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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

A METHOD FOR COASTAL RESOURCE MANAGEMENT

A Pilot Study of Lower Cape May County

A Staff Report
JULY 1978

New Jersey
Department of Environmental Protection
Division of Marine Services
Office of Coastal Zone Management

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July 1978

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ABSTRACT

This report has two objectives, the development of a general planning method applicable to the whole coast, and an illustration of the spatial implications of the method in the pilot area in Lower Cape May County.

The report describes a method for formulating balanced land and water use policies for New Jersey's coastal areas that will accomodate development in locations desired by developers without unacceptable losses of valued resources. The report illustrates how the method works using a pilot area in Lower Cape May County and presents a recommended distribution of land and water use in that area.

The structure of the method is basically simple. Two impact analyses - environmental and socio-economic - describe the changes caused by the introduction of new uses into different types of locations. A value analysis identifies goals and objectives towards coastal resources and processes. A constraint synthesis combines the impact and value analyses and identifies which changes are of concern and where and how uses should be constrained if valued resources and processes are to be protected. This part of the method incorporates only the conservation viewpoint with no consideration of the needs of development.

An opportunity analysis identifies which natural and cultural land and water factors developers look for when siting uses, and indicates where these resources are to be found. This part of the method represents the development viewpoint, with no consideration of the impact of development on resources.

These two parts, constraint and opportunity analyses, are then brought together in a suitability synthesis. Conflicts are identified. Solutions and tradeoffs proposed within a systematic structure.

Section 1 classifies coastal land and water uses for study.

Section 2 classifies coastal locations, both environmental and socio-economic, into land and water types. The environmental and cultural factors that determine types, and the distribution of types, are mapped in the pilot area.

Section 3 discusses procedures for recording the environmental and socio-economic impacts of uses.

Section 4 outlines the techniques used by DEP-OCZM for understanding coastal values and presents a preliminary list of proposed coastal objectives. The distribution of valued resources is then mapped in the pilot area.

Section 5 assesses the extent to which the impacts of development adversely affect the realization of coastal environmental objectives in differently valued land and water types. The types are placed in order of relative environmental sensitivity, from high to low. The distribution of environmental sensitivity, or constraint to development, is mapped in the pilot area. This section also discusses factors and the way these may be used to produce a socio-economic element.

Section 6 introduces the concept of opportunity, or development potential. The natural and cultural factors that favor the development of two illustrative uses, housing and marinas, are identified and their distribution in the pilot area mapped. The cost implications of factor variations are assessed and cost synthesis maps prepared showing the distribution of opportunity, or development potential, for housing and marinas in the study area.

Section 7 compares the degree of environmental sensitivity with the degree of development potential and describes a technique that can balance the conflicts and assess the acceptability or suitability of a use in a land or water type. Maps are shown showing the distribution of suitability for housing and marinas in the pilot area.

This section also discusses the inclusion of additional criteria to address socio-economic variations and the conflicts arising from juxtaposing incompatible uses, and an approach for resolving conflicts is proposed. The conflicts arising from use-competition in scarce land or water types are discussed and criteria for resolution are proposed.

Section 8 discusses possible uses for the method in coastal resource management.

The Appendices, included in a separate volume, provide additional basis and background material for the main sections of this report.

Appendix A defines the major technical words used in this report. Some special terms are necessary to explain the analysis, though these have been kept to a minimum, and some common words are used with greater precision of meaning than is usual. This glossary provides clarification and definition.

Appendix B, which is the background for Section 2, Coastal Locations, classifies land and water types and provides a brief description of each. Some of the data sources for the classification of socio-economic subregions are listed.

Appendix C, which is the background for Section 4, Value Analysis, lists the definitions of specially valued areas and the areas nominated by the public as being of particular coastal concern.

Appendix D, which is the background for Section 5, Constraint Synthesis, lists the land and water types that have different environmental sensitivity, or constraint to development, and assigns to each a ranking representing the relative degree of sensitivity.

Appendix E, which is the background for Section 6, Opportunity Analysis, records the findings of a DEP-OCZM questionnaire to coastal developers identifying siting factors, lists the varying development costs associated with each factor variation for the illustrative uses, housing and marinas, and discusses the next steps planned for opportunity analysis.

Appendix F, which is the background for Section 7, Opportunity-Constraint Synthesis, discusses the spatial implications for land and water use distribution of varying the several matrices used to combine the factor maps.

Appendix G, which is the background for Section 8, Suitability Resolution, illustrates one use of the method by analyzing a case study of a permit application received by NJDEP-OCZM under the authority of the CAFRA act.

Appendix H records the time and cost expenditures in preparing the analysis maps and includes a fold out flow chart illustrating how the maps were combined in the various analysis steps.

PURPOSE

A. Introduction

Since late 1973, the New Jersey Department of Environmental Protection, Office of Coastal Zone Management (DEP-OCZM) has been working toward the goal of preparing a comprehensive management program for the coast of New Jersey. This program includes data collection and distribution, and interpretation of data for planning purposes, proposed policy and legislation, coordination between different levels of government, experimentation with different implementation techniques and, at all stages, citizen input from both public and private sector interest groups and individuals.

In late 1976 work began on the planning method presented in this report. The purpose of the method was to detail a framework that could combine information about the resources and processes of the natural and social environment and human values, predict the implications of alternative locations of land and water use and recommend a coherent set of policies that could be applied coast-wide based on the understanding gained from the study.

The Inventory of the Coastal Area - 1975, completed in September 1975 provided much of the data. State issue papers, summarized in Alternatives for the Coast - 1976 completed in September 1976, combined with program of meetings and a mailing outreach to identify values and alternative solutions to perceived coastal problems. The Coastal Management Strategy for New Jersey - CAFRA Area of 1977 is, in part, based on this study.

This pilot study has several inter-related purposes:

1. To develop a systematic method for determining the acceptability of coastal develoment of site specific and generic land and water types in the New Jersey Coastal Zone.

2. To assist the formulation of coastal land and water use policies as part of the management strategy required by the New Jersey CAFRA and management program and the federal CZM.

3. To apply the method in a pilot area, identifying problems in using the method and exploring the spatial implications of alternate policies developed using the method.

4. To establish the framework for further coastal planning.

B. The Pilot Study and the Coastal Management Strategy

This pilot study helped formulate the Coastal Location Acceptability Method (CLAM) outlined in the Coastal Management Strategy for N.J. - CAFRA Area published by NJDEP in September 1977.

CLAM is outlined in the Coastal Management Strategy in Section Three, Coastal Policies, on page 44. Section Six of the Basis and Background on page 127 goes into more detail and Appendix Four outlines this report.

CLAM is a method that roughly measures the environmental sensitivity (called constraint in this study), and the development potential (called opportunity here) of a location and combines the two to assess the level of acceptability (called suitability here) of a particular use-location proposal.

The structure of CLAM and most of the detail is identical to the method outlined here. This report may be used by those wishing to gain a greater understanding of CLAM.

This study discusses in some detail the decisions made in the process of designing CLAM and where further debate on CLAM development could concentrate. A complete listing of the levels of environmental sensitivity of land and water types is included in Appendix E, and the way in which the development potential may be measured is illustrated for housing and marinas in Section 6. Maps in Section 7 illustrate the geographical distribution of acceptability in the pilot area.

Although much detail is presented here it should be emphasized that the development of CLAM is not complete. DEP-OCZM plans extensive public discussion and contractual studies in order to detail and refine this process.

C. Structure and Steps of The Planning Method

This section discusses briefly the structure of the planning method described here, the questions asked in each step, and the way the answers are combined to make recommendations for the distribution of land and water use.

A planning method is an orderly set of tasks that assembles data on uses, locations and natural and social processes into a structure that models the working of the built and natural environment. This structure, when combined with values and objectives, can inform decisions on the desirable location and modes of construction and operation of uses.

A planning method is not a mysterious "black box" that makes infallible decisions. Nor does a method remove the need for judgement. By linking the dynamic relationships of the environment, a method can, however, predict the implications of introducing new land and water uses and identify which values may be affected.

An example may illustrate how this method works. An important coastal value is expressed as the conservation and enhancement of marine fish populations. From the study of shore and marine ecosystems, it is clear that fish populations depend upon the preservation of estuarine spawning and nursery grounds; these in turn depend on nutrients flushed from the coastal marshes, which are affected by the physical and chemical quality of the water flowing from the land. Water quality in coastal streams depends largely on how and where uses are placed and operated in coastal watersheds. A method can link these dependencies, recording the best scientific understanding available, and can identify which uses in which locations impact the coastal fish populations. However, until the conservation of fish is introduced as a valued objective, no use-location recommendations can be made. The method itself provides only information upon which to base judgement, linking values to use-locations.

The basic questions asked in each step and the structure of the various steps of the method are outlined below.

1. Coastal Uses. What uses, or types of use, are to be studied?

Human land and water use is extremely varied and changes constantly as new technology is introduced. This is particularly true of industrial uses. The first task of the planning method is to study how uses may be grouped into a usable number of categories for analysis. Decisions must be made as to how many different types are needed to provide sufficient precision to manage the coast and yet the list of uses must be simple enough to produce usable results within the time and cost constraints of New Jersey's Coastal Zone Program.

The classification is based on six very general use classes:

1. Housing
2. Commerce and Services
3. Industry
4. Harvest of Living Resources (Agriculture, Forestry and Commercial Fishing)
5. Recreation
6. Infrastructure

2. Coastal Locations. What locations, or types of location, are to be studied?

A geographic location can be thought of as the intersection of natural and social processes at a point in time. Water and air circulation, geologic and soil processes, sunlight, photosynthesis and the movement of energy and materials through predator-prey relationships are among the natural processes. Human processes include the construction and operation of settlement and infrastructure, and economic and social interactions. Both natural and social processes are dynamic. Energy, materials, money or information are in constant movement through them. The visible form is the changing physical expression of the interaction between these different kinds of movement. In order to manage the form, it is necessary to manage the processes.

Different mixtures of natural and social resources and processes create different sub-systems. These systems have varying responses to human activities and provide dissimilar opportunities for land and water uses. A beach, for example is a different system from a marsh, and the undisturbed barrier island of Island Beach State Park is different from the barrier island at the center of Atlantic City.

The next task of this planning method is to identify the way in which locations can be grouped into a usable number of significantly different types for analysis. The natural and social variables that are relevant to the planning study, such as substrate properties and population density, must be identified and decisions made on how much variation constitutes a significant difference.

There are, for example, several different kinds of marsh, depending on water depth, flushing rate, nature of adjoining water body and extent of human disturbance. As with the classification of uses, precision and simplicity pull against one another and decisions must be made as to how many different types of location to study.

As will be seen in the discussion of each analysis, locations are defined differently depending on the type of analysis to be done.

3. Impact Analyses.

(a) What activities during the construction or operation of uses cause environmental or socio-economic changes in locations?

(b) What environmental or socio-economic changes are the immediate result of these activities?

(c) What subsequent environmental or socio-economic changes are causally related to the initial impact?

Without the introduction of human uses, or catastrophic natural disturbances, locations progress towards a slowly changing equilibrium between the natural systems operating. The introduction of a human use in the time scales of natural processes is a sudden disturbance, rather like throwing a stone into a pond. The initial impact is the splash and the disturbances that spread out through processes are the ripples.

Again an example may clarify this concept. The building of new housing in a coastal watershed may have the initial environmental impact of destroying vegetation and paving the soil surface, the ripples of impact may be such related disturbances as increased surface runoff and erosion, increased flooding and turbidity in streams, decreased marsh productivity and decreased marine fish populations.

The social and economic processes of a settled area may be thought of as another kind of pond into which a use can be thrown. The initial social impact may be from the planning, financing and construction activities of the new use. Once the use is operating, ripples may spread through social and economic systems. A new industry, for example, may provide jobs and tax revenue, strain the capacity of the service infrastructure, and alter the social patterns of the location.

The planning method identifies these environmental and socio-economic impacts. The causal chains, or ripples of impact from the use are followed through the environment and the socio-economic systems.

4. Value Analysis.

(a) Which coastal resources and processes are valued?

(b) What goals and objectives would protect these values?

(c) How important are the objectives relative to one another?

Environmental and socio-economic impact descriptions say how a use may change a location but do not assess whether the changes are desirable or undesirable. In order to do this, values must be introduced. Coastal values may be concerned with natural resources such as marine life, or social resources, such as an historic area, or towards natural processes, such as flooding, or socio-economic processes, such as employment.

The most practical way to understand the implications of a value for planning is to translate it into an objective, or desired end product, which, if achieved, would safeguard the valued elements of the built or natural environment. Thus the above examples of value could be expressed as: maintain marine species diversity and population levels, preserve the historic district, control flood levels, and maintain and enhance employment opportunities.

Once these objectives are identified, the changes (impacts) caused by uses may be compared with them and those changes that adversely or beneficially affect the realization of goals and objectives can be recorded. Any change that affects the realization of an objective either adversely or beneficially is of concern and, if coastal objectives are to be realized, these changes of concern must be managed.

5. Constraint Synthesis.

(a) Which changes generated by the introduction of new uses into location types adversely or beneficially affect realization of goals and objectives?

(b) What level, and kind, of development management is needed in different location types to minimize adverse, and maximize beneficial impacts?

By studying the degree of use restriction needed to reduce the changes caused by new or established uses in various locations to acceptable levels, the comparative sensitivity of locations (their capacity to withstand both environmental and socio-economic impacts before values are affected) may be understood. This comparative sensitivity sets varying degrees of constraint to the placing of uses in different locations if valued resources are to be preserved. Some uses generate predominantly beneficial socio-economic impacts implying a negative constraint, or promotion of the use.

6. Opportunity Analysis.

(a) Given complete freedom of choice, except from the market, without consideration of impact or regulation, what is the best place, or kind of place, for coastal uses?

(b) What are the factors of the built or natural environment that contribute to this optimum location?

(c) What are the cost implications of the presence or absence of these desired factors?

The constraint study identifies where it is desirable that uses should not go, or should be placed with care. The needs of the uses themselves and where the use developers wish to locate the uses are not addressed. The absence of constraint (a location insensitive to impact) is not an indication that this is a desirable use location to anyone except the resource manager.

For a use to be built and operate successfully, certain elements of the built and natural environment are required and others desired. The presence of these elements in a location can be used to indicate a high opportunity for the use, the absence to indicate a low opportunity. Housing for example requires access to roads and other infrastructure, schools, shops and employment, and desires access to recreation, surface water, trees and rolling topography. Sites with all these opportunity factors offer higher opportunity to the housing developer than those without them.

7. Opportunity - Constraint Synthesis and Conflict Resolution.

(a) Where both opportunity and environmental constraint are high for a use in a location, how may the conflict be overcome?

Opportunity and constraint are both important when considering the optimum location for a use. Variations in opportunity can be compared with variations of constraint. Conflicts can be identified and criteria established for resolving them. For example, marshes near roads may offer high constraint to marinas as well as high opportunity. Decisions must be made to resolve the conflict.

(b) How may the understanding of adverse and beneficial socio-economic impacts modify use acceptability?

i) Which uses should be completely excluded from certain socio-economic sub-regions because of overwhelmingly adverse socio-economic impacts?

ii) Which uses should be promoted in certain socio-economic sub-regions because of beneficial socio-economic impacts?

iii) What buffers should be provided between proposed and existing uses to ensure optimum functioning of adjacent uses?

Uses generate both adverse and beneficial socio-economic impacts. This part of the method provides a screen that maximizes beneficial and minimizes adverse impacts when making decisions on use acceptability.

Uses have varying degrees of compatibility with one another. Conflicts may arise between proposed and existing uses and critieria for resolving these must be established.

(c) Where a location is equally suitable both from the environmental and socio-economic view point for several uses, which is preferred?

A location may be highly suitable for several different uses and when there is competition for scarce locations another kind of conflict occurs that must be resolved.

The way in which opportunity and constraint are combined and the criteria for conflict resolution may then become the basis for coastal use-location policy.

8. Suitability Resolution

(a) From the answers to Step 7, what is the preferred order or priority of uses for locations?

(b) Which is the most highly preferred use?

(c) Which uses could be acceptable if certain impact control procedures were included?

(d) Which uses are entirely unacceptable?

This step collects the conclusions of the previous steps and identifies preferred uses or use groups in each location type.

These conclusions can then become the basis for master planning.

These eight steps are summarized and the relationships between them illustrated in the following flow chart (Figure 1). The chart appears at the beginning of each major section throughout the report to explain how the section fits into the whole process.

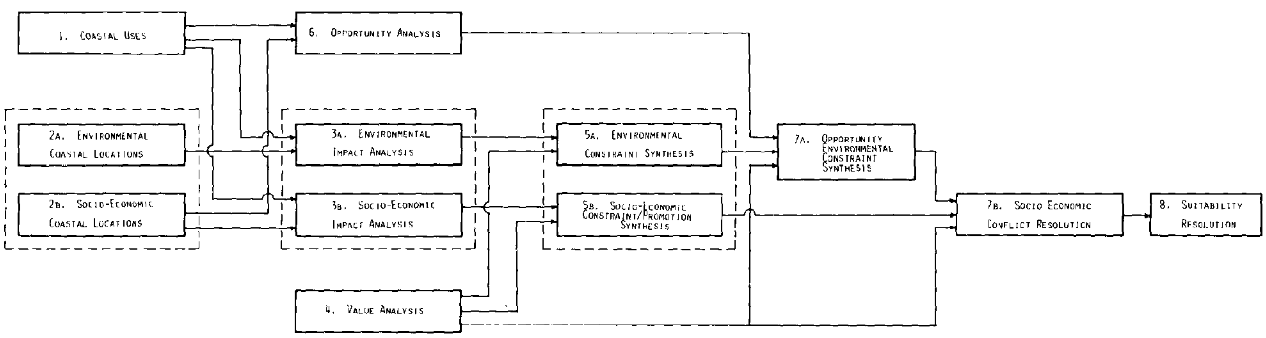


Figure 1 Flow Charts of Steps in the Planning Method

D. The Federal Coastal Zone Management Act

P.L. 92-583, the Federal Coastal Zone Management Act states that the main goal of coastal planning management should be "to preserve, protect, develop and where possible restore and enhance the resources of the Nation's coastal zone for this and succeeding generations". The dual goal of protection and development requires a method that can resolve the conflicts between the two and the method set out here has these balancing elements.

The Act goes on to require certain planning products:

Coastal Zone Boundary.

The guidance given to states by the federal law on the inland extent of the coastal zone, the most difficult to establish, is that the "zone extends inland from the shoreline only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters".

The key words here are "direct" and significant". This method defines these words as follows:

Direct Impact

- A measurable change in the natural or built environment that is either the immediate result of the introduction of a use or related to it through a direct chain of cause and effect.

These impacts are identified in this method in the environment and socio-economic impact analyses.

Significant Impact

- A measurable change in the natural or built environment directly caused by the introduction of a use that adversely or beneficially affects the realization of a coastal objective.

The objectives are identified in the value analysis and compared in the constraint synthesis with the direct impacts of uses defined above.

If these direct and significant impacts, and the use-location combinations that produce them, are understood, boundary recommendations can be made.

Geographic Areas of Particular Concern

The federal law requires that areas of particular concern be identified and priorities set within these areas for the acceptability of uses, particularly for uses likely to be unacceptable. The value analysis and constraint synthesis of this method identify both generic and site specific areas of particular value and the suitability resolution sets priorities for use in these areas.

Permissibility of Use

The federal law requires that there be an explicit method for the determination of use permissibility in all areas within the coastal zone for uses of greater than local significance.

The impact analyses of this method indicate which uses may produce impacts that extend beyond the area of the use and the whole method provides a structure to recommend use permissibility.

E. The Pilot Study

Once the general conceptual framework linking the planning tasks as outlined above was established the next step was to select a pilot area in which the method could be tested to establish that the required answers could be produced and to refine and simplify the steps.

A pilot area was needed that was representative of the coastal zone, had a good existing data base, a wide variety of land and water types and high pressures to develop a variety of potential uses.

Three alternatives were considered, Dover Township in Ocean County; an area in Lower Cape May County containing the Townships of Lower, City of Cape May, Cape May Point and West Cape May; and thirdly Atlantic City.

Lower Cape May County proved to have the greatest diversity of land and water types. There is continuing pressure there to develop a variety of land and water uses including housing, campgrounds, marinas and the possibly Outer Continental Shelf (OCS) exploration support bases and major energy facilities. For these reasons DEP-OCZM selected this area.

DEP-OCZM designed the pilot study to provide an illustrative application of the planning method and a forum to develop details. This report aims to draw attention to the form more than the content of the study.

This pilot sudy was completed in six months with the equivalent of about six full-time professional staff.

F. Related Studies

It is important to note that not all the steps of the planning method described above are equally developed in this pilot study. The classification of coastal uses and locations, a preliminary qualitative ranking of environmental constraint, and opportunity analysis and suitability synthesis for housing and marinas, are all steps that are well developed.

There are, however, important omissions, which are either subjects of present or proposed contractural studies. When the results of these studies are incorporated into the method, some of the conclusions of this preliminary study will certainly be modified, although the structure set out here will remain as a basis.

There are three major studies that have been designed to fill gaps in this pilot.

1. Estuarine Study.

Tasks specified in this study include: (a) a refinement of the use and location classifications; (b) detailed study of causal chains of environmental impact; (c) refining the matrix technique outlined in Section 3a and extending this to all location types; (d) a refinement and weighting of coastal environmental objectives; (e) a more systematic method for ranking the relative environmental sensitivity of different locations; and (f) a proposed refinement of location policy based on these findings.

2. Socio-Economic Study

This study is designed to fill a major and important gap in the pilot work outlined in this report. In this report the suitability of locations for uses is determined by balancing the environmental sensitivity of a location to use impacts against the opportunity, or development potential, of the location for the use. No systematic consideration is given to adverse or beneficial social and economic impacts nor to how this consideration should be balanced against environmental sensitivity or development potential.

Another important consideration beyond the scope of a single pilot area is the way in which regional socio-economic variations should alter the criteria for the suitability of use-locations.

These are clearly critical considerations that must enter the calculations of use-suitability. The reason that they are only lightly touched on in this report is not that DEP-OCZM considers them unimportant, but rather that they are of such importance that is was felt that the best-qualified specialists should be sought to study them.

Tasks included in the proposed socio-economic study include: (a) the identification of subregions where the socio-economic response to new uses is significantly different; (b) a study of the social and economic impacts of uses and a determination as to which are, or are perceived to be, adverse or beneficial; (c) procedures by which this socio-economic understanding can influence the suitability of new use placement; and (d) recommendations for varying use-location criteria in different socio-economic sub-regions.

The study calls for public involvement to verify the attitudes of coastal constituencies.

3. Opportunity Analysis (Development Potential)

This contracted study is designed to establish the opportunity factors sought by coastal use developers; to assess cost variations associated with factor variations; and to establish the relative profitability of developing different locations. The study calls for extensive developer input. Mapping of potential factors at a scale of 1:250,000 is included in this contract.

4. Mapping

Various mapping studies are proposed:

(a) Mapping at a scale of 1:24,000 of the factors that influence environmental sensitivity.

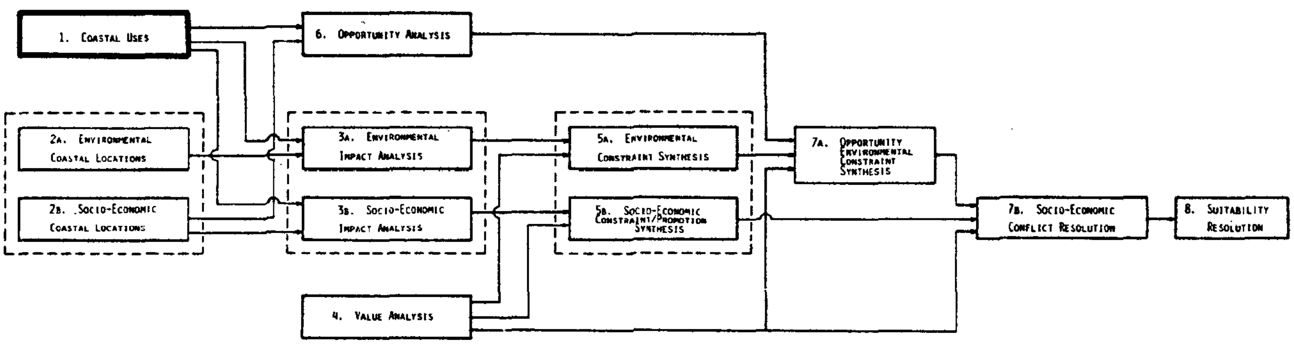
(b) Mapping at a scale of 1:100,000 of the major environmental sensitivity factors.

(c) Mapping at a scale of 1:100,000 of the socio-economic subregions.

5. Automation

A collaborative study is being discussed with the President's Council for Environmental Quality (CEQ) to digitize the maps in this report and develop a program of map overlay algorithms to allow the analysis described in this report to be automated.

SECTION I.
COASTAL USES



SECTION 1 - COASTAL USES

A. Introduction

In order to study use-location combinations, it is necessary to define first the range of uses to be studied. This is not a simple task, since human use of land and water is extremely varied and is constantly changing as new technology is introduced.

DEP-OCZM made an extensive study of existing national, state and local use-classifications. This study revealed not only the complexity of the task, but also the diversity of existing solutions, different localities classifying the same use into different categories.

DEP-OCZM has a state-wide responsibility. An important part of this is the standardization of information, so that one part of the state-wide coastal zone can be compared with another.

The table below lists the preliminary categorization of use that is proposed for use in the coastal planning program. The adoption of this classification by coastal counties and municipalities would simplify the planning tasks shared by different levels of government.

Another problem that occurs when classifying uses is that the level of detail needed varies depending on what aspect of the use is being studied. For example, when studying the environmental impacts of housing it is not important to know the age of the inhabitants, the impacts are essentially the same for all ages. However, when studying the factors that identify the highest opportunity locations, the specification for a retirement community is different from that for an apartment complex primarily for young people.

Finally, use classification is needed when mapping existing land and water use. The level of detail needed for this purpose varies depending on the use to which the map is to be put and the funds available for preparing it.

While the detail of classification may vary from one analysis to another, it is important that the overall classification is standardized and the sub-classifications used for different tasks are cross referenced to one another. The following table (Figure 2) indicates the classifications used in various parts of this study.

Figure 2

B. NJ OCZM LAND AND WATER USE CLASSIFICATION
(Reference Land and Water Use Classification for the New Jersey Coastal Zone Planning Method. Working Paper January 1977)

Major Use Type	Major Subtype	Minor Subtype	Detail or Functional Subtype	General Land Use Map	Detail Land Use Map	Opportunity Analysis	Impact & Constraint Analysis
1. Housing	a) Rural Housing (< 1 DU/A)			X	X		
			a) Sewered Rural			X	X
			b) Septic Rural			X	X
	b) Suburban Housing (1-15 DU/A)			X			
			a) Sewered Suburban Housing (1-15 DU/A)			X	X
			b) Septic Suburban Housing (1-15 DU/A)			X	X
		i) Low Density Suburban Housing (1-3 DU/A)			X		
		ii) Medium Density Suburban Housing (3-8 DU/A)			X		
		iii) High Density Suburban Housing (8-15 DU/A)			X		
	c) Urban Housing (below 6 stories) (> 15 DU/A)			X	X	X	X
	d) High Rise Housing (> 6 stories)			X	X	X	X
	e) Special types	i) Mobile Homes				X	
		ii) Retirement Communities				X	

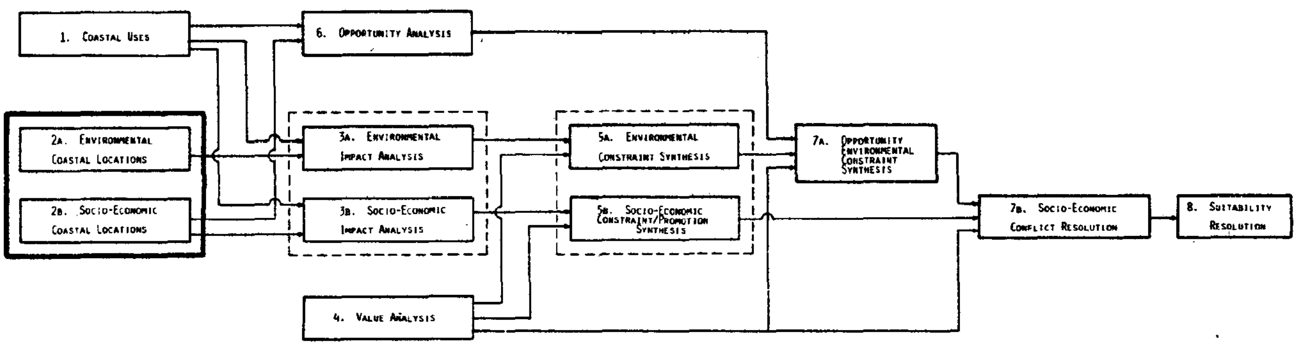
Major Use Type	Major Subtype	Minor Subtype	Detail or Functional Subtype	General Land Use Map	Detail Land Use Map	Opportunity Analysis	Impact & Constraint Analysis
2. Commerce & Services	a) Commercial Services			X			
		i) Commercial Trading					X
			a) Wholesale Trading		X	X	
			b) Retail trading		X	X	
		ii) Offices Personal Services & Entertainment			X		
			a) Offices			X	X
			b) Personal Services & Entertainment			X	X
		iii) Hotels & Motels			X	X	X
	b) Institutional Services			X			X
		i) Schools			X	X	
		ii) Hospitals			X	X	
		iii) Government			X	X	
		iv) Other			X	X	
3. Industry	a) Extractive			X			
		i) Open pit				X	X
		ii) Dredging				X	X
			a) Sand		X	X	
			b) Glass sand		X	X	
			c) Gravel		X	X	
			d) Ilmenite		X	X	
			e) Glauconite		X	X	
			f) Clay		X	X	
			g) Stone		X	X	
	b) Heavy industry (Predominatly Processing and Bulk storage)			X			X
		i) Petrochemical			X	X	
		ii) Food and drink			X	X	
		iii) Glass			X	X	
		iv) Other			X	X	

Major Use Type	Major Subtype	Minor Subtype	Detail or Functional Subtype	General Land Use Map	Detail Land Use Map	Opportunity Analysis	Impact & Constraint Analysis
3. Industry (cont.)	c) Light industry (Predominatly Assembly)			X	X	X	X
4. Harvest of Living Resources (Agriculture, Forestry and Commercial fishing)	a) General Agriculture			X			
		i) Field Crops			X	X	X
		ii) Pasture			X	X	X
		iii) Nurseries			X	X	X
		iv) Sod			X	X	X
		v) Orchard			X	X	X
		vi) Agricultural structures (Green house barn, etc.)			X	X	X
	b) Special Crops (Blueberries & Cranberries)			X			
		i) Blueberries			X	X	X
		ii) Cranberries			X	X	X
	c) Forestry			X	X	X	X
	d) Finfishing			X	X	X	X
	e) Shellfishing			X	X	X	X
5. Recreation	a) Land recreation			X			
		i) Low intensity (Natural areas)			X	X	X
		ii) Medium intensity					X
			a) Parks (immedi-ate use)		X	X	
			b) Golf course		X	X	
			c) Ball fields		X	X	
			d) Other		X	X	
		iii) High intensity					X
			a) Stadiums		X	X	
			b) Amusement Parks		X	X	
			c) Campgrounds		X	X	
			d) Other		X	X	

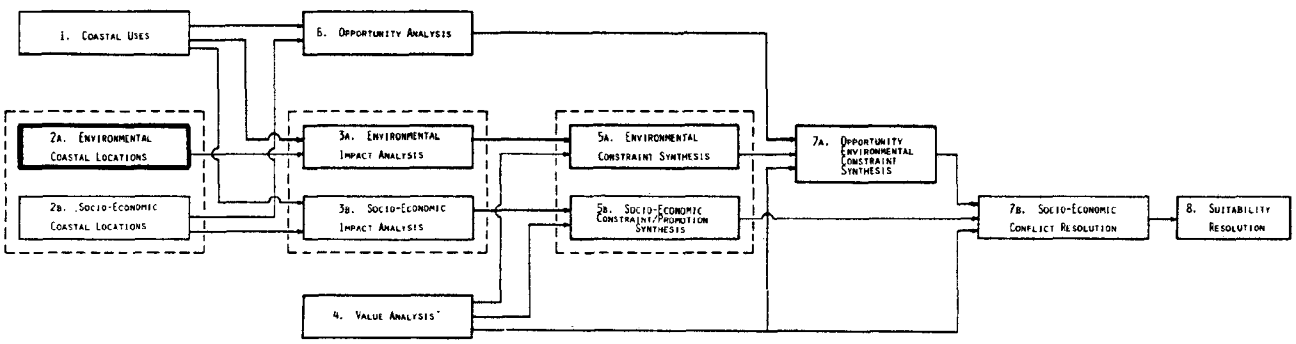
Major Use Type	Major Subtype	Minor Subtype	Detail or Functional Subtype	General Land Use Map	Detail Land Use Map	Opportunity Analysis	Impact & Constraint Analysis
5. Recreation (cont.)	b) Water Recreation			X			
		i) Primary Contact (swimming diving)			X		
			a) Low intensity			X	X
			b) Medium intensity			X	X
			c) High intensity			X	X
		ii) Secondary Contact (fishing, boating)			X		
			a) Low intensity			X	X
			b) Medium intensity			X	X
			c) High intensity			X	X
6. Infra-structure	a) Roads			X		X	X
		i) Limited Access Express			X		
		ii) Major collector			X		
		iii) Local			X		
	b) Railroads			X		X	X
		i) Passenger			X		
		ii) Freight			X		
		iii) Combined			X		
	c) Airports			X			
		i) Major				X	X
		ii) Local paved				X	X
		iii) Local unpaved				X	X
	d) Shipping			X			
		i) Ports & Navigation Channels		X			
			a) Major Commercial Port		X	X	X
			b) Minor Commerical Port		X	X	X
			c) Recreational Marina		X	X	X

Major Use Type	Major Subtype	Minor Subtype	Detail or Functional Subtype	General Land Use Map	Detail Land Use Map	Opportunity Analysis	Impact & Constraint Analysis
6. Infra-Structure (cont.)	e) Utlities			X			
		i) Power	a) Nuclear Generator		X	X	X
			b) Fossil Fuel Generator		X	X	X
			c) Other Generator			X	X
			d) Transmission structures and Rights of Way		X	X	X
		ii) Comminication			X		
			a) Communication Structures (TV studies, UHF transmitters)			X	X
			b) Communication Transmission & Rights of Way			X	X
		iii) Water Storage		X			X
			a) Potable		X	X	
			b) Agricultural		X	X	
			c) Industrial		X	X	
		iv) Water Transport & Rights of Way		X	X	X	X
		v) Liquid Waste Disposal		X			
			a) Sewer Rights of Way		X	X	X
			b) Treatment Plants		X	X	X
			c) Recycling Facilities		X	X	X
		vi) Solid Waste Disposal		X			
			a) Landfill		X	X	X
			b) Incinerator		X	X	X
			c) Recycling facilities		X	X	X

SECTION 2.
COASTAL LOCATIONS



SECTION 2a.
ENVIRONMENTAL COASTAL LOCATIONS



SECTION 2A - COASTAL LOCATIONS

I. General Introduction to the Natural Geography of New Jersey

New Jersey is a peninsula between the Delaware River to the west, the Delaware Bay to the south and the Atlantic Ocean to the east.

The northern part of the state is in the physiographic regions known as the Ridge and Valley province, the Appalachian Plateau and the Appalachian Piedmont. These areas contain the folded axes of metamorphic rock that form the Appalachian ridges and valleys and the eroded metamorphic foothills, gently rolling and much dissected by stream networks, of the Plateau and Piedmont regions (See Figure 3a).

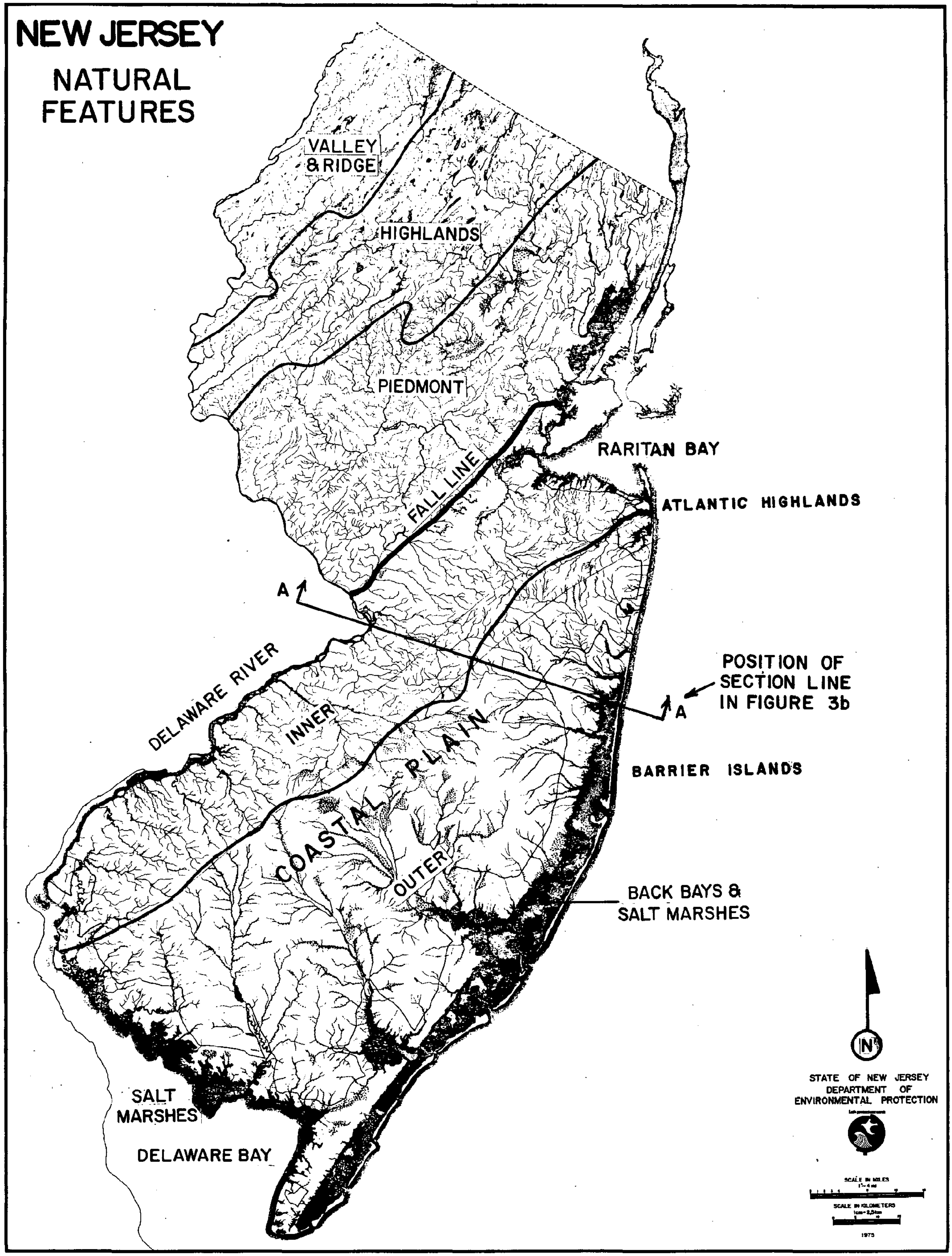
The coastal zone boundary currently proposed in these northern areas includes only limited areas adjacent to tidal waterways most of which are heavily developed, and, for this reason, the planning method does not now include an analysis of northern land areas although water's edge and water areas are included.

The southern boundary of the Piedmont is the fall line, an abrupt geologic feature running northeast from Trenton to the Raritan Bay thought to be a pivot line along which the metamorphic basement rocks to the southeast tilted downward.

To the south of the fall line the land is within the physiographic region known as the Atlantic Coastal Plain, a flat area underlain by unconsolidated sands, gravels and clays eroded from the Appalachian mountains and laid down over a tilted basement of metamorphic rock in both river and marine waters as the sea level rose and fell. These sediments are in strata dipping southeast downward from the surface over the metamorphic basement rock that is increasingly deeply buried beneath the land surface as it tilts downward southeast of the fall line (see diagrammatic section, Figure 3b). Surface slopes are slight to non existent and stream networks are dendritic, meandering and often flanked by extensive flood plains and wetlands.

The Coastal Plain of New Jersey is divided into the Inner Coastal Plain to the west and the Outer Coastal Plain to the east by a low range of hills which are the remnants of a land form called a cuesta. The Inner Coastal Plain has fertile loamy soils, extensively farmed, with a climax vegetation of mixed deciduous forest dominated by oak. The Outer Coastal Plain has mainly sandy, acid, infertile soils with high permeability, and fire-stabilized subclimax vegetation of pitch-pine and oak in the dry uplands. The lowland climax forests are dominated by deciduous hardwoods in the floodplains with pure stands of Atlantic white cedar in swamp areas.

Figure 3a Principle Natural Features of New Jersey Map



The Outer Coastal Plain supports large areas of the unique remnant ecosystem known as the New Jersey Pine Barrens, dwarf forests of pitch pine and black-jack oak with a sparse understory of crowberry and bearberry. The ecology of the Pine Barrens, partly controlled by frequent ground fires is of considerable scientific interest. The presence of this large undeveloped area is of recreational importance.

Both the Inner and Outer Coastal Plains are underlain by a huge reservoir of ground water stored in the unconsolidated, permeable sand and gravel layers. These water-storage strata are known as aquifers and divide into two types, an unconfined surface aquifer of Pleistocene sands and gravels that covers much of the area, and deep confined aquifers of dipping sand and gravel strata imperfectly separated by layers of silt and clay. Water may enter the surface aquifer from the atmosphere wherever permeable surface sediments are not covered with impermeable paving but the dipping subsurface aquifers may only be recharged in limited areas where they outcrop on the surface. This ground water reservoir is a major resource for all types of development.

The coastline and tidal shoreline of New Jersey divides into the Atlantic shore, the shorelands of estuarine bays and the banks of tidal rivers and streams.

The Atlantic coastline, except for the headlands of the Atlantic Highlands in northern Monmouth County, has offshore sand bars, or barrier islands, running almost the whole length parallel to the mainland. These are geologically unstable accretions of sand deposited by wave action. Their position and configuration are constantly changed by the movement of waves paticularly during coastal storms, and by rising sea level which causes westward movement of the coastline. The barrier islands are almost entirely developed. Damage from coastal storms and erosion from offshore currents are cause for concern. In the past federal and State funds have been used to provide temporary protection. Over the long term much of this development will have to relocate.

Between the barrier islands and the mainland are shallow sheltered tidal bays that support the growth of underwater eel grass, widgeon grass and sea-lettuce. These plants build up mats of organic debris constantly reducing water depth and tending to turn open water to marsh as cordgrass invades the organic mat. The submerged root networks stabilize the silty bay bottoms, trapping sediment in turbid water.

This submerged vegetation is an important source of primary productivity for estuarine ecosystems, winter forage for numerous migratory waterfowl, a critical habitat in the life cycle of bay scallops and marine finfish and performs important water filtration.

Landward of the open water of the back bays are extensive tidal salt marshes growing cordgrass and salt hay. These marshes and the eel grass beds are the most productive ecosystems on earth. They use the energy of the sun to convert the rich solution of inorganic nutrients flowing from the land to hydrocarbons which are the foundation of food webs supporting many oceanic species. Upland from the marshes grow a strip of common reeds. Then the land slopes gently up to the pine-oak foests of the Outer Coastal Plain.

The tidal estuarine shores have extensive salt marsh margins. The primary productivity of the marshes produces organic debris that is flushed to the waters of estuaries and bays which are either the habitat, spawning ground or nursery

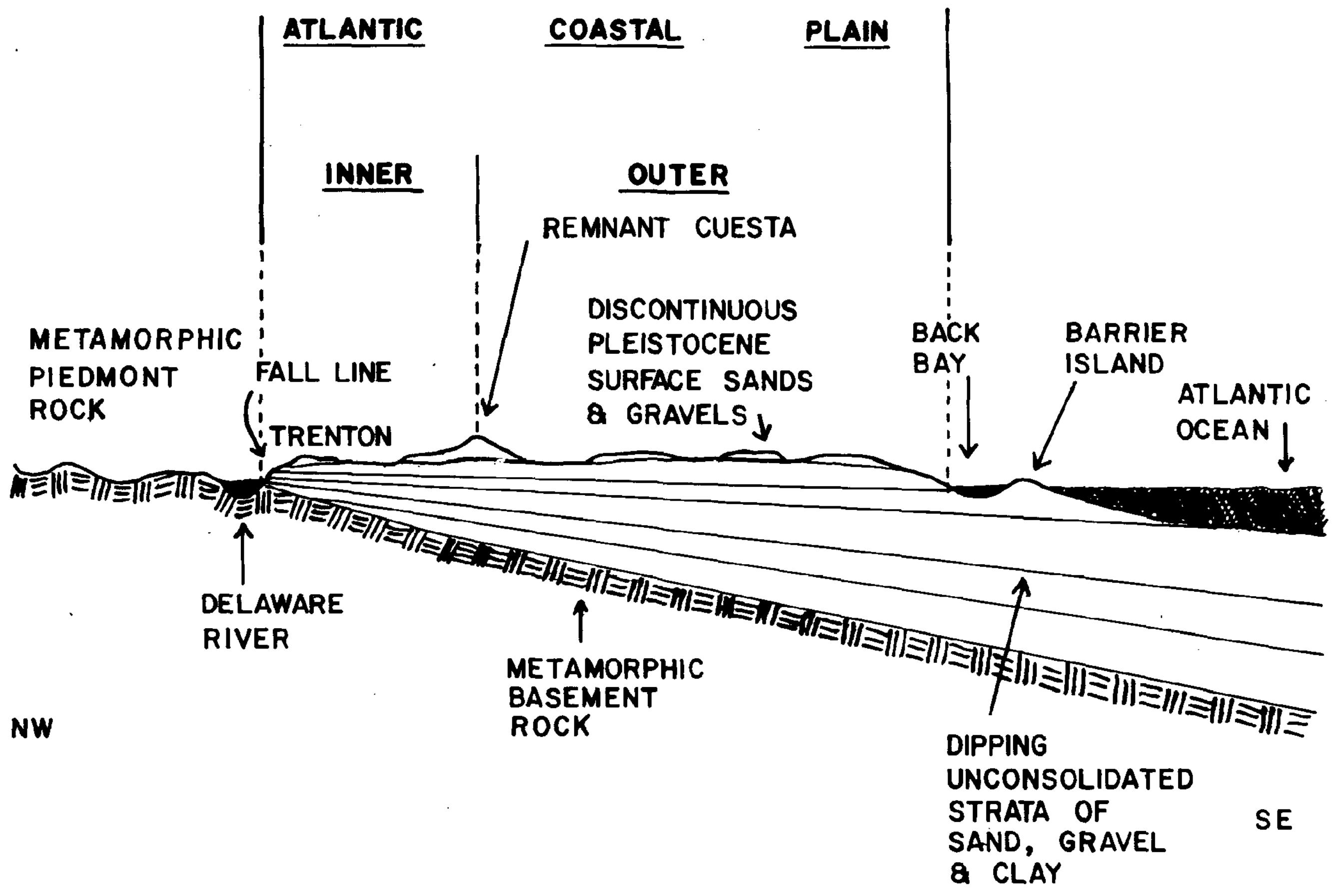


Figure 3b DIAGRAMMATIC SECTION THROUGH THE ATLANTIC COASTAL PLAIN OF NEW JERSEY.

area of the great majority of ocean finfish and shellfish species. The organic nutrients become the basis for diverse estuarine and marine food webs. The estuaries, bay ecosystems and the surrounding marshes are the most valuable natural resources of the coast because of this relationship with ocean life. They are the most important areas to protect, enhance, and restore.

Tidal rivers and streams extend inland from the estuaries, salinity and tidal influence decreasing with distance from the shore. The Delaware River is tidal to the 5 mile dam also near the Fall Line. The Hudson River is tidal throughout its length in New Jersey. These streams make an important contribution to the productivity of estuaries and are the major source of fresh water inflow. Because of this relationship, the rivers and flood plains are especially sensitive to impacts and surface runoff requires special management in tidal watersheds.

II. Classification of Environmental Land and Water Types

a) Introduction

New Jersey has a great diversity of recognizably different environmental land and water types, from dry uplands to wetlands and marshes, from the ocean to small creeks, from highly urbanized areas to sparsely populated forest.

Different land and water types not only look different but have different environmental processes operating, grow different adapted vegetation and, most importantly for the management of coastal development, have different responses to development impacts and different potentials to transmit these impacts to coastal waters.

Generally in nature there is not a sharp line between one land or water type and another. The dry uplands merge gradually into wetter terraces as the land surface falls towards the water table. Rivers grade into estuaries and estuaries into oceans.

Planning, however, demands a lack of ambiguity. It is important to know whether a certain location is in one land or water type or another in order to address specific policies to different kinds of location. For this reason definite cutoffs must be placed in the variations of factors that determine types. The criterion used in this section to establish these cutoffs is the factor quantity at which significant changes of environmental resources or processes occur.

b) Method

i) General

The classification of land and water types in the coastal areas of New Jersey divides into two major physiographic regions (see Figure 2):

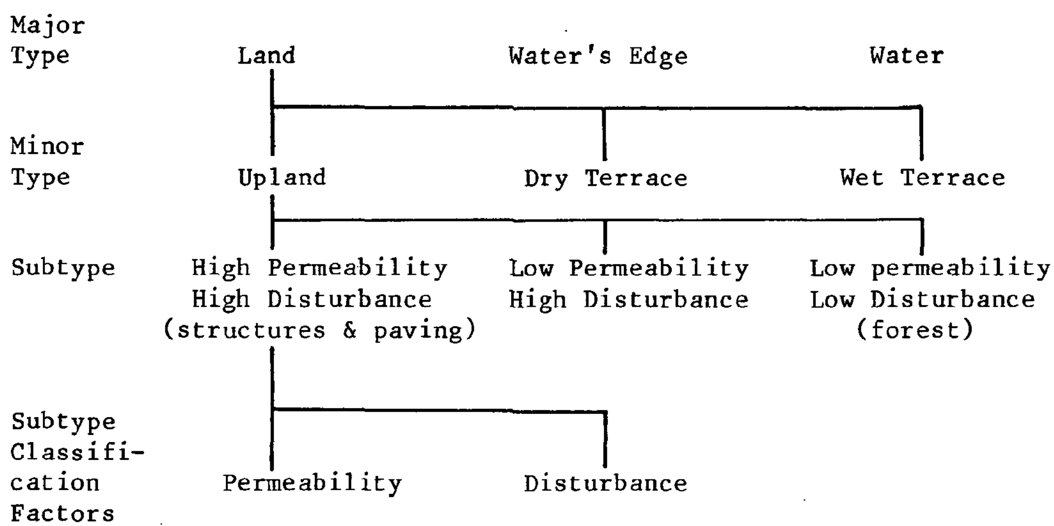
Northwest of the Fall Line; the Piedmont Plateau.

Southeast of the Fall Line; the Inner and Outer Coastal Plains.

Owing to differences in geomorphology, these two major regions must be analyzed separately. The analysis presented here applies only to the land areas of the Coastal Plain. The presently proposed coastal zone in the Piedmont Plateau is the areas in close proximity to water bodies. The analysis of environmental impacts in the Piedmont areas is confined therefore to tidal water bodies and their immediate cultural surrounds. Waters edge types and water types are defined in the same way in both the Piedmont and Coastal Plain.

If at a later time land types are required in the Piedmont the minor land types could be upland plateaus, banks, and lowland plateaus, distinguished by slope and elevation above surface water channels. The classification factors used to distinguish subtypes could be slope, orientation, soil texture, depth to bedrock, bedrock type, and level of disturbance.

Coastal Plain locations are classified first into major types, land, water's edge and water. Each of these three are subdivided into minor types. Land for example has six minor types, upland, dry terrace and wet terrace in the Inner or Outer Coastal Plain. These minor types are further divided into subtypes by variations of important factors of the built and natural environment such as soil permeability and the level of disturbance of the natural system caused by existing uses. The table below illustrates this concept of this grouping.



ii) <u>Classification of Major Types</u>

Three major location types have been defined, land, water's edge and water. This section defines the criteria for inclusion into one of these major types.

Major Types	Definition
1. Land	All areas above either the 100 year flood hazard line or the upland limit of alluvial soils whichever is the greater. The 100 year flood line shall be defined either by engineering studies carried out by NJDEP, Division of Water Resources, or, if such studies are not available, the 100 year flood line as defined by the US Geologic Survey (USGS) (based in part on Army Corps of Engineers studies) shall be used. The upland limit of alluvial soils shall be that defined by the Soil Conservation Service (SCS). Site survey information on soil distribution from an accredited surveyor will be accepted as a more accurate indication of soil distribution and may take the place of SCS published data.

2. Water's Edge — Areas periodically inundated. These lie between the Mean Low Water level (MLW) and the lower boundary of the land areas as defined above. Included here are flood prone areas, wetlands, marshes, swamp forests, beaches and dunes.

There are two exceptions to this general rule:

a) All dunes, defined as sandy ridges paralleling ocean and estuarine shorelines, shall be included within the water's edge category whether or not their elevation is below the 100 year flood line as above defined.

b) Intertidal flats, although exposed at low tide, shall be included as water types and not as water's edge types.

3. Water — All permanent surface water features below the Mean Low Water line. Except in drought periods these areas are permanently inundated. Intertidal flats, although only periodically inundated, are included here to simplify analysis.

iii) Classification Factors for Subdivision of Major Types

There are a variety of different kinds of location within each of these major types caused by variations of natural and social processes and decisions must be made as to how these variations may be grouped into a usable number of significantly different types for analysis.

When considering how to understand variations of natural processes it is useful to observe the variation of adapted plant communities and study which environmental factors cause these variations. These adapted groupings of plants have evolved over millenia to fit the environmental conditions in which they grow. Different plant communities are sensitively adjusted to different combinations of environmental factors. Since adaptive planning is also concerned with variations of the total environment that is the interaction of the same varying factors it is useful to start by understanding environmental variations recognized by plant evolution and the principle environmental factors that combine to form these variations.

Land - On the land ecological study of the vegetation of the Coastal Plain of New Jersey by Harshberger, McCormick and others has revealed that the most important natural factors that affect variation in undisturbed areas are depth to seasonal high water table and permeability of substrate. In the Outer Coastal Plain the plant communities are also affected by frequency of fire, large areas being stabilized at a sub-climax level by frequent ground fires. This factor, however, is less important when planning settlement, since the frequency of fires is lowered by human intervention and the plant communities then proceed to a new stability that responds to depth to water table and permeability.

Depth to Seasonal High Water Table (SHWT) was used to divide areas above the 100 year flood line into wet terraces (SHWT 1'-3'), dry terraces (SHWT 3'-5') and uplands (SHWT 5'+).

Permeability was used to subdivide the terraces and upland types into areas of low permeability (0.2-2.0 inches/hour), medium permeability (2.0-6.0 inches/hour) and high permeability (6.0+ inches/hour).

Disturbance, or the amount by which the native climax vegetation has been altered, was used to subdivide the water table and permeability types into areas of low disturbance, mid to late successional native forest; medium disturbance, early to mid successional herb and shrub vegetation including agricultural land, vacant lots and scrubland; and high disturbance, structures, paving and areas of exotic vegetation in high levels of maintenance immediately adjacent to structures.

Water's Edge: Classification Factors

The natural vegetation of the water's edge areas depends on the nature of the adjacent water body, its salinity, and the periodicity of flooding, which is determined by the elevation above the Mean Low Water line. These factors, plus the extent of human disturbance of the natural vegetation were used to classify subtypes in water's edge areas. The definition of categories within these classification factors is as follows:

Nature of adjoining water body was used to divide the water's edge into the shorelands of oceans, open bays, semi-enclosed bays, back bays, rivers, streams, creeks, lakes and ponds.

Elevation above mean low water level was used to divide these various water body shore types shores into low-lying marshes and wetlands and beaches and, at higher elevations, upper flood-prone areas and dunes.

Disturbance, the degree of alteration of native climax vegetation, defined as before (except that not all low disturbance types are forested) was used to divide the water's edge types above into areas of low, medium and high disturbance areas.

Water Classification Factors

In water areas it is the distribution of aquatic biota, more animal than plant communities, that can be used to indicate different kinds of water body. The factors that determine adapted biota are the size, and volume of flow of the water body; the salinity, including how salt and fresh water mix; the nature of the bottom; and the depth of the water. These factors plus the extent of human disturbance of both the water column and the bottom were used to distinguish water subtypes. Definition of factors is as follows:

Volume-flushing rate. This factor divided surface waters into minor types by size and circulation into ocean, open bay, semi-enclosed bay, back bay, various sizes of running waters, (major rivers (large), streams (medium) and creeks (small)), lakes and ponds. The average volume of flow was used to divide running waters, exact figures have yet to be determined.

Salinity divided the estuarine and running water types into areas of low salinity (0-0.5 ppt) medium salinity (0.5-3.5 ppt) and high salinity (3.5-35 ppt).

Bottom Characteristics further divided water areas into stable and unstable substrate types depending on the extent of current scour.

Water Depth was the final factor used to divide oceans and open bays into shallow water (0'-6') medium depth water (6'-18') and deep water (18'+), and semi-enclosed and back bays into shallow water (0-1/2') medium depth water (1/2'-6') and deep water (6'+).

Disturbance

All surface waters were then classified into subtypes by the existing levels of disturbance to both the water column and the bottom.

a. Water Column Disturbance. Three levels of ambient water quality were distinquished:

High water quality: areas where all water quality parameters are above standard.

Medium water quality: areas where water quality is below standard but expected to meet standards after the application of Best Practicable Treatment (BPT) to point source effluents. (Effluent Limited)

Low water quality: areas where water quality is below standard and not expected to meet standards even after application of BPT to point source effluents. (Water Quality Limited)

b. Bottom Disturbance

These three water quality types were then subdivided by the degree of bottom disturbance.

Undisturbed bottom: areas where only natural processes act on the bottom.

Disturbed bottom: areas where human activity such as dredging on subaqueous disposal has disturbed the bottom.

iv) Mapping of Factors in the Pilot Area

The distribution of each of the classification factors discussed above can be measured and recorded as map information. Much of this data is already published by different agencies at various scales and levels of accuracy.

In order to make a map showing the distribution of land and water types it is first necessary to map all the factors to the same scale. These factor maps for the pilot area are illustrated below both in reduced form and in part at the original scale (1:24,000, one inch:2,000 feet).

This scale of 1:24,000 was selected because much of the published information was already at this scale, and because it is a useful intermediate scale, small enough to understand regional patterns yet large enough to study individual sites.

A mapping contract is currently being negotiated that will map all these factors at this scale (1:24,000) for all of the coastal zone areas.

The following maps, Figures 4-21 show the distribution of the classification factors discussed above in the pilot study area. Each factor map is shown reduced in its entirity and as an excerpt at a scale of 1:24,000.

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT

FLOOD PRONE AREAS

F – FLOOD PRONE AREAS

AREA BELOW THE 10' CONTOUR AND ALLUVIAL SOILS.

SOURCE: U.S. Dept. of Interior, Geological Survey in Cooperation with U.S. Dept of HUD 1973
SCS Interim Soil Survey Report
Cape May County, New Jersey 1973

Figure 4

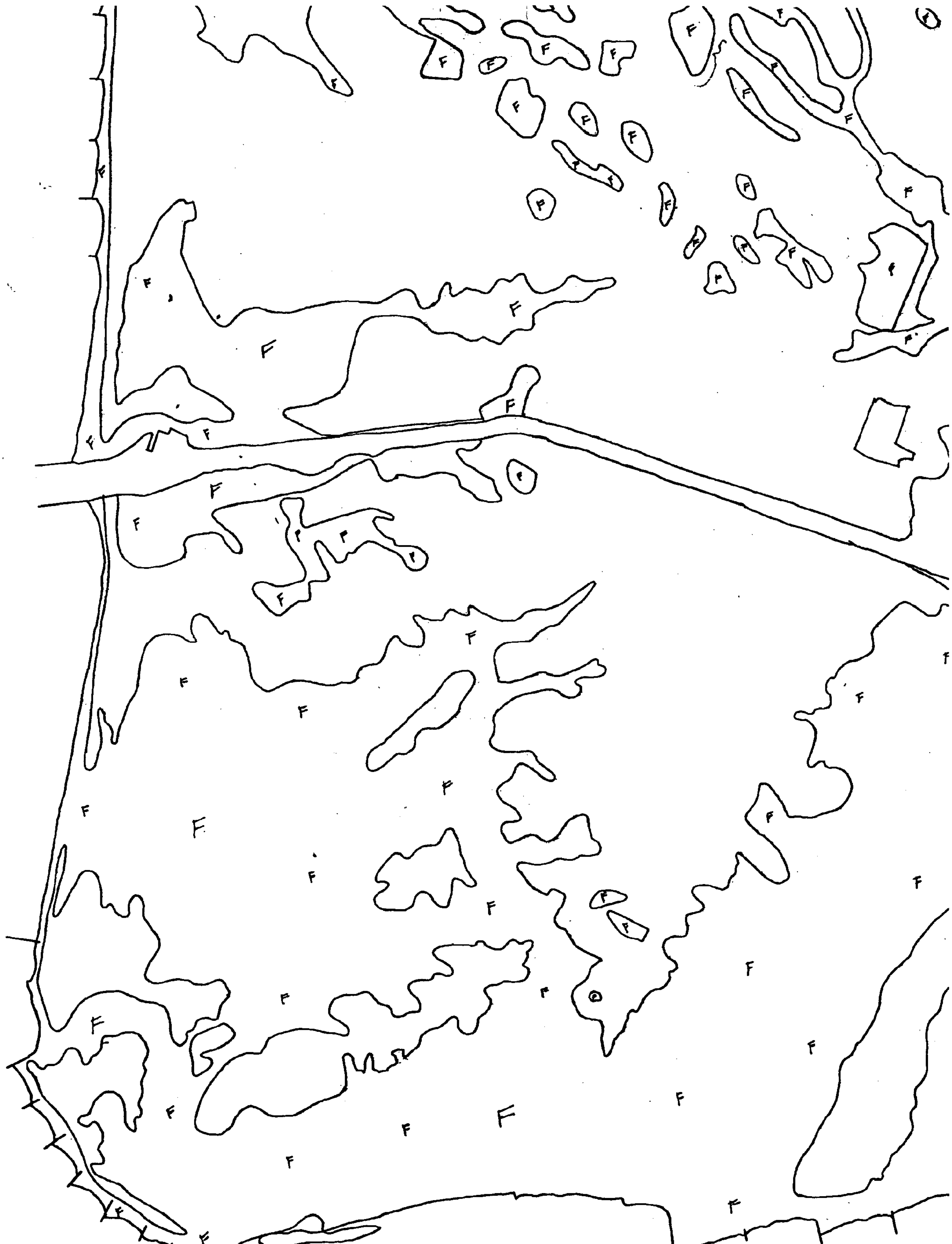


Figure 5

DEPTH TO SEASONAL HIGH WATER

1 – 0-1 Ft.
2 – 1-3 Ft.
2-3- 1-4.5 Ft
3 – 3-5 Ft.
2-4- 1-5+ Ft.
4 – 5+ Ft.

SOURCE: SCS Interim Soil Survey Report
Cape May County, New Jersey 1973

Figure 6

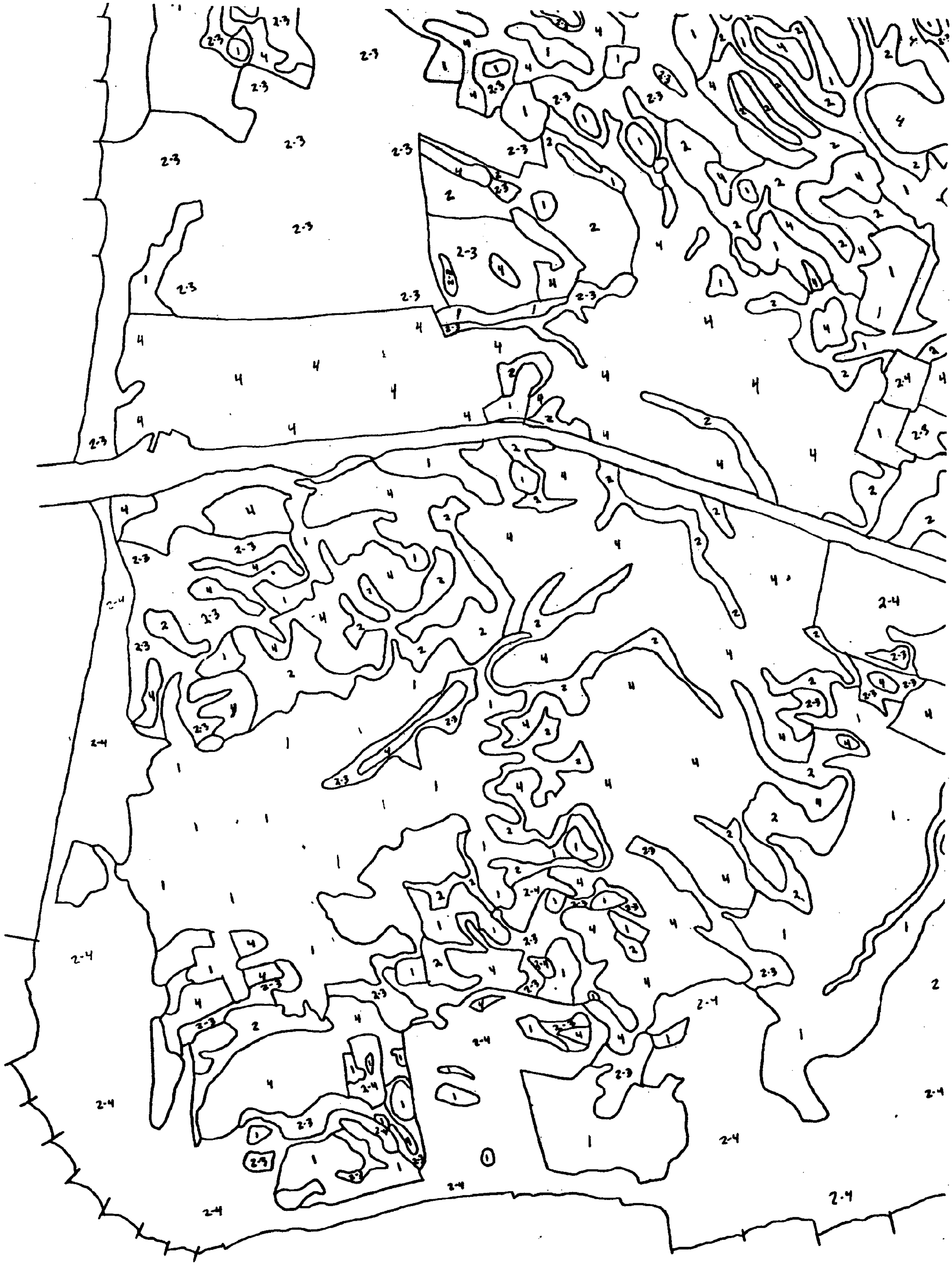
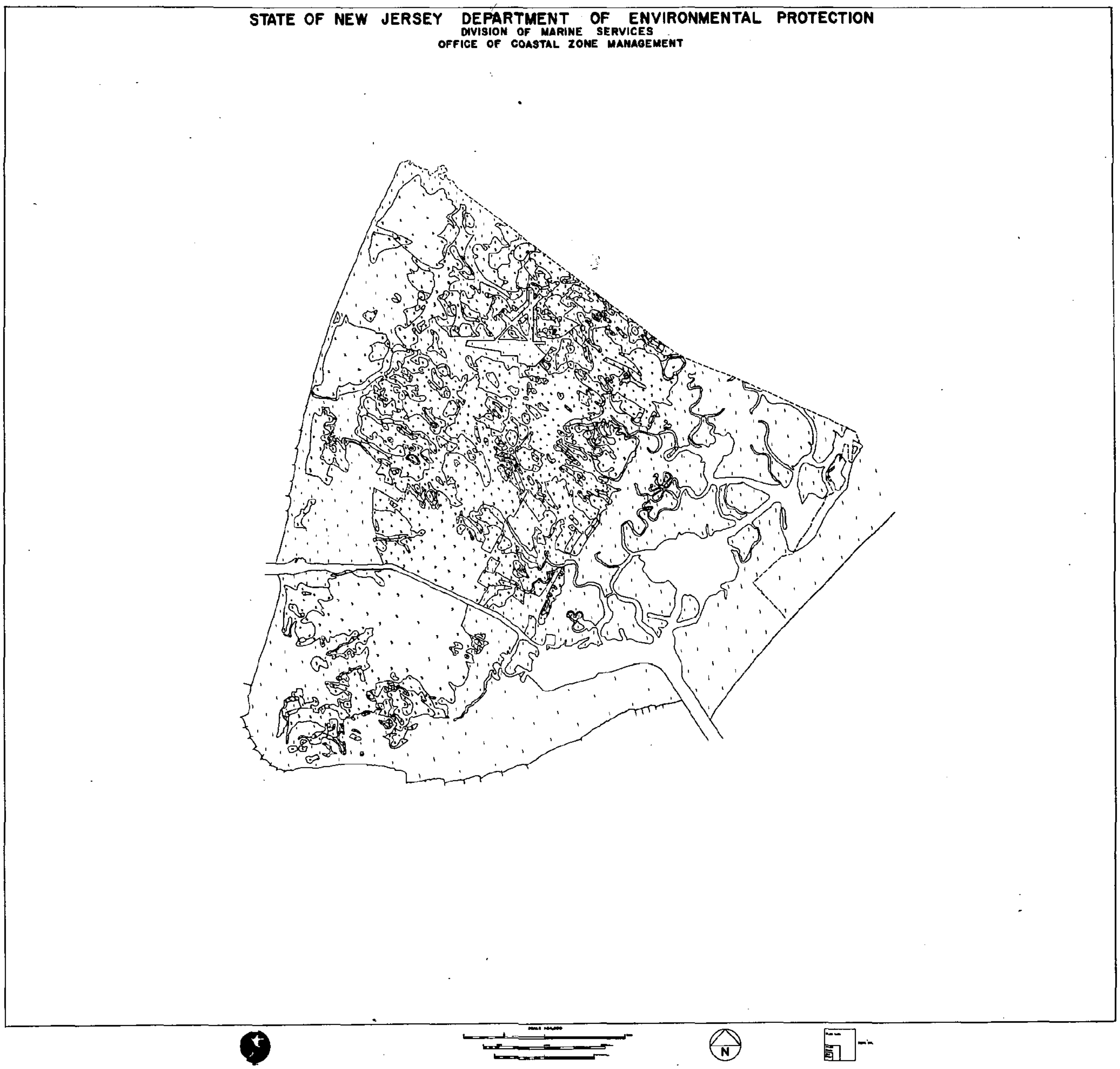


Figure 7



PERMEABILITY

1 – 0.2"–2.0"
2 – 2.0"–6.0"
3 – 6.0" +

SOURCE: SCS Interim Soil Survey Report
Cape May County, New Jersey 1973

Figure 8

Figure 9

GEOMORPHOLOGY & BATHYMETRY

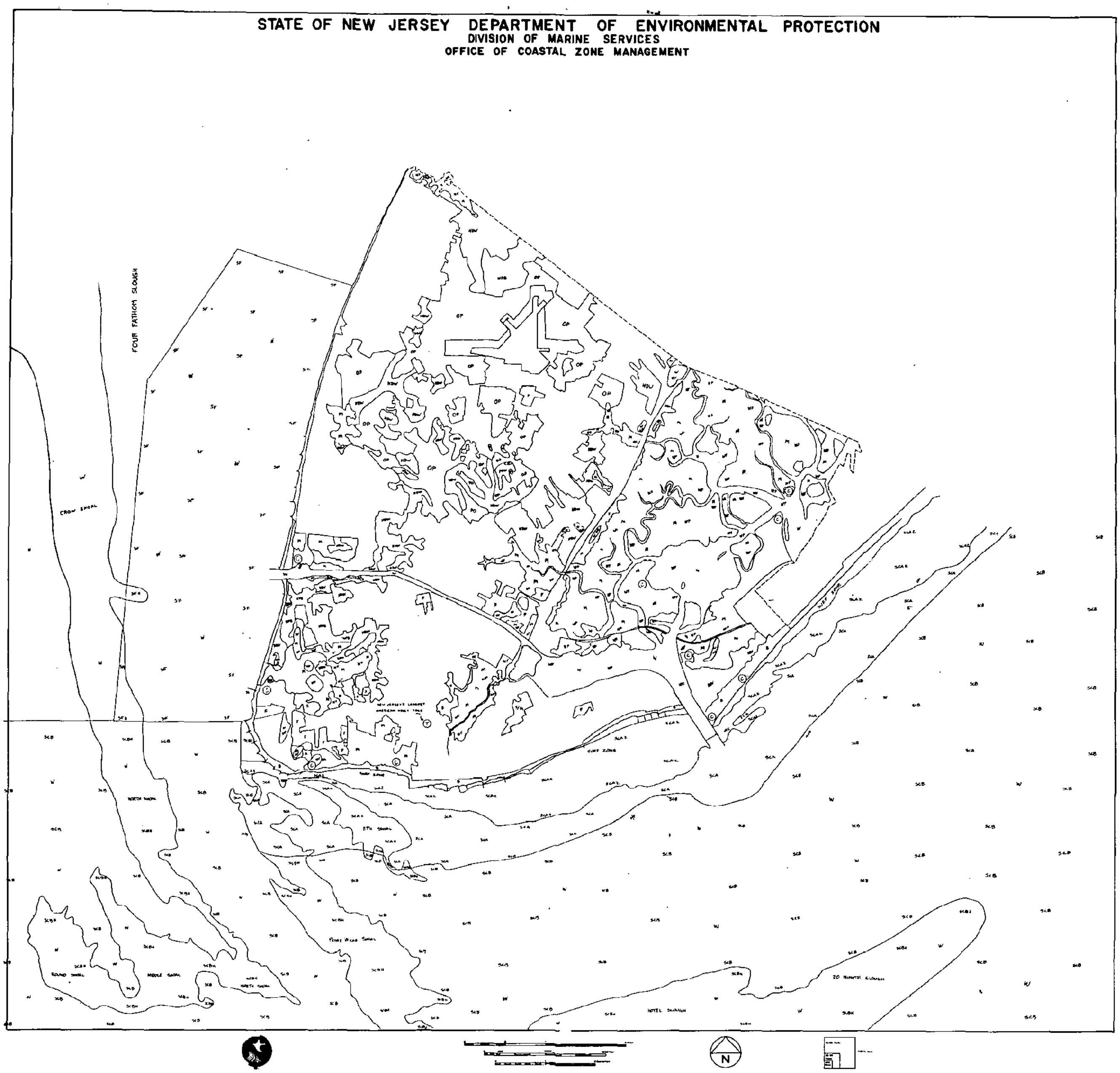
B · Beach
BI · Barrier Beach
CP · Coastal Plain
D · Dune
M · Marsh
SH · Shoals
T · Intertidal Flat

Bathymetric Readings Shown in Feet, Contour at 6 Foot Intervals.

