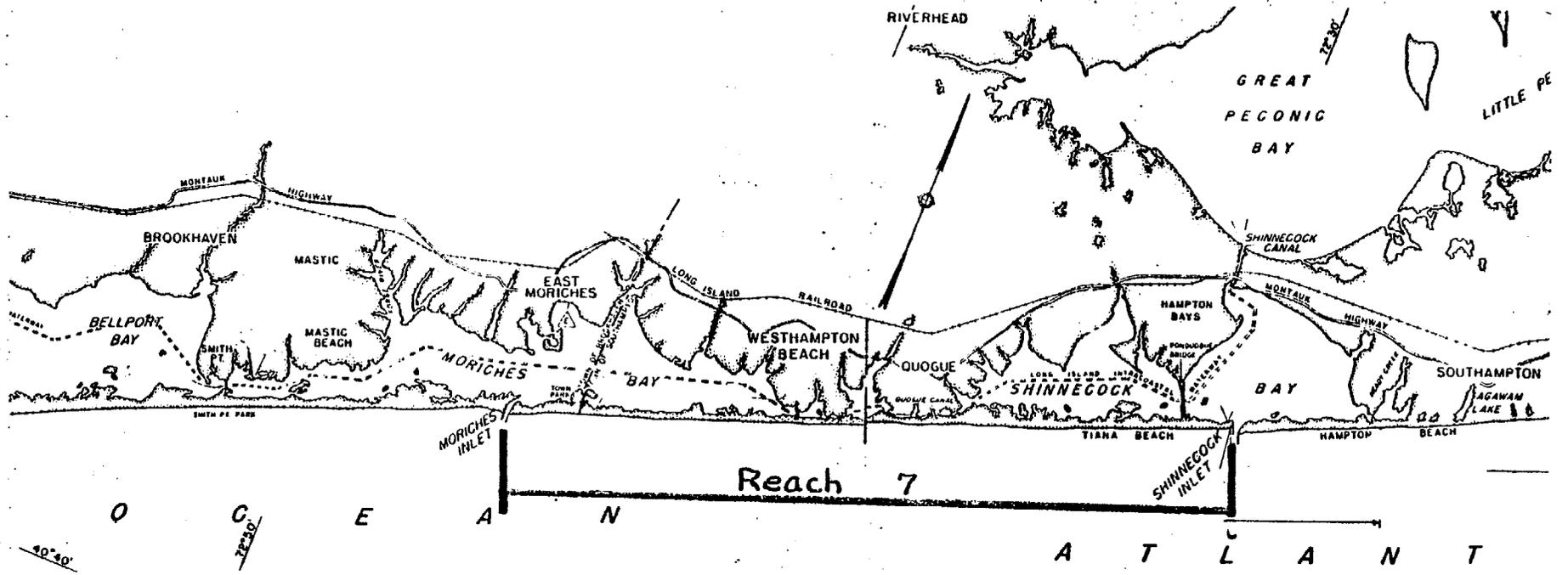
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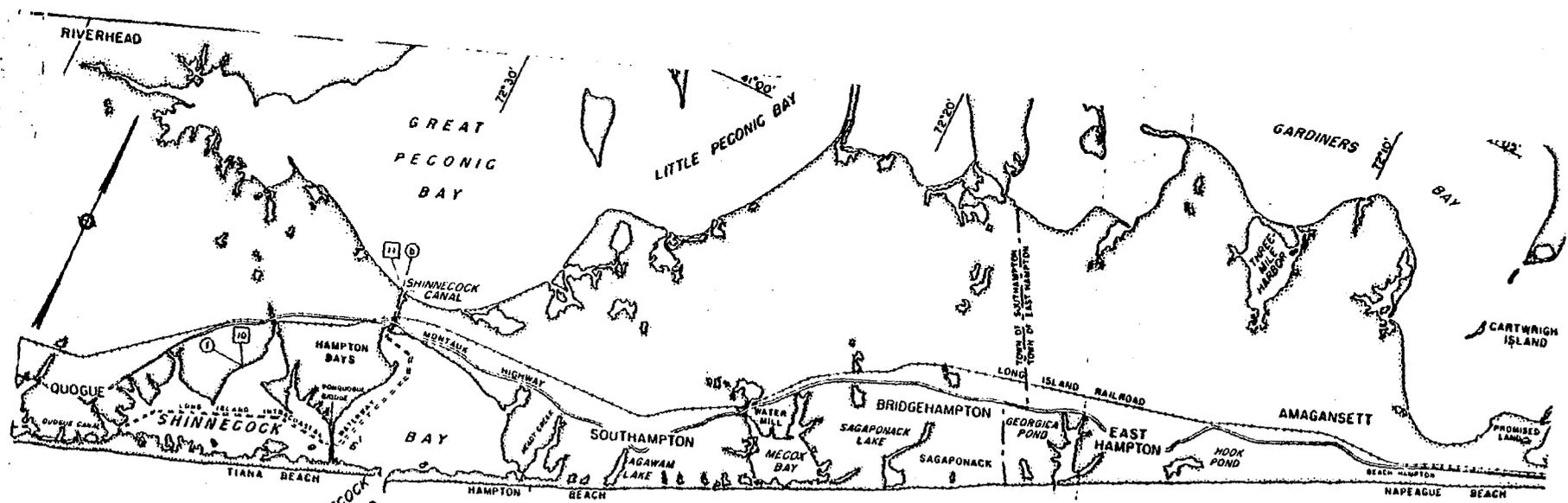
1. "Cooperative Beach Erosion Control and Interim Hurricane Study (Survey), Staten Island, New York, Fort Wadsworth to Arthur Kill", U. S. Army Corps of Engineers, March 1964.
2. "Report on Beach Erosion Control and Interim Hurricane Study of the Atlantic Coast of Long Island, New York, Jones Inlet to 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



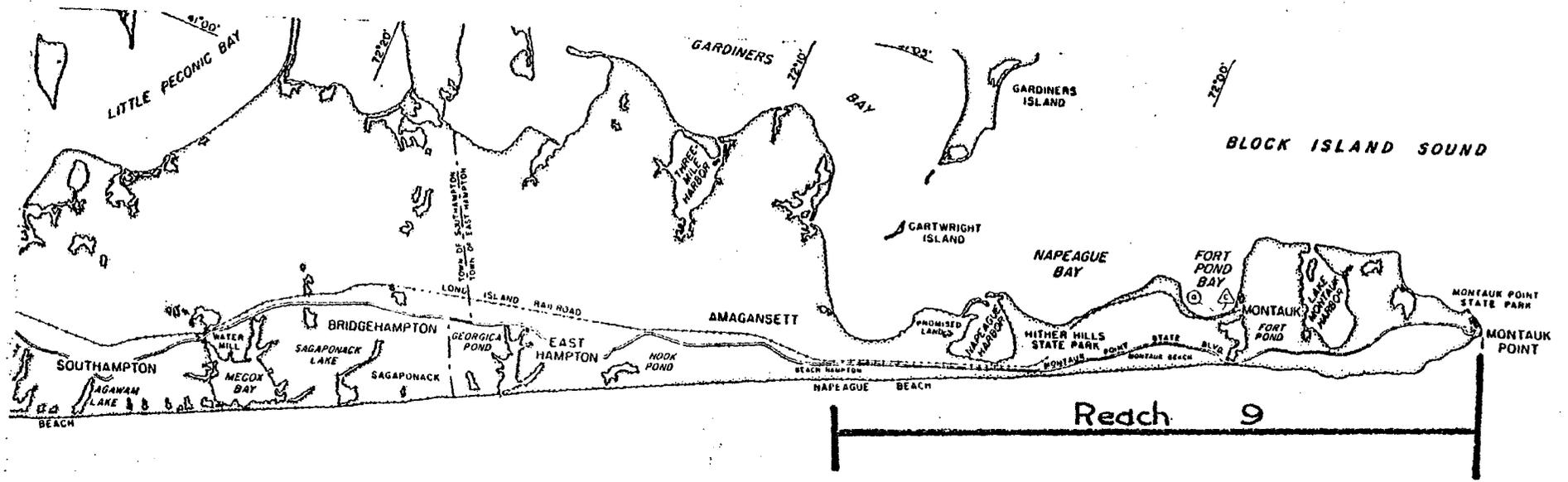




SHINNECOCK INLET

Atlantic OCEAN

Reach 8



N O T I C E 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

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 Sea-
shore.
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.
78 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:

78 STAT. 929.

78 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 a certificate indicating the property with respect to which the Secretary's authority to acquire by condemnation is suspended.

78 STAT. 931.

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.

Owners' use
of 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.

Sec. 5. The Secretary shall permit hunting, fishing, and shell-fishing 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.

Hunting and
fishing.

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.

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-

Sunken Forest
Preserve.

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.

September 11, 1964 - 5 -

Pub. Law 88-587

(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.



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

An Act

79 STAT. 957

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.

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.

Fire Island
National Sea-
shore, N. Y.
Additional land.

Filing with
Federal Reg-
ister.

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. 990 (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.

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. 635.

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 "improved 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 maximum 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 non-conformity may not exceed 2 years from the date the zoning ordinance imposing the restrictions contained in this paragraph is approved by the town.

§ 23.4 Developed areas district.

(a) Definition: This district shall include all these 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.

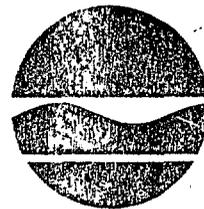
§ 23.5 Variances and exceptions.

(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.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233



Peter A.A. Berl
Commissioner

January 18, 1977

Mr. Peter L. Wise, Chairman,
Standing Committee on Great
Lakes Coastal Zone Management
300 North State Street, Room 1010
Chicago, Illinois 60610

Dear Mr. Wise:

The Preliminary Report on Great Lakes Open-Coast Flood Levels prepared by the U.S. Army Corps of Engineers and circulated on December 15 to members of the Standing Committee on Great Lakes Coastal Zone Management has been reviewed by staff in the Office of Program Development and Planning of this Department. The response to the preliminary report is favorable. There is no criticism of methodology applied and the results appear reasonable and useful. The information is far more complete and refined than the previous submission. Inclusion of the additional return periods (10, 50 and 500 year) with the already accepted 100-year data provides sufficient information needed for a standard F.I.A. Flood Insurance Study.

Two subsequent actions are needed as follow-up to this work:

1. FIA should adopt the results of the Open-Coast Flood level analysis and provide the frequency reach elevations for all study contracts for Great Lakes communities. This will result in lowering costs of individual state and local studies by eliminating additional analysis and will provide consistency of results for contiguous communities studied by different contractors.
2. FIA should request the Corps to complete the analysis by determining generalized wave runup values for the Great Lakes shoreline. While precise wave runup calculations are site specific, the limited degree of precision needed for FIA insurance applications makes such a generalized determination acceptable. Three variables in this context are significant in determination of wave runup: fetch and exposure to prevailing winds, offshore slope and depth, and beach slope. All three of these variables lend themselves to averaging over long reach lengths allowing the development of runup reaches for half-foot or one foot increments. Rather than have

-2-

runup determined on an individual basis for each community, the Corps should complete the analysis. The 100 and 500-year flood inundation lines could then be determined by study contractors for individual communities with elevation data provided by FIA.

A second letter of January 15, to Standing Committee members, referring to Phase II of the FIA Flood Level Study for Great Lakes also was reviewed by Department staff. In reviewing the items to be included in the Phase II report several comments were suggested.

The second recommended action listed above on our Phase I comments is also pertinent to our comments on Phase II. The Corps refers to wave runup by citing their Shore Protection Manual and stating they do not plan to study wave runup under Phase II. The argument inferred is that this is too complex a task to approach on a reach basis. We reiterate the point we've made in item 2 above; runup information could readily be developed for reaches at least by foot or half-foot increments.

Similarly, the same argument holds for the Corps' desire to determine precisely the flood water levels in embayments and other areas of natural protection associated with the open coast levels determined under Phase I. Such refinement in most cases is not warranted for FIA's purposes. For example, the maximum difference between the 10-year and 100-year events for Lake Ontario reaches is 0.7 feet, while the same difference for Lake Erie does not exceed 1.5 feet. FIA's concern is the nearest whole foot water surface elevation for insurance and regulatory purposes; thereby further refinement of data is purposeless.

The difference between open coast and embayment conditions is most apparent when dealing with wave runup. Bays and other sheltered areas receive little wave runup due to a lack of fetch. Half-foot or whole-foot increment reaches for wave runup could be established for most areas which would be adequate for the purpose of the flood insurance program.

Thank you for the chance to comment on the preliminary report and the proposed Phase II. Acceptance of the report by FAI will mean that everyone will be working with the same data.

Sincerely,

Fred Howell
DEC/CZM Study Manager
Land Resources Planning Group
Office of Program Development
and Planning

cc: District Engineer,
U.S. Army Corps of Engineers
Detroit District

REPORT OUTLINE

Task 7.2
Flood Plain Management
and
Erosion Control

Summary

I. Flooding and Erosion Processes

The sources of New York State's coastal zone flooding problems vary greatly from tidal to riverine to lake. The different characteristics of these varying sources are described. The causes of erosion are often complex and difficult to understand, particularly beach erosion. A straightforward description of beach processes is presented, avoiding complicated technological explanations. This chapter will enable the reader to better understand the problems and solutions discussed in later chapters.

II. Overview of Flooding and Erosion Problems in New York State's Coastal Zone

This section presents available information on flooding and erosion problems in the coastal zone. For Task 7.2, New York State's coastal zone has been divided into seven reaches, six of which are discussed in this report. Lake Erie, Niagara River, Lake Ontario west of Cayuga County, Hudson River estuary (including the East River), Long Island Sound (including the shore of Westchester County) and Atlantic Ocean. The remainder of Lake Ontario and the St. Lawrence River coastal zone will be discussed in a report being prepared by the St. Lawrence-Eastern Ontario Commission.

The narrative discusses land use patterns along the reaches, such as agricultural, residential, industrial or recreation. Soil characteristics, which are directly related to the erodibility of the shore, are noted. Information on existing shore protection and its effectiveness is also included.

III. Available Data Sources and Data Gaps

This chapter is a brief discussion of sources of information on flooding and erosion, and more importantly, identification of gaps in available information and data. Suggestions will also be made of ways to fill these gaps.

IV. Management Alternatives

This section reviews the alternatives available for managing the coastal zone. It is divided into two parts, structural and non-structural. Structural solutions to flooding and erosion problems have been used

extensively in New York's coastal zone, particularly in the Atlantic Ocean Reach. Their effectiveness in correcting problems has varied. In some instances, they had had a negative impact on the adjacent coastal area. Some of the available structural measures - and their positive and negative aspects - are discussed.

Non-structural measures cover a wide range of alternatives. They are the most desirable management method in a large part of New York's coastal zone. They are flexible and inexpensive to apply compared to most structural methods.

V. Suggested Management Alternatives by Reach

Management alternatives, structural and non-structural, are discussed for the coastal zone reaches, with suggestions made on the best methods to use, where appropriate.

VI. Programs Available for Management Implementation

Federal, State and local programs and powers for implementing suggested management measures are briefly discussed.

VII. Generalized Hazard Area Management Model

A flow model will be developed for use by regional and local agencies in identifying hazard areas and in deciding the proper management tool. This model will be generalized for use in all of New York's coastal zone.

VIII. Conclusions

IX. Recommendations

Bibliography

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TABLE OF CONTENTS

SUMMARY

- I. FLOODING AND EROSION PROCESSES
 - II. OVERVIEW OF FLOODING AND EROSION PROBLEMS IN NEW YORK STATE'S COASTAL ZONE
 - III. AVAILABLE DATA SOURCES AND DATA GAPS
 - IV. MANAGEMENT ALTERNATIVES
 - V. SUGGESTED MANAGEMENT ALTERNATIVES BY REACH
 - VI. PROGRAMS AVAILABLE FOR MANAGEMENT IMPLEMENTATION
 - VII. GENERALIZED HAZARD AREA MANAGEMENT MODEL
 - VIII. CONCLUSIONS
 - IX. RECOMMENDATIONS
- BIBLIOGRAPHY

CHAPTER I

FLOODING AND EROSION PROCESSES

The principal causes of the flooding and erosion problems in the coastal zone are (1) the forces of nature, (2) the characteristics of the shoreline areas subjected to these forces, and (3) the changes imposed on the natural shoreline by man.

An understanding of the forces acting upon the coastal beach and the resultants of these forces is essential to understanding why flooding and erosion of the shoreline occur.

BEACH PROCESSES

Much of the following description of beach processes is derived from the National Shoreline Study, "Shore Protection Guidelines," published by the U.S. Army, Corps of Engineers. While the focus of this section is on the processes occurring on the marine coastline, they are generally pertinent to the Great Lakes Shoreline. A following section treats the flooding and erosion processes peculiar to the Great Lakes and the riverine sections of the coastal zone.

Natural Processes

The natural forces which affect a coastal beach originate with the sun and the moon. The sun, through uneven heating of the Earth, causes air movements and winds. The moon, and to a lesser extent the sun, create the tidal rise and fall of the ocean. The Great Lakes have a small tidal range which has no significant effect on shoreline flooding and erosion.

The familiar waves of the sea are wind waves generated by wind blowing over the water. These waves cause most of the damage on our coasts. The height, length and period of wind waves are determined

by the fetch (the distance the wind blows over the body of water in generating the waves), the speed of the wind, and the length of time that the wind blows. Generally, the longer the fetch, the stronger the wind, and the longer the time that the wind blows over the water, the larger the waves will be.

Currents are created when the water in one area becomes higher than the water in another area. This condition could be caused by tides, winds, changes in water temperature (which results in a change in water density), waves breaking on a beach and streams flowing into the lake or ocean.

Lake Erie is subjected to phenomena called seiches. The lake is shallow and its long axis runs east-west. Low barometric pressure at the east and strong westerly winds cause a tilting of lake levels. Water levels are sometimes eight to ten feet higher at the east and because of this phenomenon.

Beach Dynamics

The sediments of a beach are determined by the forces to which the beach is exposed and the type of material available at the shore. Most beaches are composed of very fine to very coarse sand. This sand is supplied to the beaches by streams, and by erosion of the shores by waves and currents. Mud does not usually remain on the beaches because the waves create sufficient turbulence to keep these fine particles in suspension. The particles then settle out in deeper water. Those beaches which are sheltered or are subjected to normally mild wave action do retain the finer particles and one can find mud flats and marshes along their length.

The primary agent causing onshore, offshore and along shore movement of sand is the breaking wave. As the wave moves onto the

shore, it finally reaches a depth of water which is so shallow that the wave collapses or "breaks". This depth is equal to about 1.3 times the wave height. Breaking results in a sudden dissipation of the energy of the wave, which causes a great amount of turbulence in the water, and stirs up the bottom materials. After breaking, the water travels forward as a turbulent mass, expending its remaining energy in a rush up the beach slope.

Wind waves affect the beaches in two major ways. Short, steep waves, which usually occur during a storm near the coast, tend to tear the beach down. However, when the storms are distant, the waves are lower in height and their periods are lengthened by the time they reach the coast. These gradual swells tend to move sand inshore, rebuilding the beach. A series of storms occurring near the coast in a short time period can result in severe erosion if there is not sufficient time in between to rebuild the beaches. Alternate erosion and accretion is seasonal on some beaches; the winter storms tear the beach away and the summer swells rebuild it. Beaches may also follow long term cyclic patterns. They may erode for several years, and then accrete for several years. On the Great Lakes, this is a particularly noticeable pattern, resulting mainly from the cyclic periods of high and low lake levels.

The long shore current is very important in coastal processes because it carries sand which has been stirred into suspension by the turbidity of the breaking waves. The sand moved in this way is known as "littoral drift". The direction and violence of the wave attack determine the direction and magnitude of the littoral transport at a given time. For example, on a coast facing to the north, waves generated

by a northwest wind will produce a littoral drift to the east. Waves emanating from the northeast would cause drift in the opposite direction. The direction of drift will often reverse as the wind direction changes but most shores consistently have a net annual littoral transport in one direction. It is important for the planner to take this into account in his work, particularly the design of structures in the littoral zone.

The average annual net rate of littoral transport at a given place is fairly regular from year to year unless man changes the shore, and eliminates or reduces the supply of sand. The average annual rate varies considerably from place to place. In landlocked water of limited extent, such as the Great Lakes, the rate of littoral transport can normally be expected to be no more than about 150,000 cubic yards per year. For the open coasts of the oceans, the net rate of transport may be from 100,000 to 2 million or more cubic yards per year. The rate depends on the local shore conditions and alignment as well as the energy and direction of wave action in the area.

Barrier Beach Inlets

Inlets through marine barrier beaches have important effects on adjacent shores by interrupting littoral transport of sand and trapping the littoral drift. As littoral drift moves into the inlet, it narrows the inlet. Increased tidal currents caused by the constriction then pick up the littoral drift from the inlet. On the ebb current, the sand is carried a short distance out to sea and deposited on an outer bar. When this bar becomes large enough, the waves begin to break on it. and the sand again begins to move along the bar toward the beach. On the flood tide, when the water flows through the inlet into the lagoon, the littoral drift in the inlet is carried a short distance into the lagoon and deposited, creating a shoal. Although some of the

material escapes this cycle and continues to the downdrift beach, the overall effect of the inlet is to store sand and interrupt the littoral transport process. Inlets to Great Lakes bays, such as Irondequoit Bay or Lake Ontario, also interrupt the littoral drift. The process is different because there is no appreciable tidal current. Unless there is streamflow to flush it out, the inlet gradually shoals.

Hurricanes which occur along the Atlantic Ocean coastline, and other severe storms occurring close to the coastline will change beaches drastically. Such storms generate large, steep waves. These waves take sand from the beach and carry it offshore, they move much more sand than do ordinary waves. In addition, the strong winds of the storm often create a storm surge. This surge raises the water level and exposes higher parts of the beach not ordinarily vulnerable to waves. Structures, inadequately protected and located too close to the water, are then subjected to the forces of the waves and are often completely destroyed. Storm surges are especially damaging if they occur at the same time as high tide or, on the Great Lakes, during a high water period.

The berm or berms of the beach are built naturally by waves to an elevation approximating the highest point reached by normal storm waves. While the berms tend to absorb the major forces of the waves, overtopping permits waves to reach the dunes or bluffs in back of them and damage unprotected manmade features.

When storm waves erode the berm and carry the sand offshore, the protective value of the berm is reduced and large waves can overtop the beach. The width of the berm at the time of a storm is thus an important factor in the amount of upland damage the storm can inflict.

ATLANTIC COASTAL FLOODING AND EROSION

The south shore of New York City and Long Island is subjected to severe flooding and erosion. The attitude of the shoreline, facing south and projecting into the ocean from the line at the U.S. shoreline to the south, makes it open and vulnerable to hurricanes and coastal storms emanating from the south. The long, open fetch of ocean to the south permits the buildup of large waves during these storms. Hurricanes occurring coincident with high tides can cause tidal levels of 15 to 20 feet above normal. These high levels and the accompanying wave run-up can cause flooding a mile or more inland in places.

GREAT LAKES FLOODING AND EROSION

The natural foreces and beach dynamics of the Great Lakes shoreline are basically the same as those described in the section on Beach Processes. Major storms are the forces which cause the most damage and the largest changes in the shore. However, the Atlantic Ocean is affected by tidal changes which occur twice a day. There are no significant tidal effects on the Great Lakes. Water level changes occur slowly, often over a period of years.

The source of Great Lakes water is rain and snow falling on the lakes and on the tributary land areas. Seasonal fluctuations, caused by the annual weather pattern, are superimposed on the long-term variations caused by extended periods of below or above normal precipitation. Unusual variations in the amount of water evaporated from the lakes can also alter the lake levels significantly. Because of the size of the Great Lakes and the limited amount of water their outflow rivers can discharge, extreme high or low levels and flows persist for a considerable time after the factors that cause them have

changed. Releases of water from Lake Superior and Lake Ontario are artificially controlled. The other lakes are naturally regulated.

Wave action works directly on the beach or at the toe of the bank, eroding clay, silt, sand and gravel. This erosion is increased when lake levels rise, because the beaches are narrower or submerged, and the waves are able to attack the unprotected toe of the banks or bluffs directly. Thus, a wide beach is the best protection the upland shore can have from wave attack.

Seepage often comes through sandy layers in glacial till bluffs. When underground water seeps out of exposed bluffs of unstable or loose material, it causes slumping and further weakens the material. This often results in large slides. Sometimes, man-made drainage works cause problems with underground water.

One of the most severe threats to the shore is erosion by frost and ice. In certain of the fine-grained silty soils along the lakes, the alternate freezing and thawing can weaken the soil and cause it to slide. Frost and ice formation in fissures in clays, glacial tills, or shale bluffs may contribute to their erosion. Shore ice is another cause of damage when broken up and driven onto the beaches by on-shore storms. Lake bottom material may be scoured out and structures are often damaged. However, shore ice can be beneficial, too. It protects the shore from erosion by winter storms.

RIVERINE FLOODING AND EROSION

Major flooding in the Niagara and Hudson Rivers coastal zones is caused by two factors, ice jamming and tributary flooding. Tributary flooding results from intense rainfall, snowmelt and ice jamming.

Winter flooding is usually caused by a least two of these factors. Intense thunderstorms or extratropical storms cause most of the problems in the summer.

Ice jamming occurs when there is a warm spell of weather following a prolonged cold period. The warm weather, often accompanied by rain, melts some of the snow pack. The runoff causes the stream level to rise, breaking the ice into floes. The higher stream levels also result in greater streamflow velocities. The ice flows downstream until it reaches an obstruction. This could be an unbroken reach of ice or a construction of the channel such as an island or bridge piers. Here the ice jams, building out from the shore or submerging under the stationary ice pack. Soon a dam is formed blocking the flow of water behind it.

In the Niagara River, these ice jakes which occur upstream of the hydroelectric plants at Niagara Falls can cause a serious disruption of power production. The ice dams the stream, causing the stream levels below to lower. The reduced head at the power plants results in reduced power production. On the Hudson River, ice jakes not only cause flooding but can interrupt navigation which normally occurs year round.

Streambank erosion is not a major problem on either river. The components of streambank erosion are: stream velocity, water level, soil characteristics and attitude of the shoreline (the outside shoreline on a curve in the stream erodes tend to be subject to more erosion because of higher stream velocities there). Other factors are ice and navigation which can cause significant bank wash.

CHAPTER II

OVERVIEW OF FLOODING AND EROSION PROBLEMS IN NEW YORK'S COASTAL ZONE

Great Lakes

New York State has over 800 miles of coastline bordering the Great Lakes and its connecting rivers. There are 71 miles of shoreline bordering Lake Erie and 328 miles along Lake Ontario. Added to this are 70 miles on the Niagara River and 340 miles of mainland and island shoreline along the St. Lawrence River.

The water levels of the Great Lakes are constantly changing. Winds and barometric pressure changes can cause large, temporary fluctuations. Variances from long-term average precipitation can have an impact on water levels years beyond their duration.

Shoreline flooding and erosion damages are primarily caused by meteorological events. The severity of the damage increases, generally, as the lake levels rise toward the higher extremes of their natural ranges and permit storm-generated waves to attack higher and deeper on the foreshore.

Man, in his desire to enjoy and utilize the shoreline and adjacent waters, encroaches upon the vulnerable shoreland. Sometimes he is aware of the risk involved but more often there is insufficient information available to him to alert him to the hazards. Changes in lake levels, from one extreme to the other, occur over a period seldom less than a decade. It is not easy for a shoreland owner, with little knowledge of historic fluctuation, to recognize the changes that will inevitably occur.

The Great Lakes Region Inventory Report of the National Shoreline Study estimates that, of New York's shoreline on Lakes Erie and Ontario, about 196 miles are subject to erosion. Seventeen of these miles sustain critical erosion; that is, the shoreline has high value economic or recreational resources and a historic record of rapid loss of land and/or structural damage. The Inventory Report estimated that property damage caused by erosion during the 1951-52 high water period amounted \$120,000 on New York's Lake Erie shoreline and \$6,400,000

on the Lake Ontario shoreline. Updated to 1970 evaluation, these damages were \$232,000 and \$12,500,000 respectively. Three-fourths of the damage on Lake Ontario occurred in Orleans and Monroe Counties.

The Corps of Engineers, at the request of the Great Lakes States, is presently conducting an assessment of flooding and erosion damages on the United States portion of the Great Lakes shoreline for the latest high water period, 1972-1975. ~~A~~^A pilot study was conducted in 1975 in 11 Great Lakes counties, including Oswego County in New York State. The St. Lawrence-Eastern Ontario Commission, subcontractor for the Corps of Engineers, projected from its study of Oswego County that flood damages for the period September, 1972 to September, 1974 totaled \$1,290,000. Erosion damages during the same period were put at \$4,358,000.

As a further indication of the magnitude of flooding and erosion damages, the St. Lawrence-Eastern Ontario Commission, in its report, "Lake Ontario and the St. Lawrence River: Analysis of and Recommendations Concerning High Water Levels," examined damages incurred by the storm of March 17-18, 1973. This storm did severe damage to the Lake Ontario shoreline and the President declared seven counties major disaster areas. It was found that by September, 1974, the Small Business Administration had made loans for home and businesses of \$22.9 million. Damages to state park and recreation facilities were put at one million dollars.

These costs reflect damages to man-made structures. Damages to the environment are much more difficult to quantify. The high water and the resultant accelerated erosion removes much valuable beach area and farmland. The resulting sediment clogs stream mouths and navigation channels.

A more particular look at flooding and erosion problems along the New York State portions of the Lake Erie and Niagara River to the Wayne-Cayuga County line, follows. The remainder of the Lake Ontario shoreline, in Cayuga, Oswego and Jefferson Counties, and the New York shoreline of the St. Lawrence River is being examined by the St. Lawrence-Eastern Ontario Commission.

Lake Erie - Lake Erie's shoreline is characterized by high erodible bluffs. The average height of the shore bluffs is 40 to 50 feet but is as much as 100 feet in short reaches. The lower part of the bluffs, generally well above the limit of wave uprush, is shale. In some places, shale extends the full height of the bluff, but more often the top half is unconsolidated. For some distance on either side of river mouths the bluffs are lower and may be entirely granular material or silt and clay. Narrow gravel and shingle beaches, 40 to 50 feet wide at average lake levels, extend along some of the shale bluff reaches. Several wider sandy beaches occur mainly between Silver Creek and Cattaraugus Creek and in the Town of Evans. Except for these beaches and occasional pockets of sand trapped by natural headlands or shore structures, there is little sand in this entire reach. What there is, is usually a thin layer over the shale bottom.

In general, the ^{Chautauque}~~Cattaraugus~~ County shoreline is used for agriculture or is undeveloped. Between the Pennsylvania-New York State line and Van Buren Point, about 20 miles, there are only a few scattered residential developments. The next nine miles of shoreline development from Van Buren point to two miles east of Dunkirk consists of permanent and summer residences. Exceptions are the commercial and industrial frontage in Dunkirk, and two city-owned parks, and another one-quarter mile frontage in the harbor. Eight miles of shore between

Dunkirk and Silver Creek contain only scattered residential areas. The shoreline from Silver Creek to the County line at the mouth of Cattaraugus Creek is a highly developed summer resort area.

The Lake Erie shoreline of Erie County between Cattaraugus Creek and Lackawanna, a distance of approximately 22 miles, is a highly developed residential area. There are occasional open spaces, including Evangola State Park and approximately seven smaller public recreation areas. The shoreline of Lackawanna and Buffalo, to the mouth of the Buffalo River is used for heavy industry and commercial purposes.

Lake Erie has the shallowest maximum depth of all the Great Lakes, only 210 feet. The 30-foot depth contour is approximately one mile offshore all around the shoreline, which contributes to the great fluctuations in water level. These fluctuations are greater than those on any of the other Great Lakes. Strong winds blowing along the axis of the lake can create seiches that have been known to lower the water level at one end of the lake by eight feet or more, while the water depth of harbors at the other end of the lake rises several feet.

Because of the relative stability of the high shale bluffs, erosion and flooding problems in Chautauqua and Erie counties are few. Erosion of the bluffs and deterioration from weathering and frost action do occur, and improvements close to the top of the bluffs become threatened.

Flooding occurs almost annually at the mouth of Cattaraugus Creek with some years having more than one flood. Littoral drift in Lake Erie forms a sandbar across the mouth of the Creek in the summer which frequently causes ice jams and flooding in the spring. The Corps of Engineers conducted a Flood Plain Information Study of Cattaraugus Creek in 1968. Maps in the

report show the extent of creek related flooding during the Standard Project and Intermediate Regional Floods.

A Federal navigation and flood control improvement project was authorized by Congress for Cattaraugus Creek in 1968. The principal purpose of the project is to open the lower end of the creek for development as a small-boat harbor. It is also designed to reduce flooding in Sunset Bay. The project provides for breakwaters in Lake Erie to protect the approaches to the creek mouth; an entrance channel between the breakwaters and into the creek, 8 feet deep, 100 feet wide and about 1,900 feet long, terminating in an irregular-shaped maneuvering area about 300 by 600 feet in size, and 6 feet deep; and an inner channel above the maneuvering area, 6 feet deep, 100 feet wide, and about 1,900 feet long. It also provides for a number of ancillary features for flood control and to facilitate public use of the breakwater structures for recreational fishing. Estimated costs for the project are \$2,760,000 federal and \$1,210,000 non-federal. Construction of the project is scheduled to start in 1977 and be completed in 1978.

Due to the influence of westerly storms, the lake levels at the east end of Lake Erie are subject to large temporary changes. A temporary rise of five feet occurs on an average of once a year. Changes of seven or eight feet are not uncommon. Flooding of low areas, including some of the docks in Buffalo Harbor, occasionally occurs during the most extreme changes. These extreme changes also increase the erosion, because larger waves can reach shore. Thus, heavier and higher protections are needed here than at any other point on Lake Erie, where changes are much less. Because these temporary changes are taken into account when docks and other shore installations are built, there is little, if any, damage from flooding at still water levels, even during high lake levels.

The Corps of Engineers has also constructed a flood control project on Smokes Creek in the City of Lackawanna. The project, completed in 1971, consisted of deepening and minor realignment of both branches and the main channel of the creek and protects the city against a flood equal to the maximum of record.

Niagara River

The Niagara River has been described as, in reality not a river, but a strait connecting Lake Erie with Lake Ontario. The drainage area, which includes all of the Great Lakes except Ontario, is 260,400 square miles and the flow is consequently quite large, averaging 202,000 cubic feet per second. Flow in the river is directly dependent upon the water level of Lake Erie and because the lake is large and surface elevation fluctuations occur over an extended period of time, this results in a stable river flow. The exception to this is when high winds from a westerly direction increase lake levels. The velocity of the river is very swift along the rapids above Niagara Falls and in the gorge below, reaching speeds of 30 to 40 feet per second. Above and below these areas, however, the current averages four feet per second and navigation is feasible in these reaches.

The principal erosion problem along the Niagara River is the Niagara Falls. The Falls, originally located along the Niagara escarpment, have eroded over geologic time about seven miles to the south, forming an extensive gorge in their path. The rate of erosion has varied, greatly during this time, being dependent upon the variation in size of the upper lakes during and between glacial epoches. The current rate is about three and one-half feet per year.

The Falls are a great tourist attraction. Concern has been expressed that continued erosion of the crest of the American Falls, and the resultant pile-up of debris at its base, will reduce its spectacular beauty. The Corps

of Engineers undertook a study in 1969 of the erosion problem. The study, completed in 1974, did not recommend that any remedial work be done.

Other erosion problems occur in the rapids section above the Falls where swift currents cause some minor erosion problems at beaches and docks.

Flooding is not a major problem along the Niagara River, although the Flood Hazard Boundary Maps indicate that scattered developed areas are in the 100-year flood plain. The Corps of Engineers have conducted a flood plain information study of Tonawanda Creek, the major tributary to the Niagara River. The study provides flood plain information for the area of the coastal zone which is part of the Tonawanda Creek drainage area, at its junction with the Niagara River. The report indicates that this part of the coastal zone is subject to flooding under only the most extreme combination of hydrological and meteorological events deemed possible.

Lake Ontario

New York's Lake Ontario shoreline extends from the mouth of the Niagara River easterly for approximately 160 miles. The shoreline then diverts to a north - south direction to the headwaters of the St. Lawrence River at Tibbett's Point. Total shoreline length, including islands, is about 328 miles.

The westerly 75 miles of shoreline from the Niagara River to the vicinity of Rochester, is fairly regular, with few embayments or indentations. Bluffs, from 20 to 60 feet high, parallel the shoreline for most of this reach. The bluffs, for the most part, are composed of glacial deposits consisting of till of various forms and layered drift in the form of kames, eskers and sheets of outwash sand and gravel. The bluffs are open to wave attack, frost action, seepage, and surface erosion. Bedrock rises from about 10 feet below lake level, just east of the mouth of the Niagara River, to about 25 feet above lake level at Thirty Mile Point, near the Niagara-Orleans county line. Rock

outcrops occur above lake level just east of Olcott Harbor.

The beaches generally are too narrow to provide much protection. Only a small amount of residual material from erosion of the bluffs is coarse enough to remain in the beach zone and this accounts in part, for the lack of wider beaches.

The shore turns low and marshy for about 20 miles between Hamlin Beach State Park and Rochester Harbor with barrier sand and gravel beaches separating ponds and marshes from Lake Ontario. From Rochester to Sodus Bay there is a nearly continuous bluff line. The bluffs, composed of silt and clay and rising up to 70 feet above the lake, are eroding where they are unprotected. The beaches again are too narrow to provide much protection averaging ten to thirty feet in width. Ledge rock is generally no more than three feet above normal lake level in Wayne County.

The easterly 15 miles of shore in Wayne County, between Sodus Bay and Little Sodus Bay, are a series of drumlins (low, narrow hills of glacial till) separated by marshes that extend several miles inland along small creeks that enter the lake. The drumlins are up to 150 feet high above lake level and one-quarter to one-half mile wide at their base. The material at the bluff face of the eroding drumlins is glacial till, containing from about 10 to 100 percent sand and gravel. Lake Bluff, just east of Sodus Bay, and Chimney Bluff, two miles farther east, are two of the highest. The former has houses dangerously close to the top of the receding bluff. The latter is undeveloped and is in State park property. Narrow sand and gravel barrier beaches have formed across the low marsh areas or open water between the drumlins.

Shoreline use is about 50-60 percent residential. From 20-30 percent of the land is in agriculture or undeveloped. The remaining shore is primarily recreation land. Recent trends have shown an increase in the land use for

park and residential purposes with a corresponding decrease in agricultural use or undeveloped land.

The westerly 20 miles of shore, from the Niagara River to a mile east of Olcott Harbor, are quite generally developed, with a fringe of summer and permanent residences along the lake shore. The upland is in agricultural use. Between Olcott and the Niagara-Orleans County line, residential developments are more widely scattered and the shore is generally in agricultural use or undeveloped. There are four State parks in Niagara County, Fort Niagara, Four-Mile Creek, Wilson-Tuscarora, and Golden Hill State Park, with a shoreline frontage of about three and three-fourths miles. Local parks and other public and semipublic developments occupied 2.3 miles of shoreline in 1971.

The shore of Orleans County has a fringe of residential development along a little over one-half of its frontage. The remainder is mostly open space, either agricultural or undeveloped, or park lands. Twenty miles of Monroe County are in residential use, about seven miles are park land, and the remainder is undeveloped or used for commercial and industrial purposes. There is one State park located in Orleans County, Lakeside Beach, and two in Monroe County, Hamlin Beach and Braddock Bay State Park. Lakeside Beach has about 1.5 miles of frontage on Lake Ontario, most of which is along a high, unprotected bluff. Hamlin Beach is an older park and has about three miles of frontage, part of which is protected. The other main public parks in Monroe County are: Ontario Beach Park, just west of the U.S. West Pier at Rochester Harbor, owned by the City of Rochester; Durand Eastman Park, between Rochester Harbor and Irondequoit Bay, owned by the City of Rochester but leased to Monroe County; and Webster Park, a county park about four miles east of Irondequoit Bay.

The upland shore of Wayne County is used mainly for agricultural purposes. Fruit is the principal crop. A fringe of scattered residential development borders the lakeshore. Chimney Bluffs State Park, just east of Sodus Bay, has a frontage of nearly two miles.

The erosion and flooding history of the south shore of Lake Ontario is one of continual and extensive damages to the shorelands and the development on them. The loose bluff material of Niagara County is very open to erosion. A beach erosion study made about 35 years ago reported that in the 64-year period between 1875 and 1939 the highest rate of erosion, which occurred around Wilson Harbor, was nearly five feet per year. The erosion did not occur at a uniform rate and was accelerated during periods of high lake levels. Erosion rates in the easterly half of the county are much slower. However, it was found necessary to protect the lighthouse at Thirty-Mile Point with heavy stone revetment. This was done because of deterioration and erosion of the shale outcrop at the lake shore, which at this point appears as high and strong as any point in the county.

Significant erosion of the bluffs, particularly just west of Wilson, but throughout the entire length of the Niagara County shore, occurred during the 1951-52 high water period. There was also flooding of some of the commercial fishing docks at Wilson Harbor and of other low docks and land areas in Wilson and Olcott harbors.

A little over five miles of the Niagara County shoreline was protected as of 1971. This amount may have increased because of the high water period of the early 1970's. About 0.8 mile of this is stone revetment along the highway east of Wilson. Most of the protective structures are stone revetment or concrete seawalls. Groins have been constructed in a few places, at Krull

Park for instance, just east of Olcott. The Corps of Engineers, under its Operation Foresight program which was in effect from December 1972 to June 1974, constructed 1,600 feet of temporary diking at Olcott Harbor to protect that area during the current high water period.

The shores of Orleans and Monroe Counties suffered significant erosion and flood damage during the 1951-52 high water period and again in the early 1970's. During the earlier period, properties along the low shore between Hamlin Beach State Park and Rochester Harbor were the most heavily damaged. Summer homes and permanent residences on the barrier beaches were flooded for several months, and many suffered from wave action and erosion.

The existing protection provided by private property owners in Orleans and Monroe Counties is mostly stone revetment or concrete seawalls. Groins have been built at Hamlin Beach and Braddock Bay State parks to improve the recreational bathing beaches. Their effectiveness has been limited, due to the low rate of littoral drift, particularly at Braddock Bay. The Corps, under Operation Foresight, constructed 2,000 linear feet of temporary dikes in Orleans County and 10,500 linear feet in Monroe County between December 1972 and June 1974.

The shore of Wayne County is subject to significant erosion where unprotected, except for a few short reaches where bedrock rises high enough above lake level to armor the toe of the bluff against wave attack. Significant flooding also occurred during the 1951-52 high water period in low areas, particularly in Sodus Bay and around other bays, ponds and barrier beaches. About 0.8 mile of shore in the county was protected as of 1966, principally by stone revetments and concrete seawalls.

Following is a brief description of the beach erosion control projects either constructed or authorized for construction by the Corps of Engineers on Lake Ontario.

The following table lists the beach erosion control studies currently being conducted by the Corps of Engineers.

Beach Erosion Control Studies - Lake Ontario

<u>Name</u>	<u>Purpose</u>	<u>Approximate Date to be Completed</u>
Durand-Eastman Park at Rochester	To determine the advisability of undertaking measures for control of shore erosion along the Lake Ontario frontage of the park	Indefinite
South Shore of Lake Ontario	To determine the advisability of undertaking measures for control of shore erosion at several publicly-owned lake frontages, and related improvements for light draft craft	
	Interim Report. Fort Niagara State Park	Favorable report submitted by District Engineer in 1968
	Interim Report. Golden Hill State Park	Indefinite
Braddock Bay State Park, Cranberry & Long Ponds	To determine the advisability of providing improvements for light-draft. Craft at these localities and adopting certain measures for control of shore erosion	Indefinite

Fort Niagara State Park - Fort Niagara State Park is located on the south shore of Lake Ontario at the mouth of the Niagara River. The property, formerly a U.S. Military Reservation, was acquired in 1964 by the State of New York for park development under the jurisdiction of the Niagara Frontier State Park Commission. The cooperative beach erosion plan was authorized by the Senate and House Public Works Committee in December, 1970, under provisions of the Flood Control Act of 1965. The authorized project provides for the construction of a low offshore breakwater about 4,000 feet long to protect a bathing beach that is to be improved by placement of 162,000 cubic yards of sand fill. The total estimated first cost is \$3,540,000.

Hamlin Beach State Park - Hamlin Beach State Park, under jurisdiction of the Genesee State Park Commission, is located on the south shore of Lake Ontario, about 20 miles west of Rochester Harbor. The cooperative beach erosion control project by the State of New York and the Federal Government authorized in July 1958, provides for restoration and protection of the westerly beach area at the park by alteration of two existing stone groins and one existing concrete groin, construction of four new groins, grading of the nearly vertical bluffs behind the beach to a stable slope, and placement of approximately 217,000 cubic yards of sand fill. Total project cost is estimated at \$2,790,000. Construction began in July 1973 and was completed in 1975.

The Corps of Engineers have also conducted a Flood Plain Information Study of portions of Irondequoit Creek, including its junction with Irondequoit Bay. This Report presents a brief history of flooding and identifies those areas subject to possible future floods.

LONG ISLAND SOUNDReach 1 - Westchester County

This reach covers New York State's part of the northerly shoreline of Long Island Sound from Throgs Neck to Connecticut, including a portion of Bronx County. The coastal area is subject to a moderate amount of flooding from Long Island Sound and from several tributary streams. The shoreline is rocky in many locations and erosion is not a problem in this reach.

Coastal flooding is generally caused by hurricanes and severe extra-tropical storms which generate strong winds and high water levels. Damages from tidal flooding were estimated in 1965 to be less than three million dollars from the recurrence of the storm of record, the hurricane of September 1938.

There are five principal streams which cross the coastal zone and enter the Sound in this reach: Hutchinson River, Mamaroneck River, Beaver Swamp Brook, Byram River and Blind Brook. Extensive urban development has taken place in their drainage areas in recent years. As a result, swampy areas have been filled and extensive areas have been paved. This has decreased the natural storage areas available and has resulted in faster runoff of precipitation to the streams. Other factors contributing to flooding are inadequate channel capacity, poor channel alignment, low bridges and channel silting and obstructions.

A large proportion of the coastal area is residential, occupied by relatively high-income people. The grounds subject to flooding are usually limited to the waterfront property only, and are generally developed and maintained to the water's edge, including seawall protection. Residences are primarily on high ground, and damage is limited to grounds and shore

installations. Beach and boat clubs, public and semi-public parks, and commercial enterprises such as boatyards, which are necessarily located on the shore, are subject to severe damages from hurricane tides.

The major portion of these facilities are located in the harbors along the coast which provide a degree of protection during lesser storms. Small craft harbors are located at Mamaroneck, New Rochelle and Port Chester.

Reach 2 - Nassau County

To Come

Reach 3 - Suffolk County

The problem in this reach consists of damage to shorefront property and shore erosion by wave action accompanied by inundation of low-lying areas during hurricanes and intense extratropical storms. Shore erosion has caused the loss of protective shore structures and of beach and bluff areas with subsequent structural damages to buildings and roads. Tidal inundation of residences and businesses has required the evacuation of people from affected areas. Damages resulting from wave attack and beach erosion have occurred throughout the entire reach, whereas damages from tidal flooding have occurred primarily at Port Jefferson and vicinity, at Asharoken Beach, and at several low-lying beach developments.

The shoreline west of Port Jefferson to Nassau County is highly irregular, indented by several deep harbors and bays. These bays occupy drowned river valleys. They are separated by peninsulas or necks which project into Long Island Sound. The narrow beaches of the necks are backed in some areas by cliffs or bluffs. The bluffs are mainly composed of glacial till and outwash.

Bluff height is generally low, about 30 feet, in the extreme western portion of the island near Manhasset and Little Neck Bays, and increases to between 75 and 110 feet at Lloyd Point, Eatons Neck and the Nissequogue area. Further east the bluffs are less elevated - about 85 feet at Crane Neck Point and 35 feet at Old Field Point with small pocket beaches located between the projecting points of the necks.

Elevations increase abruptly from 200 feet to 295 feet in the centers of the necks and in the regions at the heads of the harbors. Eroded material has formed spits, baymouth bars and tombolos (bars which connect offshore islands to the mainland). Dune sands are frequently associated with these depositional forms. Marshes, such as those at Stony Brook Harbor, Flax Pond and West Meadow Beach, generally occupy small depressions in the coast and are separated from the Sound by beach deposits.

East of Port Jefferson, the shoreline is comprised of gently curved beaches separated by headland areas which project only a slight distance seaward of the general shore trend. For the most part, the headlands are associated with high bluffs, such as the 140 foot elevation at Herod Point.

The bluffs are more continuous than those to the west. In general, bluff height decreases from Port Jefferson to Orient Point. Between Port Jefferson and Herod Point, the bluff height ranges from 100 to 140 feet. East of Herod Point, bluff height gradually decreases, reaching about 30 feet near Orient Point. Marshes and beach deposits, such as those found at Mt. Sinai Harbor, Wading River and Fresh Pond, have accumulated in depressions where the bluff is discontinuous.

The shore erosion problem in this reach is very severe. The high projecting headlands and bluffs which characterize the shore are generally fronted by low, narrow beaches which provide insufficient protection against erosion from tidal action and wave attack. Littoral drift being carried by along shore currents generally is not providing sufficient nourishment for beaches. Slopes which have become denuded of vegetation and have eroded as a result of unstable conditions at the toe of the slope, are further eroded by surface runoff resulting from rainfall. In some cases natural springs flow out through exposed water bearing aquifers in the slope faces. The saturation of unconsolidated bluff materials results in slides of bluff segments. Residential development along the shore of the study area has increased sharply during the past 20 years and much of it was constructed very close to the top edge of the bluff slopes. Erosion has undermined many of these residences and threatens to undermine more with the passing of time.

Much residential and business development has also been built up in low-lying areas along the shores of barrier bars joining headlands or fronting

tidal marshes. Asharoken Beach, Fresh Pond, Port Jefferson, Wading River Landing, Luce Landing and Hashamomuck Beach are examples of such areas. Erosion of these shores due to wave attack and overtopping has resulted in damages to the shorefront development. During hurricanes or infrequent northeastern storms, damage to all shorefront development equal to the average loss normally occurring over a 10 year period. Analysis of shoreline and offshore depth contour movements over 128 years of record confirms such significant losses of shore due to erosion.

The shoreline of this reach is receding at an average rate of between 1.0 and 2.0 feet per year. Some locations such as at Eatons Neck, Waterside Park, Fort Salonga, Crane Neck and Old Field Points, Mt. Misery and Mattituck Hills have experienced severe recessions of up to 3.5 feet per year. The shoreline from Miller Place to Mattituck Inlet, fronted primarily by high bluffs lying in long and gently curved reaches, has generally experienced a constant recession of about 2.0 feet per year. Shoreline accretion has occurred primarily at locations where wave-built forms such as sand spits and barrier bars exist. At some of these locations such as Lloyd Neck, East Fort and Eatons Neck Point, Sunken Meadow State Park, Port Jefferson Harbor, and at Mr. Sinai Harbor, the bars or spits have experienced migrations of considerable magnitude.

Over a period of 128 years, for which records are available, offshore depth contours have generally moved landward. This factor is important because deeper water closer to shore allows larger waves to reach the beach, causing increased erosion. In the vicinity of offshore shoals at projecting headlands, however, there has been a seaward movement of these contours of up to 3,500 feet during short periods. In general, the retreat of the shoreline has been more consistent than that of the offshore depth contours which have experienced massive advances and retreats at various times during the period of record. Advances of offshore depth contours have occurred in the vicinities of offshore shoals. Undoubtedly, much of the materials eroded from the headlands and bluffs is being deposited in the shoals.

Mapping of older hydrographic surveys shows the existence of many short structures such as groins and jetties by 1885. The Corps of Engineers in their survey of the north shore of Suffolk County tabulated 236 groins, 14 jetties and 46,480 linear feet of seawalls, revetments and bulkheads in place in the mid-1960's. Artificial nourishment operations have been accomplished only at Asharoken Beach in 1960 and 1964 in the amount of 840,000 cubic yards, and at Sunken Meadow State Park in 1957 in the amount of 57,000 cubic yards..

The Corps evaluated these protective structures and found that they varied widely in effectiveness. Generally, the structures built by public interests were in better condition and more effective than those constructed by private interests. The private structures varied widely in design and construction. The lack of coordinated planning between individual private property owners has resulted in segmented protection in shore reaches. In many cases the installed protection has been rendered ineffective by erosion of the upland shore, flanking the structures. Failure to provide for control of rainfall runoff on bluff slopes has resulted in severe erosion and slope failures.

The groins have been generally effective only in holding beaches, but not in building them up. This condition is primarily due to an inadequate supply of sand in the along shore littoral drift.

Placement of sand fill to restore and widen beaches has not been a frequently used measure on the north shore. The State of New York placed two large fills at Asharoken Beach. The losses of fill material have been very large.

As noted, hurricanes and intense extratropical storms are the principal cause of flooding along the coast. Hurricanes produce the highest water levels which results in the greatest area of tidal inundation. Extratropical storms can cause greater damage than hurricanes at lower tidal levels. The duration of some of these storms can be several days, whereas most hurricanes pass through the area within a time span of several hours. The timing of the arrival of a storm

is very important. If the peak of a storm occurs during a high tide, flooding will be more extensive than if it occurred at another time.

Hurricane Carol, which struck the Long Island area on August 31, 1954, produced the highest recorded water levels on the Suffolk County north shore. Tidal inundation extended over approximately 2,600 acres. Significant flooding occurred at Lloyd Harbor, Asharoken Beach, Crab Meadow, Sunken Meadow State Park, Flax Pond, Port Jefferson Harbor and the immediate vicinity of Mt. Sinai Harbor and Hashamomuck Beach.

Land use in the area subjected to flooding is primarily residential, recreational and commercial. These types of development suffer a very high proportion of total damages. Although no lives were lost as a result of Hurricane Carol, over \$700,000 (1954 prices) of primary physical and non-physical damage occurred in the north shore area. Damage was extensive to residential and commercial buildings, waterfront facilities and small craft. Beach erosion and damages to shore protective structures were extensive. A recurrence of the tidal heights of Hurricane Carol would cause considerably more damage today because of the increased number of residential and commercial structures.

There are no existing improvements in the area designed to protect against hurricane flood inundation. Some existing shore protection works provide protection against tidal inundation during occurrences of spring tides.

ATLANTIC OCEAN

To Come

CHAPTER V
SUGGESTED MANAGEMENT ALTERNATIVES BY REACH

GREAT LAKES

To Come

LONG ISLAND SOUNDReach 1 - Westchester County

The Corps of Engineers examined the potential for constructing structural protection during their Interim Hurricane Study (2) of the Sound north shore coastal area. The Study, which examined the most vulnerable areas of the reach, showed that protective structures for prevention of damages from tides and waves that would accompany major hurricanes and other severe storms would not be feasible for economic and practical reasons. The normal annual maintenance of grounds has taken care of most of the damage resulting from brief tidal flooding, and the properly maintained seawalls have withstood the effects of tidal inundation and wave action during past storms.

The report recommended that non-structural measures were the best available means of reducing flood damages in the reach. Foremost among these measures is the formulation of an adequate hurricane preparedness plan. The National Weather Service has made significant improvements in detecting and forecasting storms in recent years. These warnings receive broad dissemination by the information media. However, a hurricane preparedness plan is a local responsibility. It is essential that procedures for evacuation of flood prone areas and maintenance of emergency services are properly planned in advance to avoid confusion during a storm.

All seven communities in the reach have entered the emergency phase of the National Flood Insurance Program. Flood insurance studies, to bring these communities into the regular program, are underway with scheduled completion dates in either 1976 or 1977 (see Table ___). Entrance into the regular flood insurance program will provide adequate insurance coverage for most of the properties in the flood hazard areas. Most of the shoreland property in this reach is developed and, consequently, land use regulations are of limited effectiveness. However, it

may be desirable to examine zoning regulations, building codes and other land use regulations in a later phase of the Coastal Zone Management program to determine their impact on land use in the flood hazard areas. Deficiencies should be reported to the local communities.

Reach 2 - Nassau County

To Come

Reach 3 - Suffolk County

The Corps survey of the north shore of Suffolk County examined the technical and economic feasibility of structural measures to alleviate flooding and erosion problems in this reach. Generally, it was found that most of the beaches are undergoing erosion and other beaches no longer exist above high water because of erosion. To correct this condition, it would be necessary to widen and restore the beaches by artificial placement of beach fill. Periodic nourishment of the beaches would be required to maintain their effectiveness. Periodic nourishment is also useful in preserving the barrier bar beaches and spits which provide protection to back-shore areas. An alternate method to direct placement of sand is the establishment of a feeder beach at the updrift end of the shore from which beach material can be distributed by the natural littoral drift. If losses of beach fill are excessively high, then groins may be considered to hold and retard the loss of the restored beach. In this case, provision should be made in the design of the groins to allow bypassing of beach material to nourish the downdrift shore.

Erosion of the toe of bluffs by wave wash or attack can be corrected by the construction of protective structures such as stone mounds, revetments and bulkheads, or by the restoration of a protective beach or by a combination of these. Where such protective works are to be constructed along the toe of bluffs, their installation should be as continuous and as uniform as possible to preclude the bypassing of the protection. When this condition exists, erosion of the backshore occurs along the unprotected areas and eventually results in a deterioration of the adjacent protective works. Also the ends of the constructed works should tie into high ground to prevent flanking by waves and erosion of the upland shore. Erosion of the slopes of bluffs by rainfall runoff can be corrected by grading or restoring the slope to a natural angle of repose, by constructing intercepting drainage ditches and by planting with shrubs and

grasses indigenous to the area. If a greater degree of protection is desired, a blanket of appropriately sized stones can be placed on the slope.