SOURCE: N.J. DEP Aerial Photo Quads, 1972; N.J. DEP Wetlands Aerial Photos, 1972; N.O.S. Nautical Charts No. 12316, 1975; No. 12304, 1974

Figure 10

Figure 11



VEGETATION & LIVING RESOURCES

VEGETATION TYPES

BBV – *BARRIER BEACH VEGETATION (Dunes)*
M – MARSH (Tidal Wetlands)
HDW – HARDWOOD LOWLAND FOREST
HPB – NON-PINE BARREN FOREST
OP – OAK/PINE FOREST
PO – *PINE/OAK FOREST*
F – UNTYPED FORESTED AREA

HABITAT TYPES

B – BEACHES
W – SURFACE WATER
–⊢⊢ SHIPWRECKS
T – STATE RECORD TREE
C – COLONIAL NESTING BIRD ROOKERIES
SF – *SHELLFISH (Hard Clams) AND FIN FISH NURSERY AREAS* ✳
WF – WATERFOWL WINTERING AREAS
SCA – SURF CLAM (Dense Concentration) ✳
SCB – SURF CLAM (Less Dense Concentration) ✳
SHOALS & SLOUGHS — PRIME SPORT FISHING GROUNDS
HDW – DEER WINTERING AREA
✳ SUFFIX H – SHOAL Z – SURF ZONE

SOURCE:
N.J. DEP - PHOTO QUADS (1973); WETLANDS MAPS (1972); ENVIRONMENTAL MAP OF NEW JERSEY FISHERIES RESOURCE MAP B (1973), N.J. DIVISION OF FISH, GAME, SHELLFISHERIES; ENDANGERED AND NON-GAME SPECIES PROJECT (ROOKERIES); BUREAU OF SHELLFISHERIES (SURF CLAMS), N.O.S. NAUTICAL CHARTS NO. 12316, (1975) NO. 12304, (1974), RUTGERS UNIVERS. LIST OF N.J. BIGGEST TREES (1974), FREEMAN; B.L. AND L.A. WALFORD – ANGLERS GUIDE TO THE ATLANTIC COAST; SECTIONS III & IV (1974)

Figure 12

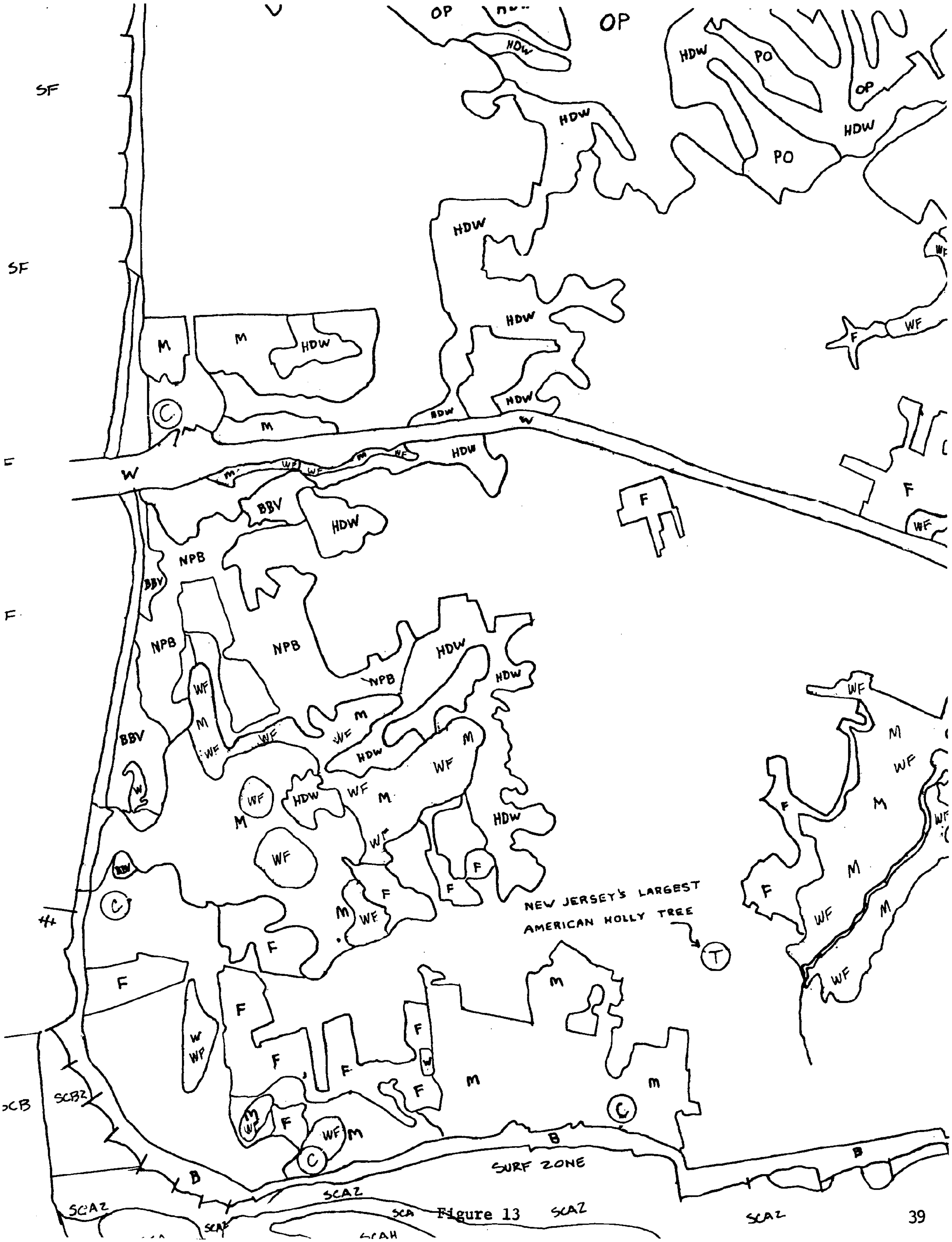
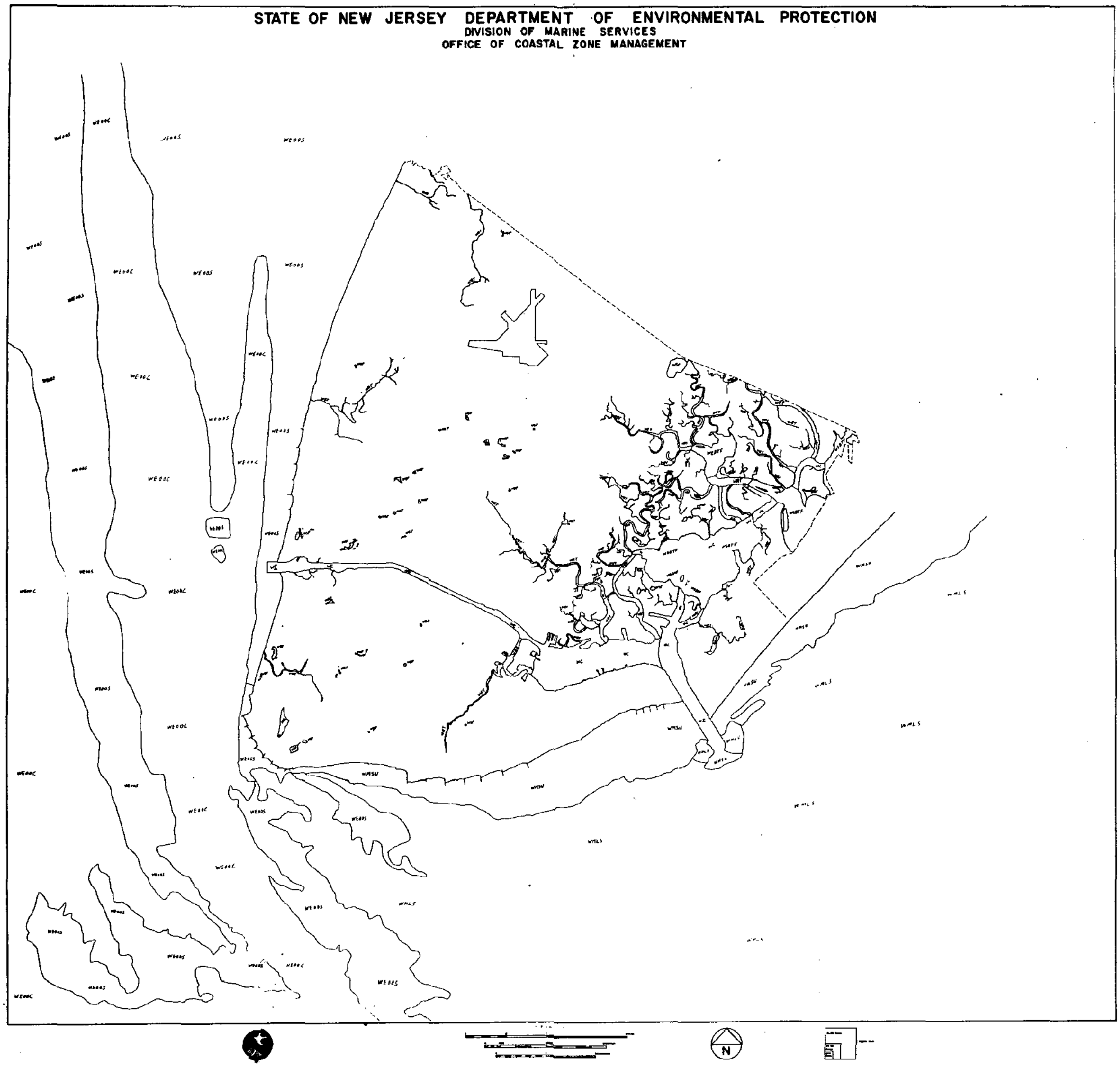

OP
HDW
PO
SF
M
C
W
BDW
WF
F
BBV
NPB
SCB
SCBZ
B
SURF ZONE
SCAZ
NEW JERSEY'S LARGEST
AMERICAN HOLLY TREE
T

Figure 13



SURFACE WATER & SALINITY

Ocean (Marine) (24-35‰ Salinity)

WMSS	Surf Zone (0'-18' MLW), Stable Substrate
WMSU	Surf Zone (0'-18' MLW), Unstable Substrate
WMLS	Lower Shoreface (+18' MLW), Stable Substrate
WMLU	Lower Shoreface (+18' MLW), Unstable Substrate
WMLH	Lower Shoreface (+18' MLW), Special Habitats
WMLM	Lower Shoreface (+18' MLW), Mineral Resource

Estuaries Open Bays

WEOOS	Ocean Influence (Salinity 3.5-35‰), Shoals
WEOOC	Ocean Influence (Salinity 3.5-35‰), Channel
WEOTC	Transition Zone (Salinity 0-20‰), Channel
WEOTF	Transition Zone (Salinity 0-20‰), Flats
WEOTH	Transition Zone (Salinity 0-20‰), Special Habitat

Estuaries Semi-Enclosed Bays (Embayments)

WESO	Ocean Influence (Salinity 3.5-35‰)
WEST	Transition Zone (Salinity 0-20‰)
WESTH	Transition Zone (Salinity 0-20‰), Special Habitats
WESF	Freshwater Influence (Salinity 0-3.5‰)
WESFH	Freshwater Influence (Salinity 0-3.5‰) Special Habitat

Estuaries Back Bays, Lagoons

WEBOC	Ocean Influence (Salinity 3.5-35‰) Channel
WEBOI	Ocean Influence (Salinity 3.5-35‰) Flat
WEBTC	Transition Zone (Salinity 0-20‰), Channel
WEBTF	Transition Zone (Salinity 0-20‰), Flat
WEBFC	Freshwater Influence (Salinity 0-3.5‰) Channel
WEBFF	Freshwater Influence (Salinity 0-3.5‰) Flat

Special Types

WI	Inlet
WC	Canal

Running Waters

WRO	Ocean Influence (Salinity 3.5-35‰)
WRT	Transition Zone (Salinity 0-20‰)
WRF	Freshwater Influence (Salinity 0-3.5‰)
WRPT	Potable Freshwater (Salinity 0-0.5‰), Tidal
WRPN	Potable Freshwater (Salinity 0-0.5‰), Non-Tidal

Standing Waters

WSR	Potable Water Reservoirs
WSL	Lakes (Non-Potable)
WSP	Ponds

SOURCE: N.J. DEP Quadrangle Sheets (1972), N.J. DEP Wetlands Maps (1971), USGS 7.5' Topographic Quadrangle Maps (1955, 1972).

Figure 14

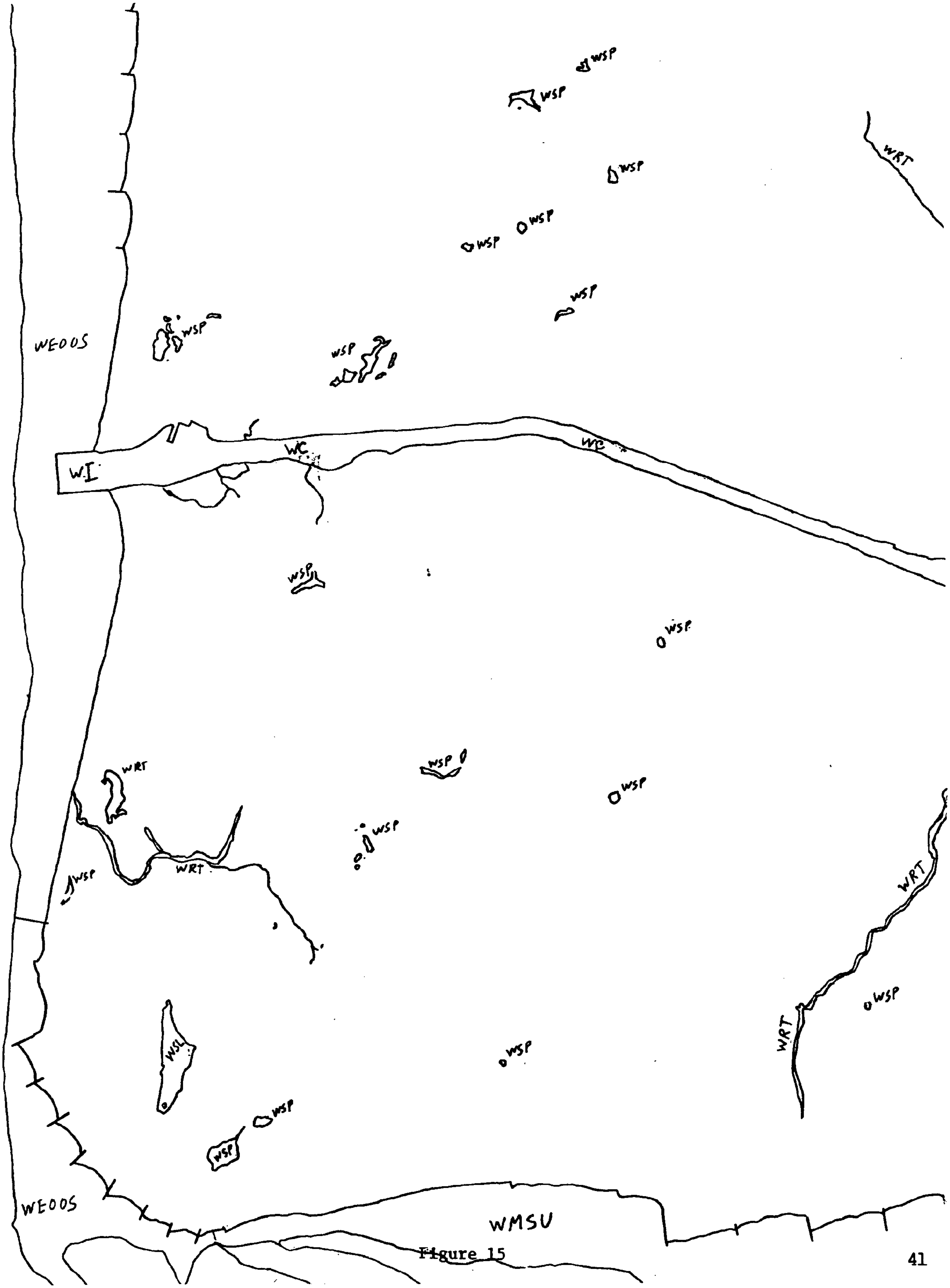

WSP
WSP
WRT
WSP
WSP
WSP
WSP
WEOOS
WSP
WSP
WI
WC
WC
WSP
WSP
WRT
WSP
WSP
WSP
WRT
WSP
WRT
WRT
WSP
WSL
WSP
WSP
WSP
WEOOS
WMSU

Figure 15

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT

DETAILED LAND/WATER USE & COVER FACTOR MAP CATEGORIES

RESIDENTIAL
(R1) LESS THAN 1 DWELLING UNIT/GROSS ACRE (RURAL)
(R2) 1-3 DWELLING UNITS/GROSS ACRE (LOW DENSITY RESIDENTIAL)
(R3) 3-8 DWELLING UNITS/GROSS ACRE (MEDIUM DENSITY RESIDENTIAL)
(R4) 8-20 DWELLING UNITS/GROSS ACRE (HIGH DENSITY RESIDENTIAL)
(R5) 20+ DWELLING UNITS/GROSS ACRE (URBAN DENSITY RESIDENTIAL)
(RV) RESIDENTIAL VACANT
(RM) MOBILE HOMES

COMMERCIAL & SERVICE
(CR) RETAIL-(SHOPPING CENTERS)
(CW) WHOLESALE-(WAREHOUSES)
(CHM) HOTELS & MOTELS
(CFP) COMMERCIAL FISHING PORTS

INDUSTRIAL
(IL) LIGHT - ASSEMBLY
(IH) HEAVY - PROCESSING
(IFI) FISHING INDUSTRY

EXTRACTIVE
(XSG) SAND & GRAVEL
(XGS) GLASS SAND
(XI) ILMENITE
(XG) GLAUCONITE
(XC) CLAY
(XS) STONE

AGRICULTURE
(AC) CROP (FIELD CROPS; TOMATOES, BEANS, ETC)
(AP) PASTURE
(ASB) SHRUB & BUSH (BLUEBERRIES)
(AN) NURSERIES (TREES, ORNAMENTALS, ETC.)
(AS) SOD
(AB) BOG (CRANBERRIES)
(AL) FORESTRY (LUMBER HARVEST)
(AI) AGRICULTURE PROCESSING (GREENHOUSE)
(AO) ORCHARD

VEGETATION
(F) FORESTED
(FS) FORESTED (SUCCESSIONAL)
(BF) BRUSHY
(BBV) BARRIER BEACH VEGETATION
(BG) BARE GROUND

SEWERAGE SYSTEMS
(SP) TREATMENT PLANTS
(SL) RIGHTS-OF-WAY

SOLID WASTE DISPOSAL
(SWT) SANITARY LANDFILL
(SWI) INCINERATOR
(SWR) RESOURCE RECOVERY CENTER
(SWA) AUTO JUNKYARD

UTILITIES
(UFG) FOSSIL FUEL ELECTRICAL GENERATING PLANT
(UNG) NUCLEAR ELECTRICAL GENERATING PLANT
(USS) SUBSTATION
(UL) RIGHTS-OF-WAY

PETROLEUM & GAS
(PR) REFINERIES
(PG) GAS PROCESSING
(PS) STORAGE (OIL OR GAS)
(PP) PUMPING STATIONS
(PL) RIGHTS-OF-WAY

COMMUNICATIONS
(CB) BROADCASTING/RECEIVING
(CT) TRANSMISSION

TRANSPORTATION
(TLA) LIMITED ACCESS HIGHWAYS (4 LANES)
(TUA) UNLIMITED ACCESS (4 LANES)
(TC) COLLECTOR (2 LANES)
(TRF) RAILROAD-FREIGHT
(TRP) RAILROAD-PASSENGER
(TRC) RAILROAD-COMBINED
(TAP) AIRPORT-PAVED
(TAU) AIRPORT-UNPAVED
(TPS) PORTS-SHIPPING
(TM) MAINTENANCE FACILITY

WETLANDS
(M) TIDAL MARSH - SPARTINA ALTERNIFLORA
(MF) FRESHWATER WETLANDS (NON-TIDAL MARSHES & SWAMPS)
(MB) BOGS (GROUNDWATER FED WETLANDS)
(MS) MARSH DREDGE SPOIL SITES

RECREATION & OPEN SPACE
(B) BEACHES
(OP) PARKS (MODERATE USE)
(OH) PARKS/PLAYGROUNDS (HEAVY USE)
(OS) STADIUMS/AMUSEMENTS/DRIVE-INS
(OC) CAMPGROUNDS
(OG) GOLF COURSES
(OM) RECREATION MARINAS
(OF) FISHING DOCKS, JETTIES, ETC.
(OT) TRAILS, BIKE, HIKE, & HORSE PATHS

WATER
(W) WATER
(WST) STORAGE TANKS

WATER USES (SUPPLY)
(WSI) INDUSTRIAL WATER SUPPLY
(WSP) POTABLE WATER SUPPLY
(WSA) AGRICULTURE WATER SUPPLY

WATER USES (WASTE DISPOSAL)
(WDN) NUTRIENTS
(WDP) PATHOGENS
(WDX) TOXIC OR HAZARDOUS WASTES
(WDT) THERMAL
(WDS) SOLIDS (SEDIMENTS, DREDGE SPOILS)
(WDC) CHEMICAL

WATER USES (RECREATION)
(WRP) PRIMARY CONTACT (BATHING, WATER SKIING, SCUBA DIVING, SURFING)
(WRS) SECONDARY CONTACT (FISHING, SHELLFISHING, BOATING)

WATER USES (COMMERCIAL)
(WCS) SHELLFISHING
(WCF) FINFISHING
(WCT) MAJOR SHIPPING
(WCB) MINOR SHIPPING

INSTITUTIONS
(INS) SCHOOLS
(INH) HOSPITALS
(ING) GOVERNMENT
(INO) OTHER (CHURCHES, CEMETERIES, ETC)
(INCG) COAST GUARD

Figure 16

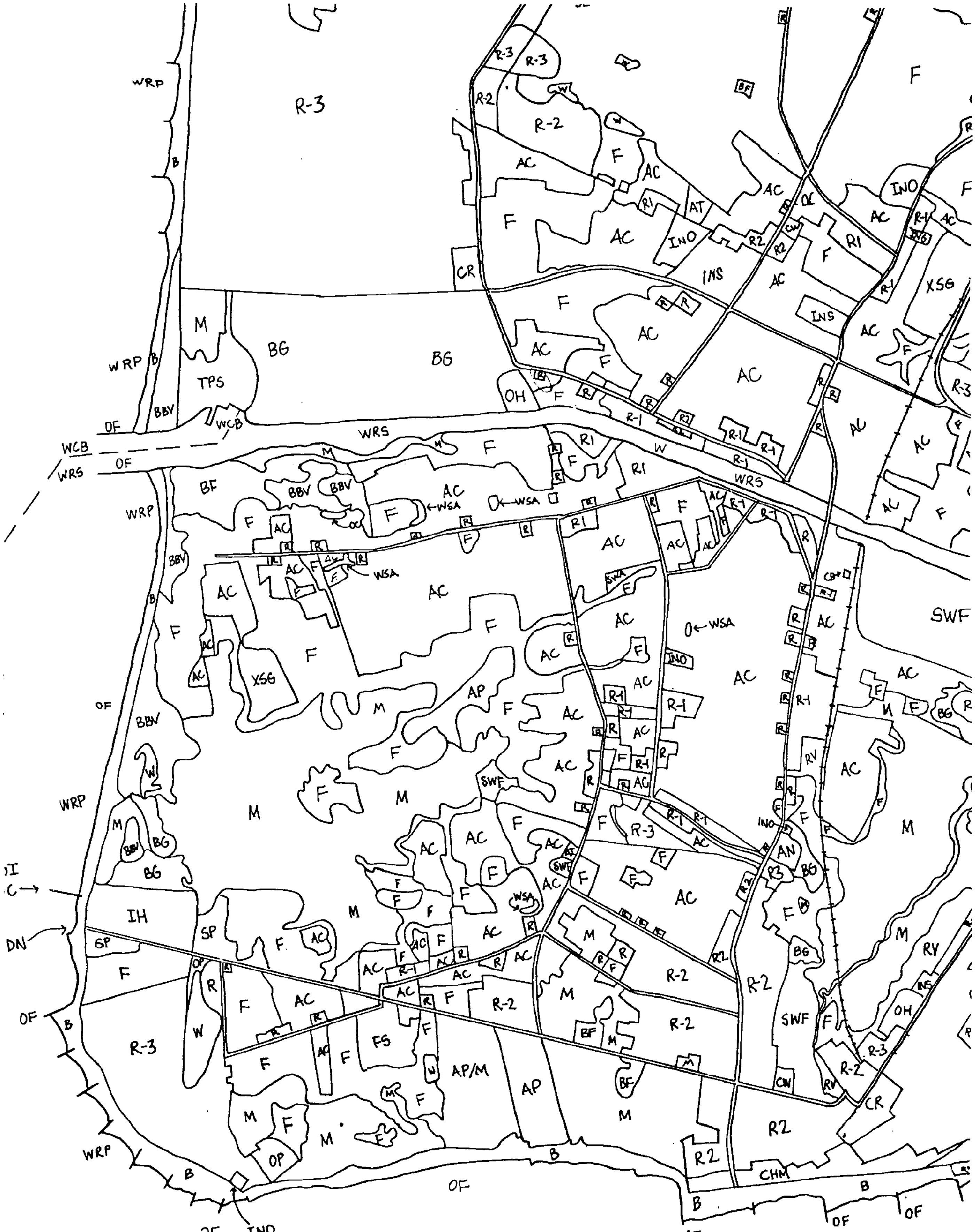

WRP
R-3
B
M
BG
TPS
BBV
WCB
OF
WRS
WRP
BF
F
AC
XSG
M
AP
SWF
IH
SP
DN
W
FS
AP/M
OP
INO
CR
OH
AC
F
INS
AT
R-1
R-2
AN
CHM
SWF
RV
R2

Figure 17

DISTURBANCE LEVELS

LAND		WATER	
L	Undisturbed	L	Undisturbed
M	Moderate	M	Moderate (Effluent Limited)
H	High	H	High (Water Quality Limited)

SOURCE: U.S.G.S. 7 1/2' Quads, Cape May; N.J. DEP. Photo Quads 1972, N.J. Wetland Maps 1972.

SOURCE: N.J. DEP. Division of Water Resource.

Figure 18

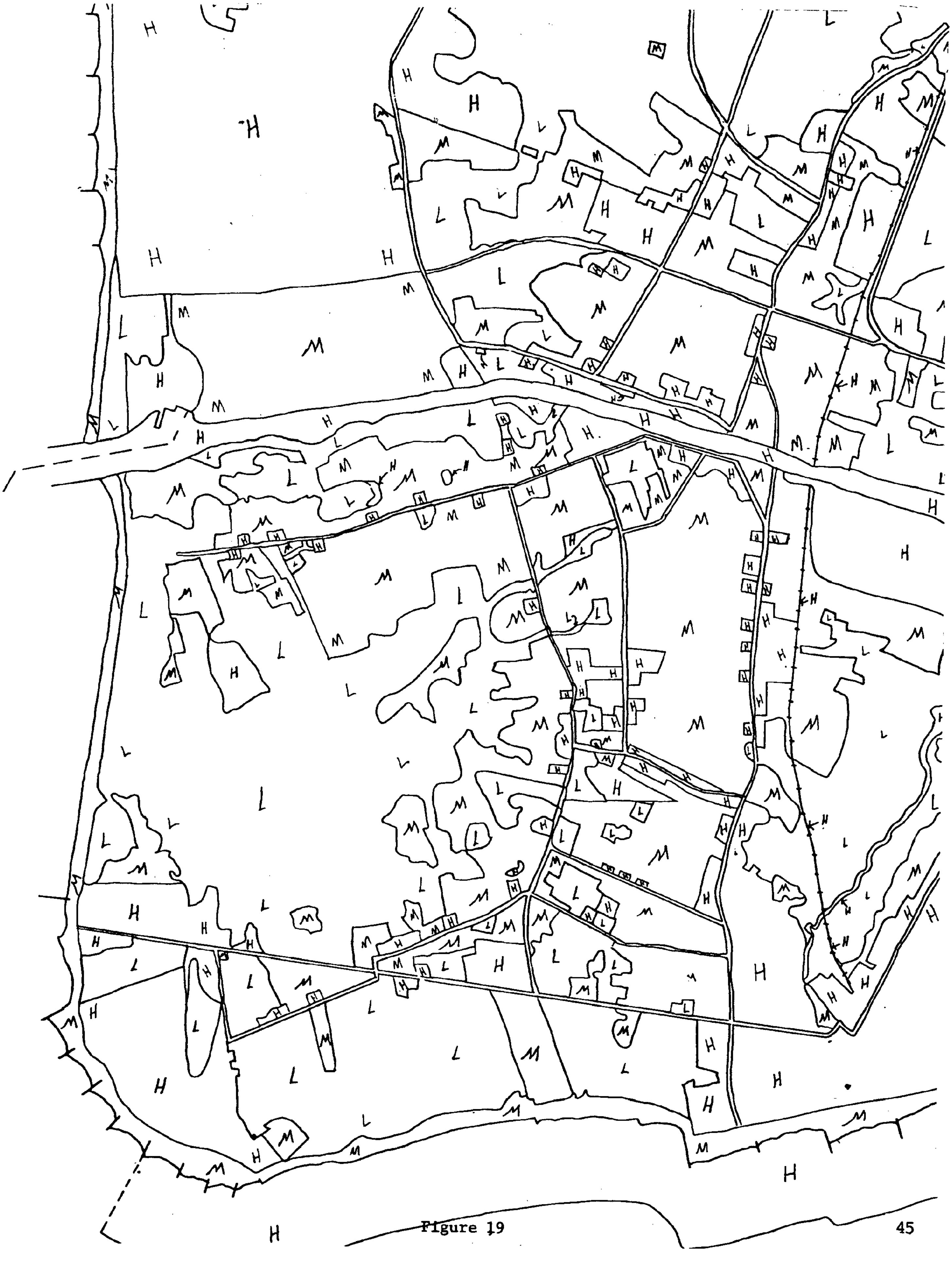
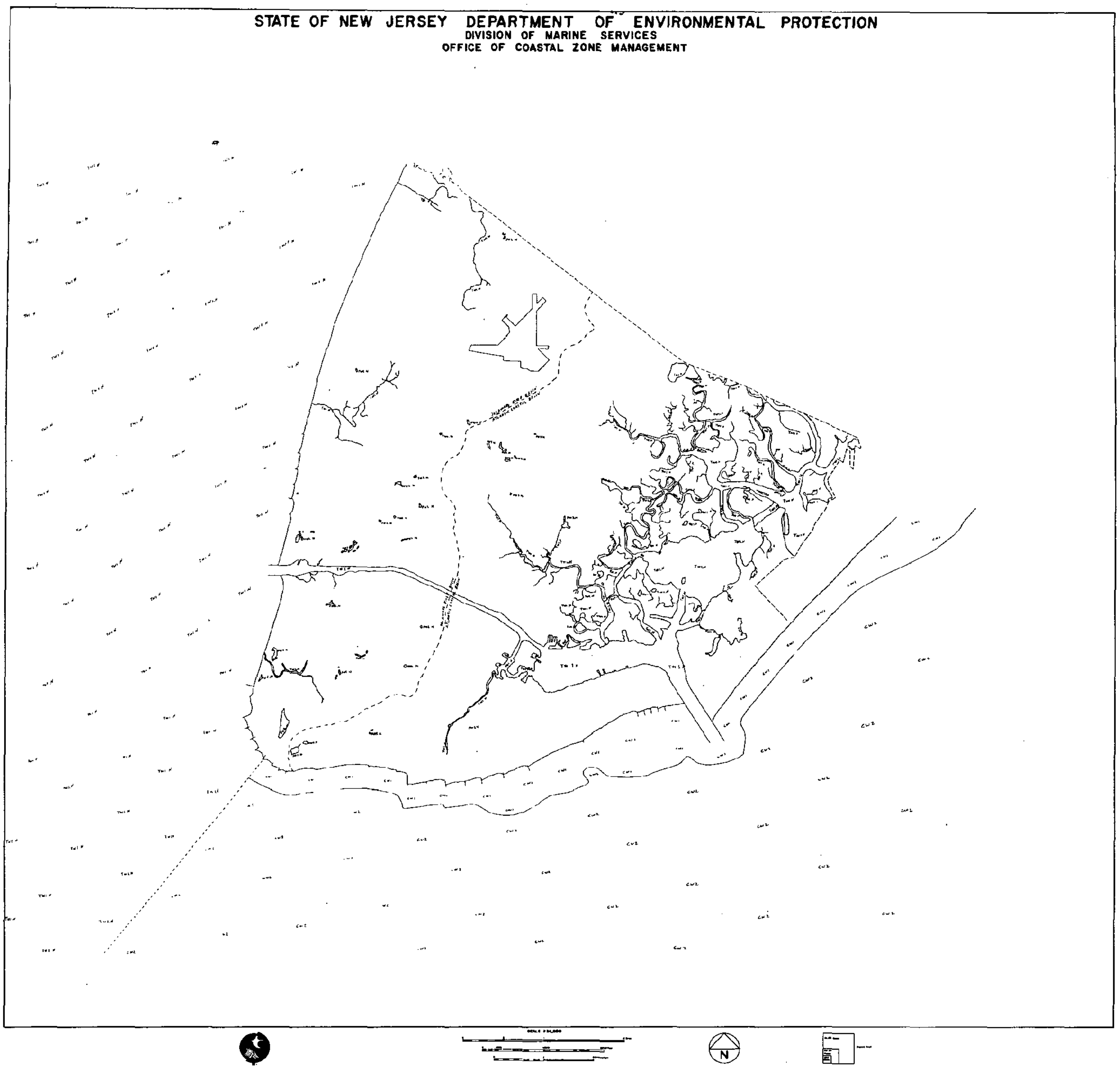


Figure 19



SURFACE WATER QUALITY CLASSIFICATIONS

Coastal Waters	Fresh Waters
CW 1	FW 1
CW 2	FW 2.P
Tidal Waters	FW 2.M
TW 1.M	FW 2.N
TW 1.N	FW 3.M, FW 3.N
TW 2	P Trout Production Waters
TW 3	M Trout Maintenance
TW 4	N Non-Trout Waters

SOURCE: N.J. DEP., Surface Water Quality Standards (December, 1974).

Figure 20

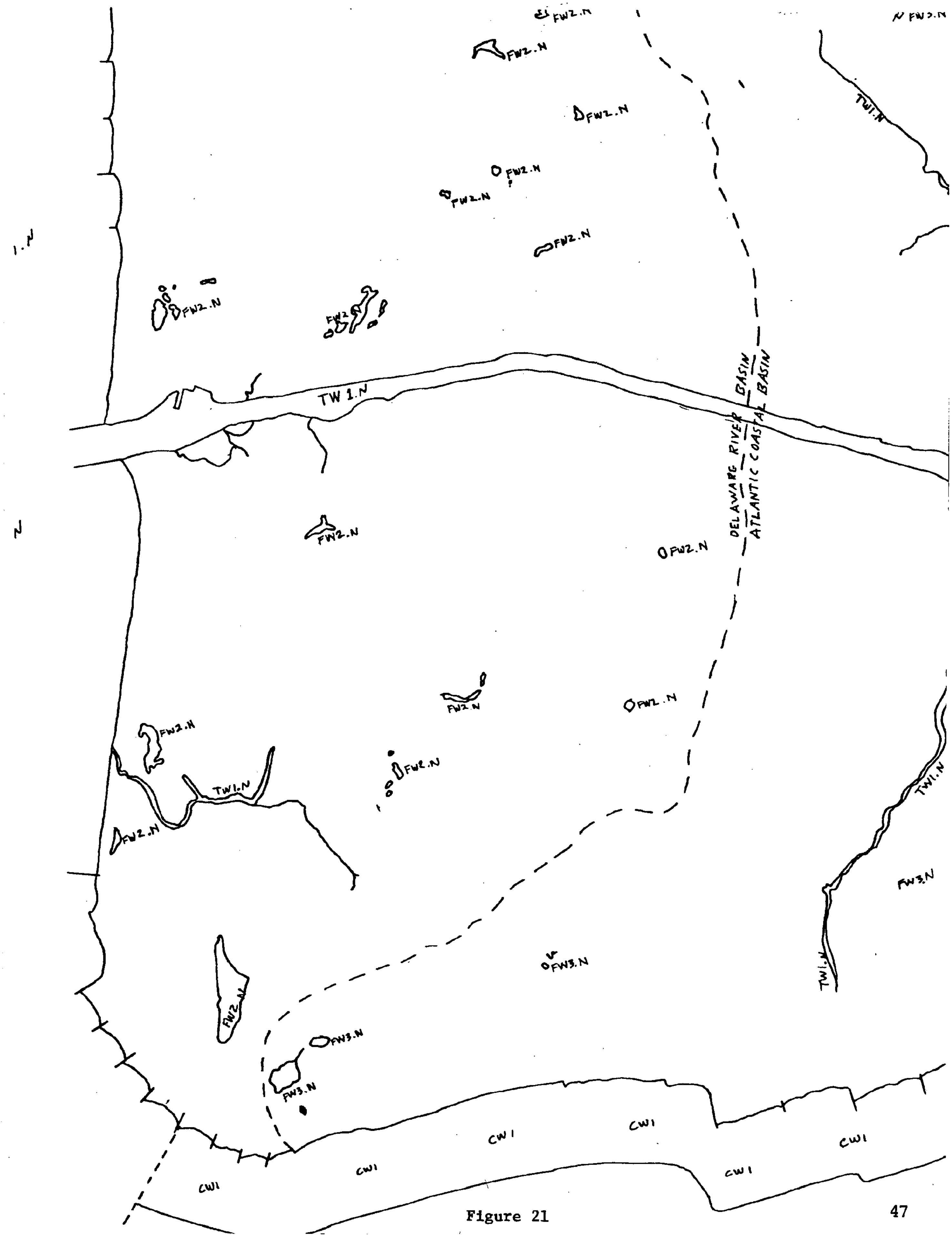

FW2.N
FW2.N
FW2.N
FW2.N
FW2.N
TW1.N
FW2.N
1.N
FW2.N
FW2
TW 1.N
DELAWARE RIVER BASIN
ATLANTIC COASTAL BASIN
N
FW2.N
FW2.N
FW2.N
FW2.N
FW2.N
FW2.N
TW1.N
FW2.N
TW1.N
FW3.N
FW3.N
FW2.N
FW3.N
FW3.N
TW1.N
CW1
CW1
CW1
CW1
CW1
CW1

Figure 21

v) Classification of Minor Types

These factors are used in various combinations to determine land and water types. For example, particular quantities of depth to seasonal high water table, soil permeability and degree of surface disturbance would describe one particular land type.

Land - Minor Types

The land areas of the Coastal Plain are first divided into Inner Coastal Plain and Outer Coastal Plain areas. Although the classification factors used to distinguish subtypes are the same in both Inner and Outer Coastal Plains, and they share unconsolidated substrates of sand gravel and clay, significant differences of substrate, soils, water quality and native vegetation require separate analyses.

The classification factors used to subdivided land areas are depth to seasonal high water table (SHWT), soil permeability and degree of disturbance. Of the three depth to water table is the most important since the available moisture plays the greatest role in varying the environmental systems operating in different areas.

Six minor land types are used for analysis subdivided by physiographic province and depth to water table:

1. Inner Coastal Plain Upland (SHWT 5'+)

2. Inner Coastal Plain Dry Terrace (SHWT 3'-5')

3. Inner Coastal Plain Wet Terrace (SHWT 1'-3')

4. Outer Coastal Plain Upland (SHWT 5'+)

5. Outer Coastal Plain Dry Terrace (SHWT 3'-5')

6. Outer Coastal Plain Wet Terrace (SHWT 1'-3')

Permeability and the level of disturbance of the natural systems are then used to classify subtypes of these six minor types as discussed in Appendix B.

Water's Edge - Minor Types

Four minor water's edge types are distinguished depending on physiographic region and elevation above Mean Low Water level.

7. Inner Coastal Plain Upper Water's Edge
(Between 100 yr. flood or upland limit of alluvial soil above and the upland limit of wetland vegetation below)

8. Inner Coastal Plain Lower Water's Edge
(Between Mean Low Water Level (MLW) below and the upland limit of wetland vegetation above)

9. Outer Coastal Plain Upper Water's Edge
(Defined as for Inner).

10. Outer Coastal Plain Lower Water's Edge
(Defined as for Inner)

Water - Minor Types

Variations in the volume and flushing rate of water bodies are used to distinguish six minor water types.

11. Standing Waters
    Inner Coastal Plain

12. Rivers and Streams

13. Outer Coastal Plain Rivers and Streams

14. Back Bays

15. Semi-Enclosed Bays

16. Open Bays

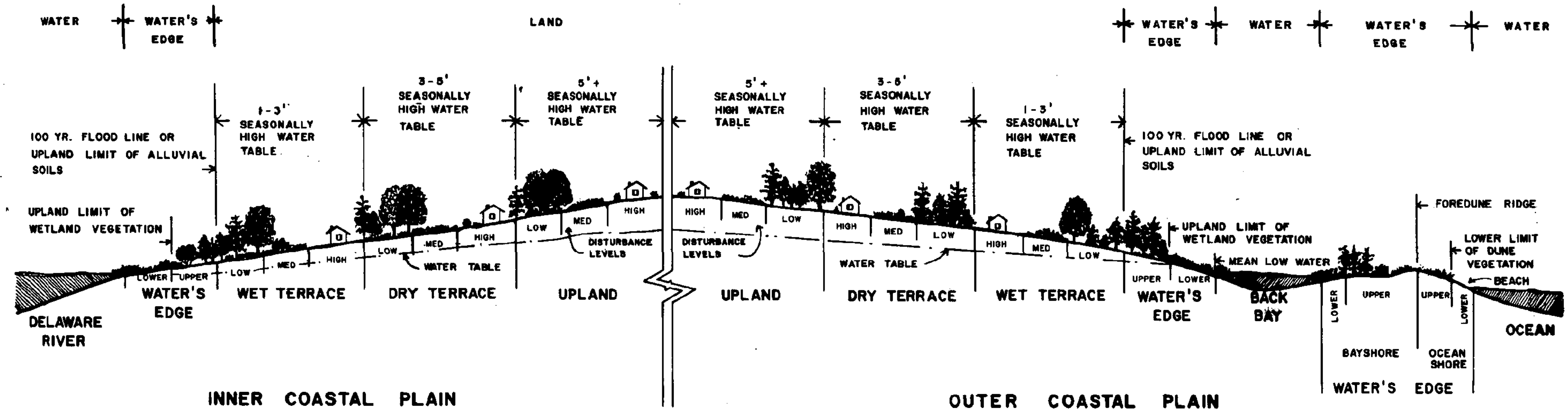
17. Ocean

Salinity, bottom characteristics, water depth and the extent of human disturbance of both the water column and the bottom were then used to distinguish subtypes as discussed in Appendix B.

The full classification of subtypes is listed in Appendix B together with brief descriptions of the natural processes and resources typically found in each.

The following diagrams (Figures No. 22 and 23) show the general distribution of land and water types.

Figure 22: Basic Land and Water's Edge Types



*NOTE

1. All land types here may be further subdivided by permeability.

2. Wet and dry terraces are shown in relation to surface water bodies. Where clay lenses in the substrate cause perched water tables, terrace types may occur that have no relation to surface water.

3. Land and water types are further divided by value factors such as soil fertility and scenic value to obtain sensitivity types.

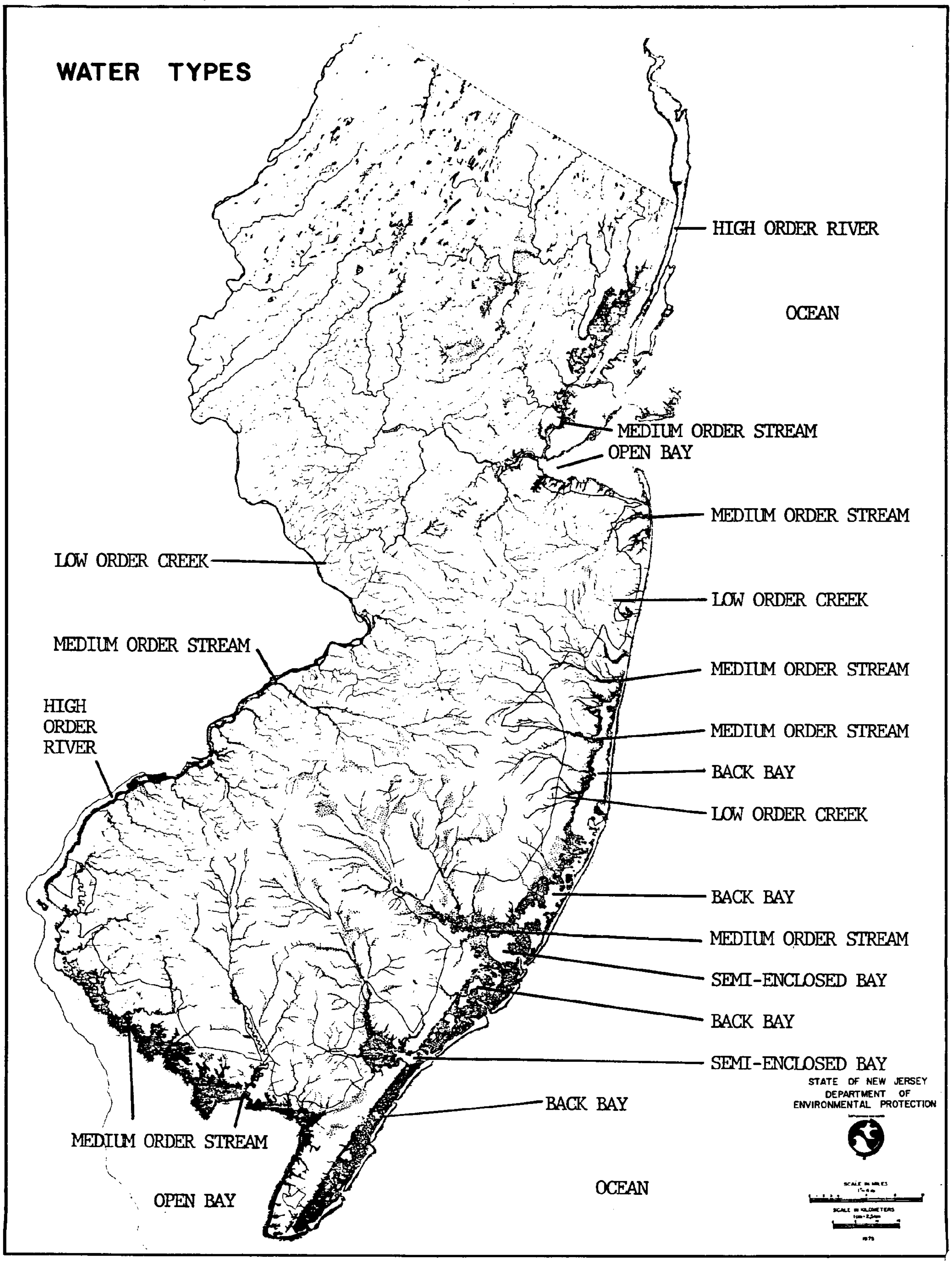

WATER TYPES
HIGH ORDER RIVER
OCEAN
MEDIUM ORDER STREAM
OPEN BAY
MEDIUM ORDER STREAM
LOW ORDER CREEK
LOW ORDER CREEK
MEDIUM ORDER STREAM
MEDIUM ORDER STREAM
HIGH ORDER RIVER
MEDIUM ORDER STREAM
BACK BAY
LOW ORDER CREEK
BACK BAY
MEDIUM ORDER STREAM
SEMI-ENCLOSED BAY
BACK BAY
SEMI-ENCLOSED BAY
BACK BAY
STATE OF NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MEDIUM ORDER STREAM
OPEN BAY
OCEAN

Figure 23

LAND & WATER TYPES

PREFIX	DISTANCE TO SEASONALLY HIGH WATER TABLE (FEET)		PERMEABILITY ("/HR)
A	0 – 1		0.2" – 2.0"
B	0 – 1		2.0" – 6.0"
C	0 – 1		6.0" +
D	1 – 3	WET TERRACE	0.2" – 2.0"
E	1 – 3	WET TERRACE	2.0" – 6.0"
F	1 – 3	WET TERRACE	6.0" +
G	3 – 5	DRY TERRACE	0.2" – 2.0"
H	3 – 5	DRY TERRACE	2.0" – 6.0"
J	3 – 5	DRY TERRACE	6.0" +
K	5 +	UPLAND	0.2" – 2.0"
M	5 +	UPLAND	2.0" – 6.0"
N	5 +	UPLAND	6.0" +
P	FLOOD PRONE AREAS		

SOURCE: S.C.S. INTERIM SOIL SURVEY REPORT, CAPE MAY COUNTY, NEW JERSEY, 1973.

OCEAN
- UPPER SURF ZONE (0'–6' water depth)
  - STABLE SUBSTRATE — W - 1
  - UNSTABLE SUBSTRATE — W - 2
- LOWER SURF ZONE (6'–18' water depth)
  - STABLE SUBSTRATE — W - 3
  - UNSTABLE SUBSTRATE — W - 4
- LOWER SHOREFACE (18+ water depth)
  - STABLE SUBSTRATE — W - 5
  - UNSTABLE SUBSTRATE — W - 6

OPEN BAY ESTUARIES
- OCEAN INFLUENCE (<35ppt salinity)
  - FLATS (0'–6' water depth) — W - 7
  - SHOALS (6'–18' water depth) — W - 8
  - CHANNELS (18+ water depth) — W - 9
  - CANAL & INLET — W - 10

BACK BAY ESTUARIES
- OCEAN INFLUENCE (<35 ppt salinity)
  - CHANNELS (6' water depth — W - 11
  - SHOALS (1/2"–6' water depth) — W - 12
  - INTERTIDAL FLATS (0'–1/2' water depth) — W - 13

OUTER COASTAL PLAIN RUNNING WATERS
LOWER ORDER CREEK
- OCEAN INFLUENCE (<35 ppt salinity) — W - 14
- TRANSITION ZONE (<20 ppt salinity) — W - 15
- TIDAL FRESHWATER INFLUENCE (<3.5ppt salinity) — W - 16

STANDING WATER
- PONDS — W - 17
- NON POTABLE LAKE — W - 18

Figure 24

SOURCE: OCZM PILOT STUDY PROJECT 1977

Figure 25

vi) Mapping of Land and Water Types in the Pilot Area

By overlaying all the relevant factor maps and classifying the resultant combinations according to the subtype classification for natural land and water types listed in Appendix B, the following maps (Figure Nos. 24 and 25) was produced, showing the distribution of land and water types in the pilot area.

These natural land and water types are modified by the extent of human disturbance, from low, essentially undisturbed forest, through medium, agriculture and recreational open space, to high, structures and paving. By overlaying an interpretation of the land cover map (Figure No. 18) on the natural land and water type map (Figure No. 24), the distribution of land and water types with disturbance can be recorded. This map becomes the geographic base for environmental impact analysis.

The following maps (Figure Nos. 26 and 27) illustrates the distribution of land and water types with disturbance in the pilot area.

LAND & WATER TYPES WITH DISTURBANCE LEVELS

PREFIX	DISTANCE TO SEASONALLY HIGH WATER TABLE (FEET)		PERMEABILITY ("/HR)
A	0 – 1		0.2" — 2.0"
B	0 – 1		2.0" — 6.0"
C	0 – 1		6.0" +
D	1 – 3	WET TERRACE	0.2" — 2.0"
E	1 – 3	WET TERRACE	2.0" — 6.0"
F	1 – 3	WET TERRACE	6.0" +
G	3 – 5	DRY TERRACE	0.2" — 2.0"
H	3 – 5	DRY TERRACE	2.0" — 6.0"
J	3 – 5	DRY TERRACE	6.0" +
K	5 +	UPLAND	0.2" — 2.0"
M	5 +	UPLAND	2.0" — 6.0"
N	5 +	UPLAND	6.0" +
P	FLOOD PRONE AREAS		

DISTURBANCE LEVEL SUFFIX: L – LOW
M – MEDIUM
H – HIGH

SOURCE: S.C.S. INTERIM SOIL SURVEY REPORT, CAPE MAY COUNTY, NEW JERSEY, 1973

OCEAN
UPPER SURF ZONE
(0'-6' water depth)
STABLE SUBSTRATE — W - 1
UNSTABLE SUBSTRATE — W - 2

LOWER SURF ZONE
(6'- 18' water depth)
STABLE SUBSTRATE — W - 3
UNSTABLE SUBSTRATE — W - 4

LOWER SHOREFACE
(18' water depth)
STABLE SUBSTRATE — W - 5
UNSTABLE SUBSTRATE — W - 6

OPEN BAY ESTUARIES
OCEAN INFLUENCE
(<35ppt salinity)
FLATS
(0'-6' water depth) — W - 7
SHOALS
(6'-18' water depth) — W - 8
CHANNELS
(18' water depth) — W - 9
CANAL & INLET — W - 10

BACK BAY ESTUARIES
OCEAN INFLUENCE
(<35 ppt salinity)
CHANNELS
(6' water depth) — W - 11
SHOALS
(1/2'- 6' water depth) — W - 12
INTERTIDAL FLATS
(0'-1/2' water depth) — W - 13

OUTER COASTAL PLAIN RUNNING WATERS
LOWER ORDER CREEK
OCEAN INFLUENCE
(<35 ppt salinity) — W - 14
TRANSITION ZONE
(<20 ppt salinity) — W - 15
TIDAL FRESHWATER INFLUENCE
(<3.5ppt salinity) — W - 16

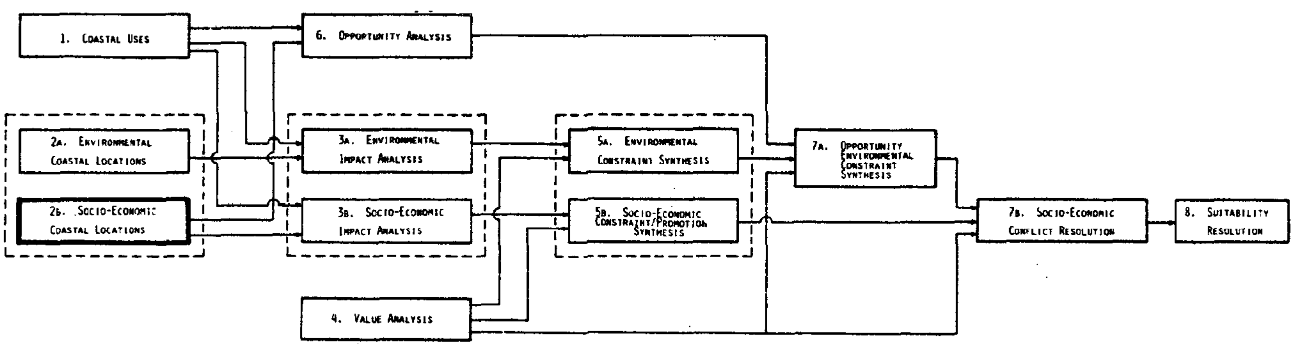
STANDING WATER
PONDS — W - 17
NON POTABLE LAKE — W - 18

SOURCE: OCZM PILOT STUDY PROJECT 1977

Figure 26

Figure 27

SECTION 2b
SOCIO-ECONOMIC COASTAL LOCATIONS



New Jersey Municipal Population Densities 1970

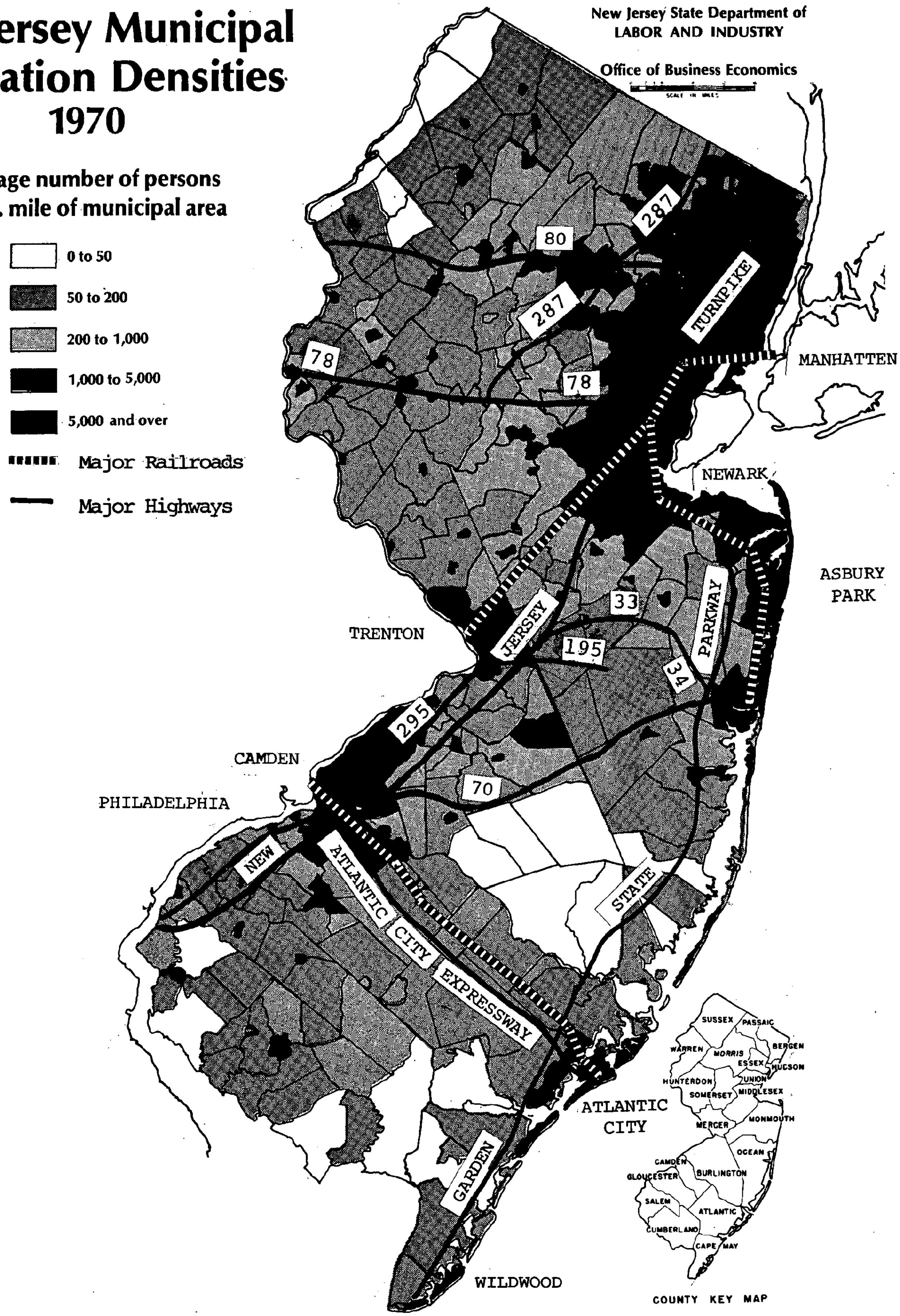


Figure 28

SECTION 2B - SOCIO-ECONOMIC COASTAL LOCATIONS

C. General Introduction to the Cultural Geography of New Jersey

Settlement in New Jersey concentrates around urban centers, of which the largest, New York and Philadelphia, are out of state. To the northeast, industry and surburban residential settlement surrounds the New York-Newark area in circles of decreasing density, to the west there is high density settlement on the Delaware River around Philadelphia-Camden, and Trenton with heavy industry on the riverfront between them. To the east there is a linear concentration of urban and suburban residences, second homes and resort facilities along the coast. (See Figure 28)

The coastal settlement grew over the past century as resort facilities serving the urban populations of New York and Philadelphia. At first, growth was in urban centers linked by rail to the metropolitan centers, Asbury Park and Atlantic City are examples. As car and air travel increased the older coastal urban areas decayed and lower density resort housing spread along the barrier islands. Generally along the coast there is a decrease in population density going south from Sandy Hook as travel times to New York increase, a concentration of population on the coast nearest to Philadelphia and then a decrease going southward to Cape May with a small concentration in the southernmost areas of Cape May including the pilot area.

Population density falls to the southwest of the concentrations around New York, to the east of Trenton and Camden and to the west of the Atlantic coastline to sparsely populated agricultural and rural areas in the center and south of the Coastal Plain.

The main transportation corridors link the population concentrations, high speed road and rail links run between New York-Newark, Trenton and Philadelphia-Camden. The metropolitan urban concentrations are linked by road and rail to centers on the Atlantic coast.

Two major port areas on the Raritan River at Newark and the Delaware River at Camden influence settlement and resource distribution. Although the ports have changed with the increase of container transportation and vessel size, and the shift from rail to road transportation, they are still a major influence in the state.

AVERAGE ANNUAL CHANGE OF DENSITY IN PERSONS/SQ MI 1960-1970

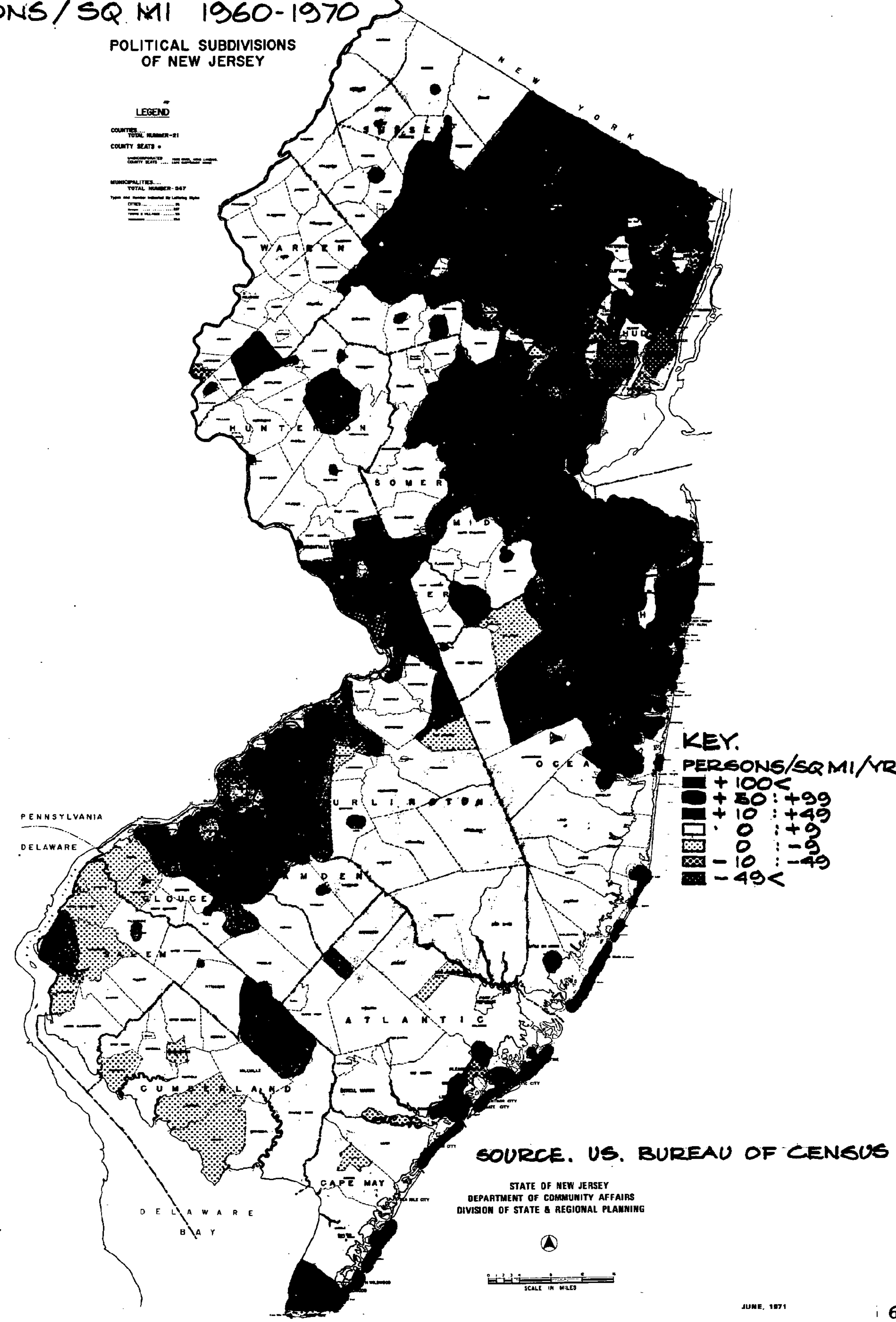


Figure 29

If the changes of population density between 1960 and 1970 are mapped (See Figure 29) the intra-state migration patterns of the decade are revealed. The picture is common to the northeast; older, decaying urban centers have declining populations, Newark, Jersey City, Trenton, Camden, Asbury Park, Atlantic City and Wildwood are the principal urban municipalities in this category.

This urban population decline is caused by the more affluent leaving the problems of low economic opportunity, overcrowding, violence, air and water pollution and declining quality of public services. Around these declining centers are municipalities that show extremely high growth rates, often greater than 100 persons/ square mile/year. These are new developments of dormitory suburbs, still largely dependent on the older centers for employment, housing a workforce that commutes by car or rail to the cities. (The explosive growth induced by the Lindenwold High Speed Line shows clearly on this map.)

These areas of intensive development on the whole are in concentric rings up to 20 miles form the urban centers. A major exception of this rule is caused by the linear nature of desirable ocean shorefront which tends to distribute high growth rates along the shorefront municipalities.

Beyond these rings and bands of high intensity growth the growth rate declines gradually going outward from the urban centers and inland from the northern shore, and rapidly going inland from the central and southern shores, to areas of low growth in the center and south of the Coastal Plain where growth rates indicate little in-migration.

In some municipalities, predominatly in the south, population has been slowly declining. On the whole these are low density rural-agricultural areas with little access to centers of employment. Declining agriculture and lack of alternative job opportunities have led to slow out-migration.

II. Classification of Socio-Economic Subregions

a) Introduction

This part of the method is much less developed than the classification of environmental land and water types because less precedent is available for comparison and DEP-OCZM decided to include this work in a future socio-economic study.

The objective of the task is to prepare maps showing regions and subregions that differ significantly in their socio-economic response to impact.

b) Method

i) General

The first task of this step is to determine what published social and economic data is available on which to base the study, what geographic bases are used for the published data, how often the data is updated and what is the level of accuracy.

This task has been started and a summary of the findings to date is included in Appendix B. The list of available data includes federal census data giving demographic information once a decade with selected annual updates by the state government; state social statistics including crime, welfare, alcholism, physical health, mental health and education; land use information including housing, industry, agriculture, commerce, and open space; municipal financial status; and employment.

The next step, which has not been started, is to determine the least number of factors that can be used to produce in combination a distribution of socio-economic subregions of sufficient variety to give adequate planning sensitivity with a usable amount of information.

Clearly such factors as population density, existing land use, income, and economic trends are of great importance and other factors such as distance from major employment centers, age-sex distribution, income, ethnicity and age of settlement, will have to be studied.

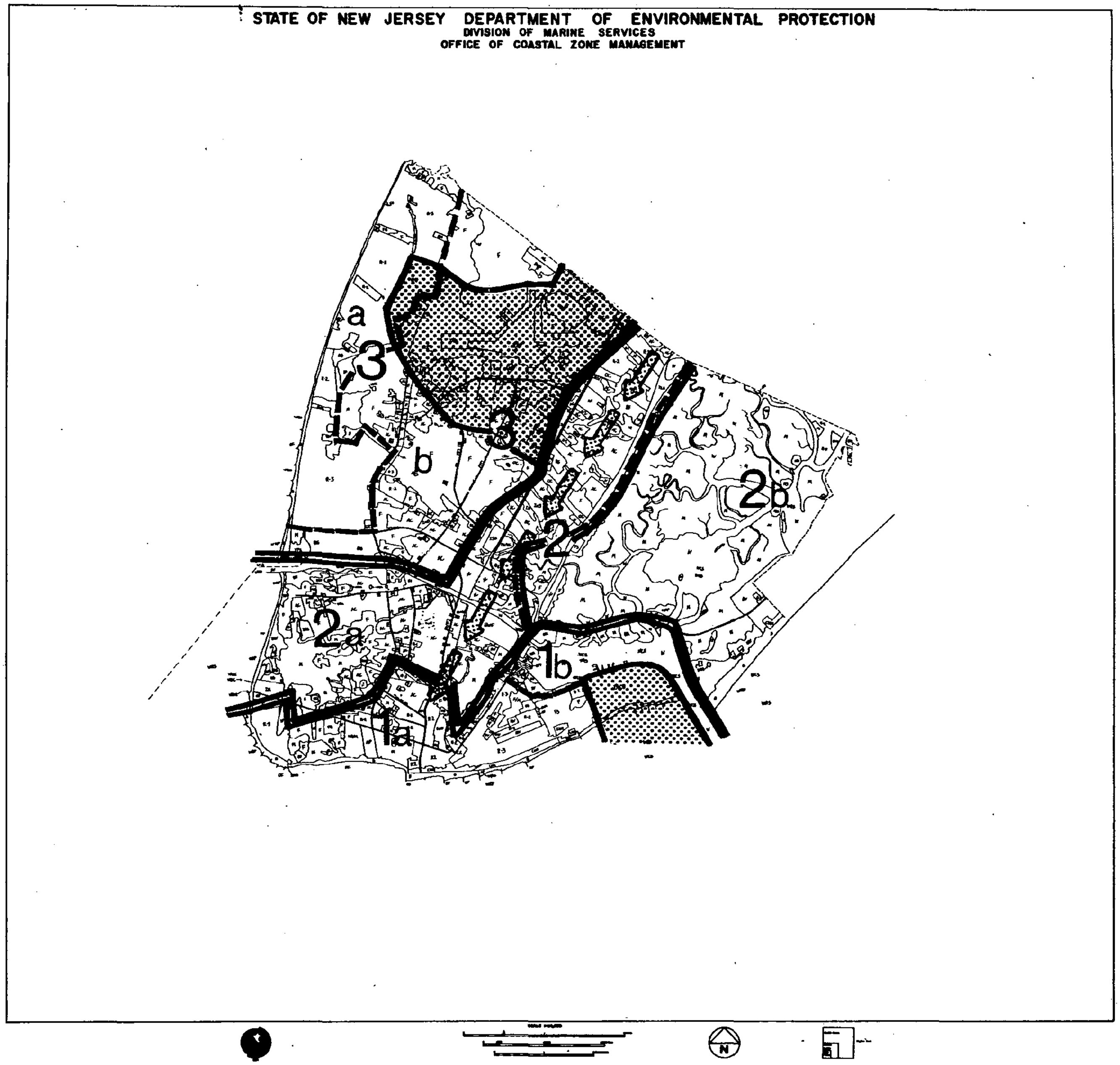
Factors need testing for interdependence. If, for example, study reveals that there is a high degree of correlation between income and public health it is not necessary to use both factors in the formation of socio-economic subregions since the areas described by both will be the same or very similar. When a first attempt to identify independent factors has been completed the individual factors will be mapped to a common scale. Since socio-economic sub-regions are larger than land and water types a scale of 1:100,000 or 1:250,000 may be more appropriate for this task than the scale of 1:24,000 used for environmental types.

Once this preliminary map is complete, field testing is needed to verify the choice of factors and the distribution of types. Confirmation is needed that different areas classed as the same type are indeed similar and that areas classed differently have significant differences.

The findings of this field work will then finalize the classification and mapping and a combination of study of the published data and field work will be used to prepare brief illustrated descriptions of the socio-economic resources and processes characteristic of each type.

ii) Preliminary Classification of Socio-Economic Subregions in the Pilot Area

The pilot area is an economic resort based unit. The unit consists of a residential resort area along the Atlantic Coast buffered by an open space area in agriculture and forest, through which there is access to the resort area. The resort area and its buffer are boundaried by Route 9 and the Canal. The service areas for the resort appear to be, by examining the data, in the more densely populated areas of the City of Cape May and West Cape May with the bulk of the service and retirement segment on the Delaware Bay side of Route 9 above the Canal.



SOCIO-ECONOMIC SUBREGIONS

(1a) OCEAN - RESORT
(1b) MARINA - RESORT
> RESORT/SERVICE

(2a) FARM
(2b) WETLANDS
> OPEN/BUFFER

(3a) RETIREMENT
(3b) DEVELOPMENT PRESSURE
> SERVICE/RETIREMENT

ACCESS

EXCLUDED AREAS

Source: DEP-OCZM

Figure 30

The map opposite (Figure No. 30) illustrates the basic socio-economic sub-regions.

The pilot area is a vacation area for residents of Delaware, Pennsylvania and New Jersey with its mild climate (same latitude as Washington, D.C.) and coastal resources. The average density of the pilot area is approximately 740 (people/sq. mile) compared with the state average of 950.

On examining the land values sharp distinctions can be made. In the older resort area of Cape May Point the land values range from $30,000 for beachfront lots to $10,000 some blocks inland from the beach. Going north into Cape May pricing is $1,200 per linear foot with a depth of 150'. The land values for multi-family lots 60' x 125' are about $25,000 while the same size lot for a SFD is about $15,000. These figures grade downward at about $2,000 interval per urban lot away from the beach front.

The subdivisions in the pilot area along the Delaware Bay have land values ranging from $15,000 to $35,000 for a building lot, 20' x 100'. This grades to $5,000 as one moves toward the airport. This area is the main stable population center of pilot area for both the retirement community and civilian labor force. The section between the bay and Route 9 where existing development pressure exists has a value range of $10-15,000/acre. As the airport is approached values become more difficult to assess.

The land area between the Garden State Parkway and Route 9 has land value ranges from $5,000 to $10,000 per acre. This linear area has potential for strip commercial and housing development. The last area is in the wetlands on the ocean (east) side of the North-south access routes, and because it is a regulated area it is tentatively valued at about $1,000/acre although the lack of recent exchanges of ownership make this figure speculative.

Using census data and Department of Labor and Industry updates, it is possible to identify an in-migration due to the expansion of the resort and retirement sectors. Most of this growth has located in the resort towns. The per capita income is slightly lower than the state average. The source of the income is mostly from wages with less people on public welfare than the state average.

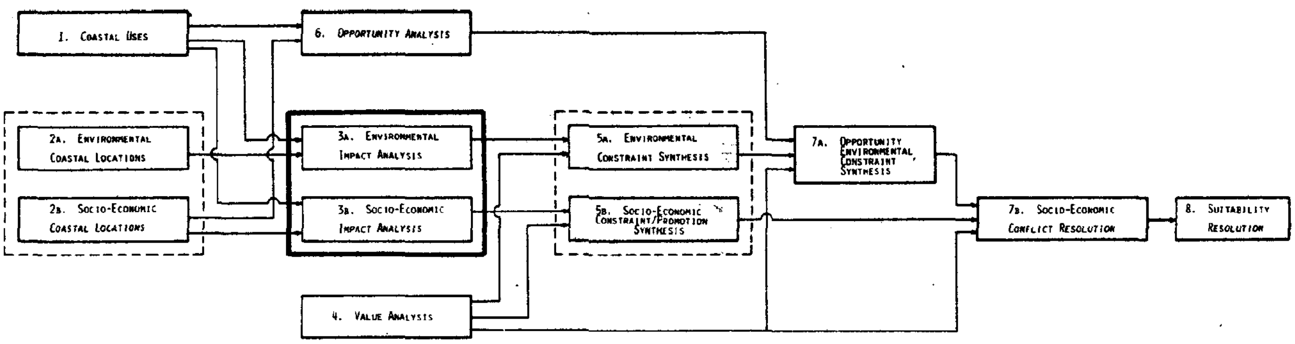
The resort industries are primarily service oriented, small scale, individually owned businesses with some construction trades represented. A large percentage of the population is self employed.

Due to the resort industry there is a sharp seasonal fluctuation in employment, with the peak in July and August. There is a core that remain unemployed even the peak months. Winter unemployment may be voluntary.

There is a low level of commutation due to the lack of public transport and the low income and distance to major employment centers. The commuters mostly go to Philadelphia and Cumberland County where there are large job bases.

The resort population consists of vacationers, who stay for short periods, second home owners, campers, and retirees who build or convert homes. The summer population can swell to ten times that of the winter. The largest percent of seasonal dwelling units is on the east coast. There are few inland seasonal units.

SECTION 3.
IMPACT ANALYSES



SECTION THREE - IMPACT ANALYSIS

General Introduction

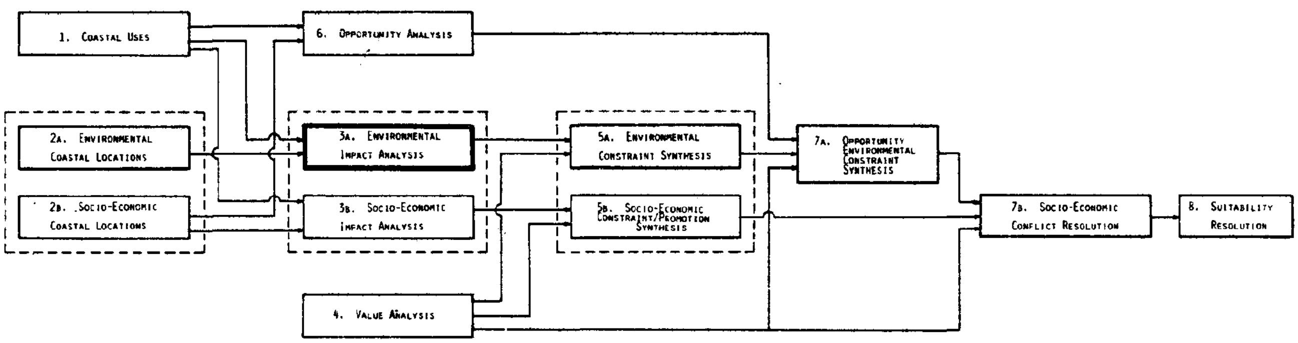
When a new use or development is introduced into a location, a set of planning and financing, site preparation, construction and operation activities take place. Many of these activities are specific both to the use and the location.

Some or all of these activities may cause measurable changes in the built or natural environment and to natural or socio-economic processes either as an immediate result, or through a direct chain of cause and effect.

Impact analysis is concerned with the ability to predict both the immediate and the causally related changes qualitatively and if possible quantitatively. This method uses two impact analyses, environmental and socio-economic.

The two analyses do not use the same geographic base. The environmental impact analysis uses the environmental land and water types of Section 2, Coastal Locations, and records environmental impacts associated with each use type of Section 1, Coastal Uses. The socio-economic impact analysis uses a classification of larger socio-economic sub-regions discussed in Section 2, Coastal Locations, and records the socio-economic impacts associated with each use type of Section 1, Coastal Uses.

SECTION 3a.
ENVIRONMENTAL IMPACT ANALYSIS



SECTION 3A - ENVIRONMENTAL IMPACT ANALYSIS

I. Introduction

A major issue faced by New Jersey's coastal management program is how to accommodate development with acceptable levels of environmental impact. In order to guide development and meet environmental objectives, the environmental impact of each use type in each land and water type must be understood. It is the objective of this element of the method to reach an understanding of all the impacts of development on the environment, and to present the data in a form which permits a comparison of the different impacts of the land and water uses identified in Section 1 on the land and water types identified in Section 2.

II. Method

The introduction of a new use into a location involves a set of activities in site preparation, construction and operation. Some or all of these activities cause measurable changes in the environment. The nature of the impacting activities and the nature and extent of environmental change depend both on the use and the location. For example, the impacting activities of housing, and the changes caused, will be different in a marsh and a wooded upland, and the impacting activities and impacts of industry on either area will also differ from those of housing.

The steps in the impact analysis can be outlined as follows:

1. Identification of the land and water uses which potentially may occur in the coastal zone. Six major categories of land use have been developed to organize the list. Subcategories of these major categories bring the total to 57 uses to be analyzed. These are listed in the Section 1, Coastal Uses.

2. Identification of a set of development activities which are associated with the site preparation, construction and operation of each land and water use. These were obtained from published sources and consultation with DEP-OCZM staff.

3. Development of a concise list of environmental impacts resulting from development and operational activities and directly affecting the chemical, physical, biological, and aesthetic environments. These were obtained from published environmental impact studies and discussion with DEP-OCZM staff. The list of 74 impacts will serve as the basis for the analysis.

4. Identification of the land and water types occuring within New Jersey's coastal zone. Individual land and water types have been identified based on perceived differences in selected key environmental parameters. A list of 116 land and water types has been developed from aggregation of longer, more detailed lists. This classification is discussed in Section 2 on Coastal Locations.

5. A matrix method is used to analyze the relationships between the above four sets of data. A separate matrix will be developed for each of the land and water types discussed in Section 2, Coastal Locations, and as many of the detail and disturbance subtypes as seems necessary to obtain the required sensitivity. This work is part of the estuarine study.

An illustrative diagram of a typical matrix is shown below in Figure 31 below.