Shore areas which have a concentration of development, and which are subject to flooding by tidal inundation during severe storms or hurricanes, can be protected by the construction of dunes, levees or floodwalls along the affected shores and barriers across inlets, bays or harbors to repress high tides and waves, or by a combination of these measures.

More particularly, three protection projects were found to be economically and technically feasible to construct in this reach.

A shore protection improvement project was recommended for construction at Sunken Meadow State Park, including the shore at Callahan's Beach consisting of:

- beach restoration and widening by artificial placement of approximately 1,000,000 cubic yards of beach fill along 2.6 miles of shorefront with a berm at an elevation of 13.0 feet above mean low water and a width of 100 feet along the easterly 2,250 feet of shore, thence a width of 150 feet in the central 5,900 feet of shore generally fronting the boardwalk area, and thence a width of 100 feet along the westerly 5,300 feet of shore fronting a bluff area;
- construction of a 560-foot long stone terminal jetty at the Nissequogue River;
- construction of five groins, if the need is demonstrated by experience, to hold the restored beach;
- appurtenant works required for recreational fishing off the jetty.

The total first cost of the project was estimated at \$4,392,000 (March 1969 prices). The Federal government would pay 68.3 percent (\$3,000,000) with New York State providing the remainder. The Federal government would also pay 68.3 percent of the cost of periodic beach nourishment, if needed, for a period not exceeding ten years. This project has not been actively pursued, although it could be reactivated by the Corps if requested by State interests.

Projects were also determined to be feasible for Caumsett and Wildwood State Parks. However, because of lack of State interest, these projects were not pursued. Plans for improvement of hurricane protection were considered for Asharoken Beach and Port Jefferson Harbor but were found to be not economically justifiable. In problem areas such as Old Field Point, Scotts Beach and Wading River Landing the State has constructed shore protection improvements. Erosion problems at Short Beach and Cedar Beach have been corrected by spoiling of beach material dredged from adjacent harbors.

Detailed consideration was not given to problem areas where there was insufficient public ownership or use. However, plans of improvement and corrective measures that may be undertaken by local interests were suggested for these problems.

Shore protection improvements were considered for Caumsett and Wildwood State Parks, respectively, located on Lloyd Neck in the town of Huntington and in Wildwood in the town of Riverhead. The plans provided for restoration and widening of beaches fronting high bluffs by the artificial placement of beach fill, and the construction of terminal structures to reduce losses of beach materials. The plans in these areas were found to be feasible. However, local interests requested that no further consideration be given to improvements there at this time.

At Asharoken Beach in the town of Huntington, a hurricane flood protection improvement was considered. The plan provides for construction of a sand dike extending along the Long Island Sound and Northport Bay shores to protect the low-lying area in the village of Asharoken against tidal inundation. A preliminary analysis indicated that the plan was not economically feasible. At Port Jefferson Harbor in the town of Brookhaven a hurricane flood protection improvement was also considered. The plan provided for construction of a barrier with a gated navigation opening across the harbor entrance and sand dikes extending along the alignments of the barrier bars to Old Field Point on the west side and to Mt. Misery on the east side. The gated opening would be closed during storms to prevent a tidal rise in the waters of Port Jefferson Harbor and in the connecting waters of Setauket Harbor, Little Bay and Conscience Bay. A preliminary analysis indicated that the plan was not economically feasible.

In those areas where a Federal project could not be economically justified, suggested plans of improvement and corrective measures were presented for possible implementation by local interests. It was recommended that in the event local interests should proceed with any plan or corrective action, a qualified engineer should be employed to make a detailed study of the conditions as the basis of the improvement and to make a detailed design and plan.

Lloyd Beach and West Neck Road, village of Lloyd Harbor. The elevation of West Neck Road which connects Lloyd Neck to the mainland portion of Lloyd Harbor, could be raised to permit passage during extreme storms and hurricanes. The side slopes of the road should be revetted to prevent erosion and undermining of its foundation.

Valley Grove area, west shore of Eatons Neck. A wide protective beach fronting the high eroding bluffs may be provided in the Valley Grove area. If needed, groins may be installed to retain the restored beach. Restoration of the bluff slope by placement of fill to gentler grades is necessary to protect the residential development from damage through undermining. In connection with the bluff restoration, the construction of bulkheads or stone mounds may be required at the toe of the bluffs, where a wide band of clay is exposed. Also, the planting of grasses and woody plants and top of bank drainage ditches would help to control surface runoff on the slope.

U.S. Coast Guard Station, Eatons Neck Point. The high eroding bluff on the east side of Eatons Neck Point may be restored and protected by construction of a stone mound in front of the bluff toe and filling in back of the mound to form a gentler slope. Grasses and woody plants may be planted on the restored slope to help control surface runoff. Also, periodic nourishment of the fronting beach would help reduce wave attack at the toe of the bluff.

Waterside Park shore, Northport. A wide protective beach fronting the bluffs may be restored by artificial placement of beach fill in those parts of this area where needed. Groins may be considered to help retain the restored beach.

Fort Salonga area of Northport (west of Fresh Pond). A wide protective beach may be restored along 3,500 feet of shore west of Fresh Pond in the town of Huntington, by the artificial placement of beach fill. The beach would afford protection to the eroding bluff at the Indian Hill golf course, the landing and low area on its east side, and to the residential shorefront development up to Fresh Pond. Construction of groins may be considered to reduce losses of beach fill. Bluff slopes may be restored or cut back to gentler grades, and planted with grasses and woody plants to reduce erosion by rainfall runoff.

Fresh Pond. The low-lying barrier beach at Fresh Pond may be raised to protect the residential development on the bar and along the pond shore against damages from tidal inundation during severe storms or hurricanes.

Nissequogue. The high eroding bluff headlands at Nissequogue could be protected by restoration of the fronting beach through the artificial placement of beach fill. Once protection is afforded at the toe of the bluffs, the slopes should be allowed to reach a natural angle of repose and then planted with grasses and woody plants to control surface runoff. The beach may also be nourished periodically.

West Meadow Beach. The barrier beach which constitutes West Meadow Beach could be raised and widened by artificial placement of beach fill to protect the shorefront cottage development against damages from wave attack and tidal inundation. The construction of terminal structures such as groins or jetties may be considered at the southerly end of the beach to reduce losses of beach materials into Porpoise Channel. Also, a feeder beach or sand stockpile could be placed along oart of the northerly section to provide nourishment.

Crane Neck. The high eroding bluff headland at Crane Neck could be protected by the artificial placement of a protective fronting beach. Following the placement of beach fill, bluff slopes should be allowed to reach a natural angle of response and then planted to reduce erosion from surface runoff. Construction of groins may be considered to hold the beach at Crane Neck Point.

Flax Pond. The barrier bar beaches at Flax Pond could be raised to reduce damage to the residential development around the pond and to the pond's ecology from tidal inundation during extreme storms.

Village of Old Field, between Flax Pond and Old Field Point. The beach in this area may be restored by artificial placement of beach fill to protect the eroding bluffs and backshore development. The bluff slopes may be restored

or cut back to gentler grades, and then planted with vegetation to reduce runoff erosion.

Old Field Point. The bluff slope above the existing riprap revetment could be stabilized by cutting it back to a more gentler grade and then planting with vegetation to reduce runoff erosion. In front of the lighthouse, consideration may be given to armoring the slope with quarry stone. Along the shore east of the existing revetment, an extension of this revetment could be constructed and the bluff slope stabilized as indicated for the westerly section.

Mount Misery, village of Belle Terre. White Beach which fronts the high eroding bluffs in this vicinity could be raised and widened by artificial placement of beach fill to prevent wave attack at the toe of the bluff slope. Slopes should be stabilized with vegetation which would be resistant to the high winds sweeping the bluffs. Groin construction may be considered only if losses of beach materials warrant such work.

Wading River Landing. The barrier bar beach could be raised and widened by the artificial placement of beach fill to protect the residential development from damages by wave attack and to reduce tidal inundation during extreme storms. Existing groins may be raised and lengthened to hold the restored beach.

Luce Landing. The beach fronting the residential cottage development may be restored by the artificial placement of beach fill. For additional protection against wave attack, a revetment could be constructed on the embankment at the back of the beach. If needed, groins may be constructed to hold the restored beach.

Shore east of Goldsmith Inlet. Along 3,000 feet of shore east of Goldsmith Inlet the eroded beach may be restored by artificial placement of sand fill. A high jetty may be constructed on the east side of Goldsmith Inlet to prevent losses of beach materials into the inlet. Also, the eroded dunes along the backshore could be restored and planted with vegetation. Nourishment of the restored beach should be conducted periodically.

Kenneys Road and Horton Lane Beaches. Sections of these beaches which are low and narrow could be raised and widened by artificial placement of beach fill to help prevent damages to the shorefront and residential development by wave attack and tidal inundation during extreme storms. Nourishment of these beaches should be conducted periodically.

Horton Neck Point. The eroding bluff at Horton Neck Point may be protected by construction of a riprap revetment high enough to dissipate wave attack and runup. Such a structure would be similar to the one at Old Field Point. The bluff slope above the revetment could be either reshaped with a gentler grade and planted with vegetation indigenous to this area, or covered with a blanket of stone to resist runoff erosion.

Hashamomuck Beach. The existing beach may be raised by the artificial placement of beach fill to reduce damages to the shorefront development caused by tidal inundation during extreme storms and hurricanes. The existing groin at the east end of the beach could be reconstructed when the beach fill operation is conducted. An alternative solution would be to construct a seawall or floodwall along the seaward side of the shore highway. However, this plan would preclude protection to developments lying outside of the seawall.

Truman Beach. The beach at this location may be raised and widened by the artificial placement of beach fill to prevent a break occurring through the northerly barrier bar with subsequent inundation of the shore highway extending along the southerly barrier bar. If needed, terminal groins could be constructed to hold the restored beach. The shore highway could be raised and its embankments armored to insure its availability for vehicular use during emergency situations under all conditions.

Orient Point. At Orient Point the low-lying farmlands which are subjected to tidal inundation during hurricanes, could be protected by construction of a seawall along both the Long Island Sound and Gardiners Bay shores of the point. However, the cost of such protection might be prohibitive until there is further development of this area.

Shore bluffs. In areas where the shore bluffs are being cut back by erosion due to wave attack and surface runoff, the initial consideration for protection should be given to the toe of the bluff. The most desirable method to provide this protection generally is by restoration of a protective beach which is of sufficient width and height to prevent wave attack on the toe of the bluff. If this method is not warranted in certain areas, then an alternative solution would be the construction of protective shore works such as riprap mounds and revetments, or bulkheads. The top elevations of these structures should be sufficient to dissipate energy of breaking waves and to contain wave runoff. Once the toe of the bluff is protected, the bluff slope should be stabilized and protected against erosion from rainfall runoff and wind.

A stone blanket may be placed on bluff slopes above protective shore structures to reduce erosion from rainfall runoff. However, long slopes on high bluffs will generally preclude use of this method. It is more desirable to be able to shape the bluff slope, so that it lies on its natural angle of repose. Construction of drainage ditches along the top of the bluff to carry rainfall runoff away from the bluff face will also serve to reduce such erosion. Vegetation indigenous to the area, as well as other suitable species, should be planted on the slope to prevent gullying by surface runoff and loss of bluff materials by wind erosion.

Some considerations which should be followed in the planning of shore protection works are: (1) groins should be designed to allow beach material to bypass and nourish the downdrift shores, (2) construction of protective structures in shore reaches should be as continuous and uniform as is possible; (3) where shore structures such as bulkheads, seawalls and revetments protect only a portion of a reach, the ends of the structures should return or tie into high ground, so that flanking by waves will not occur; (4) periodic maintenance of shore structures will greatly extend their useful life; (5) nourishment should

be provided periodically for beaches to insure protection of the upland shores;
and (6) the planning and design of shore protection should be accomplished by
qualified individuals or firms.

ATLANTIC OCEAN

To Come

30

Report
on
(TASK 7.2)
Flood Plain Management
and
Beach Erosion Along the Hudson River

Prepared by

New York State Department of Environmental Conservation
Office of Program Development, Planning and Research
50 Wolf Road
Albany, New York 12233

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CONTENTS

Introduction	
Study Area	
Scope of Study	
Flooding	
Erosion	
Dredging	
Disposal Sites	
Summary	
Coastal Zone Considerations	Considerations

List of Figures

1. Study Area Reaches
2. Areas to be dredged - General
3. Areas to be dredged - ~~North~~ Reaches 5 and 6 (part)
4. Areas to be dredged - ~~South~~ Reach 6 (cont)
5. Disposal Area - Ocean Mud Dumping
6. Disposal Site Index Map - Reaches 2 through 6
7. Disposal Sites - Reach 3
8. Disposal Sites - Reach 4 (partial)
9. Disposal Sites - Reaches 4 & 5 (partial)
10. Disposal Sites - Reach 5 (partial)
11. Disposal Sites - Reaches 5 & 6 (partial)
12. Disposal Sites - Reach 6

List of Tables

1. Study Area ~~Study~~^{Summary}, Hudson River, New York -
①: Drift & Debris Study
2. Estimated Debris Drift Contributed to
Hudson River, 1975
3. Dredging and Disposal Site Summary

INTRODUCTION

The Task 7.2 study on Flood Plain Management and Beach Erosion for Coastal Zone Management has been divided into four areas: the Great Lakes, Hudson River, North Shore of Long Island and South Shore of Long Island. Each area is thought to have problems unique to itself. This report is the result of a study of the tidal portion of the Hudson River.

STUDY AREA

The river was divided into six reaches with the boundaries for each reach based on physiographic and waterway characteristics, the extent of riverfront development, and in some instance on political boundaries.

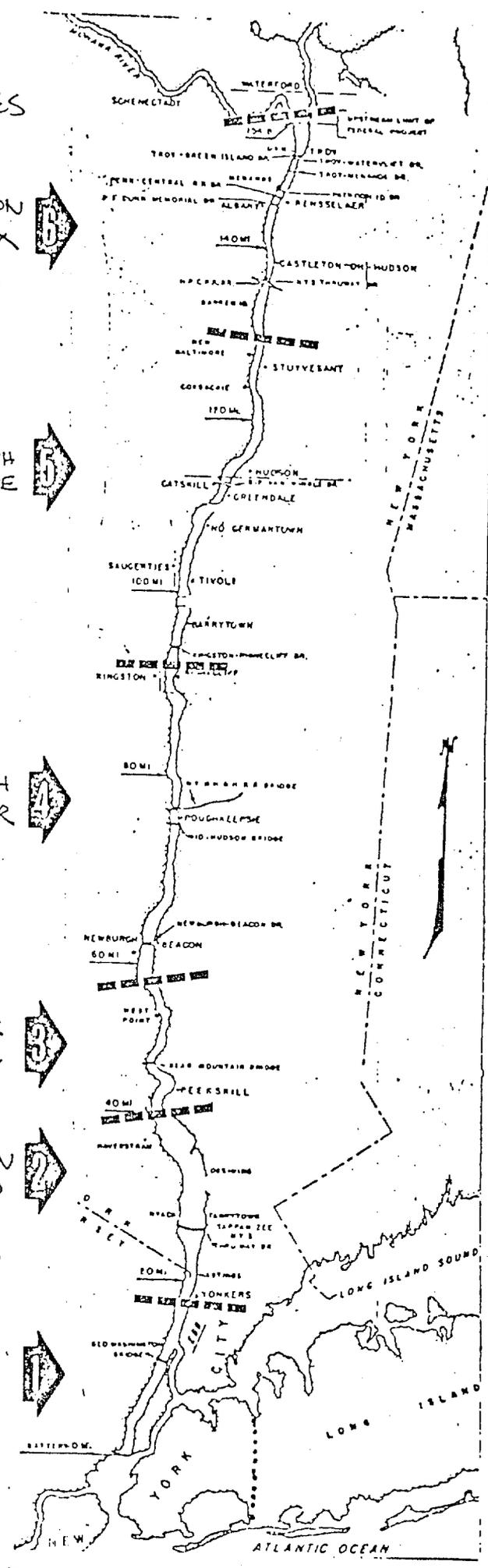
Figure 1 indicates the division of the study area into the six reaches established for study purposes. Numbering is from south to north originating with Reach 1, which includes all of New York City and extends north to the boundary between Bronx County and Westchester County. The easterly boundary of Reach 1 is defined by the Bronx and Queens borders with Nassau County, and on the south by a off-shore line parallel to Brooklyn and Queens westward to the mouth of Arthur Kill. The western boundary of the reach follows Arthur Kill and Kill Van Kull northward and eastward along the New York-New Jersey border to Upper New York Bay and continues north along the border to the Bronx County line.

Reach 2 extends north along the Hudson River from the Bronx-Westchester boundary to a line approximately between Verplanck and Stony Point. The river in this reach encompasses both the Tappan Zee and Haverstraw Bay and is considerably wider than it is downstream and upstream.

At the north end of Haverstraw Bay, the River narrows to a width of $\frac{1}{4}$ to $\frac{1}{3}$ mile as it passes through the Hudson Highlands. Reach 3 extends through this area from Peekskill to an upstream boundary approximately on a line between Newburgh and Beacon. Reach 3 contains the deepest portion of the river which in places exceeds 150 feet.

FIGURE I-1
STUDY AREA REACHES

- CAPITAL REGION REACH SIX
- MID-HUDSON NORTH REACH FIVE
- MID-HUDSON SOUTH REACH FOUR
- HIGHLANDS REACH THREE
- TAPPAN ZEE - HAVERSTRAW REACH TWO
- NEW YORK CITY REACH ONE



Where the Mid-Hudson south Reach 4 begins the river widens somewhat to about $\frac{1}{2}$ mile and traverses more moderate, rolling topography up to the vicinity of Kingston.

Reach 5 begins at Kingston. The river channel north of Kingston is narrower and in some areas divided by shoals and islands. Reach 5 extends to the vicinity of the Greene County-Columbia County line south of Castleton-on-Hudson at which point upland urban development begins to become more intense.

Reach 6 extends from the Greene-Columbia County line north along the heavily developed waterfront of the Capitol District and includes the Cities of Albany and Watervliet on the west shore and Rensselaer and Troy on the east shore. The northern boundary of the reach (and the study area) is the Troy Lock.

SCOPE OF STUDY

The purpose of this study is to locate and evaluate the flooding and beach erosion problems within the coastal zone. After evaluation of the problems, the use of coastal zone management practices will be considered as possible solutions and recommendations will be made accordingly.

FLOODING

In general, flooding along the Hudson River is not a major problem. Individual streams, which pass through the coastal zone have floods which may have large damages, but the flood flows down the Hudson River itself do not inflict large damages.

The Flood Insurance Map prepared by HUD can be used to delineate the flood plain areas after the width of the coastal zone is defined. Reproduction of these maps for this report is not considered practical.

EROSION

The Soil Conservation Service in its Erosion and Sediment Inventory of 1975 listed the amounts of sediment entering streams within New York State. For the streams tributary to the Hudson River, a total of 325,731 tons of soil has eroded into the waterways; this is equivalent to approximately 4 million cubic feet of soil. However, not all of the eroded soil enters the coastal waters of the Hudson River.

In 1976, Bhi completed a study for the U.S. Army Corps of Engineers on the uses of the Hudson River waterway. Two problems associated with erosion were identified; these are sedimentation and floating debris. The maintenance of the channels of the Hudson River is essential to future uses of the Hudson River for commercial shipping as well as recreational boating. In addition to eroding soils, debris enters the river from several sources including deteriorating piers, wharves, bulkheads and abandoned barges. Also, natural drift comprised of trees and other floatables from eroding banks enter the waterway.

In 1971, the firm of Joseph S. Ward and Associates prepared a thorough inventory of drift sources along the Hudson for the Corps of Engineers and reported on the costs that would be incurred in the removal of drift sources. A summary of conditions that were found for the entire River, the estimated volumes for 1970, 1975 and 1980, and the costs for removal of drift is shown in Table 1.

The Ward study also provided estimates of the volume of debris sources that would be contributed in future years. To give some indication of the current status of the debris problem, data on the amounts that were estimated for 1975 was excerpted from the study, totaled by reach and is shown in Table 2.

TABLE III-46

STUDY AREA SUMMARY *
 HUDSON RIVER, NEW YORK-DRIFT AND DEBRIS STUDY
 TAPPAN ZEE BRIDGE TO TROY LOCK, NEW YORK

		AMOUNT	ESTIMATED VOLUMES (CUBIC FEET)						1980 CONDITIONS (JULY 1970 PRICES)		
			YEARLY CONTRIBUTION ^a			REMOVAL ^b			REMOVAL	REPAIR AND RECONST.	
			1970	1975	1980	1970	1975	1980			
SHORE STRUCTURES	PIERS	33	1,300	1,350	1,050	29,500	23,000	19,000	\$ 60,000	\$ 12,500	
	WHARVES	15	600	800	600	30,500	29,000	28,000	\$ 57,500	\$ 20,000	
	BULKHEAD	72	1,400	1,300	1,500	44,000	41,000	38,000	\$ 118,000	\$ 45,000	
	MISCELLANEOUS	20+	750	1,100	1,600	34,000	32,500	31,000	\$ 58,000	\$ 75,000	
VESSELS	ABANDONED	FLOATABLE	24	300	700	3,350	235,000	233,000	227,000	\$ 65,000	
		NON-FLOATABLE	171	5,050	6,150	7,050	410,000	385,000	355,000	\$ 615,000	
	PRESENTLY IN USE	FLOATABLE	32	110	210	920	185,000	183,000	178,000	\$ 40,000	\$ 185,000
		NON-FLOATABLE	56	1,300	1,500	2,600	280,000	275,000	265,000	\$ 128,000	\$ 460,000
ERODING BANKS	LENGTH	93,000'	1,400	1,650	1,700	70,000	72,000	75,000	\$ 170,000	\$ 140,000	
DEBRIS ON SHORE							135,000	155,000	180,000	\$ 252,000	

III-128

a. Estimated amount of material contributed to the River from all sources in place on the year shown.
 b. Estimated amount of debris material left in place on year shown.

* Source: Report of the Hudson River Draft Study, Tappan Zee Bridge to Troy Lock, New York, Joseph S. Ward and Associates, September, 1971.

TABLE III - 47

ESTIMATED DEBRIS DRIFT CONTRIBUTED TO HUDSON RIVER
TAPPAN ZEE BRIDGE-TROY LOCK, 1975*

		Number of Sources by Reach					Source Amount by Reach (cubic feet)					Annual Contribution by Reach (cubic feet)					
		2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	
STRUCTURES	PIERS	8	11	8	6		12,600	2,420	7,500	950		890	80	320	70		
	WHARVES		2	2	6	5		4,250	16,500	3,520	4,600		410	200	55	140	
	BULKHEAD	7	9	13	33	10	4,600	1,450	5,550	16,900	4,250	180	320	350	385	70	
	MISCELLANEOUS	3	4	8	5	4	1,600	2,600	17,500	2,780	5,800	50	40	810	90	1,125	
VESSELS	ABANDONED	FLOATABLE	2	3	11	7	1	20,000	28,000	95,000	16,000	30,000			300	300	100
		NON-FLOATABLE	8	11	102	45	5	14,000	18,600	124,500	150,300	23,300	170	600	3,595	1,530	240
	PRESENTLY IN USE	FLOATABLE	2	2	17			20,000	20,000	133,000				10	200		
		NON-FLOATABLE	30	12	14			104,500	80,000	89,000			450	600	450		
	TOTALS		60	54	175	102	25	176,700	157,320	488,550	194,500	67,950	1,740	2,060	6,225	2,430	1,675
	ERODING BANKS(ft.)			1,000	17,700	59,500	14,800		1,250	21,700	45,800	6,950		5	460	1,105	160
DEBRIS ON SHORE (cu-ft.)							23,000	52,150	63,300	25,565	17,600						

*Source: Report of the Hudson River Drift Study, Tappan Zee Bridge to Troy Lock, New York, Joseph S. Ward and Associates, 1971.

DREDGING

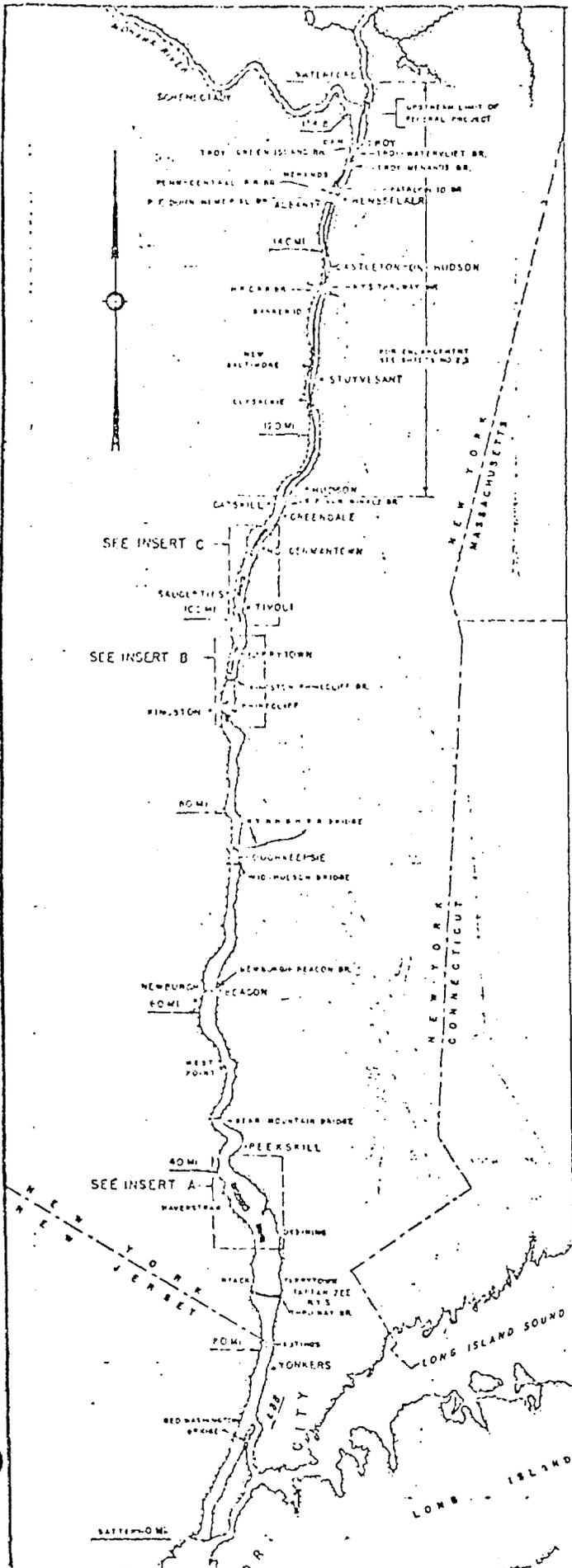
The removal of sediments from the various channels of the Hudson River is a recurring problem. The responsibility for dredging the main channels and the mouths of certain tributaries to the River rests with the Corps of Engineers. Maintenance of access channels is the responsibility of the industry or marina which require the access.

There are approximately seventy-eight federally authorized channel projects in New York Harbor (Reach 1), ranging from major channels for ocean-going vessels (e.g. Amborse Channel, Bay Ridge Channel, etc.) at project depths measured 30 to 48 feet below mean low water, and maintained widths up to 2000 feet; to shallow draft channels for recreational vessels and barges at project depths measured from 4 to 15 feet below mean low water, with widths as narrow as 50 feet.

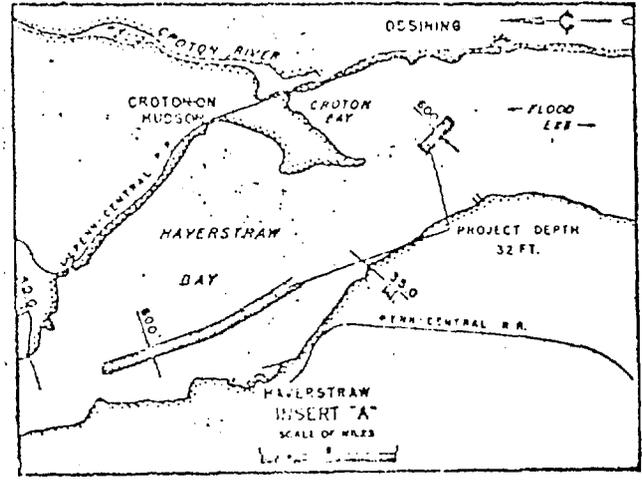
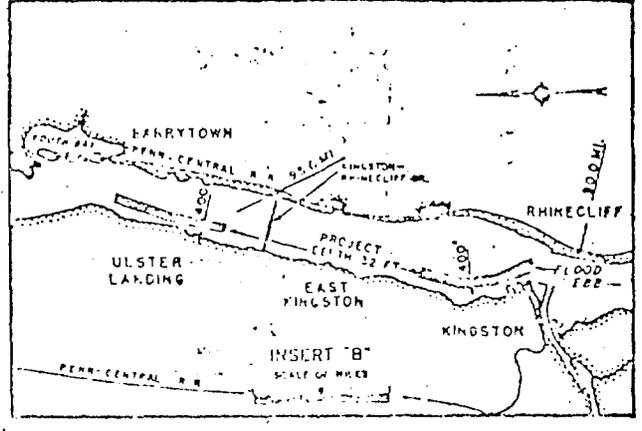
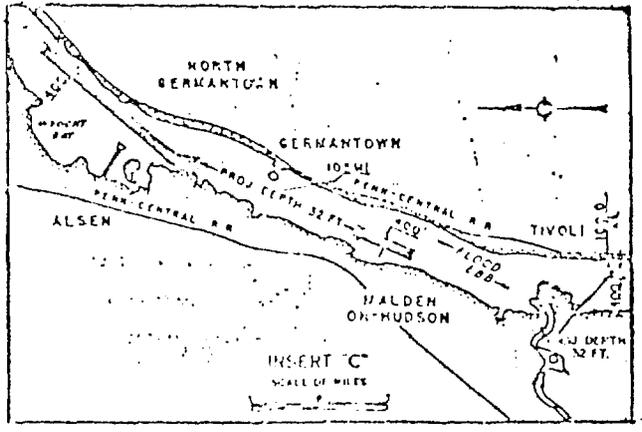
From New York City to Kingston (Reach 2 through 4) the main channel is 600 feet wide, then 400 feet wide to the Port of Albany (Reaches 5 and 6) with a turning basin at Albany and anchorages near Hudson and Stuyvesant. All channel depths are 32 feet in soft material and 34 feet in rock. Beyond Albany the channel continues to the Troy Lock at depth of 14 feet and generally 400 feet wide.

Except for areas in Haverstraw Bay and the Tappan Zee most of the main channel from New York to Kingston is naturally deep and is largely self-maintained, hence little dredging is needed. Above Kingston, the river narrows and shoals occur necessitating comparatively frequent dredging.

The Bhi report identified the major areas upstream from New York harbor that require frequent dredging by the Corps. These areas are shown on Figures 2, 3 and 4.



LEGEND:
 [Symbol] AREA TO BE DREDGED

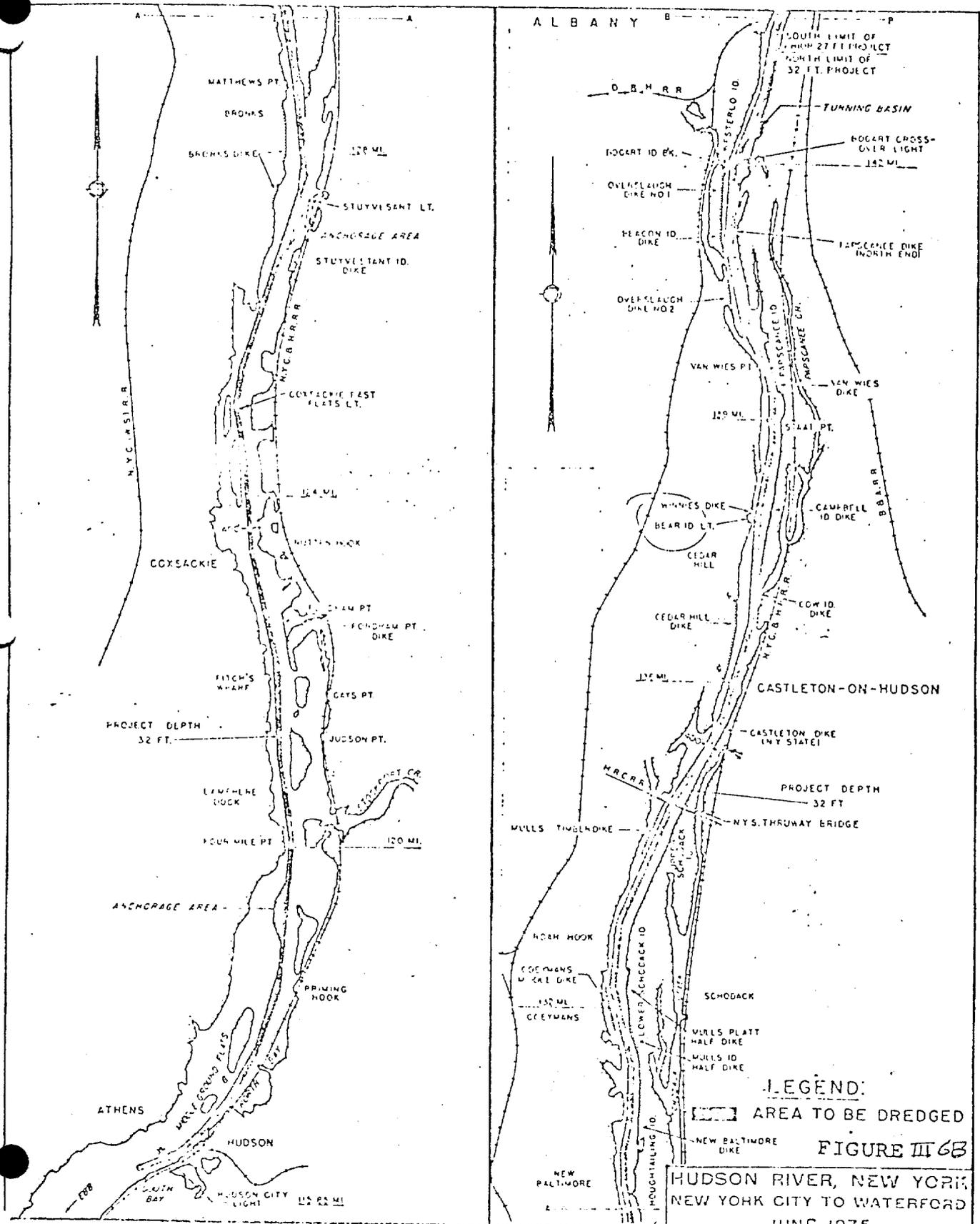


DATUM PLANES
 M.L.W. (NEW YORK CITY TO HEAD OF 32' PROJECT) - 1.75 FT. BELOW M.S.L.
 L.L.W. (HEAD OF 32' PROJECT TO TROY LOCK & DAM) - 3.0 FT. BELOW M.S.L.
 NORMAL POOL LEVEL (ABOVE DAM) - 14.33 FT. ABOVE M.S.L.

HUDSON RIVER, NEW YORK
 NEW YORK CITY TO WATERFORD
 JUNE 1975
 SCALE OF MILES

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

FIGURE III 6A

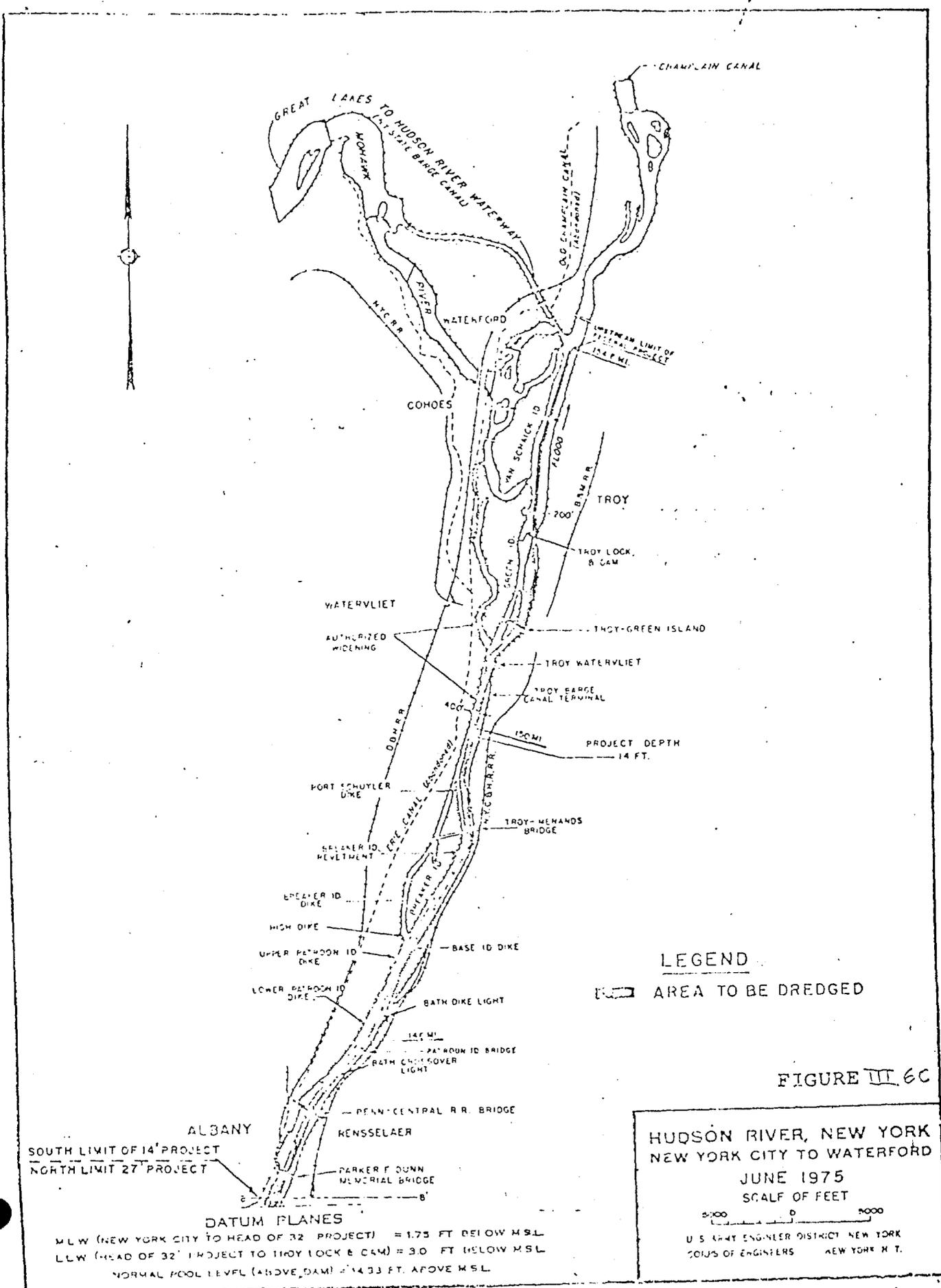


DATUM PLANES
 M.L.W. (NEW YORK CITY TO HEAD OF 32' PROJECT) 1.75 FT. BELOW M.S.L.
 C.L.W. (HEAD OF 32' PROJECT TO THUY LOCK & DAM) 30 FT. BELOW M.S.L.
 NORMAL POOL LEVEL (ABOVE DAM) 14.55 FT. ABOVE M.S.L.

LEGEND:
 [Hatched Box] AREA TO BE DREDGED

FIGURE III 6B

HUDSON RIVER, NEW YORK;
 NEW YORK CITY TO WATERFORD
 JUNE 1975
 SCALE OF FEET
 0 1000
 U.S. ARMY ENGINEER DISTRICT, NEW YORK
 CORPS OF ENGINEERS NEW YORK, N.Y.



LEGEND

 AREA TO BE DREDGED

FIGURE III 6C

**HUDSON RIVER, NEW YORK
NEW YORK CITY TO WATERFORD**

**JUNE 1975
SCALE OF FEET**

0 500 1000

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

ALBANY
SOUTH LIMIT OF 14' PROJECT
NORTH LIMIT 27' PROJECT

DATUM PLANES

M.L.W. (NEW YORK CITY TO HEAD OF 32' PROJECT) = 1.75 FT. BELOW M.S.L.
L.L.W. (HEAD OF 32' PROJECT TO TROY LOCK & DAM) = 3.0 FT. BELOW M.S.L.
NORMAL POOL LEVEL (ABOVE DAM) = 14.33 FT. ABOVE M.S.L.

DISPOSAL SITES

Maintenance of the navigation channel results in the accumulation of large quantities of sediments (dredged material) and floatable debris, which must be placed somewhere. Portions of the coastal waters and the potential coastal zone should be made available to dispose of this material.

At the present time, dredged material collected in the general area of New York Harbor (Reach 1) is transported to the "mud" and "derrick stone" disposal sites, located some nine miles southeast of the territorial base line (a theoretical line between Sandy Hook, New Jersey, and Rockaway Point, New York) and six miles off the New Jersey coast. Figure 5 shows the location of this disposal site for sediments. The floatable debris is collected by specially designed or equipped vessels. Debris for New York harbor is transported to Caven Point, New Jersey, where it is incinerated in a unique facility designed and built by the Corps for this purpose.

Figure 6 is an index map of all the disposal sites in Reaches 2 through 6. No disposal sites are located in Reach 2. Figure 7 shows the Kidds Point, Con Hook, Gees Point and Storm King disposal sites located within the Hudson River channel in Reach 3. All of the disposal sites in Reach 4 are located within the Hudson River channel including the Danskammer Point and Crum Elbow site shown in Figure 8 as well as the Dinsmore site shown in Figure 9.

All of the above sites were within the Hudson River channel and were only suited for dredged material. The sites for Reaches 5 and 6 are located along the river shoreline or on islands within the river. These sites are shown on Figures 9 through 12. Both dredged materials and floatable debris can be deposited on the sites.

The Bhi report identified the potential problem of environmental conflicts with the uses for each of these sites. Dredging or the disposal of dredged material may be affected by undesirable pollutants. Since a complete environmental impact statement could not be made for each site due to lack of data, a strong recommendation for their preservation could not be made.

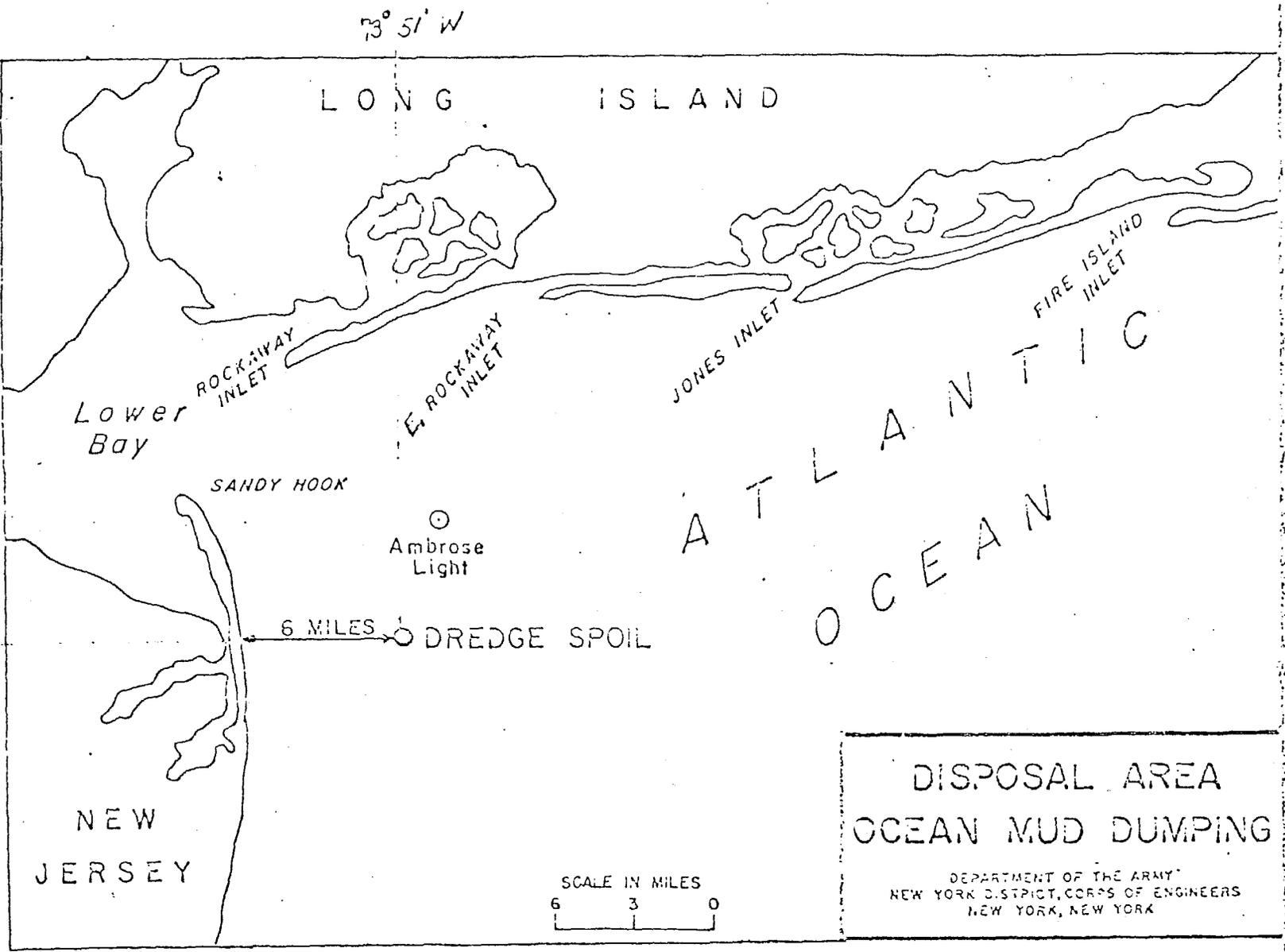
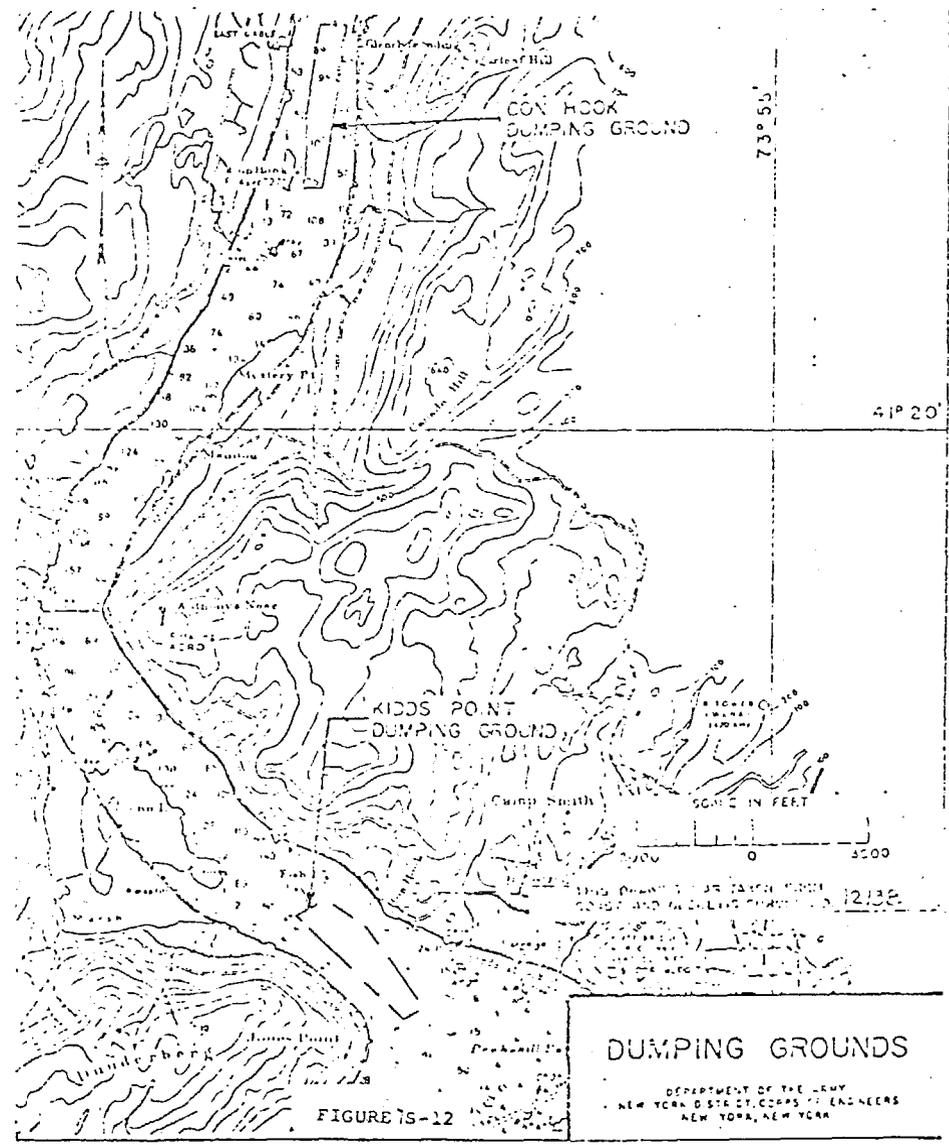
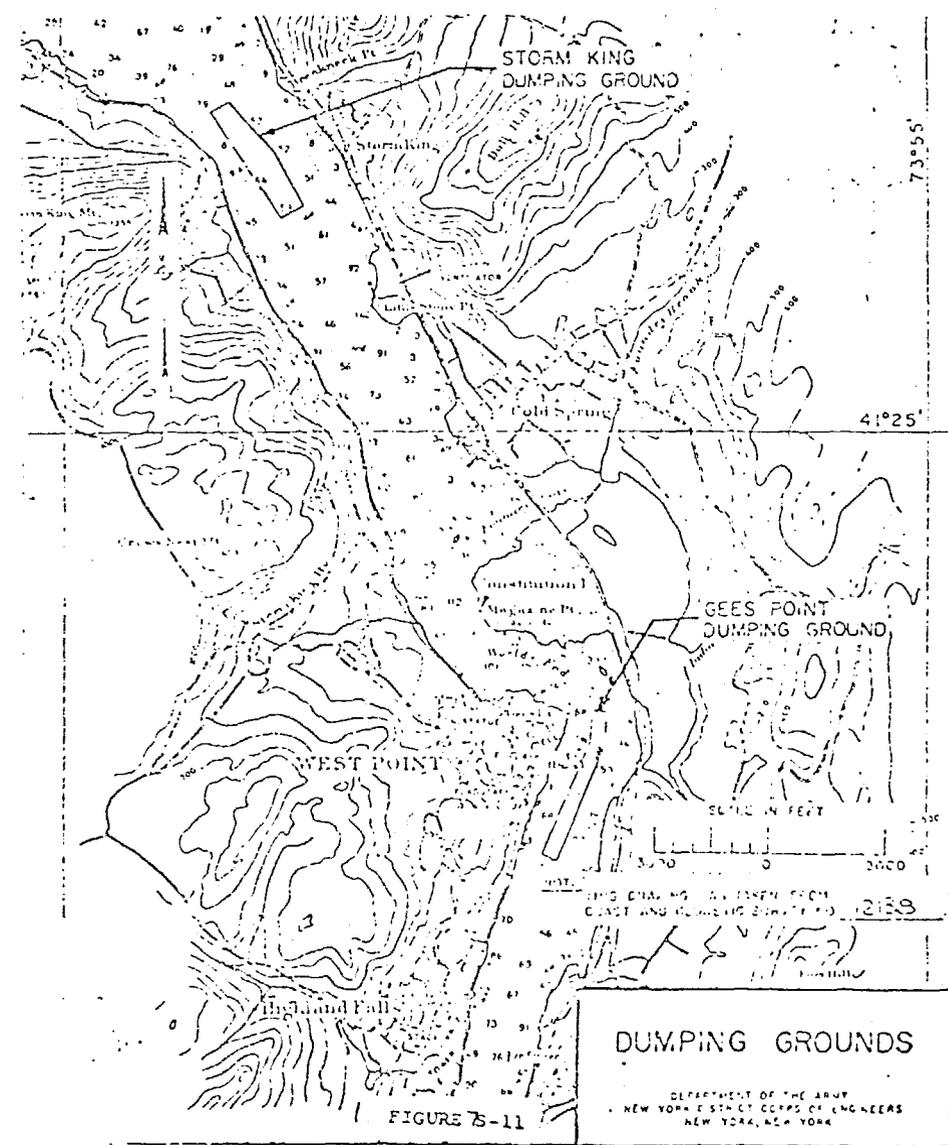
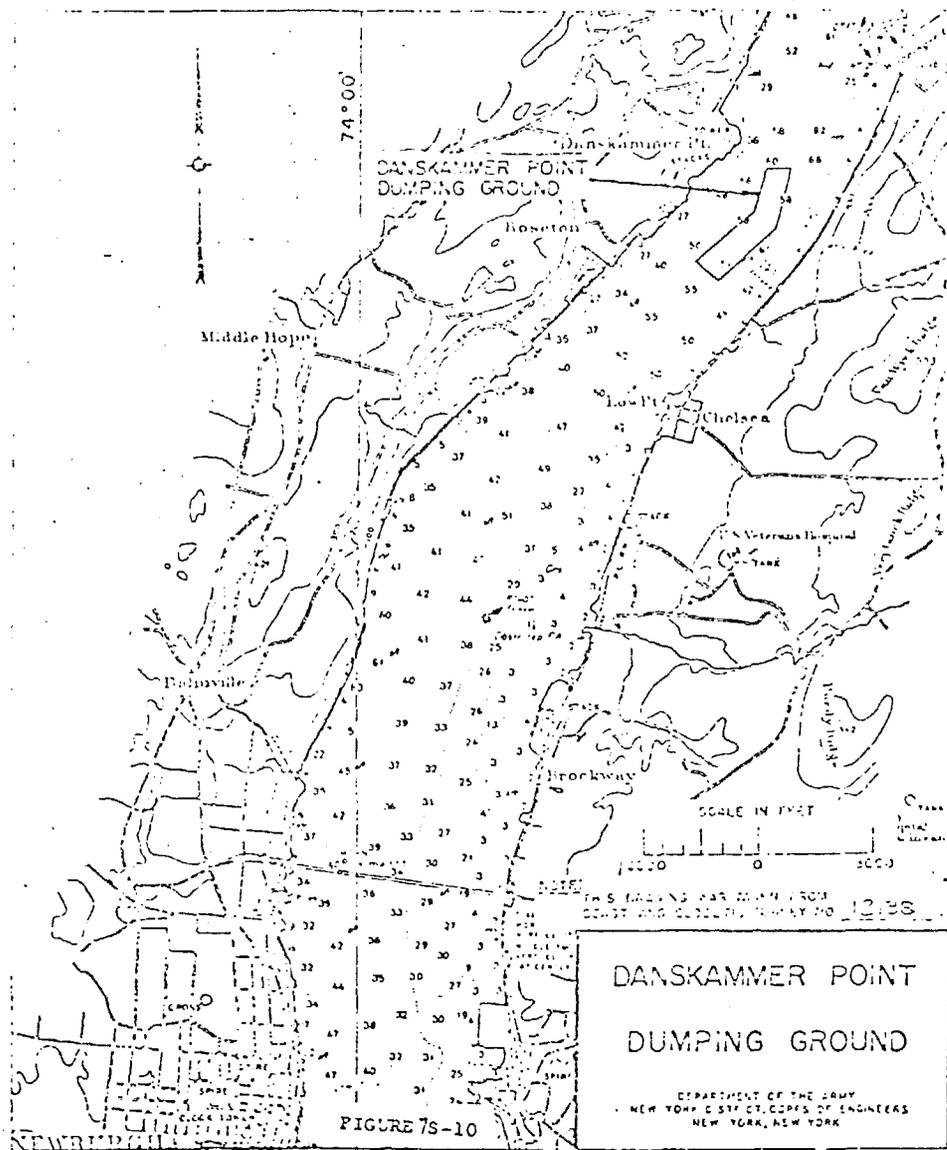
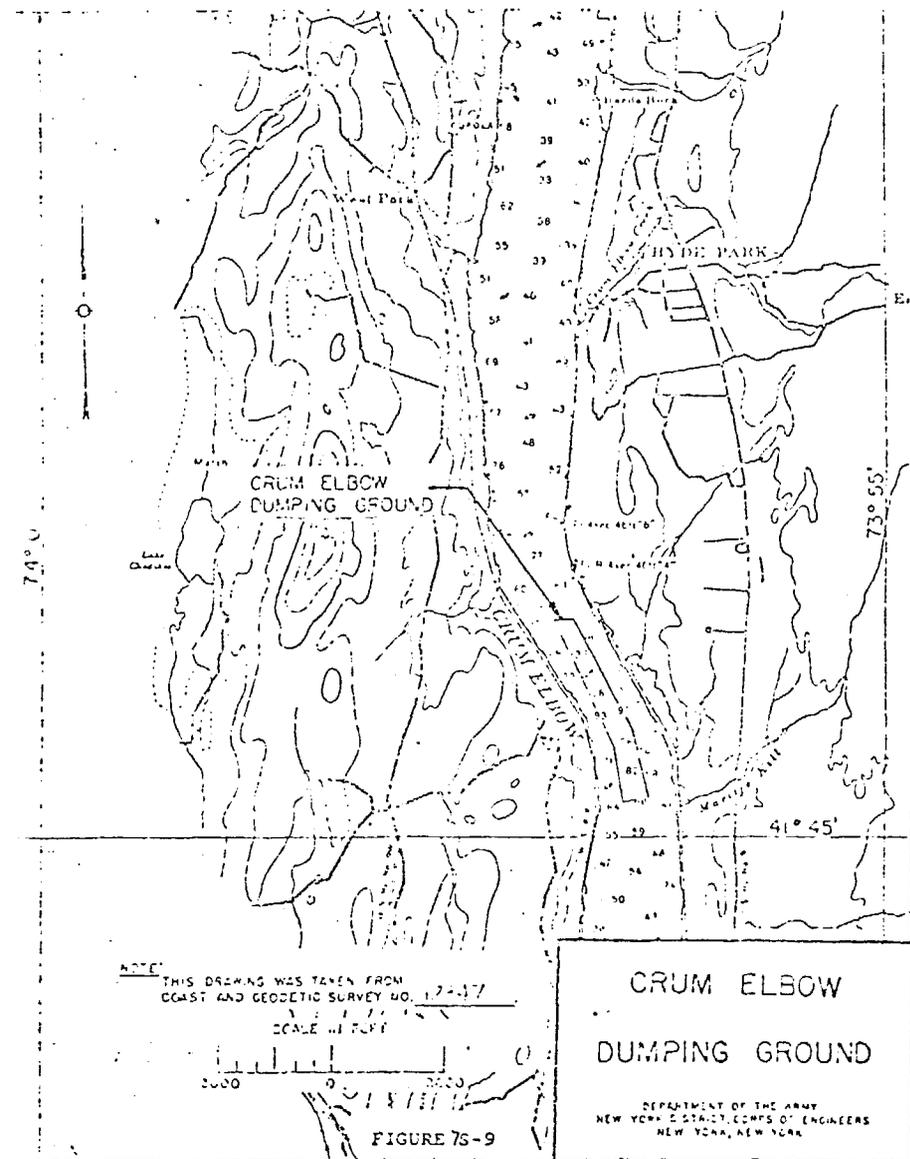
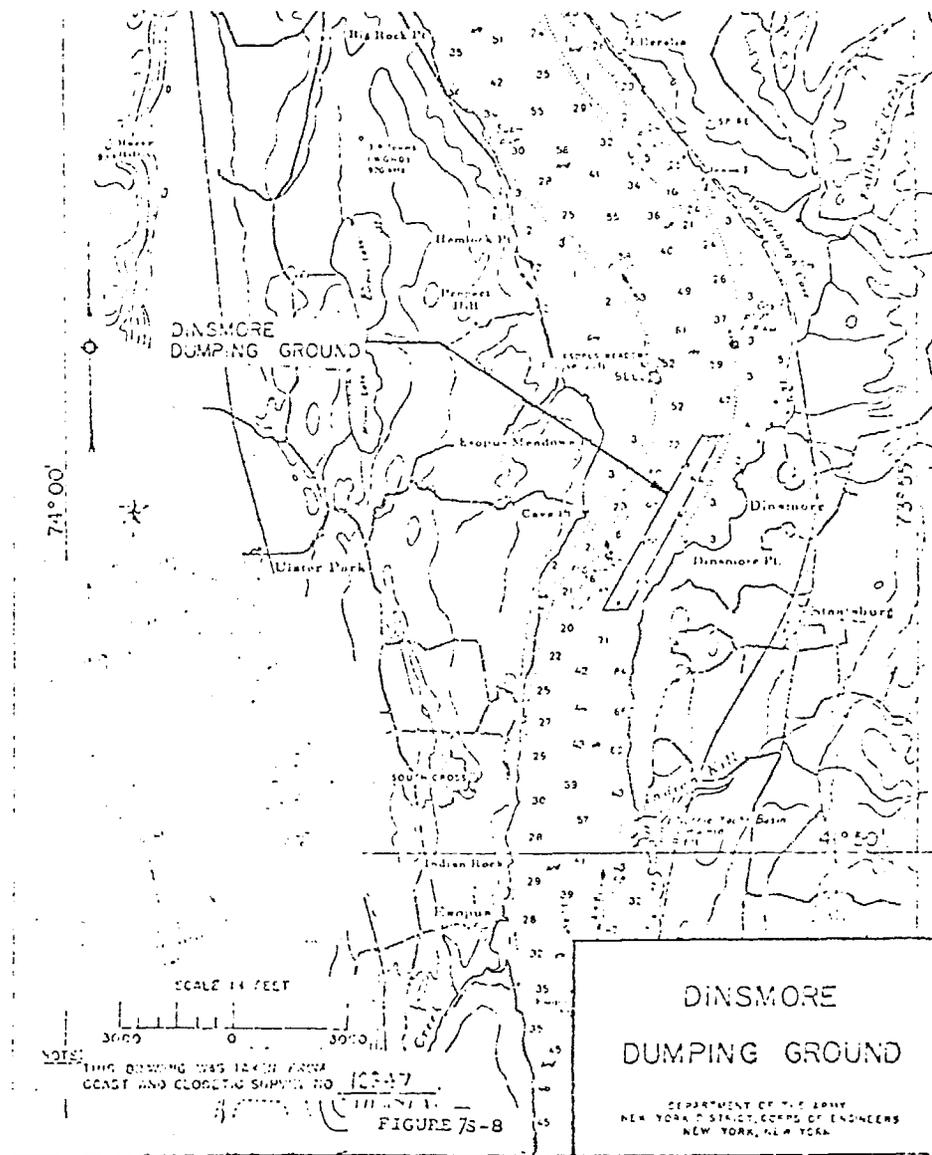
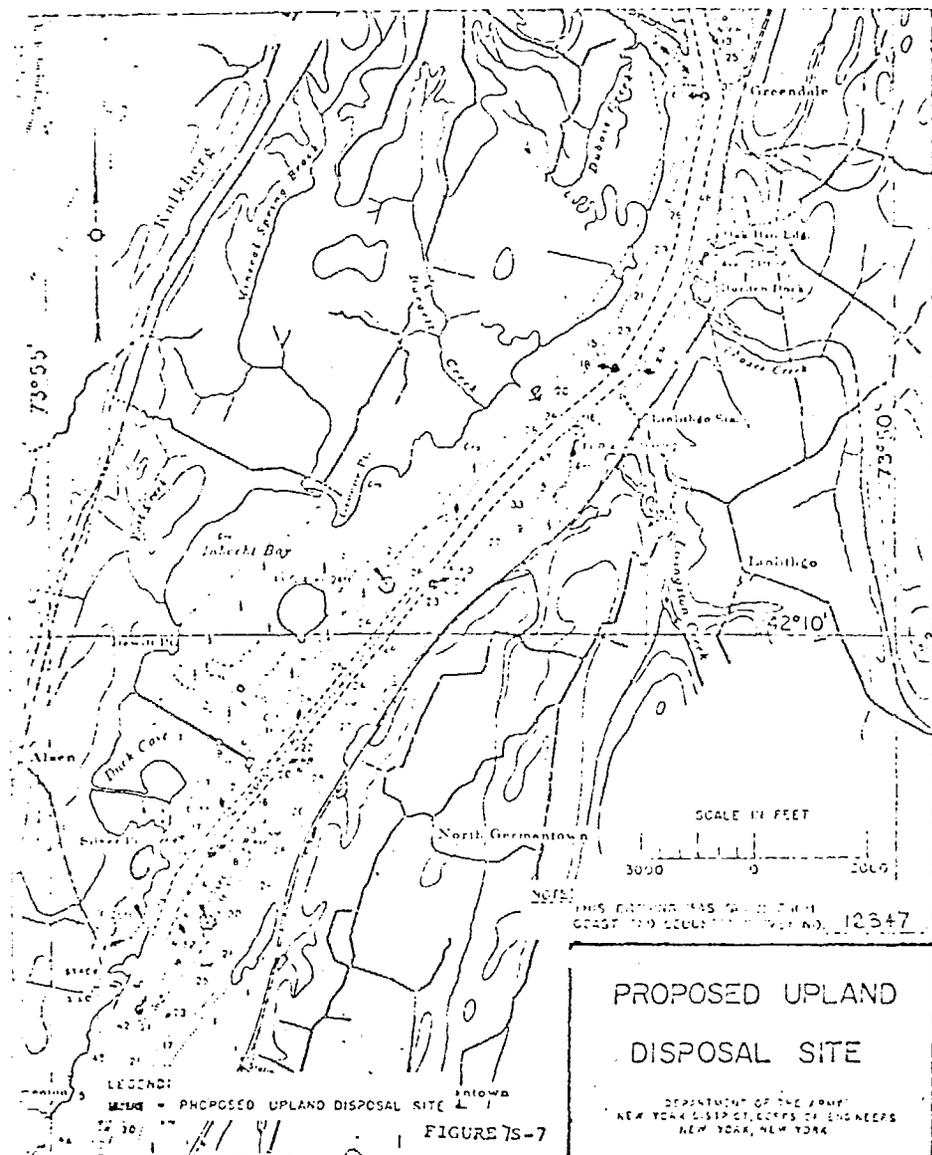