COASTAL ENVIRONMENTAL IMPACT MATRIX

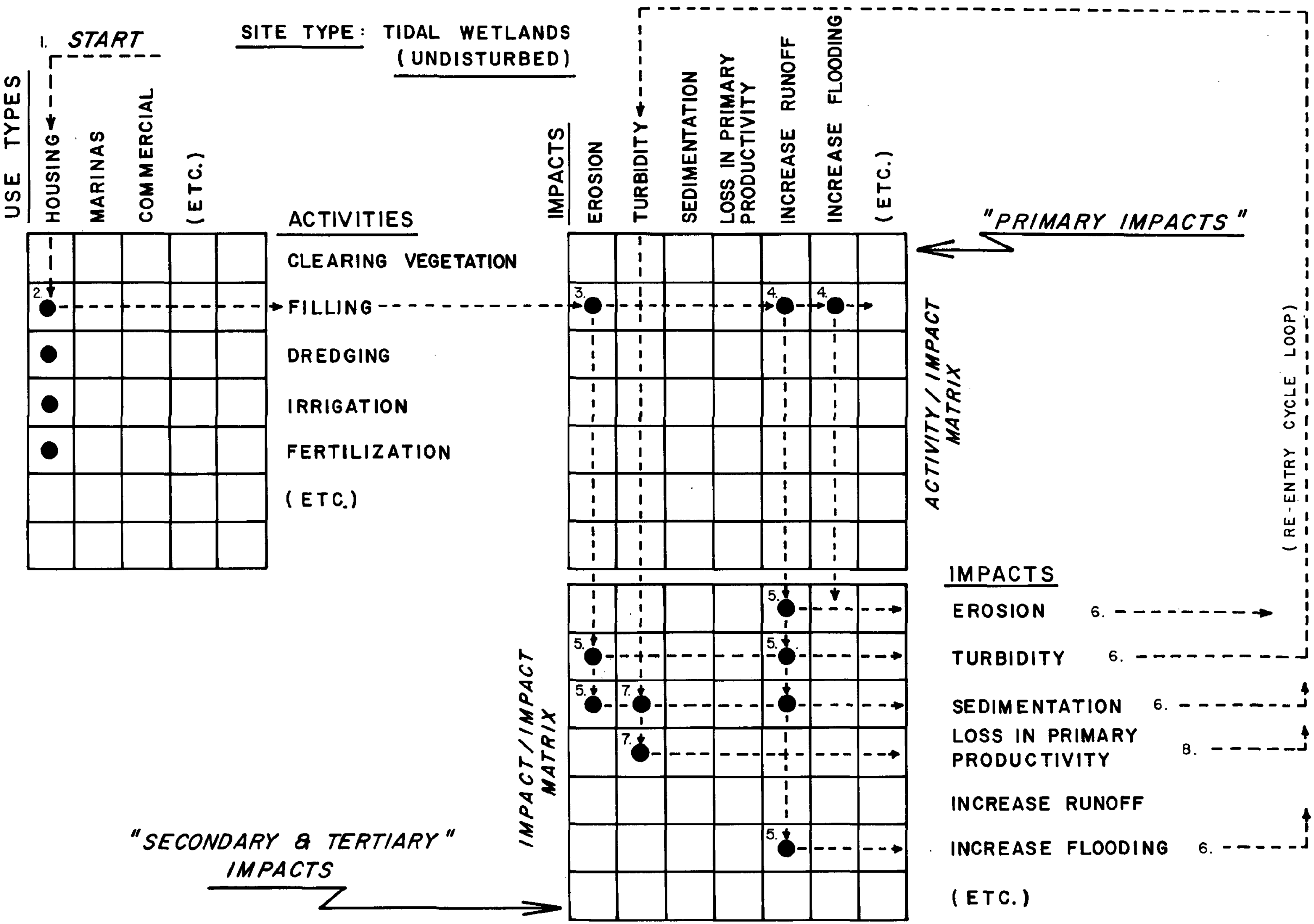


Figure 31

Coastal Environmental Impact Matrix
(working description)

(1) Start - Begin by selecting the use type. Move downward within the verticle column until first dot is encountered.

(2) This marked intersection indicates an impacting activity (developmental or operational) which is associated with the particular use, in this specific site type. Read the activity name listed to the right. Repeat procedure for all other dotted intersections within the use column until complete list of all activities associated with the use type is obtained. Next move horizontally to the right from each marked activity into the activity/impact matrix section.

(3) This is the activity/"primary" impact matrix. Each dotted intersection within the row indicates a "primary" or immediate impact to the coastal environment resulting immediately (without intermediate steps) from each activity. Read impact name at top of matrix.

(4) Continue within the same row for a complete listing of primary impacts. This procedure is to be repeated for each activity, reading the "primary" impact name at top of the grid.

(5) For each "primary" impact there will usually be a number of "secondary" environmental impacts linked by direct causal relationship with the primary impact.

The environmental causal chain of impacts can be traced through the impact/impact matrix. From each primary impact, move down each vertical column and enter the lower matrix grid. Each dotted intersection indicates a "secondary" impact resulting directly from primary impact. Continue down within vertical column, reading all "secondary" impact type names to the right.

Repeat procedure for all primary impact types by moving down columns, encounter dot, read impact type name at right, proceed within column. After all "primary" impacts have been traced through their secondary affects, enter cyclic loop.

(6) Secondary impacts may cause "tertiary" impacts. These may be identified by exiting the impact/ impact matrix at far right, following the cyclic loop, and re-entering at the top, in the same impact column as the exit. Skip over the upper (activity/ impact) matrix and proceed into the lower matrix, identifying the related impacts as before.

(7) Dotted intersections indicate a direct causal relationship between a "secondary" and a "tertiary" impact.

(8) Enter cyclic loop, and re-enter lower matrix by way of same impact type column as exit skipping over dots in upper matrix. The procedure must be repeated for each "tertiary" impact, until all causally related impacts have been identified.

If a causal chain of impact leaves a land or water type and impacts another a cross reference is made on the horizontal line to the matrix of the other type and this impact is entered on the vertical axis of the second matrix (as when turbidity from a stream enters a coastal embayment). This step is not shown on the sample matrix.

This matrix system allows for the identification of all the environmental impacts resulting from each land use and follows the causually linked impacts through the environment. Working the matrix in reverse, known environmental impacts can be traced back to land or water uses.

The complete list of uses to be considered is that included in Section 1, Coastal Uses under impact analysis. Only housing and marinas were studied in this pilot. The estuarine study recently contracted will complete this analysis.

The following tables list the impacting activities (Figure 32) and the impacts (Figure 33) that were considered in the sample matrix in Figure 34.

Figure No. 32

Activities

Cutting and Clearing Vegetation
Filling
Excavation & Trenching
Cut & Fill (Regrading)
Piling
Compacting
Construction
Paving & Structures
Plantings
Fences
Dams & Impoundments
Channeling & Culverting (drainage alterations)
Coastal Structures
Dredging
Subsurface Drilling
Surface Water Withdrawal
Groundwater Withdrawal
Subsurface Waste Disposal
Liquid Waste Disposal-Nutrient
Liquid Waste Disposal-Chemical
Liquid Waste Disposal-Thermal
Urban Runoff
Solid Waste Disposal
Surface Extraction
Pedestrian Circulation
Automobile Circulation
Boat Circulation
Cultivation
Irrigation
Harvesting
Pesticides & Herbicides
Fertilization
Air Emissions-Particulates
Air Emissions-Gaseous

Figure No. 33

Environmental Impacts

Increased Erosion

Increased Soil Flow and Deposition

Change in Soil Moisture Content

Change in Soil Ion Balance

Change in Soil pH

Compaction of Soil

Increased Slope of Shoreline

Decreased Exposure to Sunlight

Increased Exposure to Wind

Loss of Beach Buffer Lands (Dunes)

Increased Frequency of Wildfires

Increased Flooding

Loss of Terrestrial Vegetation

Change in Vegetative Communities

Reduction in Wildlife Population

Reduction in Wildlife Diversity

Introduction of Contaminants into Terrestrial Food Chains

Fragmentation of Contiguous Wildlife Habitats

Harrassment of Wildlife

Spread of Exotic Species

Visual Intrustion

Blockage of Coastal View

Creation Visible Areas of Disturbed Cover

Groundwater: Decreased Recharge

Groundwater: Decreased Quantity

Groundwater: Lowered Water Table

Increased Nutrient Levels

Increased Pathogen Levels

Increased Toxic Chemical Levels

Increased Saltwater Intrusion

Increased Runoff

Surface Water: Increased Sedimentation

Introduction of Floating Debris

Entrapment of Floating Debris

Blockage of Sediment Transport

Change in Bottom Characteristics

Creation of Anoxic Dredge Holes

Acceleration of Marsh Development

Interception of Littoral Drift

Increased Turbulence

Reduction of Estuarine Flushing

Change in Salinity Regime

Decreased Freshwater Flow into Estuaries

Increased Freshwater Flow into Estuaries

Decreased Dissolved Oysgen Levels

Increased Hydrogen Sulfide Levels

Change in pH

Decreased Nutrient Supply in Coastal Waters

Precipitation of Airborne Pollutants

Increased Nutrient Levels

Increased Pathogen Levels

Environmental Impacts - Continued

Surface Water: Increased Toxic Substances Levels

Surface Water: Increased Temperature

Decrease in Estuarine Productivity

Decrease in Oceanic Productivity

Inhibit Anadromous Fish Migration

Alteration of Natural Behavior Patterns

Reduction in Estuarine Species Diversity

Loss of Tidal Shallows & Sea Grasses

Loss of Tidal Marshes

Loss of Estuarine Nursery Areas

Loss of Estuarine Waterfowl Nesting and Feeding Areas

Loss of Estuarine Wintering Areas

Introduction of Contaminants into Food Chains

Lowering Disease Resistance in Aquatic Species

Direct Mortality of Aquatic Species

Disturbance of Food Web Relationships

Stimulation of Disease Vectors

Stimulation of Algal Blooms

Stimulation of Fish Kills

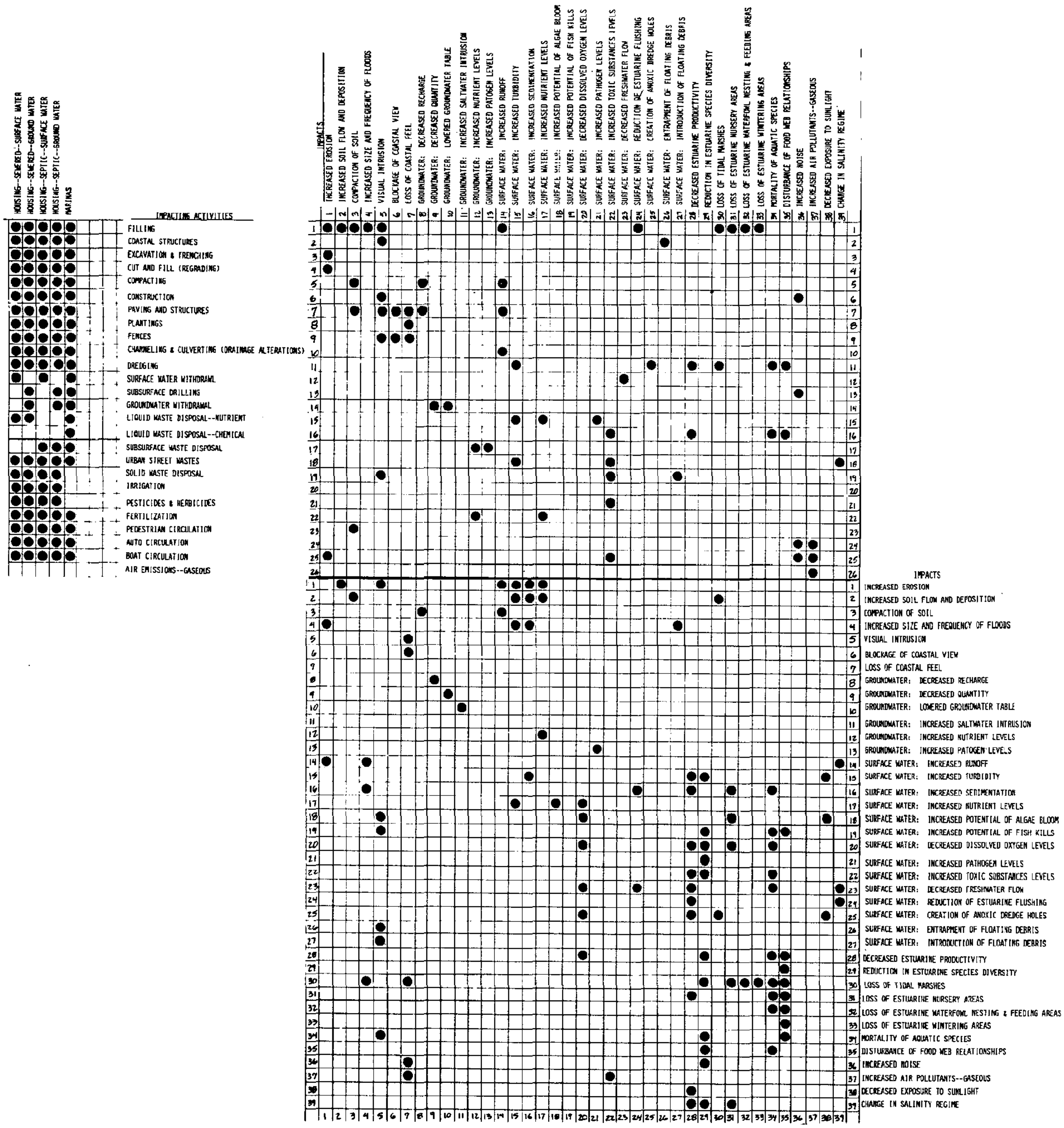
Change in Odor

Change in Color

Increased Noise

Increase in particulate Air Pollutants

Increase in Gaseous Air Pollutants

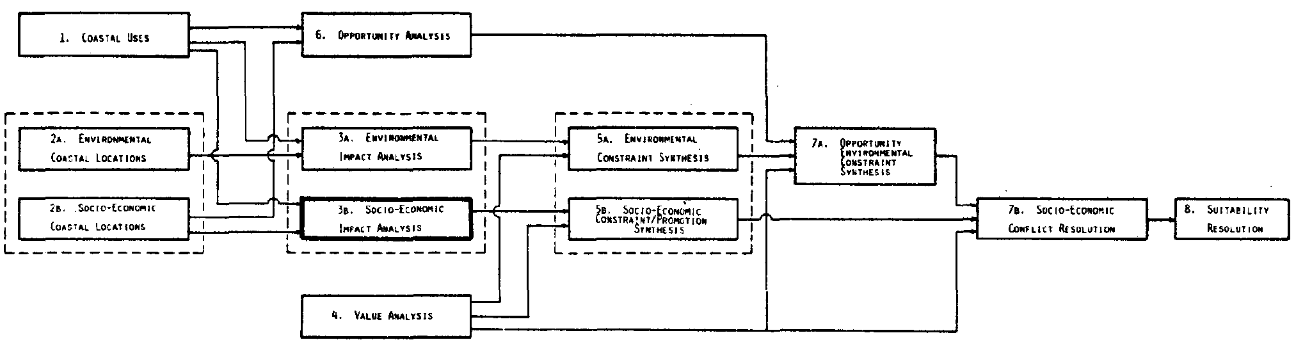


ENVIRONMENTAL IMPACT MATRIX FOR A MARSH

Figure 34

SECTION 3b.

SOCIO - ECONOMIC IMPACT ANALYSIS



SECTION 3B - SOCIO-ECONOMIC IMPACT ANALYSIS

I. Introduction

Besides causing changes in the natural environment, the introduction of new uses causes changes in the social and economic resources and processes of a location. As with environmental impacts, these changes may be an immediate result of the development or may be causally related to it through social and economic interactions.

There are, however, significant differences between the study of environmental and socio-economic impact. The natural environment can be thought of as a single constituency. The social structure contains many constituencies with different needs and the impact of a use may affect different constituencies in different ways.

II. Method

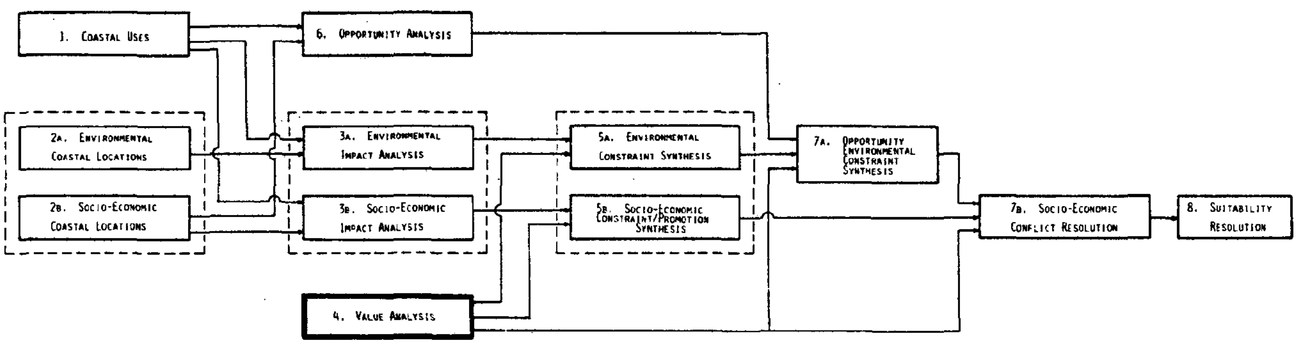
The objective of socio-economic impact analysis is to describe qualitatively and, to the extent possible, quantitatively, the immediate and causally related changes in socio-economic resources and systems caused by the introduction of each use class described in Section 1, Coastal Uses, in each of the socio-economic subregions described in Section 2, Coastal Locations.

At present DEP-OCZM has more information about the problems of doing this work than the solutions. Discussions with anthropologists, economists and sociologists reveal that there is no generally accepted predictive method that can be used to assess the quantitative socio-economic impacts of introducing new uses although qualitative, descriptive predictions are possible.

DEP-OCZM proposes socio-economic study that will survey the state-of-the-art of predictive work and use a technique most appropriate to the management needs of DEP-OCZM. Management needs in general are far less rigorous in their demands on data quality and accuracy of prediction than scientific study needs. Informed qualitative judgement may produce information sufficient to make management decisions.

SECTION 4.

VALUE ANALYSIS



SECTION FOUR - VALUE ANALYSIS

A. Introduction

This section describes the way in which DEP-OCZM has collected information on coastal issues and values, which goals and objectives would safeguard valued resources and protect and enhance valued processes and, finally, what additional geographic information is required to understand the distribution of valued resources.

The impact analyses describe what changes can be expected from the introduction of new uses into locations, but these analyses do not assess whether the changes are good or bad. In order to do this values must be introduced.

The purpose of the Federal Coastal Zone Management Act is to provide an incentive for participating states to institute planning programs geared "To preserve, protect, develop and where possible restore and enhance the resources of the Nation's coastal zone for this and succeeding generations." (Sec. 303-a). At the heart of this legislation is the challenge for each state to act as a mediator in balancing the needs of various competing interests operating in the coastal zone. These interests include the home building industry, the resort industry, conservationists, commercial fisherman, energy facility developers, coastal dependent industry and the recreating public as well as other less visible groups and individuals.

B. Method

I. Assessment of Coastal Values.

DEP-OCZM, in an attempt to understand the needs of each interest group, has solicited their input for the planning program. As part of this process, DEP-OCZM staff members have held meetings in Trenton with representatives of industry, energy and conservation organizations. DEP-OCZM staff have also travelled throughout the state from Hoboken to Cape May, meeting with community leaders, local organizations and the general public in an attempt to gain greater citizen input and to provide accurate information for N.J.'s Coastal Zone Management Program. At this time, the point of most contact between DEP-OCZM and local government is in areas where CAFRA permit applications are highest (Lower Township, Dover Township, Atlantic City). This is an indication of greater development pressure and thus greater concern on the part of both the community and DEP-OCZM.

In addition to these meetings, periodical newsletters are sent to citizens involved in coastal affairs to keep them abreast of the evolving management program. Issue papers generated by the N.J. Office of Coastal Zone Management staff were widely distributed. These papers outlined the major issues facing decision makers in the coastal zone and stimulate debate on alternative management strategies. Public meetings were held in Trenton and in Toms River to discuss these alternatives.

The Interim Land Use and Density Guidelines, although offering a "... framework for analysis and debate ..." are less of an information gathering tool than the issue papers. However, they do formalize, to some extent, the principles used in case by case decision making in issuing or denying CAFRA permits. As such, the Interim Guidelines are a statement of value and have been incorporated in this analysis.

DEP-OCZM also advertised a nomination procedure inviting individuals or groups to identify areas of the coast that concern them for any reason, to date 175 areas have been nominated and the program is still open. Maps showing the distribution of these nominated areas and an analysis of the nominations are included in Appendix C. Further work is planned to visit nominated sites and assess their comparative value, and to collect further nominations.

The CAFRA permit process, which by April 1978 has reviewed 244 applications, has helped to focus attention on coastal issues. During the pre-application conferences, the permit review process, the preparation of decisions, the appeal process, and in some cases in court procedures generated from CAFRA decisions, coastal values have ben extensively debated by a wide variety of individuals and groups and brought before a wide audience by media reporting of the more controversial decisions.

DEP-OCZM has also solicited input from other state and federal agencies concerned with land use decisions, resource management, the economic strength and the social welfare of coastal areas. Similarly, the values and interests of the scientific and research community as represented in the literature has also been included as an integral part in the development of the coastal management program.

II. Identification of Goals and Objectives

A value may be held towards a coastal resource or process. For example, an individual or group may value marine finfish. In order to use the value as a guide for planning, it is necessary to identify a general goal and a more specific set of objectives, which, if realized, would protect and enhance the valued resource or process.

The value of finfish, for example, may be translated into the goal of maintaining and enhancing finfish populations. Objectives associated with this goal could be to regulate the harvest of finfish populations to ensure adequate reproduction, to protect finfish habitats, breeding and nursery areas from immediate and transferred impacts and to maintain and enhance the primary productivity of marshes providing nutrients that support finfish populations. These objectives if realized would assist in the protection of the valued resource, finfish.

From the DEP-OCZM value studies described above, two very general goals were identified, one addressing natural systems, the other socio-economic.

Natural Goal

Maintain where possible restore, and enhance, the productivity, diversity and stability of coastal ecosystems.

Socio-Economic Goal

Maintain, where possible restore, and enhance the health, safety and welfare of the coastal population.

From these very general goals, a number of more specific objectives were identified. This preliminary list is included in the following pages. Over the next year of planning work, both in DEP-OCZM, in the several contracts associated with this method, and in public meetings, this list will be refined and enlarged and an assessment will be made of the comparative importance of the objectives.

NATURAL PROCESS GOALS AND OBJECTIVES

Goal

Maintain and, where possible, restore and enhance, the productivity, diversity and stability of coastal ecosystems.

Objectives

1. Geomorphology Objectives (the shape and physical nature of the land and water bottom)

   a) Maintain and, where possible, restore the natural processes affecting the geomorphology of coastal land and water areas.

      Critical variables that should be maintained or restored to accomplish this objective include natural water flow patterns in land and water areas, natural levels and patterns of erosion and sedimentation, and the amounts of precipitation the enter the ground and run off the surface.

2. Land Drainage System Objectives

   a) Surface Watersheds (inland drainage systems)

      Maintain and, where possible, restore the natural flow patterns, natural variations of flow, and natural physical and chemical water quality of coastal drainage channels and control disturbance in coastal flood plains and watersheds which buffer and assimilate impact.

      Critical variables that should be maintained or restored to accomplish this objective include the volume and natural variation of volume and patterns of overland water flow, ground water recharge rates, adapted wetland and flood plain vegetation, and natural levels of salinity, turbidity, temperature, nutrients, and disolved oxygen in water bodies. The release of toxic chemicals, pathogens and other pollutants must be controlled.

   b) Ground Water Aquifer Systems

      i) Maintain and, where possible, restore the natural volume and variation of volume and chemical quality of water percolating into the ground water aquifer systems.

      ii) Regulate withdrawal from the ground water aquifer systems to volumes within the safe sustained yield, an amount that does not cause unacceptable lowering of water tables, disturbance of adapted vegetation, drying of wells, or saline intrusion.

3. Coastal Water Basin Objectives (ocean and estuarine waters)

   a) Maintain and where possible, restore the natural flow patterns and physical and chemical water quality of coastal water basins. (the ocean and estuarine systems), and control disturbance in surrounding shorelands that buffer and assimilate impacts.

Critical variables that must be maintained or restored to accomplish this objective include natural fresh and salt water flow patterns and natural variation of flow including fresh-salt water stratification and mixing, and natural levels of salinity, dissolved oxygen, temperature and temperature stratification. The release of toxic chemicals, pathogens, and other pollutants must be controlled.

4. Living Resource Objectives

a) Maintain and, where possible, restore the natural levels of primary productivity of coastal areas including tidal and non tidal wetlands and marshes, flood plains, and prime agricultural lands. Control disturbance of associated areas that assimilate degrading impacts.

Critical variables that must be maintained or restored to accomplish this objective include fertility and stability of substrate, areal extent of prime areas of productive vegetation, nutrient levels and transport patterns, and physical and chemical water quality.

b) Prevent the release to the environment of substances known to harm plant or animal species either directly or through natural causal relationships except for selected bio-degradable biocides under controlled conditions.

c). Maintain and, where possible, restore the habitats, breeding, and nursery areas of coastal finfish and shellfish and control disturbance in surrounding areas that buffer and assimilate impacts.

Critical variables that must be maintained or restored to accomplish this objective include physical and chemical water quality, bottom disturbance and natural saline and fresh water flow patterns.

d) Maintain and, where possible, restore the habitats of rare, endangered, sensitive, unique, or otherwise specially valued plants and animals, and provide protective buffer areas around them.

e) Maintain and, where possible, restore migratory bird and fish corridors.

f) Maintain the diversity of plant and animal communities.

g) Promote settlement patterns that preserve contiguous areas of undisturbed wildlife habitats large enough to preserve self regenerating plant and animal populations, and minimize the area destruction of natural habitats.

h) Regulate commercial and recreational harvesting of native plant and animal species when necessary to ensure continuing supply and surviving populations large enough to allow sufficient reproduction.

SOCIO-ECONOMIC PROCESS GOALS AND OBJECTIVES

Goal

Maintain, if necessary restore, and enhance the health, safety and welfare of the coastal population.

Objectives

5. Health Objectives

   a) Prevent the release to land, air, or water, from existing or proposed development to of any substance known to be hazardous to human health either immediately or through a direct chain of cause and effect.

   b) Maintain and enhance access to health services.

6. Safety Objectives

   a) Prevent the location of new development in areas where natural hazards such as fire, flood, storm or erosion may cause loss of life or property.

   b) Protect existing development located in natural hazard areas from damage in a way that does not increase environmental impact.

   c) Relocate development seriously damaged by natural hazard to areas beyond the hazardous area.

   d) Prevent the location of potentially hazardous technology in populated areas.

   e) Promote pedestrian circulation systems that are overlooked by day and night from inhabited structures to maximize self-policing and minimize opportunities for crime.

7. Welfare Objectives

   a) Economic Welfare

      i) Maintain and enchance the economic base of coastal communities encouraging rehabilitation of decayed structures and, where appropriate, diversification of employment.

      ii) Regulate the exploitation of coastal economic resources for the long term benefit of the whole population of New Jersey including energy resources, prime agricultural land, recreation areas, mineral and water resources.

      iii) Discourage development with high car-dependency and enhance access to alternative means of transportation.

      iv) Promote development that minimizes use of land by such formal arrangements as clustering of dwellings, concentration of settlement and in-filling and rounding-off vacant lands in and around existing development.

      v) Promote development that maximizes energy self sufficiency through local power generation from natural processes such as sunlight and wind and water movement, and through minimization of heat loss or gain by such techniques as clustering, insulation and natural microclimate control through siting, grading and planting.

III. Specially Valued Resources

Some objectives apply coast-wide to any development in any location, these require no information on the distribution of value. An example would be to regulate ground water withdrawal at levels below the safe sustained yield.

Other objectives apply only to specific land or water types as identified in Section 2 on Coastal Locations. These land and water types are used in environmental impact analysis and the geographic base showing their distribution may be used as the base for the distribution of any values linked to this location classification. An example of this kind of value distribution would be the objective to preserve the primary productivity of marshland.

Other objectives apply only to particular socio-economic zones as discussed in Section 3B on Socio-Economic Analysis. In these cases the distribution of socio-economic zones can serve as the geographic base to understand the distribution of value. An example of this kind of value distribution would be the objective to promote employment in economically declining areas.

There are however objectives that imply a distribution of specially valued areas not included in any of the land or water types or zones identified in the impact analyses, the distribution of these must therefore be understood if these values are to be addressed.

These specially valued areas are as follows:

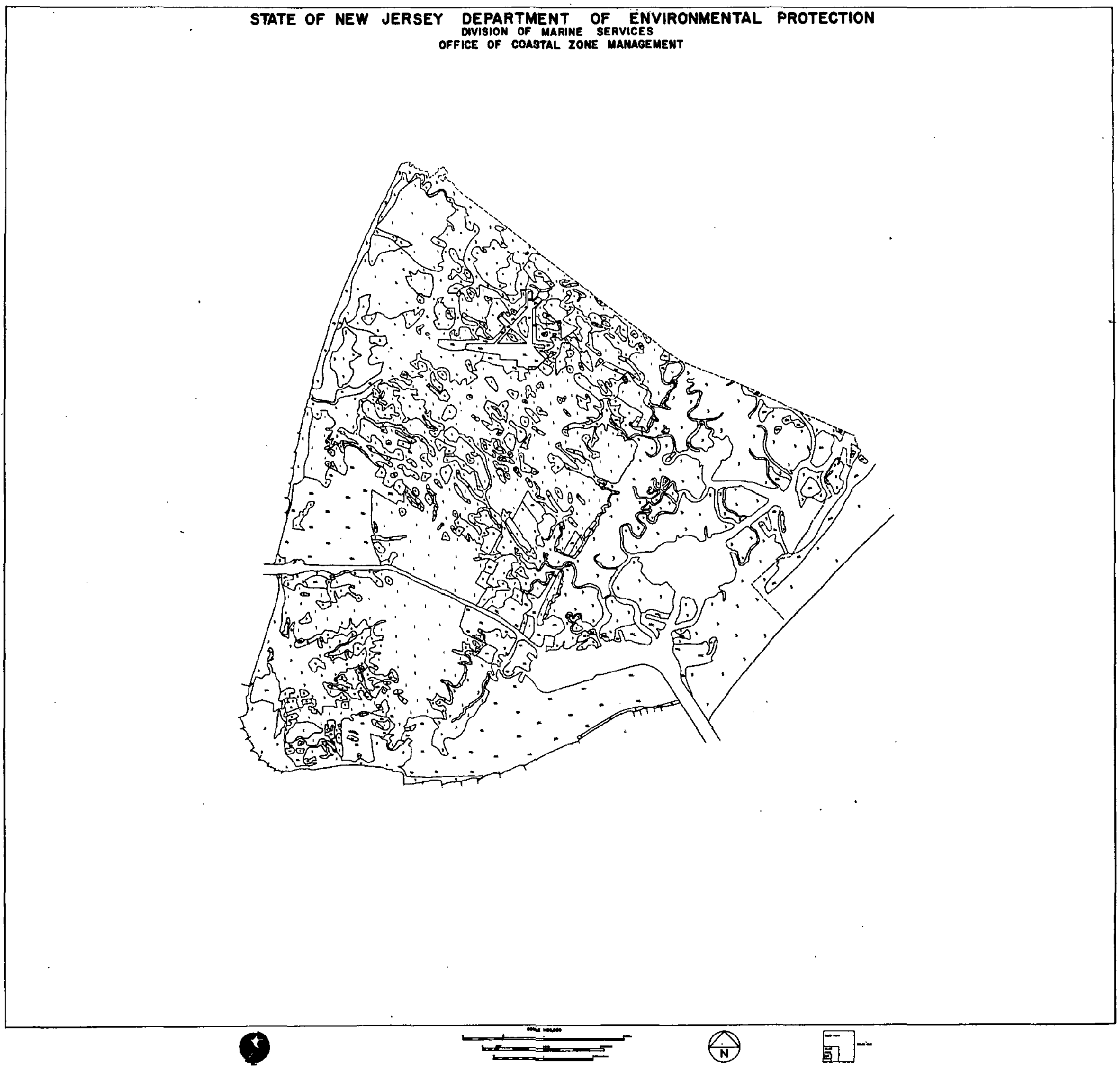
Prime agricultural land
Prime woodland suitability soils
Prime forest
Prime aquifer recharge
Historic and archaeological sites
Specimen trees
Endangered species habitats
Areas of scientific or educational importance
Scenic areas
Prime wildlife habitats
Prime recreation areas
Prime wetlands
Shellfish beds
Surf clam areas
Finfish nursery areas
Prime fishing areas
Finfish migratory pathways
Shipwrecks
Navigation channels

Definitions of each of these types of valued area may be found in Appendix C.

IV. Mapping of Valued Resources in the Pilot Area

These specially valued factors were mapped in the pilot area and a synthesis map prepared showing a summary of value distribution.

These maps appear on the following pages. (Figures 35-40)



AGRICULTURAL
CAPABILITY CLASSES

1 - I II
2 - III
3 - IV & UP
4 - SPECIAL CROPS
NC - NOT CLASSIFIED
W - WATER

Source: SCS Interim Soil Survey Report
Cape May County, New Jersey 1973

Figure 35

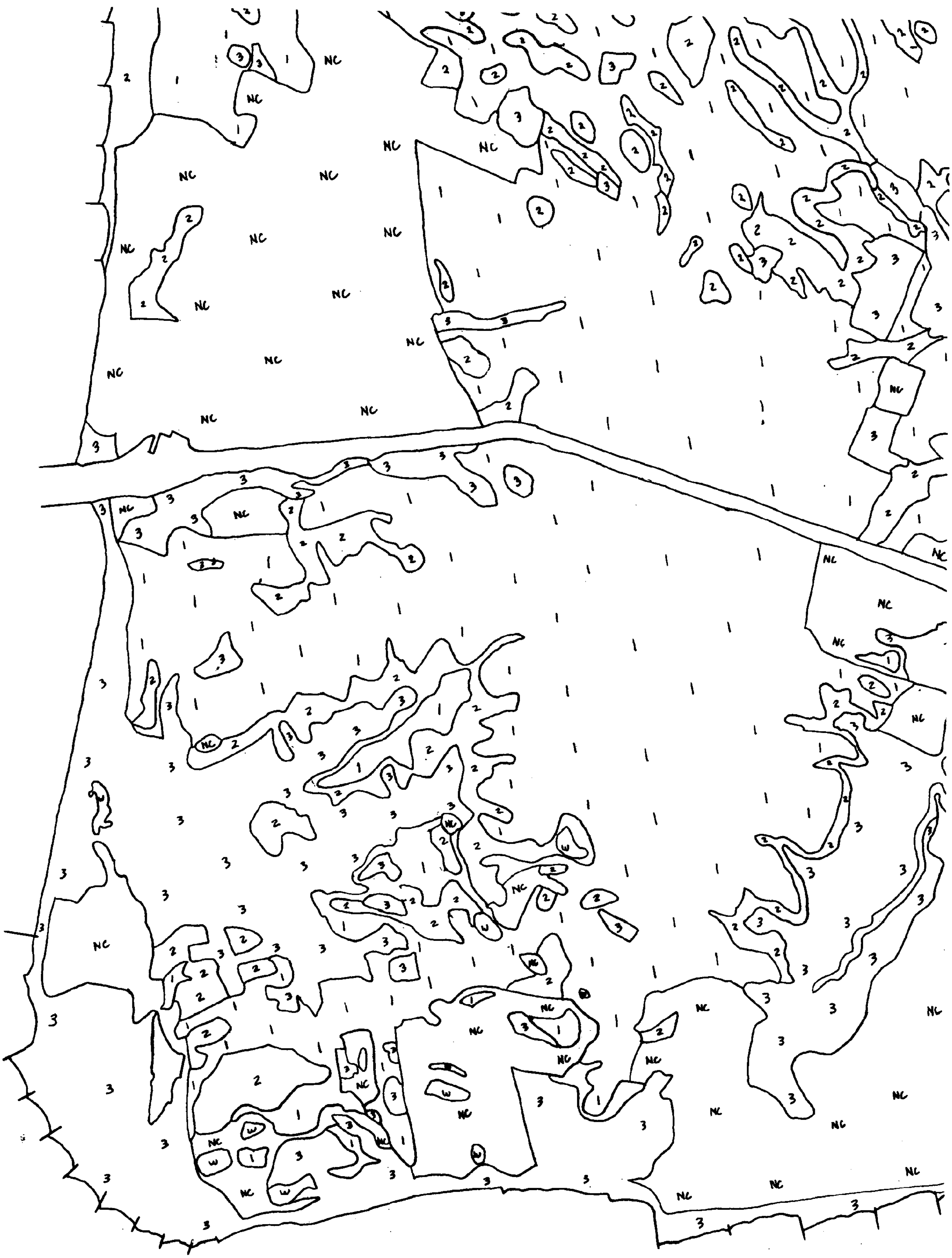
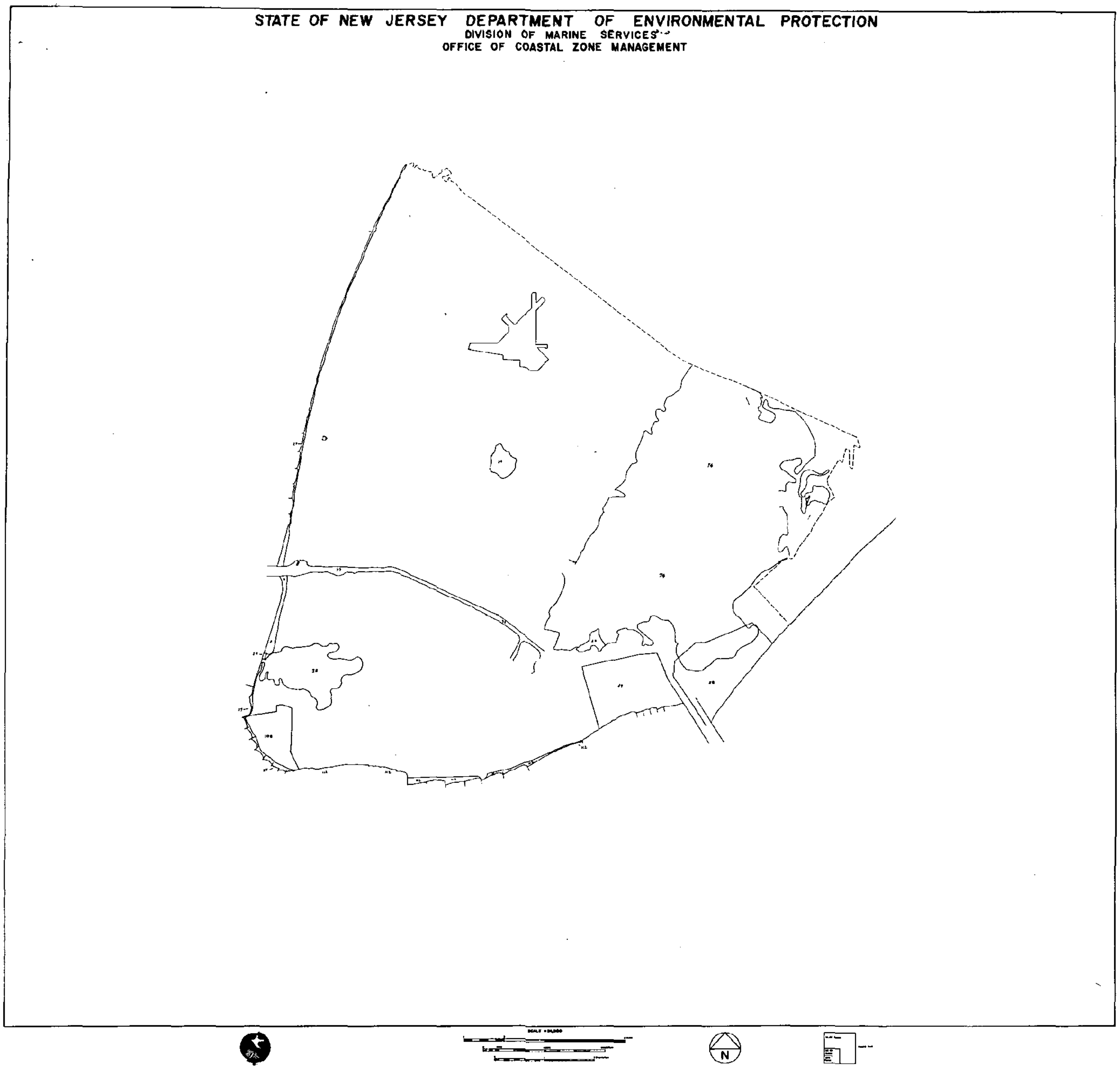


Figure 36



NOMINATED AREA OF PUBLIC CONCERN

- 2 — HIGBEE BEACH
- 23 — CEDAR ISLAND
- 27 — BAY SHORELINE
- 28 — BARRIER BEACH
- 29 — COAST GUARD BASE
- 32 — POND CREEK
- 33 — CAPE MAY CANAL
- 34 — BENNETTS BOG
- 74 — OCEAN WETLANDS
- 106 — CAPE MAY COUNTY LOCATIONS
- 112 — CAPE MAY BEACH

SOURCE: Public Nomination Letters

Figure 37

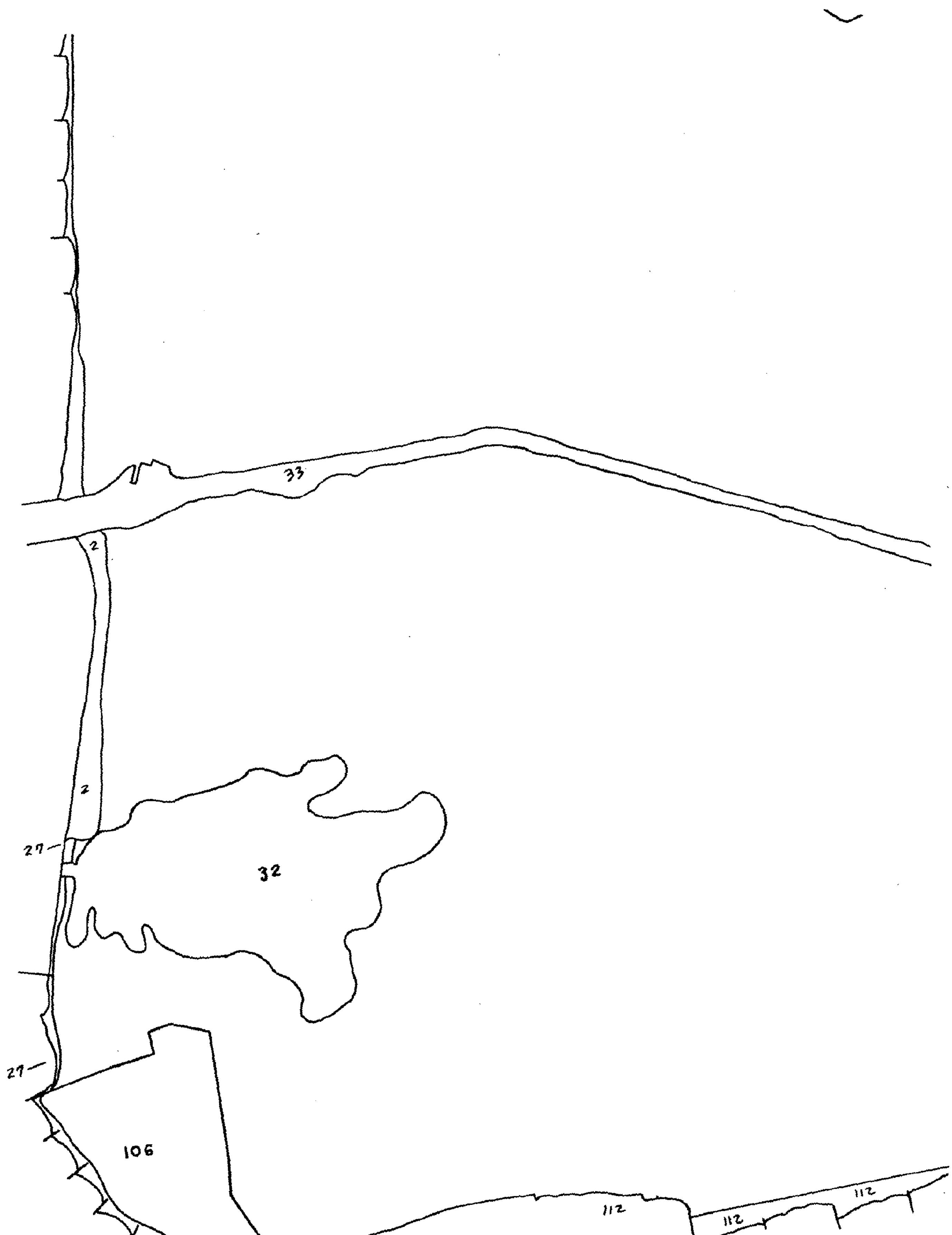


Figure 38

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT

VALUE SYNTHESIS

HISTORICAL AREAS

- (45) CAPE MAY HISTORIC DISTRICT
- (46) CAPE MAY LIGHTHOUSE

ARCHEOLOGICAL SITES

- INDIAN ARTIFACTS CAPE MAY POINT BEACH
- LILY LAKE INDIAN VILLAGE
- SIGNAL HILL

NOMINATED GEOGRAPHICAL AREA OF PARTICULAR CONCERN

- (2) HIGBEE BEACH
- (23) CEDAR ISLAND
- (27) BAY SHORELINE
- (28) BARRIER BEACH
- (29) U.S. COAST GUARD BASE
- (32) POND CREEK
- (33) CAPE MAY CANAL
- (34) BENNET'S BOG
- (112) CAPE MAY BEACH

NATURAL VALUE CONCERNS

AG	AGRICULTURAL CAPABILITY CLASSES I, II, III
F	FOREST AREAS
PF	PRIME FOREST AREAS
SF	SHELLFISH BEDS (Hard Clams)
HP	HIGH PRODUCTIVITY WETLANDS
LP	LOW PRODUCTIVITY WETLANDS (Phragmites)
SC(n)	SURF CLAM BEDS
(n):	1= HIGH PRODUCTIVITY — 4= LOW PRODUCTIVITY
FN	FINFISH NURSERY AREAS
FA	PRIME FISHING AREAS
↔	FINFISH MIGRATION PATHWAYS
ESH	ENDANGERED SPECIES AREA
©	COLONIAL BIRD ROOKERIES
✦	SHIPWRECK HABITATS
(H)	N.J. LARGEST AMERICAN HOLLY TREE

SOURCE:
N.J. STATE REGISTER OF HISTORIC PLACES, NOMINATED GAPC'S, S.C.S. INTERIM SOIL SURVEY: CAPE MAY COUNTY, N.J. DEP. ENVIRONMENTAL MAP OF N.J. FISHERIES RESOURCE 1976, N.J. D.E.P. BUREAU OF SHELLFISHERIES 1974, N.O.S. NAUTICAL CHARTS NO. 12316 (1975); 12304 (1974); COOK R.C. (1960) THE CAPE MAY POINT SITE, ARCHEOLOGICAL SOCIETY OF N.J. VOL. 17: 3-5

Figure 39

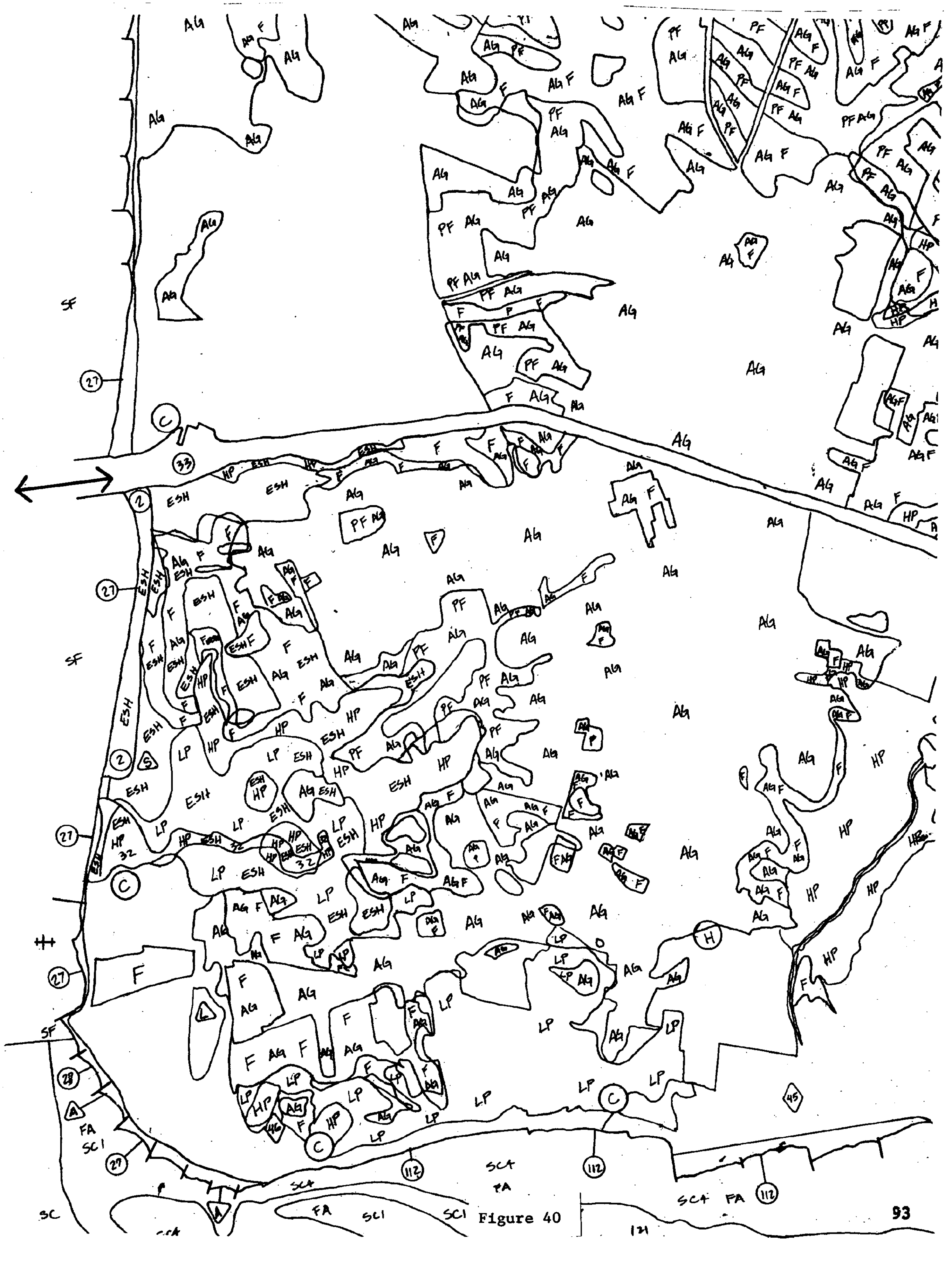

AG
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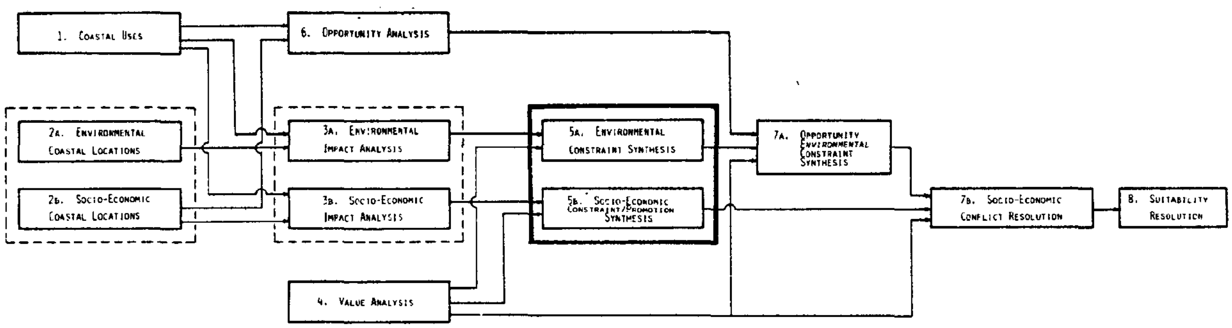
Figure 40

SECTION 5.

CONSTRAINT - PROMOTION SYNTHESIS



SECTION 5 - CONSTRAINT/PROMOTION SYNTHESIS

General Introduction

Constraint/promotion synthesis combines the impact analyses with the value analysis to identify which changes caused by the introduction of new uses are of concern, either because they are adverse or beneficial, and what implications this concern has on the placing and operation of uses if values are to be protected.

The environmental and socio-economic impact analyses identify which changes in natural or socio-economic resources or processes would be the direct result of the introduction of new uses. These analyses are purely descriptive, no attempt is made to judge whether the changes are good or bad.

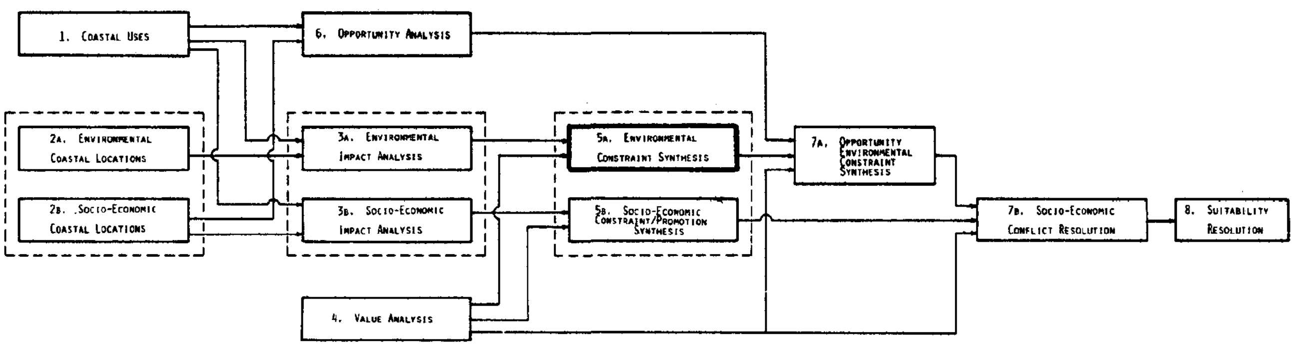
The value analysis identifies which coastal resources or processes are valued and identifies a set of objectives which, if realized, would protect these valued elements.

In this synthesis the impacts are tested against objectives to determine which may adversely or beneficially affect realization of objectives, and identifies how the placement and operation of uses should be constrained or promoted if valued elements are to be protected.

In this part of the method the objective is to constrain or promote use as necessary to preserve value without consideration of the needs of development. These needs are analyzed in Section 6 Opportunity Analysis.

SECTION 5a.

ENVIRONMENTAL CONSTRAINT SYNTHESIS



SECTION 5A - ENVIRONMENTAL CONSTRAINT SYNTHESIS

I. Introduction

For the purposes of this study, the coastal ecosystem is considered as coastal and estuarine waters, tidal rivers and streams and their watersheds, and recharge areas for the coastal aquifers.

Uses developed in any of these areas theoretically have the potential to transmit direct and significant impact to coastal waters. The sensitivity of different areas to impact, however, varies from place to place depending on the value of the resources present in a location and the ease with which impacts may be transmitted through natural processes to coastal waters.

This section describes two methods by which the land and water types of Section 2, Coastal Locations, may be combined with the value types of Seciton 4, Value Anaysis and sorted into a gradient of environmental sensitivity from high to low. If valued resources are to be preserved this gradient also represents the necessary degree of constraint to development.

II. Method

a) Final Method

This method will be used when the environmental impact analysis is complete. A description is included here to explain how the environmental impact analysis discussed in Section 3A can combine directly with the value analysis to identify constraint.

The environmental impact matrices (see Figure 32) identify the causal chains of impact associated with uses in the range of land and water types identified in Section 2 Coastal Locations. Some of these types may be subdivided by varying value as described in Section 4, Value Analysis.

By matrixing the list of objectives identified in value analysis with the list of impacts in the impact matrices, each impact may be tested against each environmental objective. Any impact that adversely or beneficially affects the realization of any objective may be so marked at the relevant matrix intersection.

Once this is done, the placing of a new use in a range of location types can be analysed in terms of its effect on the realization of objectives and the individual causal chains of impact traced in the impact matrix can be discussed in terms of value.

By studying the way in which uses, and their associated environmental impacts, affect goals and objectives various statements can be made on the implications of use-locations for value:

1. The general effect of introducing a new use into a land and water type may be understood in terms of value. Standards can be proposed that describe the maximum amount of change acceptable before the values are unacceptably affected. For example, study of the marsh impact matrix reveals that almost all impacts degrade the vital productivity function.

If this marshland process is to be preserved, stringent standards are required on all variables controlling productivity, such as extent of productive vegetation, fresh water input, turbidity, nutrient input, flow patterns within the marsh etc. These may then become target thresholds for ambient quality within the land or water type.

2. The impacts associated with uses may be identified and divided into three types.

   a) Impacts and causal chains with no effect on objectives. Uses with only this type of impact would be permissible without special management requirements.

   b) Impacts and causal chains that adversely affect objectives but may be reduced to acceptable levels by including impact control measures that either break the causal linkage of adverse impact chains or reduce the level of impacting activities.

      Use-location combinations generating this kind of impact, or mixtures of this and the preceding type, are conditionally acceptable provided stated precautions are taken that contain impacts within specified limits during construction and operation.

   c) Uses that generate impacts or causal chains of impact adversely affecting objectives in a way impossible to reduce to acceptable levels by impact control measures.

      In the constraint synthesis any use-location combination generating any impacts of this type would be unacceptable if objectives are to be realized.

      This unacceptability may be modified by opportunity ranking (see Section 7, Opportunity-Constraint Synthesis).

By repeating this process for the placement of a use in different land and water types, the extent to which objectives are impacted may be directly compared and land and water types may be ranked by their sensitivity. A scoring technique is needed that compares the anticipated size of an impact in relation to acceptable maximum standards and weights the importance of realizing objectives. Tasks detailing these elements are included in the Estuarine study and in future DEP-OCZM projects.

In this pilot study it is not possible to use the matrices to establish the degree of constraint imposed on uses by values held towards land and water types since the matrices are yet to be completed. A general sorting of land and water types into levels of constraint may however be done by identifying the individual factors that contribute to environmental sensitivity and combining them in a systematic way. This method is described below.

b) Preliminary Classification and Ranking of Constraint Types

i) Introduction

All areas are not equally sensitive to the impacts of a use. For example, far less valued resources are lost if a house is built in an infertile, early successional upland than if it is built in a marsh.

Variations of sensitivity may be caused by variations of resources, processes, or values. A forested area, for example, is more sensitive than scrubland because more of the valued forest resource is lost if it is developed. A wet terrace is more sensitive than an upland because of the higher potential of water quality degradation through the processes of ground and surface water movement. An historic area is more sensitive than a non-historic area because it has more social value.

In this constraint synthesis there is a general objective to preserve valued resources and processes. Therefore, the higher the sensitivity of a location, the higher the constraint to development necessary to protect value.

If the factors that affect variations of sensitivity and constraint can be identified these may be used to classify a number of different constraint types, each with a different degree of sensitivity to development.

This section first identifies minor constraint types that correspond to the minor land and water types identified in Section 2, Coastal Locations, and ranks them into a gradient of constraint from least to most.

The factors that may vary constraint within these minor types are identified. Variations of each factor are ranked in a gradient of constraint from least to most and the reasons discussed. These are called intratype constraint rankings. Finally all the minor types are combined to create a list of constraint subtypes. Each subtype is assigned a ranking from 1 (low) to 10 (high) depending on the relative degree of constraint to development required to protect valued resources or processes. These are called intertype rankings.

ii) Method

A constraint type is defined as a land or water area within which the placement of a use in any location will produce a similar impact on valued land or water resources.

The different land and water types identified in Section 2, Coastal Locations, each have significantly different resources and processes so this classification can be used as a base on which to classify constraint types.

The variation of valued resources identified and mapped in Section 4, Value Analysis, also varies sensitivity to impact so these factors must be added to the land and water type classification factors to produce constraint types.

ii a) Classification of Minor Constraint Types

Introduction

Environmental Constraint types are classified into a hierarchy similar to that used to classify environmental land and water types in Section 2, Coastal Locations. The following table summarizes the levels of this classification hierarchy:

Major Constraint Type	Land	Water's Edge	Water
Minor Constraint Type	Upland	Dry Terrace	Wet Terrace
Constraint Subtype	Moderate Perm. Low Disturbance High Agric. Cap.	High Permeability Medium Disturbance Low Agric. Cap.	
Constraint Factors	Depth to Seasonal High Water Table	Permeability	Agricultural Capability

The major and minor environmental constraint types are the same as the major and minor environmental land and water types except for slight differences of definition, but the subtypes are more varied since value factors such as agricultural capability and vegetation value are introduced.

By far most important process on land that varies environmental sensitivity is the amount of water on or near the surface. A general rule is that the more water there is on or near the surface of a land area, the greater the potential to transmit degrading impacts, the greater the sensitivity and the greater the constraint required to protect valued resources.

This general rule may be used to arrange the eight minor land and waters edge subtypes of the Inner and Outer Coastal Plain into a gradient of increasing sensitivity to impact and therefore increasing constraint to development:

<u>Minor Land and Water's Edge Constraint Types</u>

Constraint Level	Type	Definition
Least Constraint	Upland 1. Inner Coastal Plain 4. Outer Coastal Plain	All areas regardless of cover with a depth to seasonal high water table of 5' or greater. Excepted are areas that are flood prone or fall within any of the other water's edge definitions, these are considered water's edge types.
	Dry Terrace 2. Inner Coastal Plain 5. Outer Coastal Plain	All areas regardless of cover with a depth to seasonal high water table between 3' to 5'. Excepted are areas that are flood prone or fall within any of the other water's edge definitions. These are considered water's edge types.
	Wet Terrace 3. Inner Coastal Plain 6. Outer Coastal Plain	All areas regardless of cover either with a depth to seasonal high water table between 1' and 3'. Excepted are areas that are flood prone or fall within any of the other water's edge definitions. These are considered water's edge types.

Constraint Level	Type	Definition
Most Constraint	Waters Edge 7. Inner Coastal Plain 8. Outer Coastal Plain	Areas periodically inundated. These lie between the mean low water level and either the 100 year flood line as delineated by NJDEP or USGS, or the upland limit of alluvial soils as delineated by SCS, or 50' feet horixontally from the mean low water line in a water body whichever is the greater. Included here are flood prone areas, wetlands, marshes, beaches and dunes.

Minor Water Constraint Types

Water bodies have a capacity to assimilate impacts either because the volume of the water dilutes the impacts or because biological, chemical or physical processes absorb them.

Assimilative capacity is generally proportional to the water volume and the flushing rate and these therefore vary the sensitivity and constraint level required to protect valued resources in water areas.

Constraint Level	Types	Definition
Least Constraint	9. Ocean	All areas of salt water without confinement by land out to the limit of the territorial sea, three nautical miles from the shoreline.
	10. Open bay	A larger confined coastal water body that has a shoreline length in excess of three times the width of its outlet to the sea. The outlet is typically wide and unrestricted. The Delaware and Raritan Bays are the representatives of this type in New Jersey.
	High order river 11. Inner Coastal Plain 12. Outer Coastal Plain	The order of river is defined in this study by the volume of water flowing past a point in a given time in Cubic Feet per Second (CFS) with the exact range yet to be determined. This high order category includes only New Jersey's major rivers, the Delaware and Hudson.
	Medium order stream 13. Inner Coastal Plain	Included in New Jersey are the lower reaches of such streams as the Raritan, Navesink, Manasquan, Toms, Wading, Mullica, Great Egg, Maurice, Cohansey and Salem and Rancocas. As with high order rivers a

Constraint Level	Type	Definition
	14. Outer Coastal Plain	range of flow volume in CFS will be used to define this type.
	15. Semi-enclosed bay	A confined coastal body with narrow restricted inlets and with significant fresh water, inflow. In New Jersey this category includes only Great Bay and Great Egg Harbor.
	16. Back-bay	A coastal water body with restricted inlets to the sea and without significant fresh water inflows. Included in New Jersey are Barnegat Bay, Little Egg Harbor, Reeds Bay, Absecon Bay, Lake's Bay and Cape May Sounds.
	Low order creek 17. Inner Coastal Plain 18. Outer Coastal Plain	These creeks are the smallest of the stream types. They are the small tributaries of medium and high order streams and small creeks flowing into bays. Included in New Jersey are such creeks as: Cedar Creek, Oyster Creek, Dividing Creek, Salem Creek, and Crosswick Creek, etc.
Most Constraint	Standing waters 19. Inner Coastal Plain 20. Outer Coastal Plain	Enclosed water bodies with no, or insignificant, flow. The slow flushing makes these the most sensitive of all water bodies since pollutants tend to concentrate. Included are such water bodies as Atlantic City Reservoir, Natco Lake, Deal Lake, Lilly Lake, Magnolia Lake and Glendola Reservoir, etc.

ii b) Classification of Constraint Factors for Subdividing Minor Types

Each of twenty minor constraint types, eight land and water's edge and twelve water types, can be further divided by their degree of sensitivity to impact and therefore constraint to development. In general, the more valued resources that are present, the more valuable these resources, and the higher the potential to transmit degrading impacts beyond the development, the greater the sensitivity and constraint.

The factors used to distinguish constraint subtypes are both those used to distinguish land and water subtypes in Section 2, Coastal Locations, such as permeability and disturbance, and the value factors identified in Section 4, Value Analysis, such as agricultural capability.

Each constraint factor used to distinguish constraint subtypes is listed below together with the reason for inclusion and how the gradient of constraint from least to most relates to variations of the factor. These gradients show only the relative degree of constraint of factor variations.

Land and Waters Edge

Eight Minor land and water's edge constraint subtypes have been identified, four in the Inner Coastal Plain, four in the Outer. The Inner and Outer Coastal Plains are subdivided in the same way. The section below lists each of the minor types, upland, dry terrace, wet terrace and water's edge, and discusses each of the factors used to subdivide them.

A. Minor Constraint Type: Upland

1. Inner Coastal Plain
2. Outer Coastal Plain

Three factors are combined within the upland minor type to determine sensitivity: disturbance, agricultural capability and permeability.

a. Disturbance:

This is a measure of how much the native adapted climax vegetation has been removed and replaced with human settlement. After removal, if left to grow back, the area may succeed slowly to its original vegetation and the level of disturbance become correspondingly less.

Least Constraint

High disturbance, Deteriorating structures: This is land that is already developed. Included are structures and areas of open space immediately adjacent to structures either paved or in high levels of maintenance. Structures in this category are either unoccupied, in poor condition or poorly maintained, and the value for further use is marginal. This is the lowest level of constraint of all disturbance types because of the desirability to renovate or replace structures in areas of existing infrastructure and high level of disturbance.

Medium disturbance: This is open space without structures and not immediately adjacent to structures where the native adapted vegetation has been highly disturbed. Included are agricultural lands, successional meadows and vacant urban lots. The constraint is higher than the previous category because relatively undisturbed soils are still in place.

Low disturbance: This is open space growing climax or near-climax adapted vegetation. These natural areas are variously valued for the time investment in plant growth, soil stabilization, runoff and microclimate control and visual screening. This low disturbance category divides into two:

(i) Forest areas: Areas of early-mid successional forest vegetation or late successional forest vegetation of no special value. The time investment in the plant growth sets a constraint on these, but less than in the prime category.

(ii) Prime forest areas: Areas of scarce, unique, or otherwise specially valued late successional forest or wetland vegetation. These are valued for all the reasons of the previous category plus a special value rating because of unusual quality.

Most Constraint — High disturbance, maintained structures: This land is already developed. Included are areas of open space immediately adjacent to structures paved or in high levels of maintenance. Structures in this category are in good condition and well maintained. The value placed on the structures sets a high level of constraint.

b. Agricultural Capability

Fertile, well drained, gently sloping, workable soils are valued as agricultural areas. These soils are the product of millenia of soil forming processes and once paved are irreperably lost. The food production capacity of a society is proportional to the extent and productivity of soils. With population still expanding this sets a high value on prime agricultural soils.

The Soil Conservation Service (SCS) has identified eight levels of agricultural capability in soils. These are grouped in this study into three.

Least Constraint	Low: SCS ratings IV and below
	Medium: SCS rating III
Most Constraint	High: SCS rating I & II and soils suitable for special crops (blueberries, cranberries)

NB. After the conclusion of this study it was decided to include high woodland suitability soils as defined by SCS in this category. This was not done in the pilot mapping but will be included in future studies.

It should be noted that these constraints are for general construction impacts of developement that include paving and structures and are not for agricultural use.

c. Permeability

In the uplands, permeability of soils is of importance because it controls the amount of water that enters the aquifers below.

The high permeability soils of the uplands are the prime aquifer recharge areas of the Coastal Plain. Significant loss of ground water recharge in these areas to development would reduce the amount of high quality water that could be withdrawn, lower water tables, alter vegetation and increase saline intrusion. Low permeability areas do offer constraints to development because of the problems of drainage, however, in upland areas these low permeability areas were considered of lower importance than aquifer recharge.

Least Constraint	Low: 0.2-2. inches/hr.
	Medium: 2.0-6.0 inches/hr.
Most Constraint	High: 6.0+ inches/hr.

B. Minor Constraint Type

Dry Terrace	2. Inner Coastal Plain
	5. Outer Coastal Plain
Wet Terrace	3. Inner Coastal Plain
	6. Outer Coastal Plain

The constraint factors used to subdivide wet and dry terraces are the same as those used in uplands. Disturbance, agricultural capability, and permeability.

a. Disturbance

Least Constraint	High disturbance: deteriorating structures
	Medium disturbance:
	Low disturbance: forest areas
	Low disturbance: Prime forest areas
Most Constraint	High disturbance: high quality structures

Definitions of these terms are the same as for uplands.

b. Agricultural Capability

Least Constraint	Low agricultural capability
	Medium agricultural capability
Most Constraint	High agricultural capability

Definitions as for uplands

c. Permeability

In the dry and wet terraces, aquifer recharge is still important. However, as surface water channels are approached, surface runoff and transmission of pollutants though permeable soils and over impermeable soils to streams become more important because water borne impacts may be transferred to coastal waters. In these categories, the lowest constraint is offered by soils of medium permeability.

Least Constraint	Medium: 2.0-6.0 inches/hour
	Low: 0.2-2.0 inches/hour
Most Constraint	High: 6.0+ inches/hour

C. Minor Constraint Type

Water's Edge	7. Inner Coastal Plain
	8. Outer Coastal Plain

Water's edge areas are all periodically inundated and play a vital role in aquatic systems, providing primary productivity, filtration of land runoff and flood surge control. They are all designated primary water quality buffer areas and have a very low tolerance to disturbance. Six factors are combined to identify water's edge constraint subtypes: assimilative capacity of adjacent water body, disturbance, elevation, mobility of shoreline, water quality standard, and ambient water quality.

a. Assimilitive Capacity of Adjacent Water Body

The larger the adjacent water body and the higher the flushing rate, the greater the assimilitive capacity. Shorelands of large, well flushed water bodies thus have a lower constraint than shorelands of small, poorly flushed water bodies.

Least Constraint	Ocean Shores
	Open bay shores
	High order river shores
	Medium order stream shores
	Semi-enclosed bay shores
	Back bay shores
	Low order creek shores
Most Constraint	Standing lake and pond shores

b. Disturbance

Least Constraint	High disturbance: deteriorating structures
	Medium disturbance
	Low disturbance: Forest or wetland
	Low disturbance: Prime Forest or prime wetland
High Constraint	High disturbance: high quality structures

A special condition arises here in the high disturbance category if it is seriously damaged by flood. This moves the area from high to low quality. Since structures in flood hazard areas are undesirable because of loss of flood storage capacity and reduction of productivity constraint placed on rebuilding structures remains high.

c. Elevation

Low lying marsh lands and wetlands at or close to normal water level are valued for their productivity, flood storage capacity, water purification and sediment control functions. Development in these areas has a higher capacity to impact coastal waters than more upland flood prone areas which may be inundated only at infrequent intervals. Marshes and wetlands, therefore have higher constraint than flood prone areas. An exception to this occurs on ocean shores. Dunes have higher constraint than more low-lying beaches, due to their vulnerability to disturbance and the role they play in protecting shorelands from coastal storms and to the relatively low vulnerability of beaches to disturbance.

Least Constraint	Upper storm hazard and flood prone areas
	Beaches
	Marshes and wetlands
Most Constraint	Dunes

d. Mobility of Shoreline

Owing to variations of offshore littoral drift, local currents and other coastal processes, some shorelines are eroding, others stable and others accreting. Development placed near eroding shorelines is more liable to water damage and these areas thus have the highest constraint.

Least Constraint	Accreting Shoreline
	Stable Shoreline
Most Constraint	Eroding shoreline

e. Water Quality Standard

The Division of Water Resources in NJ DEP sets varying water quality standards and as the coastal zone management program and the Area-Wide Water Quality Management Program progress, these standards may become increasingly rigorous in the future.

The water quality standard in water bodies adjacent to shorelines varies constraint if the existing ambient water quality is above the standards because DEP-OCZM recommends a policy to concentrate further development in or near areas of existing settlement, which have the lower water quality standards, rather than to disperse development into undisturbed areas where water quality standards are set high. Thus if the ambient water quality is above standard constraint varies as follows:

Least Constraint	Low Standard
	Medium Standard
Most Constraint	High Standard

These standards will be set on critical water quality parameters such as dissolved oxygen, turbidity, fecal coliform count, concentrations of toxic substances, etc. The current Tidal Water (TW) and Fresh Water (FW) water quality standards are examples, but may be revised upon completion of the DEP-OCZM Estuarine Study and the NJDEP Division of Water Resources 208 studies.

f. Ambient Water Quality

The existing, or ambient, water quality determines both the capacity of the water body to support life and the remaining ability to assimilate pollutants. Ambient water quality is stated in terms of its relation to water quality standards.

By comparing existing water quality to the varying standards discussed above, the ambient quality may be expressed as being above or below standard. Ambient water quality below standard is already degraded below the acceptable limit and so sets high constraints. Ambient water quality well above standard can accept a limited amount of impact before values are affected and so has lower constraint.

The distribution of constraint is therefore:

Lowest Constraint	Ambient water quality well above standard
	Ambient water quality above standard
Highest Constraint	Ambient water quality below standard

Water

The main factor affecting constraint in water areas is that of assimilitive capacity, which is used to divide water areas into eight minor constraint types, as follows:

Least Constraint	Ocean (highest assimilitive capacity)
	Open Bay Estuaries
	High order river
	Medium order stream
	Semi-enclosed bay
	Back bay
	Low order creek
Most Constraint	Standing water (lowest assimilitive capacity)

The factors affecting environmental constraint of each of these minor constraint types is analyzed separately below. The individual factors that affect constraint, such as depth and water quality, are identified in this process, as was done for the constraint rankings of land and water's edge subtypes.

1. Ocean

a. Depth

The deeper the water, the higher the assimilitive capacity and the lower the constraint.

Least Constraint	Lower shoreface (18' +)
	Lower surf zone (6'-18')
Most Constraint	Upper surf zone (0'-6')

2. Open Bay Estuaries

a. Depth

Least Constraint	18'+
	6'-18'
Most Constraint	0'-6'

b. Water Quality Standard

Provided ambient quality is above standard the lower the standard the lower the constraint because low quality standards are characteristic of more intensely settled areas and NJOCZM wishes to concentrate development in these areas rather than disperse it into more undisturbed areas of the coast.

Least Constraint	Low standard
	Medium Standard
Most Constraint	High standard

c. Ambient Water Quality

Least Constraint	Well Above Standard
	Above Standard
Most Constraint	Below Standard

In this and other major water subtypes, salinity affects the biota of estuaries and rivers. Biological productivity, however, depends on the protection of both salt and fresh water elements equally and the management techniques that protect salt and fresh water are essentially the same. Salinity is, therefore, omitted from this analysis.

The relative proportions of salt and fresh water and the flow patterns that mix them are critical to the productivity of estuaries. There is a general policy that present salinity and flow patterns should not be disturbed.

3. High Order River

a. Water Quality Standard

Least Constraint	Low standard
	Medium standard
Most Constraint	High standard

b. Ambient Water Quality

Least Constraint	Well above standard
	Above standard
Most Constraint	Below standard

4. Medium Order Stream

a. Water Quality Standard

Least Constraint	Low standard
	Medium standard
Most Constraint	High standard

b. Ambient Water Quality

Least Constraint	Well Above Standard
	Above Standard
Most Constraint	Below standard

5. Semi-Enclosed Bays

a. Depth

The greater the water depth, the higher the assimilitive capacity and the lower the constraint, because larger volumes of water have a higher dilution effect.

Least Constraint	6'
	1/2' - 6'
Most Constraint	0 - 1/2'

b. Water Quality Standard

Least Constraint	Low standard
	Medium standard
Most Constraint	High standard

c. Ambient Water Quality

Least Constraint	Well above standard
	Above standard
Most Constraint	Below standard

6. Back Bay

a. Depth

Least Constraint	6'
	1/2' - 6'
Most Constraint	0 - 1/2'

b. Water Quality Standard

Least Constraint	Low standard
	Medium standard
Most Constraint	High standard

c. Ambient Water Quality

Least Constraint	Well above standard
	Above standard
Most Constraint	Below standard

7. Low Order Creek

a. Water Quality Standard

Least Constraint	Low standard
	Medium standard
Most Constraint	High standard

b. Ambient Water Quality

Least Constraint	Well above standard
	Above standard
Most Constraint	Below standard

8. <u>Standing Water</u>

a. <u>Volume</u>

The larger the volume the higher the assimilitive capacity and the lower the constraint. Volume is defined as the approximate number of cubic feet contained. Numbers defining the range in each of the three types have not yet been set.

Least Constraint	High volume
	Medium volume
Most Constraint	Low volume

b. <u>Water Quality Standard</u>

Least Constraint	Low standard
	Medium standard
Most Constraint	High standard

c. <u>Ambient Water Quality</u>

Least Constraint	Well above standard
	Above standard
Most Constraint	Below standard

Of particular importance is the storage of high quality potable water in standing reservoirs, of all types this is the most vulnerable to impact.

ii c) <u>Intratype Constraint Ranking</u>

i) Land, Water's Edge

Each minor constraint type of the land and water's edge (e.g. upland, wet terrace) contains varying amounts of the several constraint factors (e.g. permeability, agricultural capability) used to distinguish constraint subtypes.

This variation of constraint factors varies the level of environmental sensitivity within the minor type. For example an upland with prime forest, high agricultural capability and high permeability is more sensitive to impact than an upland with deteriorating structures, low agricultural capability and low permeability.