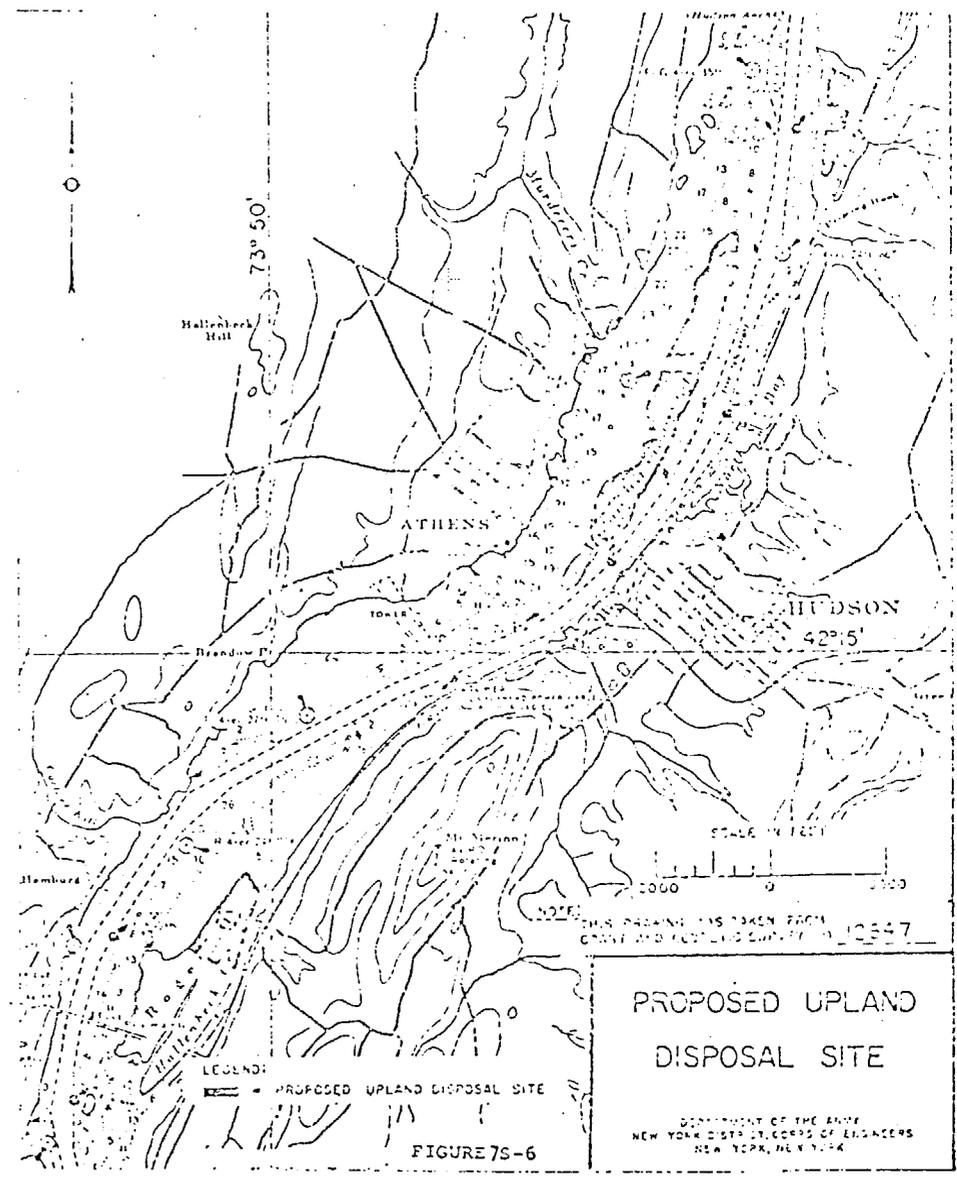
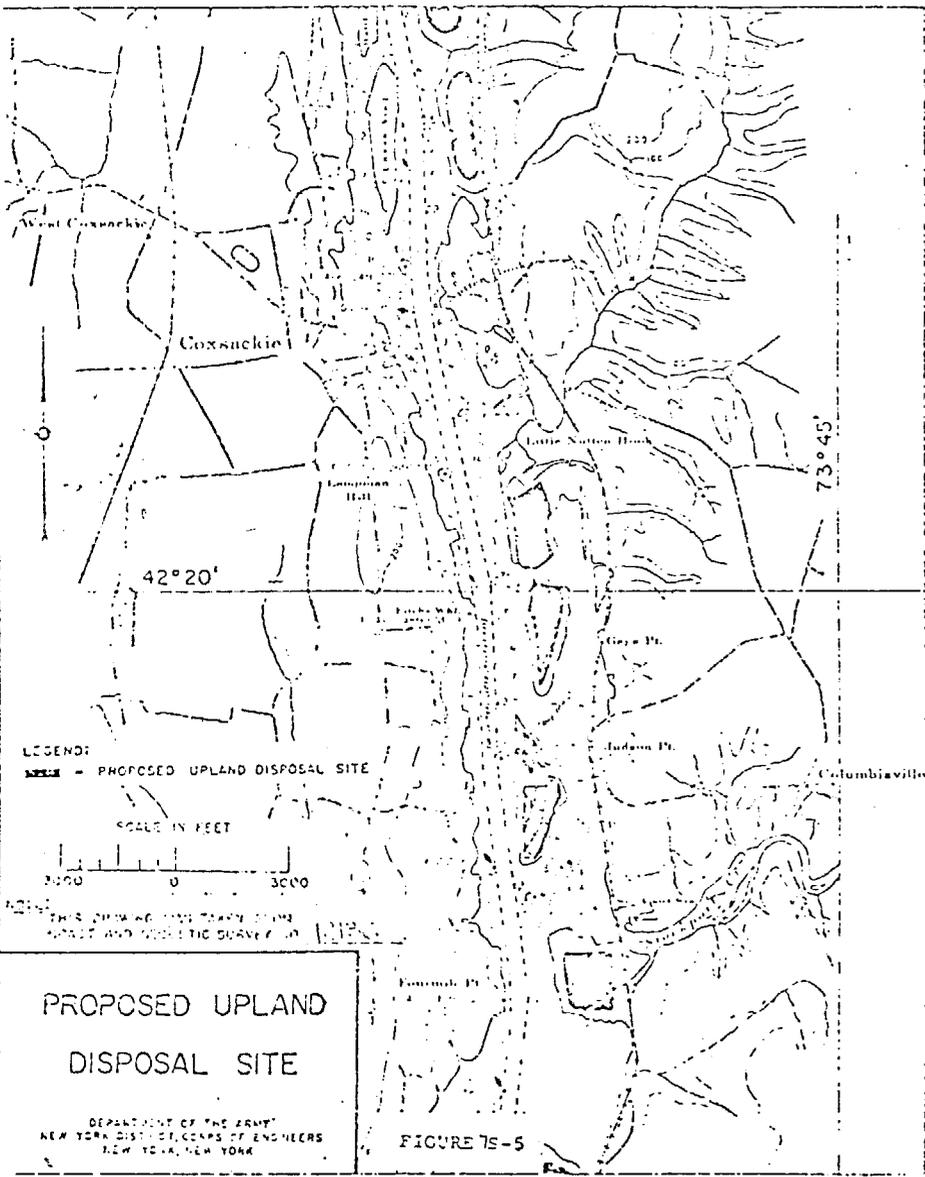
FIGURE 75-13

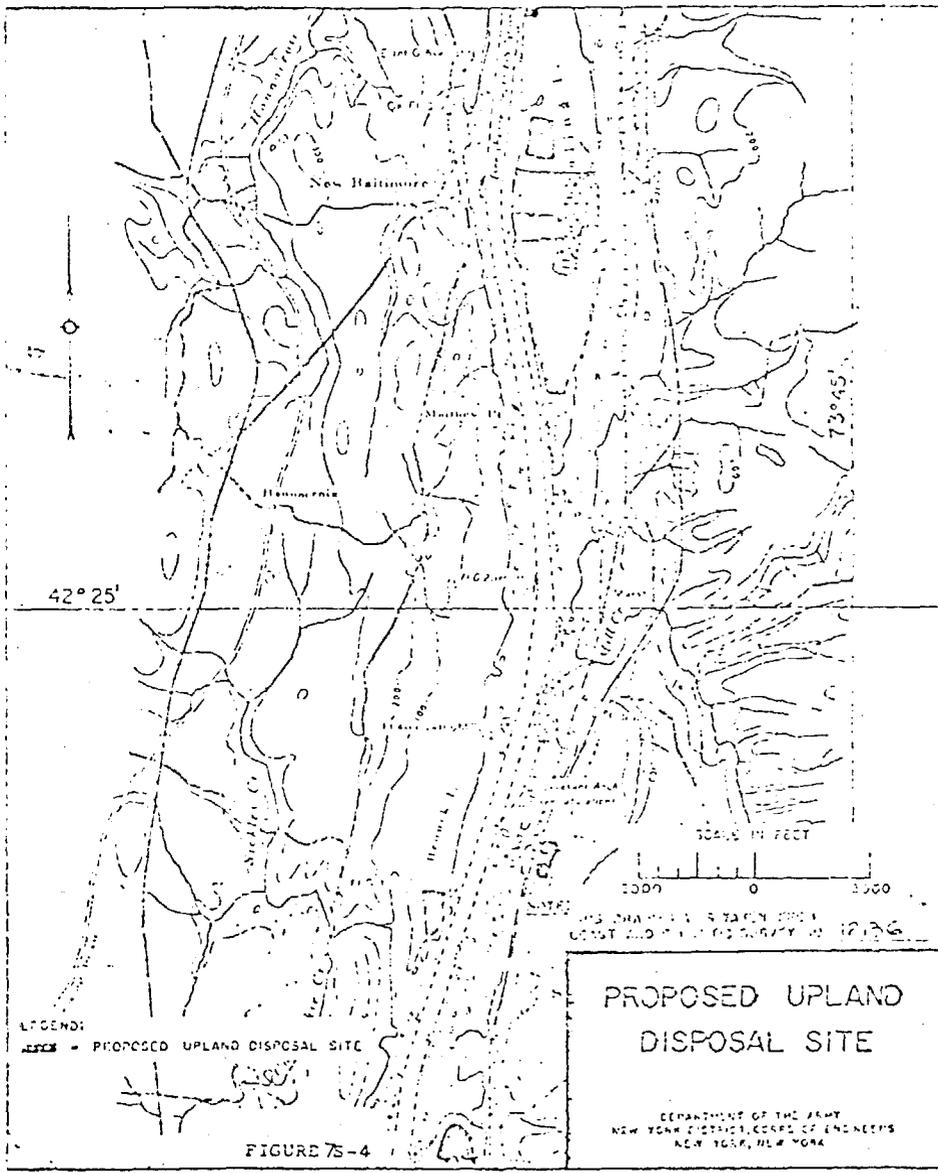
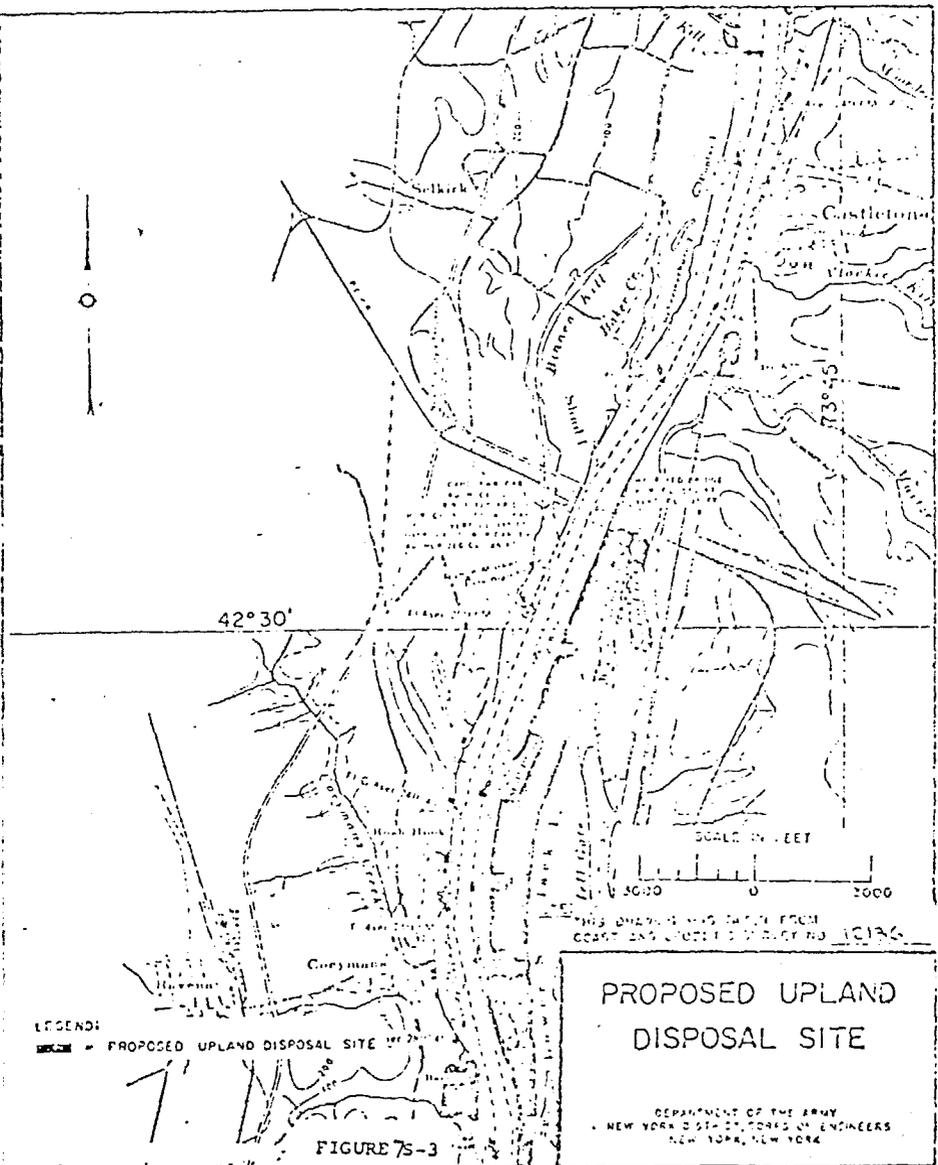
III-105

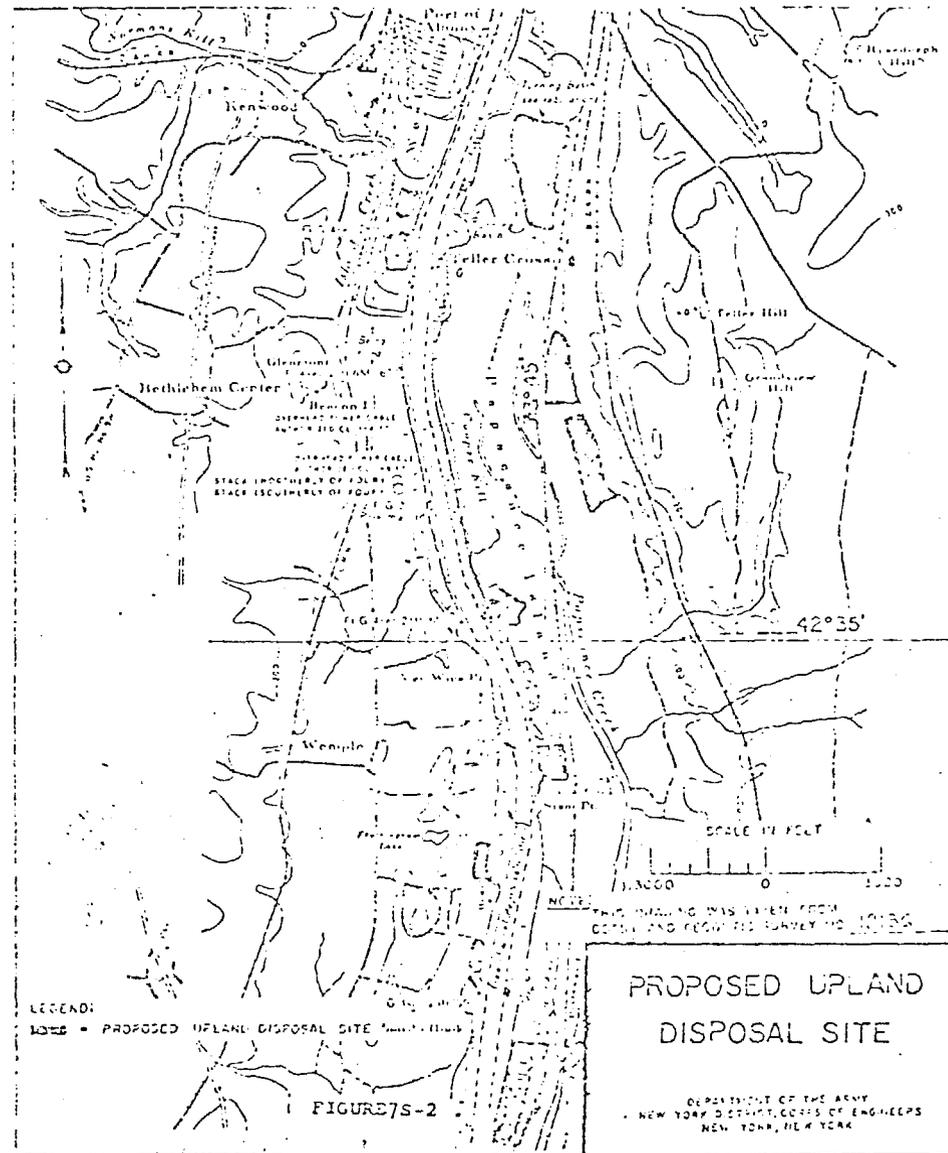
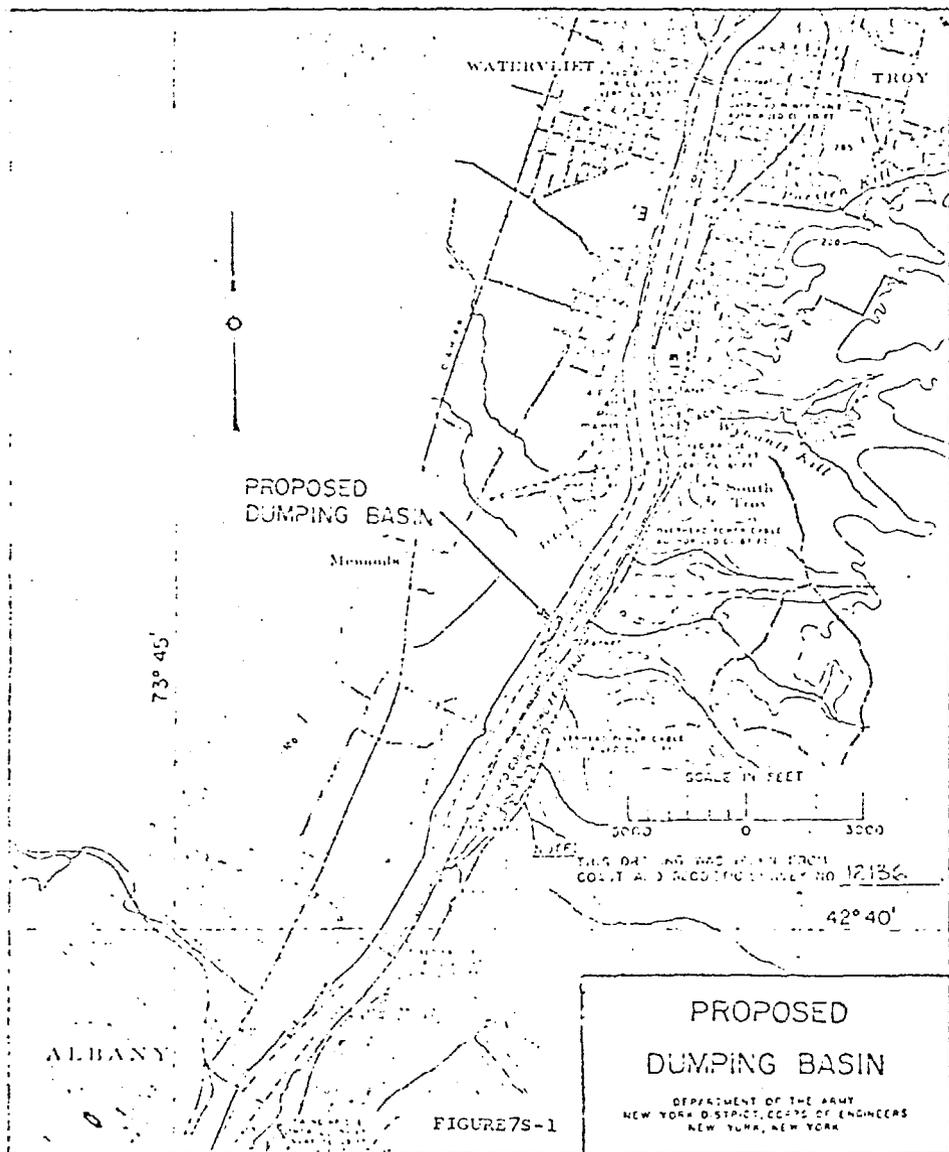












SUMMARY

The Hudson River from the Atlantic Ocean to the Federal Dam is a tidal estuary. Flood flows through the estuary are not a major problem. Some flooding problems may occur in the potential coastal zone near the mouths of certain tributaries. These areas can be identified from the HUD Flood Insurance Maps if needed.