The example above is a simple one, in the first type all the constraint factors are at the highest level of environmental sensitivity in the second all at the lowest. Few people would disagree that the first is more sensitive than the second. Between these two extremes however the situation is more complicated since decisions must be made as to how important one constraint factor is relative to another. For example which is more sensitive to impact, an aquifer recharge area, a forest or a prime agricultural soil?

In analysis these are called weighting decisions and it is very important that they should be explicit since they have critical implications for later analytical steps.

DEP-OCZM has set a preliminary weighting on the factors used to distinguish subtypes within minor land, water's edge constraint types as follows:

Land Areas

Most Important	1.	Agricultural Capability. Soils take many thousands of years to form, this large time investment sets a high importance on these areas.
	2.	Disturbance. Forests take many hundreds of years to grow. This time investment sets a high priority on the disturbance factor, but less than soils.
Least Important	3.	Permeability. This is of importance for ground and surface water and sediment management. If performance standards are required that contain impacts on these processes within a site boundary this factor has the lowest importance of the three.

Water's Edge Areas

Most Important	Elevation. Low lying areas are highly valued for their contribution to estuarine productivity, and water quality and flood control. Impacts in these areas are easily transferred to coastal waters. Thse considerations combine to make elevation the most important factor.
Equal Second	The other factors used to subdivide the water's edge, nature of adjacent water body, disturbance, and ambient water quality relative to standards were considered of approximately equal importance.

Within each minor type (e.g. upland) each subtype (e.g. upland, medium disturbance, high agricultural capability, medium permeability) is assigned a constraint rank from 1 (least) to 4 (most) by listing the various factor combinations and considering the importance of each factor separately and in combination.

The gradients of constraint of individual factors are discussed above, these intratype rankings combine these individual gradients to form a single gradient within each minor type.

The full list of all possible combinations of factors within each minor type is included in Appendix D together with the rank from 1 to 4 assigned to each combination. These rankings are not final and will be tested and discussed both in DEP-OCZM and in the Estuarine contract.

The comments below indicate the type of values affected (disturbed) if development were to take place in each of the four intratype constraint rankings.

Upland, Dry Terrace, Wet Terrace

Least Constraint 1. No disturbance of highly valued areas

2. Disturbance of forest and high constraint permeability areas

3. Disturbance of prime agriculture or prime forest but not in combination.

Most Constraint 4. Disturbance of valued combinations of prime agriculture, and forest.

Water's Edge

Least Constraint 1. Disturbance of upper flood prone areas with deteriorating structures in low and medium water quality areas.

2. Disturbance of upper flood prone areas without structures.

3. Disturbance of higher value wetlands areas including marshes and wetlands.

Most Constraint 4. Disturbance of most valued areas, dunes and well maintained structures.

Intratype Constraint Ranking

ii) Water

The water constraint factors discussed above are combined to identify constraint subtypes within each minor constraint types in the same way as for land and water's edge areas. For example a subtype of the minor type ocean is ocean, lower surf zone, ambient water quality well above medium standard.

Within each minor type each subtype is assigned a constraint rank from 1 (least) to 4 (most) depending on the comparative sensitivity and therefore constraint to development of the subtype. The value of the resources present, the amount of valued resources and the relative capacity to assimilate degrading impacts are the criteria used to set these intratype rankings.

As with the land rankings decisions must be made on the comparative importance of different constraint factors. In all water areas depth was considered the most important factor with water quality equally important if below standard, otherwise less important.

The way in which the water constraint factors are combined and the intratype rankings assigned to the combinations are listed in Appendix D.

As stated for the land types the rankings given here are not final and will be the subject of considerable work and refinement to reach a consensus.

ii d) Intertype Constraint Ranking

The intratype rankings sort the subtypes within (intra) each minor constraint type (e.g. upland, ocean) into levels of environmental sensitivity. There is also a gradient of sensitivity between (inter) the minor types. A wet terrace is more sensitive than an upland because of a shallower ground water table. A back bay is more sensitive than an ocean because of a lower assimilitive capacity.

i) Land, Water's Edge

Figure 41 below shows how the intratype rankings from 1 to 4 (figures in the body of the table) of each minor type (top row) may be combined to form an intertype constraint ranking (figures in the right column) of all constraint subtypes from 1 (least) to 10 (most).

Figure 41 - Inter-Type Constraint Rankings. Land

Upland	Dry Terrace	Wet Terrace	Waters Edge	Inter-Type Ranking	
1				1	Least Constraint
2	1			2	
	2			3	
3		1		4	
	3	2		5	
		3		6	
4	4	4	1	7	
			2	8	
			3	9	
			4	10	Most Constraint

From this table it can be seen that, for example, the least sensitive upland type (intratype rank 1) which has an intertype rank of 1, is less sensitive than the least sensitive wet terrace type (intratype rank 1), which has an intertype rank of 4. The shallower ground water table of wet terraces is the cause of this.

Special emphasis is placed on the fact the both the intratype and the intertype rankings are preliminary. They were prepared quickly by DEP-OCZM staff so that further steps in the method could be mapped and illustrated. In the Estuarine Study, in public meetings, and in DEP-OCZM studies these rankings will be tested, debated and refined.

No amount of work however will make these rankings wholly objective, since the common unit of the different factors is the relative value of fundamentally different elements of the environment. On the other hand this difficulty cannot be allowed to prevent the making of these decisions. At some stage a consensus must be reached on the relative level of environmental sensitivity of different locations if reasonable planning decisions are to be made. This method offers a framework within which the consensus may be recorded.

ii) Water

As with the land and water's edge there is a gradient of environmental sensitivity between (inter) as well as within (intra) minor types. For example the ocean is less sensitive and therefore less constrained than estuaries or streams because the greater volume and flushing rate has a greater capacity to assimilate degrading impacts.

The intratype rankings within each minor type must therefore be compared with one another to form a single intertype water constraint ranking.

Figure 42 below shows the intratype rankings (figures in the body of the table) of each minor water constraint type (top row) combined to form intertype constraint rankings (figures in the right column) from 1 (least) to 10 (most).

Figure 42 - Intertype Constraint Rankings. Water

	OCEAN	OPEN BAY	HIGH ORDER RIVER	MEDIUM ORDER STREAM	SEMI-ENCLOSED BAY	BACK BAY	LOW ORDER CREEK	STANDING WATER	INTERTYPE RANKINGS
Least	1								1
Con-		1							2
straint	2		1						3
	3	2		1					4
	4		2		1				5
		3		2		1	1		6
			3		2	2	2	1	7
				3	3	3	3	2	8
Most		4	4	4	4	4	4	3	9
Con-								4	10
straint									

Constraint Rankings of Subtypes

The intertype constraint rankings of constraint subtypes assign a preliminary number from 1 (least) to 10 (most) that indicates the relative sensitivity, and therefore level of constraint, to all possible combinations of constraint factors and therefore all coastal locations. These combinations form the constraint subtypes and are listed, together with their intertype rankings in Appendix D. This appendix should be consulted to understand general variation of constraint or the ranking of a particular subtype.

ii e) Special Value Types

In addition to the values held towards the generic constraint subtypes some areas are of particular and unique value that cannot be incorporated into a generic type. Scenic areas, special habitats, historic and archaeological sites are examples of such areas.

These areas are identified at the end of this section. The ranking of these special value types is somewhat different than the ranking of constraint types. Constraint types are ranked in relative terms from one to ten while special value types are ranked eight, nine or ten according to specific allowable disturbance. Unlike constraint types which have no specific policy until compared with opportunity, special valued types have an acceptable level of disturbance assigned as shown below for the three levels and this level is not modified by opportunity.

Figure 43: Land/Water Edge Constraint Ranking for Special Value Area

	Constraint Ranking	
Least Constraint	8	Moderate disturbance possible up to medium intensity recreation, some porous paving.
	9	Low disturbance possible up to low intensity recreation, unpaved paths and picnic areas.
Most Constraint	10	No disturbance possible, human access controlled.

Water Ranking for Special Valued Areas

As was done with special value types in land and waters edge areas, three rankings of value are placed on these areas that imply the following restrictions:

Figure 44: Water Rankings for Special Value Areas

	Constraint Ranking	
Least Constraint	8	No bottom disturbance; no use that would preclude existing use.
	9	No bottom disturbance; limited non-mechanized boats with regulated effluents.
Most Constraint	10	Human access controlled.

Figure 45 lists the kinds of area that may be included in the special value category and the constraint ranking associated with them.

Figure 45: Constraint in Special Value Areas

Land, Waters Edge and Water Constraint Rank	
	Cultural Resources
8	Historic sites and districts
8-9	Archaeological sites
8-9	Scenic areas
	Living Resources
10	Endangered species habitats -plant -animal
	Scarce or unique vegatative communities
8-9	-the Pine Barren Plains
10	-dunes
9	-holly forests
	Critical wildlife habitats
10	-coastal bird rookeries
9	-critical wintering areas
9	Anadromous spawning
9	Finfish nursery areas
9	Estuarine shellfish beds
9	Waterfowl wintering, feeding, breeding
9	Migration pathways
9	Estuarine submerged vegetation bed
9	Marine shellfish bed-surf clams
9	Prime fin fishing areas: wrecks inlets, ourcrops, ridges, basins
8	Shoreline fishing jetties & piers
	Physical Resources
8	Terrestrial mineral deposits -sand, gravel, etc. (Mining acceptable under certain circumstances)
8	Marine mineral -sand or gravel -oil or gas (Mining acceptable under certain circumstances)
8	Navigation channels (maintenance dredging acceptable)

ii f) Use of Constraint Matrices and Rankings

Appendix D lists all possible constraint subtypes by permutating variations of constraint factors and assigns to each constraint rankings from 1 (least) to 10 (most) that indicate the degree of sensitivity and therefore the degree of constraint required if valued resources are to be preserved.

For subtypes without special value these numbers are relative and have no meaning until combined with opportunity rankings later in the analysis. In specially valued areas the rankings are related to specific policies on acceptable levels of disturbance and these are not affected by further considerations.

Any land or water location falls within one of the constraint subtypes. In order to determine which subtype classifies a particular location it is necessary to observe or measure the amount of each relevant constraint factor, for example, in a land area, relationship to flood level, depth to seasonal high water table, disturbance, agricultural capability, etc. Once these observations or measurements are taken, either from site survey or from published data, the constraint subtype, and the intertype ranking can be determined by consulting the matrices in Appendix D. It must then be determined whether the location falls within any of the "special value" categories. If it does, the constraint ranking may be revised.

These rankings are then used in various ways. If the study is of a single location the ranking or rankings (if several constraint subtypes are present) go forward to the opportunity-constraint matrices of Section 7 where the level of opportunity determined in Section 6, Opportunity Analysis, is combined with the constraint ranking. The combination is assigned a suitability ranking which is related to an acceptable level of disturbance.

ii g) Mapping of Constraint in the Pilot Area

When an area is being studied the distribution of constraint subtypes is obtained by overlaying the map of land and water subtypes with the map of specially valued areas. The constraint ranking of each subtype is then obtained from the matrices of Appendix D and a map prepared showing the distribution of constraint. A map of this type was prepared for the pilot area and is reproduced below (Figures 46 and 47). The further use of this map is discussed in Section 7, Opportunity-Constraint Synthesis.

If this map is compared with the factor maps upon which it is based (see Section 2, Coastal Locations and Section 4, Value Analysis) it is possible to get a general visual idea of the way that individual factors influence constraint. The wetland vegetation, flood plains, and existing structures for example show as high constraint areas (since data on the condition of structures was lacking it was assumed that all were in good condition). Some of the forested areas with lower fertility soils to the north appear as lower constraint than prime agricultural lands to the south owing to the higher value placed on fertile soils.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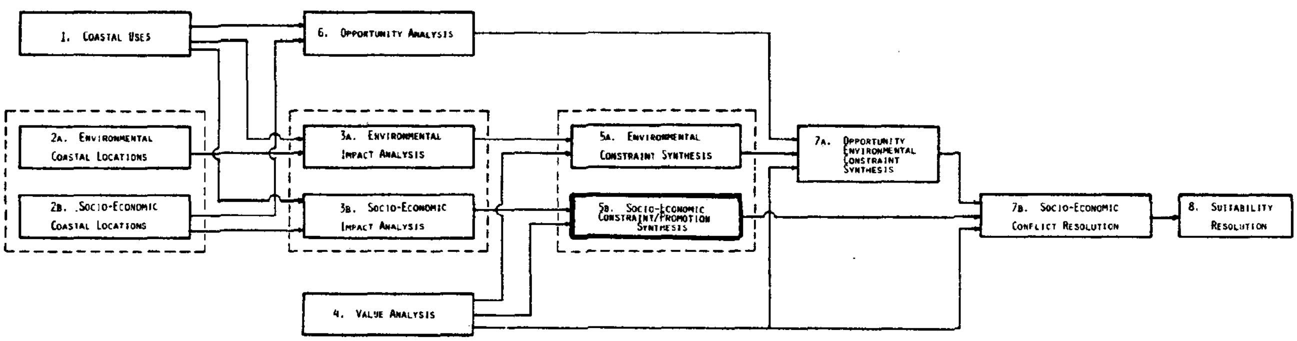
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
CONSTRAINT LEVELS
High Constraint
1
2
3
4
5
6
7
8
9
10
N

Figure 46

Figure 47

SECTION 5b.

SOCIO - ECONOMIC CONSTRAINT / PROMOTION SYNTHESIS



SECTION 5B - SOCIO-ECONOMIC CONSTRAINT AND PROMOTION

I. Introduction

The purpose of this part of the study is to compare the anticipated socio-economic impacts of uses in each socio-economic subregion as determined in Section 3b, Impact Analysis, with the socio-economic objectives listed in Section 4, Value Analysis.

Use impacts may adversely or beneficially affect the realization of socio-economic objectives, or may adversely affect some and beneficially affect others. In order to protect socio-economic values adverse impacts must be constrained and beneficial impacts promoted.

A systematic method is required that weighs the positive and negative effects of the introduction of a use into a particular socio-economic subregion and recommends the degree to which the use should be promoted or constrained in order to maximize beneficial impacts and minimize adverse impacts.

For example, heavy industry in resort sub-regions, or intensive residential uses in agricultural sub-regions may have predominantly adverse impacts on the social and economic systems indicating constraint. A labor intensive industry, on the other hand, in an economically depressed sub-region may have predominantly beneficial socio-economic impacts indicating promotion.

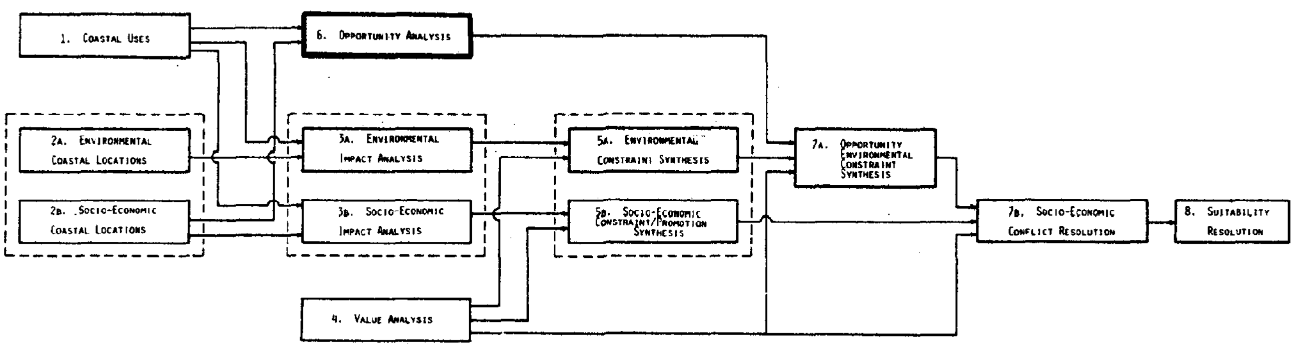
This dual product of analysis, either constraint or promotion, introduces a new element in the socio-economic analysis not present in the environmental analysis. In the latter, almost all human impacts are adverse and so only constraint is indicated.

II. Method

As with the determination of socio-economic impact, the method for assessing the degree of socio-economic use constraint or promotion associated with proposed use-locations is not yet selected or designed.

The importance of having such a method, and of having a value assessment of the socio-economic impacts to put into the balance with environmental impacts is clearly understood. This work is proposed as part of a socio-economic study.

SECTION 6
OPPORTUNITY ANALYSIS



SECTION 6 - OPPORTUNITY ANALYSIS

A. Introduction

This part of the study analyzes which areas are most opportune for development, or have most development potential, without consideration of impact.

The constraint synthesis discussed in the previous section analyzes the implications to development of value conservation. Use impacts are analyzed without consideration of the needs of the uses themselves. The lack of constraint does not, however, indicate opportunity for development. Often the most desirable sites for development are in the areas of highest constraint. Most planning methods analyze only where uses should not be placed, this method takes another step and analyzes where developers wish to place uses, and why, and then balances this understanding against constraint.

B. Method

Opportunity analysis asks of coastal use developers the following question:

"Given complete freedom of choice except from the market, without consideration of impact or regulation, what is the best place, or kind of place, for your development?"

Typically this question is answered as a list of required or desired elements of the built and natural environment. These are called "opportunity factors".

Coastal housing, for example, requires certain minimum levels of access to roads and other essential infrastructure, employment, shops, health facilities and schools, freedom from flood, storm and other natural disasters, soils with suitable load bearing capacity and drainage properties and desires access to amenities such as recreation, surface water, rolling topography and trees.

If the individual opportunity factors that make up these optimum location specifications can be identified, each can be studied separately. The variations possible within each opportunity factor can be classified and the extra value or extra cost (cost bonuses or penalties) that varying amounts of opportunity factors imply for development can be assessed. The distribution of these factors can be identified and sites with varying opportunity recorded.

Opportunity factors may be costed by assessing the penalty costs of the absence of required opportunity factors (the cost of remedying deficiencies), or the bonus costs of the presence of desired opportunity factors (the additional value). For example, access to roads for housing is a necessity, if the nearest road is not adjacent to the site a new road must be built incurring a penalty cost proportional to the length. View of the ocean, on the other hand, is a bonus if present, adding to the value, but would not, indeed could not, be provided if absent.

If costs are assessed for each opportunity factor in a use specificaiton, the bonus and penalty costs implied by the various amounts of factors present in a location may be assessed and summed, producing an overall opportunity figure. By doing this for more than one location, the comparative overall opportunity offered by locations to uses may be compared.

Land and Water Uses: The same six general land and water use categories used for impact analysis have again been used for the opportunity analysis. Different subcategories are used particular to this analysis. Section 1, Coastal Uses, shows the categories selected for study in opportunity analysis.

C. Pilot Study

I. Uses and Opportunity Factors

Housing and marinas were the uses that were selected to illustrate the opportunity analysis. The following opportunity factors were selected from the lists of location factors generated by a literature search and a questionnaire distributed to use developers. Details of these references are included in Appendix E.

		Housing	Marinas
Access to:	roads	x	x
	railroads	x	
	airports	x	
	harbors	x	x
	navigation channels		x
	surface water	x	x
	sewers	x	x
	public water supply	x	x
	soils suitable for septic tanks	x	
	schools	x	
	shops	x	
Availability of open space		x	x
Flooding		x	
Drainage		x	
Load bearing capacity		x	

Two important location factors, land value and property tax, were omitted. Clearly, these offer important opportunities, however, land value is difficult to assess, poorly documented and subject to rapid change. Property tax, although better documented, also changes in different local ways.

In an attempt to map land value in the pilot area, the assessed value in the tax maps was studied. This very detailed large scale information records assessed rather than real value. Assessment procedures vary locally. Furthermore, some land is preferentially taxed at a special agricultural rate. For these reasons, tax documents were considered unusable for wide scale mapping.

DEP-OCZM interviewed a realtor in the pilot study area in an attempt to assess land value. This revealed patterns that showed clearly the past response of settlement to opportunity factors, ocean or bay influence and the effects of roads and railroads particularly. This was not mapped, however, since much of the information was speculative, particularly in the coastal wetlands where regulation has lowered development value and no property had changed hands recently owing to building restrictions.

This interview technique could not form the basis of a regional survey within reasonable time and cost constraints and with reasonable accuracy and updatedness. The fact that regulation affects land value further complicates the issue since the output of coastal zone management may be regulation which could affect land value creating a logical feedback loop.

The final fact that there is no proposed coastal zone management objective that varies with land value as such tipped the decision by DEP-OCZM to exclude from the pilot study both land value and the associated property tax. This exclusion changes the results of the opportunity synthesis in a clarifying way. Land values that depend on opportunity factors, such as ocean frontage, are high when opportunity is high. The penalty of high land cost cancels out the bonus of ocean view and variation is lost.

II. Mapping of Opportunity Factors

The following maps show the distribution of each of the selected opportunity factors mapped in the pilot area. The reason that each is important to the study uses, housing and marinas, is discussed.

Availability of Unpaved Open Space - Figures 48 and 49

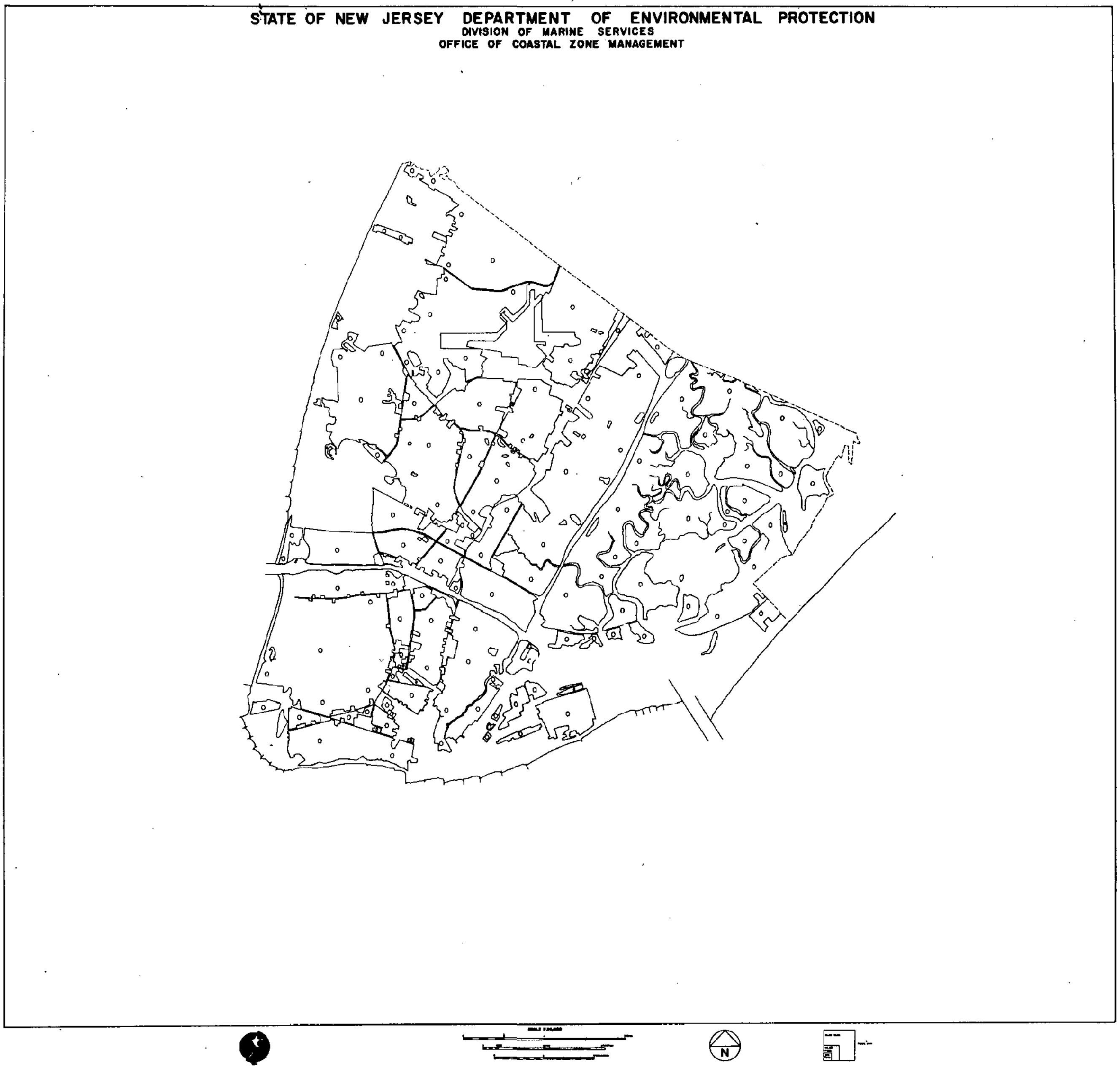
The term open space is used here to mean areas currently undeveloped, without structures or paving or subsurface infrastructure that requires access from the land surface.

Areas that are already developed with uses that are successfully operating offer very low opportunity to new uses. The cost of purchasing land that is already subdivided and developed and the cost of demolition add such large costs as to preclude development except in areas of the most intense development pressure such as the center of Atlantic City.

There is an exception to this in areas where there is paving and structures but they are abandoned, derelict or so poorly maintained as to be structurally unsound, have marginal value for further use and the site is cheaply available. These areas offer similar, if somewhat lower, opportunities to unpaved open space. Sufficient data was not available on the conditon of structures in the pilot area to distinguish which are deteriorating so all existing built up areas were considered low opportunity.

The practice of renovating and rehabilitating existing structures in fair to good condition is such a different process from building new development that the opportunity must be studied separately and is not included here.

For both housing and marinas the opportunity in areas already developed was considered to be so low that areas already developed were eliminated from further analysis.



OPEN SPACE

O- OPEN SPACE

Source: Land Use & Cover Factor Map & Aerial Photo Interpretation

Figure 48

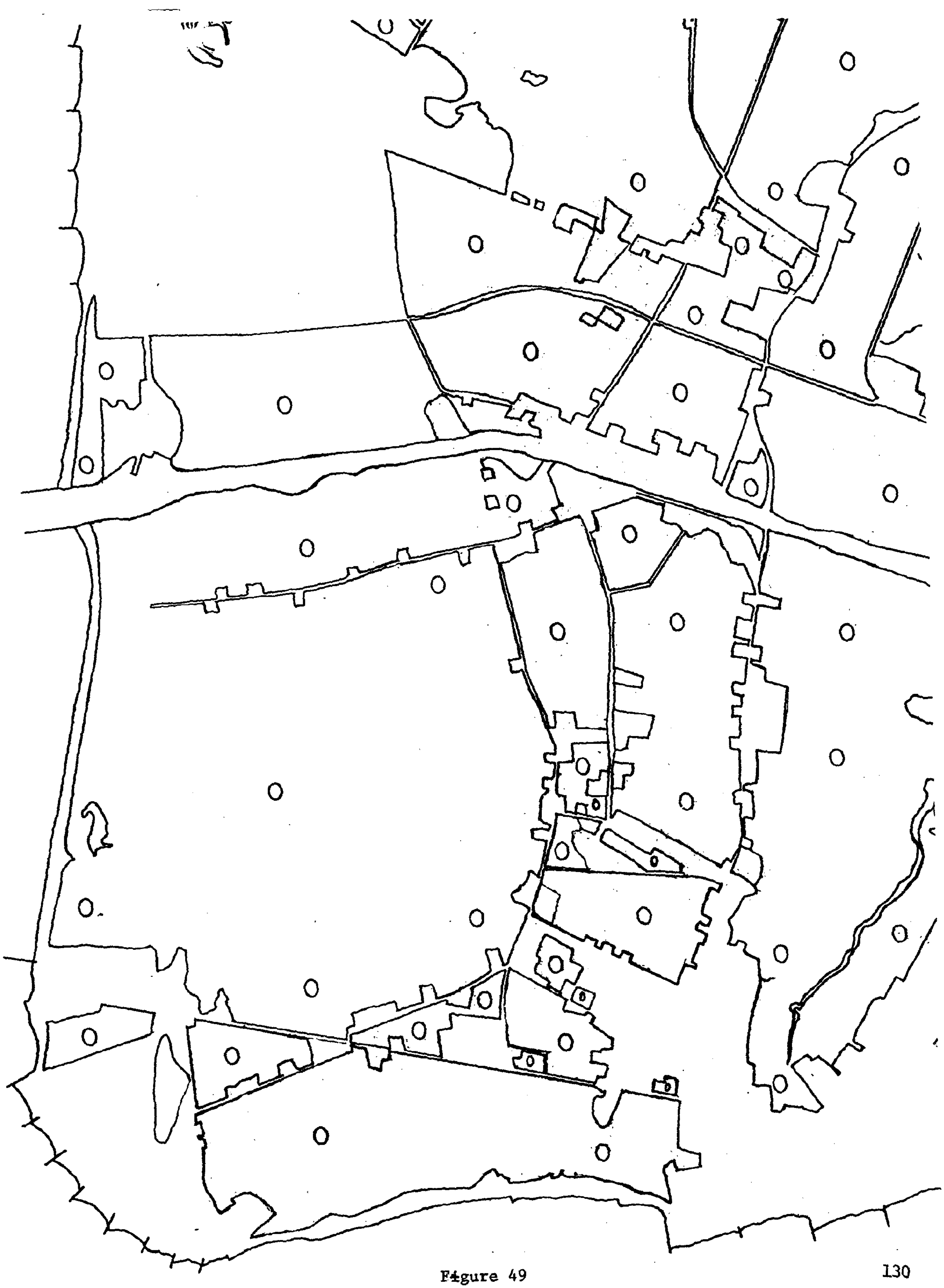


Figure 49

Access To Roads - Figures 50 and 51

Both housing and marinas must have direct access to road networks. If such a connection is not available a road must be constructed, the longer this road construction the higher the cost and the lower the opportunity.

Both uses also desire close access to an expressway intersection allowing high speed transportation. Proximity is a cost bonus for housing although the noise of the high speed roads in close proximity lowers the bonus somewhat. Marinas are not affected by noise and so the closer to the intersection the higher the bonus.

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ACCESS TO ROADS

1st Digit
Distance to Nearest Road
1 — 0'-300' (100 yds)
2 — 100yds-300yds (3/16 Mi)
3 — 3/16 Mi - 1/2 Mi
4 — 1/2 - 1
5 — 1-2
6 — 2-4
7 — 4+

2rd Digit
Class of Nearst Road
1 — Major Collector
2 — Minor Collector
3 — Local

3rd Digit.
Distance Along Nearest Road to Limited Access Express Intersection
1 — 0-1/2 Mi.
2 — 1/2-1 1/2
3 — 1 1/2 - 3 1/2
4 — 3 1/2 - 7 1/2
5 — 7 1/2 - 15 1/2

SOURCE: USGS 7 1/2' Quads Cape May, Rio Grande, Wildwood, Stone Harbor Dates Various
N.J. Dot. Road Atlas Sheets No. 63 & 64 1975

Figure 50

Figure 51

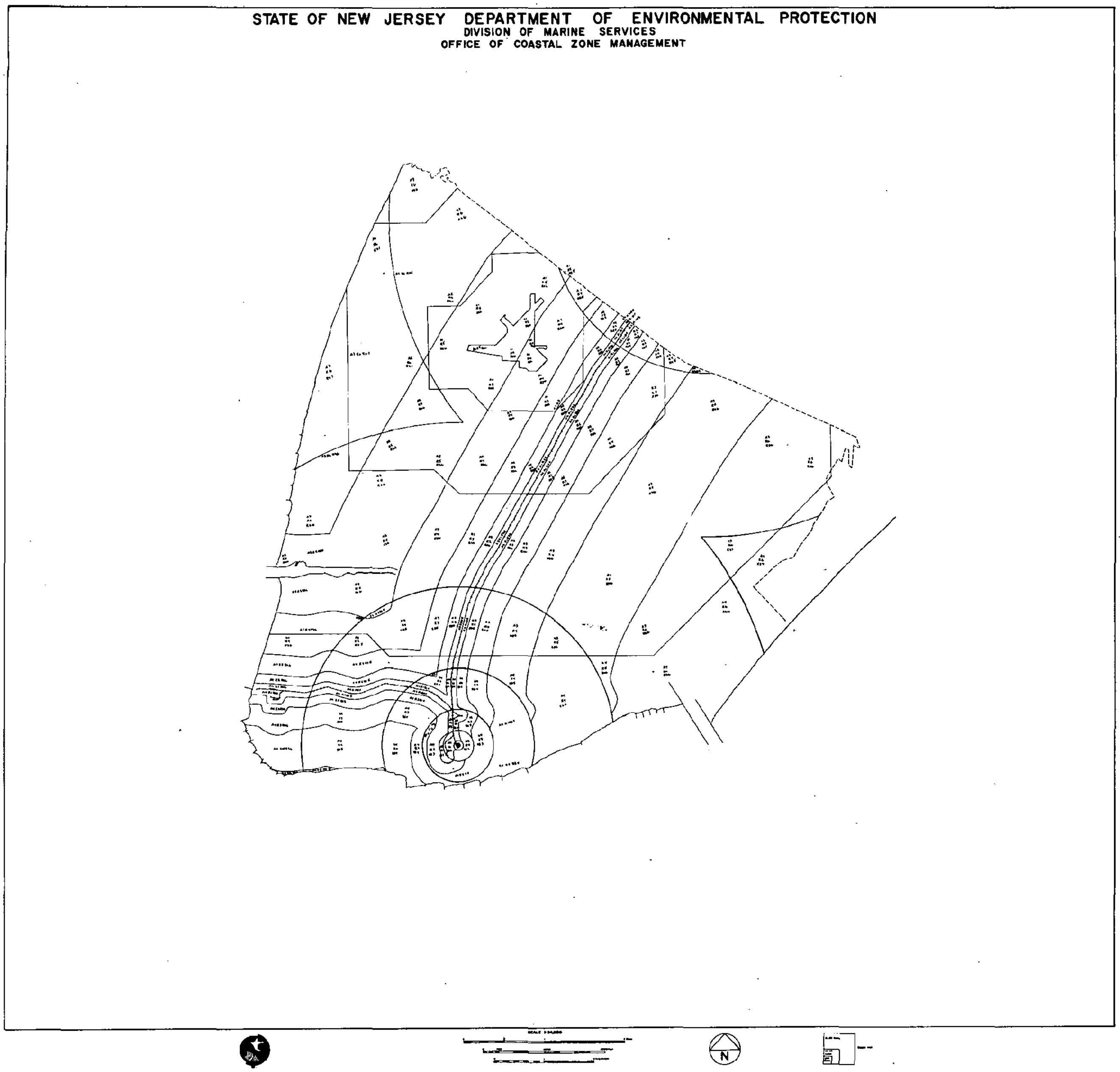
Access To Railroads - Figures 52 and 53

For housing, access to railroad stations is a small bonus; small, since the service is irregular and most transportation is by car, but a bonus since the choice of transportation is enlarged. Areas in close proximity to either railroad tracks or stations have a penalty factor owing to the noise and fumes of the trains, outside this radius areas within easy walking distance of stations have a small bonus factor.

Rail transportation is of so little importance to marinas that it was not included as an opportunity factor.

Access To Local Airports - Figures 52 and 53

For housing the proximity of local airports is undesirable since the small runway is of little transportation importance but the noise and hazard of close proximity depresses housing value. The importance of airports for marinas was considered too small to include this as an opportunity factor.



ACCESS TO RAILROAD & AIRPORTS

(R) RAILROAD & (RS) RAILROAD STATION
Distance From:

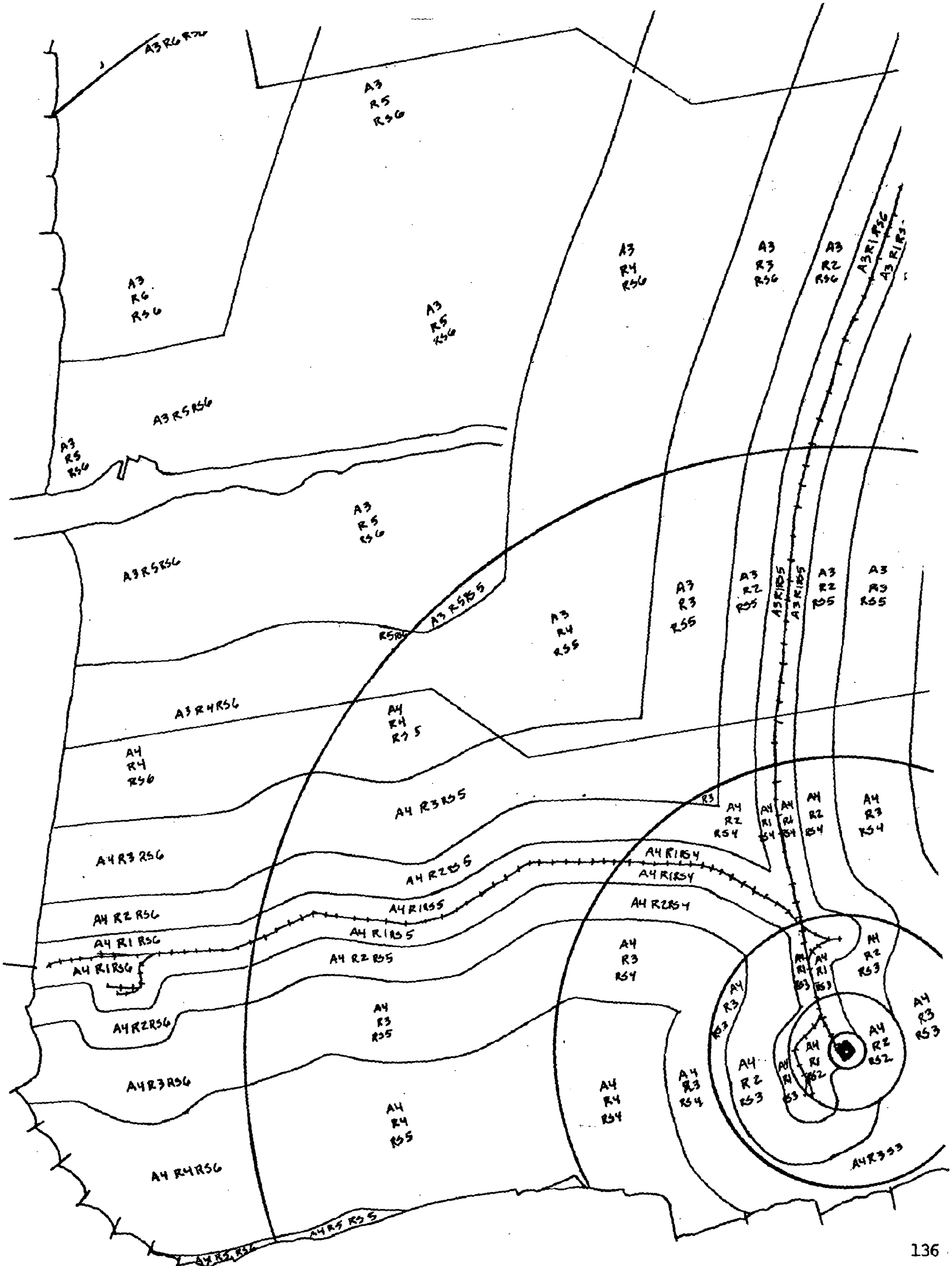
R1, RS1 0'-300' (100 Yds)
R2, RS2 100Yds-300Yds (3/16 Mi)
R3, RS3 3/16 Mi-1/2 Mi
R4, RS4 1/2-1 Mi
R5, RS5 1-2 Mi
R6, RS6 2-4
R7, RS7 4+

(A) AIRPORT
Distance From:

A1 - 0'-1/2 Mi
A2 - 1/2 - 1 1/2 Mi
A3 - 1 1/2 - 3 1/2
A4 - 3 1/2 - 7 1/2

SOURCE: N.J. D.O.T. Traffic Volume Map, Cape May County, N.J. 1975.

Figure 52


A3 R5 RS6
A3 R6 RS6
A3 R5 RS6
A3 R4 RS6
A3 R3 RS6
A3 R2 RS6
A3 R1 RS6
A3 R5 RS6
A3 R5 RS6
A3 R5 RS6
A3 R5 RS6
A3 R5 RS5
RS RS4
A3 R4 RS5
A3 R3 RS5
A3 R2 RS5
A3 R1 RS5
A3 R2 RS5
A3 R3 RS5
A3 R4 RS6
A4 R4 RS5
A4 R4 RS6
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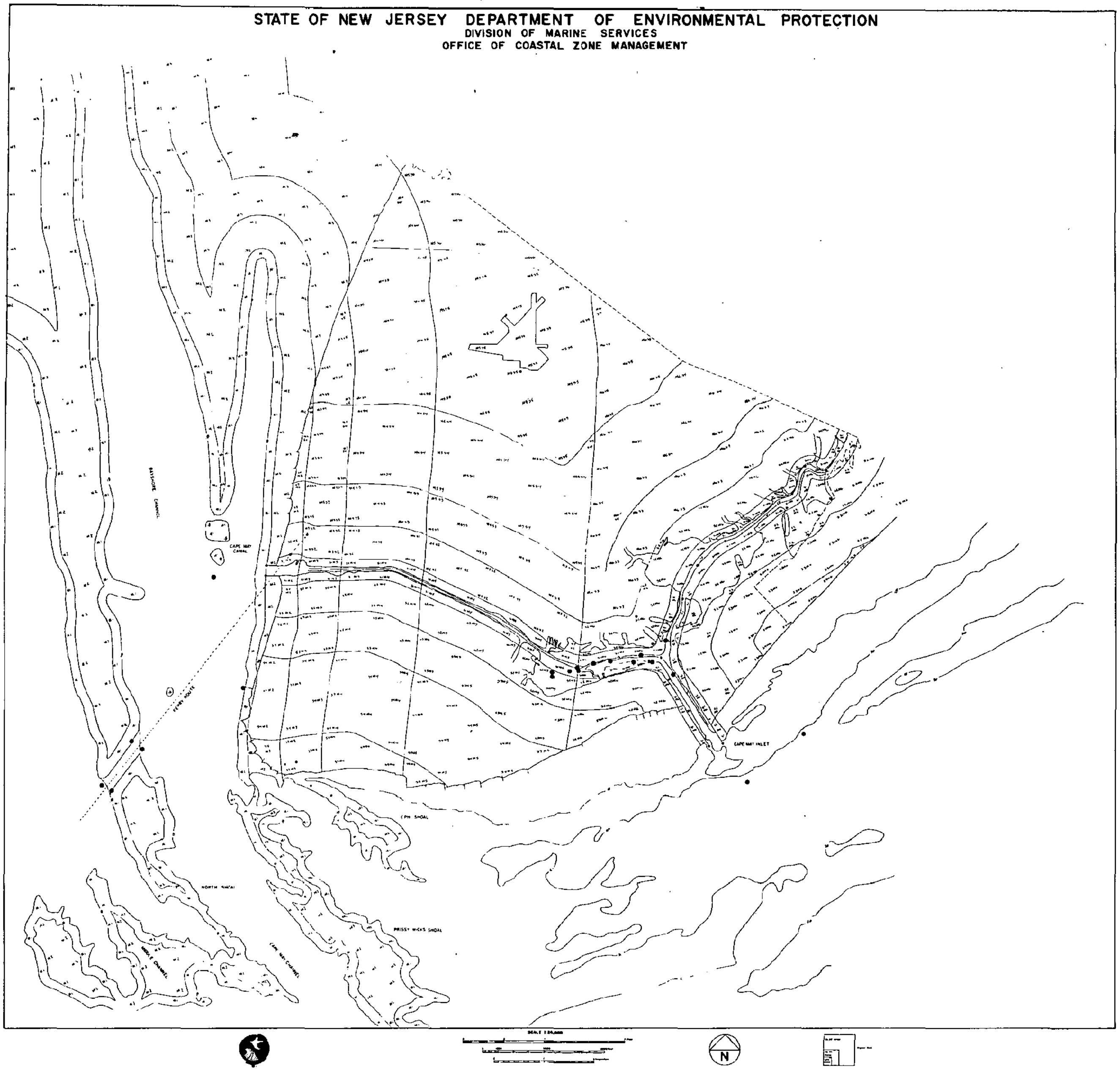
A4 R1 RS4
A4 R1 RS4
A4 R2 RS4
A4 R3 RS4
A4 R4 RS4
A4 R3 RS4
A4 R2 RS3
A4 R1 RS3
A4 R3 RS3
A4 R2 RS2
A4 R1 RS2
A4 R3 RS3

Figure 53

Access To Navigation Channels - Figures 54 and 55

For housing this is not a factor. For marinas it is a necessity. Any location that does not have immediate access to an adequate channel must construct a new channel, the longer this is, the more expensive, and the lower the opportunity.



ACCESS TO NAVIGATIONAL CHANNELS

Channel Types

L-Major M-Medium S-Minor

Navigational Aides

●- Buoys

•- Light On Fixed Structure

1 - 0-200Yds.

2 - 200Yds.-1/2 Mile

3 - 1/2-1 Mile

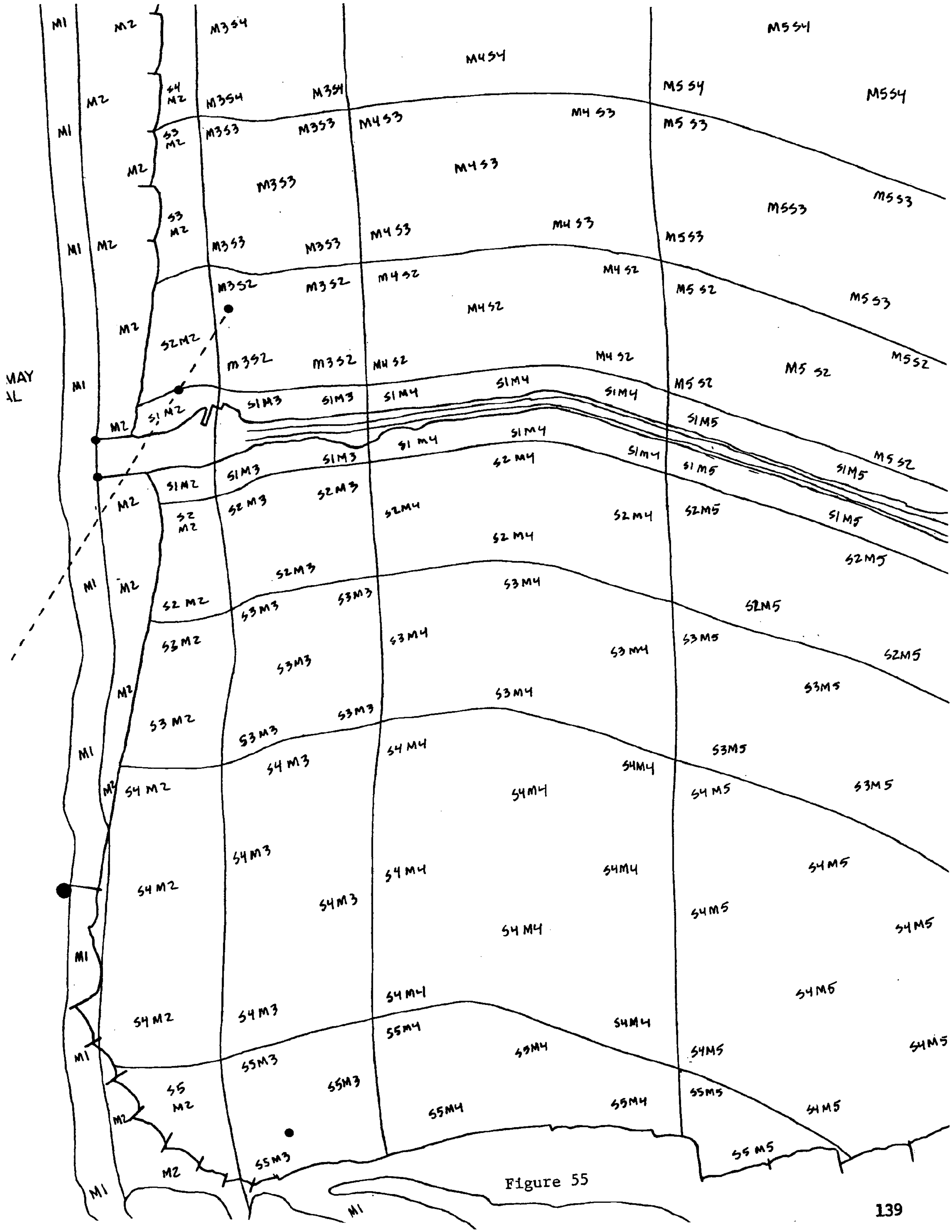
4 - 1-2 Miles

5 - 2-4 Miles

6 - 4+Miles

SOURCE: N.O.S. Nautical Charts: No.12316,1975; No.12304,1974.

Figure 54


MAY
AL
M1
M2
M3S4
M4S4
M5S4
S4 M2
M3S4
M3S4
M5 S4
M5S4
M2
M1
S3 M2
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S4M5
S4M5
S5 M2
S5M3
S5M4
S5M4
S5M5
S4M5
M2
M2
S5M3
S5 M5
M1
M1

Figure 55

Access To Surface Water - Figures 56 and 57

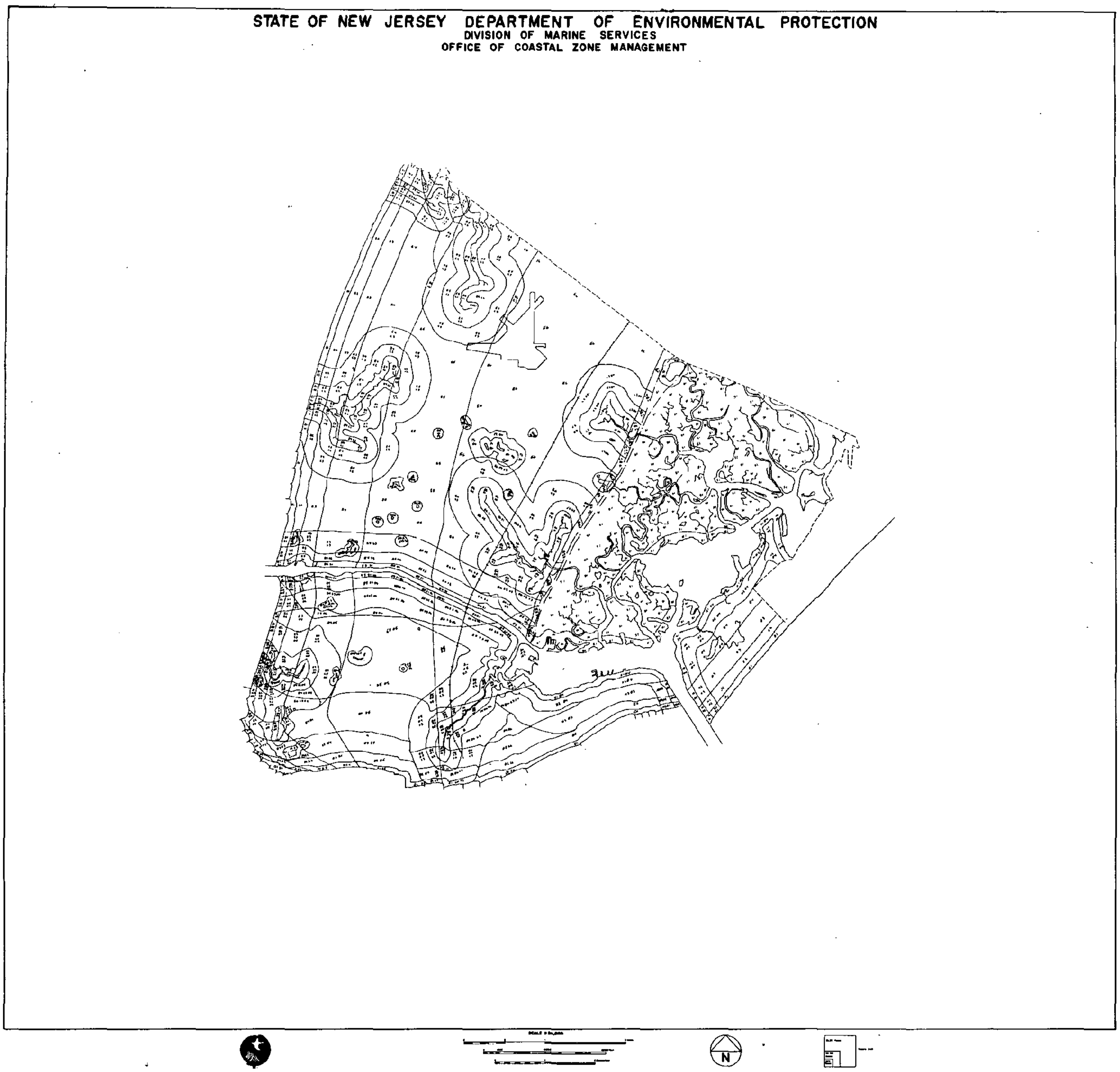
In coastal areas, access to and view of surface water is the most important bonus opportunity factor for many uses, including housing. A glance at coastal settlement patterns shows how residential development clusters at the water's edge and land value studies show phenomenally high values on the ocean front, somewhat less on bay fronts and the shores of inland water bodies and then a rapid decline as the distance from water increases.

For marinas direct access to surface water is a necessity, if the site is inland a channel must be constructed connecting to surface water, the longer the channel, the greater the expense and the lower the opportunity.

Access To Harbors - Figures 56 and 57

For housing the proximity of any surface water is a bonus, harbor water is less important than, for example, ocean water but the view of a harbor and, particularly, direct access to water allowing a private launching ramp adds a considerable bonus.

For marinas access to harbor water is a necessity, if harbors are absent they must be constructed incurring a penalty cost.



ACCESS TO & VIEW OF SURFACE WATER

1 - 0' - 300' (100 Yds)
2 - 100 Yds - 300 Yds (3/16 Mi.)
3 - 3/16 Mi. - 1/2 Mi.
4 - 1/2 - 1 Mi.
5 - 1 - 2 Mi.
C - CREEK
E - ESTUARY
H - HARBOR
O - OCEAN
S - STREAM

SOURCE: U.S.G.S. 7 1/2' Quads: Cape May, Rio Grande, Wildwood, Stone Harbor, Dates Various.

Figure 56

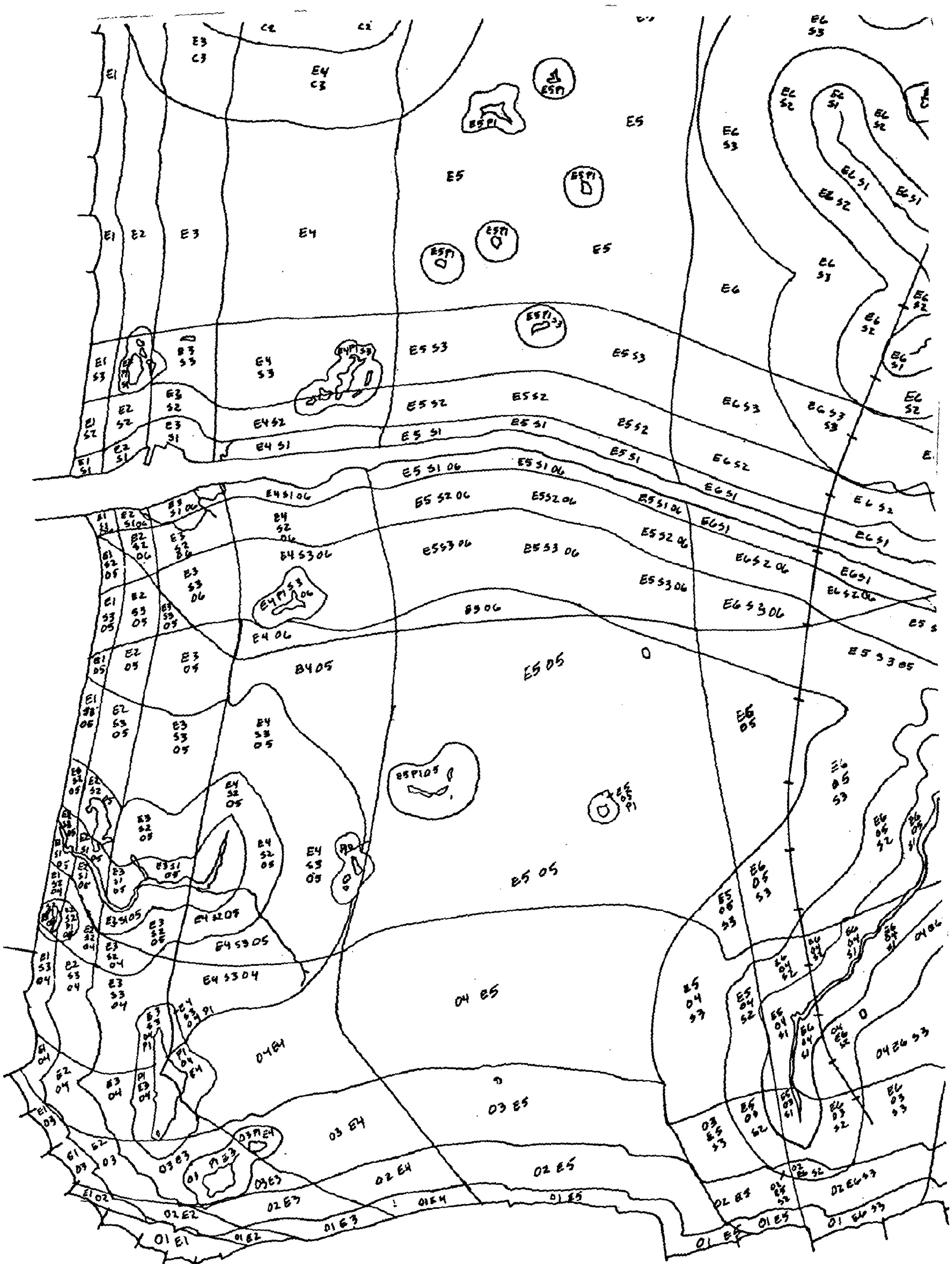

E3 C3
E4 C3
E5 P1
E5
E6 S3
E6 S2
E6 S1
E1
E2
E3
E4
E6
E5 S3
E4 S3
E1 S3
E3 S3
E5 S2
E6 S3
E4 S2
E5 S1
E4 S1
E5 S1 06
E4 S1 06
E5 S2 06
E5 S2 06
E5 S3 06
E4 S3 06
E6 S3 06
E4 06
E5 06
E4 05
E5 05
E6 05
E5 P1 05
E4 S3 05
E4 S3 04
04 E5
04 E4
03 E5
03 E4
02 E4
02 E5
02 E3
01 E5
01 E4
01 E3
01 E1
01 E2
02 E2

Figure 57

Access To Sewers - Figures 58 and 59

Two types of housing are analyzed, one with septic tank waste treatment, one connected by sewers to public waste treatment facilities.

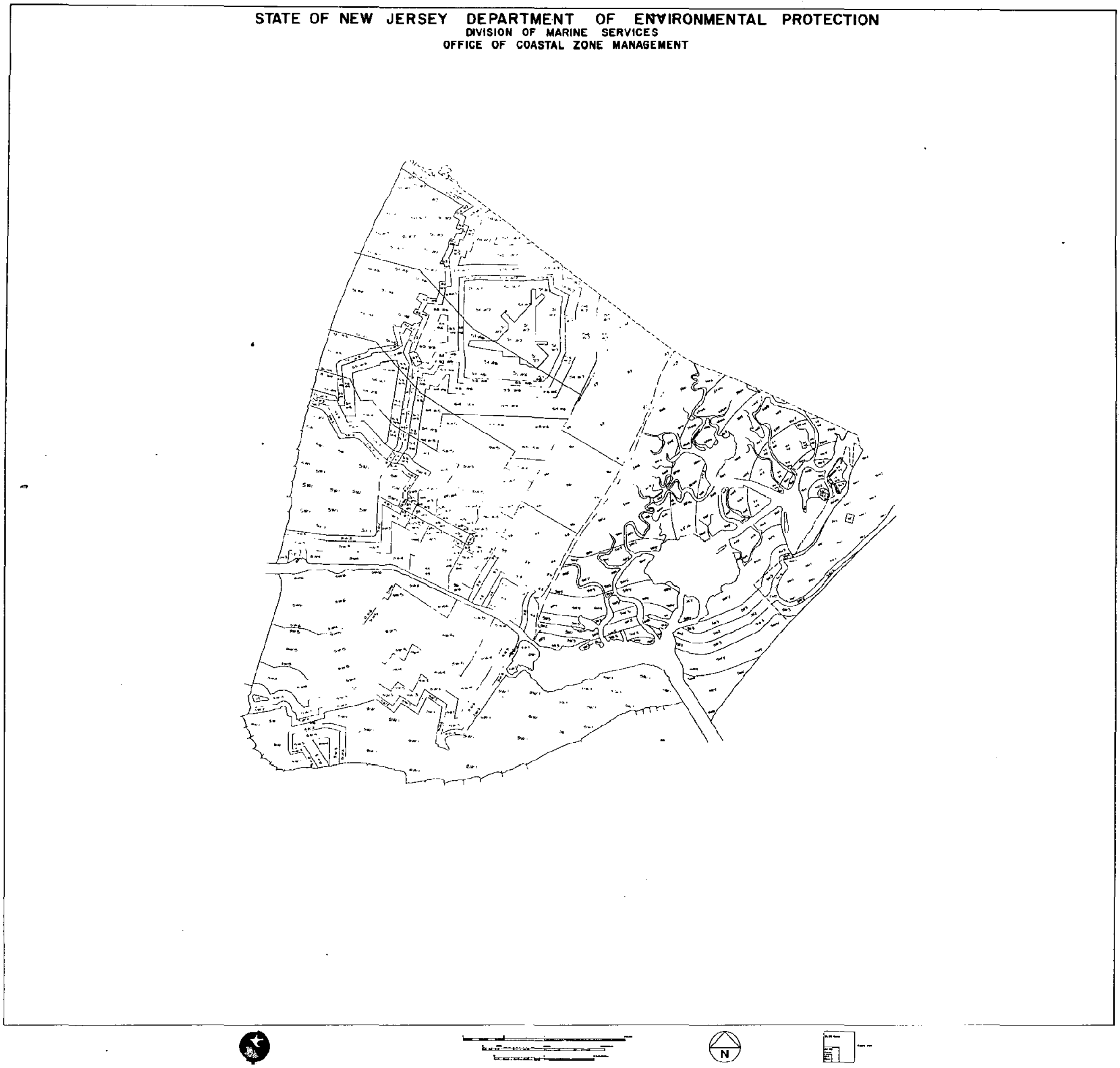
For housing with septic tanks access to sewers is not a factor, for sewered housing it is a necessity. If immediate sewer access is not available on site new sewers must be constructed to connect to the existing sewer system. The further this is, the greater the expense and the lower the opportunity.

It is assumed that marinas have toilet facilities. Since septic tanks are impossible in the low-lying flood prone areas around water bodies only sewer connection is possible. Access to sewers is a necessity, the greater the distance between the site and the existing sewer system the greater the cost penalty.

Access to Public Water Supply - Figures 58 and 59 .

In the Outer Coastal Plain domestic water supplies may be obtained either from private wells or from public water supplies piped from public well fields or surface reservoirs. There is too little information on the availability of ground water to prepare a map showing distribution of variations of available ground water although this information is important and further study should be made.

For both housing and marinas water supply is a necessity. If water is to be obtained from public water supplies then direct connection to the distribution system is necessary. If the existing water pipes are not on site new pipework must be constructed. The longer this is the higher the penalty cost and the lower the opportunity.



ACCESS TO SEWERS & PUBLIC WATER SUPPLY

S1, W1 —— 0- 300ft (100 Yds)
S2, W2 —— 100Yds –300Yds (3/16Mile)
S3, W3 —— 3/16Mile – 1/2Mile
S4, W4 —— 1/2Mile – 1Mile
S5, W5 —— 1Mile – 2Miles
S6, W6 —— 2 Miles – 4 Miles
S7, W7 —— 4Miles +

SOURCE: N.J. DEP Bureau of Geology & Topography Sewer Overlay & Water Supply Overlay Sheets 36 & 37, 1975

Figure 58

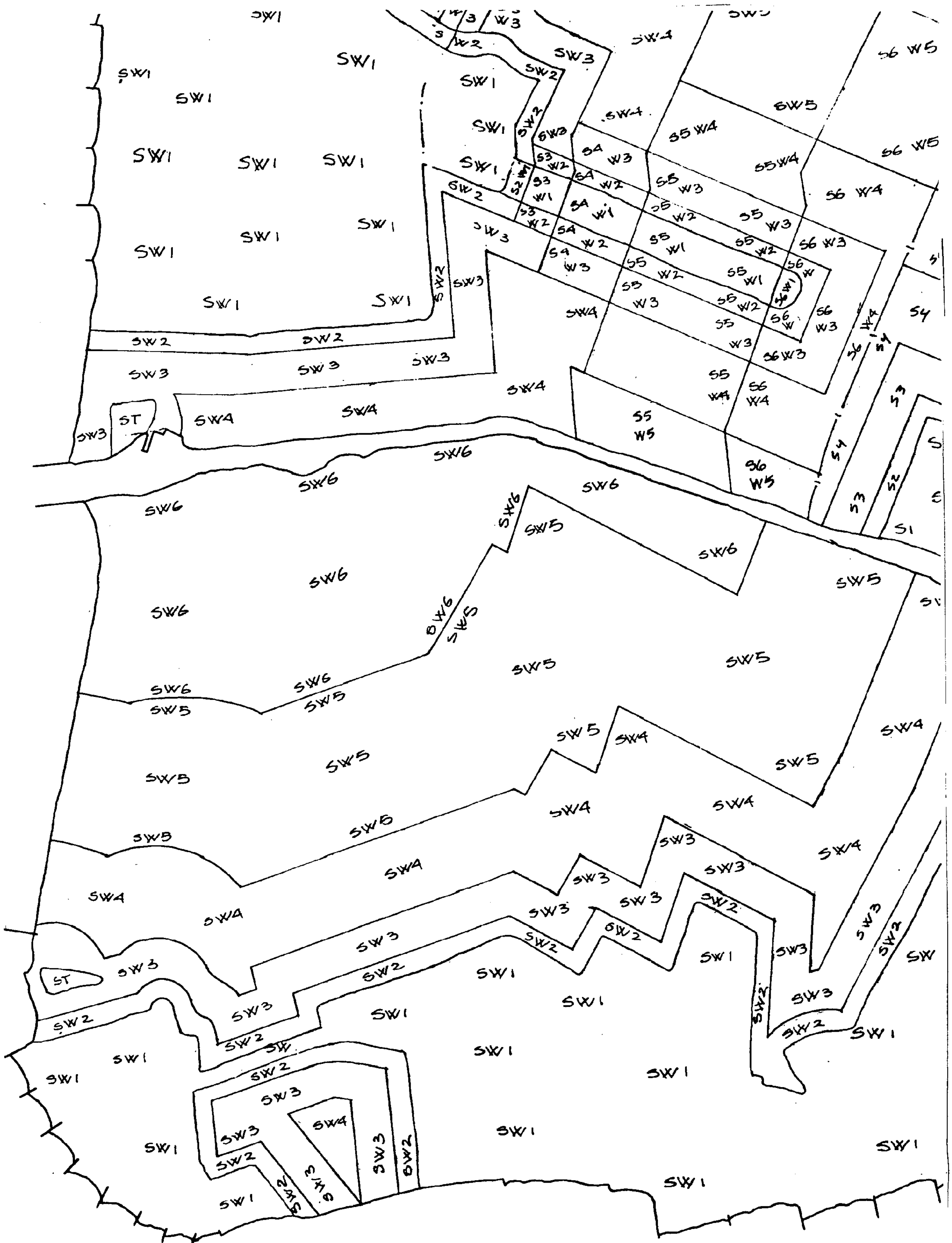

SW1
SW2
SW3
SW4
SW5
SW6
ST
S3 W1
S3 W2
S4 W1
S4 W2
S4 W3
S5 W1
S5 W2
S5 W3
S5 W4
S5 W5
S6 W3
S6 W4
S6 W5
S4
S3
S2
S1

Figure 59

Access to Schools - Figures 60 and 61.

Housing must have access to both elementary and secondary schools, however, with the widespread availability of private cars and general school policy to provide bus transportation to students that live more than two miles distant there is no cost penalty associated with distance from schools.

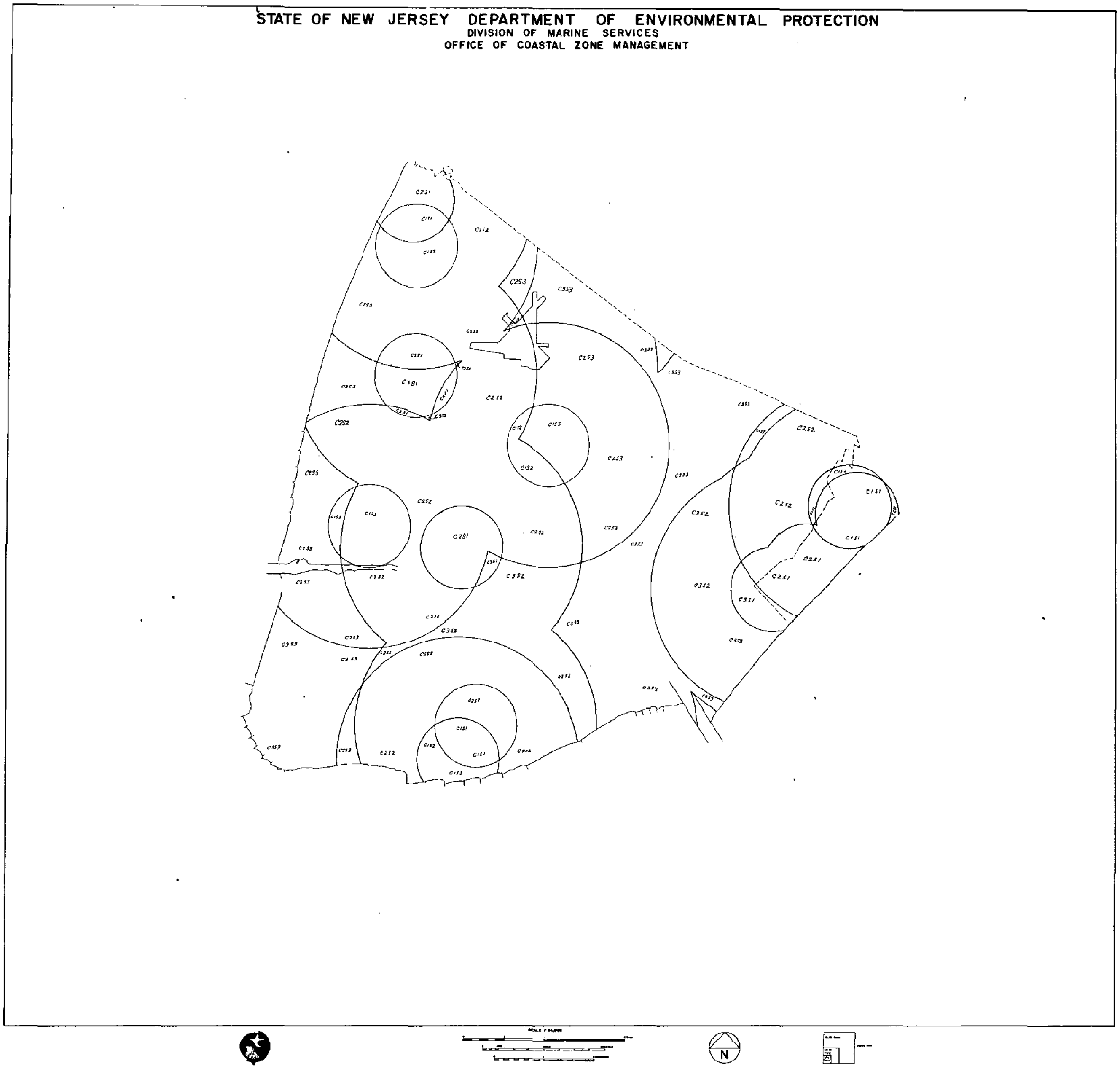
There is, however, a small cost bonus associated with areas within easy walking or cycling distance from a school because of the convenience of being able to send children to school unsupervised and the proximity of school facilities for adult use in evenings, weekends and vacations.

This factor is of no significance to the siting of marinas.

Access to Shops - Figures 60 and 61

For housing it is a bonus to be within short distances of commercial centers that can provide day to day consumer necessities. A single small grocery store is not included here, the smallest grouping considered would be a small neighborhood commercial area that provided a complete range of foodstuffs, both perishable and dry goods, everyday non food goods such as hardware and small appliances, and possibly some services such as restaurants and barbers.

Shops are not considered important to the placing of marinas.



ACCESS TO SHOPPING CENTERS & ELEMENTARY SCHOOLS

SHOPPING CENTERS ACCESS:

C1 – 1/2 Mi Radius
C2 – 11/2 Mi Radius
C3 – 31/2 Mi Radius

ELEM. SCHOOL ACCESS:

S1 – 1/2 Mi Radius
S2 – 11/2 Mi Radius
S3 – 31/2 Mi. Radius

SOURCE: N.J.DEP. Aerial Photo Quads 1972, Lower Township Planning Board.

Figure 60

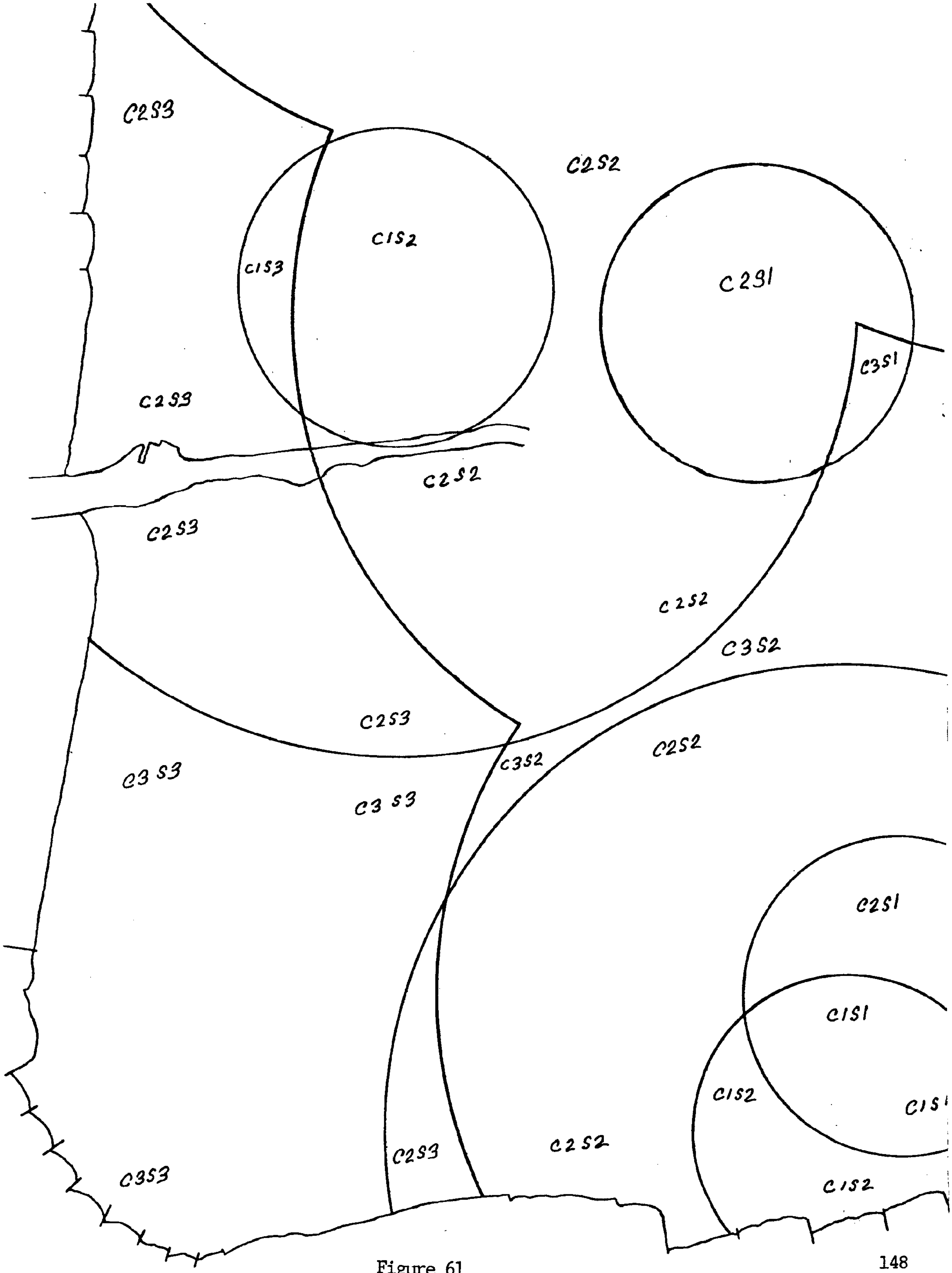

C2S3
C2S2
C1S2
C1S3
C2S1
C3S1
C2S3
C2S2
C2S3
C2S2
C3S2
C2S3
C3S2
C2S2
C3 S3
C3 S3
C2S1
C1S1
C1S2
C1S
C2S3
C2S2
C3S3
C1S2

Figure 61

Freedom from Flood - Figures 62 and 63

The assumption is made in this opportunity study that the ground floor level of all housing must be at least one foot above the 100 year flood, therefore fill is required in flood prone areas to raise the land beneath the structure to the required level. The lower the land, the more fill required, the higher the cost and the lower the opportunity.

This requirement does not apply to marinas and so this factor is not included.

An area prone to flooding in a 100 year storm is defined in the study as either below the 10 foot contour or has alluvial soils.

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT

FLOOD PRONE AREAS

F – FLOOD PRONE AREAS

Either Below 10 Foot
Contour
or Alluvial Soils

SOURCE: U.S. Dept. of Interior, Geological Survey
in Cooperation with U.S. Dept of HUD 1973
SCS Interim Soil Survey Report
Cape May County, New Jersey 1973

Figure 62

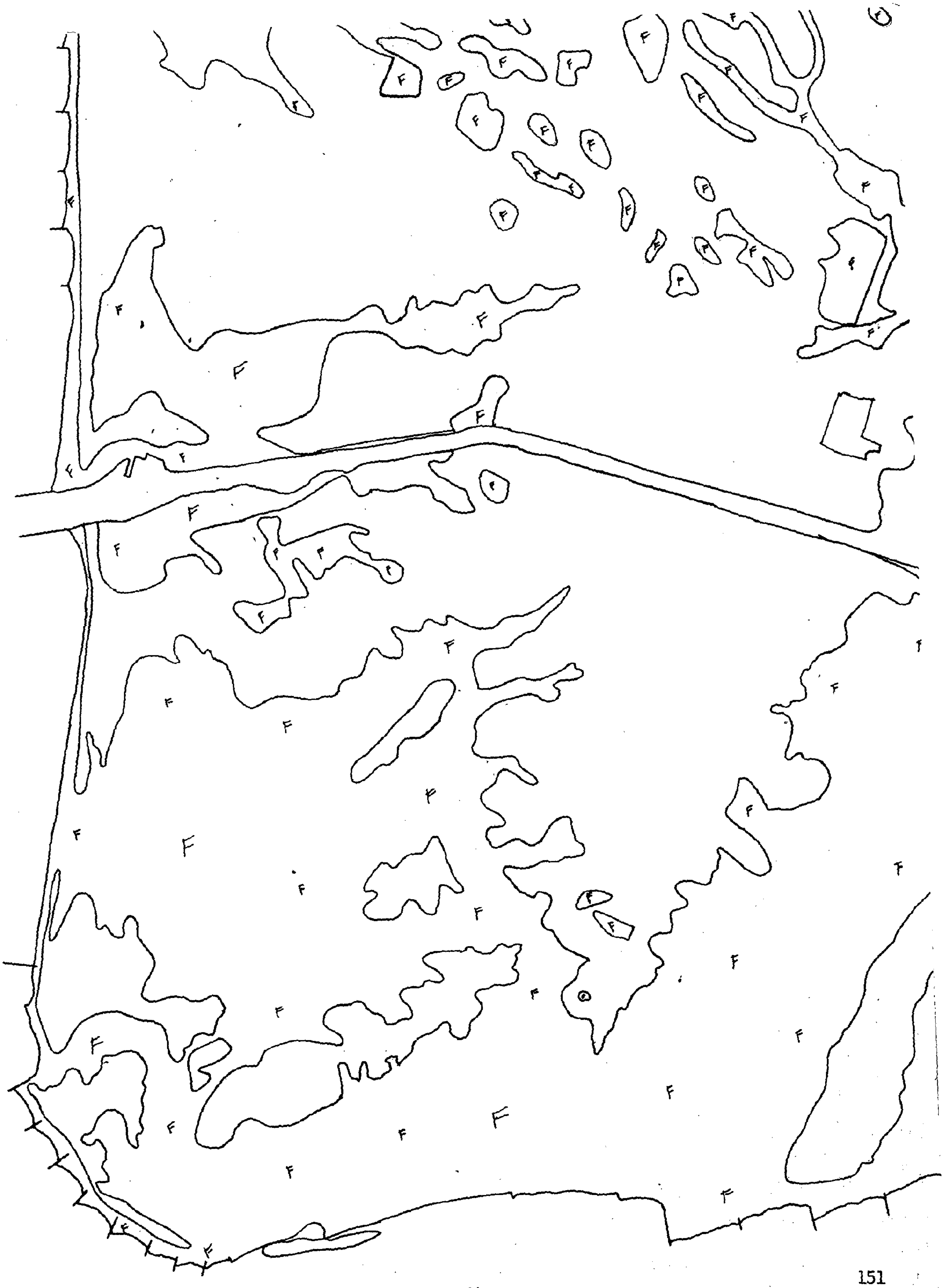
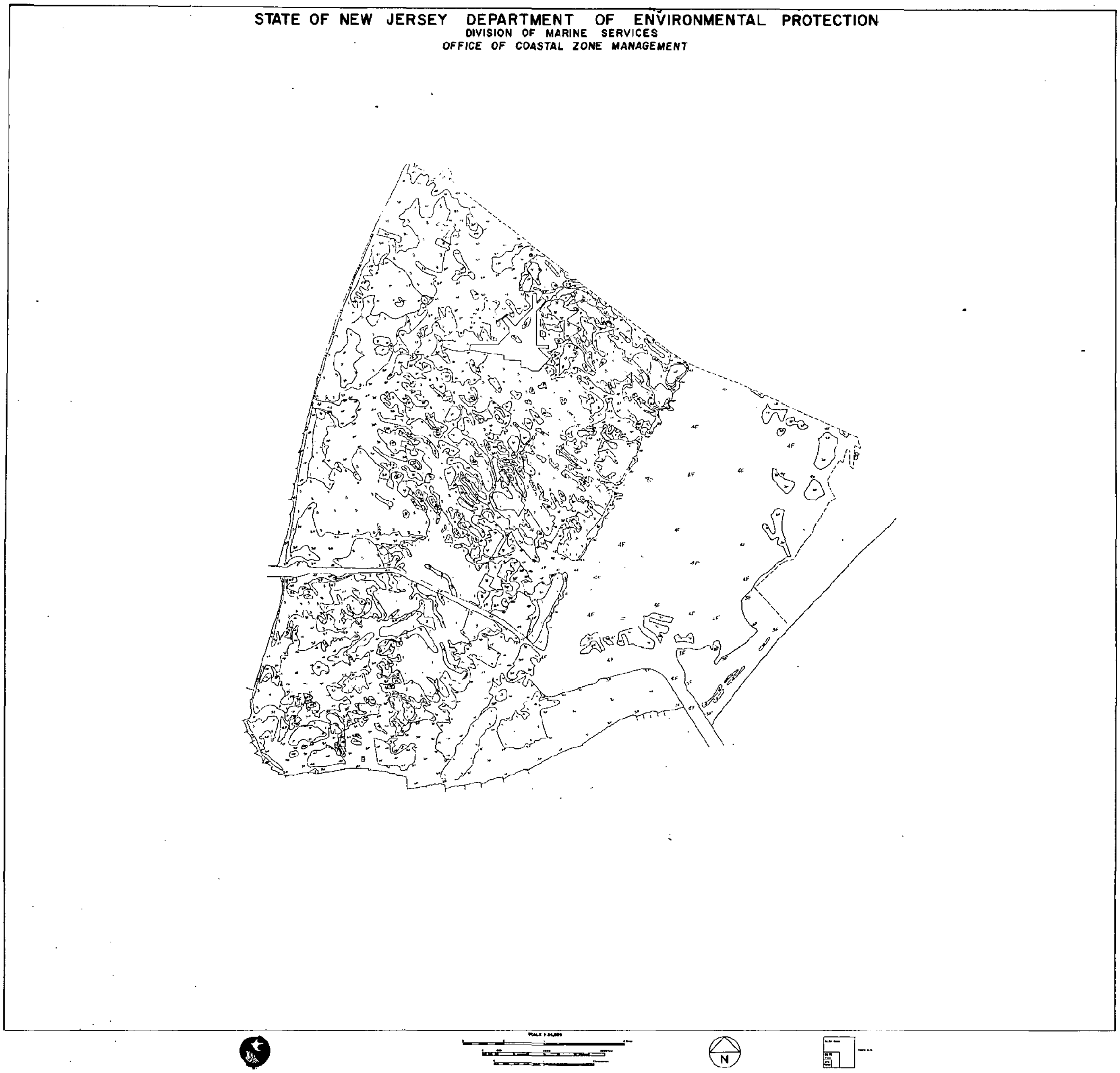


Figure 63

Soils, Suitable for Septic Tanks - Figures 64 and 65

For sewered housing this is not a factor, for housing with septic tanks an adequate functioning septic system is a necessity. Soils suitable for septic systems have no penalty costs, in soils that have restrictions it is assumed that the restrictions may be overcome by filling the area of the drainage field to a suitable depth with overburden of suitable permeability. The increasing cost of this fill as restrictions increase progressively lowers opportunity.

Marinas, as mentioned above, are sewered so this factor is not important.



SUITABILITY OF SOILS FOR SEPTIC TANKS

1 - Few Restrictions
2 - Moderate Restrictions
3-4 - Severe Restrictions

Suffix Code:
F - Flood Prone Area
P - High Permeability

SOURCE: S.C.S. Interim Soil Survey
Cape May County N.J. 1973;
U.S. Dept Of Interior, Geological Survey
In Cooperation With U.S. Dept Of H.U.D. 1973.

Figure 64

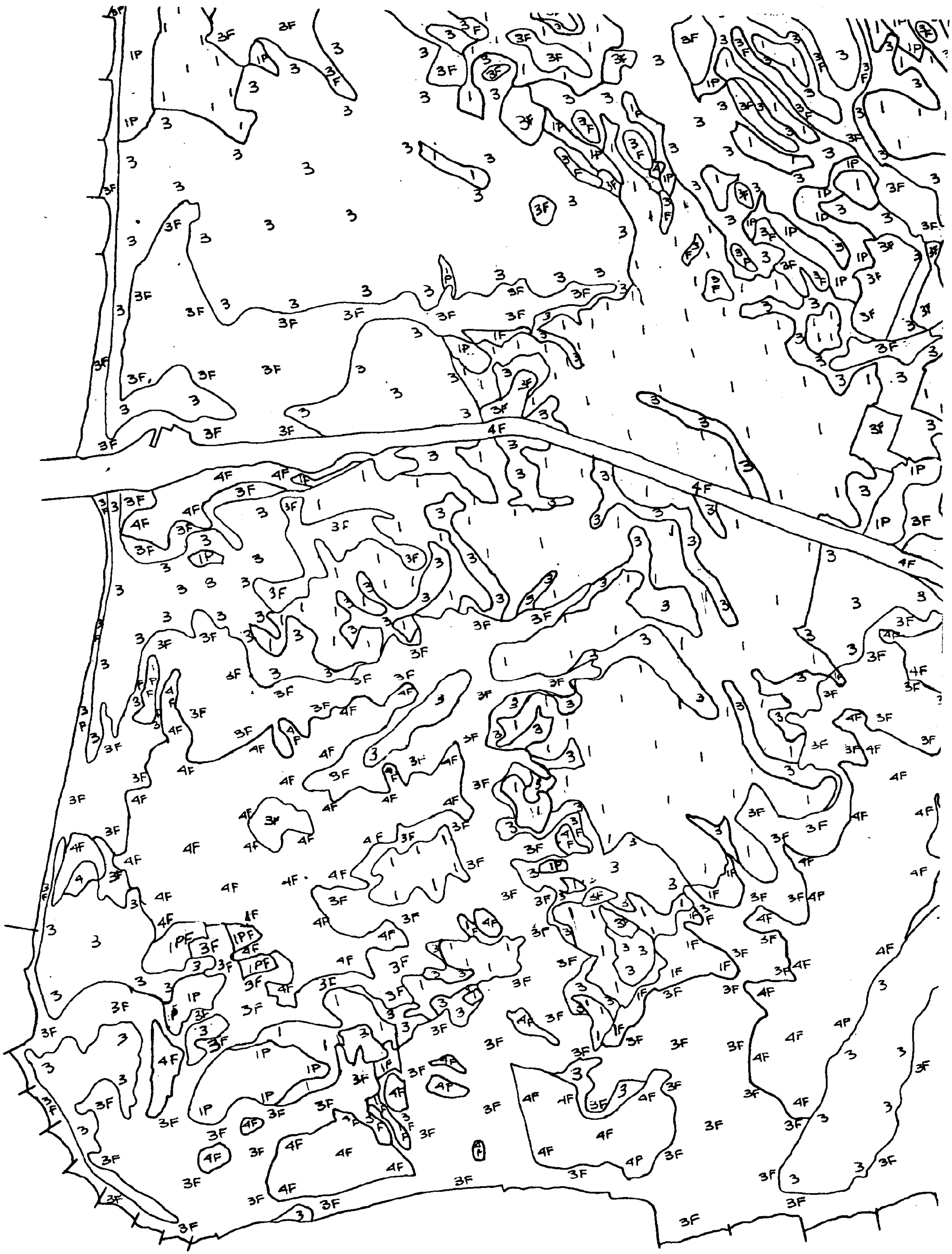


Figure 65

Drainage - Figures 66 and 67

Areas with poor drainage present problems for housing. Water-logged soils offer low load bearing capacity, have the potential for frost heave and are undesirable for gardens. The assumption is made that these problems can be overcome by filling areas of the house site with permeable overburden. The worse the drainage problems the more the fill and the cost, and the lower the opportunity.

Since marinas must locate in low lying areas adjacent to water which typically have poor drainage it is assumed that drainage problems must be overcome equally in all locations. The cost therefore is included in the base cost and this factor is not analysed for variability.

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT

LAND DRAINAGE

Limitations:

1 - Slight

2 - Moderate

3 - Severe

SOURCE: S.C.S. Interim Soil Survey: Cape May County, N.J. 1973

Figure 66

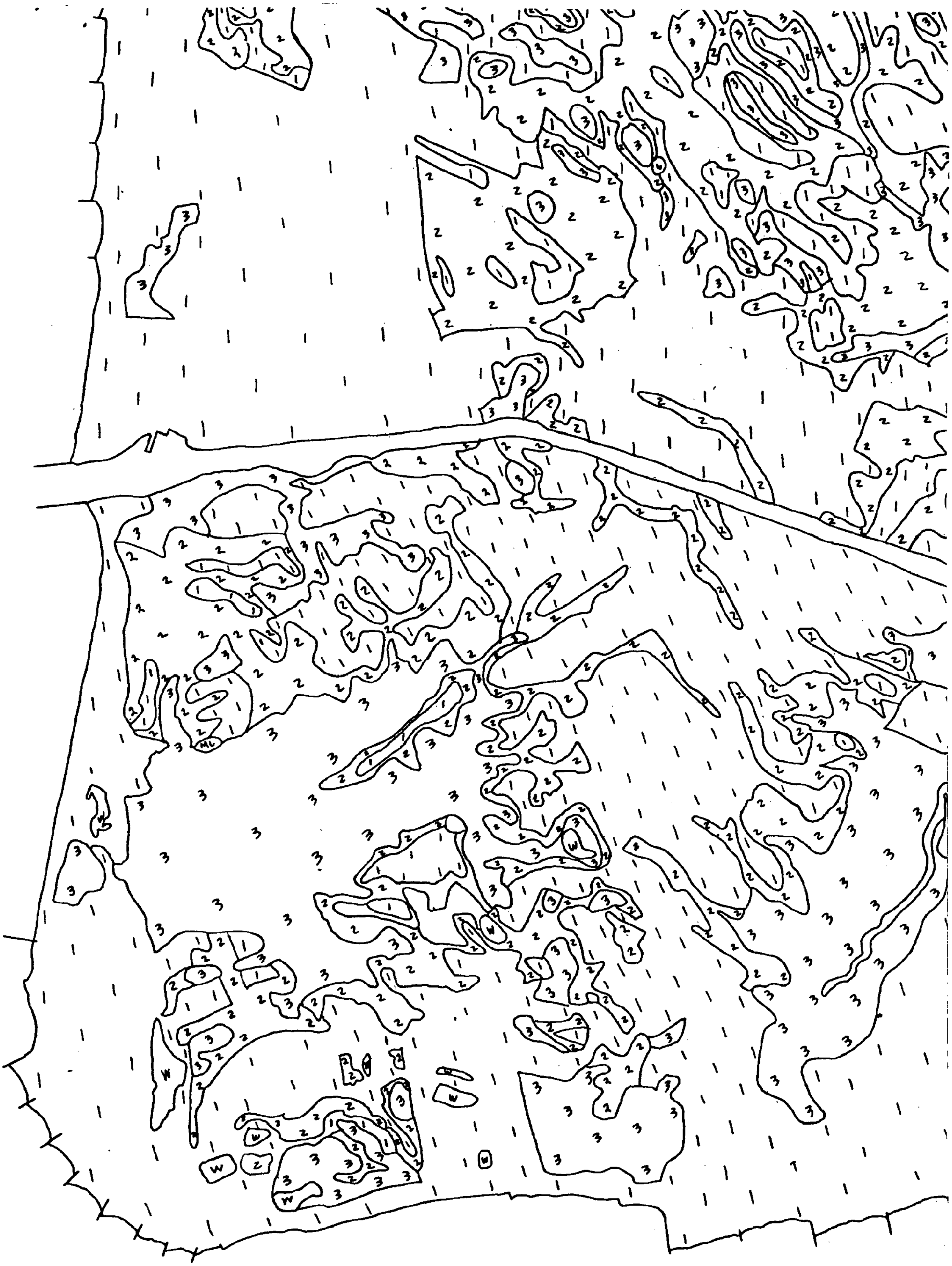


Figure 67

Load Bearing Capacity

Different substrates have different load bearing capacities. If these capacities are exceeded foundations will settle causing structural damage. Special foundation techniques, involving additional costs, are required to prevent settlement when the load bearing capcity is low and this additional cost lowers opportunity.

The only fully reliable way of assessing load bearing capacity is to make trial borings of the site and measure blow counts, however, a general indication can be obtained from the texture and structure of the soil.

The American Association of State Highway Officials (AASHO) has assigned ratings to soil types from 1-7 which indicate general land bearing properties. These are as follows:

AASHO Rating	Approximate Load Bearing in tons/sq. ft.
1	> 2
2	> 2
3	> 2
4	> 2
5	> 2
6	1 - 2
7	< 1
(8) Marsh areas	< 1/2

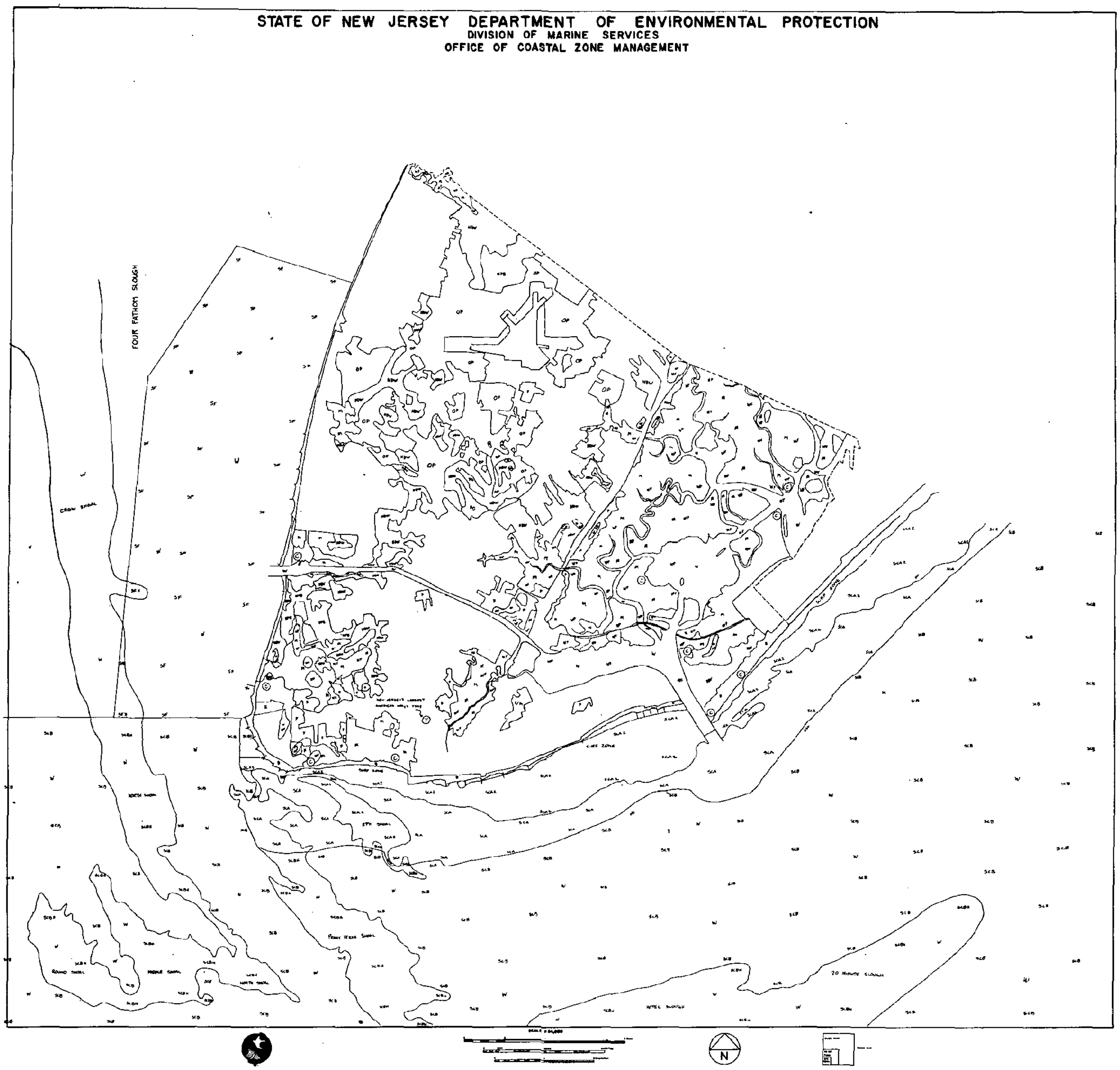
During the analysis it became clear that those areas with low load bearing capacity coincided with areas with flooding and drainage problems and that the fill required to solve these would also solve the load bearing problem for single family detached dwellings so no additional penalty calculation was required.

Marinas characteristically have to locate in areas of poor load bearing so this cost was included in the base cost and not as a variable penalty factor.

Vegetation - Figures 68 and 69

For housing the presence of mature trees is a bonus factor of sufficient importance that housing developers have a scale of add-on costs for forested sites, depending on the number and maturity of trees.

For marinas this factor is not considered.



VEGETATION & LIVING RESOURCES

VEGETATION TYPES

- BBV – BARRIER BEACH VEGETATION (Dunes)
- M – MARSH (Tidal Wetlands)
- HDW – HARDWOOD LOWLAND FOREST
- HPB – NON-PINE BARREN FOREST
- OP – OAK/PINE FOREST
- PO – PINE/OAK FOREST
- F – UNTYPED FORESTED AREA

HABITAT TYPES

- B – BEACHES
- W – SURFACE WATER
- ⧺ SHIPWRECKS
- T – STATE RECORD TREE
- C – COLONIAL NESTING BIRD ROOKERIES ✳
- SF – SHELLFISH (Hard Clams) AND FIN FISH NURSERY AREAS
- WF – WATERFOWL WINTERING AREAS
- SCA – SURF CLAM (Dense Concentration) ✳
- SCB – SURF CLAM (Less Dense Concentration) ✳
- SHOALS & SLOUGHS – PRIME SPORT FISHING GROUNDS
- HDW – DEER WINTERING AREA
- ✳ SUFFIX H – SHOAL Z – SURF ZONE

SOURCE: N.J. DEP - PHOTO QUADS (1973); WETLANDS MAPS (1972); ENVIRONMENTAL MAP OF NEW JERSEY FISHERIES RESOURCE MAP B (1973), N.J. DIVISION OF FISH, GAME, SHELLFISHERIES; ENDANGERED AND NON-GAME SPECIES PROJECT (ROOKERIES); BUREAU OF SHELLFISHERIES (SURF CLAMS), N.O.S. NAUTICAL CHARTS NO. 12316, (1975) NO. 12304, (1974), RUTGERS UNIVERS. LIST OF N.J. BIGGEST TREES (1974), FREEMAN; B.L. AND L.A. WALFORD – ANGLERS GUIDE TO THE ATLANTIC COAST; SECTIONS III & IV (1974)

Figure 68

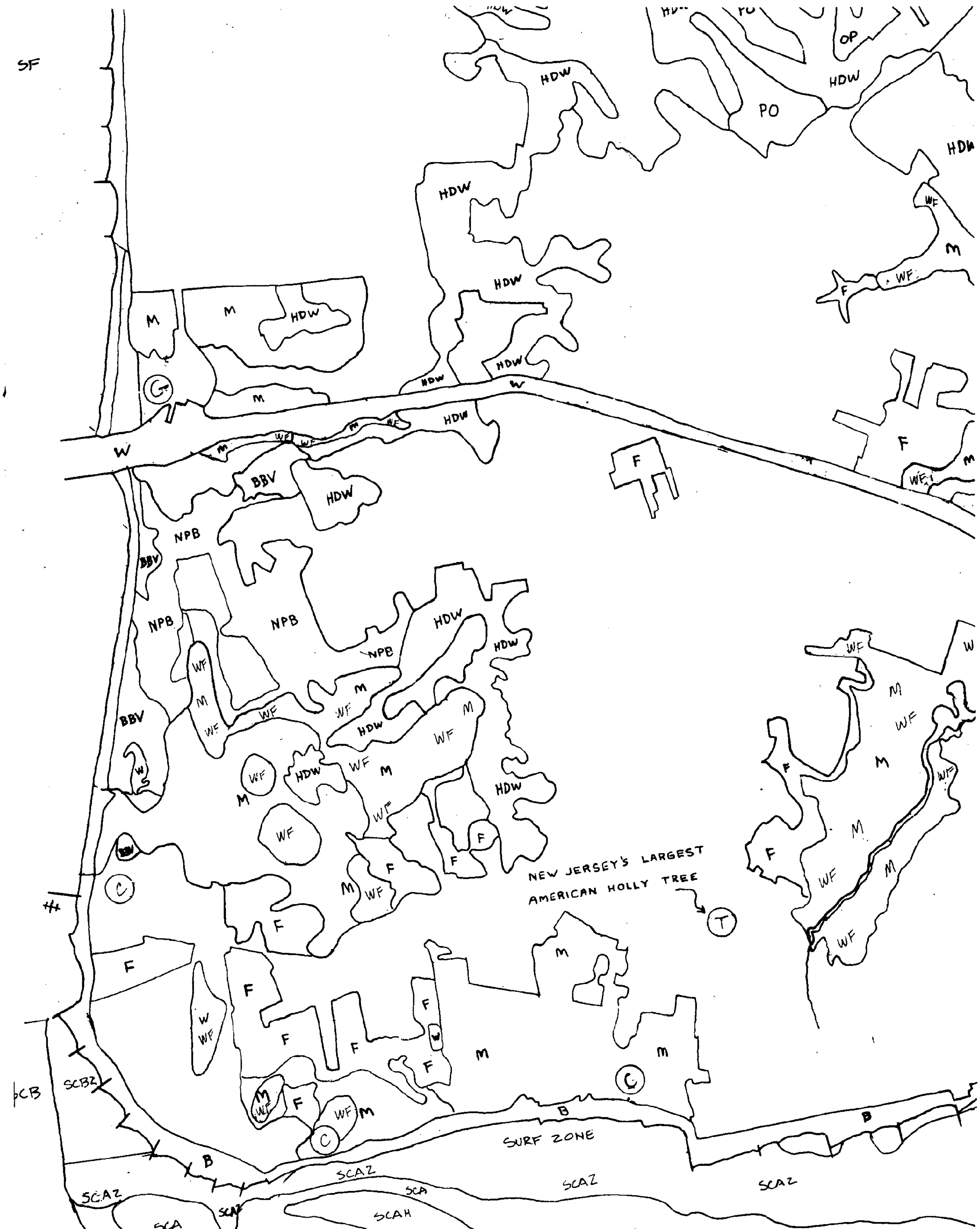

SF
HDW
PO
OP
HDW
M
WF
F
M
HDW
W
BBV
NPB
C
T
NEW JERSEY'S LARGEST
AMERICAN HOLLY TREE
B
SURF ZONE
SCBZ
CB
SCAZ
SCA
SCAH

Figure 69

III. Synthesis of Opportunity Factors

In order to determine the distribution of opportunity for a particular use, three steps are taken once the distribution of individual opportunity factors has been mapped. First, the opportunity factors that affect the placing of the study use must be identified. Second the cost penalty or bonus that each category of variation in each opportunity factor offers to the use must be estimated. Third the opportunity factor maps must be costed, overlaid, and the costs summed within each area on the overlay synthesis map. The distribution of cost on the final synthesis map represents the distribution of opportunity offered by the selected factors to the use.

The matrices in Appendix E. ii. and iii. list the estimated cost bonuses and penalties associated with all the variations of opportunity factors associated with housing and marinas.

These cost estimates are at present speculative. Some are fairly straightforward, as for example the cost of building roads. Others are estimates based on experience, as for example the bonus to housing of being close to schools or surface water.

Within the time allowed for this study, costs were either generated by use developers or checked with them to the greatest possible extent, but many remain questionable. It is intended that further contract work should gather location factors and cost data with the objective of generating data directly from developers.

This pilot study should be seen as an illustration of how the data could be used to analyze the distribution of opportunity, once costs are verified.

Cost figures are calculated from whatever unit costs are available, whether per acre, per linear foot or per total development. These are converted to a total bonus or penalty cost for the whole development and expressed in the tables in thousands of dollars.

These dollar costs are then converted to a percentage of the base development cost, that is the cost of development on an average site with no exceptional site costs either of bonus or penalty and excluding the cost of site acquisition.

This is important because a scale factor is introduced. Clearly penalty costs that occur once per development are a smaller percentage of a large than a small development. Penalties that occur per dwelling unit or per acre are the same for all scales of development. The opportunity distribution will therefore vary somewhat with scale.

IV. Mapping in the Pilot Area

The following maps (Figure Nos. 70 to 75) illustrate the synthesis of cost indicating the distribution of opportunity in the pilot area for 3 dwelling unit/acre single family detached housing development with sewers or with septic tanks and for marinas.

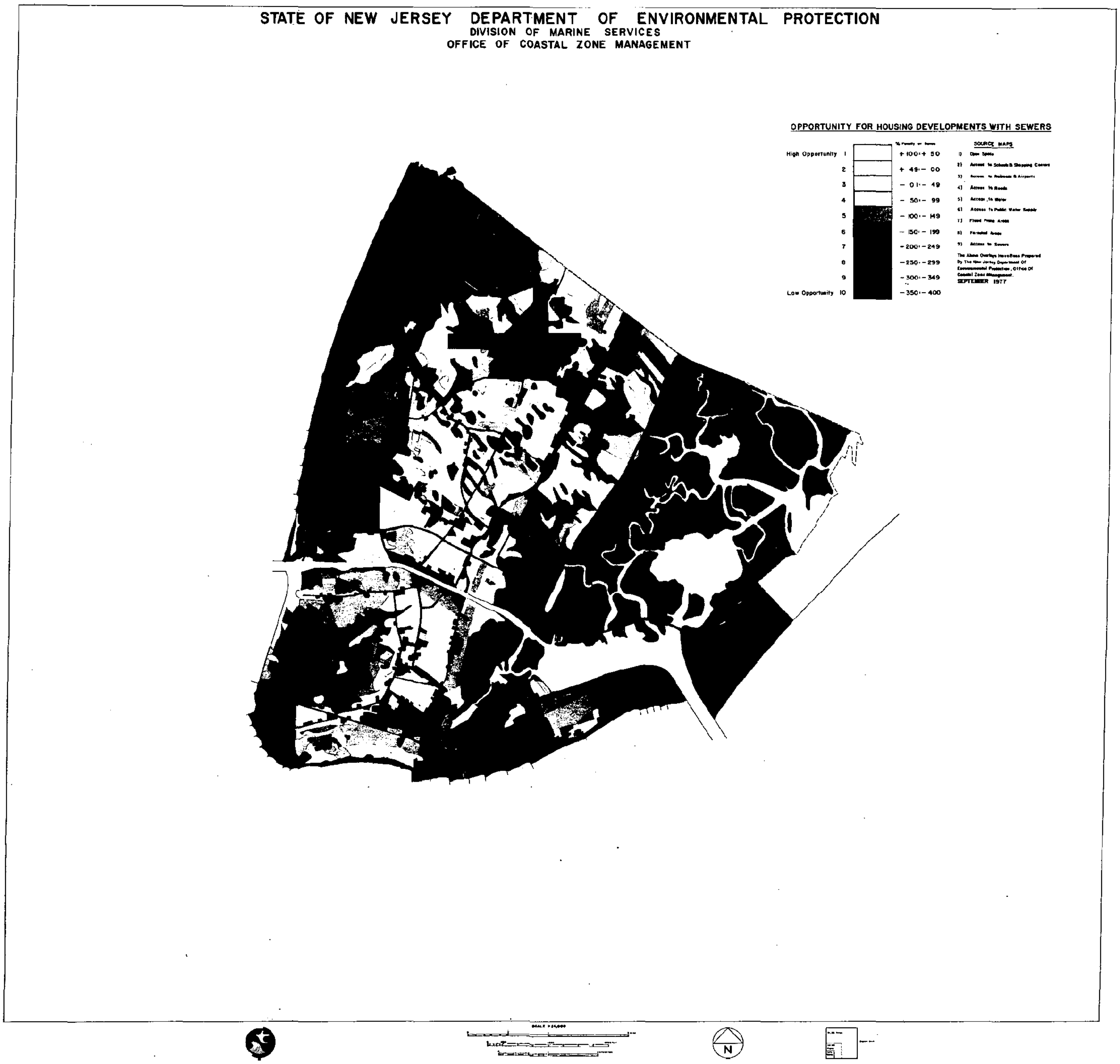

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
OPPORTUNITY FOR HOUSING DEVELOPMENTS WITH SEWERS
High Opportunity 1
2
3
4
5
6
7
8
9
Low Opportunity 10
+100 + 50
+ 49 − 00
− 01 − 49
− 50 − 99
− 100 − 149
− 150 − 199
− 200 − 249
− 250 − 299
− 300 − 349
− 350 − 400
SOURCE MAPS
1) Open Space
2) Access to Schools & Shopping Centers
3) Access to Railroads & Airports
4) Access to Roads
5) Access to Water
6) Access to Public Water Supply
7) Flood Prone Areas
8) Forested Areas
9) Access to Sewers
SEPTEMBER 1977
N

Figure 70

Figure 71

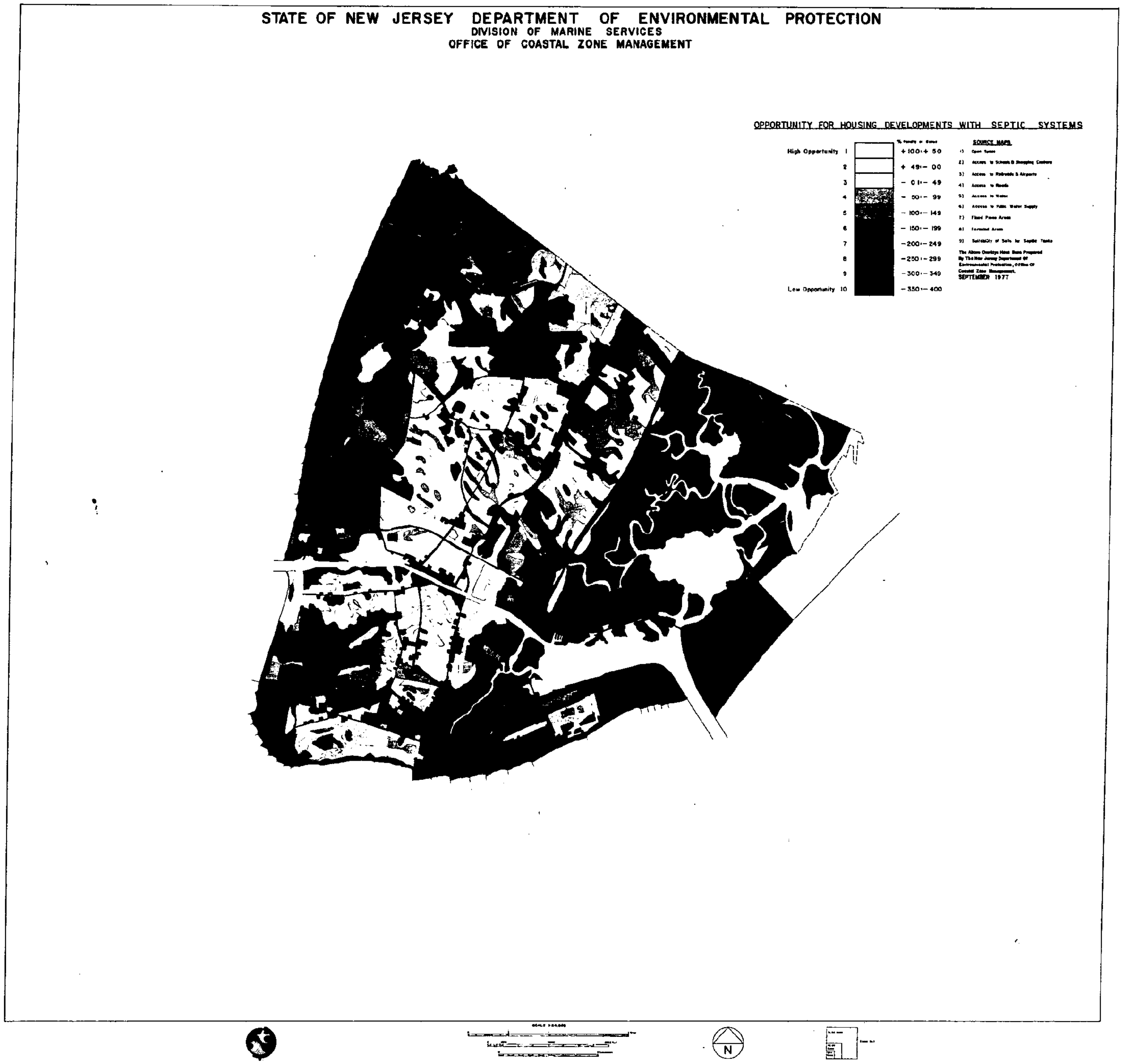

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
OPPORTUNITY FOR HOUSING DEVELOPMENTS WITH SEPTIC SYSTEMS
High Opportunity 1
2
3
4
5
6
7
8
9
Low Opportunity 10
+100-+50
+49-00
-01-49
-50-99
-100-149
-150-199
-200-249
-250-299
-300-349
-350-400
SOURCE MAPS
SEPTEMBER 1977
N

Figure 72

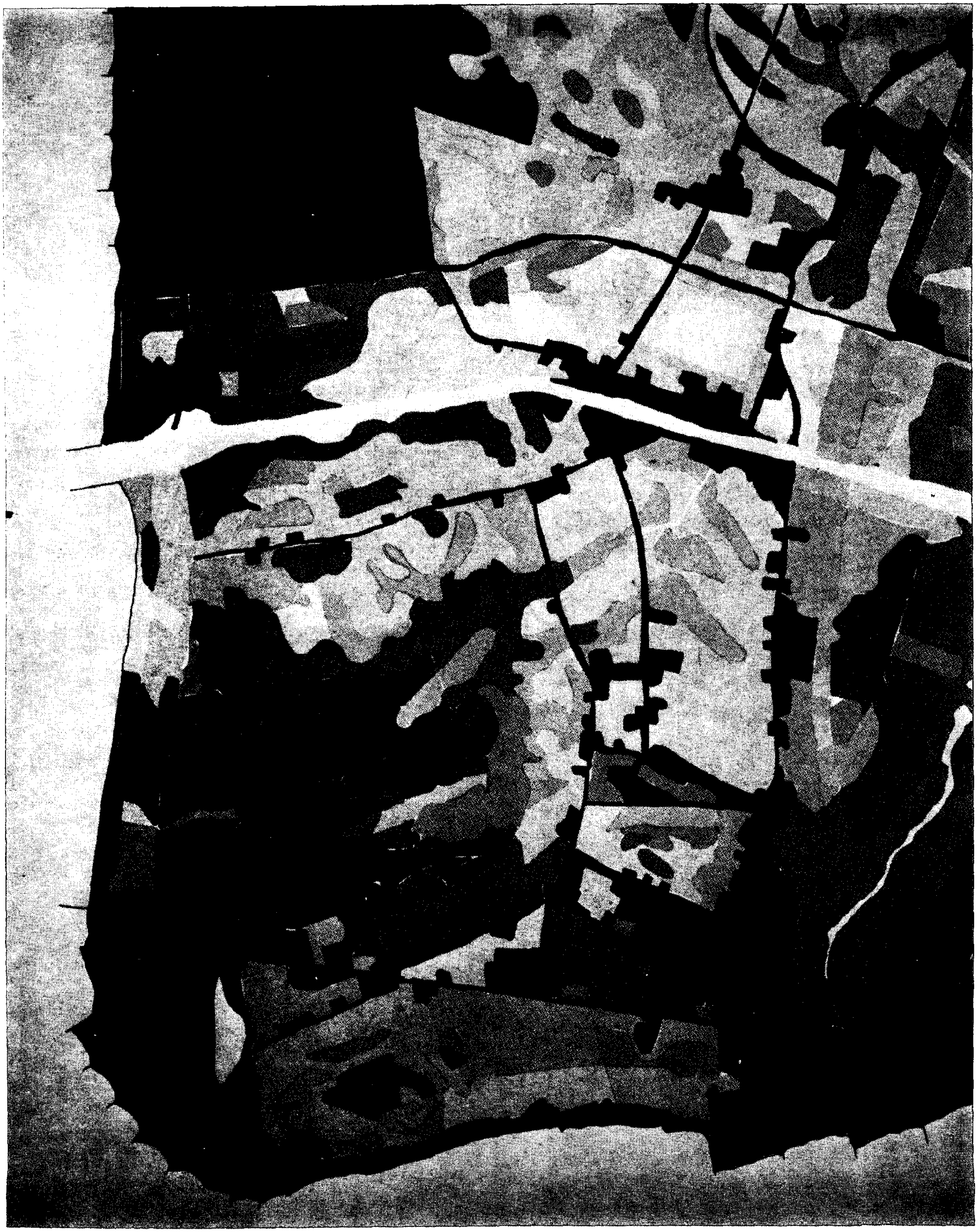


Figure 73

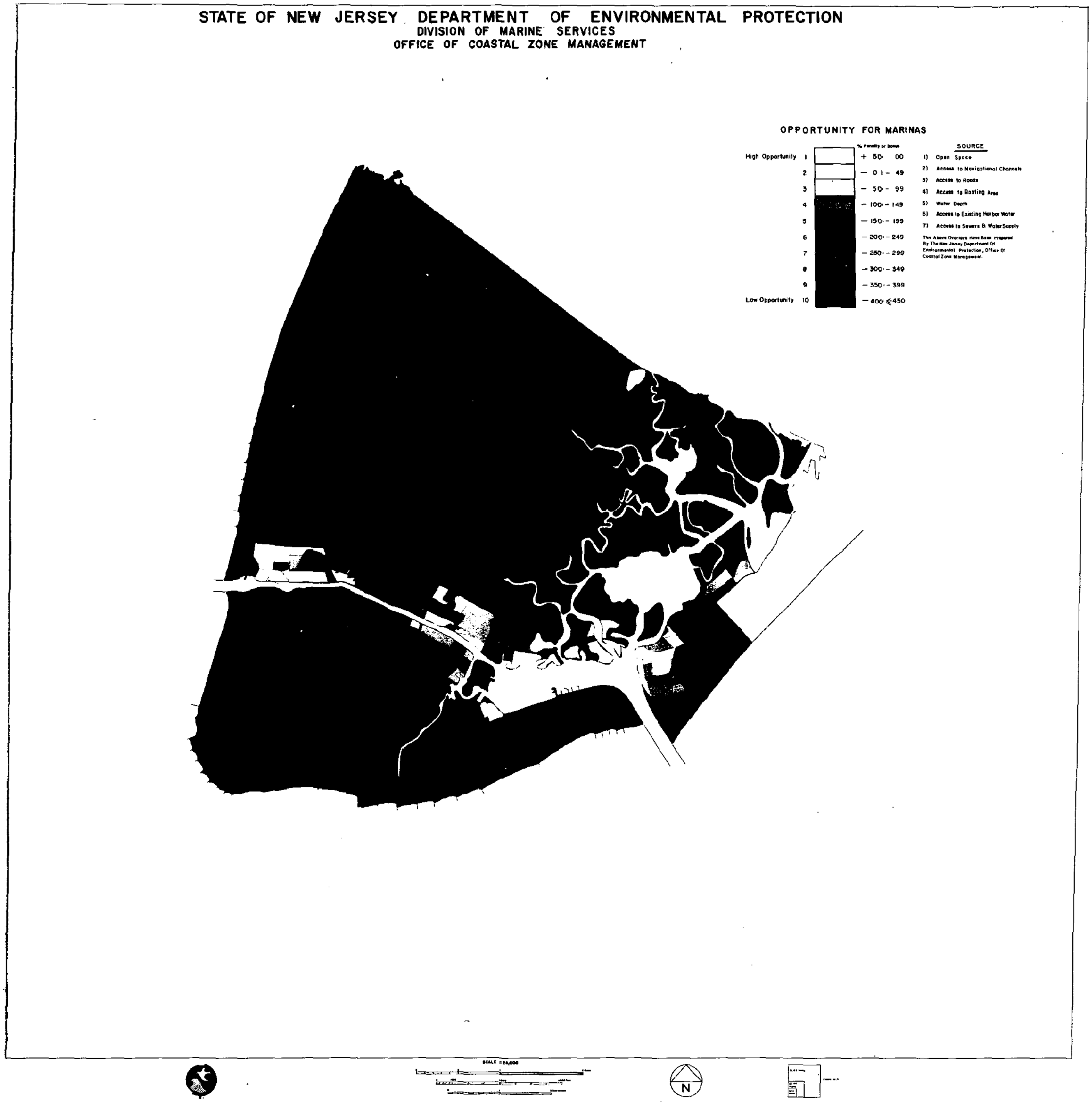
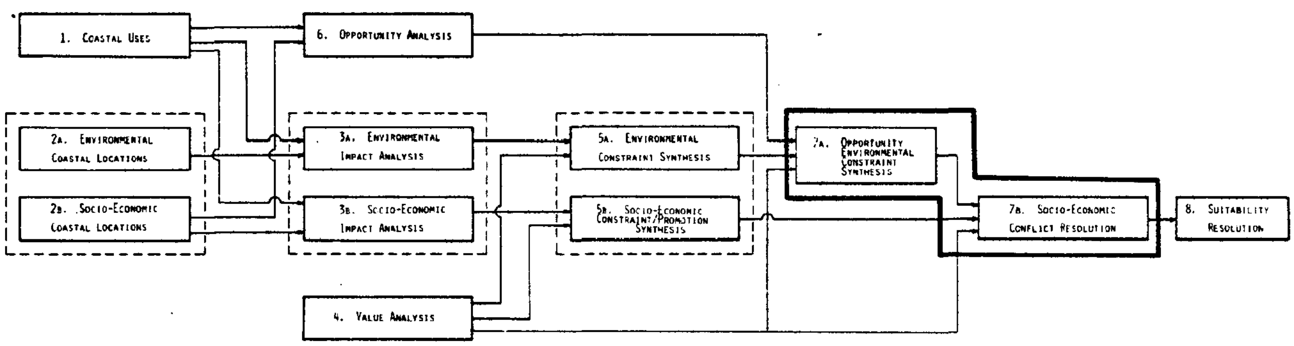

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
OPPORTUNITY FOR MARINAS
% Penalty or Bonus
High Opportunity 1 + 50 00
2 − 0 − 49
3 − 50 − 99
4 − 100 − 149
5 − 150 − 199
6 − 200 − 249
7 − 250 − 299
8 − 300 − 349
9 − 350 − 399
Low Opportunity 10 − 400 ≤ 450
SOURCE
1) Open Space
2) Access to Navigational Channels
3) Access to Roads
4) Access to Boating Area
5) Water Depth
6) Access to Existing Harbor Water
7) Access to Sewers & Water Supply
The Above Overlays Have Been Prepared By The New Jersey Department Of Environmental Protection, Office Of Coastal Zone Management.
N

Figure 74

Figure 75

SECTION 7.

OPPORTUNITY - CONSTRAINT - SYNTHESIS



SECTION 7 - OPPORTUNITY-CONSTRAINT SYNTHESIS

General Introduction

The purpose of this section is to combine the products of environmental constraint synthesis (Section 5a), opportunity analysis (Section 6) and socio-economic constraint-promotion synthesis (Section 5b). The objective of this combination is to determine for each use-location a level of suitability, or acceptability, that takes into consideration the requirements of environmental conservation, development, and the social and economic systems already in place.

The environmental constraint synthesis suggests a distribution of development that preserves valued environmental resources, addressing only the requirements of conservation.

The opportunity analysis suggests a distribution of development that maximizes the development potential of locations without considering impact.

The socio-economic synthesis suggests a distribution of development that maximizes beneficial socio-economic impacts and minimizes adverse impacts without consideration of environmental conservation needs or the needs of development.

These three recommended use distributions are not the same. In some locations the recommendations may be in serious conflict. A water's edge location in a resort area, for example, may offer high opportunity to marina development and such development may offer socio-economic benefits to the community, but the high level of environmental constraint associated with marsh land sets up a high degree of conflict.

These conflicts are the reason that the three elements of use-placement, environmental, developmental and socio-economic, are analyzed separtely. By maximizing the requirements of each in isolation the nature and distirbution of conflict may be clearly understood.

A systematic method may then be designed that combines conflicting requirements, assesses the extent to which alternative conflict resolutions affect the optimum use distribution of each of the three elements, and proposes explicit trade-offs to arrive at a middle ground acceptable to all requirements.

This is the heart of the method and also the part where the most alternative solutions are possible. Once the impact analyses are completed and all the opportunity costs confirmed the calculation of opportunity and constraint is fairly uncontroversial for a given set of objectives. Different analysts working separately would come to similar conclusions.

In the combination of opportunity and constraint, however, new values must be introduced and political decisions made. There is no one "right" answer, tradeoffs and compromises are necessary to overcome conflicts.

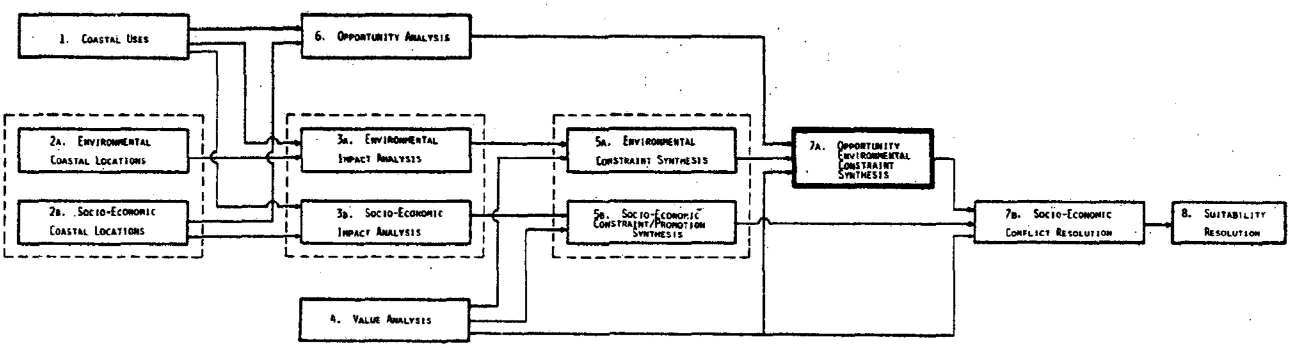
This section has three parts. First, the ten levels of environmental constraint identified in Section 5a are combined with the ten levels of opportunity identified in Section 6. Criteria are proposed to overcome conflicts and a level of suitability, or acceptability, is assigned to each of the 100 possible combinations.

Second, the criteria established in the socio-economic synthesis of Section 5b, and the way in which these may change the rules of combination of environmental constraint and opprotunity are discussed. The conflicts that may arise from the juxtaposition of incompatible uses and a technique of assigning buffer sizes is outlined.

Third, the conflicts that may arise when two or more equally suitable uses are in competition for scarce location types is discussed and criteria are proposed to identify the preferred use.

SECTION 7a.

OPPORTUNITY - ENVIRONMENTAL CONSTRAINT SYNTHESIS



SECTION 7A - OPPORTUNITY-ENVIRONMENTAL CONSTRAINT SYNTHESIS

I. Introduction

The environmental constraint synthesis identifies the gradient of restriction to use that must be placed on locations if valued environmental resources are to be preserved. This describes the conservation viewpoint without considering the needs of development.

The opportunity analysis identifies the areas where uses most wish to locate. This represents the development viewpoint without considering impact.

When the two analysis are combined, it is clear that conflicts arise between opportunity and environmental constraint. If the analyses are correct, an overlay of these two maps will identify where conflicts are arising, or will arise, on the ground between developers and conservation groups and where special management procedures are required.

Figures 76 and 77 on the following pages illustrate the distribution of constraint to and opportunity for housing with sewers in the pilot area. Figures 78 and 79 illustrate the degree if conflict between these two maps, the darker the tone, the higher the conflict.

Conflicts are high in the pilot area. Owing to the proximity to water on three sides, the extensive marshlands, flood prone areas and areas of prime agricultural lands, constraint is high in much of the area, creating conflict in high opportunity areas. Particularly as water bodies are approached both opportunity and constraint rise. The question asked in this section is: how may these conflicts be resolved and a final suitability ranking given to combinations of opportunity and constraint that addresses the needs of both conservation and development?

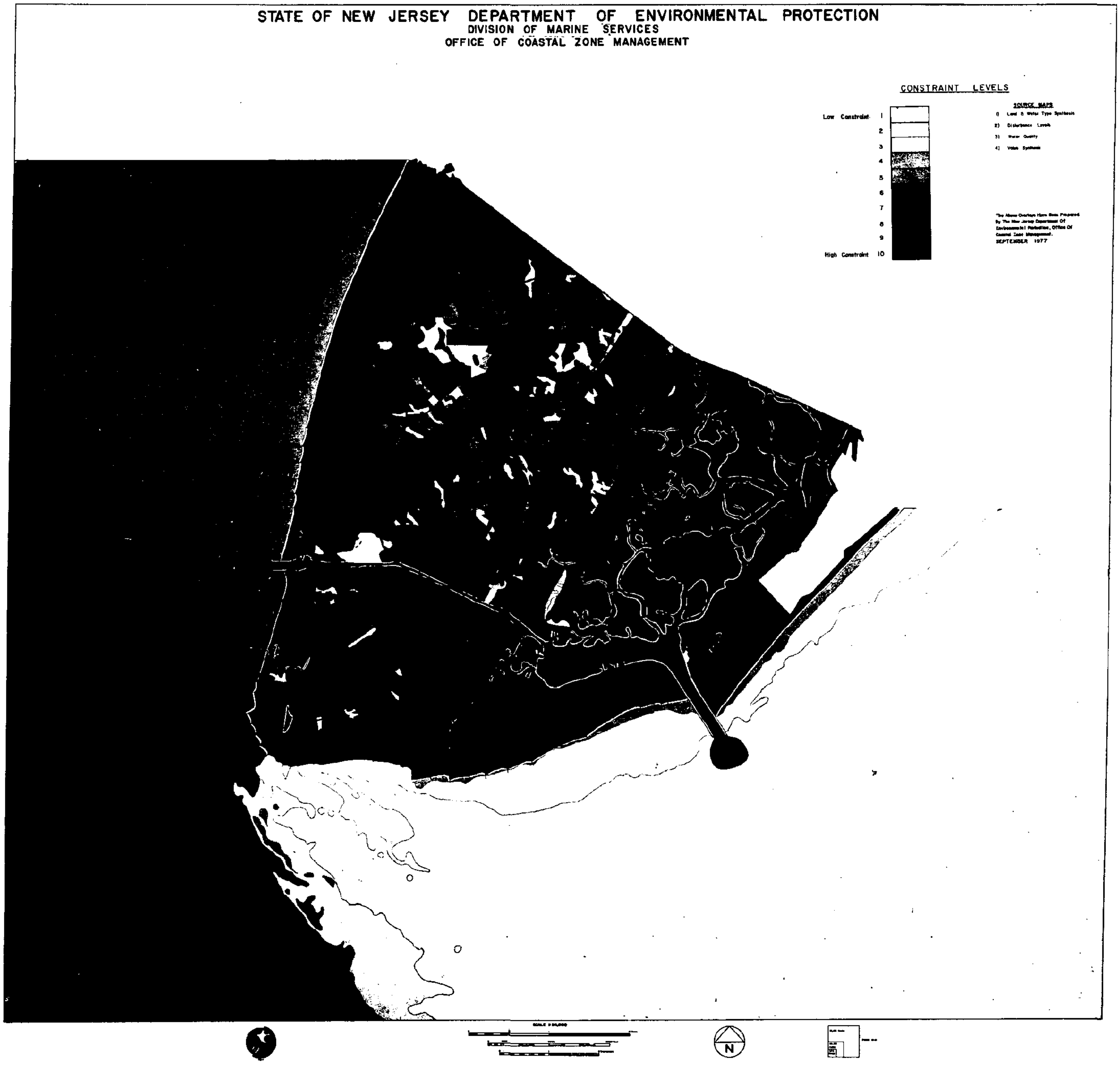

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
CONSTRAINT LEVELS
SOURCE MAPS
Low Constraint 1
2
3
4
5
6
7
8
9
High Constraint 10
SEPTEMBER 1977
N

Figure 76

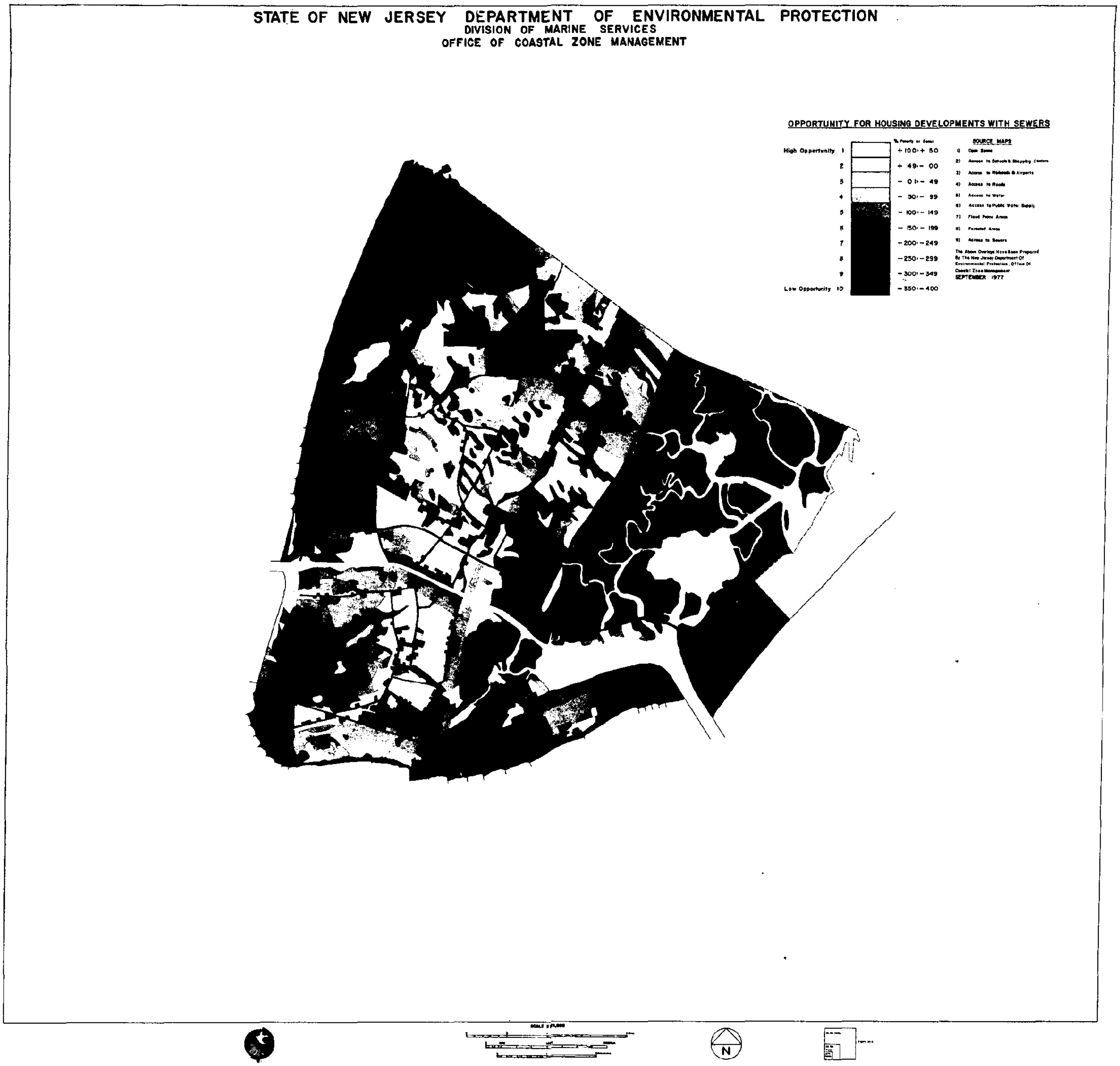

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
OPPORTUNITY FOR HOUSING DEVELOPMENTS WITH SEWERS
High Opportunity 1
2
3
4
5
6
7
8
9
Low Opportunity 10
+100 + 50
+ 49 - 00
- 01 - 49
- 50 - 99
- 100 - 149
- 150 - 199
- 200 - 249
- 250 - 299
- 300 - 349
- 350 - 400
SOURCE MAPS
4) Access to Roads
6) Access to Public Water Supply
7) Flood Prone Areas
8) Forested Areas
9) Access to Sewers
SEPTEMBER 1977
N

Figure 77

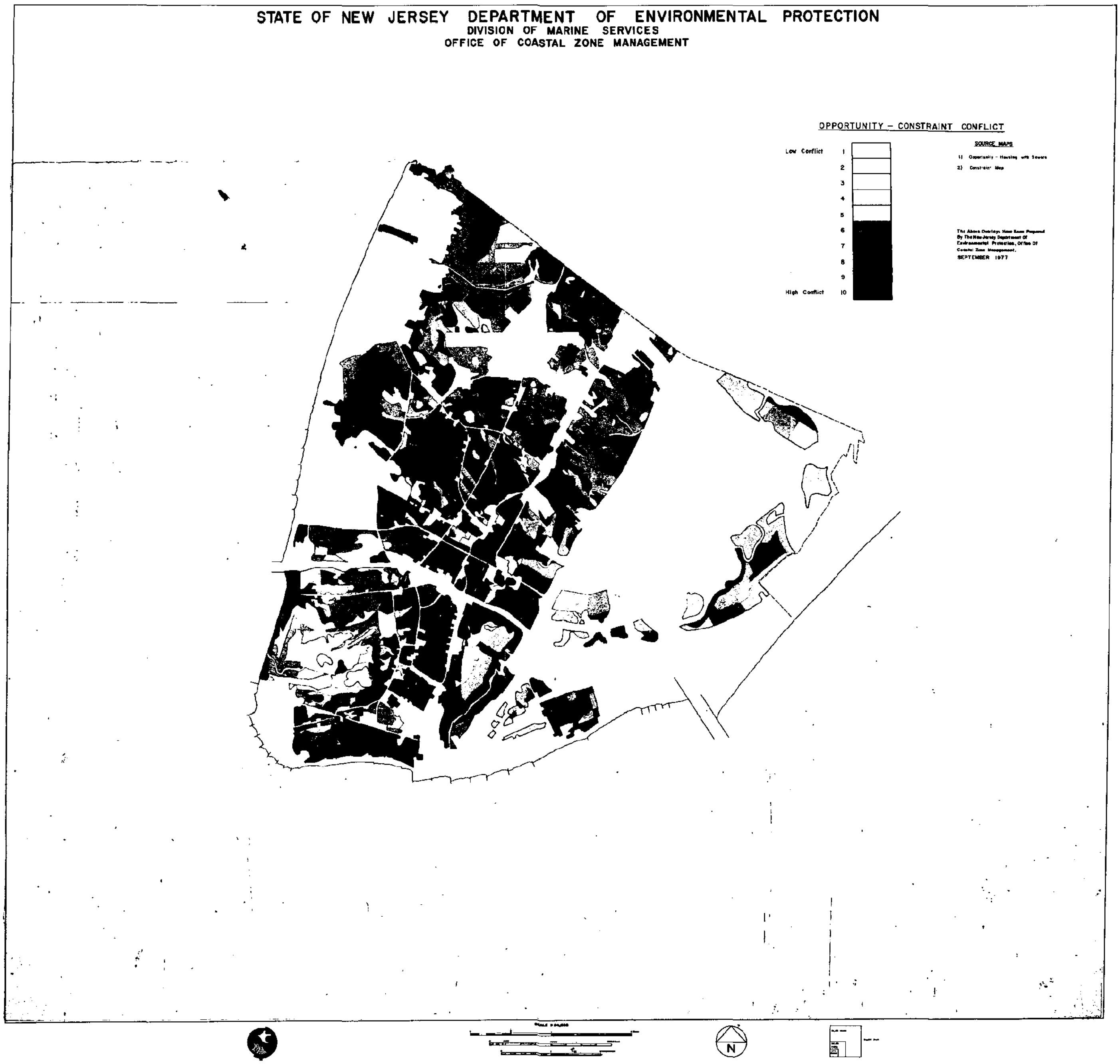

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
OPPORTUNITY – CONSTRAINT CONFLICT
Low Conflict
1
2
3
4
5
6
7
8
9
10
High Conflict
SOURCE MAPS
SEPTEMBER 1977

Figure 78

Figure 79

II. Method

In order to aid preliminary decisions that could resolve conflicts, DEP-OCZM policies used in the past in the Interim Guidelines and in permit decisions under the CAFRA act, or currently proposed were studied.

The most important policies that affected opportunity-constraint conflict were: 1) the general recommendation to concentrate future development between and immediately around existing development, and 2) to concentrate rather than disperse future impact.

Other relevant policies included the very high values set on dunes, marshlands and other wetlands, identified in this method in constraint rankings 9 and 10, and on flood plains with constraint rankings of 8 and 9.

If the ten levels of constraint are matrixed against the ten levels of opportunity, 100 intersections of varying opportunity and constraint are produced.

If development is permitted only in low constraint areas, valued environmental resources will be preserved but the needs of development will be ignored causing conflict. Also development will be dispersed causing secondary impacts that may disturb valued resources.

If development is distributed only according to opportunity the objective of concentration will be achieved since the opportunity factor specifications for most development includes access to infrastructure, most importantly roads, but sewer and water supplies as well. Valued resources however will be destroyed in high opportunity areas.

The question therefore becomes how high in the constraint gradient should various intensities of development occur in high opportunity areas?

In order to address both the needs of developers, as expressed by the opportunity rankings, and the desire to concentrate development, DEP-OCZM favors a major tradeoff in the combination of opportunity and constraint. In areas of high opportunity and no "special value" designation, constraint rankings shall, within limits, be overriden to allow intensive development. In areas of low opportunity, development shall be discouraged to avoid sprawl. Put another way, this policy specifies locations where the benefits offered by opportunity outweigh the loss of valued resources and areas where lack of opportunity becomes a constraint.

Two matrices, one for land, one for water, (Figures 80 and 81) sort opportunity-constraint combinations into six rankings of suitability which reflect the decisions resolving opportunity-constraint conflicts.

Figure 80: SUITABILITY MATRIX: LAND/WATER'S EDGE

Opportunity Ranking	Constraint Ranking	10 Most Constraint	9	8	7	6	5	4	3	2	1 Least Constraint
Most Opportunity	1	6	5	4/1*	3/1	2	1	1	1	1	1
	2	6	5	4/1*	3/1	2	2	1	1	1	1
	3	6	5	4/4	3/1	3	2	2	1	1	1
	4	6	5	4/4	3/3	3	3	2	2	1	1
	5	6	5	4/4	3/3	3	3	3	2	2	1
	6	6	5	4/4	3/3	3	3	3	3	2	2
	7	6	5	4/4	3/3	3	3	3	3	3	3
	8	6	5	4/4	3/3	3	3	3	3	3	3
	9	6	5	4/4	3/4	4	4	4	4	4	4
Least Opportunity	10	6	5	4/4	3/4	4	4	4	4	4	4

* Except in specially valued areas then ranking 4

Double-numbered intersections
Nonwater dependent use x/y Water dependent use

Suitability Rankings

Key to number of intersections

The following numbers refer to the allowable intensity of development. These constitute the ranking of suitability for development.

1 = Intensive development.

2 = Medium intensity development with structures

3 = Medium high intensity use with grading and some paving but without structures. Extensive vegetation disturbance. (For example agriculture, ball fields).

4 = Medium low intensity use without grading, paving or structures. Limited vegetation disturbance. (For example picnic areas).

5 = Low intensity use without vegetation clearance, grading, paving or structures. (For example nature walks).

6 = No disturbance, human access controlled.

Figure 81: SUITABILITY MATRIX: WATER

Opportunity	Constraint	10 Most Constraint	9	8	7	6	5	4	3	2	1
Most	1	6	5	4	4	3	2	2	1	1	1
Opportunity	2	6	5	4	4	3	2	2	1	1	1
	3	6	5	5	4	4	2	2	2	1	1
	4	6	5	5	5	4	3	2	2	2	2
	5	6	5	5	5	5	4	3	2	2	2
	6	6	5	5	5	5	5	4	3	3	3
	7	6	5	5	5	5	5	5	4	4	4
	8	6	5	5	5	5	5	5	5	5	5
	9	6	5	5	5	5	5	5	5	5	5
Least Opportunity	10	6	5	5	5	5	5	5	5	5	5

Suitability Rankings

Key: The numbers at intersections

1 = Commercial water use and bottom disturbance

2 = Medium intensity commercial water use, limited bottom disturbance

3 = Medium intensity recreational water use, limited bottom disturbance

4 = Low intensity recreational water use, maintenance dredging only

5 = Limited low intensity recreational water use, no bottom disturbance

6 = No disturbance, human access controlled

Use of Suitability Matrices

These suitability matrices may be used in one of two ways. The suitability of individual locations may be determined by assessing the opportunity and constraint rankings as described in previous sections and noting the suitability ranking at the relevant intersection. This indicates proposed DEP-OCZM location policy for the location.

These two matrices are the precursors of the more general tables indicating location policy in the Coastal Mangement Strategy. Again it should be emphasized that these rankings are preliminary, DEP-OCZM work will test alternatives and measure the developable acreage implied by each, and will discuss these alternatives at a wide variety of meetings. Some of the implications of varying rankings in the several matrices that combine the form suitability are discussed in Appendix F.

The socio-economic criteria, once these are established, may also vary the way that opportunity and environmental constraint combine in different socio-economic sub-regions as discussed in the following section.

III. Mapping in the Pilot Area

The following maps (Figures 82-87) show the distribution of suitability for housing with sewers, housing with septic systems, and marinas. These maps were prepared by overlaying the relevant opportunity maps and the environmental constraint map and assigning suitability according to the matrices above.

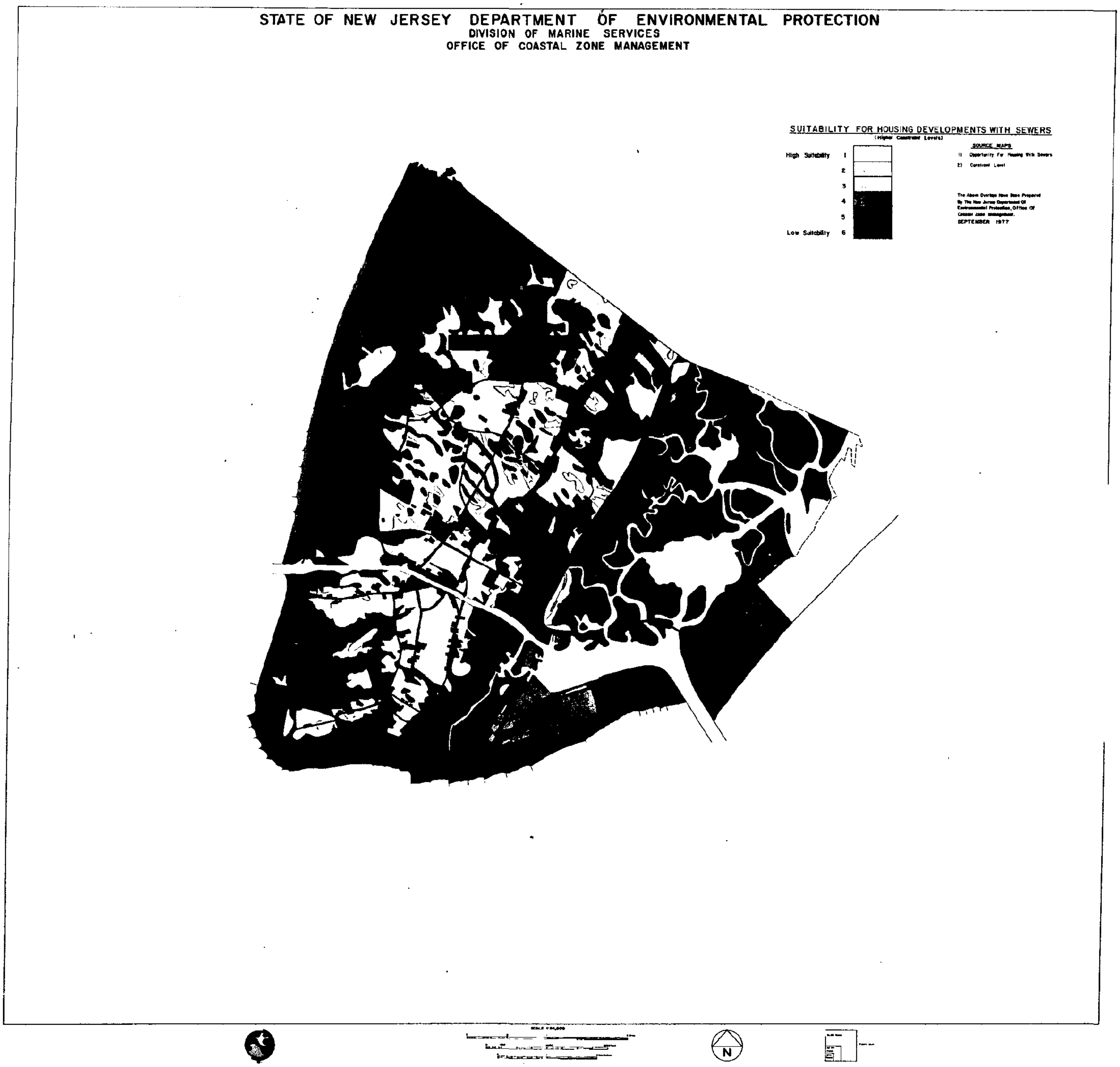

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
SUITABILITY FOR HOUSING DEVELOPMENTS WITH SEWERS
SOURCE MAPS
High Suitability
1
2
3
4
5
Low Suitability
6
SEPTEMBER 1977
N

Figure 82

Figure 83

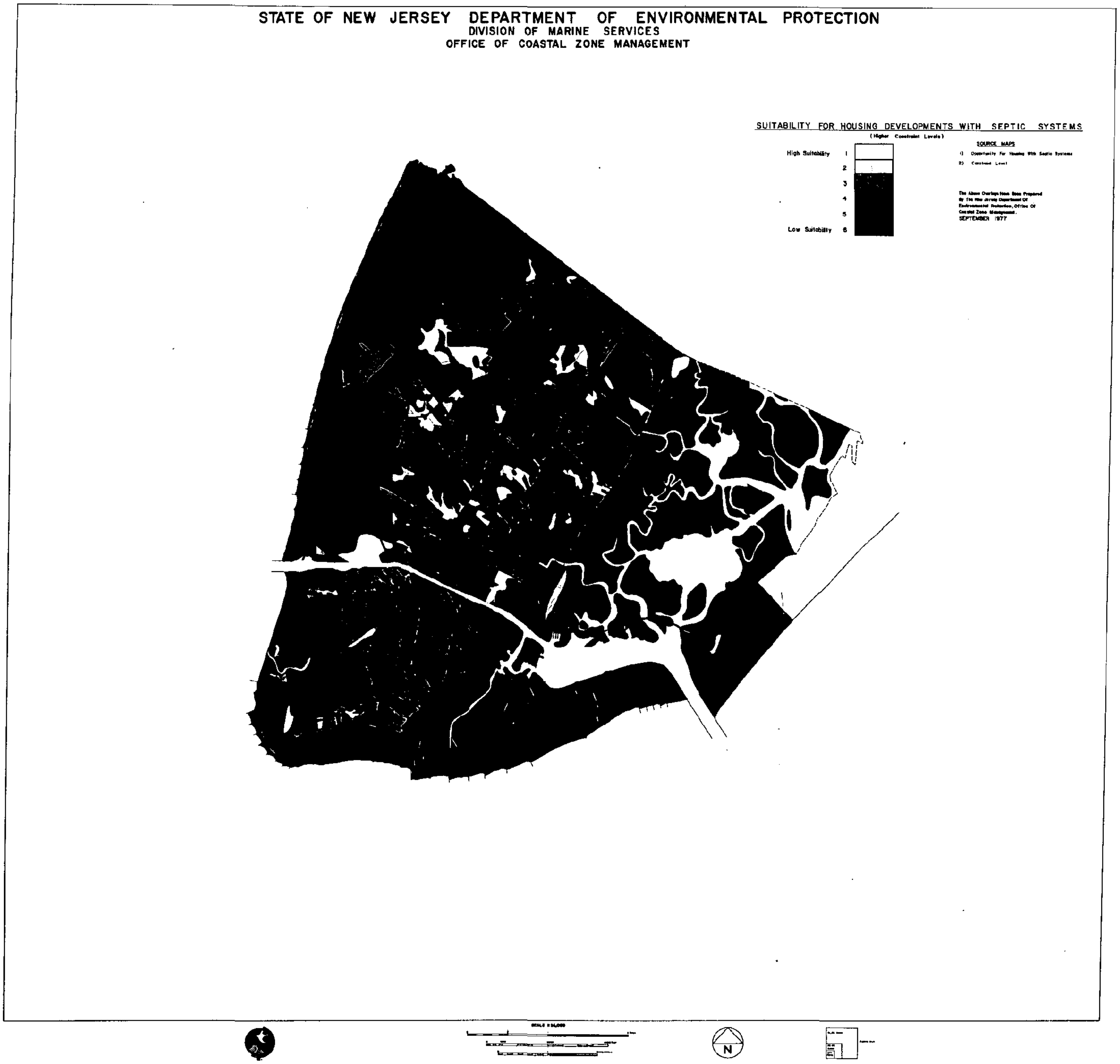

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
SUITABILITY FOR HOUSING DEVELOPMENTS WITH SEPTIC SYSTEMS
(Higher Constraint Levels)
High Suitability 1
2
3
4
5
Low Suitability 6
SOURCE MAPS
SEPTEMBER 1977
N

Figure 84

Figure 85

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT

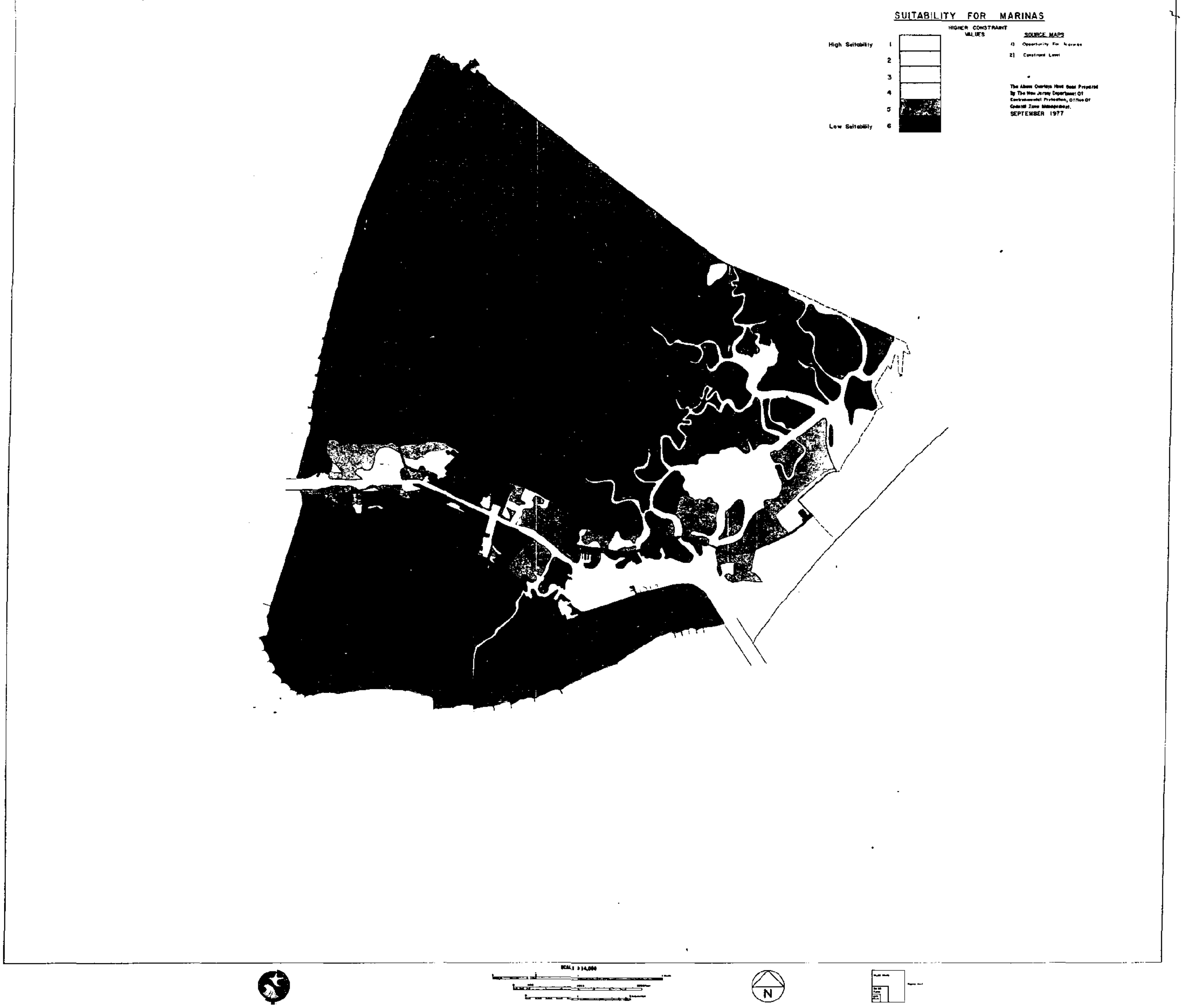
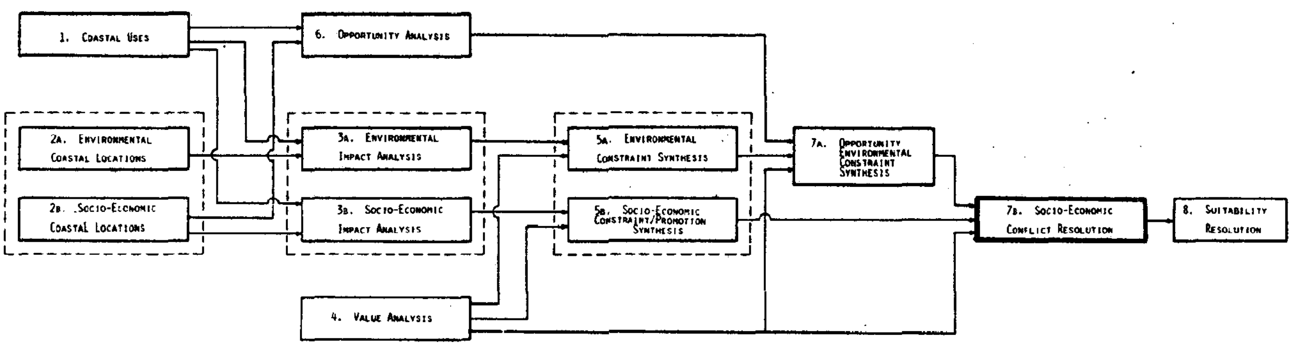


Figure 86

Figure 87

SECTION 7b.