The erosion along the shoreline results in two types of problems in regards to navigation; these are floating debris and sedimentation.

Floating and partially submerged debris is a constant and sometimes dangerous problem to commercial shipping and recreational boating on the Hudson. Debris enters the River from several sources including deteriorating piers, wharves and bulkheads, abandoned barges, and natural drift comprised of trees and other floatables from eroding banks. One of the striking, negative visual aspects of the Hudson River is the large number of old wooden barges, abandoned in years gone by, rotting and breaking up on shores and creeks along the River. Approximately 14,130 cubic feet of debris enters the waterway from deteriorating vessels and shore structures.

Sedimentation from eroding soils along the shoreline and from various tributaries cause problems with navigation. Figures from the Soil Conservation Service in its Erosion and Soil Inventory of 1975 indicate that approximately 6 million cubic feet of soil entered the streams tributary to the Hudson River. Not all of this sediment entered the navigation channel and not all the navigation channel is subject to sedimentation.

In 1976, Bruce Howlett, Inc. prepared a report for the U.S. Army Corps of Engineers entitled "New York City and Hudson River Waterway Use Study." The report, which is the primary source of reference material for this study, identified the reaches of the Hudson River that require frequent dredging plus the location of potential disposal areas within the waterway or along its shoreline. Figure 3 lists the above mentioned area.

Table 3

Dredging and Disposal Site Summary ²
 CZM Flooding & Beach Erosion Study (Task 7.4)

<u>Reach</u>	<u>Limit Description</u>	<u>Dredging Area</u>	<u>Stream Dumping Area</u>	<u>Upland Dumping Site</u>
1	Atlantic Ocean Bronx-Westchester Co	New York Harbor	Sandy Hook-Rockaway Pk.	Caven Point, N.J.
2	Tappan Zee-Haverstraw Bay	Ossining Haverstraw		
3	Newburgh & Beacon		Kidds Point, Con Hook, Gees Point, & Storm King	
4	Kingston		Danskammer Point, Crum Elbow and Dinsmore	
5	Green-Columbia Co line	Nearly entire Reach		Various sites along shoreline
6	Federal dam	Entire Reach		Various sites along shoreline

COASTAL ZONE CONSIDERATIONS

The Bhi report has identified areas which require frequent dredging as well as areas which could be used for dumping materials from the debris clearing and dredging operations. Although environmental impact statements have not been made for each of these sites, these areas should be carefully considered in the coastal zone management plan. The State's reliance upon a navigable waterway for both commercial and recreational purposes depends upon suitable disposal areas.

DRAFT

TECHNICAL REPORT
ON THE IDENTIFICATION AND LOCATION OF
SOILS SUITABLE FOR SEPTIC TANK ABSORPTION FIELDS
IN THE
COASTAL ZONE MANAGEMENT AREA OF NEW YORK

The preparation of this report plus accompanying maps and analyses was financially aided through a Federal Grant from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972.

This report plus accompanying maps and analyses was prepared under the Coastal Zone Management Act of 1972 for the Division of State Planning, Department of State.

Grant Number: 04-5-158-50002

NEW YORK STATE

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

September 1976

INTRODUCTION

For any land use planning it is important to know how well suited the land is for specific purposes. One such purpose is to identify, locate, and evaluate the limitations of land for on-site sewage effluent disposal relating to housing and community development.

The most common on-site sewage effluent disposal system consists of a septic tank and leach field. The leach field is a subsurface tile system laid in such a way that effluent from the septic tank is distributed reasonably uniformly into the natural soil.

Because the effluent is leached into the natural soil, soil characteristics reflect the suitability of land for septic tank absorption fields. In turn, the soil map is the key to locating the area best suited for this purpose.

CRITERIA

Criteria for rating soils (slight, moderate, and severe) for use as absorption fields are based on the limitations of soils to absorb effluent. Factors include permeability of the subsoil and substratum, percolation rate, depth to seasonal or permanent ground water level, depth to consolidated rock or other impervious layers, flooding, slope, and amount of stoniness or rockiness. Table 1 details the specific criteria for each factor.

1. Soils with moderate to very rapid permeability are rated as having slight limitations. Those soils having a permeability at the slower end of the moderate range (hydraulic conductivity rate about 1.0 to 0.6 inches per hour) are rated as having moderate limitations. Moderately slow and slowly permeable soils are rated as having severe limitations.

Very coarse textured soil materials have rapid permeability but are relatively poor filtering materials. Although such soils have slight limitations for absorption fields, they permit unfiltered effluent to travel long distances. Unfiltered effluent may create a contamination hazard if water supplies, streams, ponds, or lakes are nearby and receive seepage from the absorption field.

2. Soils having percolation rates faster than 45 minutes per inch function satisfactorily. Those between 45 and 60 minutes per inch have moderate limitations and those slower than 60 minutes per inch have severe limitations.

Because the methods of measuring percolation and permeability are different, correlation between the two values is imperfect.

3. A seasonal water table should be at least 4 feet below the bottom of the trench at all times for soils rated as having slight limitations. Soils with a water table less than 2 feet below the bottom of the trench for extended periods have a severe limitation.
4. Floodwaters interfere with the functioning of the filter field and carry away unfiltered sewage. Areas that are rarely flooded have moderate limitations. Soil areas that are commonly flooded have severe limitations. Soils that are subject to flooding have severe limitations even if the permeability is satisfactory and the groundwater level is below 4 feet.
5. Soils on slopes less than 8 percent are the best sites for sewage disposal systems from the standpoints of construction and successful operation of an absorption field. Mechanical problems of layout and construction, however, increase with steepness of slope. Slopes bet-

ween 8 and 15 percent slopes have moderate limitations. Those greater than 15 percent have severe limitations.

Lateral seepage or down-slope flow is a problem on sloping soils, especially where impermeable materials occur within the 4-foot depth.

6. Impervious layers, including rock formations, should be 4 feet or more below the bottom of the tile french bottoms. Impervious layers more than 72 inches deep are rated as slight limitations. Those between 48 and 72 inches are moderate, while those less than 48 inches are severe.
7. Soils having no stones or stones 30' to 100' apart (classes as stony) have slight limitations and extremely stony soils (less than 5' apart) have severe limitations.

Problems with layout and construction increase with the stoniness of the soil. In addition, large rocks, boulders, and rock outcrops increase construction costs.

8. Areas having no bedrock have slight limitations. Those having bedrock exposed on about 10% of the area have moderate limitations, and exposures covering more than 10% of the area are severely limited.

Crevice or fractured rock, such as limestone, may allow unfiltered sewage to become a contamination hazard to aquifers, streams or lakes.

PROCEDURES

An initial review of soils maps indicates that soils suitable for septic tank absorption fields are not very extensive in the Coastal Zone Management study area. For this reason, the procedure for locating the suitable areas has been simplified.

Table I Soil limitation ratings for septic tank absorption fields

Items affecting use	Degree of soil limitation		
	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
Permeability class ^{1/}	Rapid ^{2/} moderately rapid and upper end of moderate	Lower end of moderate	Moderately slow and slow
Percolation rate (Auger hole method)	Faster than 45 min/ in. ^{2/}	45-60 min./in.	Slower than 60 min/in
Depth to water table	More than 72 in.	48-72 in.	Less than 48 in.
Flooding	None	Rare	Occasional or frequent
Slope	0-8%	8-15%	More than 15%
Depth to hard rock, ^{3/} bedrock, or other impervious materials	More than 72 in.	48-72 in.	Less than 48 in.
Stoniness class	None or stony	Very stony	Extremely stony
Rockiness class	No bedrock	Bedrock ex- posed about 10% of area	Bedrock exposed more than 10% of area.

^{1/} The limitation ratings are related to the permeability of soil layers at and below depth of the tile line (2 feet).

^{2/} There may be a pollution hazard to water supplies.

^{3/} Based on a 2-foot depth of the tile.

1. Soil mapping units, soil types, or soil associations which meet the criteria for septic tank absorption fields have been identified for each county. The lists are presented in the Appendix.

Because areas of suitable soils are not extensive, it was decided that most counties would not warrant detailed delineations on overlays of 7½ minute topographic quadrangles. For most counties

- 2a. Soil survey maps will be reviewed and suitable areas will be described as to their location within a township and in relation to proximity to cities, villages, roads, streams or other identifiable cultural and physical features. An estimate will be made of the approximate acreage in each area.

Counties or parts of counties having sizable areas of suitable soils

- 2b. Will be delineated on overlays of 7½ minute topographic quadrangles.

INFORMATION SOURCES

Delineations and criteria for septic tank absorption fields were adapted from the publication, Guide for Interpreting Engineering Uses of Soils, U.S.D.A. Soil Conservation Service, Issued November 1971.

Soil maps and legends were procured from the National Cooperative Soil Survey program conducted by the Soil Conservation Service in cooperation with the Cornell University Agricultural Experiment Station.

Soil Survey Report - Albany and Schenectady Counties, Issued May 1942.

Albany County General Soil Associations, Technical Report 200-1, Capital District Regional Planning Commission.

Cayuga County Soil Survey, Issued May 1971.

Chautauqua County Soil Survey (in progress).

Soil Survey of Columbia County, Issued 1929.

Dutchess County Soil Survey, Issued December 1955.

Erie County Soil Survey (in progress).

Greene County General Soil Map and Interpretations, Temporary State
Commission to Study the Catskills.

Jefferson County Soil Survey (in progress).

Monroe County Soil Survey, Issued March 1973.

Niagara County Soil Survey, Issued October 1972.

Orange County Soil Survey (manuscript).

Orleans County Soil Survey (manuscript).

Oswego County Soil Survey (manuscript).

Putnam, Rockland and Westchester Counties Soil Survey (manuscript)

Rensselaer County Soil Survey (in progress).

General Soil Map, St. Lawrence County, New York,

U.S.D.A. Soil Conservation Service in Cooperation with the Cornell
University Agricultural Experiment Station.

Suffolk County Soil Survey, Issued April 1975

Ulster County Soil Survey (manuscript)

Wayne County Soil Survey (manuscript)

RECOMMENDATIONS

(To be developed after the septic tank absorption field data has
been analyzed and evaluated.)

APPENDIX

County Listings of

Limitations for Septic Tank Absorption Fields

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Albany County, New York

Soil Types

Colonie loamy fine sand
Copake fine sandy loam
Hoosic coarse sandy loam

Limitations ratings would be: Slight for 0 to 8 percent slopes and Moderate for 8 to 15 percent slopes

Source: Soil Survey Report-Albany and Schenectady Counties
Issued May 1942.

Correlated with Albany County General Soil Associations. Technical Report
200-1, Capital District Regional Planning Commission.

Colonie-Elnora Association, rolling

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Cayuga County, New York

Mapping Units

Limitations

Alton cobbly loam, 0 to 8 percent slopes	Slight
Alton gravelly sandy loam, 0 to 8 percent slopes	Slight
Alton gravelly sandy loam, 8 to 15 percent slopes	Moderate
Arkport fine sandy loam, 1 to 6 percent slopes	Slight
Arkport fine sandy loam, 6 to 12 percent slopes	Moderate
Colonie fine sandy loam, 1 to 6 percent slopes	Slight
Colonie loamy fine sand, 1 to 6 percent slopes	Slight
Colonie loamy fine sand, 6 to 12 percent slopes	Moderate
Howard gravelly loam, 0 to 8 percent slopes	Slight
Howard gravelly loam, 8 to 15 percent slopes	Moderate
Palmyra gravelly loam, 0 to 8 percent slopes	Slight
Palmyra gravelly loam, 8 to 15 percent slopes	Moderate
Palmyra gravelly sandy loam, 3 to 8 percent slopes	Slight
Palmyra gravelly sandy loam, 8 to 15 percent slopes	Moderate
Wampsville gravelly silt loam, 0 to 8 percent slopes	Slight

Source: Cayuga County Soil Survey,
Issued May 1971.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Chautauqua County, New York

Mapping Units

Limitations

Allard silt loam, 0 to 8 percent slopes	Slight
Allard silt loam, 8 to 15 percent slopes	Moderate
Arkport fine sandy loam, 8 to 15 percent slopes	Moderate
Chenango gravelly loam, 0 to 8 percent slopes	Slight
Chenango gravelly loam, 8 to 15 percent slopes	Moderate
Colonie loamy fine sand, 0 to 8 percent slopes	Slight
Colonie loamy fine sand, 8 to 15 percent slopes	Moderate
Mardin-Chenango gravelly silt loam, 0 to 8 percent slopes	Moderate
Mardin-Chenango gravelly silt loam, 8 to 15 percent slopes	Moderate

Source: Chautauqua County Soil Survey (in progress).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Columbia County, New York

Soil Types

Hoosic coarse sandy loam
Hoosic fine sandy loam
Hoosic gravelly fine sandy loam
Hoosic gravelly loam
Hoosic loam
Otisville gravelly loam
Pittsfield gravelly loam
Pittsfield stony loam

Limitations ratings would be: Slight for 0 to 8 percent slopes and Moderate for 8 to 15 percent slopes.

Source: Soil Survey of Columbia County,
Issued 1921.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Dutchess County, New York

Mapping Units

Limitations

Colonie fine sandy loam, 0 to 8 percent slopes	Slight
Colonie fine sandy loam, 8 to 15 percent slopes	Moderate
Colonie loamy fine sand, 0 to 8 percent slopes	Slight
Colonie loamy fine sand, 8 to 15 percent slopes	Moderate
Copake fine sandy loam, 0 to 8 percent slopes	Slight
Copake fine sandy loam, 8 to 15 percent slopes	Moderate
Copake gravelly loam, 0 to 8 percent slopes	Slight
Copake gravelly loam, 8 to 15 percent slopes	Moderate
Gloucester gravelly loam, 0 to 8 percent slopes	Slight
Gloucester gravelly loam, 8 to 15 percent slopes	Moderate
Gloucester stony loam, 0 to 8 percent slopes	Slight
Gloucester stony loam, 8 to 15 percent slopes	Moderate
Hoosic fine sandy loam, 0 to 8 percent slopes	Slight
Hoosic fine sandy loam, 8 to 15 percent slopes	Moderate
Hoosic gravelly loam, 0 to 8 percent slopes	Slight
Hoosic gravelly loam, 8 to 15 percent slopes	Moderate
Hoosic gravelly sandy loam, 0 to 8 percent slopes	Slight
Hoosic gravelly sandy loam, 8 to 15 percent slopes	Moderate
Hoosic loam, 0 to 8 percent slopes	Slight
Hoosic loam, 8 to 15 percent slopes	Moderate
Merrimac gravelly fine sandy loam, 0 to 8 percent slopes	Slight
Merrimac gravelly fine sandy loam, 8 to 15 percent slopes	Moderate
Merrimac gravelly sandy loam, 0 to 8 percent slopes	Slight
Merrimac gravelly sandy loam, 8 to 15 percent slopes	Moderate
Merrimac gravelly silt loam, 0 to 8 percent slopes	Slight
Merrimac gravelly silt loam, 8 to 15 percent slopes	Moderate
Palmyra gravelly loam, 0 to 8 percent slopes	Slight
Palmyra gravelly loam, 8 to 15 percent slopes	Moderate
Pittsfield gravelly loam, 0 to 8 percent slopes	Slight
Pittsfield gravelly loam, 8 to 15 percent slopes	Moderate
Pittsfield stony loam, 0 to 8 percent slopes	Slight
Pittsfield stony loam, 8 to 15 percent slopes	Moderate
Stockbridge gravelly loam, 0 to 8 percent slopes	Slight
Stockbridge gravelly loam, 8 to 15 percent slopes	Moderate
Stockbridge stony loam, 0 to 8 percent slopes	Slight
Stockbridge stony loam, 8 to 15 percent slopes	Moderate

Sources: Dutchess County Soil Survey,
Issued December 1955.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Erie County, New York

<u>Mapping Units</u>	<u>Limitations</u>
Allard silt loam, 0 to 8 percent slopes	Slight
Allard silt loam, 8 to 15 percent slopes	Moderate
Alton finely gravelly loam, 0 to 8 percent slopes	Slight
Alton finely gravelly loam, 8 to 15 percent slopes	Moderate
Alton gravelly loam, silty substratum, 0 to 8 percent slopes	Slight
Alton gravelly loam, silty substratum, 8 to 15 percent slopes	Moderate
Arkport very fine sandy loam, 3 to 8 percent slopes	Slight
Arkport very fine sandy loam, 8 to 15 percent slopes	Moderate
Blasdell shaly silt loam, 0 to 8 percent slopes	Slight
Blasdell shaly silt loam, 8 to 15 percent slopes	Moderate
Chenango channery silt loam, fan, 0 to 8 percent slopes	Slight
Chenango cobbly loam, 0 to 8 percent slopes	Slight
Chenango cobbly loam, 8 to 15 percent slopes	Moderate
Chenango gravelly loam, 0 to 8 percent slopes	Slight
Colonie loamy fine sand, 3 to 8 percent slopes	Slight
Colonie loamy fine sand, 8 to 15 percent slopes	Moderate
Palmyra gravelly loam, 0 to 8 percent slopes	Slight
Palmyra gravelly loam, 8 to 15 percent slopes	Moderate
Valois gravelly silt loam, 2 to 8 percent slopes	Slight
Valois gravelly silt loam, 8 to 15 percent slopes	Moderate

Source: Erie County Soil Survey (in progress).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Greene County, New York

Soil Associations^{1/}

Limitations^{2/}

<u>Barbour-Tunkhannock</u> Association, nearly level	Slight
<u>Chenango</u> Association, nearly level	Slight
<u>Colonie</u> Association, rolling	Moderate
<u>Stockbridge-Farmington-Rock Outcrop</u> Association, rolling	Moderate
<u>Tunkhannock</u> Association, gently sloping	Slight
<u>Tunkhannock-Suncook-Barbour</u> Association, nearly level	Slight

Source: Greene County General Soil Map and
Interpretations, Temporary State Commission
to Study the Catskills.

^{1/} The underlined members of the soil associations are considered to be the soils suited for septic tank absorption fields.

^{2/} Ratings are given for the dominant slope phase.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Jefferson County, New York

Mapping Units

Limitations

Agawam fine sandy loam, 0 to 8 percent slopes	Slight
Alton gravelly sandy loam, 0 to 8 percent slopes	Slight
Arkport fine sandy loam, 0 to 8 percent slopes	Slight
Arkport fine sandy loam, 8 to 15 percent slopes	Moderate
Bonaparte gravelly loamy fine sand, 0 to 8 percent slopes	Slight
Bonaparte gravelly loamy fine sand, 8 to 15 percent slopes	Moderate
Charlton gravelly fine sandy loam, 0 to 8 percent slopes	Slight
Charlton gravelly fine sandy loam, 8 to 15 percent slopes	Moderate
Charlton very stony soils, sloping	Moderate
Herkimer shaly silt loam, 0 to 8 percent slopes	Slight
Herkimer shaly silt loam, 8 to 15 percent slopes	Moderate
Hinckley gravelly loamy sand, 0 to 8 percent slopes	Slight
Kars gravelly loam, 0 to 8 percent slopes	Slight
Kars gravelly loam, 8 to 15 percent slopes	Moderate
Windsor loamy fine sand, 0 to 8 percent slopes	Slight
Windsor sand, gently sloping	Slight

Source: Jefferson County Soil Survey (in progress).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Monroe County, New York

Mapping Units

Limitations

Alton gravelly loam, 0 to 8 percent slopes	Slight
Alton gravelly loam, 8 to 15 percent slopes	Moderate
Arkport very fine sandy loam, 0 to 6 percent slopes	Slight
Arkport very fine sandy loam, 6 to 12 percent slopes	Moderate
Arkport-Dunkirk very fine sandy loams, 2 to 12 percent slopes	Moderate
Colonie loamy fine sand, 0 to 6 percent slopes	Slight
Colonie loamy fine sandy, 6 to 12 percent slopes	Moderate
Palmyra gravelly fine sandy loam, 0 to 8 percent slopes	Slight
Palmyra gravelly fine sandy loam, 8 to 15 percent slopes	Moderate
Palmyra gravelly loam, 3 to 8 percent slopes	Slight
Wampsville cobbly loam, 0 to 8 percent slopes	Slight
Wampsville cobbly loam, 8 to 15 percent slopes	Moderate

Source: Monroe County Soil Survey,
Issued March 1973.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Niagara County, New York

Mapping Units

Limitations

Arkport fine sandy loam, gravelly substratum, 0 to 6 percent slopes	Slight
Arkport very fine sandy loam, 0 to 6 percent slopes	Slight
Arkport very fine sandy loam, 6 to 12 percent slopes	Moderate
Colonie loamy fine sand, 0 to 6 percent slopes	Slight
Howard gravelly loam, 0 to 8 percent slopes	Slight
Howard gravelly loam, 8 to 15 percent slopes	Moderate
Otisville gravelly sandy loam, 0 to 8 percent slopes	Slight

Source: Niagara County Soil Survey,
Issued October 1972.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Orange County, New York

Mapping Units

Limitations

Allard silt loam, 0 to 8 percent slopes	Slight
Charlton fine sandy loam, 3 to 8 percent slopes	Slight
Charlton fine sandy loam, 8 to 15 percent slopes	Moderate
Chenango gravelly silt loam, 0 to 8 percent slopes	Slight
Chenango gravelly silt loam, 8 to 15 percent slopes	Moderate
Hoosic gravelly sandy loam, 0 to 8 percent slopes	Slight
Hoosic gravelly sandy loam, 8 to 15 percent slopes	Moderate
Oakville loamy fine sand, 0 to 8 percent slopes	Slight
Otisville gravelly sandy loam, 0 to 8 percent slopes	Slight
Otisville gravelly sandy loam, 8 to 15 percent slopes	Moderate
Pittsfield gravelly loam, 3 to 8 percent slopes	Slight
Pittsfield gravelly loam, 8 to 15 percent slopes	Moderate
Riverhead sandy loam, 0 to 8 percent slopes	Slight
Riverhead sandy loam, 8 to 15 percent slopes	Moderate
Unadilla silt loam, 0 to 8 percent slopes	Slight
Unadilla silt loam, 8 to 15 percent slopes	Moderate

Source: Orange County Soil Survey (manuscript).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Orleans County, New York

Mapping Units

Limitations

Alton gravelly sandy loam, 3 to 8 percent slopes	Slight
Arkport very fine sandy loam, 0 to 6 percent slopes	Slight
Arkport very fine sandy loam, 6 to 12 percent slopes	Moderate
Colonie loamy fine sand, 0 to 6 percent slopes	Slight
Colonie loamy fine sand, 6 to 12 percent slopes	Moderate
Howard gravelly loam, 3 to 8 percent slopes	Slight
Wampsville gravelly loam, 3 to 8 percent slopes	Slight

Source: Orleans County Soil Survey (Manuscript).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Oswego County, New York

Mapping Units

Limitations

Adams-Windsor complex, rolling	Moderate
Alton cobbly silt loam, rolling	Moderate
Alton gravelly fine sandy loam, 0 to 8 percent slopes	Slight
Alton gravelly fine sandy loam, rolling	Moderate
Alton gravelly silt loam, 3 to 8 percent slopes	Slight
Colton-Hinckley complex, rolling	Moderate
Herkimer shaly silt loam, 2 to 8 percent slopes	Slight
Herkimer shaly silt loam, 8 to 15 percent slopes	Moderate
Hinckley gravelly loamy sand, 3 to 8 percent slopes	Slight
Hinckley gravelly loamy sand, 8 to 15 percent slopes	Moderate
Otisville loamy fine sand, 0 to 6 percent slopes	Slight

Source: Oswego County Soil Survey (manuscript).

LIMITATIONS FOR SPETIC TANK ABSORPTION FIELD

Putnam, Rockland and Westchester Counties, New York

Mapping Units

Limitations

Agawam fine sandy loam, 2 to 8 percent slopes	Slight
Agawam fine sandy loam, 8 to 15 percent slopes	Moderate
Charlton fine sandy loam, 2 to 8 percent slopes	Slight
Charlton fine sandy loam, 8 to 15 percent slopes	Moderate
Cheshire gravelly sandy loam, 2 to 8 percent slopes	Slight
Cheshire gravelly sandy loam, 8 to 15 percent slopes	Moderate
Haven loam, 0 to 8 percent slopes	Slight
Hinckley gravelly loamy sand, 0 to 8 percent slopes	Slight
Hinckley gravelly loamy sand, 8 to 15 percent slopes	Moderate
Merrimac fine sandy loam, 0 to 8 percent slopes	Slight
Merrimac fine sandy loam, 8 to 15 percent slopes	Moderate
Stockbridge gravelly fine sandy loam, 0 to 8 percent slopes	Slight
Stockbridge gravelly fine sandy loam, 8 to 15 percent slopes	Moderate

Source: Putnam, Rockland and Westchester Counties
Soil Survey (manuscript).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Rensselaer County, New York

Mapping Units

Limitations

Chenango gravelly loam, 0 to 8 percent slopes	Slight
Chenango gravelly loam, fan, 3 to 8 percent slopes	Slight
Hartland silt loam, 0 to 8 percent slopes	Slight
Hartland silt loam, 8 to 15 percent slopes	Moderate
Haven silt loam, 0 to 8 percent slopes	Slight
Hoosic gravelly loam, 0 to 8 percent slopes	Slight
Hoosic gravelly loam, rolling	Moderate
Oakville variant loamy fine sand 0 to 8 percent slopes	Slight
Oakville variant loamy fine sand, 8 to 15 percent slopes	Moderate
Otisville gravelly loam, 0 to 8 percent slopes	Slight
Riverhead fine sandy loam, 0 to 8 percent slopes	Slight
Riverhead fine sandy loam, rolling	Moderate

Source: Rensselaer County Soil Survey (in progress).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

St. Lawrence County, New York

Soil Associations 1/

Limitations 2/

<u>Adams</u> Association, gently sloping	Slight
<u>Adams</u> - Croghan Association, nearly level	Slight
<u>Allagash</u> Association	Slight
<u>Charlton</u> - Sutton Association, stony, gently sloping	Slight
<u>Charlton</u> - Sutton Association, very stony, gently sloping	Moderate
<u>Colton</u> Association, gently sloping	Slight
<u>Colton</u> - <u>Adams</u> Association, sloping	Moderate
<u>Croghan</u> - <u>Adams</u> Association, nearly level	Slight
<u>Kars</u> Association, gently sloping	Slight
<u>Pittsfield</u> - Georgia Association, stony, gently sloping	Slight
<u>Pittsfield</u> - Georgia Association, very stony, gently sloping	Moderate
<u>Trout River</u> - Fahey Association, gently sloping	Slight

Source: General Soil Map, St. Lawrence County, New York, U.S.D.A.,
Soil Conservation Service in cooperation with Cornell University
Agricultural Experiment Station.

1/ The underlined members of the soil associations are considered to be the soils suited for septic tank absorption fields.