SOCIO - ECONOMIC CONFLICT RESOLUTION



SECTION 7B - SOCIO-ECONOMIC CONFLICT RESOLUTION

I. Introduction

This section combines the suitability rankings of the previous section that resolve conflicts between environmental constraint and development opportunity, with the use constraint and promotion recommendations of the socio-economic synthesis of Section 5b.

As with the other socio-economic work the method here is in very early stages. The development of this task is planned for the socio-economic study. At present it is anticipated that socio-economic criteria may influence use-location in four ways:

a) Specific uses may be excluded from consideration in certain socio-economic subregions because of overwhelmingly adverse impacts to the surrounding community. A nuclear power station in a populated sub-region could be an example.

b) The balance of opportunity and environmental constraint may vary from one socio-economic sub-region to another particularly for uses that provide a high level of socio-economic benefit.

c) The acceptability of use-location may vary depending on the degree of compatibility between the proposed use and existing uses in immediate juxtaposition.

d) In certain location-types several competing uses may be equally suitable from all points of view used in analysis. Priorities must be set to overcome these conflicts.

This section discusses each of these three screens in principle. At this stage no conclusions are reached.

II. Method

a. Socio-Economic Use Exclusion.

This screen would identify which uses in which subregions generated unacceptably adverse socio-economic impacts. In general these would be uses that seriously endangered the health, safety or welfare of the existing community.

Hazardous uses, such as nuclear power stations and liquid natural gas storage facilities; uses with effluents hazardous to public health such as petrochemical refineries and paper processing plants in regions already highly polluted; uses that interfered with existing economies, such as offshore mining in shellfishing regions; and uses that are visually incompatible such as high-rise structures in low rise areas, would be examples of use-locations that might be excluded by this screen.

b. Variation of Opportunity-Environmental Constraint Combination.

It may be appropriate in some socio-economic sub-regions and for some uses to vary the suitability rankings assigned to combinations of opportunity and environmental constraint. For example if there were small amounts of prime agricultural land remaining in a pedominantly built-up region, these may be of marginal use for agriculture because of scattered small acreages and incompatibility of surrounding uses.

In these areas it would be reasonable to allow opportunity for uses with socio-economic benefit to override the constraint set by prime agricultural land whereas in an agricultural subregion the soils should be preserved.

c. Compatibility Conflicts

i) Introduction

When a new development is placed next to existing uses there may arise a varying degree of conflict along the property boundaries because the operation of the two uses in some way is incompatible. The juxtaposition of a campground and forestry operation has little conflict, or is highly compatible, but the juxtaposition of a heavy industry and recreation sets up conflicts, there is low compatibility. The two uses cannot both function successfully without a physical separation.

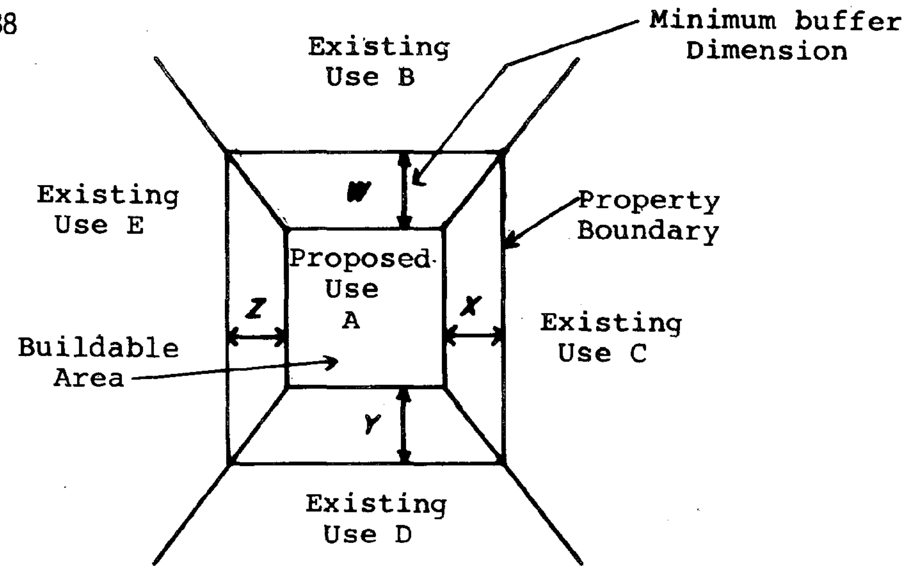
Some uses that are potentially dangerous, such as nuclear power generators or liquid natural gas storage facilities require a large separation from almost all other uses; others are compatible with some and not with others.

In some situations a use may be given a high suitability ranking in the opportunity-constraint conflict resolution and be of high socio-economic benefit but still be unsuitable because of low compatibility with surrounding uses. This use compatibility screen is used to test proposed uses for compatibility with existing uses adjacent to property boundaries and recommend minimum buffer widths to ensure that both uses may function successfully.

ii) Method

The diagrams (Figure 88) below show how a matrix format may be used to record decisions about the minimum distance between the property line of a proposed use and the inner edge of a flat forested edge buffer between the proposed use (horizontal axis) and an existing use adjacent to the property boundary (vertical axis).

Figure 88



SITE PLAN

Proposed Use

Adjacent Existing Use	A	B	C	D	E
A					
B	W				
C	X				
D	Y				
E	Z				

Minimum Buffer Size

COMPATIBILITY MATRIX

In some cases, the recommended minimum buffer size will be larger than the site area. This will indicate that the use is unacceptable because of incompatibility with surrounding uses.

Buffers reduce sound, dust, odor, visual impacts and overlooking, increase safety in case of accident and help to assimilate the environmental impacts of use before they spread beyond the site. The dimensions suggested would be for flat buffers planted or preserved with forest vegetation. Some buffer functions can be served by a vertical element, such as an earth berm and thus, within limits, the size of horizontal ubffer may be reduced by increasing the vertical height without loss of buffering capacity. A table could be constructed indicating the equivalence of flat buffer requirements to berms of varying heights and widths.

d. Use Competition Conflict Resolution

i) Introduction

A use may have a high suitability for a location and be highly compatible with adjacent uses but still cause conflict if there is high competition between several equally highly suitable potential uses for the same location or location type. This kind of conflict occurs particularly in waterfront locations.

An area of high competition shall be defined as any area that offers high opportunity to any use that has in its opportunity factor specification one or more penalty factors that are impossible or prohibitively expensive to create by site modification. Water's edge locations for example would thus be high competition areas because of high opportunity offered to water-dependent uses. Areas of mineral concentration would be high competition areas because of mining opportunity and areas of fish and shellfish concentration for fishing opportunity.

Within these high competition areas several criteria may be used to identify the preferred use:

Dependency: Since there is an element of scarcity in competition areas, only those uses that are dependent on the locations should be considered, thus marinas and fishing harbors would compete for waterfront locations since they must have water access, whereas housing would be excluded since it can operate successfully in other locations.

Demand: If a number of uses are equally suitable for a location, compatible with existing uses, and location-dependent, then the demand and scale of demand must be used to sort them into an order of preference. Basically the question is which use will benefit the greatest number of people?

ii) Method

These criteria may be used to identify preferred uses in competition areas as follows:

Criteria	Answer	Implications
1. Is the use in a high competition area?	Yes No	Go to next criterion. This analysis does not apply.

Criteria	Answer	Implications
2. Is the use dependent on this location-type?	Yes No	Go to next criterion. Use is not preferred unless there is no demand for location-dependent uses or no shortage of alternative sites.
3. Is there significant national demand for the products or services produced by the use?	Yes No	Use is preferred. Go to next criterion.
4. Is there significant regional demand for the products or services provided by the use?	Yes No	Use is preferred unless in competition with uses with national demand. Go to next criterion.
5. Is there significant local demand for the products or services provided by the use?	Yes No	Use is preferred unless in competition with uses with national or regional demand. Use is not preferred.

iii) Mapping of Conflict

The map below (Figures 89 and 90) shows the distribution of suitability conflict between housing and marinas prepared by overlaying the suitability maps for housing with sewers and marinas and assigning conflict rankings according to the following matrix.

Suitability for Housing with Sewers

Subitability for Marinas		High 1	2	3	4	5	Low 6
High	1	6	5	4	3	2	1
	2	5	4	3	2	1	1
	3	4	3	2	1	1	1
	4	3	2	1	1	1	1
	5	2	1	1	1	1	1
Low	6	1	1	1	1	1	1

Numbers in intersections = degree of conflict.

1 = low 6 = high

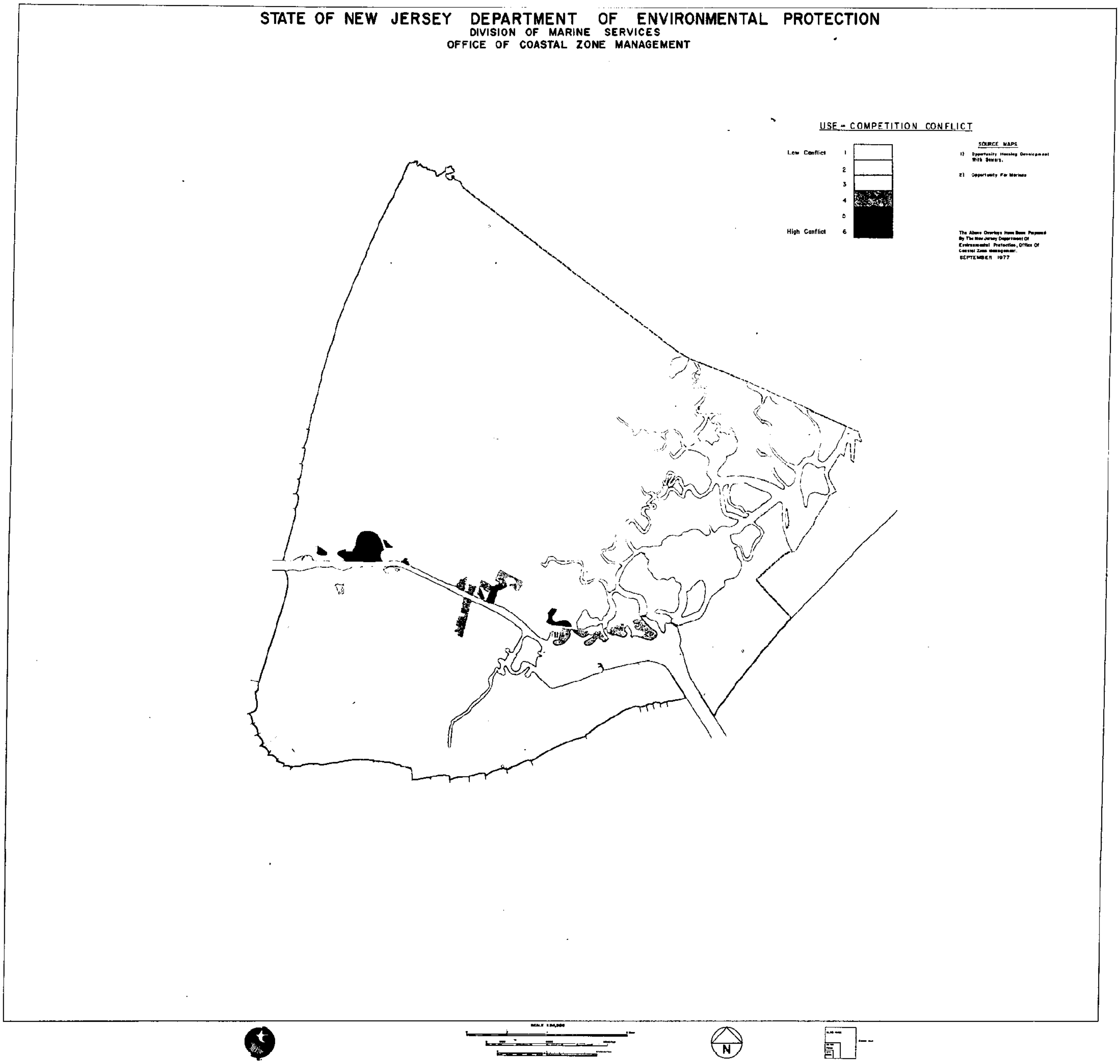

STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
USE - COMPETITION CONFLICT
Low Conflict
1
2
3
4
5
High Conflict
6
SOURCE MAPS
1) Opportunity Housing Development With Sewers.
2) Opportunity For Marinas
SEPTEMBER 1977
N

Figure 89

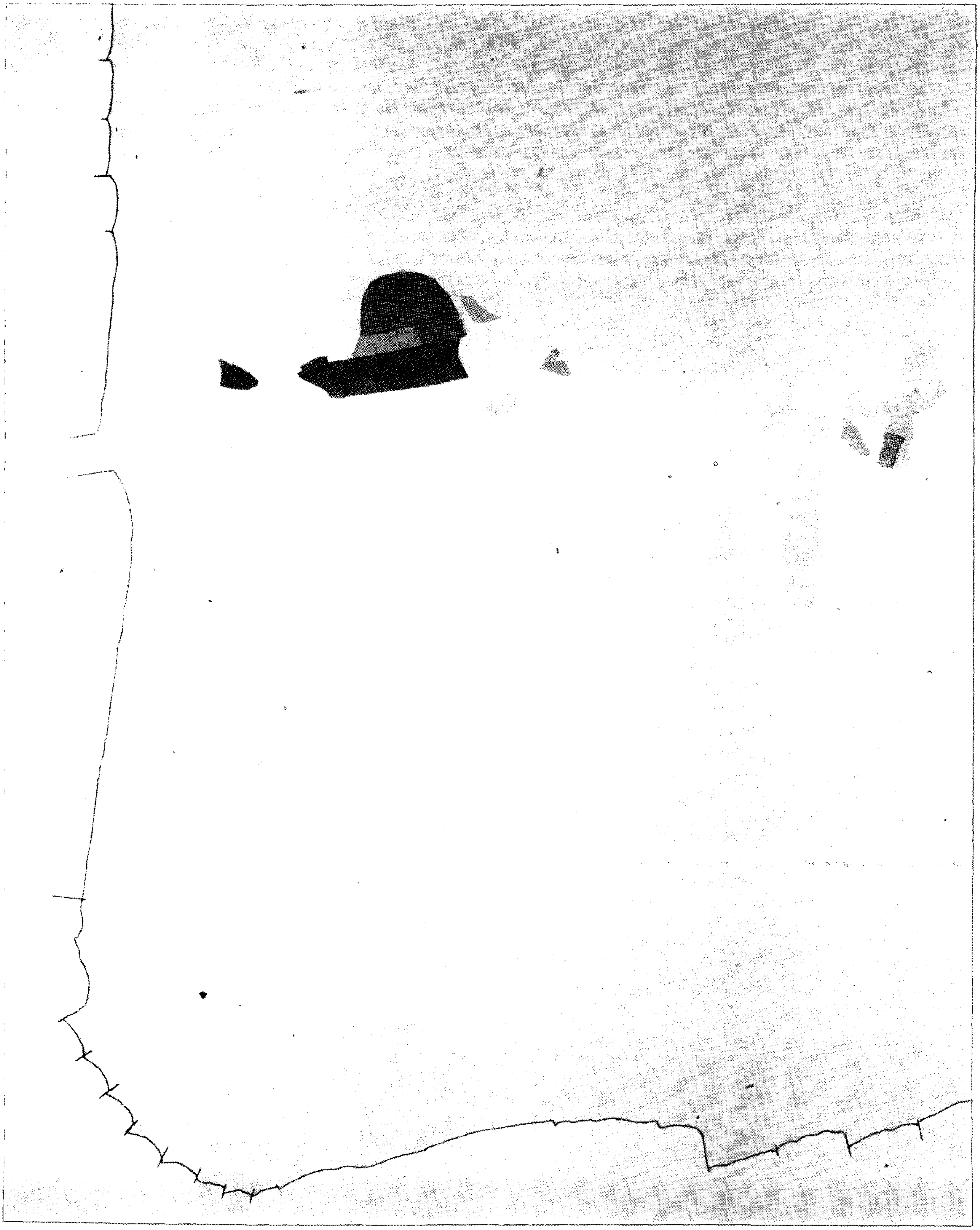
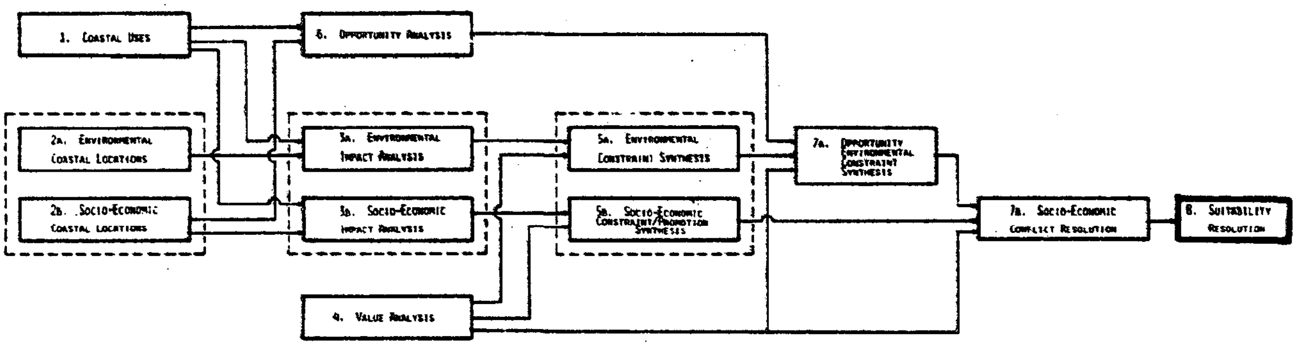


Figure 90

SECTION 8.
SUITABILITY RESOLUTION



SECTION 8 - SUITABILITY RESOLUTION

A. Uses of the Method

In the pilot only housing and marinas have been studied. However, if all the study uses were analyzed in the same way, the following information could be provided by the method for all locations within a study area.

1) The most preferred uses (or use in high competition areas).

2) Uses that would be conditionally acceptable if stated impact control measures were taken.

3) Uses that are entirely unacceptable if valued resources and processes are to be protected.

This data may then form the basis of a number of planning products.

1) State-wide coastal policies. The Coastal Management Strategy lists proposed coastal policies that were generated in part from this method and the understanding gained from the pilot study.

2) Master plans. A municipality or county could use the distribution of use recommended by this method as the basis of master plans that responded to a complex interaction of variables in a sensitive way. Further criteria would need to be introduced to narrow preference to a single use in some areas since outside areas of high competition the method may indicate several uses as equally suitable. Growth projections and associated demand are the most important additional data needed.

3) Assessment of master plans.

   The method may be used to compare objectively the extent to which alternative master plans satisfy a given set of values, by comparing the acreages of areas of high value either for development or conservation that are optimally used and where the use distribution either causes unacceptable loss of valued resources or fails to optimize areas of high opportunity.

4) Structure for permit decisions.

   The method may be used in several ways in a coastal zone permit process.

   a) To provide a standardized structure for coastal zone permit decisions allowing applicants to anticipate responses and reducing uncertainty.

   b) To inform pre-application meetings. The conceptual method as it now stands (exept for completion of the opportunity matrices) could be used to analyze any single use-location combination for opportunity and environmental constraint and indicate the DEP-OCZM policy response.

If state-wide coastal zone mapping were completed, the method could become a tool for developers to aid in the selection of sites that have high opportunity for the use required and satisfy coastal zone requirements. This has great potential for reducing dispute.

c) To provide a structure for information in applicants impact statements. The method recommends a list of opportunity and constraint factors of locations that should be measured to determine a level of suitability and the categories into which the measurements should be placed. This provides a simple standard basis for impact statement information.

d) To provide criteria for project review officers to aid decisions on applications. To date the policies of DEP-OCZM under the CAFRA permit program have been influenced by the CAFRA legislation, the Interim Guidelines, and by precedent set in previous similar permit decisions. These three sources have given some guidance to DEP-OCZM staff and applicants on the standardization of policy but there is still some uncertainty. The policies of the Coastal Zone Managment Strategy and the structure of this method could reduce this uncertainty.

B. Conclusions

This method outlines a comprehensive structure by which rational decisions may be made about the future of New Jersey's coastal zone. Many factors can be systematically combined to obtain predictable and replicable conclusions about the relative suitability of alternative use-locations. The values of many different constituencies are considered and balanced in an explicit fashion that is open to debate.

Besides illustrating the conclusions in the Lower Cape May pilot area the method was tested in a CAFRA permit application for a housing project in the pilot area. This study is included in Appendix G.

The method produced very quickly a detailed critique of the proposed application that recommended denial. The reasons for this were easily extracted from the method data and corresponded closely to the reasons given in the actual CAFRA decision denying the project.

A revised design was re-submitted and this time the CAFRA decision accepted the new layout. The method analysis recommended denial again because all but a small part of the area was in the flood prone water's edge zone of a small creek, a highly constrained location type.

Although the specific decisions recommending denial of this case would have gone against the developer there is a general benefit to both conservation and development in the setting of policy on the acceptability of uses in general location types.

The developer may have saved much time (the total period from first application to final decision was two years), and considerable front-end costs if the response of the permit authority could have been accurately predicted before design began.

It is also necessary to separate the structure from the content of this method. If decisions are to be made on use acceptability in general location types and applied coast-wide it is essential that vigorous debate should precede the final setting of suitability rankings.

The rankings used to determine acceptability in this report are the first best try of a limited number of planning professionals and are intended to focus debate on coast-wide development issues. Different rankings could produce a different decision in the example above but the relevance of the structure would remain.

C. Next Steps

Coastal Policy

This method has been used to frame policy recommendations for use at first in the CAFRA area, later in coastal areas along the Delaware River and in the Piedmont. These draft policies are listed in the Coastal Management Strategy.

Further Study

Several studies are presently under way that are structured by this method to produce information for use in the method.

The most important of these is an Estuarine Study that is analyzing the environmental impacts associated with uses in the location types distinguished in Section 1, Coastal Locations, identifying environmental objectives and impacts of concern, recommending impact control measures and levels of constraint and suggesting a coastal zone boundary and use location policies based on these results.

A coastal geomorphology study is analyzing natural processes in beaches, dunes and barrier islands, and recommending use-location policies.

Several studies are analyzing the requirements and impacts of Outer Continental Shelf (OCS) oil exploration and drilling onshore suport and service bases.

A study is planned that will identify socio-economic subregions, record the socio-economic impacts of uses and develop socio-economic criteria to combine with environmental constraint and opportunity in the calculation of suitability.

Two contracts are planned to determine opportunity factors and costs, one for major facilities, one for other coastal uses.

There are several other contracted studies that are planned. A mapping study is proposed. The constraint factors and constraint types will be mapped at a scale of 1:24,000 for all areas within the curently proposed coastal zone, areas including CAFRA, the Hackensack Meadowlands and the shorelands of tidal rivers and streams outside these areas upland for 2,000 feet or up to the first cultural feature.

Other studies that are being considered for the future include a settlement pattern study, a visual study and an archaeological study. The settlement pattern study would use the output of the method to compare the relative suitability of different groupings of uses. The energy consumption of alternatives will be estimated and compared and growth centers and associated settlement patterns will be proposed.

The visual study will identify visual landscape types of the coast, cross reference them to the location classification used in this method, and study the visual impacts of the introduction of uses. Aesthetic policies will be recommended based on the findings of this study as part of the socio-economic criteria. The illustrations developed in this study will help to assess visual impacts.

The archaeological study will identify and map known archaeological sites, identify areas where there is a high probabiity of discovering new sites and propose policy within these areas to protect this valued resource.

Automation

An important possibility for the future is the automation of this planning method.

The method in its entirety has been designed in a way that can be computerized. The map information can be digitized and the matrices that control the way that maps are combined are largely ready for card punching.

The benefits of computerization are great for a program of this type that stores and combines very large amounts of data. The storage of data in a single, readily accessible, format is a great advantage in itself. When combined with data manipulation programs that can combine and analyze the data very quickly this advantage grows enormously.

Current Computer Work

NJOCZM is currently collaborating in two computer pilot studies, one funded by NASA that is studying how remote sensing data, map and tabular data may be automatically combined. The second, funded by the President's Council for Environmental Quality (CEQ), is preparing an interactive computer program to aid planning tasks, the automation of this pilot study is proposed as part of this collaboration.

A METHOD FOR COASTAL RESOURCE MANAGEMENT

A Pilot Study of Lower Cape May County

APPENDICES

A Staff Report
JULY 1978

New Jersey
Department of Environmental Protection
Division of Marine Services
Office of Coastal Zone Management

APPENDIX A

Definition of Major Terms

This appendix defines technical terms commonly used in this report.

APPENDIX A DEFINITION OF MAJOR TERMS

In order to follow the process outlined in the main report it is important to have a clear understanding of a few recurring technical terms.

Term	Definition
Constraint	Restriction to development caused by sensitivity to impact of valued elements of the natural or social environment. This is called sensitivity in the Coastal Management Strategy.
Constraint Factor	A varying property of the built or natural environment which varies constraint to development. For example, permeability and agricultural capability levels are constraint factors.
Constraint Gradient	A relative scale of restriction to development, from most to least, caused by variation of constraint factors.
Constraint Ranking	The position of a particular combination of constraint factors in a constraint gradient.
Constraint Type	A generic land or water type containing a combination of constraint factors. A forested upland with high permeability and low agricultural capability would be one environmental constraint type.
Disturbance	Significant and abrupt events causing changes in the equilibrium of natural and processes and resources. Development or catastrophic natural events such as hurricanes and floods are disturbances.
Environmental Sensitivity	A relative scale from most to least indicating the degree by which valued elements of the natural environment are affected by disturbance in different land or water types. If a general objective is to preserve these valued elements then the gradient of environmental sensitivity is identical to the gradient of constraint to development.
Environmental Impact Model	A theoretical structure representing causal relationships of environmental impact.
Factor	A varying property of the built or natural environment that varies either opportunity or constraint. Refer to the definition of constraint factor or opportunity factor for examples.
Gradient	A relative scale from most to least.
Impacts	The changes in the natural or social environment that are either the immediate result of the introduction of a new use or causally related to it.
Land and Water Types	a) Major types The broad general classification into land, water's edge and water.

b) Minor subtypes
The subdivision of major types into more specific generic types. Upland, Dry Terrace, Wet Terrace, waters edge, ocean, back bay, etc. are all minor subtypes.

c) Subtypes
The subdivision of minor types into more specific generic types.

Opportunity	Potential satisfaction of the resource demands of a land or water use by resources (opportunity factors) present in land or water areas. This is called development potential in the Coastal Management Strategy.
Opportunity Factor	A varying property of the built or natural environment which varies opportunity. Access to water, roads and sewers and shops are all opportunity factors.
Opportunity Gradient	A relative scale of opportunity for development from most to least caused by variation of opportunity factors.
Opportunity Ranking	The position of a particular combination of opportunity factors on an opportunity gradient.
Opportunity Type	A generic land or water type containing a combination of specific amounts of opportunity factors required by a use. A location that has direct access to harbor water, within 50 feet of a road and sewer line and has access to boating areas is an opportunity type for marinas.
Socio-Economic Impact Model	A theoretical structure representing causal relationships of socio-economic impact.
Socio-Economic Subregions	Areas within which the placement of a use in any location will cause similar socio-economic impacts.
Suitability Gradient	A relative scale from most to least of the suitability of land or water areas for development.
Suitability	The acceptability of a location for a use considering opportunity and constraint, and socio-economic criteria. This is called acceptability in the Coastal Management Strategy.
Suitability Gradient	A relative scale from most to least of the suitability of land or water areas for development.
Suitability Ranking	The position of a particular combination of opportunity and constraint factors on a suitability gradient.

APPENDIX B

Background for Section 2

Coastal Locations

1. Environmental Land and Water Subtype Listing
2. Environmental Land and Water Subtype Descriptions
3. Data Sources for Socio-Economic Subregions

APPENDIX B 1.

Environmental Land and Water Subtype Listing

LAND AND WATER SUBTYPES

N.B. For the sake of brevity only the natural subtypes are listed. Each land and water's edge type in the list can be further subdivided by the existing extent human disturbance into three:

1	Low disturbance	Native adapted climax or near climax vegetation with little or no disturbance, forest or wetland species.
2	Medium disturbance	Early successional herb or shrub vegetation. Agriculture successional meadow and srubland and mown grass. Medium to low water quality or limited flow disturbance in wetlands.
3	High disturbance	Structures, paving and immediately adjacent areas with exotic vegetation in high levels of maintenance. Filling in wetlands.

Each water type in the list can be further subdivided by the existing extent of human disturbance into six:

1. High ambient water quality, no human bottom disturbance.
2. High ambient water quality, human bottom disturbance (i.e. dredge, subaqueous spoil dumping or structures).
3. Medium ambient water quality, no human bottom disturbance.
4. Medium ambient water quality, human bottom disturbance.
5. Low ambient water quality, no human bottom disturbance.
6. Low ambient water quality, human bottom disturbance.

LAND AND WATER SUBTYPES

MAJOR TYPE	MINOR TYPE	SUBTYPE
A. Land (above 100 yr. flood no alluvial soils)	1. Inner Coastal Plain Upland (SHWT 5+)	a) Low permeability (0.2"-2"/hour) b) Medium permeability (2"-6"/hour) c) High Permeability (6"+/hour)
	2. Inner Coastal Plain Dry Terrace (SHWT 3'-5')	a) Low permeability (0.2"-2"/hour) b) Medium permeability (2"-6"/hour) c) High Permeability (6"+/hour)
	3. Inner Coastal Plain Wet Terrace (SHWT 1'-3')	a) Low permeability (0.2"-2"/hour) b) Medium permeability (2"-6"/hour) c) High Permeability (6"+/hour)
	4. Outer Coastal Plain Upland (SHWT 5'+)	a) Low permeability (0.2"-2"/hour) b) Medium permeability (2"-6"/hour) c) High Permeability (6"+/hour)
	5. Outer Coastal Plain Dry Terrace (SHWT 3'-5')	a) Low permeability (0.2"-2"/hour) b) Medium permeability (2"-6"/hour) c) High Permeability (6"+/hour)
	6. Outer Coastal Plain Wet Terrace (SHWT 1'-3')	a) Low permeability (0.2"-2"/hour) b) Medium permeability (2"-6"/hour) c) High Permeability (6"+/hour)
B. Water's Edge (between MLW and 100 yr. flood or upland alluvial soil line)	7. Inner Coastal Plain Upper Water's Edge Flood Hazard Areas (between upland limit of wetland vegetation and 100 yr. flood)	
	8. Inner Coastal Plain Lower Water's Edge Wetland Areas (between MLW and the upper limit of wetland vegetation)	a) High Order River Wetlands (Delaware) b) Medium Order Stream Wetlands (e.g. Rancocas Cooper) c) Low Order Creek Wetlands d) Standing Water Wetlands

LAND AND WATER SUBTYPES

MAJOR TYPE	MINOR TYPE	SUBTYPE
	9. Outer Coastal Plain Upper Water's Edge (between 100 yr. flood and upper limit of wetland vegetation)	a) River and Stream Banks i) Fresh Medium Order Stream Banks (e.g. Mullica, Batsto) ii) Brackish Medium Order Stream Banks iii) Fresh Low Order Creek Banks iv) Brackish Low Order Creek Banks b) Standing Water Banks i) Potable Water Reservoir Banks ii) Non Potable Water Lake and Pond Banks c) Inland Wetland Banks d) Mainland Bay Shores i) Back Bay and Semi-Enclosed Bay Shore ii) Open Bay Shore Dunes iii) Open Bay Shores Adjacent to Stable or Eroding Beaches iv) Open Bay Shores Adjacent to Eroding Beaches e) Barrier Island Bay Shores i) Dune ii) Non-dune f) Ocean Shores i) Headland Adjacent to Stable or Accreting Beach ii) Headland Adjacent to Eroding Beach iii) Barrier Island Dunes Seaward of Foredune Ridge Adjacent to Stable or Eroding Beach iv) Barrier Island Dunes Seaward of Foredune Ridge Adjacent to Eroding Beach

LAND AND WATER SUBTYPES

MAJOR TYPE	MINOR TYPE	SUBTYPE
	10. Outer Coastal Plain Lower Water's Edge (Marshes and wetlands between MLW and upper limit of wetlands vegetation or beaches between MLW and upper limit of unvegetated beach)	a) River and Stream Wetlands i) Fresh Medium Order Stream Wetlands ii) Brackish Medium Order Stream Wetlands iii) Fresh Low Order Creek Wetlands iv) Brackish Low Order Creek Wetlands b) Standing Water Wetlands i) Potable ii) Non potable c) Inland Wetlands (Bogs) d) Back Bay Marshes e) Semi-Enclosed Bay Lower Shoreface i) Marshes ii) Beaches f) Open Bay Lower Shoreface i) Marshes ii) Beaches g) Ocean Beaches i) Northern Barrier Spit/Headland (A. Exposed) ii) Northern Barrier Spit/Headland (F. Exposed) iii) Central Barrier Island Complex (A. Exposed) iv) Central Barrier Island (B. Inlet Adjacent) v) Southern Barrier Island Complex (B. Inlet Adjacent) vi) Southern Barrier Island Complex (C. Inlet Throat) vii) Southern Barrier Island (F. Complex)

LAND AND WATER SUBTYPES

MAJOR TYPE	MINOR TYPE	SUBTYPE
		iv) Tidal Freshwater (<0.5 ppt salinity)
		v) Non-tidal Freshwater (<0.5 ppt salinity)
		b) Low Order Creek
		i) Ocean Influence (<35 ppt salinity)
		ii) Transition Zone (<20 ppt salinity)
		iii) Tidal Freshwater Influence (<3.5 ppt salinity)
		iv) Tidal Freshwater (<0.5 ppt salinity)
		v) Non-tidal Freshwater (<0.5 ppt salinity)
	14. Back Bay Estuaries (lagoons)	a) Ocean Influence (<35 ppt salinity)
		i) Intertidal Flats (0'-1/2' water depth)
		ii) Shoals (1/2'-6' water depth)
		iii) Channels (6'+ water depth)
		b) Transition zone (<20 ppt salinity)
		i) Intertidal Flats (0'-1/2' water depth)
		ii) Shoals (1/2'-6' water depth)
		iii) Channels (6'+ water depth)
		c) Freshwater Influence (<35 ppt salinity)
		i) Intertidal Flats (0'-1/2' water depth)
		ii) Shoals (1/2'-6' water depth)
		iii) Channels (6'+ water depth)
	15. Semi-Enclosed Bay Estuaries	a) Ocean Influence (<35 ppt salinity)
		i) Intertidal Flats (0'-1/2' water depth)
		ii) Shoals (1/2'-6' water depth)

LAND AND WATER SUBTYPES

MAJOR TYPE	MINOR TYPE	SUBTYPE
C. Water (Areas Below MLW)	11. Standing Waters	a) Potable Reservoirs
		b) Non potable Lakes
		c) Ponds
		d) Bogs
	12. Inner Coastal Plain Running Waters	a) High Order River
		i) Ocean Influence (<35 ppt salinity)
		ii) Transition Zone (<20 ppt salinity)
		iii) Tidal Freshwater Influence (<3.5 ppt salinity)
		iv) Tidal Freshwater (<0.5 ppt salinity)
		v) Non-tidal Freshwater (<0.5 ppt salinity)
		b) Medium Order Stream
		i) Ocean Influence (<35 ppt salinity)
		ii) Transition Zone (<20 ppt salinity)
		iii) Tidal Freshwater Influence (<3.5 ppt salinity)
		iv) Tidal Freshwater (<0.5 ppt salinity)
		v) Non-tidal Freshwater (<0.5 ppt salinity)
		c) Low Order Stream
		i) Ocean Influence (<35 ppt salinity)
		ii) Transition Zone (<20 ppt salinity)
		iii) Tidal Freshwater Influence (<3.5 ppt salinity)
		iv) Tidal Freshwater (<0.5 ppt salinity)
		v) Non-tidal Freshwater (<0.5 ppt salinity)
	13. Outer Coastal Plain Running Waters	a) Medium Order Stream
		i) Ocean Influence (<35 ppt salinity)
		ii) Transition Zone (<20 ppt salinity)
		iii) Tidal Freshwater Influence (<3.5 ppt salinity)

LAND AND WATER SUBTYPES

MAJOR TYPE	MINOR TYPE	SUBTYPE
		iii) Channels (6'+ water depth)
		b) Transition zone (<20 ppt salinity)
		i) Intertidal Flats (0'-1/2' water depth)
		ii) Shoals (1/2'-6' water depth)
		iii) Channels (6'+ water depth)
		c) Freshwater Influence (<35 ppt salinity)
		i) Intertidal Flats (0'-1/2' water depth)
		ii) Shoals (1/2'-6' water depth)
		iii) Channels (6'+ water depth)
	16. Open Bay Estuaries	a) Ocean influence (<35 ppt salinity)
		i) Flats (0'-6' water depth)
		ii) Shoals (6'-18' water depth)
		iii) Channels (18'+ water depth)
		b) Transition Zone (<20 ppt salinity)
		i) Flats (0'-6' water depth)
		ii) Shoals (6'-18' water depth)
		iii) Channels (18'+ water depth)
	17. Ocean (24-35 ppt salinity)	a) Upper Surf Zone (0'-6' water depth)
		b) Lower Surf Zone (6'-18' water depth)
		i) Stable Substrate
		ii) Unstable Substrate
		c) Lower Shoreface (18'+ water depth)
		i) Stable Substrate
		ii) Unstable Substrate

LAND AND WATER SUBTYPES

TOTALS

MAJOR TYPES	MINOR TYPES	GENERAL SUBTYPES	DETAIL SUBTYPES	DISTURBANCE SUBTYPES
3	17	56	116	542

APPENDIX B 2.

Environmental Land and Water Subtype Descriptions

Outlines of Land and Water Types

The following section briefly outlines the various land and water types listed above indicating the natural and social processes and resources that distinguish them from one another and the role that each plays in the coastal systems.

Land and Water Types of the Coastal Plain

Land Types (Minor Types 1-6)

The land areas of the Coastal Plain are defined as areas above the 100 year flood line and not covered with alluvial soils (see Section 2 above for more detailed definition).

Minor types are distinguished first by physiographic region into Inner and Outer Coastal Plains areas.

Inner Coastal Plain Land Types (Minor Land Types 1-3)

The Inner Coastal Plain is separated from the Outer Coastal Plain by a low belt of hills which are the remnants of a landform called a cuesta. These hills run southwest from the Atlantic Highlands to the Delaware River and, unlike the lowlands on either side, where substrate sediments are unconsolidated, some of the sands and gravels on the cuestas are cemented into a rocklike cap.

The Inner Coastal Plain lies to the west of the cuestas and drains to the Delaware River or the Raritan Bay. The underlying sediments are dipping strata of unconsolidated sand, gravel, silt and clay, many high in glauconite. Many of the sand-gravel layers that form the deep aquifers for the whole Coastal Plain outcrop in the Inner Coastal Plain. These outcrops are the prime recharge areas of the Coastal Plain since precipitation may enter the deep aquifers only where the permeable sediments outcrop on the surface. Overlaying the dipping strata are discontinuous deposits of Pleistocene sand and gravel that form a surface aquifer.

The soils of the Inner Coastal Plain are mainly deep, well drained, fertile sandy loams of the Freehold-Collington and Greenwich associations and large areas are fertile prime agricultural soils. Surface slopes are slight to non-existent, being associated mainly with drainage channels and the remnant cuestas.

The native vegetation varies with the amount of soil moisture present which depends mainly on the depth to seasonal high water table (SHWT) and, to a lesser extent on the permeability of substrate and these are the environmental variables used to distinguish Inner Coastal Plain minor and sub-types.

Inner Coastal Plain Uplands (SHWT 5'+) (Minor Type 1)

The uplands, although the driest of the Inner Coastal Plain types, are a mesic, or moist, habitat, owing to the moderate permeability of the substrate compared with the Outer Coastal Plain.

The native vegetation without human disturbance would be a mixed deciduous forest dominated by a variety of oaks (white, black, red, chestnut and scarlet) and beech. Other common trees would be tulip-poplar, sweetgum, red maple and hickory.

Undisturbed vegetation is rare, settlement of all kinds clusters along the river, particularly near the bridges and the main east-coast transportation corridor around the New Jersey Turnpike and Penn Central railroad. The fertile soils are extensively farmed.

If moderately disturbed areas are left unused they revert over a period of about 200 years to native climax forest (described above) passing through a series of successional vegetative stages that include a herb stage of horseweed, ragweed, goldenrod and broom sedge, a shrub-pioneer tree stage that includes blackberry, sumac, sweetgum, red maple, red cedar and wild cherry and an early successional forest stage dominated by sweetgum, virginia pine and red maple.

The permeability of soils is used to distinguish sub-types within the Inner Coastal Plain Uplands. High permebility soils (6"+/hour) are prime recharge areas and tend to be droughty. Medium permeability soils (2"-6"/hour) are prime for land application of nutrients. Low permeability soils (0.2-2"/hour) may have poor drainage and the native vegetation may resemble lowland communities.

The extent of disturbance of the native adapted vegetation is used to subdivide the upland permeability subtypes into three. Areas of high disturbance, structures, paving and open space adjacent to structures growing exotic vegetation in high levels of maintenance; medium disturbance, early successional herb and shrub communities, agriculture, golf courses and successional meadow; and low disturbance native forest in various successional stages.

Inner Coastal Plain Dry and Wet Terraces (Minor Types 2 & 3)

These areas are distinguished from uplands by the decreasing depth to seasonal high water table.

Subtypes, as with uplands are distinguished by variations of permeability and disturbance. The native vegetation grades from the upland communities as described above in dry areas (high permeability dry terrace) to the lowland communities as described below in wetter areas (low permeability wet terrace).

As with uplands human disturbance has various and thórough although the wetter areas are less suitable than uplands for crops owing to drainage problems and tend to be used for pasture.

Outer Coastal Plain Land Types (Minor Types 4-6)

The Outer Coastal Plain is land that lies to the east of the cuesta hills. The environmental differences between the Inner and Outer Plains are sufficient that an Indian tribe lived on the edge, burning clearings in the dry pinelands of the Outer Plain while hunting in the fertile, moist forests of the Inner.

Streams drain eastward on a gentle slope to the ocean or the Delaware Bay. (The Rancocas Creek is an exception, rising in the Outer Coastal Plain and draining to the Delaware River).

The substrate sediments of the Outer Coastal Plain have less clay and silt and more sand and gravel than those of the Inner. They are unconsolidated yellow to gray quartzose sands with a few clay lenses in strata dipping to the southeast overlain with discontinuous Pleistocene sands and gravels.

There are various soil associations on the uplands and terraces of the Outer Coastal Plain mostly sharing properties of sandiness, acidity, infertility and low moisture content and ion exchange. In the south Sassafras-Cape May and Aura Association soils are more loamy and fertile and are more similar to those of the Inner Coastal Plain.

Surface slopes are almost non-existent, even less than the Inner Coastal Plain, reflecting the water deposited origin of the sediments. Native vegetation varies with substrate moisture content which is dependent on depth to seasonal high water table (SHWT) and permeability. These are the environmental variables used to determine minor types and subtypes.

Outer Coastal Plain Uplands (SHWT 5+) (Minor Type 4)

These areas are dry, sandy, acid and infertile providing a xeric, or dry habitat except in limited areas to the south where soils are mesic and more fertile. The low water table makes the uplands the prime aquifer recharge areas of the Outer Plain principally for the surface Plesitocene aquifer since the deeper strata outcrop in the Inner Coastal Plain.

The native adapted climax vegetation of the uplands is oak-pine forest dominated by various oaks (black, scarlet, white, chestnut and post) with frequent pitch pine, short leaf pine, blackjack oak and sassafras and an understory of huckleberry and blueberry.

In undisturbed areas the vegetation climax is rarely achieved because the droughty land is extremely susceptible to fire. Fire destroys some species completely, some of the oaks for example. Others such as blackjack oak are fire resistant and others depend on fire either to remove the overshadowing canopy and allow light to pass to the forest floor, or to release nutrients, or to provide heat for seed germination. Pitch pine for example has a fire resistant bark and a serotenous (closed) seed cone which requres the heat of fires to open. Pine seedlings cannot germinate in oak leaf litter therefore the more frequent the fires the more dominant are pines.

In areas of occasional fires the native forest is pine-oak with pitch pine dominant and frequent shortleaf pine, black oak, blackjack oak and post oak. The understory is mainly huckleberry and blueberry.

In areas of frequent fires and high permeability there occurs a dwarf forest about 5 feet high which is called the Pine Plain forest or the Pine Barrens. This is dominated by stunted pitch pine with occassional blackjack and bear oak and an understory including crowberry and bearberry. Why both pines and oaks should be stunted equally to this low canopy is a question of continuing scientific inquiry.

Because the Outer Coastal Plain is more distant from major metropolitan centers, and because the soils that cover much of the area are infertile, there are large areas of undisturbed forest, particularly in the central areas. These large open spaces represent a valuable recreational resource for the surrounding urban areas.

Settlement in the Outer Coastal Plain historically clustered around small regional centers. More recently scattered suburban development has begun to encroach mainly eastward from the expanding suburbs of Philadelphia and westward from the coast. Special crops including blueberries and huckleberries thrive on the sandy soils and areas are cleared for this purpose, cranberries are harvested in swampy areas. In the south there is general agriculture on the more fertile soils.

One of the effects of settlement is a reduction of forest fires, this tends to favor the climax oak-dominated forest and in some areas the pine-oak and dwarf pine forests are now succeeding to climax. This has caused problems in the past since dry leaf litter accumulates to a depth that may generate major crown fires that cannot be controlled. Controlled ground-burning that mimics natural conditions is becoming a widely accepted management practice.

If cleared areas are left unused they succeed either to the oak-pine climax or to one of the fire-stabilized sub-climaxes through a series of successional stages. A herb stage occurs first that includes panic grass, horseweed and ragweed followed by woody invaders including red cedar, pine oaks, sumac, sassafras and wild cherry. The pine-oak forests follow.

The sandy soils and coarse sand-gravel substrates common in the Outer Coastal Plain have little biophysical filtration capacity for nutrients and other pollutants. Permeability and lateral tramissibility are high and ion exchange low. Nutrients released from septic tanks and from fertilizers applied to agriculture and lawns may travel long distances without absorbtion and impact surface waters and wells. The traditional suburban development with septic tank and mown lawn is particularly unsuitable since the maintenance of lawn grass, not naturally suited to acid sandy soils, requires extensive liming, fertilization and irrigation which flushes pollutants long distances.

The uplands are subdivided by permeability. High permeability areas (6"+/hour are prime aquifer recharge areas. Medium permeability areas (2"-6"/hour) also have an important recharge function. Low permeability areas (0.2" - 2"/hour) are less common in the Outer Coastal Plain than the Inner and have a low rate of ground water percolation and a high surface runoff.

The level of disturbance of the naturally adapted vegetation is then used to subdivide the upland permeability subtypes into areas of high medium and low disturbance as defined for the Inner Coastal Plain.

Outer Coastal Plain Terrace Types (Minor Types 5 & 6)

The terraces are distinguished from the uplands by depth to seasonal high water table (SHWT). Dry Terraces (SHWT 3'-5') and Wet Terraces (SHWT 1'-3') have in general similar properties to those of the uplands described above except that as the water table is approached the incidence of wetland plant species increases. Red maple, black gum, sweet bay magnolia and other trees of lowland swamps (see description below) mix with the upland species.

The increasing shallowness of water table in the terrace types increases the possibility of transmitting pollutants to surface waters, particularly in areas of high or low permeability. The wet terraces are often close to surface water and serve an important buffering function if relatively undisturbed.

Water's Edge Types (Minor Types 7-10)

The water's edge is defined as areas between mean low water level and either the 100 year flood level or the upland limit of alluvial soils (sediments laid down in water) whichever is the greater.

These are areas that are inundated with varying periodicity and have at all times a shallow water table, poor drainage and wet soils forming a hydric (wet) habitat.

For many reasons water's edge areas in an undisturbed state play a vital role in coastal ecosystems, they have a biophysical filtration function, absorbing inorganic nutrients and pollutants flowing from the land and converting the nutrients to organic biomass that stabilizes the shores and provides a slow release of organic nutrients. Nutrient-rich sediments deposited during floods and trapped by vegetation and abundant available moisture make these areas the main source of primary productivity for aquatic systems and an important terrestrial wildlife habitat. The flood storage capacity buffers the severity of flood surges in surface waters.

These areas are an ecotone, or ecological edge, between land and water, they share properties with both land and water sytems. Impacts may be transferred across them either way principally by the downhill flow of surface and groundwater movement and by the uphill impacts of floods and storms. They are fragile, being susceptible to physical and chemical alterations both within the water's edge and in upland areas.

Historically the value of these areas has been seriously under-estimated. As settlement has spread they have been seen as a source of cheap land and thousands af acres have been lost to filling, diking, drainage and paving. Of all the areas within the jurisdiction of coastal zone management these are in the most urgent need of protection both from disturbance to the water's edge itself and from impacts transmitted from the surrounding land. If these areas are lost estuarine and ocean life will be affected. The Wetlands Act protects some of the most valuable areas but freshwater wetlands and flood plains are still vulnerable.

As with the land areas the first division is into water's edge areas of the Inner and Outer Coastal Plains.

Inner Coastal Plain Water's Edge Types (Minor Types 7 & 8)

These are the shorelands of water bodies to the west of the cuestas that divide the Coastal Plain. The adjacent water, unless standing, flows to the Delaware River or the Raritan Bay, or in the case of the Delaware River itself, to the Delaware Bay.

Minor types are distinguished by their elevation above mean low water level. Two elevation types are used, an upper flood prone area that is infrequently inundated by major storms or spring tides and a lower wetland area that is frequently inundated by light rainfall, seasonal water level variations or normal high tide. The upper and lower areas are distinguished by vegetation. The upper area naturally grows flood plain forest, the lower grows wetland vegetation.

Inner Coastal Plain Upper Water's Edge Types (Minor Type 7)

The upper flood hazard areas are defined as areas where the native climax vegetation is lowland forest rather than wetland species.

The potential climax vegetation of these upper flood hazard areas in the Inner Coastal Plain would be a mixture of the mixed deciduous forest of the uplands (see above) in the drier areas grading into a forest of sweetgum, red maple, beech, willow oak, spanish oak, swamp white oak, and tulip poplar in the wetter areas with rich shrub and herb communities. The nearness to water and the high species diversity and productivity of plant species in these flood prone areas make them a rich wildlife habitat.

In the past structures and paving have been placed in flood hazard areas either on fill or at grade. Both diminish the important productivity, flood water storage and sediment trapping functions and structures at grade are liable to flood damage. Not only is it important that further flood plain encroachment should be discouraged but also, if existing structures are badly damaged by flood, it is desirable that they should be relocated outside hazard areas for the benefit of both the structures and the floodplain.

Subtypes in the upper water's edge areas are distinguished by the extent of human disturbance in areas of high medium and low disturbance defined in the section on uplands.

Inner Coastal Plain Lower Water's Edge Types (Minor Type 8)

These are areas immediately adjacent to water bodies that are frequently or predominantly inundated and grow wetland vegetation.

The adapted vegetation depends on the salinity of the water. Freshwater wetlands grow such species as cattail, wild rice, bulrush, arrowhead, spatterdock, bur-reed and sedges. In brackish wetlands, or salt marshes, plant species include salt-marsh cordgrass, salt-meadow grass, marsh fleabane, sea-lavender and marsh mallow. Sometimes the upland edge of the lower water's edge areas in both fresh and brackish water is marked by a fringe of the common reed, Phragmites.

All brackish and some fresh water wetlands are subject to the rise and fall of the tide. These are known as pulse-stabilized ecosystems. The changing conditions of moisture and, in some cases, salinity produce a rigorous environment to which few species are adapted. Those that are, however, are phenomenally productive and play a vital role in estuarine ecosystems. The ebb and flow of the tide flushes inorganic nutrients to the wetland vegetation and carries organic detritus from the marshes down to the lower reaches of the estuary where it forms the basis for estuarine food webs.

Marsh vegetation has the capacity to cleanse water not only of nutrients, which may cause algal blooms leading to oxygen depletion and eutrophication, but studies also show that both the vegetation and the substrate are an environmental sink for heavy metals and other pollutants carried by water from the land. The value of these marshes and wetlands and the need for protection cannot be overestimated, the possibility of expanding them to treat sewage should be considered.

Subtypes of these inner Coastal Plain marshes and wetlands are identified first by the nature of the adjacent water body. High order rivers are the major rivers of New Jersey. In the Inner Coastal Plain only the Delaware River falls within this category. Medium order streams are the lower reaches of such Inner Coastal Plain streams as the Rancocas, Cooper and Salem (the distinciton is made on the basis fo the volume of normal flow in cubic feet per second but exact figures have yet to be determined). Low order creeks are the small tributary channels that flow into the larger rivers and streams.

The final water body type used to distinguish wetlands is standing water. These water bodies have either no flow or insignificantly small flow. There are few in the Inner Coastal Plain and these are man-made, either reservoirs or ponds or the remnants of old quarry operations.

Each of the Inner Coastal Plain lower water's edge subtypes associated with different water bodies is subdivided by the salinity of the water into freshwater wetlands (<0.5 ppt) and brackish wetlands (>0.5 ppt) and these subtypes are finally subdivided by the extent by which the native wetland vegetation has been disturbed by human use.

The kinds of disturbance characteristic of these wetland areas are somewhat different from upland disturbances particularly since one of the commoner disturbances, filling, may raise the land surface above flood level and change the nature of the natural processes. The quality of the water is also an important element of wetland disturbance.

Low disturbance is defined as areas of native adapted vegetation with high water quality (see definition below in water types), and undisturbed substrate and water flow patterns.

Medium disturbance is either a medium-low water quality (see definition below in water types) or limited substrate or surface disturbance, such as mosquito ditches, that may change water flow patterns but do not greatly alter the vegetation.

High disturbance is defined as areas where human activities that have completely removed the wetland vegetation and destroyed the productivity function. Filled wetlands are included in this category even if the land surface has been raised above the 100 year flood line. Structures, paving, and landfills are also included.

<u>Outer Coastal Plain Water's Edge Types (Minor Types 9 & 10)</u>

These are the shorelands of water bodies to the east of the cuestas that divide the Coastal Plain. They lie between the 100 year flood line or the upland limit of alluvial soils and Mena Low Water Line (MLW). The adjacent water, unless standing, flows to the Atlantic Ocean, the coastal back bay estuaries or the Delaware Bay.

As with the water's edge areas of the Inner Coastal Plain, the important functions of the floodplains and wetlands of the Outer Plain have been extensively diminished by development. The salt marshes of estuarine shores and the extensive flood plains surrounding coastal rivers and streams are essential to estuarine productivity, fish and wildlife conservation, water quality, shoreline stability and sediment and flood control. Their protection is critical and their restoration to natural function is desirable where developed areas have been damaged by flood or storm.

Minor types are distinguished as with the Inner Coastal Plain by their elevation above mean low water level. Two minor types are distinguished, an upper flood prone or storm hazard area that is infrequently inundated by major storms or spring tides and a lower wetland area that is frequently inundated.

Outer Coastal Plain Upper Water's Edge Types (Minor Type 9)

These upper storm hazard areas are infrequently inundated by major storms or spring tides. They grow flood plain forests rather than wetland or aquatic vegetation. An exception to this general rule occurs along ocean and bayshores exposed to wave action, here the upper water's edge naturally grows dune vegetation above an unvegetated beach.

The environmental conditions of Outer Coastal Plain upper water's edge areas vary more than those of the Inner because of the more varied nature of the adjacent water body and subtypes are distinguish using this factor.

Outer Coastal Plain Upper Water's Edge River and Stream Banks (Subtype 9a)

These areas are on the shores of Outer Coastal Plain streams and rivers between the 100 year flood line or the upland limit of alluvial soils above and the upland limit of wetland vegetation below.

The natural vegetation of these upper flood plain areas grades from oak-pine, pine-oak forests in drier areas to flood plain or swamp forests of swamp hardwoods in wetter areas dominated by red maple, sweetbay, and black gum with some Atlantic white cedar in the wettest areas. Other trees include gray birch, sweetgum, ash, sassafras and american holly. Shrubs include sweet pepper bush, blueberry and swamp azalia. Herbs include chain fern, mosses and sedges. In southern areas, including the pilot area the swampy areas include such species as loblolly pine, pond pine, basket oak, and water oak as well as those found in the northern swamps and flood plains. In some parts of the pine plains there occurs a pitch pine lowland forest typical of sandy soils.

These areas have important water quality buffering, sediment and flood control functions and further disturbance should be limited to exclude structures and paving and control the removal of vegetation.

Outer Coastal Plain Upper Water's Edge Standing Water Banks (Subtype 9b)

These are the upper flood hazard areas of water bodies with no water flushing or insignificant flow. In the highly mature drainage systems of the Outer Plain, unaffected by glaciation, such lakes and ponds do not occur naturally but are man-made either by damming streams, forming reservoirs, or by cutting below the waterline during sand quarrying or the creation of ponds.

Immediately bayward and in the lee of the ocean foredune, somewhat sheltered from the salty onshore winds, is a beach heather community growing a mosaic of low cushion plants that respond to micro-variations of climate and substrate and are shaped and stunted by the wind. Species include beach heather, virginia creeper, poison ivy and seaside golden rod.

Westward in the more sheltered areas behind the secondary dune there is a shrub thicket of low growing, wind shaped trees such as red cedar, black cherry, american holly, and scrub oak and shrubs such as bayberry, beach plum, shadbush and blueberry.

In the center and upper bayshore of the barrier islands grows a taller forest of red cedar, american holly, black cherry, pitch pine, hackberry and sassafras.

The vegetation of the barrier islands depends on a lens of freshwater stored in the unconsolidated sandy substrate and recharged by precipitation falling on permeable areas of the surface.

Subtypes of barrier islands are distinquished by the degree of disturbance of natural vegetation, high, medium and low disturbance levels are defined above.

Very little of the natural vegetation remains. Urban and suburban development extends almost the whole length of the Atlantic shore destroying vegetation, paving the surface and lowering water tables by removing water from wells and decreasing recharge. Island Beach State Park is one of the few areas where the natural vegetation that once covered the barrier islands can still be seen.

All the remaining undisturbed barrier islands should be protected as parks and in areas where hurricane and storm damage to existing structures is severe in suburban areas relocation beyond the hazard area (essentially off the barrier island) should be encouraged and natural vegetation re-established.

The water supply of barrier islands can become a problem unless piped from the mainland. Runoff management should ensure that runoff from paving and structures is directed to recharge areas where it can percolate into the ground.

In the long run barrier islands are unsuitable sites for structures because of their extreme geologic mobility. Coastal storms and rising sea level produce alterations of island configuration in as short a time as the five years between USGS survey updates, and in a brief time by geological standards the present land areas will be beneath the sea. A house built on shifting sand is often the proverbial criticism of these developed sand bars.

The development is, however, there, and pressure to increase the intensity continues in such areas as Atlantic City, until recently a decaying urban center. Recommended policy in the barrier islands is at present that in urban areas particularly where existing structures are deteriorating, clustered development of certain kinds should be encouraged, but in suburban areas no further development should be permitted. In areas damaged by hurricanes some development should be relocated off the barrier island or into urban areas.

The natural vegetation of the flood plain forests of standing water bodies is similar to that of stream flood plains discussed above. The water quality buffering function of the flood plain forest is even more critical for standing waters, particularly potable standing waters, since pollutants are concentrated in stagnant water by lack of flushing and by evaporation.

Outer Coastal Plain Upper Water's Edge Inland Wetland Banks (Subtype 9C)

Inland wetlands or bogs are low lying wetlands solely fed by seasonal rising of groundwater table. This upper water's edge category contains the drier areas. In bog habitat types, there is not regular flooding and substrate conditions are quite different from swamps and floodplains. Bog waters are extremely acidic and have low fertility with very poor drainage. Bogs are frequently unlain with peat deposits.

Bogs support an unique assemblage of flora and fauna which are adapted to acidic bog conditions, such as: White-cedar, red maple, black gum and sweet bay, with shrubs such as leather leaf, laurel, swamp azalia, cranberry and high bush blueberry and herbs such as sphagnum moss, sedges, pitcher plant, sundew and marsh fern. The curly grass fern and bog asphodel that are found in New Jersey Bogs are considered endangered species.

Bogs are in evolution and as time passes will become progressively drier and the vegetation will change to plants adapted to drier conditions.

In some areas inland wetlands are cleared or created in order to cultivate cranberries and the tall, straight, light and durable cedar trees have been felled for lumber. Owing to the high number of rare and endangered species found in bogs further disturbance is discouraged in these surrounding areas that serve as water quality buffers.

Outer Coastal Plain Upper Water's Edge Mainland Bay Shores (Minor Type 9d)

These are the storm hazard areas of estuarine bay shores of open bays, semi-enclosed bays or back bays. They lie between the 100 year flood line or the upland limit of alluvial soils above and the upland limit of wetland vegetation below.

The natural vegetation is similar to that of river and stream flood plains, hardwood forests dominated by red maple, sweet bay and black gum. These upper storm hazard areas play an important role in buffering the extensive salt marshes below from upland impacts. Further disturbance of these areas is discouraged.

Outer Coastal Plain Upper Water's Edge Barrier Island Bay Shores (Subtype 9e)

A special type of bayshore storm hazard area occurs on the offshore barrier islands on the bayward, or eastern, side of the foredune ridges. All the land between the ocean foredune ridge and the upland edge of bayshore wetland vegetation or, if foredunes are absent, between the upper limit of the ocean-facing beach and the bayshore wetlands, is included in this category irrespective of elevation.

The natural vegetation of these areas is adapted to the rigorous seashore conditions and falls into several distinct zones depending on the degree of exposure to wind and salt-spray.

Outer Coastal Plain Upper Water's Edge Ocean Shores (Subtype 9f)

These are coastal tidal floodprone areas lying between the upland limit of beaches and the 100 year flood level or the ridge of the foredune whichever is higher.

This is a high energy environment exposed to high winds, salt spray and periodic flooding with breaking ocean storm waves. Few plant species are adapted to such rigorous conditions, on the foredunes of the barrier islands there is naturally a dunegrass community dominated by dunegrass and including such species as seaside goldenrod, sea rocket, spurge and beach pea.

The dune-grass spreads by the rhizomes, root like growths that form a fibrous mat beneath the dune surface. This traps sediment and gives some stability to the shifting foredunes which form natural seawalls absorbing the energy of storms. The rhizome mat is susceptible to trampling and is easily destroyed making these barrier island foredunes, where they remain, the most fragile of all coastal types requiring the most complete management of human access.

Few barrier island foredunes remain, sea walls, roads, boardwalks, hotels and residential structures cluster along the prime ocean front shores with centers of urbanization clustered around bridges and widenings of the island. Recommended policy in these areas is the same as that for bayshore flood hazard areas.

To the north and south of the barrier islands the ocean shores are steeper headlands rather than water-formed dunes. In these areas the upper water's edge areas are very narrow and steeply sloping.

Subtypes are distinguished by the level of disturbance of natural vegetation into high medium and low disturbance areas as defiend above.

Outer Coastal Plain Lower Water's Edge Types (Minor Type 10)

These areas are immediately adjacent to the water bodies of the Outer Coastal Plain and lie betweent he mean low water level below and the upland limit of wetland and aquatic vegetation above or, in the case of beaches, the upland limit of the sandy unvegetated area.

These lower water's edge types are frequently or predominatly inundated by normal high tide, seasonal water variation or normal rainfall, they include the coastal marshes, beaches, and the wetter areas of bogs and swamps. Many are pulse stabilized systems similar to those described above in the Inner Coastal Plain.

The Outer Coastal Plain wetlands are the chief source of primary productivity for the estuarine and marine areas. Their value to society is greater the less the disturbance since the productivity of the fish and shellfish industries is proportional to the undisturbed acreage of productive marshland. Protection is imperative, restoration and creation of new productive marshland desirable.

Subtypes are distinguished by the nature of the adjacent water body salinity, and disturbance.

Outer Coastal Plain Lower Water's Edge River and Stream Wetlands (Subtypes 10a)

These are the wetland areas surrounding the channels of Outer Coastal Plain rivers and streams. They lie between the Mean Low Water Level (MLW) below and the upland limit of wetland vegetation above. Extensive swampy areas of sluggish flow surround some of the freshwater reaches of meandering streams and these are included as are the salt marshes around the lower reaches.

Natural vegetation varies with the salinity of the water and is different from the vegetation of the Inner Coastal Plain because of differences in water quality. In the pinelands of the Outer Plain the fallen pine needles lower the pH of water running over and percolating through the ground. This produces stream channel water so acid that the normal breakdown of organic detritus does not occur. The water is rich in complex organic molecules, brown in colour, and low in pH with many scraps of organic debris in suspension. This is the Cedar Water of the Pinelands. The wetlands of the south of the Outer Coastal Plain are less acid and more like those of the Inner in this respect.

In freshwater wetlands the hummocks of drier ground grow the swamp forest species, Atlantic white cedar, often in large pure stands, red maple, also sometimes in pure stands with cranberries and swamp azalea in the shrub layer, sometimes in dense thickets and chain fern in the herb layer.

The wetter areas of the freshwater wetlands surrounding rivers and streams grow aquatic herbs such as pickerel weed, arrowhead, cattail, burreed and spikerush.

Extensive areas of these freshwater swamps and wetlands have been altered by felling the cedars or lost to filling and construction. The water filtration, sediment and flood control functions of the remaining areas and their aesthetic and recreational value raise their value for protection beyond any economic value that could be gained from development. Further disturbance should be strongly discouraged and timber harvesting carefully regulated.

The brackish water wetlands or salt marshes are almost completely herbacious. In drier areas shrubs such as marsh elder grow with herbs such as marsh mallow and seaside golden rod but the majority of the marsh areas are vegetated by the few herbs adapted to the varying conditions of moisture and salinity caused by diurnal tides and seasonal variations of precipitation and freshwater runoff.

In the landward marsh zones grow salt-meadow grass, black marsh grass and spike grass with glasswort, sea blite and marsh fleabane in hyper-saline depressions, also called salt pans. In the marsh areas immediately adjacent to open water grow almost pure stands of salt-marsh cordgrass.

These salt marshes surrounding the lower reaches of Outer Coastal Plain rivers together with the estuarine bayshore marshes are the chief areas of primary productivity for the estuarine system since they cover the greatest acreage and their organic detritus is flushed directly to the estuarine spawning and nursery grounds. The capacity of wetland vegetation to absorb nutrients and convert them to organic hydrocarbons essential to the estuarine food webs suggests that experiments should be made creating new marshlands to provide sewage treatment and increase estuarine productivity.

Further loss of productive acreage should be strongly discouraged. In limited areas where an urgently needed water dependent use cannot locate unless a wetland is destroyed the overall productivity should be maintained by the creation of new wetland areas. A high degree of protection is needed both to preserve these areas and prevent downstream impacts. Both immediate and transferred impacts require management to maintain water quality.

Subtypes of the river and stream wetlands of the Outer Coastal Plain are distinguished first by the size of the adajacent stream. There are no major rivers on the Outer Plain so only medium and low order streams and creeks are distinguished. Medium order streams are the middle and lower reaches of such waterways as the Batsto River, the Mullica River and the Bass River. Low order creeks are the small tributaries that flow into the larger streams or the bays.

Subtypes are further divided by salinity into fresh water wetlands (<0.5 ppt) salinity) and brackish water wetlands (<20 ppt salinity).

Finally, subtyes are divided into areas of high, medium and low disturbance in the same way as the wetlands of the Inner Plain.

Outer Coastal Plain Lower Water's Edge Standing Water (Subtype 10b)

These are the wetlands surrounding standing water bodies with no water flushing or insignificant flow. They lie between the Mean Low Water Line and the upland limit of wetland vegetation.

The vegetation is similar to that of the swampy areas around streams but the water quality buffering function, particularly nutrient absorbtion, is more critical in standing water areas. The lack of flushing combines with evaporation to concentrate chemicals washed from the land. Eutrophication, caused by fertilizers or malfunctioning septic tanks occurs easily, toxic levels of biocide residues, toxic petrochemical wastes and heavy metals are quickly reached and may be biomagnified through the complex wetland food webs.

These should be amongst the most highly protected areas particularly if they surround potable water reservoirs. Both immediate and transferred impacts require management.

Outer Coastal Plain Lower Water's Edge Inland Wetlands (Subtype 10c)

These are the wetland areas of bogs, swampy areas fed solely by groundwater. All the areas below the upland limit of wetland vegetation including small, permanently inundated ponds, are included in this category. The following extract from the Vegetation of New Jersey, written in the early nineteenth century by an ornithologist, Alexander Wilson, vividly desribes this wetland type and indicates some of the reasons why those areas remaining should be specially protected.

"These swamps are from half a mile to a mile in breadth, and sometimes five or six in length, and appear as if they occupied the former channel of some choked up river stream, lake, or arm of the sea. The appearance they present to a stranger is singular: a front of tall and perfectly straight trunks, rising to the height of fifty or sixty feet without a limb, and crowded in every direction, their tops so closely woven together as to shut out the day, spreading the gloom of a perpetual twilight below. On a nearer approach, they are found to rise out of the water, which, from the impregnation of the fallen leaves and roots of the cedars, is of the color of brandy. Amidst this bottom of congregated springs, the ruins of the former forest lie piled in every state of confusion. The roots, prostrate logs, and in many places, the water, are covered with green, mantling moss, while an undergrowth of laurel fifteen or twenty feet high, intersects every opening so completely as to render a passage through laborious and harassing beyond description; at every step you either sink to the knees, clamber over fallen timber, squeeze yourself through between the stubborn laurels, or plunge to the middle in ponds made by the uprooting of large trees, and which the moss concealed from observation. In calm weather the silence of death reigns in these dreary regions; a few interrupted rays of light shoot across the gloom; and unless for the occassional hollow screams of the Herons, and the melancholy chirping of one or two species of small birds, all is silence, solitude, and desolation. When a breeze rises, at first it sighs mournfully through the tops; but as the gale increases, the tall mast-like cedars wave like fishing-poles and, rubbing against each other, produce a variety of singular noises that, with the help of a little imagination, resemble shrieks, groans, or the growling of beasts of prey."

The presence of endangered species, such as the rare whistling swan the Pine Barrens tree frog, carnivorous plants such as pitcher plants and sundews and many rare orchids; the nutrient absorbtion and water filtration function; and the historical importance of these bogs are other reasons to protect them from development and regulate their harvest.

Disturbance, defined as for Inner Coastal Plain Wetlands, is used to divided these wetlands into areas of high, medium and low disturbance.

Outer Coastal Plain Lower Water's Edge Bay Shores (Subtypes 10d-f)

These are areas immediately adjacent to the water of estuarine bays and lagoons. They lie between the Mean Low Water Line and either the upland limit of wetland vegetation or the upland limit of unvegetated sandy beach.

Subtypes are first distinguished by the volume and flushing rate of the adjacent water.

Back Bay Marshes (Subtype 10d)

These are areas around back bay lagoons between the Mean Low Water Line and the upland limit of marsh vegetation. Too few back bay beaches exist to warrent a separate category.

Back bays are the most poorly circulated (flushed) of all the estuarine types. Therefore, development of their adjacent shorelines must be more carefully managed.

Back bay tidal marshes are more vulnerable than other estuarine tidal marshes because pollutants discharged in these water have less chance to be quickly flushed owing to very limited freshwater input and limited areas of tidal flushing. The water purification function of the vegetation is correspondingly more important.

Filling and dredging for lagoon development, dyking, spoil dumping and drainage, have in the past depleted the extent of this category. As these areas are prime for protection. Further disturbance is strongly discouraged unless an essential water-dependent use cannot otherwise gain access to the water. In limited areas already disturbed such uses could remove marshland if an equivalent productive acreage were newly created.

Disturbance, as defined for Inner Coastal Plain Wetlands, is used to divide these back-bay marshes into areas of low, medium and high disturbance.

Semi-Enclosed Bay Lower Shoreface (Marshes and Beaches) (Subtype 10e)

Semi-enclosed bays are restricted coastal embayments that have a narrow outlet to the sea. The tidal flushing and freshwater inflow is greater than that of back bays. The lower shoreface lies between the Mean Low Water line and either the upland limit of wetland vegetation or sandy unvegetated beaches.

Subtypes are marshes and beaches. Marshes are similar in vegetation, function and value to the back bay marshes but the higher flushing rate of semi-enclosed bays makes them more important as nutrient distributers and slightly less vulnerable to pollution.

Avian composition on these semi-enclosed bay marshes is singificantly richer adjacent to inlets, supporting numerous colonial nesting bird rookeries (egrets, herons, gulls, terns, etc.). These sites are "specially valued areas". All marshes in this category require protection. Small beaches typically surround the inlet istself, these are sandy, unvegetated slopes adjacent to the water. They are mobile, changing configuration particularly during storms, and unsuitable for development.

Open Bay Lower Shoreface (Marshes and Beaches) (Subtype 10f)

Open bays are larger embayments typically at the mouths of major rivers in New Jersey. The outlet to the sea is large but not more than a third of shore length. The Delaware and Raritan Bays fall into this category.

These lower shore areas lie between Mean Low Water Level and the upland limit of either wetland vegetation or unvegetated sandy beach. Subtypes are beaches and marshes.

Open bay beaches are less dynamic than ocean beaches, with reduced ocean swells and less littoral drift. During periods of high winds west-facing beaches are subjected to intense wave activity. Erosion of bay beach is generally less of a problem than for ocean beaches although erosion can be severe locally. Bay beaches are less heavily utilized for human recreation than ocean beaches, partly owing to degraded water quality in some areas.

Open bay tidal marshes are partially saline (brackish). This habitat type is by far the most biologically productive type in the coastal zone. Wetlands support a wide diversity of fish, shellfish, waterbirds and other wildlife, either directly by by providing feeding, nesting, and wintering areas and indirectly by providing organic material (detritus) into coastal water which is an essential nutrient for many lower estuarine and marine organisms.

Outer Coastal Plain, Lower Water's Edge Ocean Beaches (Subtype 10g)

Beaches are defined as a shore of a permanent surface feature with a gentle slope covered with unconsolidated sand and/or gravel and/or shell fragments, with no vegetation. Beaches are found along the Atlantic coastline, portions of open and semi-enclosed bays, and infrequently on river and lake shorelines.

Ocean coastline beaches in New Jersey are further classified by the region of the coastline where they are found: Northern, Central, or Southern, owing to their common characteristics. Northern beaches are very narrow with steep slopes, have larger sand grain size, and are adjacent to strong erosional northern littoral currents.

Central beaches are all located on barrier beach islands, are fairly narrow, have moderate slope, with high wave energies and weaker and variable littoral currents.

Southern barrier island beaches are wide, gently sloping, with smaller sand grain sizes and generally southern longshore littoral drift. Distance from inlets play strong role in accretion or erosion of sediment.

The ocean beach is a very dynamic environment. Stresses arise from high wave energies, unstable substrates with periodic changes, intense light reflection, and wind blown sands, and salt spring. Beach and dune formations are constantly changing.

Beaches are exceptional amongst water's edge types, in being fairly resistant to impact. They are a vital resource for the resort industry.

Water Types

Water areas are defined as areas below Mean Low Water Level. They are normally permanently inundated except in periods of drought.

Standing Waters (Minor Type 11)

Standing waters are defined here as permanent surface water impoundments, lakes, ponds, or reservoirs retaining surface runoff or aquifer discharge. This major type grouping is further subdivided into potable water reservoirs, (non-potable) lakes, and smaller (non-potable) ponds.

Standing waters are important as public water supply storage areas, flood water retention basins, fish and wildlife habitat, sediment retention basins, and public recreation areas.

Inner Coastal Plain Running Waters (Minor Type 12)

This grouping is characterized as permanent surface water drainage channels which drain surface or ground waters (aquifer discharge) towards the sea. This group includes rivers, creeks, and streams. Running waters are subdivided into different stream orders by their assimilative capacity based on discharge rate as measured in cubic feet of water per second (CFS). Each stream order type is further subdivided by salt content (salinity and wheterh tidally influenced on non-tidal and by the extent of human disturbance both to the water column and the bottom.

Estuarine running waters (brackish and tidal) support many of the same living resources and human uses as coastal embayments. The general rule is the smaller the stream, the more susceptible to human disturbance and environmental degradations. Non-saline potable running water are frequently utilized for domestic and industrial water supply.

Outer Coastal Plain Running Waters (Minor Type 13)

Defined as in the Inner Coastal Plain, the rivers and streams of the Outer Plain flow to the coastal bays. The water quality of the Outer Plain is different from the Inner due to the low pH as discussed above. These Outer Coastal Plain streams are the principal conduit through which land based impacts are transmitted to coastal waters. Both point source and non-point source pollutants are flushed into tidal embayments and both require careful management.

Subtypes are distinguished by salinity, tidal influence and degree of disturbance.

Back Bay Estuaries (Lagoons) (Minor Type 14)

These are highly confined coastal estuaries with restricted inlets to the sea and without significant freshwater inflow. This type has very limited wind driven circulation of water, which is poorly flushed and relatively stagnant. Sediment accumulation can be rapid. These water areas tend to be shallow outside of channels. Biological communities of lagoons may be somewhat different from other estuaries owing to relatively constant salinity, less extreme temperatures, and somewhat higher and more constant pH, and greater wind effect. Flushing rate is slow.

Back bays support lush beds of eelgrass and widgeon grass, which is a subtidal vascular flowering plant. These rooted aquatics help stabilize muddy bay bottoms, act as sediment and wave energy traps and help purify bay water by absorbing nutrients. Eelgrass is essential to the life cycle of commercial bay scallops, and acts as shelter areas for juvenile finfishes. Widgeon and eelgrass is a very important winter forage for thousands of migratory waterfowl, especially American brant, whose prime wintering areas is southern New Jersey.

Back bays are again subdivided into ocean influence, transitional zone, and freshwater (river) influence areas, which are further subdivided by water depth into intertidal flats, shoals, and channels.

Semi-Enclosed Bay Estuaries (Embayments) (Minor Type 15)

These are moderate size confined coastal water bodies with restricted inlets and with significant fresh water inflow. Embayments usually have lower tidal action and are generally smaller in volume and shallower than open bays. Two embayments are found within New Jersey; there are Great Bay and Great Egg Harbor. Tidal flushing is less than in open bays but greater than back bays.

Embayments are further subdivided into subtypes by salinity: ocean influence (salinity 3.5-35 ppt) transitional zone (salinity less than 20 ppt) freshwater (river) influence (salinity 9.0-3.5 ppt). Salinity plays a strong role in determining species distribution limits and community structures.

The above subtypes are further distinguished by water depths. Intertidal flats are shallow areas partially or fully exposed at low tide, with MLW depth of 0 to 1/2 foot. These barren looking expanses are rich sources of basic nutrients for the estuarine/ marine ecosystem, feeding areas for finfish at high tide and littoral birds at low tide. In New Jersey they produce high yield of shellfish and baitworms. Shoals are important shellfish habitats (hard clam, soft clam and oyster).

Open Bay Estuaries (Minor Type 16)

These are defined as the Delaware and Raritan Bays. This type is characterized by large somewhat confined water area, with wide inlet areas and major river discharge. Salinities range widely and serve as the distinguishing parameter between ocean influence areas (salinity 3.5-32 ppt) and transitional zone (salinity less than 20 ppt).

Open bays are effectively flushed by tidal currents in conjunction with vertical stratification and fresh water flow. Subtypes are distinguished by water depth into: Flats (0-6 feet), shoals (6-18 feet) and channels (18+ feet). Channel areas exhibit complex current patterns, stratified by salinity differences, waters of lower specific gravity and salinity "float" seaward above an upstream tongue of more saline oceanic water frequently flowing upstream counter to surface flow.

The estuarine ecosystem is the most valuable in the nation; primary productivity is high, biota (flora and fauna) of open bays are highly diverse including euryhaline, wholly estuarine or estuarine dependent species. Many important fin fish and shellfish species use the open bay (as well as other estuarine areas) as larval and juvenile nursery areas. Migratory movements are frequently tidal or temperature influenced. Oceanic species frequently occur in areas of higher salinities.

Ocean (Marine) Waters (Minor Type 17)

That portion of the Atlantic Ocean boarding the exposed eastern coastline of the state and study area, which is the southern most extent of the New York Bight. Coastal marine (continental shelf) waters are characterized by a salinity range of 24 to 32 ppt (parts chorline/thousand parts water). The coastal marine ecosystem is a well mixed, high energy type activiated by wind driven waves (ocean swells), longshore currents (littoral drift), and daily tidal flows. Neritic (coastal) flora and fauna are highly diverse, migratory, and display significant seasonal changes, reflecting the extremely dynamic nature of the type. Subtypes are distinguished by water depth and stability of bottom sediments.

Upper Surf Zone - Or sub-littoral (sub-tidal) zone is found between the mean low water (MLW) line to depth of 6 feet. High wave energies are dissipated causing surface water turbulence and turbidity. Biological communities are strongly influenced by tidal changes, virtually all benthic (bottom) invertebrates are burrowers or sessile (attached) when hard substrates are present. Vertebrate predators key movements into and out of zone with the tidal state. Flora are dominated by neritic phytoplankton or attached algaes when artificial hard substrates are present. The upper surf zone is further subdivided into: unstable (where strong littoral drift is either depositing or eroding the sand sediments), and stable (where unconsolidated sediments have not shown short term changes).

Lower Surf Zone - Extending seaward from the upper surf zone (6' ft. MLW) out to 18 ft. MLW isobath (contour). Nearly as energetic as the upper surf zone, turbulence is caused by cresting and breaking ocean swells, littoral currents, and tidal currents. Bottom sand sediments are slightly more stable, but show long term storm-induced changes. Species diversity is high with both neritic and oceanic (pelagic) species. This zone is further sub-divided on sediment stability into stable and unstable areas.

Lower Shoreface - Zone extends from MLW depths of 18 feet or greater. Wave energies, turbulence, and turbity are less than surf zone. Longshore currents which run parallel to shoreline are strongest during storm episodes and cause upper sediment movement. This type is characterized by sand ridge and swale topography. These features are important migratory finfish habitat and migratory congregation and feeding areas. Benthic organisms such as commercially important surf clams burrow or live on surface of substrate. The lower shoreface is subdivided into stable and unstable sediment areas.

APPENDIX B 3.

Data Sources for Socio-Economic

Subregions

DATA	FORMAT	SOURCE	ACCURACY	UPDATE	SOCIO-ECONOMIC INTEREST
Income Maintenance Food Stamps Youth Family Services Medical Assistance Mental Retardation Mental Health Services Correction-parole Institutions Public Advocate	Tape	Human Services Peter Roebas 895-2454 3524 Quaker- bridge Rd.	(This information is protected by confiden-tiality law)		Yes
Arrests-since 1972 Aquittal/conviction (each incident in individuals criminal record-250,000 individuals)	Tape	Law & Safety Bianco x 4463 Wadia x 4719	Good		Yes
N.J. crime index State, county, municipal profiles Criminal Statistics by region Criminal statistics by urban, suburban,rural Criminal statistics by population group Police Employee Data	Tabular	1975 UNIFORM CRIME REPORT			Yes
Alcoholic related arrests by county	Tabular	Alcoholism Control Program Ted Seamans x 7232			Yes
Public Health Statistics Consumer Health Services Veneral Disease Control Vital Statistics Registration Maternal and Child Care Program Narcotics & Drug Abuse Control Crippled Children Program Blood-Lead Food-Cosmetic Manpower	Computer	Health Dept. (D'Allesandro)			Yes

DATA	FORMAT	SOURCE	ACCURACY	UPDATE	SOCIO-ECONOMIC INTEREST
Mental Health indicators and geographic ranking Indicators (unique) admission statistics outpatient care man-hour/week infant mortality illegitimate births suicides drug program cases	Tabular	NJ Comprehensive Mental Health Service Plan '77			Yes
Agricultural Census number of farms farm acreage farm operators land in farms size of farms land use practices income-sales expenditures machinery-equipment livestock, poultry, etc. greenhouse-forest	Tape	US Department of Commerce Orvin Wilhite 301-763-5230			
Education Dept. i.e. vehicles adult education equivalency home instruction feeding cash enrollment list is very detailed (36 items)	Tape	Annual Data Collection Plan (1977) (Mr. Gaydos x 8405)			Yes
Municipal Form of government Expenditures Revenue realized Capital outlay Real property evaluations Land Area Property tax Current Finances	Tape (250,000 records)	Financial Condition of Counties and Municipalities (DCA) Mr. Beagleman (6110 or 6602)			Yes

DATA	FORMAT	SOURCE	ACCURACY	UPDATE	SOCIO-ECONOMIC INTEREST
Density Mapping using satellite imagery	Tape	State and Regional Planning NJECN Bineski-8916 Bosted -2659	might be bum lead		Yes
Number of miles of each type of road by county	Tabular	DOT-"NJ Highway Mileage by System"			Yes
Covered jobs by counties Total wages by industry Total wages by county Statewide distributional -liable employer units Statewide distribution of covered jobs by size group Total wages Covered jobs by industry Women in covered jobs By county selected manufacturing For municipalities Covered employment trends	Tabular	"Covered Employment Trends" Bureau of Operational Statistics and Reports		quarterly	Yes
County Economic Indicators civilian labor force total resident employment nonfarm payroll employment unemployment personal income nonfarm job nonfarm job placements initial claims	Tabular	"NJ Economic Indicators" (Div. of Planning & Research)		monthly	Yes
Labor force data nonfarm wage and salary employment Hours and earnings characteristics of job -service applications	Tabular	Division of Planning & Research - Labor Market area Reports		annual	Yea

DATA	FORMAT	SOURCE	ACCURACY	UPDATE	SOCIO-ECONOMIC INTEREST
ILPS	Tape(?)	Division of Planning & Research			Yes
Census- Demographics Housing Census Designated Place Program	Tape	NE regional contact Dave Lewis 215-597-8313 Ed Butterer-OBE Shirley Goetz-OBE			Yes
Classification- urban-center urban-surburban Urban-center-rural Suburban Suburban-Rural Rural Rural center Rural Center-Rural	Tabular	State & Regional Planning-DCA			Yes
Population Estimates 1976 Per capita Income '77	Tabular	OBE			Yes
State Economic areas					Yes
Economic Sub regions					Yes
Health Service Areas		Federal Legislation			
State Psychiatric Hospital Regions					
Mental Retardation Regions					
Community Mental Health Centers (demographics, agencies, need, unified delivery		NIMH Grant			

DATA	FORMAT	SOURCE	ACCURACY	UPDATE	SOCIO- ECONOMIC INTEREST
Agricultural Areas (major crop concentration)		County Agents Survey			
Farmland Quality map		Tedrows' NJ Trends Rutgers			
<u>Transportation</u>	pictor-ial-written				Yes
Principal Indian trails		Lane '39			
Major Colonial roads		Cranmer '64			
NJ Railroad System		Lane			
Principal NJ Railroad Locations		Lane Lane Cranmer			
<u>County Units</u>	tabular	SCORP			Yes
Supply of recreation resources		Green Acres			
Outdoor recreational demand					
Recreational deficiencies					

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
1) Census Information	1970										Federal	x	x
Total Population			x										
Housing Units and Group Quarters													
Year Round Housing Units													
Occupied Housing Units													
Race													
Tenure													
Plumbing Facilities													
Units in Structure													
Persons per Room													
Average number of Rooms													
Average value													
Average contract rent													
One-person households													
with female head of family													
with roomers, boarders, or lodgers													
General Population Characteristics	1970			x							Federal	x	x
Social Characteristics of Population													
Labor Force Characteristics of Populations													
Income Characteristics of Population													
Negro: General and Social Characteristics													
Negro: Economic Characteristics													
Puerto Rican: General and Social Characteristics													
Puerto Rican: Economic Characteristics													
Occupancy, Utilization, and Financial Characteristics of Housing Units													
Structuaral, Equipment, and Financial Characteristics of Housing Units													
Negro Head of household: Occupancy, Utilization and Financial Characteristics of Housing Units													
Negro Head of household: Structural, Equipment, and Financial Characteristics of Housing Units													
Puerto Rican head of household: Characteristics of Housing Units													

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
1) Census Information (continued)	1970				x						Federal	x	x
Number of Inhabitants													
Summary Characteristics													
Age													
Race													
Nativity and Parentage													
Place of Birth													
Country of birth or origin													
Mother Tongue													
Residence in 1965													
Residence by selected class of Migrants													
School Enrollment													
School Enrollment by percent enrolled													
Year of School completed by age													
Veteran Status													
Marital Status													
Fertility: Children ever born													
Households and household relationship													
Group Quarters													
Inmates of Institutions													
Families: by presence and number of own children under 18 years old													
Families: by type and composition													
Families: by income													
Families: by poverty status													
Subfamilies													
Unrelated Individuals													
Economic Characteristics	1970				x						Federal	x	x
Labor Force Status													
Employment Status													
Employment Status for males 16-21 not attending school													
Weeks worked in 1969													

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
1) Census Information (continued)	1970				x						Federal	x	x
Occupation by employment characteristics													
Occupation by experienced unemployed													
Industry by employment characteristics													
Class of Worker													
Activity 5 years ago													
Place of work													
Personal Income in 1969													
Family Income in 1969													
Family Income by type of income													
Income of Unrelated Individuals in 1969													
Household Earnings in 1969 by occupation													
Personal poverty status in 1969													
Family by characteristics of head-Poverty Status 1969													
Family by presence or number of children under 18-Poverty Status 1969													
Poverty Status: unrelated individuals-1969													
Poverty Status: households in 1969													
1) Census Information (continued)													
Census of Agriculture	1974						x				Federal	x	?
number of farms													
farm characteristics (total land, average size, value)													
livestock (and products)													
poultry (and products)													
crops													
crop values													
irrigation													
drainage													
type of farm operations													
farm finances													

DATA CLASS	DATE	DATA BASE								SOURCE		FORMAT	
		PROPERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	STATE	OTHER (SPECIFY)	TABULAR	TAPE
1) Census Information (continued) Census of Construction Industries Volume II - area statistics	1973							x ↓			Federal ↓	x ↓	?
1) Census Information (continued) Census of Wholesale Trade Vol.II kind of business number of establishments Sales inventories operating expenses payroll number of employees	1972				cities ↓						Federal ↓	x ↓	?

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
2) Agriculture	1976											x ↓	
Crop data							x ↓			↓			
acres harvested													
yield per acre													
production													
Livestock and Dairy data													
Poultry Data													

DATA CLASS	DATE	DATA BASE								SOURCE		FORMAT	
		PROPERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	STATE	OTHER (SPECIFY)	TABULAR	TAPE
3) Crime													
Offense Data	1976				x					x		x	
Crime Index					↓					↓		↓	
Crime rate per 100,000 persons					↓					↓		↓	
Violent Crime rate per 100,000 persons					↓					↓		↓	
Non-Violent Crime rate per 100,000 persons					↓					↓		↓	
Crime count for each major crime type					↓					↓		↓	
Police employees					↓					↓		↓	
Arrest Data	1976				x					x			x
Arrest figures for adult offenders listed for each statutory law (confidentiality law applies)													

DATA CLASS	DATE	DATA BASE								SOURCE		FORMAT	
		PROPERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	STATE	OTHER (SPECIFY)	TABULAR	TAPE
4) Education													
Secondary enrollment (monthly)	1976				x				School	x			x
Public and Private school enrollment	1976				x				School		county or city	x	
Educational Facility Survey					x				School			x	
Enrollment Trends							x					x	
Handicapped population in schools by handicap type							x					x	
Migrant School Programs							x					x	

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
5) Employment and Economic Status													
Per Capita Income	1969				x					from federal census			
Average Family Income					↓					x		x	
Number of families by income group					↓					↓		↓	
Total number of families					↓					↓		↓	
Income in experienced civilian labor force by sex	1969				x					x		x	
Per Capita Income	1974				x						Federal	x	
Covered Employment Trends	1976				x					x		x	
employment in major industry groups by month					↓					↓		↓	
employment in major manufacturing groups by month					↓					↓		↓	
number of employer units (Sept.)					↓					↓		↓	
total number of covered jobs (Sept.)					↓					↓		↓	
Occupational Employment Statistics by classes (6 classes, not reported, total)	1970				x					x		x	
Sales, Clerical					↓					↓		↓	
Craftsmen, Foreman, Operatives					↓					↓		↓	
Laborers					↓					↓		↓	
Farmers, Farm Managers					↓					↓		↓	
Service					↓					↓		↓	
Not Reported					↓					↓		↓	
Total					↓					↓		↓	

DATA CLASS	DATE	DATA BASE								SOURCE		FORMAT	
		PROPERTY BOUND'Y	BLOCK URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	STATE	OTHER (SPECIFY)	TABULAR	TAPE
5) Employment and Economic Status (continued)													
Total Labor Force	Monthly								Labor Market Area	x		x	
Total Employment									↓	↓		↓	
Total Unemployment									↓	↓		↓	
Unemployment rate									↓	↓		↓	
Seasonally adjusted unemployment and unemployment rate									↓	↓		↓	
Non Farm Wage and salary employment									↓	↓		↓	
Compensation - number of claimants									↓	↓		↓	

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6) Land Use													
CARETS Program Series of maps at 100,000 scale in 6 categories with 26 subclasses Urban and Builtup-9 subclasses Agriculture - 4 subclasses Forestland - 2 subclasses Water - 5 subclasses Non-Forested Wetland - 2 subclasses Barren Land - 4 subclasses	1970								by location at 1:100,000 ↓		Federal ↓	Map ↓	
Zoning Control and Residential Land Supply	1972												
Property Classification Code corresponding to lot size and number	1976	x									Real Estate Data, Inc/	x	?
Property Boundary map		x									DEP city or county	map	
Land Use Summary with acreage per category					x						city or county	x	

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7) Municipal Characteristics													
Trends in NJ Land Value	1973				x					x		x	
cost/acre													
% increase 1972-73													
Property Ownership (individual) with corresponding information													
Alphabetical and geographical listing of ownership		x									Real Estate Data, Inc.	x also maps	?
Municipal Tax Roll page number													
owner's name and address													
assessors lot number													
assessors block number													
property location													
lot size													
assessed land value													
assessed improvement value													
property classification code													
mortgage code													
building description code													

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
7) Municipal Characteristics (continued)													
Financial characteristics	1975												
Expenditures					x					x		x	x
Revenues realized													
Capital Outlay													
Capital Debt Authorized													
Real property Valuations including class, number of parcels, percent valuation													
Net Value of Land													
Property Tax Collected													
Outstanding taxes													
Current Finances													
Outstanding capital debt													
Equalized Property Tax Rates													
Finances of Municipal Operated Utilities													
Property Boundary Map		x									City or County	Map	

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
8) Population and Housing													
Intensity of Urbanization	1970				x					x from US census		x	
municipality code													
government type													
1960, 1970 population													
1960, 1970 area (sq. miles)													
1960, 1970 density													
population % change 1960-70													
character of municipality (i.e. urban center)													
Municipal Population density map	1970				x					x		map	
Minority population and density	1970				x					x from US census		x	
Population Characteristics	1970					x				x from US census		x	
Social and Economic Characteristics													
General housing characteristics													
Detailed housing characteristics													
1960-70 housing census	1970				x					x		x	
1960-70 housing density													
1970 population per housing unit													
1970 home occupance status													
year round													
occupied													
1 unit structure													
2 or more unit structure													
occupied mobile home/trailer													
vacant seasonal and migratory													
1970 number rooms/housing unit in year round housing units													

DATA CLASS	DATE	DATA BASE								SOURCE		FORMAT	
		PROPERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	STATE	OTHER (SPECIFY)	TABULAR	TAPE
8) Population and Housing (continued)													
1973, 1975 population estimates	1975						x				Federal-US census	x	
1972, 1974 per capita income estimates	1974						x					x	
percent change 1969-74	1974						x					x	
Educational Attainment of persons 25 years and over, by sex and grade increment	1970				x					x from US census		x	

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
9) Public Assistance welfare - income maintenance food stamps youth family services medical assistance mental retardation mental health services corrections - parole institutions public advocate - complaints Confidentiality Law applies to data!		x								x			x

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	SOURCE: STATE	OTHER (SPECIFY)	FORMAT: TABULAR	TAPE
10) Public Health													
Specific causes of death	1976				x					x		x	
Births, Marriages, Deaths: numbers and rates	1976						x ↓		selected places ↓	x ↓		x ↓	
Births by sex and race													
Births by legitiamcy, by race													
Births by maturity													
Births with respect to prenatal care													
Infant, Fetal, Neonatal, Prenatal deaths - by race													
Death by age, sex, race													
Death by select causes													
TB, Circulatory Disease deaths													
VD Statistics													
Populations;births;marriages;deaths; Infant, Fetal, Neonatal Deaths					x					x		x	
Alcohol Treatment needs	1975						x ↓		Health service area ↓	x ↓		x ↓	
County population													
alcohol abusers													
target population													
emergency medicare incidence													
medical/surgical/alcohol beds													
alcohol abusers by sex													
alcohol related arrests with breakdown of traffic fatalities													

DATA CLASS	DATE	DATA BASE: PROP-ERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICI-PALITY	TOWN-SHIP	COUNTY	STATE	OTHER	SOURCE: STATE	OTHER (SPECIFY)	FORMAT: TABULAR	TAPE
10) Public Health (continued)	1970												
Public Health statistics													
Consumer health services										x			x
Venereal Disease Control													
Vital Statistics Registration													
Maternal and child care program													
Narcotics and drug abuse control													
Crippled children program													
Mental Health Indicators													
Population (1975)													
Families and unrelated individuals below the poverty line (1970)						x				x		x	
Psychiatric hospital admissions and readmissions (1974)													
Outpatients under care by mental health projects (1975)													
Mental health man-hours (1975)													
Infant Mortality (1974)													
Illegitimate births (1974)													
Suicides (1972)													
Unemployment (1970)													
Venereal Disease (1975)													
Crime Index (1974)													
Drug Program Cases (1976)													
General Assistance (1975)													

DATA CLASS	DATE	DATA BASE: PROPERTY BOUND'Y	DATA BASE: BLOCK (URBANIZED AREA ONLY)	DATA BASE: CENSUS TRACT (SMSA ONLY)	DATA BASE: MUNICIPALITY	DATA BASE: TOWNSHIP	DATA BASE: COUNTY	DATA BASE: STATE	DATA BASE: OTHER	SOURCE: STATE	SOURCE: OTHER (SPECIFY)	FORMAT: TABULAR	FORMAT: TAPE
) Transportation													
On state highways only, given is:	1975				x					x		x	
number of lanes					↓					↓		↓	
length in miles					↓					↓		↓	
average daily volume					↓					↓		↓	
accidents - number and rate					↓					↓		↓	
Injury accidents - number and rate					↓					↓		↓	
Fatal accidents - number and rate					↓					↓		↓	
Accident data listing	1976								highway location	x			x
road system									↓	↓			↓
location on road system									↓	↓			↓
total number of accidents									↓	↓			↓
fatal accidents and number killed									↓	↓			↓
injury accidents and number injured									↓	↓			↓
property damage accidents									↓	↓			↓
State Highways Legislated							x			x		x	
State Highways Operating							↓			↓		↓	
County roads							↓			↓		↓	
Municipal roads							↓			↓		↓	
NJ Turnpike							↓			↓		↓	
Garden State Parkway							↓			↓		↓	
AC Expressway							↓			↓		↓	
Toll and Others							↓			↓		↓	
Total Operating roads							↓			↓		↓	
On state highways only, given is:	1975				x					x		x	
Injuries - number and rate					↓					↓		↓	
Fatalities - number and rate					↓					↓		↓	

DATA CLASS	DATE	DATA BASE								SOURCE		FORMAT	
		PROPERTY BOUND'Y	BLOCK (URBANIZED AREA ONLY)	CENSUS TRACT (SMSA ONLY)	MUNICIPALITY	TOWNSHIP	COUNTY	STATE	OTHER	STATE	OTHER (SPECIFY)	TABULAR	TAPE
11) Transportation (continued) Parking Facilities listing of municipal, public, commercial, private, off-street, metered curb space, total curb, total parking spaces.									Depends on source ↓	x ↓	county or city ↓	x ↓	
Traffic counting figures average annual daily traffic									count locations within urban area	x		x	

APPENDIX C

Background for Section 4

Value Analysis

1) Definitions of Specially Valued Areas

2) Nominated Areas of Concern

APPENDIX C 1

Definitions of Specially Valued Areas

1. <u>Specially Valued Land Areas</u>

(a) Prime Agricultural Land	- Those lands with soils of agricultural capabiity Classes I, II and III as classified by the Soil Conservation Service (SCS). These soils have few to moderate limitations restricting their agricultural use. These include deep, well-drained loams and sandy loams which are nearly flat or gently sloping.
(b) Prime Forest Lands	- Areas growing native forest vegetation of exceptional quality or special value as identified by the Estuarine Study.
(c) Prime Aquifer Recharge	- Those lands with soils of high permeability and seasonal groundwater table of 5 feet or greater. These areas allow infiltration of percipitation into groundwater reservoirs which are utilized as potable water sources and maintain stream base flows.
(d) Prime Woodland Suitability	- Lands with soils of very high woodland suitability as determined by SCS. These ratings are based on field determination of average site index which is the height reached by the taller trees of a given species in natural unmanaged stands in a stated number of years.
(e) Historic and Archeological Sites	- This category includes buildings, districts, or other landmarks presently appearing, or under consideration for inclusion, on the State Register of Historic Sites or the Federal Register of Historic Sites. Archaeological sites are known archaeological (Indian) habitations of state or national significance. These appear on state listing or are under consideration for future listing.
(f) Specimen Trees	- The largest known individual (New Jersey state record) tree specimens of a species growing within the state as listed by N.J. Bureau of Forestry. A specimen tree site includes sufficient area immediately surrounding the specimen necessary for its survival. This area is normally defined as the outer limit of crown.
(g) Endangered Species Habitats	- These are specific areas known to support flora and/or fauna species appearing on the federal endangered and threatened list or State of New Jersey list of endangered or threatened species.
(h) Areas of Scientific or Educational Importance	- These are land areas, sites, or regions of a unique character, where natural, physical or biotic processes normally obscure, or not occurring elsewhere, are clearly apparent for study or where commonly occuring processes are particularly well displayed.

(i) Scenic Areas - These are areas whose vegetation, land form and individual features characterize them as having high aesthetic value in their present condition. Included may be unobstructed views across open water and barrier islands and major panoramic views as from a rise overlooking a vista with open fields, forests and streams.

(j) Prime Wildlife Habitats - Contiguous areas which are known to serve a critical function to native wildlife during some part of the year. Examples would include critical breeding or wintering areas such as colonial nesting bird rookeries and white-tail deer wintering yards.

(k) Prime Recreation Areas - These are areas where the existing recreational use is sensitive to disturbance. Such areas include beaches, fishing and hunting areas, swimming, canoeing and hiking areas, and other recreational areas. To date these have not been systematically identified.

2. Specially Valued Water's Edge Areas

(a) Prime Forest Areas - Areas supporting typical south Jersey lowland swamp forest: Atlantic white-cedar, hardwoods and pitch pine.

(b) Prime Wetlands - Tidal and non-tidal low lying marshland supporting native aquatic adapted species. Prime wetlands exhibit high vegetative productivity which is exemplified by Spartina alterniflora in brackish marshes.

(c) Eroding - These areas are not truly a specially valued type, but are of high concern owing to the hazard to adjacent human habitation. Areas include highly mobile shorefronts, due to variation of long-shore littoral drift, local currents, storms and other coastal processes.

(d) Other Areas - Note: Scenic, historic and archaeological, specimen trees, endangered and threatened species, critical wildlife habitats have been defined previously. The same criteria are used in water's edge areas as in water and land areas.

3. Specially Valued Water Areas

(a) Shellfish Beds - Estuarine bay or river bottoms (tidelands) presently supporting commercial and/or recreational fisheries for hard clams, oysters, bay scallops, and/or soft clams. These areas will include open, seasonally condemned, and/or specially restricted water quality classifications. Source areas for transplant (relays) and depuration processing are included, as well as natural and/or artificial oyster seed (spat) beds.

(b) Surf Clam - Those ocean (marine) waters within New Jersey's three mile territorial sea supporting commercially exploitable quantities of surf (sea) clams, regardless of their size. This will also include sea clam research sanctuaries established by the Bureau of Shellfisheries pursuant to the authority of N.J.S.A. 50:1-5 and adopted as N.J.A.C. 7:26-7.9, June 1974.

(c) Finfish Nursery Areas - This includes tidal bay and river (estuarine) waters known to support larval and juvenile finfishes which have commercial, recreational, or ecological importance in New Jersey. This will include most coastal estuaries with sufficient summer period dissolved oxygen levels.

(d) Prime Fishing - This category will include marine waters (within New Jersey's three mile territorial sea) and any land areas directly adjacent to water areas, which have a history of supporting a significant quantity of recreational fishing activity. This will include identifiable marine bathymetric features such as: rock outcroppings, sand ridges, depressions, swales, basins, channels, and jetties (groins). Specific land sites included are those which lie immediately adjacent to surface water areas which provide public access. Examples are: inlet throat shorelines, canal shorelines, and Deal Lake flume edge.

(e) Finfish Migratory Pathways - Waterways (rivers, streams, creeks, bays, inlets) which are known to serve as passage ways or anadromous, catadromous, or estuarine dependent fishes to or from seasonal spawning areas. Species of concern include alewife (river herring) blueback herring, American shad, American eels, and striped bass.

(f) Shipwrecks - This category includes all permanently submerged shipwrecks lying within New Jersey's three mile territorial seas, whether sunk intentionally or unintentionally through acts of war or storms, which are known to support or concentrate territorial and/or migratory finfish and lobsters for some part of the year. Also included in this category are artificial fishing reefs.

(g) Navigation - Deeper water areas presently maintained (dredged) and marked with bouys or stake markers, shown on N.O.S. charts as navigation channels.

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APPENDIX C 2

NEW JERSEY'S NOMINATED AREAS OF PUBLIC CONCERN

Table of Contents

This report was made possible by the people of New Jérsey who submitted postcards, letters, and detailed papers nominating and commenting on areas of particular concern in the New Jersey coastal zone. The American Littoral Society was particularly helpful in publicizing the request for public nominations.

The nominations were reviewed, and the report prepared by staff of the Office of Coastal Zone Management in the Department of Environmental Protection. The work was primarily performed by Martin K. Pillsbury, Andrea L. Topper and John R. Weingart.

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INTRODUCTION

As part of the Office of Coastal Zone Management's (OCZM) continuing effort to involve the public in the formation and implementation of New Jersey's coastal zone management program, OCZM solicited public suggestions for "Nominated Areas of Public Concern" (NAPC's) beginning in the fall of 1976. Over a nine month period, nominations for 176 areas were received from 140 individuals and organizations. The areas nominated were diverse, and covered the entire coastal zone, ranging from the urbanized Hudson River waterfront, to the Jersey shore, to the Delaware Bay and River waterfront. This document will explain the purpose and background of the NAPC nomination process, discuss how the nominations will be used, summarize the nominations received, and describe the regional distribution of the nominations.

Coastal planning in New Jersey, as in other states, has led to policies towara general types of areas rather than to statements on specific sites. New Jersey's Interim Land Use and Density Guidelines for the Coastal Area, for example, state that development will be "encouraged" in urban infill areas and "discouraged" in wetlands areas. In general, New Jersey's coastal zone is too large for a state agency to be able to make site-specific policies; that is more properly the function of local government.

Certain sites in the coastal zone, however, are of statewide importance and interest. Some, like New Jersye's beaches, are well known but others are familiar to fewer people. This nomination process ws intended to bring areas of regional or statewide concern to the attention of both the Office of Coastal Zone Management, and the public.

The public nomination process is also in part a response to the federal Coastal Zone Management Act of 1972 which requires that states designate "areas of particular concern within the coastal zone." Under the federal Act, states must designate two or more areas which meet sepcific criteria established in the Rules and Regulations adopted under the Act (15 CFR Part 923.13). These areas, known as "GAPC's", for "Geographic Areas of Particular Concern," will eventually be selected from the Nominated Areas. At this time, New Jersey OCZM is considering Atlantic City in Atlantic County, Higbee Beach in Cape May County, Greenwich Township in Cumberland County, and all coastal wetlands for formal GAPC designation. All NAPC's, however, will receive attention from NJ OCZM and hopefully from other appropriate government and private agencies.

PUBLIC NOMINATION PROCESS

The Office of Coastal Zone Management, in seeking the suggestions of the public, hoped that the nominations process would not only provide specific workable suggestions, but would also serve as an indicator of general public concerns about the coastal zone. The public nominations were solicited by notices in local newspapers and on radio stations, through an announcement in The Jersey Coast, the OCZM newsletter, and by a formal legal notice published in the New Jersey Register (9 N.J.R. 77). The public was asked to nominate favorite spots along the Jersey Coast, whether it be a fishing or swimming spot, an area of scenic beauty or historical value, an area in need of preservation or conservation, or an area suited to certain types of development. (See Appendix C; page 119).

The nomination process is open ended. OCZM continues to welcome public comments on specific areas. This report has been prepared to summarize the results to date.

WHAT IT MEANS TO BE AN NAPC

The Office of Coastal Zone Management has received 176 Nominations of Areas of Public Concern. The responses ranged from a single sentence on a postcard to lengthy and detailed letters and reports, some accompanied by maps and drawings.

Each nomination has been transferred to a standardized form and evaluation by OCZM staff. These forms follow page 11 of this report. In addition OCZM will share the individual evaluations and this summary report with appropriate county and municipal planning boards and environmental commissions, relevant state agencies including Green Acres and the Divisions of Water Resources, Environmental Quality, and Solid Waste Management in the Department of Environmental Protection, and the Departments of Agriculture, Community Affairs, Energy, Labor and Industry and Transportation.

OCZM's review has classified the nominations in terms of their location. Nominated aeas outside the coastal zone delineated by OCZM are classified as "Non-Coastal". The non-coastal sites will be shared with appropriate state and local agencies but are not listed in this report. In addition, a nomination is considered a "Generic NAPC" when it incudes a type of area, such as "all barrier beaches", rather than a specific site.

No further classification is made at this time. An Estuarine Contract, being performed during the next year for OCZM by Jack McCormick and Associates, will use the information submitted in the nominations to help OCZM make specific coastal policy statements.

Effective immediately, however, the nominations will automatically be included in the review process for CAFRA permit applications. After New Jersey submits the coastal zone management program to the National Oceanic and Atmospheric Administration, this information will also be included in the processing of other state and federal coastal permit programs.

OVERVIEW OF NOMINATIONS

Nominations were received for areas throughout the coastal zone, but they were concentrated in Cape May, Ocean, and Monmouth Counties. The overwhelming majority of nominations were for the preservation of conservation of natural resources or specific sites. Several were for historic sites, and several others urged agricultural preservation, creation of parks or study areas, and public acess to shore areas. Only one nomination for a development site was received.

Most nominations were submitted by interested individuals. A significant number were also submitted by local and state environmental groups, including the Audubon Society, the American Littoral Society, the Sierra Club, Citizen Association for Protection of the Environment (CAPE), Save Our River Environment (SORE), Committee for a Better Environment, and the New Jersey Conservation Foundation. Several were submitted by county planning boards and environmental agencies and municipal governments and environmental commissions. A number of nominations of the Palisades by the Wave Hill Center for Environmental Studies in New York, and of New Jersey's barrier islands by the Barrier Beach Worrkshop in Washington.

The request for public nominations was designed to bring important areas to the state's attention. It was not a vote or popularity contest. Nevertheless, it is interesting to note that 28 sites received more than one nomination. The largest number (33) was received by Ocean Crest State park, apparently as the result of an organized campaign on behalf of the park. The other sites nominated by three or more people are:

Pine Barrens	8
Higbee Beach	7
Sandy Hook	4
Hackensack Meadowlands .	4
Stone Harbor Point	4
Great Egg Harbor River	4
Natco Lake	4
Passaic River	3

The list of multiple nominations shows that some of the most environmentally sensitive and valuable sites throughout the coastal zone have been identified by the public. Development proposals at several of these sites have been the subject of considerable controversy.

Most nominations received expressed a concern for the appropriate use of the site. The nominations have been grouped according to the uses which have been suggested for them as most appropriate by the nominators. The use groups are:

1. Preservation -- The concern in these nominations is the preservation and/or conservation of valuable natural resources, such as marsh land, prime forests, endangered species, water quality, and wildlife habitats. These nominations are primarily concerned with the maintenance of the quality of the ecosystem.

2. Historic -- These nominations suggested the preservation of historically significant sites or areas. Landmarks, houses, cemeteries, and entire historic districts have been nominated.

3. Recreation -- These nominations are concerned with one of the following aspects of recreation: (a) acquisition of land or water areas with high recreation use potential; (b) improved maintenance of existing recreation facilities; or (c) improved public access to existing or potential recreation sites, typically at the water's edge.

4. Visual -- Some nominations were concerned with the maintenance of the scenic beauty of an area, or the visual and aesthetic quality of a site. These were usually either outstanding natural areas, or pockets of scenic beauty near urbanized areas which are seen as a necessary visual buffer around dense development.

5. Other -- Almost all of the nominations fall into one of the above four categories. The remaining few cover topics including creation of study areas, public utilities development, and extending the CAFRA boundary to new areas.

The following page contains a summary of the nominations received in each county, as well as the generic nominations, showing the breakdown among the five use groups.

SUMMARY OF NOMINATIONS BY COUNTY

This section briefly describes the types of nominations received for each county in the coastal zone. The northeastern counties of Bergen, Essex, Hudson, and Union are grouped in one category called the Northeast Waterfront.

Northeast Waterfront (15 nominations)

More than in any of the other counties, the nominations in the Northeast Waterfront counties reflected a concern for open space, recreation opportunities, and visual amenity. Many urban waterfront lands were nominated for their potential contribution to urban open space and recreation, and as a buffer for development.

1. Hackensack Meadowlands
2. Passaic River Bank
3. Palisades
4. Paramus site
5. Paramus site
6. Ridgewood site
7. Hackensack River (tidal)
8. Hudson estuary
9. Passaic estuary
10. Hackensack estuary
11. Passaic River floodplain
12. Weehawken riverfront sites
13. North Bergen riverfront sites
14. Hoboken riverfront sites
15. Hudson waterfront

Middlesex (14)

Eleven of the fourteen nominations in Middlesex county were concerned with preservation. Of these, four identified the Raritan River or Bay; the balance identified other streams, ponds or flood plain areas.

1. Raritan River
2. Smith Creek - Sewaren
3. South Amboy tidal area
4. Henderson Woods/Morgan landfill
5. Jamesburg Park
6. Old Bridge - Historic district
7. Lawrence Brook
8. Weston Mills Pond

9. Helmetta Pond
10. Pidgeon Swamp & Burnt Fly Bog
11. Metuchen site
12. Old Bridge - Old Provost Cemetery
13. Raritan Bay
14. Helmetta woods & bog

Monmouth (25)

Half of Monmouth County's nominations were for preservation and conservation. Most of these focused on water bodies such as Sandy Hook Bay, Raritan Bay, the Shrewsbury and Navesink Rivers, and wetlands. Interest was also expressed in historic sites in Atlantic Highlands, Keyport, and Eatontown. The Natco Lake area, which received three nominations for preservation, is the site of a CAFRA application. These nomintions have been included in the CAFRA permit review.

1. Keyport
2. Sandy Hook
3. Navesink estuary
4. Shark River estuary
5. Wetland tract (2160)
6. Wetland tract (2166)
7. Henry Hudson Springs
8. Atlantic Highlands Site
9. Long Branch Site
10. Monmouth Beach Site
11. Coastal jetties
12. Port Monmouth site
13. Wampum Lake district
14. Middletown site
15. Natco Lake area
16. Atlantic Highlands
17. Manasquan - Yard tract
18. Navesink & Shrewsbury Island
19. Swimming River shoreline
20. Horseshoe Cove, Sandy Hook
21. Shrewsbury estuary
22. Wreck Pond
23. Rumson Peninsula
24. Raritan Bay shore
25 Deal, West End, Elberon, Long Branch beaches.

Ocean (32)

Twnety-three of Ocean County's 32 nominations were for preservation. Most often nominated were Long Beach Island and its beaches, Barnegat Bay, and Little Egg Harbor and its shoals and marshes. The beaches of Lavallette, Mantoloking, and Bay Head were identified for the need for better public access. The unique pygmy pines (upper and lower plains) in the Pine Barrens were also nominated.

1. Long Beach Island beaches
2. Manahawkin site
3. Upper & Lower Plains
4. Goose Creek
5. Riverview Point
6. Sedge Island
7. Toms River riverbanks
8. Dillon Creek
9. Mantoloking, Lavallette, and Bayhead (beach access)
10. Pt. Pleasant to Island Beach State Park
11. Harvey Cedars marsh
12. Kettle Creek (Bricktown) site
13. Pt. Pleasant Boro site
14. Oyster Creek (north bank) & Barnegat Bay shore
15. Forked River Beach site
16. Old Forked River Airport area - east
17. Old Forked River Airport area - north
18. South Seaside Park - marsh
19. Barnegat Bay - west shore
20. Barnegat Bay islands
21. Marsh - west of Long Beach Island
22. Little Egg Harbor
23. Manahawkin Bay
24. Barnegat Bay
25. Tract near Lebanon State Forest
26. Egg Harbor Bay marshes
27. Long Beach Island
28. Island in Great Bay
29. Beaches, Island Beach State Park south to Ocean Beach
30. Tuckerton Marsh
31. Great Bay
32. Island Beach Sedge Islands

Burlington (East) (4)

The eastern (Atlantic Watershed) portion of Burlington County received nominations for its major rivers, the Mullica River, Oswego River, and Wading River watershed. All nominations were for preservation.

1. Oswego River & Lake
2. Sim Place tract
3. Wading River watershed
4. Mullica River

Atlantic (2)

Atlantic County received 12 nominations, 9 of which were for preservation. These included the Great Egg Harbor River, the wetlands, ocean beaches, and several inland wildlife sites. One nomination identified the area between Atlantic City and the mainland, citing the increased pressure for development on this wetland area due to the approval of the Casino referendum.

The only nomination for a development site is in Atlantic County. This is City Island, nominated by the Atlantic County Sewerage Authority because of its suitability for public utilities development.

1. City Island - southern half
2. Great Egg Harbor River
3. Great Blue Heron Rookery
4. Mattix Run
5. Great Creek Bog
6. Maple Run Creek
7. Longport Sod banks
8. Gull Island
9. Area between Atlantic City & mainland
10. Inlet, waterway shores - Atlantic City to Longport
11. Coast of North Brigantine
12. Weymouth Lake - wooded tract
13. Egg Harbor Bay marshes

Cape May (35)

This county received 35 nominations -- the largest number of any county in the State. Twenty-two were for preservation, including Higbee Beach, Pond Creek, Stone Harbor Point, Avalon Dunes, Ocean Crest State Park, Gravens Island, several swamps and bogs, the ocean beaches, the bay shore, and the wetlands. Cape May City and North Wildwood were nominated for their visual amenity and character. Five historic zones were also identified. Higbee Beach and Stone Harbor Point have been the subjects of recent CAFRA permit decisions.

1. Higbee Beach
2. Great Cedar Swamp
3. Timber Beaver Swamp
4. Cedar Island
5. Flood Prone areas
6. Bay shoreline
7. Barrier Beach south of Wildwood Crest
8. Coast Guard Base
9. Whale Beach
10. Stone Harbor Point
11. Pond Creek
12. Cape May Canal
13. Bennett's Bog
14. Cooper's Swamp
15. Avalon Dunes
16. Strathmere Beach
17. Ocean front wetlands
18. North Graven's Island
19. Cape May/North Wildwood
20. Cape May City
21. Cape May Pointl.
22. Cape May Court House
23. Dennisville

24. Route 9 corridor
25. North Wildwood to Cape May Point beaches
26. Lower Township, Cape May City area
27. Ocean Crest State Park
28. Coastal waters, bays, wetlands, floodways
29. Agricultural areas
30. Shoreline, beach areas
31. Sally Marshall Crossing
32. High's Beach
33. Nummy Island
34. Reed's Beach
35. Cedar Islands

Cumberland (13)

Twelve of Cumberland County's thirteen nominations were for preservation, including the Delaware Bay and its shroeline and wetlands, the Maurice and Cohansey Rivers, and several lowland swamp forests. The towns of Greenwich and Othello were nominated for their historic value.

1. Cohansey waterbed
2. Bear Swamp
3. Hansey Creek Swamp
4. Garrens Neck Swamp
5. Maurice River watershed
6. Indian Head
7. Greenwich & Othello
8. Delaware Bay Oyster Seed Beds
9. Delaware Bay marshes
10. Delaware Bay shoreline
11. Delaware Bay mudflats
12. Dividing Creek
13. Maurice River - Millville Site

Salem (4)

All four nominations in Salem County were for preservation. Parvin State Park, Mannington Meadow and the Delaware River coastal lands were identified.

1. Parvin State Park
2. Delaware River shoreline
3. Mannington Meadows
4. Islands in Mannington Meadow & agricultural land (Delaware Bay shoreline)

Gloucester (1)

Gloucester County's one nomination was for preservation of the banks of Racoon Creek. The Delaware River banks were also mentioned in a nomination for Salem County's riverfront lands.

1. South bank Racoon Creek (Delaware River shoreline)

Camden (5)

The principal rivers and streams of Camden County were nominated for preservation, including the Delaware River, Pennsauken Creek, Cooper River, Newton Creek and Big Timber Creek.

1. Delaware River Shoreline
2. Pennsauken Creek
3. Cooper River System
4. Newton Creek
5. Big Timber Creek

Burlington (West) (6)

The western (or Delaware Watershed) portion of Burlington County received two preservation nominations, including Rancocas Creek, and four for recreation, including Rancocas State Park and Sylvan Lane.

1. Plum Point
2. Rancocas State Park
3. Sylvan Lake
4. Rancocas Creek waterbed
5. Moorestown Site
6. Moorestown Site

Generic (10)

Nine preservation nominations were received for "generic" types, including the pine barrens, coastal waters, barrier islands, wildlife areas, and wetlands. One nomination urged restricting high rise development at the Jersey shore.

1. Pine Barrens
2. Coastal waters/N.Y. Bight
3. N.J. watershed
4. Wildlife areas
5. Barrier islands
6. Wetlands
7. Atlantic Basin watersheds
8. Jersey Shore (no high-rises)
9. Prime Forest area
10. Streams, rivers, swamps, wetlands, bays, ocean

CONCLUSION

This public nomination process cannot insure that the areas nominated will automatically assume the character or use suggested. Decisions affecting the areas nominated are not made only by state agencies. Private interests, municipal bodies, and, in many cases, county and/or federal authorities also determine the future of coastal areas. Bringing specific areas to public attention, however, will serve as a guide and a catalyst to OCZM and other agencies charged with making land use decisions.

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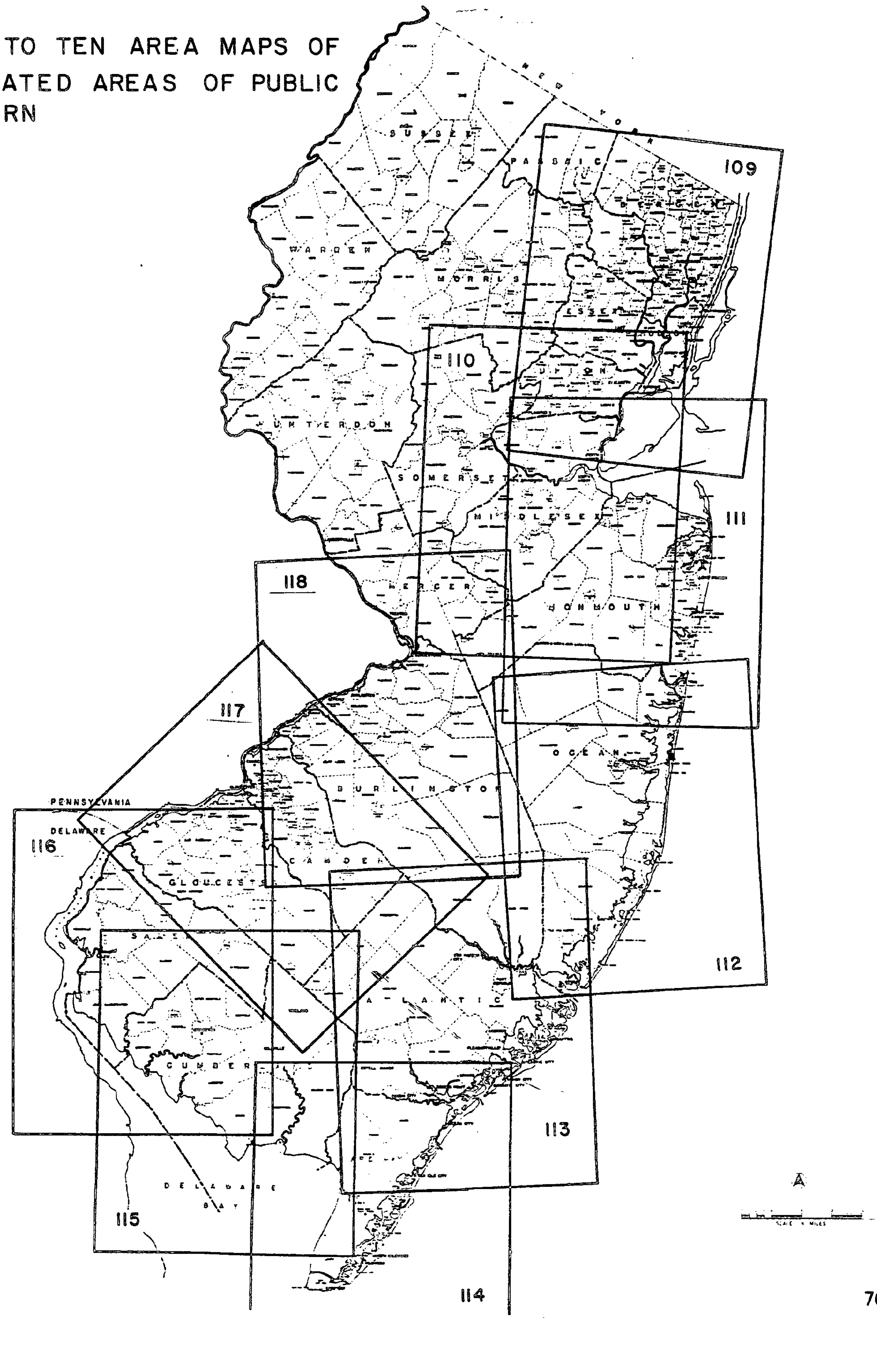
Summary of N.A.P.C. Nominations

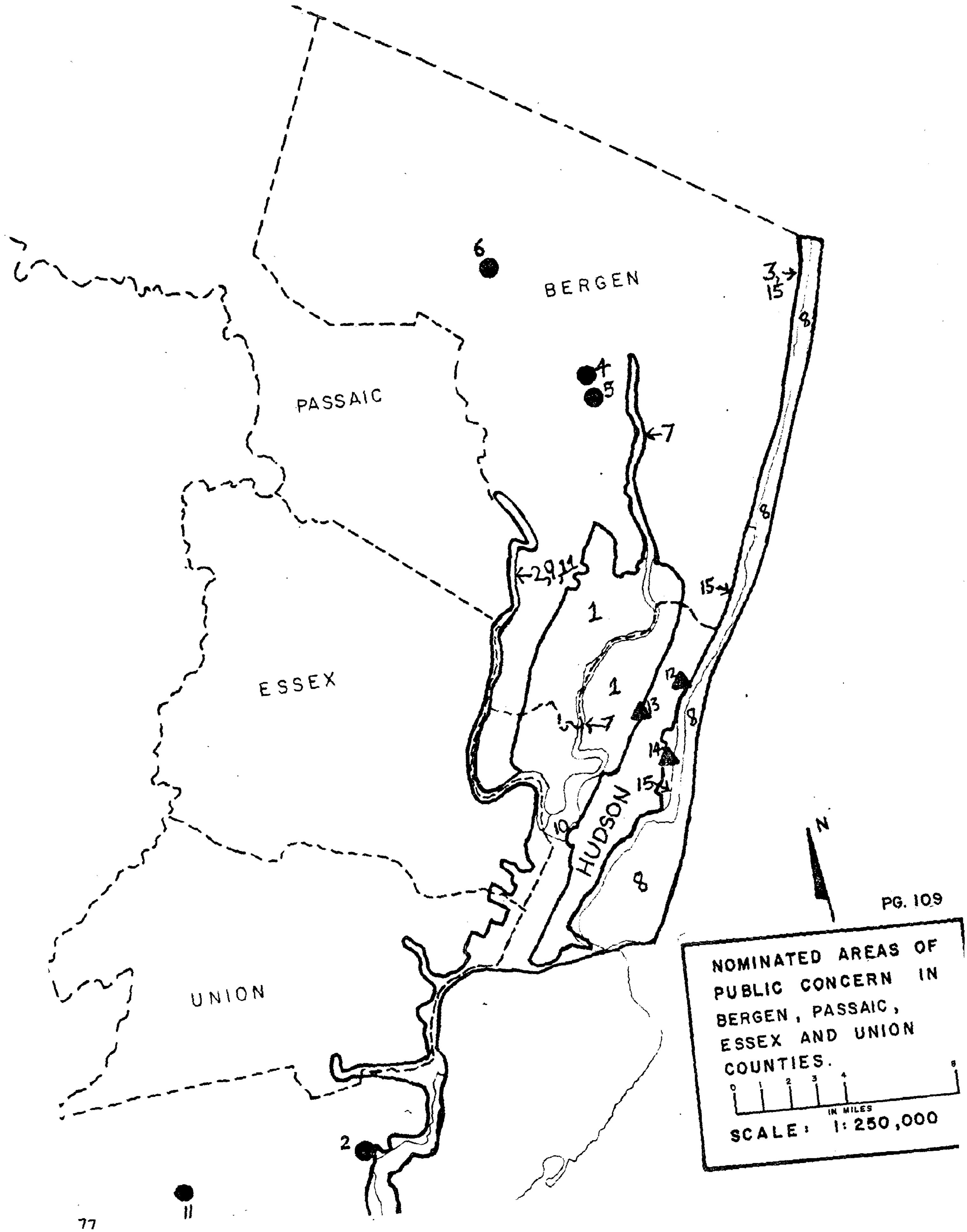
	Preser-vation	Historic	Recreation	Visual	Other	Total
Northeast Waterfront	9		5	1		15
Middlesex	11	2	1			14
Monmouth	12	5	4	2	2	25
Ocean	26		5		1	32
Burlington (East)	4					4
Atlantic	9	1	1		1	12
Cape May	26	5	2	1	1	35
Cumberland	12	1				13
Salem	3					4
Gloucester	1					1
Camden	5					5
Burlington (West)	2		4			6
Generic	9				1	10
TOTAL	130	14	21	4	7	176

REPRINTED FROM DEP-OCZM REPORT

The results of the nomination process demonstrate the public concern and interest in the management of New Jersey's coastal resources. Preservation is, in fact, the dominant use suggested for the nominated areas, even though the request for nominations specifically invited suggestons for development locations. Also, the preservation emphasis was strong even though OCZM sent the request for nominations to the 5,000 people on the OCZM mailing list, which includes federal, state and local agencies, interest groups ranging from buidlers associations to energy related industry to environmental groups, and other interested individuals. The NAPC process is clearly not a scientific test of public sentiment, but it does indicate a strong public concern for preservation and conservation in the management of the New Jersey coast.

INDEX TO TEN AREA MAPS OF NOMINATED AREAS OF PUBLIC CONCERN

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PASSAIC
ESSEX
UNION
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NOMINATED AREAS OF PUBLIC CONCERN IN BERGEN, PASSAIC, ESSEX AND UNION COUNTIES.
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IN MILES
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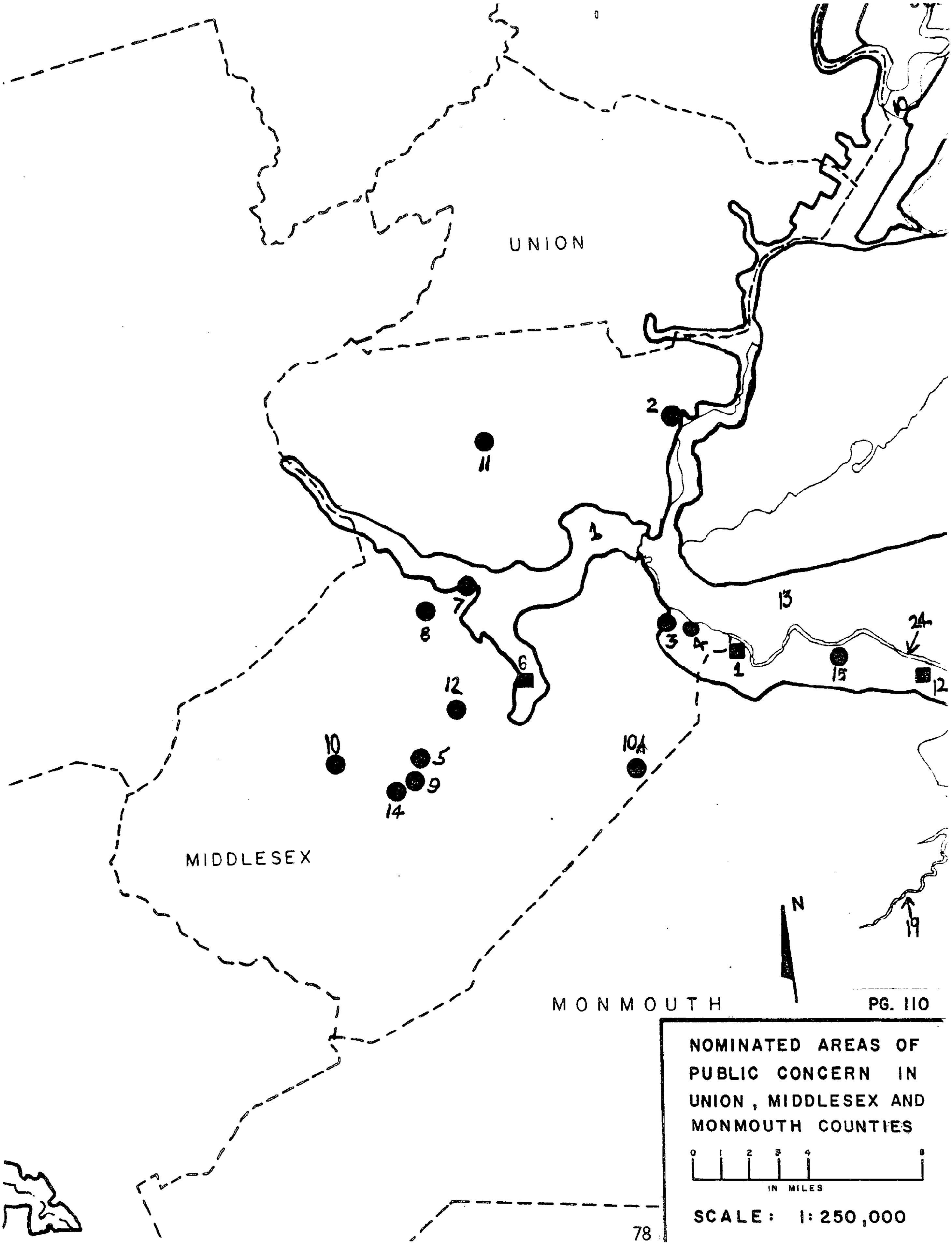
UNION
MIDDLESEX
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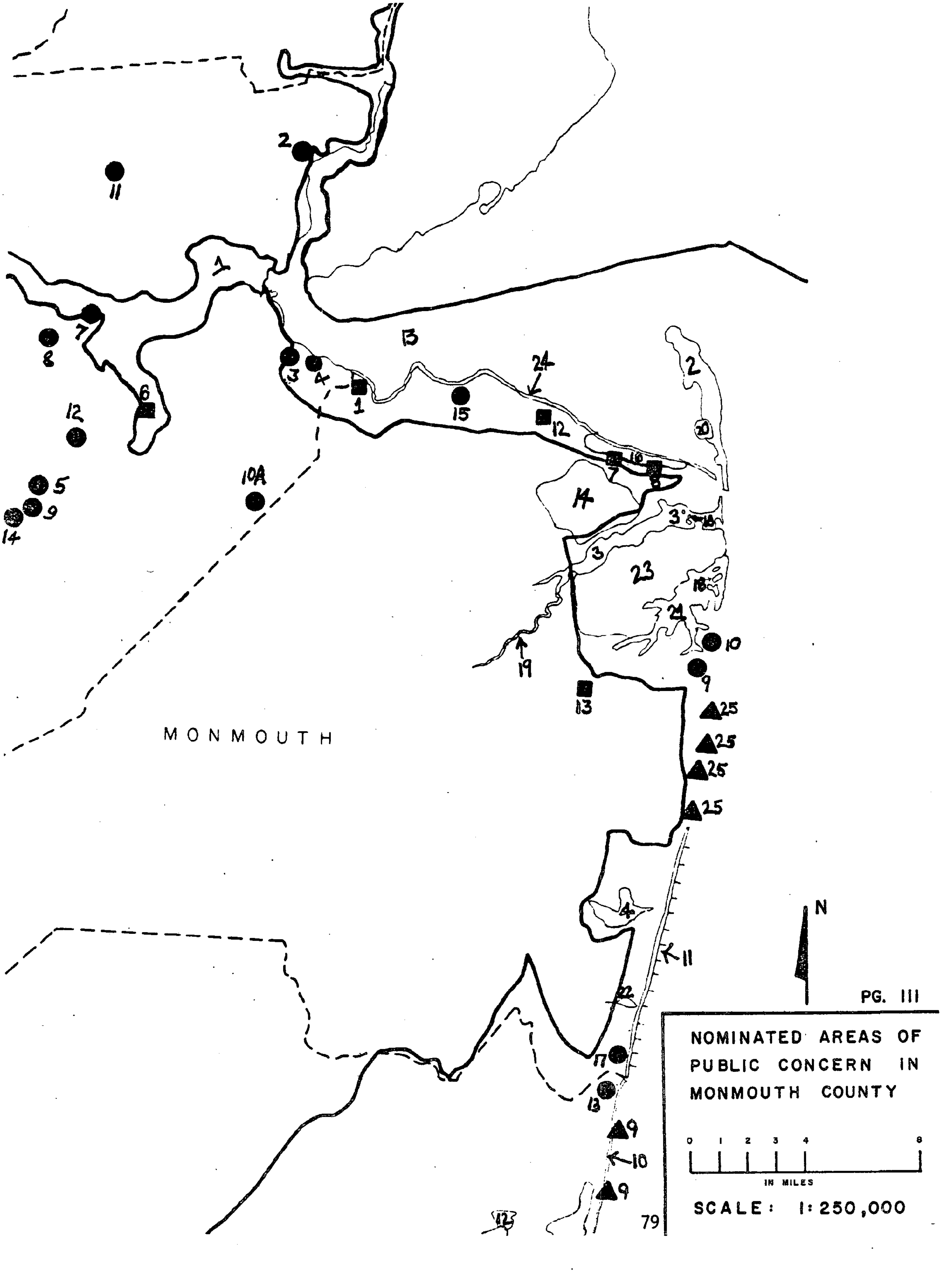
19
PG. 110
NOMINATED AREAS OF PUBLIC CONCERN IN UNION, MIDDLESEX AND MONMOUTH COUNTIES
0 1 2 3 4 8
IN MILES
SCALE: 1:250,000



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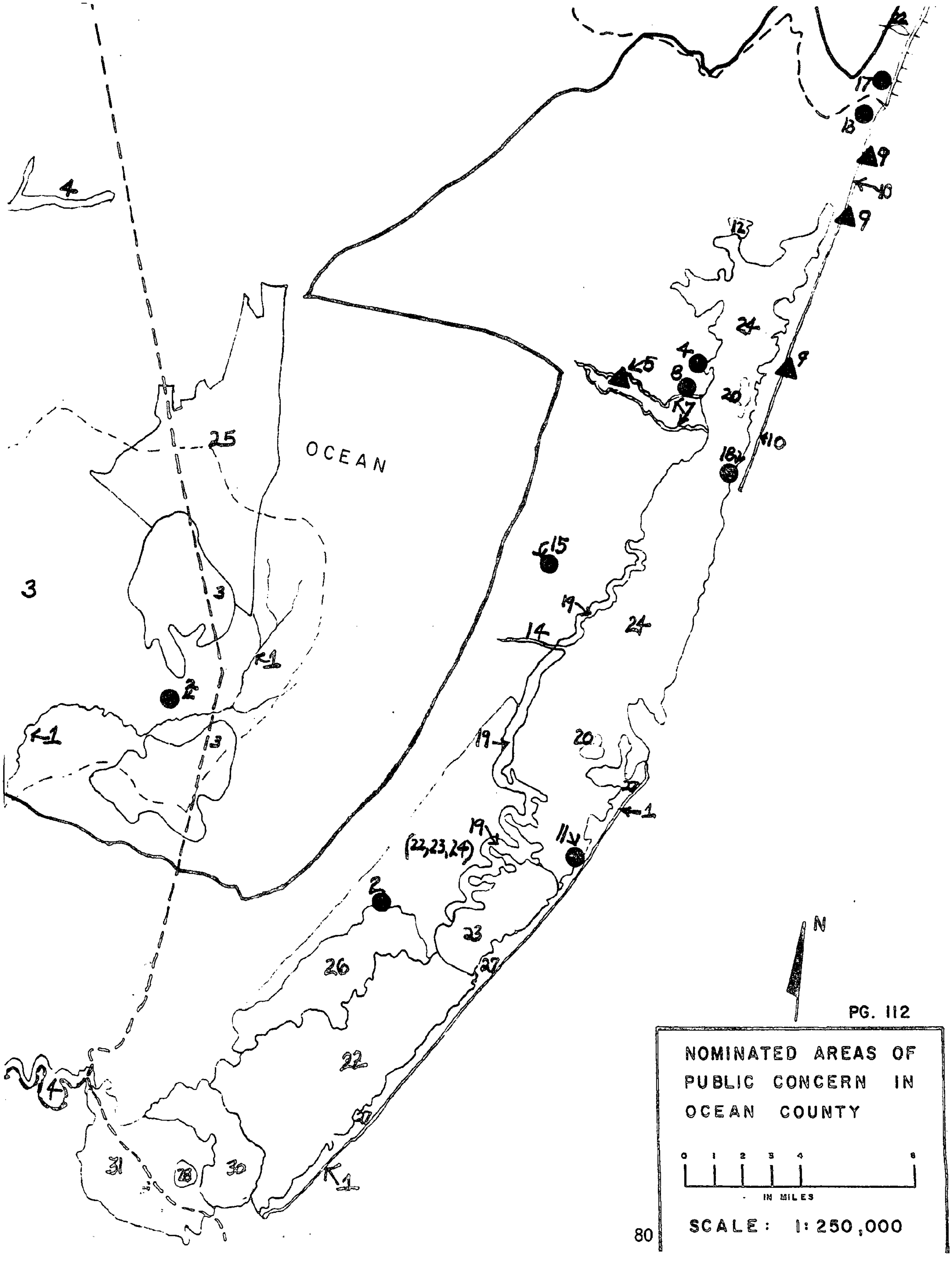
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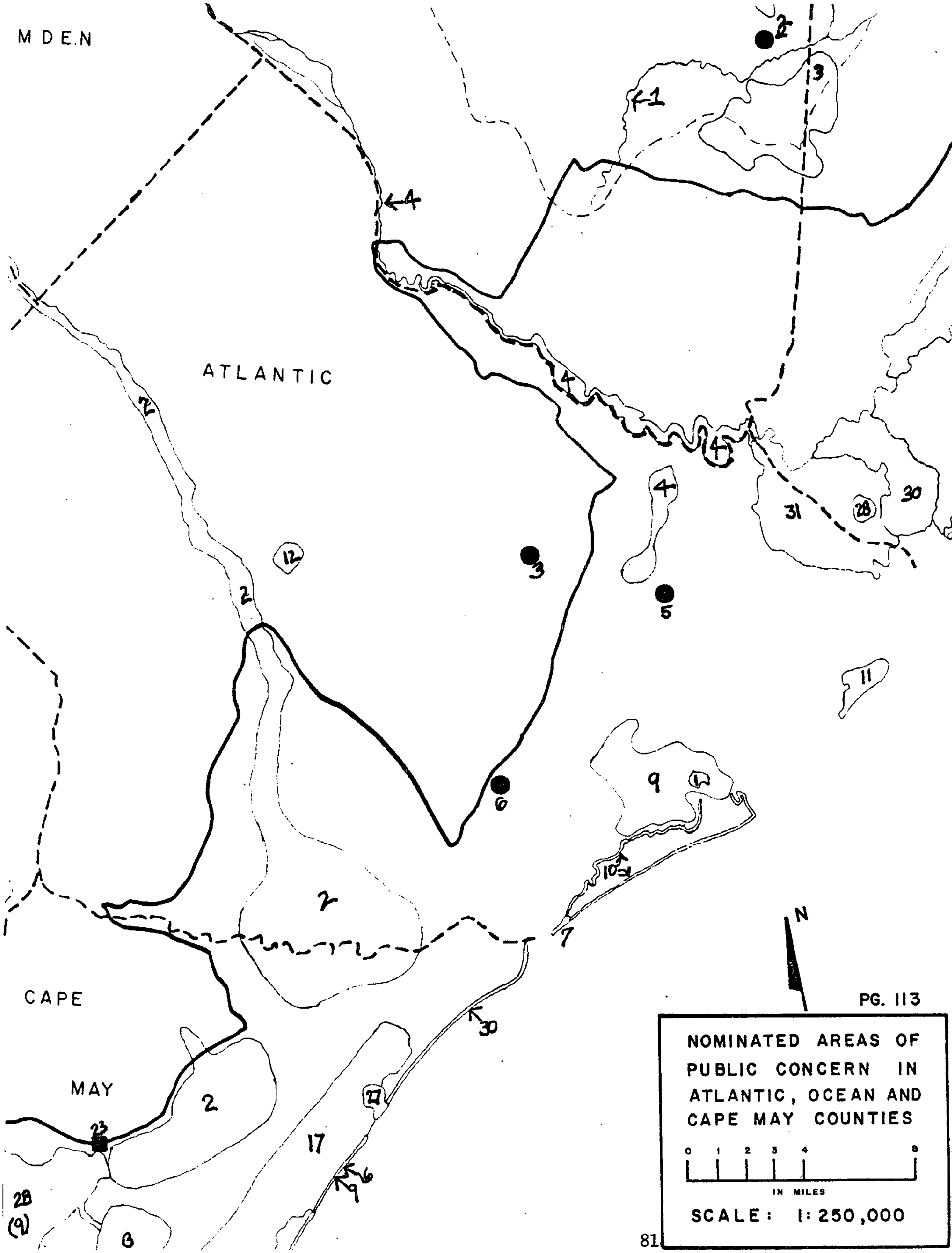