2/ Ratings are given for the dominant slope phase.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Suffolk County, New York

Mapping Units

Limitations

Bridgehampton silt loam, 0 to 6 percent slopes	Slight
Bridgehampton silt loam, graded	Slight
Carver and Plymouth sands, 0 to 3 percent slopes	Slight
Carver and Plymouth sands, 3 to 15 percent slopes	Slight to Moderate
Haven loam, 0 to 6 percent slopes	Slight
Haven loam, 6 to 12 percent slopes	Moderate
Plymouth loamy sand, 0 to 8 percent slopes	Slight
Plymouth loamy sand, 8 to 15 percent slopes	Moderate
Plymouth loamy sand, silty substratum, 0 to 9 percent slopes	Slight
Riverhead sandy loam, 0 to 8 percent slopes	Slight
Riverhead sandy loam, 8 to 15 percent slopes	Moderate
Riverhead very stony sandy loam, 3 to 15 percent slopes	Moderate
Riverhead and Haven soils, graded, 0 to 8 percent slopes	Slight
Riverhead and Haven soils, graded, 8 to 15 percent slopes	Moderate

Source: Suffolk County Soil Survey, Issued April 1975.

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Ulster County, New York

Mapping Units

Limitations

Chenango gravelly silt loam, 0 to 8 percent slopes	Slight
Chenango gravelly silt loam, 8 to 15 percent slopes	Moderate
Hoosic cobbly loam, 0 to 3 percent slopes	Slight
Hoosic gravelly loam, 0 to 8 percent slopes	Slight
Hoosic gravelly loam, rolling	Moderate
Plainfield loamy sand, 0 to 8 percent slopes	Slight
Plainfield loamy sand, 8 to 15 percent slopes	Moderate
Riverhead fine sandy loam, 0 to 8 percent slopes	Slight
Riverhead fine sandy loam, 8 to 15 percent slopes	Moderate
Tunkhannock gravelly loam, 0 to 8 percent slopes	Slight
Tunkhannock gravelly loam, rolling	Moderate
Unadilla silt loam	Slight

Source: Ulster County Soil Survey (manuscript).

LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELD

Wayne County, New York

Mapping Units

Limitations

Alton cobbly loam, 0 to 8 percent slopes	Slight
Alton gravelly sandy loam, 0 to 8 percent slopes	Slight
Alton gravelly sandy loam, 8 to 15 percent slopes	Moderate
Colonie loamy very fine sand, 0 to 6 percent slopes	Slight
Colonie loamy very fine sand, 6 to 12 percent slopes	Moderate
Oakville loamy fine sand, 0 to 6 percent slopes	Slight
Palmyra cobbly loam, 0 to 8 percent slopes	Slight
Palmyra gravelly loam, 0 to 8 percent slopes	Slight
Palmyra gravelly loam, 8 to 15 percent slopes	Moderate

Source: Wayne County Soil Survey (manuscript).

TECHNICAL REPORT

ON THE

LOCATION OF SLOPES GREATER THAN 15 PERCENT

IN THE

COASTAL ZONE MANAGEMENT AREA IN NEW YORK

The preparation of this report, plus accompanying maps and analyses was financially aided through a Federal Grant from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972.

This report plus accompanying maps and analyses was prepared under the Coastal Zone Management Act of 1972 for the Division of State Planning, Department of State.

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NEW YORK STATE

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

September 1976

INTRODUCTION

The gradient of a landscape is an important factor in the use of land. In general, it becomes a limiting factor for most land uses and management where slopes are greater than 15 percent.

For example, slopes greater than 15 percent have a limiting effect on the intensity of agriculture and the management of land for agricultural uses. Similarly, steep slopes affect housing and community development, and road, highway and public works projects. Effects are through the need for more stringent specifications, complicated designs, and special construction techniques, all increase costs. These increased costs frequently become prohibitive for the local community.

CRITERIA

1. The dominant slope is greater than 15 percent.

PROCEDURES

Within the Coastal Zone Management area in New York, steep slopes are more common in the Hudson Valley. Here,

1. Delineations will be made on overlays using the contour interval-linear distance relationship on 7½ minute topographic quadrangles.

In the other sections of the CZM study area, these steep slopes are small and infrequent. Delineations on 7½ minute overlays would be unwarranted. In these areas

- 1a. A brief narrative will describe the steep slope areas in each county as noted from 7½ minute quadrangles and from appropriate mapping units shown on the soils maps.

TECHNICAL REPORT
ON THE IDENTIFICATION AND LOCATION OF
PROBABLE SOURCES OF SAND AND/OR GRAVEL

The preparation of this report plus accompanying maps and analyses was financially aided through a Federal Grant from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972.

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Grant Number: 04-5-158-50002

NEW YORK STATE

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

September 1976

INTRODUCTION

Earth products, such as sand and gravel, are valuable natural resources. There is a tremendous demand for these resources as materials for construction and engineering purposes including manufacturing of concrete, sub-base for highways, backfill for leach fields, and fill on construction and development projects.

The intent of this report is to identify and locate the probable sources of sand and/or gravel in the Coastal Zone Management study area. Such an inventory can be evaluated as to how well these sources will meet the future needs of communities within the Coastal Zone.

CRITERIA

Soil series are identified on the probability that these soils generally contain sizable quantities of sand and/or gravel.

1. Probable sources must have sand and/or gravel deposits at least 3 feet thick.

Most of the identified soils typically have sand and/or gravel parent materials within 6 feet. However, some soils may have little or no sand or gravel in the upper 5 or 6 feet. Yet, from observations made in deep cuts or from knowledge of local geology, that the identified soils are underlain by sand or gravel is known.

Although, ^{existing} beaches, dunes, and streambeds are potential sources of sand and gravel, these areas will not be identified because of their environmental sensitivity.

All areas containing granular material may not be economically feasible for extraction. Neither the quantity nor the quality of the sand and/or gravel source is assured for the areas identified.

PROCEDURES

1. Soil types or soil associations which are likely to have deposits of sand and/or gravel at least 3 feet thick have been listed for each county. County lists are in the Appendix.

A preliminary review of soils maps indicates that sand and/or gravel deposits within the Coastal Zone Management study area are small and scattered. Therefore, the procedure for locating these areas in most counties would not warrant detailed delineations on 7½ minute topographic quadrangle overlays.

- 2a. Soil maps will be reviewed and sand and/or gravel deposits will be deposited as to their location within a township and in relation to proximity to cities, villages, roads, streams or other identifiable cultural and physical features. An estimate will be made of the approximate acreage in each area.

Counties or parts of counties having sizable areas.

- 2b. Will be delineated on overlays of 7½ minute topographic quadrangles.

INFORMATION SOURCES

Criteria for sand and/or gravel sources were adapted from the Guide for Interpreting Engineering Uses of Soils, U.S.D.A. Soil Conservation Service, Issued November 1971.

Soil maps and legends were procured from the National Cooperative Soil Survey Program conducted by the Soil Conservation Service in cooperation with the Cornell University Agricultural Experiment Station.

Soil Survey Report - Albany and Schenectady Counties, Issued May 1942.

Albany County General Soil Associations, Technical Report 200-1, Capital District Regional Planning Commission.

Cayuga County Soil Survey, Issued May 1971.

Chautauqua County Soil Survey (in progress).

Soil Survey of Columbia County, Issued 1929.

Dutchess County Soil Survey, Issued December 1955.

Erie County Soil Survey (in progress).

Greene County General Soil Map and Interpretations, Temporary State

Commission to Study the Catskills.

Jefferson County Soil Survey (in progress).

Monroe County Soil Survey, Issued March 1973.

Niagara County Soil Survey, Issued October 1972.

Orange County Soil Survey (manuscript).

Orleans County Soil Survey (manuscript).

Oswego County Soil Survey (manuscript).

Putnam, Rockland and Westchester Counties Soil Survey (manuscript).

Rensselaer County Soil Survey (in progress).

General Soil Map, St. Lawrence County, New York, U.S.D.A. Soil Conservation

Service in cooperation with the Cornell University Agricultural Experiment Station.

Suffolk County Soil Survey, Issued April 1975.

Ulster County Soil Survey (manuscript).

Wayne County Soil Survey (manuscript).

EVALUATION

(To be made after the probable sources of sand and/or gravel have been located.)

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Albany County, New York

Soil Type

Claverack fine sandy loam, deep phase
Colonie loamy fine sand
Copake fine sandy loam
Granby loamy fine sand
Hoosic coarse sandy loam

Source: Soil Survey of Albany and Schenectady Counties,
Issued May 1972.

Correlated with Albany County General Soil Associations, Technical
Report 200-1, Capital District Regional Planning Commission.

Colonie-Elnoria Association, rolling
Elnora-Elmwood Association, nearly level

see Elnora.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Cayuga County, New York

Soil Type

Alton cobbly loam
Alton gravelly sandy loam
Alton and Howard soils
Arkport fine sandy loam
Colonie fine sandy loam
Colonie loamy fine sand
Colonie and Arkport soils
Fredon loam
Galen fine sandy loam
Howard gravelly loam
Langford-Howard gravelly loam
Minoa fine sandy loam
Palmyra gravelly loam
Palmyra gravelly sandy loam
Palmyra soils
Palmyra, Howard and Alton soils
Phelps gravelly silt loam
Stafford fine sandy loam
Wampsville gravelly silt loam

Source: Cayuga County Soil Survey,
Issued May 1971

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Chautauqua County, New York

Soil Types

Allard silt loam
Arkport fine sandy loam
Braceville gravelly silt loam
Caneadea-Scio complex
Castile gravelly silt loam
Chenango gravelly silt loam
Colonie lo my fine sand
Fredon loam
Galen fine sandy loam
Mardin-Chenango gravelly silt loams
Mardin-Valois channery silt loams
Minoa fine sandy loam
Red Hook gravelly silt loam
Scio silt loam
Unadilla-Caneadea complex

Source: Chautauqua County Soil Survey (in progress).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Columbia County, New York

Soil Types

Hoosic coarse sandy loam
Hoosic fine sandy loam
Hoosic fine sandy loam, steep phase
Hoosic gravelly fine sandy loam
Hoosic gravelly loam
Hoosic loam
Otisville gravelly loam

Source: Soil Survey of Columbia County,
Issued 1929.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Dutchess County, New York

Soil Types

Atherton silt loam
Braceville gravelly loam
Braceville silt loam
Colonie fine sandy loam
Colonie loamy fine sand
Copake fine sandy loam
Copake gravelly loam
Homer gravelly silt loam
Hoosic fine sandy loam
Hoosic gravelly loam
Hoosic gravelly sandy loam
Hoosic loam
Melrose fine sandy loam
Merrimac gravelly fine sandy loam
Merrimac gravelly sandy loam
Merrimac gravelly silt loam
Palmyra gravelly loam
Red Hook silt loam

Source: Dutchess County Soil Survey,
Issued December 1955.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Erie County, New York

Soil Types

Allard silt loam
Alton finely gravelly sandy loam
Alton gravelly loam
Arkport very fine sandy loam
Blasdell shaly silt loam
Castile cobbly loam
Castile gravelly loam
Chenango channery silt loam, fan
Chenango cobbly loam
Chenango gravelly loam
Chenango and Palmyra soils
Colonie loamy fine sand
Elnora loamy fine sand
Farnham shaly silt loam
Farnham shaly silt loam, fan
Galen very fine sandy loam
Halsey silt loam
Junius loamy fine sand
Minoa very fine sandy loam
Palmyra gravelly loam
Phelps finely gravelly loam
Phelps gravelly loam
Red Hook silt loam
Scio silt loam
Valois gravelly silt loam

Source: Erie County Soil Survey (in progress).

PROBABLE SOURCES OF SAND AND/OR GRAVEL 1/

Greene County, New York

Soil Associations

Barbour-Tunkhannock Association, nearly level
Chenango Association, moderately steep
Chenango Association, nearly level
Colonie Association, rolling
Tunkhannock Association, gently sloping
Tunkhannock-Suncook-Barbour Association, nearly level

Source: Greene County General Soil Map and Interpretations, Temporary
Commission to Study the Catskills

1/ The underlined members of the soil associations are considered to be
the probable sources of sand and/or gravel.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Jefferson County, New York

Soil Types

Agawam fine sandy loam
Altmar gravelly loam
Alton gravelly sandy loam
Arkport fine sandy loam
Bonaparte gravelly loamy fine sand
Deerfield loamy fine sand
Fredon gravelly loam
Galen fine sandy loam
Halsey mucky loam
Herkimer shaly silt loam
Hinckley cobby soils
Hinckley gravelly loamy sand
Kars gravelly loam
Kars soils
Minoa fine sandy loam
Phelps gravelly loam
Scarboro mucky loamy fine sand
Wareham loamy fine sand
Windsor loamy fine sand
Windsor sand
Windsor soils

Source: Jefferson County Soil Survey (in progress).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Monroe County, New York

Soil Types

Alton gravelly loam
Alton gravelly sandy loam
Arkport very fine sandy loam
Arkport-Dunkirk very fine sandy loam
Arkport, Dunkirk and Colonie soils
Colonie loamy fine sand
Elnora loamy fine sand
Galen very fine sandy loam
Halsey gravelly loam
Minoa very fine sandy loam
Ontario-Palmyra-Arkport complex
Palmyra gravelly fine sandy loam
Palmyra gravelly loam
Phelps gravelly fine sandy loam
Wampsville cobbly loam

Source: Monroe County Soil Survey,
Issued March 1973.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Niagara County, New York

Soil Types

Altmar loamy fine sand
Altmar gravelly fine sandy loam
Arkport very fine sandy loam
Arkport fine sandy loam, gravelly substratum
Colonie loamy fine sand
Elnora loamy fine sand
Fredon gravelly loam
Galen very fine sandy loam
Howard gravelly loam
Otisville gravelly sandy loam
Phelps gravelly loam

Source: Niagara County Soil Survey,
Issued October 1972.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Orange County, New York

Soil Types

Allard silt loam
Castile gravelly silt loam
Chenango gravelly silt loam
Fredon loam
Halsey silt loam
Hoosic gravelly sandy loam
Oakville loamy fine sand
Otisville gravelly sandy loam
Otisville and Hoosic soils
Riverhead sandy loam
Scarboro mucky sandy loam
Scio silt loam
Suncook sandy loam
Unadilla silt loam

Source: Orange County Soil Survey (manuscript).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Orleans County, New York

Soil Types

Alton gravelly sandy loam
Arkport very fine sandy loam
Arkport-Collamer complex
Colonie loamy fine sand
Fredon loam
Galen very fine sandy loam
Howard gravelly loam
Howard soils
SP. → Janius loamy fine sand
Phelps gravelly fine sandy loam
Wampsville gravelly loam

Source: Orleans County Soil Survey (manuscript).

Janius

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Oswego County, New York

Soil Types

Adams-Windsor complex
Alton cobbly silt loam
Alton gravelly fine sandy loam
Alton gravelly silt loam
Colton-Hinckley complex
Deerfield loamy fine sand
Fredon gravelly fine sandy loam
Granby loamy fine sand
Halsey gravelly loam
Herkimer shaly silt loam
Hinckley gravelly loamy sand
Minoa fine sandy loam, mod. well-drained variant
Minoa very fine sandy loam
Naumburg loamy fine sand
Naumburg-Duane complex
Naumburg-Granby complex
Oakville loamy fine sand
Windsor loamy fine sand

Source: Oswego County Soil Survey (manuscript).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Putnam, Rockland and Westchester Counties

Soil Types

Agawam fine sandy loam
Cheshire gravelly sandy loam
Fredon loam
Haven loam
Hinckley gravelly loam
Merrimac fine sandy loam

Source: Putnam, Rockland and Westchester Counties
Soil Survey (Manuscript).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Rensselaer County, New York

Soil Types

Castleton gravelly silt loam
Chenango gravelly loam
Chenango gravelly loam, fan
Fredon silt loam
Haven silt loam
Hoosic gravelly loam
Hoosic soils
Oakville soils
Oakville variant loamy fine sand
Otisville gravelly loamy sand
Riverhead fine sandy loam

Source: Rensselaer County Soil Survey (in progress).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

St. Lawrence County, New York

Soil Associations ^{1/}

Adams Association, gently sloping
Adams-Croghan Association, nearly level
Adams-Colton Association, moderately steep
Allagash Association, gently sloping
Colton Association, gently sloping
Colton-Adams Association, sloping
Colton-Adams Association, very steep
Coveytown-Cook Association, nearly level
Croghan-Adams Association, nearly level
Kars Association, gently sloping
Naumburg-Scarboro Association, nearly level
Trout River-Fahey Association, gently sloping

Source: General Soil Map, St. Lawrence County, New York, U.S.D.A., Soil Conservation Service in Cooperation with Cornell University Agricultural Experiment Station

^{1/} The underlined members of the soil associations are the probable sources of sand and/or gravel.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Suffolk County, New York

Soil Types

Atsion sand
Berryland mucky sand
Bridgehampton silt loam
Carver and Plymouth sands
Deerfield sand
Haven loam
Montauk fine sandy loam
Montauk loamy sand, sandy variant
Montauk silt loam
Plymouth gravelly loam sand
Plymouth loamy sand
Riverhead sandy loam
Riverhead very stony sandy loam
Riverhead and Plymouth very bouldery soils
Scio silt loam, sandy substratum
Sudbury sandy loam
Walpole sandy loam
Wareham loamy sand

Source: Suffolk County Soil Survey,
Issued October 1972.

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Ulster County, New York

Soil Types

Atherton silt loam
Castile gravelly silt loam
Chenango gravelly silt loam
Haven loam
Hoosic cobbly loam
Hoosic gravelly loam
Hoosic soils
Plainsfield loamy sand
Plainfield-Riverhead complex
Pompton fine sandy loam
Red Hook gravelly silt loam
Riverhead fine sandy loam
Scio silt loam
Suncook loamy fine sand
Tunkhannock gravelly loam
Unadilla silt loam
Walpole fine sandy loam

Source: Ulster County Soil Survey (manuscript).

PROBABLE SOURCES OF SAND AND/OR GRAVEL

Wayne County, New York

Soil Types

Alton cobbly loam
Alton gravelly sandy loam
Colonie loamy very fine sand
Colonie and Dunkirk soils
Elnora loamy fine sand
Fredon loam
Halsey silt loam
Junius loamy very fine sand
Minoa very fine sandy loam
Oakville loamy fine sand
Palmyra cobbly loam
Palmyra gravelly loam
Palmyra soils
Palmyra and Alton soils
Phelps cobbly loam
Phelps gravelly loam

Source: Wayne County Soil Survey (manuscript).

TECHNICAL REPORT
ON THE
IDENTIFICATION AND MAPPING OF PRIME FARMLAND
IN THE
COASTAL ZONE MANAGEMENT AREA OF NEW YORK

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NEW YORK STATE

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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INTRODUCTION

One of the tasks in the Coastal Zone Management study area is the mapping of natural critical areas. Interpretive soil maps are well-suited to showing the extent of several natural critical areas, particularly prime farmland.

Prime farmland is defined as the land best suited for producing food, feed, forage, fiber, and oilseed crops, and also available for these uses, (the land could be cropland, pasture, forest or other land but not urban land or water). It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

The purpose of delineating prime farmland is to provide an inventory of this important natural resource in the Coastal Zone study area. This inventory is intended to help decision-makers evaluate the implications of various options in planning for various and oftentimes conflicting land uses. This report also recommends various methods of retaining the best suited land for the production of food, feed, forage and fibre crops in the Coastal Zone Management area of New York.

CRITERIA

The criteria for the identification of prime farmlands are entirely related to soil characteristics and physical features. The physical criteria chosen are stable criteria that accurately measure the soil's responsiveness to modern management techniques.

1. Soils have adequate moisture within 40 inches (1 meter) or in the root zone to produce the commonly grown crops in 7 or more years out of 10.

2. At a depth of 20 inches (50 cm) the soils have a mean annual temperature higher than 32 F (0 C). In addition, the mean summer temperature at this depth in soils with an organic (O) horizon is higher than 47 F (8 C).
3. The soils have a PH between 4.5 and 8.4 in all horizons within a depth of 40 inches (1 meter) or in the root zone if the root zone is less than 40 inches deep. This range of PH is favorable for growing a wide variety of crops without adding large amounts of amendments.
4. The soils have no water table or a water table that is maintained at a sufficient depth during the cropping season to allow food, feed, fiber, forage, oilseed crops common to the area to be grown.
5. The soils are not flooded frequently during the growing season (less often than once in 2 years).
6. The soils have a product of K (erodibility factor) x percent slope of less than 2.0. That is, prime farmland does not include soils having a serious erosion hazard.
7. The soils have a permeability rate of at least 0.06 inches (0.15 cm) per hour in the upper 20 inches (50 cm).
8. Less than 10 percent of the surface layer in these soils consist of rock fragments coarser than 3 inches (7.6 cm). These soils present no particular difficulty in cultivating with large equipment.

In general, the prime farmland definition embraces all lands in the Soil Conservation Service Land Capability Classes I, most of Class II, and Class III W. Land in Classes II W and III W are included if an adequate water management

system maintains the water table at a depth to allow the growing of crops common to the area.

PROCEDURES

A soil designated by a given name (series) varies somewhat from place to place in the wide-spread coastal area of New York. Therefore, soil interpretations were based on the typical soil properties of the soil series to a depth of five or six feet. It should be noted that soil interpretations of the same series may differ from county to county, particularly upon whether water management systems in the county are properly installed and maintained (criteria 4) or whether less than 10 percent of the surface layer consisted of rock fragments coarser than 3 inches (criteria 8).

Four levels of soils data were available. Most CZM counties had a modern medium-intensity soil survey on 1:15840 (4" = 1 mile) scale aerial photographs. The medium-intensity level is the standard for conducting a prime farmland inventory at the national level. However, data was not available for all counties, therefore, the best available soils data was used, such as:

Albany - Old soil survey report (map included) and an up-dated general soils map.

Columbia - Old soil survey report.

Dutchess - Old soil survey report. Availabe maps were at 4" = 1 mile.

Greene - Updated general soils map.

Jefferson - A modern medium-intensity soil survey for the whole CZM study area is incomplete at this time. Also available was an old soil survey report and soil association map.

St. Lawrence - Old soil survey report and an up-dated general soils map.

The old soil survey and the up-dated generalized soils maps were at a 1:62500 scale (1" = 1 mile). The soil association map for Jefferson County was at a scale of 1:13500 (1" = 2 miles).

The following procedures were used in the study:

1. A list of soil mapping units, soil types, or soil associations which met the criteria for prime farmlands was compiled for each county. Lists are given in the Appendix.
2. For Albany, Columbia, Dutchess and Greene Counties, a field reconnaissance of the potential prime farmland soil types and soil associations was conducted with Soil Conservation Service soil scientists to see how well the mapped areas met the criteria for prime farmlands. Based upon the reconnaissance a final list of soil types and soil associations was developed for these counties.
3. Using the list of prime farmland mapping units, the boundaries of the prime farmland soils delineated on the aerial photographs at the medium-intensity level were sketched on overlays of 7½ minute topographic quadrangle (Scale 1:24000) sheets.
- 3a. From the list of soil types and soil associations and notes from the field reconnaissance, prime farmlands were similarly sketched on 7½ minute overlays.

At the medium-intensity soil survey level, contrasting soils may comprise up to 15 percent of a delineated area. However, where the old soil surveys and/or generalized soils map levels, contrasting soils may make up 50 percent of the area.

INFORMATION SOURCES

Definitions and criteria for prime farmlands were obtained from the U.S.D.A. Soil Conservation Service, Land Inventory and Monitoring Memorandum NY-1, titled Prime and Unique Farmlands.

Soil maps and legends were procured from the National Cooperative Soil Survey program conducted by the Soil Conservation Service in cooperation with the Cornell University Agricultural Experiment Station.

Soil Survey Report - Albany and Schenectady Counties, Issued May 1942.

Albany County General Soil Associations, Technical Report 200-1,

Capital District Regional Planning Commission.

Cayuga County Soil Survey, Issued May 1971

Chautauqua County Soil Survey (in progress).

Soil Survey of Columbia County, Issued 1929.

Dutchess County Soil Survey, Issued December 1955.

Erie County Soil Survey (in progress).

Greene County General Soil Map and Interpretations, Temporary State

Commission to Study the Catskills.

Jefferson County Soil Survey (in progress).

Monroe County Soil Survey, Issued March 1973.

Niagara County Soil Survey, Issued October 1972.

Orange County Soil Survey (manuscript).

Orleans County Soil Survey (manuscript).

Oswego County Soil Survey (manuscript).

Putnam, Rockland and Westchester Counties Soil Survey (manuscript).

Rensselaer County Soil Survey (in progress).

General Soil Map, St. Lawrence County, New York, U.S.D.A. Soil Conservation Service in cooperation with the Cornell University Agricultural Experiment Station.

Suffolk County Soil Survey, Issued April 1975.

Ulster County Soil Survey, (manuscript).

Wayne County Soil Survey (manuscript).

RECOMMENDATIONS

(To be developed after the prime farmland data has been analyzed and evaluated.)

APPENDIX

County Listings of Prime Farmlands

PRIME FARMLAND

Albany County, New York

Soil Types

Genesee fine sandy loam

Genesee silt loam

Hudson silty clay loam (heavy silt loam)

Source: Soil Survey Report-Albany and Schenectady Counties, Issued May 1942.

Correlated with the following soil associations from the Albany County General Soil Associations, Technical Report 200-1, Capital District Regional Planning Commission.

Rhinebeck-Madalin Association, nearly level

Hamlin-Wayland-Teel Association, nearly level

PRIME FARMLAND

Cayuga County, New York

Mapping Units

Alton gravelly sandy loam, 0 to 3 percent slopes
Alton gravelly sandy loam, 3 to 8 percent slopes
Arkport fine sandy loam, 1 to 6 percent slopes
Cazenovia silt loam, 2 to 8 percent slopes
Collamer silt loam, 0 to 2 percent slopes
Collamer silt loam, 2 to 6 percent slopes
Conesus gravelly silt loam, 0 to 3 percent slopes
Conesus gravelly silt loam, 3 to 8 percent slopes
Dunkirk silt loam, 1 to 6 percent slopes
Edward muck
Eel silt loam
Eel silt loam, high bottom
Fredon loam
Galen fine sandy loam, 0 to 2 percent slopes
Galen fine sandy loam, 2 to 6 percent slopes
Genesee gravelly loam, fan
Genesee silt loam
Genesee silt loam, high bottom
Hilton loam, 0 to 3 percent slopes
Hilton loam, 3 to 8 percent slopes
Honeoye silt loam, 2 to 8 percent slopes
Howard gravelly loam, 0 to 3 percent slopes
Howard gravelly loam, 3 to 8 percent slopes
Ira gravelly loam, 0 to 3 percent slopes
Ira gravelly loam, 3 to 8 percent slopes
Kendaia silt loam, 3 to 8 percent slopes
Landford-Howard loams, 2 to 8 percent slopes
Lansing gravelly silt loam, 2 to 8 percent slopes
Lima silt loam, 0 to 3 percent slopes
Lima silt loam, 3 to 8 percent slopes
Minoa fine sandy loam
Muck, deep
Niagara fine sandy loam
Odessa silt loam, 0 to 2 percent slopes
Odessa silt loam, 2 to 6 percent slopes
Ontario fine sandy loam, 2 to 8 percent slopes
Ontario loam, 2 to 8 percent slopes
Ovid silt loam, 0 to 2 percent slopes
Ovid silt loam, 2 to 6 percent slopes
Palmyra gravelly loam, 0 to 3 percent slopes
Palmyra gravelly loam, 3 to 8 percent slopes
Palmyra gravelly sandy loam, 3 to 8 percent slopes
Phelps gravelly silt loam
Schoharie silt loam, 2 to 6 percent slopes
Sodus gravelly loam, 2 to 8 percent

PRIME FARMLAND

Cayuga County, New York(Continued)

Wampsville gravelly silt loam, 0 to 3 percent slopes

Wampsville gravelly silt loam, 3 to 8 percent slopes

Warners loam, fan

Williamson silt loam, 0 to 2 percent slopes

Williamson silt loam, 2 to 6 percent slopes

Source: Cayuga County Soil Survey Report, Issued May 1971.

PRIME FARMLAND

Chautauqua County, New York

Mapping Units

Allard silt loam, 0 to 3 percent slopes
Allard silt loam, 3 to 8 percent slopes
Braceville gravelly silt loam, 0 to 3 percent slopes
Braceville gravelly silt loam, 3 to 12 percent slopes
Canandaigua silt loam, 0 to 2 percent slopes
Canaseraga silt loam, 0 to 2 percent slopes
Canaseraga silt loam, 2 to 6 percent slopes
Carlisle muck
Chenango gravelly loam, 0 to 3 percent slopes
Chenango gravelly loam, 3 to 12 percent slopes
Collamer silt loam, 2 to 6 percent slopes
Danley gravelly silt loam, 0 to 8 percent slopes
Darien gravelly silt loam, 0 to 8 percent slopes
Darien silt loam, 0 to 3 percent slopes
Darien silt loam, 3 to 8 percent slopes
Galen fine sandy loam, 2 to 6 percent slopes
Hamlin silt loam
Langford gravelly silt loam, 0 to 3 percent slopes
Langford gravelly silt loam, 3 to 12 percent slopes
Mardin-Chenango gravelly silt loam, 0 to 3 percent slopes
Mardin-Chenango gravelly silt loam, 3 to 12 percent slopes
Minoa fine sandy loam, 0 to 6 percent slopes
Niagara silt loam, 0 to 2 percent slopes
Palms muck
Scio silt loam, 0 to 3 percent slopes
Teel silt loam
Williamson silt loam, 0 to 2 percent slopes
Williamson silt loam, 2 to 6 percent slopes

Source: Chautauqua County Soil Survey (in progress).

PRIME FARMLAND

Columbia County, New York

Soil Types

Cossayuna gravelly loam

Hoosic loam (Riverhead)

Hotaling loam

Hudson silt loam (dominantly Rhinebeck)

Hudson silty clay loam (heavy silt loam) (dominantly Rhinebeck)

Ondawa loam

Ondawa silt loam

Pittsfield gravelly loam

Source: Soil Survey of Columbia County, Issued 1929.

PRIME FARMLAND

Dutchess County, New York

Soil Type

Amenia silt loam
Bernardston gravelly silt loam
Braceville gravelly loam
Braceville silt loam
Chagrin gravelly loam
Chagrin silt loam
Charlton gravelly loam
Copake fine sandy loam
Copake gravelly loam
Cossayuna fine sandy loam
Cossayuna gravelly loam
Dover fine sandy loam
Dutchess gravelly silt loam
Eel silt loam
Genesee fine sandy loam
Gloucester gravelly loam
Homer gravelly silt loam
Hudson fine sandy loam
Hudson silt loam
Ondawa gravelly loam
Palmyra gravelly loam
Pawlet loam
Pawlet silt loam
Pittsfield gravelly loam
Pittstown gravelly silt loam
Poultney loam
Poultney silt loam
Red Hook silt loam
Rhinebeck silt loam
Stockbridge gravelly loam
Sutton silt loam
Troy gravelly loam
Woodbridge gravelly loam

Source: Dutchess County Soil Survey, Issued December 1955.

PRIME FARMLAND

Erie County, New York

Mapping Units

Allard silt loam, 0 to 3 percent slopes
Allard silt loam, 3 to 8 percent slopes
Alton finely gravelly loam, 0 to 3 percent slopes
Alton finely gravelly loam, 3 to 8 percent slopes
Alton gravelly loam, 3 to 8 percent slopes, silty substratum
Appleton silt loam, 0 to 3 percent slopes
Appleton silt loam, 3 to 8 percent slopes
Arkport very fine sandy loam, 3 to 8 percent slopes
Blasdell shaly silt loam, 0 to 3 percent slopes
Blasdell shaly silt loam, 3 to 8 percent slopes
Canaseraga silt loam, 3 to 8 percent slopes
Castile gravelly loam, 0 to 3 percent slopes
Castile gravelly loam, 3 to 8 percent slopes
Cayuga silt loam, 0 to 3 percent slopes
Cayuga silt loam, 3 to 8 percent slopes
Cazenovia silt loam, 3 to 8 percent slopes
Chenango gravelly loam, 0 to 3 percent slopes
Chenango gravelly loam, 3 to 8 percent
Collamer silt loam, 0 to 3 percent slopes
Collamer silt loam, 3 to 8 percent slopes
Collamer silt loam, 3 to 8 percent slopes, till substratum
Danley silt loam, 3 to 8 percent slopes
Darien silt loam, 0 to 3 percent slopes
Darien silt loam, 3 to 8 percent slopes
Farnham shaly silt loam, 0 to 3 percent slopes
Farnham shaly silt loam, 3 to 8 percent slopes
Farnham shaly silt loam, fan, 0 to 3 percent slopes
Farnham shaly silt loam, fan, 3 to 8 percent slopes
Fremont silt loam, 0 to 3 percent slopes
Fremont silt loam, 3 to 8 percent slopes
Galen fine sandy loam, till substratum, 3 to 8 percent slopes
Galen very fine sandy loam, 0 to 3 percent slopes
Galen very fine sandy loam, 3 to 8 percent slopes
Hamlin silt loam
Honeoye loam, 0 to 3 percent slopes
Honeoye loam, 3 to 8 percent slopes
Hudson silt loam, 3 to 8 percent slopes
Kendaia silt loam
Lima loam, 0 to 3 percent slopes
Lima loam, 3 to 8 percent slopes
Marilla shaly silt loam, 0 to 3 percent slopes
Marilla shaly silt loam, 3 to 8 percent slopes
Minoa very fine sandy loam, 0 to 3 percent slopes
Minoa very fine sandy loam, 3 to 8 percent slopes
Mohawk shaly silt loam, 3 to 8 percent slopes
Niagara silt loam, 0 to 3 percent slopes
Niagara silt loam, 3 to 8 percent slopes
Niagara silt loam, fan
Niagara silt loam, till substratum

PRIME FARMLAND

Erie County, New York (Continued)

Odessa silt loam, 0 to 3 percent slopes
Ovid silt loam, 0 to 3 percent slopes
Ovid silt loam, 3 to 8 percent slopes
Palmyra gravelly loam, 0 to 3 percent slopes
Palmyra gravelly loam, 3 to 8 percent slopes
Phelps finely gravelly loam, 0 to 3 percent slopes
Phelps finely gravelly loam, 3 to 8 percent slopes
Phelps gravelly loam, 0 to 3 percent slopes
Phelps gravelly loam, 3 to 8 percent slopes
Raynham silt loam, 0 to 3 percent slopes
Raynham silt loam, 3 to 8 percent slopes
Rhinebeck gravelly loam, 0 to 3 percent slopes
Rhinebeck silt loam, 0 to 3 percent slopes
Rhinebeck silt loam, 3 to 8 percent slopes
Rhinebeck variant, silt loam
Schoharie silt loam, 0 to 3 percent slopes
Schoharie silt loam, 3 to 8 percent slopes
Scio silt loam, 0 to 3 percent slopes
Teel silt loam
Teel silt loam, gravelly substratum
Tioga silt loam
Valois gravelly silt loam, 2 to 8 percent slopes
Varysburg gravelly loam, 0 to 3 percent slopes
Varysburg gravelly loam, 3 to 8 percent slopes
Williamson silt loam, 0 to 3 percent slopes
Williamson silt loam, 3 to 8 percent slopes

Source: Erie County Soil Survey (in progress).

PRIME FARMLAND ^{1/}

Greene County, New York

Soil Associations

Lordstown-Mardin Association, gently sloping
Odessa-Cayuga Association, gently sloping
Rhinebeck-Hudson Association, gently sloping
Rhinebeck-Madalin Association, nearly level
Chenango Association, nearly level
Tunkhannock Association, gently sloping
Tunkhannock-Surcook-Barbour Association, nearly level
Barbour-Basher Association, nearly level
Barbour-Tunkhannock Association, nearly level
Hamlin-Wayland-Teel Association, nearly level
Tioga-Middlebury-Wayland Association, nearly level

Source: Greene County General Soil Map and Interpretations, Temporary State Commission to Study the Catskills.

1/ The underlined members of the soil associations are considered to be the prime farmland soils.

PRIME FARMLAND

Jefferson County, New York

Mapping Units

Agawam fine sandy loam, 0 to 3 percent slopes
Agawam fine sandy loam, 3 to 8 percent slopes
Altmar gravelly loam, 0 to 8 percent slopes
Alton gravelly sandy loam, 0 to 3 percent slopes
Alton gravelly sandy loam, 3 to 8 percent slopes
Amenia silt loam, 0 to 3 percent slopes
Amenia silt loam, 3 to 8 percent slopes
Arkport fine sandy loam, 0 to 3 percent slopes
Arkport fine sandy loam, 3 to 8 percent slopes
Bombay gravelly loam, 0 to 3 percent slopes
Bombay gravelly loam, 3 to 8 percent slopes
Camroden gravelly silt loam, 0 to 3 percent slopes
Camroden gravelly silt loam, 3 to 8 percent slopes
Canandaigua silt loam
Charlton gravelly silt loam, 3 to 8 percent slopes
Claverack loamy fine sand, 0 to 3 percent slopes
Claverack loamy fine sand, 3 to 8 percent slopes
Colamer silt loam, 3 to 8 percent slopes
Elmwood fine sandy loam, 0 to 3 percent slopes
Elmwood fine sandy loam, 3 to 8 percent slopes
Fredon gravelly loam
Galen fine sandy loam, 0 to 3 percent slopes
Galen fine sandy loam, 3 to 8 percent slopes
Hamlin silt loam
Herkimer shaly silt loam, 0 to 3 percent slopes
Herkimer shaly silt loam, 3 to 8 percent slopes
Hudson silt loam, 3 to 8 percent slopes
Ira gravelly fine sandy loam, 0 to 3 percent slopes
Ira gravelly fine sandy loam, 3 to 8 percent slopes
Kars gravelly loam, 0 to 3 percent slopes
Kars gravelly loam, 3 to 8 percent slopes
Lowville silt loam, 0 to 3 percent slopes
Lowville silt loam, 3 to 8 percent slopes
Madrid gravelly loam, 0 to 3 percent slopes
Madrid gravelly loam, 3 to 8 percent slopes
Massena gravelly loam, 0 to 3 percent slopes
Massena gravelly loam, 3 to 8 percent slopes
Minoa fine sandy loam
Munson silt loam, 3 to 8 percent slopes
Nellis silt loam, 0 to 8 percent slopes
Niagara silt loam, 0 to 3 percent slopes
Niagara silt loam, 3 to 8 percent slopes
Ondawa fine sandy loam
Phelps gravelly loam, 0 to 3 percent slopes
Phelps gravelly loam, 3 to 8 percent slopes
Pinckney gravelly silt loam, 3 to 8 percent slopes
Podunk fine sandy loam

Jefferson County, New York (continued)

Rhinebeck silt loam, 0 to 3 percent slopes

Rhinebeck silt loam, 3 to 8 percent slopes

Sodus gravelly fine sandy loam, 3 to 8 percent slopes

Swanton fine sandy loam

Teel silt loam

Varysburg gravelly sandy loam, 0 to 8 percent slopes

Williamson very fine sandy loam, 3 to 8 percent slopes

Source: Jefferson County Soil Survey (in progress).

PRIME FARMLAND

Monroe County, New York

Mapping Units

Alton gravelly loam, 3 to 8 percent slopes
Appleton loam, 0 to 3 percent slopes
Arkport very fine sandy loam, 0 to 6 percent slopes
Cayuga silt loam, 0 to 2 percent slopes
Cayuga silt loam, 2 to 6 percent slopes
Cazenovia gravelly loam, 0 to 3 percent slopes
Cazenovia gravelly loam, 3 to 8 percent slopes
Churchville silt loam, 0 to 2 percent slopes
Churchville silt loam, 2 to 6 percent slopes
Claverack loamy fine sand, 0 to 2 percent slopes
Claverack loamy fine sand, 2 to 6 percent slopes
Collamer silt loam, 0 to 2 percent slopes
Collamer silt loam, 2 to 6 percent slopes
Collamer silt loam, loamy subsoil variant, 0 to 2 percent slopes
Collamer silt loam, loamy subsoil variant, 2 to 6 percent slopes
Cosad loamy fine sand
Dunkirk silt loam, 2 to 6 percent slopes
Edwards muck
Eel silt loam
Galen very fine sandy loam, 0 to 2 percent slopes
Galen very fine sandy loam, 2 to 6 percent slopes
Genesee silt loam
Hamlin silt loam
Hilton fine sandy loam, 0 to 3 percent slopes
Hilton fine sandy loam, 3 to 8 percent slopes
Hilton loam, 0 to 3 percent slopes
Hilton loam, 3 to 8 percent slopes
Honeoye silt loam, 3 to 8 percent slopes
Honeoye silt loam, limestone substratum, 0 to 3 percent slopes
Honeoye silt loam, limestone substratum, 3 to 8 percent slopes
Hudson silt loam, 2 to 6 percent slopes
Ira gravelly fine sandy loam, 0 to 6 percent slopes
Lima silt loam, 0 to 3 percent slopes
Lima silt loam, 3 to 8 percent slopes
Lima and Cazenovia silt loams, limestone substratum, 0 to 6 percent slopes
Madrid fine sandy loam, 0 to 3 percent slopes
Madrid fine sandy loam, 3 to 8 percent slopes
Massena fine sandy loam
Minoa very fine sandy loam
Muck, deep
Niagara silt loam, loamy subsoil variant
Odessa silt loam, 0 to 2 percent slopes
Odessa silt loam, 2 to 6 percent slopes
Ontario fine sandy loam, 3 to 8 percent slopes
Ontario loam, 3 to 8 percent slopes
Ovid silt loam
Ovid and Appleton silt loams, limestone substratum

Monroe County, New York (continued)

Mapping Units

Palmyra gravelly fine sandy loam, 0 to 3 percent slopes
Palmyra gravelly fine sandy loam, 3 to 8 percent slopes
Palmyra gravelly loam, 3 to 8 percent slopes
Phelps gravelly fine sandy loam, 0 to 3 percent slopes
Phelps gravelly fine sandy loam, 3 to 8 percent slopes
Rhinebeck silt loam
Schoharie silt loam, 0 to 2 percent slopes
Schoharie silt loam, 2 to 6 percent slopes
Sodus gravelly fine sandy loam, 2 to 8 percent slopes

Source: Monroe County Soil Survey, Issued March 1973.

PRIME FARMLAND

Niagara County, New York

Mapping Units

Altmar gravelly fine sandy loam
Altmar loamy fine sand
Appleton gravelly loam, 0 to 3 percent slopes
Appleton silt loam, 0 to 3 percent slopes
Arkport very fine sandy loam, 0 to 6 percent slopes
Arkport fine sandy loam, gravelly substratum, 0 to 2 percent slopes
Arkport fine sandy loam, gravelly substratum, 2 to 6 percent slopes
Bombay fine sandy loam, 0 to 2 percent slopes
Bombay fine sandy loam, 2 to 6 percent slopes
Canandaigua silt loam
Canandaigua silty clay loam
Cayuga and Cazenovia silt loams, 0 to 2 percent slopes
Cayuga and Cazenovia silt loams, 2 to 6 percent slopes
Cazenovia gravelly silt loam, 0 to 3 percent slopes
Cazenovia gravelly silt loam, 3 to 8 percent slopes
Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes
Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes
Collamer silt loam, 0 to 2 percent slopes
Collamer silt loam, 2 to 6 percent slopes
Dunkirk silt loam, 2 to 6 percent slopes
Elnora loamy fine sand, 0 to 2 percent slopes
Elnora loamy fine sand, 2 to 6 percent slopes
Fredon gravelly loam
Galen very fine sandy loam, 0 to 2 percent slopes
Galen very fine sandy loam, 2 to 6 percent slopes
Hamlin silt loam
Hilton gravelly loam, 0 to 3 percent slopes
Hilton gravelly loam, 3 to 8 percent slopes
Hilton silt loam, 0 to 3 percent slopes
Hilton silt loam, 3 to 8 percent slopes
Howard gravelly loam, 0 to 3 percent slopes
Howard gravelly loam, 3 to 8 percent slopes
Hudson silt loam, 2 to 6 percent slopes
Lamson very fine sandy loam
Lamson fine sandy loam, gravelly substratum
Massena fine sandy loam
Monoa very fine sandy loam
Niagara silt loam, 0 to 2 percent slopes
Niagara silt loam, 2 to 6 percent slopes
Ontario loam, 2 to 8 percent slopes
Ontario loam, limestone substratum, 0 to 3 percent slopes
Ontario loam, limestone substratum, 3 to 8 percent slopes
Ovid silt loam, 0 to 2 percent slopes
Ovid silt loam, 2 to 6 percent slopes
Ovid silt loam, limestone substratum, 0 to 3 percent slopes
Ovid silt loam, limestone substratum, 3 to 8 percent slopes

PRIME FARMLAND (continued)

Niagara County, New York

Phelps gravelly loam, 0 to 5 percent slopes
Raynham silt loam, 0 to 2 percent slopes
Raynham silt loam, 2 to 6 percent slopes
Rhinebeck silt loam, 0 to 2 percent slopes
Rhinebeck silt loam, 2 to 6 percent slopes
Rhinebeck silt loam, thick surface variant
Schoharie silty clay loam, 2 to 6 percent slopes

Source: Niagara County Soil Survey, Issued October 1972.

PRIME FARMLAND

Orange County, New York

Mapping Units

Allard silt loam, 0 to 3 percent slopes
Allard silt loam, 3 to 8 percent slopes
Barbour fine sandy loam
Basher fine sandy loam
Carlisle muck
Carlisle muck, very deep
Castile gravelly silt loam, 0 to 3 percent slopes
Castile gravelly silt loam, 3 to 8 percent slopes
Charlton fine sandy loam, 3 to 8 percent slopes
Chenango gravelly silt loam, 0 to 3 percent slopes
Chenango gravelly silt loam, 3 to 8 percent slopes
Collamer silt loam, 3 to 8 percent slopes
Fredon loam
Mardin gravelly silt loam, 3 to 8 percent slopes
Middlebury silt loam
Palms muck
Pittsfield gravelly loam, 3 to 8 percent slopes
Raynham silt loam
Rhinebeck silt loam, 0 to 3 percent slopes
Rhinebeck silt loam, 3 to 8 percent slopes
Riverhead sandy loam, 0 to 3 percent slopes
Riverhead sandy loam, 3 to 8 percent slopes
Scio silt loam, 0 to 3 percent slopes
Scio silt loam, 3 to 8 percent slopes
Swartswood gravelly loam, 3 to 8 percent slopes
Tioga silt loam
Unadilla silt loam, 0 to 8 percent slopes
Wurtsboro gravelly loam, 3 to 8 percent slopes

Source: Orange County Soil Survey (manuscript).

PRIME FARMLAND

Orleans County, New York

Mapping Units

Appleton silt loam, 0 to 3 percent slopes
Appleton silt loam, 3 to 8 percent slopes
Arkport very fine sandy loam, 0 to 6 percent slopes
Bombay fine sandy loam, 0 to 3 percent slopes
Bombay fine sandy loam, 3 to 8 percent slopes
Carlisle muck
Cayuga silt loam, 2 to 6 percent slopes
Cazenovia silt loam, 0 to 3 percent slopes
Cazenovia silt loam, 3 to 8 percent slopes
Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes
Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes
Churchville silt loam, 0 to 2 percent slopes
Churchville silt loam, 2 to 6 percent slopes
Claverack loamy fine sand, 0 to 6 percent slopes
Collamer silt loam, 0 to 2 percent slopes
Collamer silt loam, 2 to 6 percent slopes
Cosad loamy fine sand
Edwards muck
Fredon loam
Galen very fine sandy loam, 0 to 2 percent slopes
Galen very fine sandy loam, 2 to 6 percent slopes
Hamlin silt loam
Hilton loam, 0 to 3 percent slopes
Hilton loam, 3 to 8 percent slopes
Hilton loam, rock substratum, 0 to 3 percent slopes
Hilton loam, rock substratum, 3 to 8 percent slopes
Howard gravelly loam, 3 to 8 percent slopes
Madrid fine sandy loam, 3 to 8 percent slopes
Massena fine sandy loam
Minoa very fine sandy loam
Niagara silt loam, 0 to 2 percent slopes
Niagara silt loam, 2 to 6 percent slopes
Odessa silt loam, 0 to 2 percent slopes
Odessa silt loam, 2 to 6 percent slopes
Ontario loam, 3 to 8 percent slopes
Ontario loam, rock substratum, 0 to 8 percent slopes
Ovid silt loam, 0 to 3 percent slopes
Ovid silt loam, 3 to 8 percent slopes
Ovid silt loam, shale substratum, 0 to 4 percent slopes
Palms muck
Phelps gravelly fine sandy loam
Rhinebeck silt loam, 0 to 2 percent slopes
Rhinebeck silt loam, 2 to 6 percent slopes
Schoharie silt loam, 2 to 6 percent slopes
Teel silt loam
Wampsville gravelly loam, 3 to 8 percent slopes

Sources: Orleans County Soil Survey (manuscript).

PRIME FARMLAND

Oswego County, New York

Mapping Units

Alton gravelly fine sandy loam, 0 to 3 percent slopes
Alton gravelly fine sandy loam, 3 to 8 percent slopes
Alton gravelly silt loam, 3 to 8 percent slopes
Amboy very fine sandy loam, 2 to 6 percent slopes
Carlisle muck
Elmwood fine sandy loam, 2 to 6 percent slopes
Fredon gravelly fine sandy loam
Herkimer shaly silt loam, 2 to 8 percent slopes
Hudson silt loam, 2 to 6 percent slopes
Ira gravelly fine sandy loam, 0 to 3 percent slopes
Ira gravelly fine sandy loam, 3 to 8 percent slopes
Massena silt loam
Middlebury loam
Minoa very fine sandy loam
Minoa fine sandy loam, moderately well drained variant, 0 to 6 percent slopes
Palms muck
Raynham silt loam, 0 to 6 percent slopes
Sodus gravelly fine sandy loam, 3 to 8 percent slopes
Williamson very fine sandy loam, 0 to 2 percent slopes
Williamson very fine sandy loam, 2 to 6 percent slopes

Source: Oswego County Soil Survey (manuscript).

PRIME FARMLAND

Putnam, Rockland, and Westchester Counties, New York

Mapping Units

Agawam fine sandy loam, 2 to 8 percent slopes
Charlton fine sandy loam, 2 to 8 percent slopes
Cheshire gravelly sandy loam, 2 to 8 percent slopes
Haven loam, 0 to 3 percent slopes
Haven loam, 3 to 8 percent slopes
Paxton fine sandy loam, 2 to 8 percent slopes
Sodus gravelly fine sandy loam, 2 to 8 percent slopes
Stockbridge gravelly fine sandy loam, 0 to 3 percent slopes
Stockbridge gravelly fine sandy loam, 3 to 8 percent slopes
Sutton fine sandy loam, 0 to 3 percent slopes
Sutton fine sandy loam, 3 to 8 percent slopes
Watchaug fine sandy loam
Woodbridge fine sandy loam, 0 to 3 percent slopes
Woodbridge fine sandy loam, 3 to 8 percent slopes

Source: Putnam, Rockland, and Westchester Counties Soil Survey (manuscript).

PRIME FARMLAND

Rensselaer County, New York

Mapping Units

Albrights silt loam, 3 to 8 percent slopes
Belgrade very fine sandy loam, 0 to 3 percent slopes
Belgrade very fine sandy loam, 3 to 8 percent slopes
Bernardston gravelly silt loam, 3 to 8 percent slopes
Castleton gravelly silt loam
Chenango gravelly loam, 0 to 3 percent slopes
Chenango gravelly loam, 3 to 8 percent slopes
Elmwood very fine sandy loam, 0 to 3 percent slopes
Elmwood very fine sandy loam, 3 to 8 percent slopes
Fredon silt loam
Hamlin silt loam
Hartland silt loam, 0 to 3 percent slopes
Hartland silt loam, 3 to 8 percent slopes
Haven silt loam, 0 to 3 percent slopes
Haven silt loam, 3 to 8 percent slopes
Pittstown gravelly silt loam, 3 to 8 percent slopes
Rayhnam silt loam
Rhinebeck silt loam, 0 to 3 percent slopes
Rhinebeck silt loam, 3 to 8 percent slopes
Riverhead fine sandy loam, 0 to 3 percent slopes
Riverhead fine sandy loam, 3 to 8 percent slopes
Swanton very fine sandy loam
Teel silt loam

Source: Rensselaer County Soil Survey (in progress).

PRIME FARMLAND

St. Lawrence County, New York

Soil Associations ^{1/}

Collamer-Niagara Association, gently sloping

Elmwood-Swanton Association, gently sloping

Kars Association, gently sloping

Niagara-Collamer Association, nearly level

Rhinebeck Association, nearly level

Source: General Soil Map, St. Lawrence County, New York,
US.D.A., Soil Conservation Service in cooperation
with Cornell University Agricultural Experiment Station.

^{1/} The underlined members of the soil association are considered
to be the prime farmland soils.

PRIME FARMLAND

Suffolk County, New York

Mapping Units

Bridgehampton silt loam, 0 to 2 percent slopes
Bridgehampton silt loam, 2 to 6 percent slopes
Bridgehampton silt loam, till substratum, 2 to 6 percent slopes
Haven loam, 0 to 2 percent slopes
Haven loam, 2 to 6 percent slopes
Haven loam, thick surface layer
Montauk fine sandy loam, 0 to 3 percent slopes
Montauk fine sandy loam, 3 to 8 percent slopes
Montauk silt loam, 0 to 3 percent slopes
Montauk silt loam, 3 to 8 percent slopes
Plymouth loamy sand, silty substratum, 0 to 3 percent slopes
Plymouth loamy sand, silty substratum, 3 to 8 percent slopes
Raynham loam
Riverhead sandy loam, 0 to 3 percent slopes
Riverhead sandy loam, 3 to 8 percent slopes
Scio silt loam, till substratum, 2 to 6 percent slopes
Scio silt loam, sandy substratum, 0 to 2 percent slopes
Scio silt loam, sandy substratum, 2 to 6 percent slopes
Sudbury sandy loam
Wallington silt loam, till substratum

Source: Suffolk County Soil Survey, Issued April 1975.

PRIME FARMLAND

Ulster County, New York

Mapping Units

Barbour loam
Basher silt loam
Cambridge gravelly silt loam, 3 to 8 percent slopes
Castile gravelly silt loam, 0 to 3 percent slopes
Castile gravelly silt loam, 3 to 8 percent slopes
Cayuga silt loam, 3 to 8 percent slopes
Chenango gravelly silt loam, 0 to 3 percent slopes
Chenango gravelly silt loam, 3 to 8 percent slopes
Hamlin silt loam
Haven loam
Hudson silt loam, 3 to 8 percent slopes
Mardin gravelly silt loam, 3 to 8 percent slopes
Middlebury silt loam
Pompton fine sandy loam
Riverhead fine sandy loam, 0 to 3 percent slopes
Riverhead fine sandy loam, 3 to 8 percent slopes
Schoharie silt loam, 3 to 8 percent slopes
Scio silt loam
Teel silt loam
Tioga fine silt loam
Tunkhannock gravelly loam, 0 to 3 percent slopes
Tunkhannock gravelly loam, 3 to 8 percent slopes
Tunkhannock gravelly loam, clayey substratum, 3 to 8 percent slopes
Unadilla silt loam
Williamson silt loam, 0 to 3 percent slopes
Williamson silt loam, 3 to 8 percent slopes

Source: Ulster County Soil Survey (manuscript).

PRIME FARMLAND

Wayne County, New York

Mapping Units

Alton gravelly sandy loam, 0 to 3 percent slopes
Alton gravelly sandy loam, 3 to 8 percent slopes
Appleton loam, 0 to 5 percent slopes
Bombay gravelly fine sandy loam, 0 to 3 percent slopes
Bombay gravelly fine sandy loam, 3 to 8 percent slopes
Carlisle muck
Cazenovia silt loam, 3 to 8 percent slopes
Cazenovia gravelly silt loam, bedrock substratum, 0 to 3 percent slopes
Cazenovia gravelly silt loam, bedrock substratum, 3 to 8 percent slopes
Collamer silt loam, 2 to 6 percent slopes
Dunkirk silt loam, 2 to 6 percent slopes
Edwards muck
Fredon loam
Hamlin silt loam
Hilton gravelly loam, 0 to 3 percent slopes
Hilton gravelly loam, 3 to 8 percent slopes
Hilton gravelly loam, bedrock substratum, 0 to 3 percent slopes
Hilton gravelly loam, bedrock substratum, 3 to 8 percent slopes
Ira gravelly fine sandy loam, 0 to 3 percent slopes
Ira gravelly fine sandy loam, 3 to 8 percent slopes
Madrid gravelly fine sandy loam, 2 to 8 percent slopes
Massena gravelly loam, 0 to 3 percent slopes
Massena gravelly loam, 3 to 8 percent slopes
Minoa very fine sandy loam
Niagara silt loam
Ontario gravelly loam, 3 to 8 percent slopes
Ovid silt loam, 0 to 3 percent slopes
Ovid silt loam, 3 to 8 percent slopes
Palmyra gravelly loam, 0 to 3 percent slopes
Palmyra gravelly loam, 3 to 8 percent slopes
Phelps gravelly loam, 0 to 3 percent slopes
Phelps gravelly loam, 3 to 8 percent slopes
Sodus gravelly fine sandy loam, 3 to 8 percent slopes
Teel silt loam
Wallington silt loam
Williamson silt loam, 0 to 2 percent slopes
Williamson silt loam, 2 to 6 percent slopes

Source: Wayne County Soil Survey (manuscript).