PG. 113

NOMINATED AREAS OF PUBLIC CONCERN IN ATLANTIC, OCEAN AND CAPE MAY COUNTIES

0 1 2 3 4 8

IN MILES

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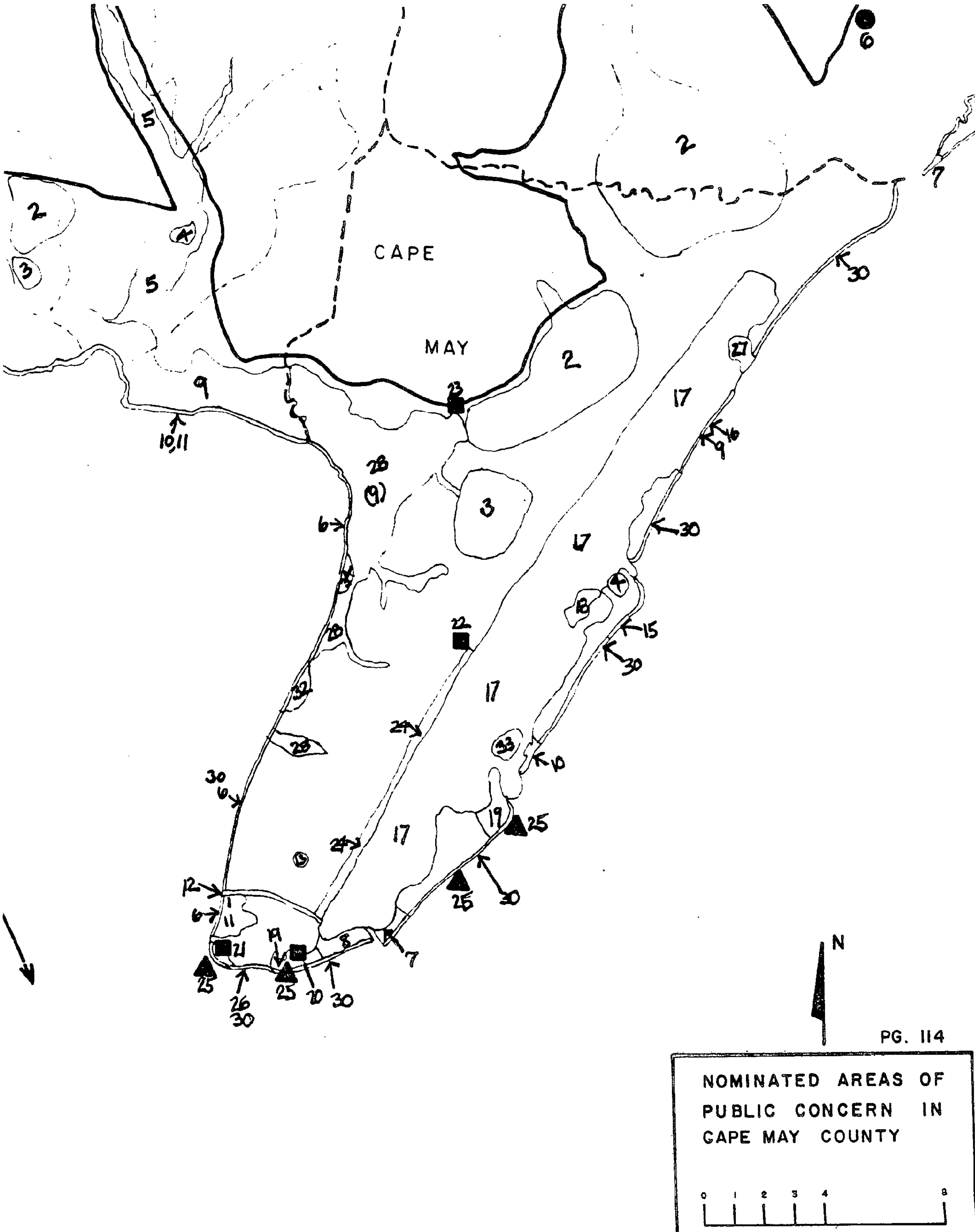
CAPE
MAY
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CAPE MAY COUNTY
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IN MILES
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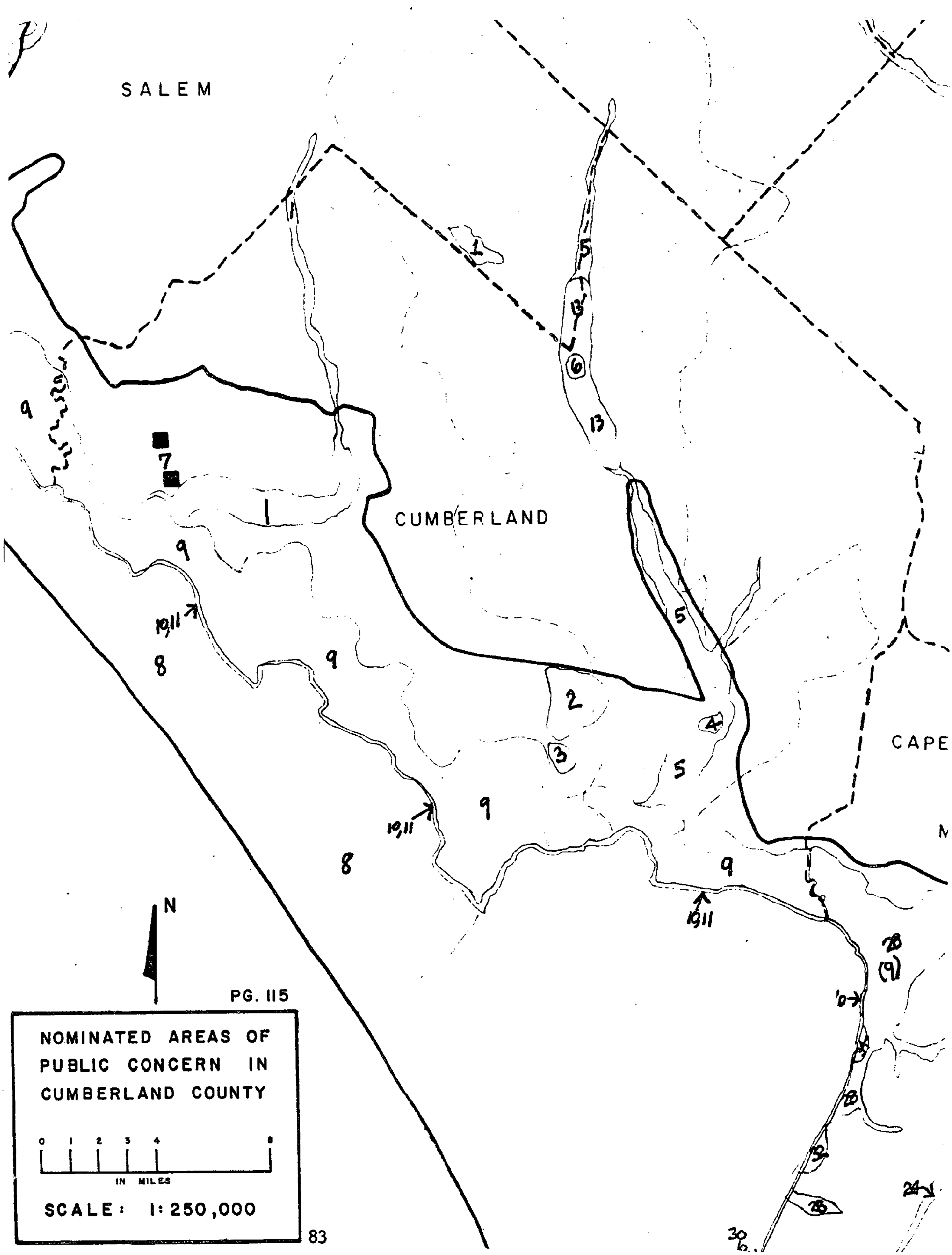
SALEM
CUMBERLAND
CAPE
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PG. 115
NOMINATED AREAS OF PUBLIC CONCERN IN CUMBERLAND COUNTY
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IN MILES
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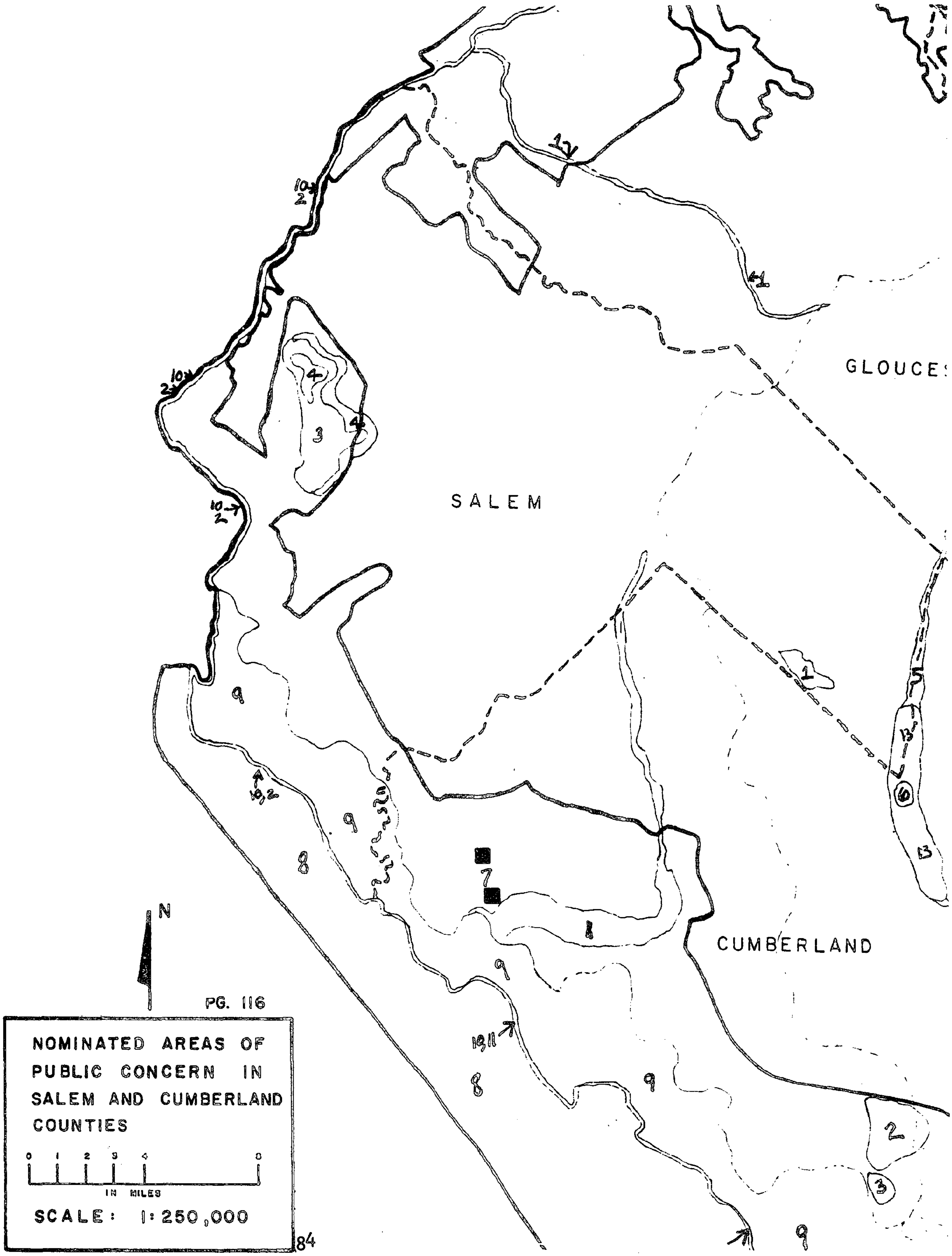
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SALEM
CUMBERLAND
N
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NOMINATED AREAS OF PUBLIC CONCERN IN SALEM AND CUMBERLAND COUNTIES
IN MILES
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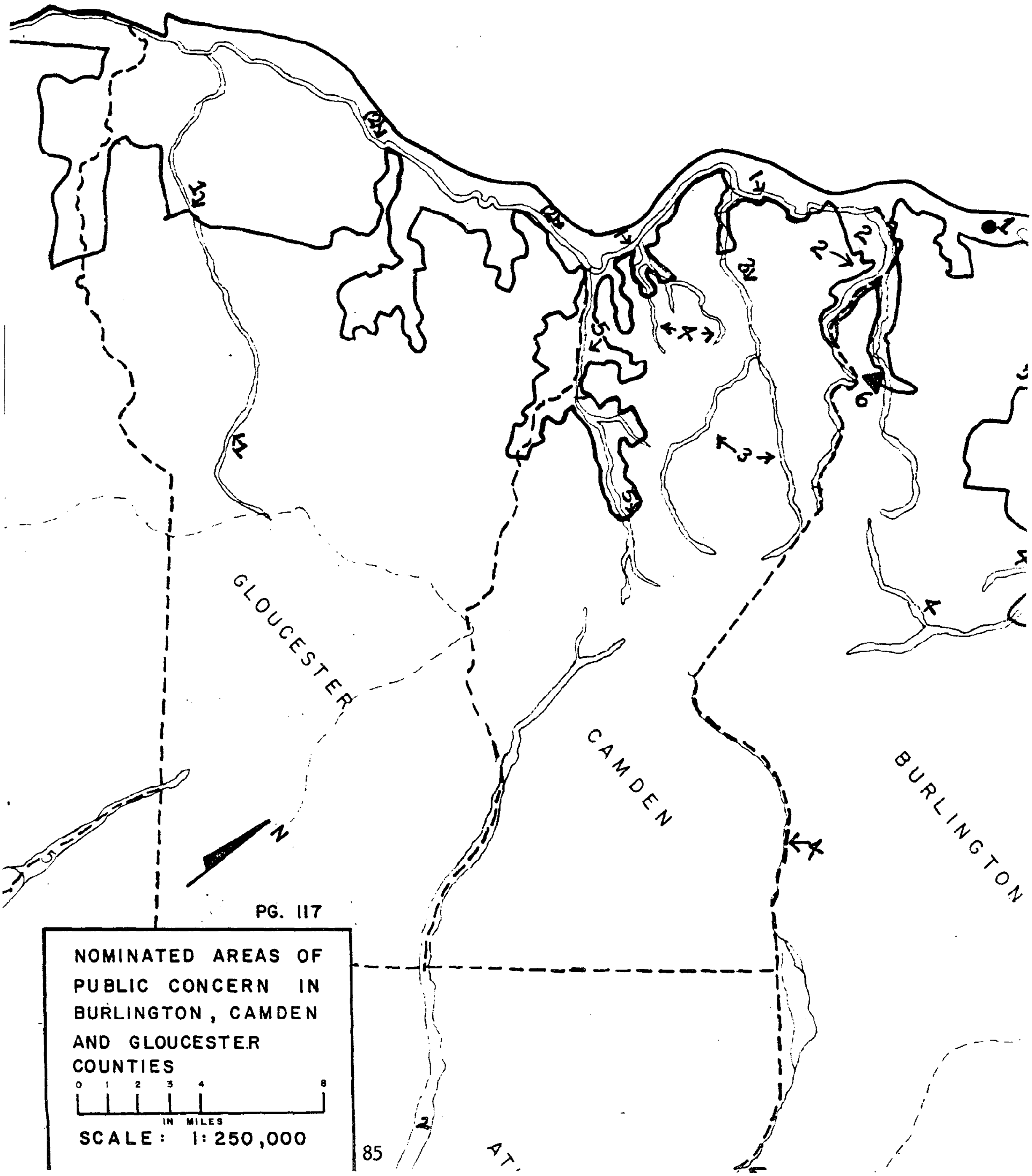
GLOUCESTER
CAMDEN
BURLINGTON
N
PG. 117
NOMINATED AREAS OF PUBLIC CONCERN IN BURLINGTON, CAMDEN AND GLOUCESTER COUNTIES
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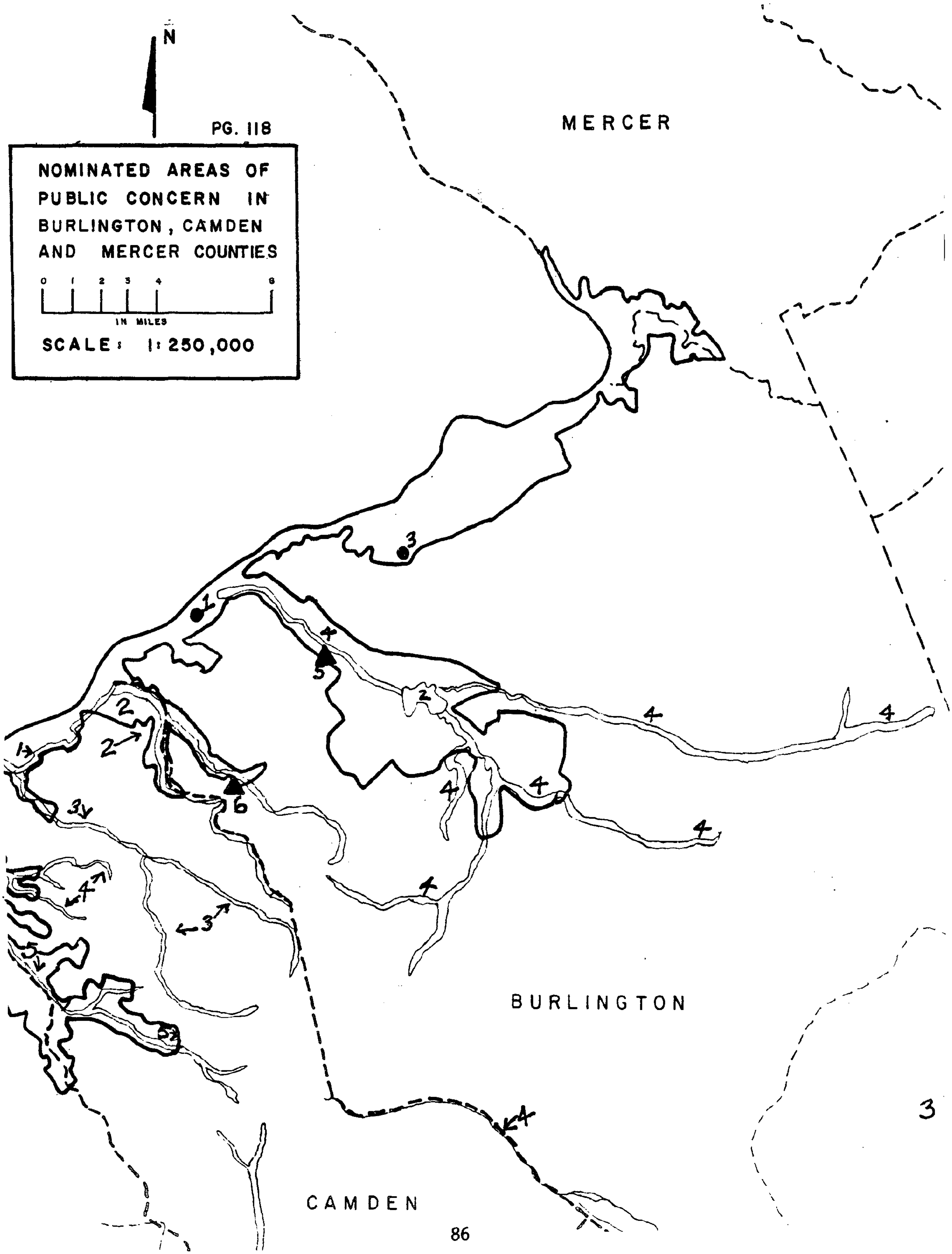
IN MILES
SCALE: 1:250,000



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PG. 118
NOMINATED AREAS OF PUBLIC CONCERN IN BURLINGTON, CAMDEN AND MERCER COUNTIES
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IN MILES
SCALE: 1:250,000
MERCER
BURLINGTON
CAMDEN
3

APPENDIX D

Background for Section 5a

Environmental Constraint Synthesis

Constraint Subtypes and Rankings

These matrices list all possible combinations of constraint factors and assign to each an intratype ranking, indicating the relative constraint of subtypes within minor constraint types, and an intertype ranking indicating the relative constraint of the subtypes between minor land or water types.

Figure : <u>Upland Constraint Types</u> SHWT 5+

	DISTURBANCE					AGRICULTURAL CAPABILITY			PERMEABILITY			CONSTRAINT RANKING	
	HIGH		MEDIUM	LOW								UPLAND	LAND
	High Quality	Low Quality		Forest	Prime Forest	Low	Med	High	Low	Med	High	Ranking (1=low)	Ranking (1=low)
1	x											5	10
2		x										1	1
3			x			x			x			1	1
4			x			x				x		1	1
5			x			x					x	2	2
6			x				x		x			1	1
7			x				x			x		2	2
8			x				x				x	2	2
9			x					x	x			3	4
10			x					x		x		3	4
11			x					x			x	4	7
12				x		x			x			2	2
13				x		x				x		2	2
14				x		x					x	3	4
15				x			x		x			2	2
16				x			x			x		3	4
17				x			x				x	3	4
18				x				x	x			3	4
19				x				x		x		4	7
20				x				x			x	4	7
21					x	x			x			3	4
22					x	x				x		3	4
23					x	x					x	4	7
24					x		x		x			3	4
25					x		x			x		3	4
26					x		x				x	4	7
27					x			x	x			4	7
28					x			x		x		4	7
29					x			x			x	4	7

Figure____: Dry and Wet Terrace Constraint Types

	DISTURBANCE					AGRICULTURAL CAPABILITY			PERMEABILITY		BANK RANK	SHWT 3 - 5 UPPER BANK LAND RANK	SHWT 1 - 3 LOWER BANK LAND RANK
	HIGH		MEDIUM	LOW									
	High Quality	Low Quality		Forest	Prime Forest	Low	Med	High	Med	Other			
1	x										5	10	10
2		x									1	2	4
3			x			x			x		1	2	4
4			x			x				x	2	3	5
5			x				x		x		1	2	4
6			x				x			x	2	3	5
7			x					x	x		3	4	6
8			x					x		x	4	7	7
9				x		x			x		2	3	5
10				x		x				x	3	4	6
11				x			x		x		2	3	5
12				x			x			x	3	4	6
13				x				x	x		3	4	6
14				x				x		x	4	7	7
15					x	x			x		3	4	6
16					x	x				x	3	4	6
17					x		x		x		3	4	6
18					x		x			x	4	7	7
19					x			x	x		4	7	7
20					x			x		x	4	7	7

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
1	x								x					x				x				--			--		1	7
2	x								x					x					x			--			--		1	7
3	x								x					x						x		--			--		2	8
4	x								x						x			x				--			--		2	8
5	x								x						x				x			--			--		2	8
6	x								x						x					x		--			--		2	8
7	x								x							x		x				--			--		3	9
8	x								x							x			x			--			--		3	9
9	x								x							x				x		--			--		3	9
10	x								x								x	x				--			--		4	10
11	x								x								x		x			--			--		4	10
12	x								x								x			x		--			--		4	10
13	x									x				x				x				--			--		2	8
14	x									x				x					x			--			--		2	8
15	x									x				x						x		--			--		2	8
16	x									x					x			x				--			--		2	8
17	x									x					x				x			--			--		2	8
18	x									x					x					x		--			--		2	8
19	x									x						x		x				--			--		3	9
20	x									x						x			x			--			--		3	9
21	x									x						x				x		--			--		3	9
22	x									x							x	x				--			--		4	10
23	x									x							x		x			--			--		4	10
24	x									x							x			x		--			--		4	10
25	x										x			x				x				--			--		2	8
26	x										x			x					x			--			--		2	8
27	x										x			x						x		--			--		2	8
28	x										x				x			x				--			--		3	9
29	x										x				x				x			--			--		3	9
30	x										x				x					x		--			--		3	9
31	x										x					x		x				--			--		3	9
32	x										x					x			x			--			--		3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Elevation: Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Mobility: Dune	Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
33	x										x					x				x							3	9
34	x										x						x	x									4	10
35	x										x						x		x								4	10
36	x										x						x			x							4	10
37	x											x		x				x									3	9
38	x											x		x					x								3	9
39	x											x		x						x							3	9
40	x											x			x			x									3	9
41	x											x			x				x								3	9
42	x											x			x					x							3	9
43	x											x				x		x									3	9
44	x											x				x			x								3	9
45	x											x				x				x							3	9
46	x											x					x	x									4	10
47	x											x					x		x								4	10
48	x											x					x			x							4	10
49	x												x														4	10
50		x							x					x				x			x			x			1	7
51		x							x					x				x			x				x		2	8
52		x							x					x				x			x					x	3	9
53		x							x					x				x				x		x			1	7
54		x							x					x				x				x			x		2	8
55		x							x					x				x				x				x	3	9
56		x							x					x				x					x	x			2	8
57		x							x					x				x					x		x		2	8
58		x							x					x				x					x			x	3	9
59		x							x					x					x		x			x			1	7
60		x							x					x					x		x				x		2	8
61		x							x					x					x		x					x	3	9
62		x							x					x					x			x		x			1	7
63		x							x					x					x			x			x		2	8
64		x							x					x					x			x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
65		x							x					x					x				x	x			2	8
66		x							x					x					x				x		x		2	8
67		x							x					x					x				x			x	3	9
68		x							x					x						x	x			x			3	9
69		x							x					x						x	x				x		3	9
70		x							x					x						x	x					x	3	9
71		x							x					x						x		x		x			3	9
72		x							x					x						x		x			x		3	9
73		x							x					x						x		x				x	3	9
74		x							x					x						x			x	x			3	9
75		x							x					x						x			x		x		3	9
76		x							x					x						x			x			x	3	9
77		x							x						x			x			x			x			2	8
78		x							x						x			x			x				x		2	8
79		x							x						x			x			x					x	3	9
80		x							x						x			x				x		x			2	8
81		x							x						x			x				x			x		2	8
82		x							x						x			x				x				x	3	9
83		x							x						x			x					x	x			2	8
84		x							x						x			x					x		x		3	9
85		x							x						x			x					x			x	3	9
86		x							x						x				x		x			x			2	8
87		x							x						x				x		x				x		2	8
88		x							x						x				x		x					x	3	9
89		x							x						x				x			x		x			2	8
90		x							x						x				x			x			x		2	8
91		x							x						x				x			x				x	3	9
92		x							x						x				x				x	x			2	8
93		x							x						x				x				x		x		3	9
94		x							x						x				x				x			x	3	9
95		x							x						x					x	x			x			3	9
96		x							x						x					x	x				x		3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
97		x							x						x					x	x					x	3	9
98		x							x						x					x		x		x			3	9
99		x							x						x					x		x			x		3	9
100		x							x						x					x		x				x	3	9
101		x							x						x					x			x	x			3	9
102		x							x						x					x			x		x		3	9
103		x							x						x					x			x			x	3	9
104		x							x							x		x			x			x			3	9
105		x							x							x		x			x				x		3	9
106		x							x							x		x			x					x	3	9
107		x							x							x		x				x		x			3	9
108		x							x							x		x				x			x		3	9
109		x							x							x		x				x				x	3	9
110		x							x							x		x					x	x			3	9
111		x							x							x		x					x		x		3	9
112		x							x							x		x					x			x	3	9
113		x							x							x			x		x			x			3	9
114		x							x							x			x		x				x		3	9
115		x							x							x			x		x					x	3	9
116		x							x							x			x			x		x			3	9
117		x							x							x			x			x			x		3	9
118		x							x							x			x			x				x	3	9
119		x							x							x			x				x	x			3	9
120		x							x							x			x				x		x		3	9
121		x							x							x			x				x			x	3	9
122		x							x							x				x	x			x			3	9
123		x							x							x				x	x				x		3	9
124		x							x							x				x	x					x	3	9
125		x							x							x				x		x		x			3	9
126		x							x							x				x		x			x		3	9
127		x							x							x				x		x				x	3	9
128		x							x							x				x			x	x			3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
129		x							x						x					x			x	x			3	9
130		x							x						x					x			x		x		3	9
131		x							x											x			x			x	3	9
132		x							x								x		x								4	10
133		x								x				x				x			x			x			2	8
134		x								x				x				x			x				x		2	8
135		x								x				x				x			x					x	3	9
136		x								x				x				x				x		x			2	8
137		x								x				x				x				x			x		3	9
138		x								x				x				x				x				x	3	9
139		x								x				x				x					x	x			2	8
140		x								x				x				x					x		x		3	9
141		x								x				x				x					x			x	3	9
142		x								x				x					x		x			x			2	8
143		x								x				x					x		x				x		2	8
144		x								x				x					x		x					x	3	9
145		x								x				x					x			x		x			2	8
146		x								x				x					x			x			x		2	8
147		x								x				x					x			x				x	3	9
148		x								x				x					x				x	x			2	8
149		x								x				x					x				x		x		3	9
150		x								x				x					x				x			x	3	9
151		x								x				x						x	x			x			3	9
152		x								x				x						x	x				x		3	9
153		x								x				x						x	x					x	3	9
154		x								x				x						x		x		x			3	9
155		x								x				x						x		x			x		3	9
156		x								x				x						x		x				x	3	9
157		x								x				x						x			x	x			3	9
158		x								x				x						x			x		x		3	9
159		x								x				x						x			x			x	3	9
160		x								x					x			x			x			x			3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
161		x								x					x			x			x				x		3	9
162		x								x					x			x			x					x	3	9
163		x								x					x			x				x		x			2	8
164		x								x					x			x				x			x		2	8
165		x								x					x			x				x				x	3	9
166		x								x					x			x					x	x			2	8
167		x								x					x			x					x		x		3	9
168		x								x					x			x					x			x	3	9
169		x								x					x				x		x			x			3	9
170		x								x					x				x		x				x		3	9
171		x								x					x				x		x					x	3	9
172		x								x					x				x			x		x			2	8
173		x								x					x				x			x			x		2	8
174		x								x					x				x			x				x	3	9
175		x								x					x				x				x	x			2	8
176		x								x					x				x				x		x		3	9
177		x								x					x				x				x			x	3	9
178		x								x					x					x	x			x			3	9
179		x								x					x					x	x				x		3	9
180		x								x					x					x	x					x	3	9
181		x								x					x					x		x		x			3	9
182		x								x					x					x		x			x		3	9
183		x								x					x					x		x				x	3	9
184		x								x					x					x			x	x			3	9
185		x								x					x					x			x		x		3	9
186		x								x					x					x			x			x	3	9
187		x								x						x		x			x			x			3	9
188		x								x						x		x			x				x		3	9
189		x								x						x		x			x					x	3	9
190		x								x						x		x				x		x			3	9
191		x								x						x		x				x			x		3	9
192		x								x						x		x				x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
193		x								x						x		x					x	x			3	9
194		x								x						x		x					x		x		3	9
195		x								x						x		x					x			x	3	9
196		x								x						x			x		x			x			3	9
197		x								x						x			x		x				x		3	9
198		x								x						x			x		x					x	3	9
199		x								x						x			x			x		x			3	9
200		x								x						x			x			x			x		3	9
201		x								x						x			x			x				x	3	9
202		x								x						x			x				x	x			3	9
203		x								x						x			x				x		x		3	9
204		x								x						x			x				x			x	3	9
205		x								x						x				x	x			x			3	9
206		x								x						x				x	x				x		3	9
207		x								x						x				x	x					x	3	9
208		x								x						x				x		x		x			3	9
209		x								x						x				x		x			x		3	9
210		x								x						x				x		x				x	3	9
211		x								x						x				x			x	x			3	9
212		x								x						x				x			x		x		3	9
213		x								x						x				x			x			x	3	9
214		x								x							x										4	0
215		x									x			x				x			x			x			2	8
216		x									x			x				x			x				x		3	9
217		x									x			x				x			x					x	3	9
218		x									x			x				x				x		x			2	8
219		x									x			x				x				x			x		3	9
220		x									x			x				x				x				x	3	9
221		x									x			x				x					x	x			3	9
222		x									x			x				x					x		x		3	9
223		x									x			x				x					x			x	3	9
224		x									x			x					x		x			x			2	8

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
225		x									x			x					x		x				x		3	9
226		x									x			x					x		x					x	3	9
227		x									x			x					x			x		x			2	8
228		x									x			x					x			x			x		3	9
229		x									x			x					x			x				x	3	9
230		x									x			x					x				x	x			3	9
231		x									x			x					x				x		x		3	9
232		x									x			x					x				x			x	3	9
233		x									x			x						x	x			x			3	9
234		x									x			x						x	x				x		3	9
235		x									x			x						x	x					x	3	9
236		x									x			x						x		x		x			3	9
237		x									x			x						x		x			x		3	9
238		x									x			x						x		x				x	3	9
239		x									x			x						x			x	x			3	9
240		x									x			x						x			x		x		3	9
241		x									x			x						x			x			x	3	9
242		x									x				x			x			x			x			3	9
243		x									x				x			x			x				x		3	9
244		x									x				x			x			x					x	3	9
245		x									x				x			x				x		x			2	8
246		x									x				x			x				x			x		3	9
247		x									x				x			x				x				x	3	9
248		x									x				x			x					x	x			3	9
249		x									x				x			x					x		x		3	9
250		x									x				x			x					x			x	3	9
251		x									x				x				x		x			x			3	9
252		x									x				x				x		x				x		3	9
253		x									x				x				x		x					x	3	9
254		x									x				x				x			x		x			2	8
255		x									x				x				x			x			x		3	9
256		x									x				x				x			x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
257		x									x				x				x				x	x			3	9
258		x									x				x				x				x		x		3	9
259		x									x				x				x				x			x	3	9
260		x									x				x					x	x			x			3	9
261		x									x				x					x	x				x		3	9
262		x									x				x					x	x					x	3	9
263		x									x				x					x		x		x			3	9
264		x									x				x					x		x			x		3	9
265		x									x				x					x		x				x	3	9
266		x									x				x					x			x	x			3	9
267		x									x				x					x			x		x		3	9
268		x									x				x				x				x			x	3	9
269		x									x					x		x			x			x			3	9
270		x									x					x		x			x				x		3	9
271		x									x					x		x			x					x	3	9
272		x									x					x		x				x		x			3	9
273		x									x					x		x				x			x		3	9
274		x									x					x		x				x				x	3	9
275		x									x					x		x					x	x			3	9
276		x									x					x		x					x		x		3	9
277		x									x					x		x					x			x	3	9
278		x									x					x			x		x			x			3	9
279		x									x					x			x		x				x		3	9
280		x									x					x			x		x					x	3	9
281		x									x					x			x			x		x			3	9
282		x									x					x			x			x			x		3	9
283		x									x					x			x			x				x	3	9
284		x									x					x			x				x	x			3	9
285		x									x					x			x				x		x		3	9
286		x									x					x			x				x			x	3	9
287		x									x					x				x	x			x			3	9
288		x									x					x				x	x				x		3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation			Mobility				Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
289		x									x					x				x	x					x	3	9
290		x									x					x				x		x		x			3	9
291		x									x					x				x		x			x		3	9
292		x									x					x				x		x				x	3	9
293		x									x					x				x			x	x			3	9
294		x									x					x				x			x		x		3	9
295		x									x					x				x			x			x	3	9
296		x									x						x										4	10
297		x										x		x				x			x			x			3	9
298		x										x		x				x			x				x		3	9
299		x										x		x				x			x					x	3	9
300		x										x		x				x				x		x			3	9
301		x										x		x				x				x			x		3	9
302		x										x		x				x				x				x	3	9
303		x										x		x				x					x	x			3	9
304		x										x		x				x					x		x		3	9
305		x										x		x				x					x			x	3	9
306		x										x		x					x		x			x			3	9
307		x										x		x					x		x				x		3	9
308		x										x		x					x		x					x	3	9
309		x										x		x					x			x		x			3	9
310		x										x		x					x			x			x		3	9
311		x										x		x					x			x				x	3	9
312		x										x		x					x				x	x			3	9
313		x										x		x					x				x		x		3	9
314		x										x		x					x				x			x	3	9
315		x										x		x						x	x			x			3	9
316		x										x		x						x	x				x		3	9
317		x										x		x						x	x					x	3	9
318		x										x		x						x		x		x			3	9
319		x										x		x						x		x			x		3	9
320		x										x		x						x		x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
321		x										x		x						x			x	x			3	9
322		x										x		x						x			x		x		3	9
323		x										x		x						x			x			x	3	9
324		x										x			x			x			x			x			3	9
325		x										x			x			x			x				x		3	9
326		x										x			x			x			x					x	3	9
327		x										x			x			x				x		x			2	8
328		x										x			x			x				x			x		3	9
329		x										x			x			x				x				x	3	9
330		x										x			x			x					x	x			3	9
331		x										x			x			x					x		x		3	9
332		x										x			x			x					x			x	3	9
333		x										x			x				x		x			x			3	9
334		x										x			x				x		x				x		3	9
335		x										x			x				x		x					x	3	9
336		x										x			x				x			x		x			2	8
337		x										x			x				x			x			x		3	9
338		x										x			x				x			x				x	3	9
339		x										x			x				x				x	x			3	9
340		x										x			x				x				x		x		3	9
341		x										x			x				x				x			x	3	9
342		x										x			x					x	x			x			3	9
343		x										x			x					x	x				x		3	9
344		x										x			x					x	x					x	3	9
345		x										x			x					x		x		x			3	9
346		x										x			x					x		x			x		3	9
347		x										x			x					x		x				x	3	9
348		x										x			x					x			x	x			3	9
349		x										x			x					x			x		x		3	9
350		x										x			x					x			x			x	3	9
351		x										x				x		x			x			x			3	9
352		x										x				x		x			x				x		3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
353		x										x				x		x			x					x	3	9
354		x										x				x		x				x		x			3	9
355		x										x				x		x				x			x		3	9
356		x										x				x		x				x				x	3	9
357		x										x				x		x					x	x			3	9
358		x										x				x		x					x		x		3	9
359		x										x				x		x					x			x	3	9
360		x										x				x			x		x			x			3	9
361		x										x				x			x		x				x		3	9
362		x										x				x			x		x					x	3	9
363		x										x				x			x			x		x			3	9
364		x										x				x			x			x			x		3	9
365		x										x				x			x			x				x	3	9
366		x										x				x			x				x	x			3	9
367		x										x				x			x				x		x		3	9
368		x										x				x			x				x			x	3	9
369		x										x				x				x	x			x			3	9
370		x										x				x				x	x				x		3	9
371		x										x				x				x	x					x	3	9
372		x										x				x				x		x		x			3	9
373		x										x				x				x		x			x		3	9
374		x										x				x				x		x				x	3	9
375		x										x				x				x			x	x			3	9
376		x										x				x				x			x		x		3	9
377		x										x								x			x			x	3	9
378		x										x					x										4	10
379		x											x														4	10
380			x						x					x							x			x			1	7
381			x						x					x							x				x		2	8
382			x						x					x							x					x	3	9
383			x						x					x								x		x			2	8
384			x						x					x								x			x		2	8

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
385			x						x					x								x				x	3	9
386			x						x					x									x	x			2	8
387			x						x					x									x		x		3	9
388			x						x					x									x			x	3	9
389			x						x							x					x			x			3	9
390			x						x							x					x				x		3	9
391			x						x							x					x					x	3	9
392			x						x							x						x		x			3	9
393			x						x							x						x			x		3	9
394			x						x							x						x				x	3	9
395			x						x							x							x	x			3	9
396			x						x							x							x		x		3	9
397			x						x							x							x			x	3	9
398			x							x				x							x			x			2	8
399			x							x				x							x				x		2	8
400			x							x				x							x					x	3	9
401			x							x				x								x		x			2	8
402			x							x				x								x			x		3	9
403			x							x				x								x				x	3	9
404			x							x				x									x	x			3	9
405			x							x				x									x		x		3	9
406			x							x				x									x			x	3	9
407			x							x						x					x			x			3	9
408			x							x						x					x				x		3	9
409			x							x						x					x					x	3	9
410			x							x						x						x		x			3	9
411			x							x						x						x			x		3	9
412			x							x						x						x				x	3	9
413			x							x						x							x	x			3	9
414			x							x						x							x		x		3	9
415			x							x						x							x			x	3	9
416			x							x						x					x			x			3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
417			x								x			x							x				x		3	9
418			x								x			x							x					x	3	9
419			x								x			x								x		x			3	9
420			x								x			x								x			x		3	9
421			x								x			x								x				x	3	9
422			x								x			x									x	x			3	9
423			x								x			x									x		x		3	9
424			x								x			x									x			x	3	9
425			x								x					x					x			x			3	9
426			x								x					x					x				x		3	9
427			x								x					x					x					x	3	9
428			x								x					x						x		x			3	9
429			x								x					x						x			x		3	9
430			x								x					x						x				x	3	9
431			x								x					x							x	x			3	9
432			x								x					x							x		x		3	9
433			x								x					x							x			x	3	9
434			x									x		x							x			x			3	9
435			x									x		x							x				x		3	9
436			x									x		x							x					x	3	9
437			x									x		x								x		x			3	9
438			x									x		x								x			x		3	9
439			x									x		x								x				x	3	9
440			x									x		x									x	x			3	9
441			x									x		x									x		x		3	9
442			x									x		x									x			x	3	9
443			x									x				x					x			x			3	9
444			x									x				x					x				x		3	9
445			x									x				x					x					x	3	9
446			x									x				x						x		x			3	9
447			x									x				x						x			x		3	9
448			x									x				x						x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
449			x									x				x							x	x			3	9
450			x									x				x							x		x		3	9
451			x									x				x							x			x	3	9
452			x										x												-		4	10
453			x						x					x							x			x			2	8
454				x					x					x							x				x		3	9
455				x					x					x							x					x	3	9
456				x					x					x								x		x			2	8
457				x					x					x								x			x		3	9
458				x					x					x								x				x	3	9
459				x					x					x									x	x			3	9
460				x					x					x									x		x		3	9
461				x					x					x									x			x	3	9
462				x					x							x					x			x			3	9
463				x					x							x					x				x		3	9
464				x					x							x					x					x	3	9
465				x					x							x						x		x			3	9
466				x					x							x						x			x		3	9
467				x					x							x						x				x	3	9
468				x					x							x							x	x			3	9
469				x					x							x							x		x		3	9
470				x					x							x							x			x	3	9
471				x						x				x							x			x			2	8
472				x						x				x							x				x		3	9
473				x						x				x							x					x	3	9
474				x						x				x								x		x			2	8
475				x						x				x								x			x		3	9
476				x						x				x								x				x	3	9
477				x						x				x									x	x			3	9
478				x						x				x									x		x		3	9
479				x						x				x									x			x	3	9
480				x						x				x		x					x			x			3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
481				x						x						x					x				x		3	9
482				x						x						x					x					x	3	9
483				x						x						x						x		x			3	9
484				x						x						x						x			x		3	9
485				x						x						x						x				x	3	9
486				x						x						x							x	x			3	9
487				x						x						x							x		x		3	9
488				x						x						x							x			x	3	9
489				x							x			x							x			x			3	9
490				x							x			x							x				x		3	9
491				x							x			x							x					x	3	9
492				x							x			x								x		x			3	9
293				x							x			x								x			x		3	9
294				x							x			x								x				x	3	9
495				x							x			x									x	x			3	9
496				x							x			x									x		x		3	9
497				x							x			x									x			x	3	9
498				x							x					x					x			x			3	9
499				x							x					x					x				x		3	9
500				x							x					x					x					x	3	9
501				x							x					x						x		x			3	9
502				x							x					x						x			x		3	9
503				x							x					x						x				x	3	9
504				x							x					x							x	x			3	9
505				x							x					x							x		x		3	9
506				x							x					x							x			x	3	9
507				x								x		x							x			x			3	9
508				x								x		x							x				x		3	9
509				x								x		x							x					x	3	9
510				x								x		x								x		x			3	9
511				x								x		x								x			x		3	9
512				x								x		x								x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
513				x								x											x	x			3	9
514				x								x											x		x		3	9
515				x								x											x			x	3	9
516				x								x									x			x			3	9
517				x								x									x				x		3	9
518				x								x									x					x	3	9
519				x								x										x		x			3	9
520				x								x										x			x		3	9
521				x								x										x				x	3	9
522				x								x											x	x			3	9
523				x								x											x		x		3	9
524				x								x											x			x	3	9
525				x									x												-		3	9
526					x				x					x							x			x			1	7
527					x				x					x							x				x		2	8
528					x				x					x							x					x	3	9
529					x				x					x								x		x			2	8
530					x				x					x								x			x		2	8
531					x				x					x								x				x	3	9
532					x				x					x									x	x			3	9
533					x				x					x									x		x		3	9
534					x				x					x									x			x	3	9
535					x				x						x						x			x			3	9
536					x				x						x						x				x		3	9
537					x				x						x						x					x	3	9
538					x				x						x							x		x			2	8
539					x				x						x							x			x		3	9
540					x				x						x							x				x	3	9
541					x				x						x								x	x			3	9
542					x				x						x								x		x		3	9
543					x				x						x								x			x	3	9
544					x				x							x					x			x			3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
545					x				x							x					x				x		3	9
546					x				x							x					x					x	3	9
547					x				x							x						x		x			3	9
548					x				x							x						x			x		3	9
549					x				x							x						x				x	3	9
550					x				x							x							x	x			3	9
551					x				x							x							x		x		3	9
552					x				x							x							x			x	3	9
553					x				x								x				x			x			4	10
554					x				x								x				x				x		4	10
555					x				x								x				x					x	4	10
556					x				x								x					x		x			4	10
557					x				x								x					x			x		4	10
558					x				x								x					x				x	4	10
559					x				x								x						x	x			4	10
560					x				x								x						x		x		4	10
561					x				x								x						x			x	4	10
562					x					x				x							x			x			2	8
563					x					x				x							x				x		3	9
564					x					x				x							x					x	3	9
565					x					x				x								x		x			2	8
566					x					x				x								x			x		3	9
567					x					x				x								x				x	3	9
568					x					x				x									x	x			3	9
569					x					x				x									x		x		3	9
570					x					x				x									x			x	3	9
571					x					x					x						x			x			3	9
572					x					x					x						x				x		3	9
573					x					x					x						x					x	3	9
574					x					x					x							x		x			3	9
575					x					x					x							x			x		2	8
576					x					x					x							x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
577					x					x					x								x	x			3	9
578					x					x					x								x		x		3	9
579					x					x					x								x			x	3	9
580					x					x						x					x			x			3	9
581					x					x						x					x				x		3	9
582					x					x						x					x					x	3	9
583					x					x						x						x		x			3	9
584					x					x						x						x			x		3	9
585					x					x						x						x				x	3	9
586					x					x						x							x	x			3	9
587					x					x						x							x		x		3	9
588					x					x						x							x			x	3	9
589					x					x							x				x			x			4	10
590					x					x							x				x				x		4	10
591					x					x							x				x					x	4	10
592					x					x							x					x		x			4	10
593					x					x							x					x			x		4	10
594					x					x							x					x				x	4	10
595					x					x							x						x	x			4	10
596					x					x							x						x		x		4	10
597					x					x							x						x			x	4	10
598					x						x			x							x			x			3	9
599					x						x			x							x				x		3	9
600					x						x			x							x					x	3	9
601					x						x			x								x		x			3	9
602					x						x			x								x			x		3	9
603					x						x			x								x				x	3	9
604					x						x			x									x	x			3	9
605					x						x			x									x		x		3	9
606					x						x			x									x			x	3	9
607					x						x				x						x			x			3	9
608					x						x				x						x				x		3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
609					x						x				x						x					x	3	9
610					x						x				x							x		x			3	9
611					x						x				x							x			x		3	9
612					x						x				x							x				x	3	9
613					x						x				x								x	x			3	9
614					x						x				x								x		x		3	9
615					x						x				x								x			x	3	9
616					x						x					x					x			x			3	9
617					x						x					x					x				x		3	9
618					x						x					x					x					x	3	9
619					x						x					x						x		x			3	9
620					x						x					x						x			x		3	9
621					x						x					x						x				x	3	9
622					x						x					x							x	x			3	9
623					x						x					x							x		x		3	9
624					x						x					x							x			x	3	9
625					x						x						x				x			x			4	10
626					x						x						x				x				x		4	10
627					x						x						x				x					x	4	10
628					x						x						x					x		x			4	10
629					x						x						x					x			x		4	10
630					x						x						x					x				x	4	10
631					x						x						x						x	x			4	10
632					x						x						x						x		x		4	10
633					x						x						x						x			x	4	10
634					x							x		x							x			x			3	9
635					x							x		x							x				x		3	9
636					x							x		x							x					x	3	9
637					x							x		x								x		x			3	9
638					x							x		x								x			x		3	9
639					x							x		x								x				x	3	9
640					x							x		x									x	x			3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
641					x							x		x									x		x		3	9
642					x							x		x									x			x	3	9
643					x							x			x						x			x			3	9
644					x							x			x						x				x		3	9
645					x							x			x						x					x	2	8
646					x							x			x							x		x			3	9
647					x							x			x							x			x		3	9
648					x							x			x							x				x	3	9
649					x							x			x								x	x			3	9
650					x							x			x								x		x		3	9
651					x							x			x								x			x	3	9
652					x							x				x					x			x			3	9
653					x							x				x					x				x		3	9
654					x							x				x					x					x	3	9
655					x							x				x						x		x			3	9
656					x							x				x						x			x		3	9
657					x							x				x						x				x	3	9
658					x							x				x							x	x			3	9
659					x							x				x							x		x		3	9
660					x							x				x							x			x	4	10
661					x							x					x				x			x			4	10
662					x							x					x				x				x		4	10
663					x							x					x				x					x	4	10
664					x							x					x					x		x			4	10
665					x							x					x					x			x		4	10
666					x							x					x					x				x	4	10
667					x							x					x						x	x			4	10
668					x							x					x						x		x		4	10
669					x							x					x						x			x	4	10
670					x								x		--							--			--		4	10
671						x			x					x							x			x			2	8
672						x			x					x							x				x		2	8

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
673						x			x					x							x					x	3	9
674						x			x					x								x		x			2	8
675						x			x					x								x			x		3	9
676						x			x					x								x				x	3	9
677						x			x					x									x	x			3	9
678						x			x					x									x		x		3	9
679						x			x							x							x			x	3	9
680						x			x							x					x			x			3	9
681						x			x							x					x				x		3	9
682						x			x							x					x					x	3	9
683						x			x							x						x		x			3	9
684						x			x							x						x			x		3	9
685						x			x							x						x				x	3	9
686						x			x							x							x	x			3	9
687						x			x					x									x		x		3	9
688						x			x					x									x			x	3	9
689						x				x				x							x			x			2	8
690						x				x				x							x				x		2	8
691						x				x				x							x					x	3	9
692						x				x				x								x		x			2	8
693						x				x				x								x			x		3	9
694						x				x				x								x				x	3	9
695						x				x				x									x	x			3	9
696						x				x						x							x		x		3	9
697						x				x						x							x			x	3	9
698						x				x						x					x			x			3	9
699						x				x						x					x				x		3	9
700						x				x						x					x					x	3	9
701						x				x						x						x		x			3	9
702						x				x						x						x			x		3	9
703						x				x						x						x				x	3	9
704						x				x						x							x	x			3	9

WATER'S EDGE CONSTRAINT TYPES

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
705						x				x						x							x		x		3	9
706						x				x						x							x			x	3	9
707						x					x			x							x			x			3	9
708						x					x			x							x				x		3	9
709						x					x			x							x					x	3	9
710						x					x			x								x		x			3	9
711						x					x			x								x			x		3	9
712						x					x			x								x				x	3	9
713						x					x			x									x	x			3	9
714						x					x			x									x		x		3	9
715						x					x			x									x			x	3	9
716						x					x					x					x			x			3	9
717						x					x					x					x				x		3	9
718						x					x					x					x					x	3	9
719						x					x					x						x		x			3	9
720						x					x					x						x			x		3	9
721						x					x					x						x				x	3	9
722						x					x					x							x	x			3	9
723						x					x					x							x		x		3	9
724						x					x					x							x			x	3	9
725						x						x		x							x			x			3	9
726						x						x		x							x				x		3	9
727						x						x		x							x					x	3	9
728						x						x		x								x		x			3	9
729						x						x		x								x			x		3	9
730						x						x		x								x				x	3	9
731						x						x		x									x	x			3	9
732						x						x		x									x		x		3	9
733						x						x		x									x			x	3	9
734						x						x				x					x			x			3	9
735						x						x				x					x				x		3	9
736						x						x				x					x					x	3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Mobility: Accreting	Stable	Eroding	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
737						x						x				x						x		x			3	9
738						x						x				x						x			x		3	9
739						x						x				x						x				x	3	9
740						x						x				x							x	x			3	9
741						x						x				x							x		x		3	9
742.						x						x				x							x			x	3	9
743						x							x			-							-		-		4	10
744							x		x					x							x			x			2	8
745							x		x					x							x				x		3	9
746							x		x					x							x					x	3	9
747							x		x					x								x		x			3	9
748							x		x					x								x			x		3	9
749							x		x					x								x				x	3	9
750							x		x					x									x	x			3	9
751							x		x					x									x		x		3	9
752							x		x					x									x			x	3	9
753							x		x							x					x			x			3	9
754							x		x							x					x				x		3	9
755							x		x							x					x					x	3	9
756							x		x							x						x		x			3	9
757							x		x							x						x			x		3	9
758							x		x							x						x				x	3	9
759							x		x							x							x	x			3	9
760							x		x							x							x		x		3	9
761							x		x							x							x			x	3	9
762							x			x				x							x			x			3	9
763							x			x				x							x				x		3	9
764							x			x				x							x					x	3	9
765							x			x				x								x		x			3	9
766							x			x				x								x			x		3	9
768							x			x				x								x				x	3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
769							x			x				x									x		x		3	9
770							x			x				x									x			x	3	9
771							x			x						x					x			x			3	9
772							x			x						x					x				x		3	9
773							x			x						x					x					x	3	9
774							x			x						x						x		x			3	9
775							x			x						x						x			x		3	9
776							x			x						x						x				x	3	9
777							x			x						x							x	x			3	9
778							x			x						x							x		x		3	9
779							x			x						x							x			x	3	9
780							x				x			x							x			x			3	9
781							x				x			x							x				x		3	9
782							x				x			x							x					x	3	9
783							x				x			x								x		x			3	9
784							x				x			x								x			x		3	9
785							x				x			x								x				x	3	9
786							x				x			x									x	x			3	9
788							x				x			x									x		x		3	9
789							x				x					x							x			x	3	9
790							x				x					x					x			x			3	9
791							x				x					x					x				x		3	9
792							x				x					x					x					x	3	9
793							x				x					x						x		x			3	9
794							x				x					x						x			x		3	9
795							x				x					x						x				x	3	9
796							x				x					x							x	x			4	10
797							x				x					x							x		x		3	9
798							x					x		x									x			x	3	9
799							x					x		x							x			x			4	10
800							x					x		x							x				x		3	9

	WATER'S EDGE CONSTRAINT TYPES																											
	Nature of Adjacent Water Body							Disturbance						Elevation				Mobility			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	Accreting	Stable	Eroding	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
801							x					x		x								x		x			3	9
802							x					x		x								x			x		3	9
803							x					x		x								x				x	4	10
804							x					x		x									x	x			3	9
805							x					x		x									x		x		3	9
806							x					x		x									x			x	4	10
807							x					x				x					x			x			3	9
808							x					x				x					x				x		3	9
809							x					x				x					x					x	4	10
810							x					x				x						x		x			3	9
811							x					x				x						x			x		3	9
812							x					x				x						x				x	4	10
813							x					x				x							x	x			3	9
814							x					x				x							x		x		3	9
815							x					x				x							x			x	4	10
816							x						x									'			'		4	10
817								x	x					x				x			x			x			3	9
818								x	x					x				x			x				x		3	9
819								x	x					x				x			x					x	3	9
820								x	x					x				x				x		x			3	9
821								x	x					x				x				x			x		3	9
822								x	x					x				x				x				x	3	9
823								x	x					x				x					x	x			3	9
824								x	x					x				x					x		x		3	9
825								x	x					x				x					x			x	4	0
826								x	x					x					x		x			x			3	9
827								x	x					x					x		x				x		3	9
828								x	x					x					x		x					x	3	9
829								x	x					x					x			x		x			3	9
830								x	x					x					x			x			x		3	9
831								x	x					x					x			x				x	3	9
832								x	x					x									x	x			3	9

WATER'S EDGE CONSTRAINT TYPES

	Nature of Adjacent Water Body								Disturbance					Elevation				Volume			Water Quality Standard			Ambient Water Quality				
TYPE NUMBER	Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Upper Flood prone	Beach	Marsh & Wetland	Dune	High	Medium	Low	Low	Medium	High	Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
833								x	x					x					x				x		x		3	9
834								x	x					x					x				x			x	4	10
835								x	x					x						x	x			x			3	9
836								x	x					x						x	x				x		3	9
837								x	x					x						x	x					x	4	10
838								x	x					x						x		x		x			3	9
839								x	x					x						x		x			x		3	9
840								x	x					x						x		x				x	4	10
841								x	x					x						x			x	x			3	9
842								x	x					x						x			x		x		3	9
843								x	x					x						x			x			x	4	10
844								x	x					x				x			x			x			3	9
845								x	x							x		x			x				x		3	9
846								x	x							x		x			x					x	4	10
847								x	x							x		x				x		x			3	9
848								x	x							x		x				x			x		3	9
849								x	x							x		x				x				x	4	10
850								x	x							x		x					x	x			4	10
851								x	x							x		x					x		x		4	10
852								x	x							x		x					x			x	4	10
853								x	x							x			x		x			x			3	9
854								x	x							x			x		x				x		3	9
855								x	x							x			x		x					x	4	10
856								x	x							x			x			x		x			3	9
857								x	x							x			x			x			x		3	9
858								x	x							x			x			x				x	4	10
859								x	x							x			x				x	x			3	9
860								x	x							x			x				x		x		4	10
861								x	x							x			x				x			x	4	10
862								x	x							x				x	x			x			3	9
863								x	x							x				x	x				x		3	9
864								x	x							x				x	x					x	4	10

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Disturbance: Standing Water	High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Volume: High	Medium	Low	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
865								x	x							x				x		x		x			3	9
866								x	x							x				x		x			x		3	9
867								x	x							x				x		x				x	4	10
868								x	x							x				x			x	x			3	9
869								x	x							x				x			x		x		4	10
870								x	x							x				x			x			x	4	10
871								x		x				x				x			x			x			3	9
872								x		x				x				x			x				x		3	9
873								x		x				x				x			x	x				x	4	10
874								x		x				x				x				x		x			3	9
875								x		x				x				x				x			x		3	9
876								x		x				x				x					x			x	4	10
877								x		x				x				x					x	x			3	9
878								x		x				x				x					x		x		4	10
879								x		x				x				x			x					x	4	10
880								x		x				x					x		x			x			3	9
881								x		x				x					x		x				x		3	9
882								x		x				x					x			x				x	4	10
883								x		x				x					x			x		x			3	9
884								x		x				x					x			x			x		3	9
885								x		x				x					x				x			x	4	10
886								x		x				x					x				x	x			3	9
887								x		x				x					x				x		x		4	10
888								x		x				x					x		x					x	4	10
889								x		x				x						x	x			x			3	9
890								x		x				x						x	x				x		3	9
891								x		x				x						x		x				x	4	10
892								x		x				x						x		x		x			3	9
893								x		x				x						x		x			x		3	9
894								x		x				x						x			x			x	4	10
895								x		x				x						x			x	x			3	9
896								x		x				x						x			x		x		4	10

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Volume: High	Medium	Low	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
897								x		x				x						x			x			x	4	10
898								x		x						x		x			x			x			3	9
899								x		x						x		x			x				x		3	9
900								x		x						x		x			x					x	4	10
901								x		x						x		x				x		x			3	9
902								x		x						x		x				x			x		3	9
903								x		x						x		x				x				x	4	10
904								x		x						x		x					x	x			3	9
905								x		x						x		x					x		x		4	10
906								x		x						x		x					x			x	4	10
907								x		x						x			x		x			x			3	9
908								x		x						x			x		x				x		3	9
909								x		x						x			x		x					x	4	10
910								x		x						x			x			x		x			3	9
911								x		x						x			x			x			x		3	9
912								x		x						x			x			x				x	4	10
913								x		x						x			x				x	x			3	9
914								x		x						x			x				x		x		4	10
915								x		x						x			x				x			x	4	10
916								x		x						x				x	x			x			3	9
917								x		x						x				x	x				x		3	9
918								x		x						x				x	x					x	4	10
919								x		x						x				x		x		x			3	9
920								x		x						x				x		x			x		3	9
921								x		x						x				x		x				x	4	10
922								x		x						x				x			x	x			3	9
923								x		x						x				x			x		x		4	10
924								x		x						x				x			x			x	4	10
925								x			x			x				x			x			x			3	9
926								x			x			x				x			x				x		3	9
927								x			x			x				x			x					x	4	10
928								x			x			x				x				x		x			3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Volume: High	Medium	Low	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
929								x			x			x				x				x			x		3	9
930								x			x			x				x				x				x	4	10
931								x			x			x				x				x		x			3	9
932								x			x			x				x					x		x		4	10
933								x			x			x				x					x			x	4	10
934								x			x			x				x					x	x			3	9
935								x			x			x					x		x				x		3	9
936								x			x			x					x		x					x	4	10
937								x			x			x					x		x			x			3	9
938								x			x			x					x			x			x		3	9
939								x			x			x					x			x				x	4	10
940								x			x			x					x			x		x			3	9
941								x			x			x					x				x		x		4	10
942								x			x			x					x				x			x	4	10
943								x			x			x					x				x	x			3	9
944								x			x			x						x	x				x		3	9
945								x			x			x						x	x					x	4	10
946								x			x			x						x	x			x			3	9
947								x			x			x						x		x			x		3	9
948								x			x			x						x		x				x	4	10
949								x			x			x						x		x		x			3	9
950								x			x			x						x			x		x		4	10
951								x			x			x						x			x			x	4	10
952								x			x			x						x			x	x			3	9
953								x			x					x		x			x				x		3	9
954								x			x					x		x			x					x	4	10
955								x			x					x		x			x			x			3	9
956								x			x					x		x				x			x		3	9
957								x			x					x		x				x				x	4	10
958								x			x					x		x				x		x			3	9
959								x			x					x		x					x		x		4	10
960								x			x					x		x					x			x	4	10

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Volume: High	Medium	Low	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
961								x			x					x			x		x			x			3	9
962								x			x					x			x		x				x		3	9
963								x			x					x			x		x					x	4	10
964								x			x					x			x			x		x			3	9
965								x			x					x			x			x			x		3	9
966								x			x					x			x			x				x	4	10
967								x			x					x			x				x	x			3	9
968								x			x					x			x				x		x		4	10
969								x			x					x			x				x			x	4	10
970								x			x					x				x	x			x			3	9
971								x			x					x				x	x				x		3	9
972								x			x					x				x	x					x	4	10
973								x			x					x				x		x		x			3	9
974								x			x					x				x		x			x		3	9
975								x			x					x				x		x				x	4	10
976								x			x					x				x			x	x			3	9
977								x			x					x				x			x		x		4	10
978								x			x					x				x			x			x	4	10
979								x				x		x				x			x			x			3	9
980								x				x		x				x			x				x		3	9
981								x				x		x				x			x					x	4	10
982								x				x		x				x				x		x			3	9
983								x				x		x				x				x			x		3	9
984								x				x		x				x				x				x	4	10
985								x				x		x				x					x	x			3	9
986								x				x		x				x					x		x		4	10
987								x				x		x				x					x			x	4	10
988								x				x		x					x		x			x			3	9
989								x				x		x							x				x		3	9
990								x				x		x					x		x					x	4	10
991								x				x		x					x			x		x			3	9
992								x				x		x					x			x			x		3	9
993								x				x		x					x			x				x	4	10

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Volume: High	Medium	Low	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
994								X				X		X					X				X	X			3	9
995								X				X		X					X				X		X		4	10
996								X				X		X					X				X			X	4	10
997								X				X		X						X	X			X			3	9
998								X				X		X						X	X				X		3	9
999								X				X		X						X	X					X	4	10
1000								X				X		X						X		X		X			3	9
1001								X				X		X						X		X			X		3	9
1002								X				X		X						X		X				X	4	10
1003								X				X		X						X			X	X			3	9
1004								X				X		X						X			X		X		4	10
1005								X				X		X						X			X			X	4	10
1006								X				X				X		X			X			X			3	9
1007								X				X				X		X			X				X		3	9
1008								X				X				X		X			X					X	4	10
1009								X				X				X		X				X		X			3	9
1010								X				X				X		X				X			X		3	9
1011								X				X				X		X				X				X	4	10
1012								X				X				X		X					X	X			3	9
1013								X				X				X		X					X		X		4	10
1014								X				X				X		X					X			X	4	10
1015								X				X				X			X		X			X			3	9
1016								X				X				X			X		X				X		3	9
1017								X				X				X			X		X					X	4	10
1018								X				X				X			X			X		X			3	9
1019								X				X				X			X			X			X		3	9
1020								X				X				X			X			X				X	4	10
1021								X				X				X			X				X	X			3	9
1022								X				X				X			X				X		X		4	10
1023								X				X				X			X				X			X	4	10
1024								X				X				X				X	X			X			3	9
1025								X				X				X				X	X				X		3	9

WATER'S EDGE CONSTRAINT TYPES

TYPE NUMBER	Nature of Adjacent Water Body: Ocean	Open Bay	High Order River	Medium Order Stream	Semi_Enclosed Bay	Back Bay	Low Order Creek	Standing Water	Disturbance: High (low qual)	Medium	Low	Low prime	High (high qual)	Elevation: Upper Flood prone	Beach	Marsh & Wetland	Dune	Volume: High	Medium	Low	Water Quality Standard: Low	Medium	High	Ambient Water Quality: Well Above Standard	Above Standard	Below Standard	Water's Edge Rank	Land Rank
1026								x				x				x				x	x					x	4	10
1027								x				x				x				x		x		x			3	9
1028								x				x				x				x		x			x		3	9
1029								x				x				x				x		x				x	4	10
1030								x				x				x				x			x	x			3	9
1031								x				x				x				x			x		x		4	10
1032								x				x				x				x		-	x			x	4	10
1033								x					x		-			-							-		4	10

APPENDIX E

Background for Section 6

Opportunity Analysis

1. Opportunity Analysis References and Questionnaire

2. Opportunity Factors and Costing for Housing

3. Opportunity Factors and Costing for Marinas

4. Next Steps in Opportunity Analysis

APPENDIX E 1.

Opportunity Analysis References and Questionnaire

This appendix lists data sources for the selection of opportunity factors and summarizes the findings of a NJOCZM questionnaire to developers on opportunity factors.

References: The first essential of opportunity analysis is accurate and complete opportunity factor specification for all of the study uses.

An ongoing search of the published data has so far revealed two major reference documents and a number of minor ones.

The major sources data area:

1. Industrial Location Service (ILS). This is a computer tape summarizing the findings of a U.S. Department of Commerce questionnaire to manufacturing industries in December 1975.

   This tape is referenced to the Standard Industrial Classification (SIC) 4 digit code and records the voting of relevancy and weight given by industrial users to a standard list of opportunity factors. This tape has been verified to a certain extent by use by the U.S. Department of Commerce and NJDLI.

2. A facility specification manual prepared by Rogers and Golden, Inc. as part of their Major Facility Siting Study for Maryland CZMP.

   Included in this are opportunity factor specifications for major coastal uses such as power generating stations, ports, onshore oil facilities and coastal housing. The information is based on published data and interviews with developers.

NJ OCZM Questionnaires: To fill gaps in the published data and to verify, localize and update it, the New Jersey Office of Coastal Zone Management has initiated a series of questionnaires for coastal users.

The first of these, a rather general, unstructured questionnaire, deliberately avoided the listing of specific opportunity factors to avoid prejudging, and to establish whether developers found this a desirable way of specifying optimum locations.

One hundred copies of this pilot questionnaire were circulated on February 11, 1977, to New Jersey developers, primarily coastal. Twelve questionnaires failed to reach their target and 20 were returned, for a 23% return.

Industry was not emphasized in this mailing, since the ILS tape and the NJOCZM "Call for Information" to the energy and petrochemical industries provided sufficient preliminary information in these categories. Further questionnaires will include industry, particularly coastal dependent industry.

The questions of the first questionnaire and summaries of the answers are found in Figure 1. Study of the results indicated preferences for selected opportunity factors for various uses. These results have led to a list of opportunity factors to be included in the second questionnaire.

Figure 1: Questionnaire #1: Opportunity Factors

1. What is your professional occupation?

Developer	6
Engineer	6
Builder	3
Planner	3
Landscape Architect/ Architect	3
Farmer	1
Campground Director	1
Land Packager	1
Director of Employee Relations	1
Total	25 (some answers checked more than one)

2. With what types of development are you typically involved?

Residential Development	11
Recreational Development	6
Commercial Development	5
Roads	5
Public Utiities	5
Marinas	4
Mining	4
Industry	4
Institutions	2
Agriculture	1
Railroads	1
Airports	1
Dredging	1
Spoil Dumping	1
Total	51 (some answers checked more than one)

3. Has your organization developed explicit criteria to follow when making decisions about where to locate your developments?

Yes 15 Not Exactly 2 No 3

Total 20

4. If any location could be selected for the facility free of restraint what kind of site would be ideal for development?

Housing

Good road access	8
Undulating topography	8
Cheap land	7

Access to Utilities	6
Wooded area	6
Freedom from flood	5
Access to expressway	4
Low property tax	4
Character of area	4
Suitable soils	4
Surface water access and view	3
Access to employment	3
Access to public transit	3
Access to community services	3
Good drainage	2
Access to shops	2
Access to schools	2
Access to churches	2
Market demand	2
Access to recreation	1
Away from dense development	1
Near similar development	1

Marinas

Access to surface water	2
Access to navigation channel	2
Access to sheltered cove or harbor	2
Access to roads	2
Access to utilities	2
Suitable for car parks	1
Development in area	1

Campgrounds

Access to ocean, bay, lake pond or stream	1
Access to regional recreation	1
Wooded	1
Good road access	1
Low population increase	1
Low tax rate	1
Freedom from flood	1
Good drainage	1
Soils suitable for septic tanks	1

Commercial recreation

Woods	1
Surface water	1
Road access	1
Cheap land	1
Access to market	1
Recreation site opportunities	1

Retirement Communities

Outer fringe of suburban development	1
No work access requirement	1
Road access	1
Rolling topography	1

Quarrying

Minable mineral concentrations	1
Sparse population	1

Roads

Shortest distance between service areas	1
Cheap land	1
Minimum demolition	1

Sewage Treatment Plant

Distribution of existing and proposed sewage networks	1
Suitable Topography	1
Access to surface water	1

APPENDIX E 2.

Opportunity Factors and Costs for Housing

This table lists the bonus and penalty costs for variations in all opportunity factors selected as relevant to single family detached housing.

OPPORTUNITY FACTORS & COSTS
HOUSING

1. USE TYPE: Housing

2. USE SUB-TYPE: Suburban

3. FURTHER USE DEFINITION: Single family detached

4. USE UNIT COST: $10,000
   (building costs only excluding land acquisition or exceptional site costs)

5. NUMBER OF UNITS: 25

6. TOTAL DEVELOPMENT COST: $250,000
   (excluding land acquistion or exceptional site costs)

7. DENSITY: 3 du/acre gross

8. ACREAGE REQUIRED: 8.3 acres

9. SEWAGE DISPOSAL TECHNIQUE: A. Sewered
   B. Septic System

SELECTED LOCATION FACTORS

Available open space free of structures
Access to roads
    railroads
    airports
    surface water
    sewers (Alterntive A)
    public water supply
    soils suitable for septic tanks (Alternative B)
    schools
    shops
Freedom from flooding
Living resources

A. 0-1/2 Mile to Expressway Intersection Bonus + 4,000/DU
Noise of Road Depresses Bonus Slightly
* % of Base Development Cost of $250,000

	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 2-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Unit Cost $115/lin. ft. Marsh Areas Requiring Piling & Fill	
Distance to nearest road	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no penalty cost included in site costs	+50	+20	+50	+20	+50	+20	+50	+20	+50	+20
2) 300 ft. - (100 yds) - 300 yds.	+45	+18	+45	+17	+43	+16	+30	+12	+13	+5
3) 300 yds. (3/16 mile) - 1/2 mile	+25	+10	+18	+7	+10	+4	-50	-20	-125	-50
4) 1/2 - 1 mile	-10	-4	-25	-10	-45	-18	-190	-76	-405	-162
5) 1 - 2 miles	-70	-28	-105	-42	-142	-57	-430	-172	-863	-345
6) 2 - 4 miles	-190	-76	-263	-105	-335	-134	-910	-364	-1775	-710

B. 1/2 mile - 1 1/2 miles to expressway intersection Bonus +5000/du

Optimum Distance

* % of Base Development Cost of $250,000

Distance to nearest road	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 2-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Unit Cost $115/lin. ft. Marsh Areas Requiring Piling & Fill	
	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no (no penalty)	+125	+50	+125	+50	+125	+50	+125	+50	+125	+50
2) 300 ft. - (100 yds) - 300 yds.	+120	+48	+118	+47	+115	+46	+105	+42	+88	+35
3) 300 yds. (3/16 mile) - 1/2 mile	+100	+40	+93	+37	+85	+34	+25	+10	-65	-26
4) 1/2 - 1 mile	+65	+26	+50	+20	+30	+12	-115	-46	-330	-132
5) 1 - 2 miles	+5	+2	-30	-12	-68	-27	-335	-142	-788	-315
6) 2 - 4 miles	-115	-46	-188	-75	-260	-104	-835	-334	-1700	-680

C. More Than 1 1/2 Miles from Expressway Intersection Bonus +0

* % of Base Development Cost of $250,000

Distance to nearest road	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 2-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Unit Cost $115/lin. ft. Marsh Areas Requiring Piling & Fill	
	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no (no penalty)	0	0	0	0	0	0	0	0	0	0
2) 300 ft. - (100 yds) - 300 yds.	-5	-2	-7.5	-3	-10	-4	-20	-8	-37.5	-15
3) 300 yds. (3/16 mile) - 1/2 mile	-25	-10	-32.5	-13	-40	-16	-100	-40	-190	-76
4) 1/2 - 1 mile	-60	-24	-75	-30	-95	-38	-240	-96	-455	-182
5) 1 - 2 miles	-120	-48	-155	-62	-192.5	-77	-480	-192	-912.5	-365
6) 2 - 4 miles	-240	-96	-312.5	-125	-385	-154	-960	-384	-1825	-730

ACCESS TO RAILROADS

a. Distance to Existing Station or Freight Yard

Undesirable very close to station, desirable within walking distance

		Cost Cost Units $1,000s/ dwelling unit	% cost
1)	0-200 yds. (600 ft.)	-10	-100
2)	200 yds. - 1/2 mile	+5	+50
3)	1/2 - 1 mile	+2	+25
4)	1 - 2 miles	0	0
5)	2 - 4 miles	0	0
6)	4 - 8 miles	0	0
7)	More than 8 miles	0	0

b. Distance to existing track (assuming spurs can be constructed)

+ = bonus
- = penalty

Noise of railroad depresses value in close proximity

Unit Cost $/ft. finished track
Cost Unit $1000s/

		Cost units $1000s/DU	% cost
1)	0-200 yds. (600 ft.)	-5	-50
2)	200 yds. - 1/2 mile	0	0
3)	1/2 - 1 mile	0	0
4)	1 - 2 miles	0	0
5)	2 - 4 miles	0	0
6)	4 - 8 miles	0	0
7)	More than 8 miles	0	0

ACCESS TO AIRPORTS

c. Distance to runway, Local Airport

Noise depresses value in close proximity

		Cost Cost Units $1,000s/ dwelling unit	% age cost
1)	0 - 1/3 mile	-5	-50
2)	1/3 - 1 mile	0	0
3)	1 - 3 miles	0	0
4)	3 - 9 miles	0	0
5)	9 - 27 miles	0	0
6)	27; miles	0	0

ACCESS TO PORTS AND HARBORS

view and access to desirable

Cost + = bonus - = penalty | % age cost

b) Access to minor harbor

distance to harbor

		Cost Units $1000s/acre	% age cost
1)	0 ft.-300 ft. (100 yds.)	+125	+50
2)	100 yds.-300 yds. (3/16 mile)	+25	+10
3)	3/16 mile (300 yds.)-1/2 mile	0	0
4)	1/2-1 mile	0	0
5)	1-2 miles	0	0
6)	2-4 miles	0	0
7)	More than 4 miles	0	0

ACCESS TO SURFACE WATER

		Cost + = bonus - = penalty	
a)	Access to ocean water		
	. Most desirbale coastal oppotunity factor	Cost Units $1,000s/acre	% age cost
	distance to water		
1)	0 ft.-300 ft. (100 yds.)	+ 1000	+400
2)	100 yds.-300 yds. (3/16 mile)	+500	+200
3)	3/16 mile (300 yds.)-1/2 mile	+250	+100
4)	1/2-1 mile	+25	+10
5)	1-2 miles	0	0
6)	2-4 miles	0	0
7)	More than 4 miles	0	0

b)	Access to estuarine water		
1)	0 ft.-300 ft. (100 yds.)	+250	+100
2)	100 yds.-300 yds. (3/16 mile)	+125	+50
3)	3/16 mile (300 yds.)-1/2 mile	+25	+10
4)	1/2-1 mile	0	0
5)	1-2 miles	0	0
6)	2-4 miles	0	0
7)	More than 4 miles	0	0

c) Access to backway water

Distance to water	Cost Cost Units $1000s/acre	% cost
1) 0 ft.-300 ft. (100 yds.)	+125	+50
2) 100 yds.-300 yds. (3/16 mile)	+25	+10
3) 3/16 mile (300 yds.)-1/2 mile	0	0
4) 1/2-1 mile	0	0
5) 1-2 miles	0	0
6) 2-4 miles	0	0
7) More than 4 miles	0	0

ACCESS TO SEWERS

	Distance to sewer	Unit Cost $15/linear foot Cost Units $1,000s/ developement	% cost
1)	On site	0	0
2)	0 ft.-300 ft. (100 yds.)	-2	-1
3)	100 yds.-300 yds. (3/16 mile)	-5	-2
4)	3/16 mile (300 yds.)-1/2 mile	-25	-10
5)	1/2-1 mile	-60	-25
6)	1-2 miles	-120	-50
7)	2-4 miles	-240	-100
8)	More than 4 miles	-480	-200

ACCESS TO PUBLIC WATER SUPPLY

Cost
+ = bonus
− = penalty

		Unit Cost $10/linear ft. water line complete Cost Units $1,000s/ development	% cost
1)	On site	0	0
2)	0 ft.-300 ft. (100 yds.)	-1.5	-0.5
3)	100 yds.-300 yds. (3/16 mile)	-6	-2.5
4)	3/16 mile (300 yds.)-1/2 mile	-18	-7
5)	1/2-1 mile	-40	-16
6)	1-2 miles	-80	-32
7)	2-4 miles	-160	-64
8)	More than 4 miles	-320	-128

ACCESS TO SURFACE WATER

e) Access to stream water
(Minor river and streams)

Cost
+ = bonus
- = penalty

Distance to water	Cost Units $1000s/acre	% cost
1) 0 ft.-300 ft. (100 yds.)	+50	+20
2) 100 yds.-300 yds. (3/16 mile)	0	0
3) 3/16 mile (300 yds.)-1/2 mile	0	0
4) 1/2-1 mile	0	0
5) 1-2 miles	0	0
6) 2-4 miles	0	0
7) More than 4 miles	0	0

f) Access to lake and pond water
(Major Rivers: Delaware, Hudson)

Distance to Water		
1) 0 ft.-300 ft. (100 yds.)	+50	+20
2) 100 yds.-300 yds. (3/16 mile)	0	0
3) 3/16 mile (300 yds.)-1/2 mile	0	0
4) 1/2-1 mile	0	0
5) 1-2 miles	0	0
6) 2-4 miles	0	0
7) More than 4 miles	0	0

SUITABILITY OF SOILS FOR SEPTIC TANKS

Cost
+ = bonus
− = penalty

Unit Cost
fill
$6.5/cu. yd.
450 sq. yd.
Drainage Field

	Costs Units $1,100s/DU	% Cost
1) Few restrictions* (no fill required)	0	0
2) Moderate restrictions* (3'0" fill required on the drainage field)	-3	-30
3) Severe restrictions* (6'0" fill required on drainage field	-6	-60

* Soil Conservation Ratings.

ACCESS TO SCHOOLS	Cost Cost Units $1,000s/DU	% Costs
1) 0 - 1/3 mile	+0.5	+5
2) 1/3 - 1 mile	0	0
3) 1 - 3 miles	0	0
4) 3 - 9 miles	0	0
5) 9+ miles	0	0

ACCESS TO SHOPS

	Cost Cost Units $1,000x/DU	% Cost
Distance to nearest commercial grouping sufficient to provide all basic consumer goods.		
1) 0 - 1/3 mile	+1	+10
2) 1/3 - 1 mile	+0.5	+5
3) 1 - 3 miles	0	0
4) 3 - 9 miles	0	0
5) 9+ miles	0	0

FREEDOM FROM FLOODING

	Cost Unit cost $6.25/cu. yd. fill average 6'0" fill Cost Units $1,000s/acre	% Cost
Relevant Not Relevant		
f) Flood prone	-60	-200

LIVING RESOURCES

	Cost Cost Units $1,000s/DU	% age Cost
On site resources		
I. Forest	+5	+50
Shrub	0	0
Herb	0	0
Barrier Beach Vegetation	+5	+50
Freshwater wetlands	0	0
Bogs	0	0
Freshwater Bodies	0	0

APPENDIX E 3.

Opportunity Factors and Costs for Marinas

This table lists the bonus and penalty costs for variations in all opportunity factors selected as relevant to marinas.

OPPORTUNITY FACTORS AND COSTS: MARINAS

1. USE TYPE: Recreation

2. USE SUB-TYPE: Intense water

3. Further USE DEFINITION: Marina

4. USE UNIT COST: $1,000/boat
   (complete excluding land
   acquisition or exceptional
   site cost)

5. NUMBER OF UNITS: 75 boats

6. TOTAL DEVELOPMENT COST: $75,000
   (complete excluding land acquisition
   or exceptional site costs)

7. DENSITY In units/acre: N/A
   (where appropriate)

8. ACREAGE REQUIRED: 3

9. SEWAGE DISPOSAL TECHNIQUE: Sewered

2. Opportunity Factor Specification: Marina

Available open space free of structures

Access to roads
navigation channels
navigable water areas (12'+)
water depth (for fill costs)
harbor water
sewers
Public water supply

AVAILABLE OF UNPAVED OPEN SPACE

		Optimum	Unacceptable
P	Paved		X
O	Open	X	

* % of Base Development Cost of $75,000 0-1/2 Mile to Expressway

Distance to Nearest Road	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 20-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Marsh Areas Requiring Piling & Fill	
< 1/2 xpress	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no penalty included in site costs	+9.7	+13	+9.7	+13	+9.7	+13	+9.7	+13	+9.7	+13
2) 300 ft. - (100 yds) - 300 yds.	+4.5	+6	+3	+4	+2	+3	-9.7	-13	-27.7	-37
3) 300 yds. (3/16 mile) - 1/2 mile	-15	-20	-23	-31	-30	-40	-90	-120	-180	-240
4) 1/2 - 1 mile	-50	-67	-68	-91	-86	-115	-230	-307	-446	-595
5) 1 - 2 miles	-110	-147	-146	-195	-182	-243	-470	-627	-902	-1203
6) 2 - 4 miles	-230	-307	-302	-403	-374	-499	-950	-1267	-1814	-2419
7) > 4 miles	-470	-627	-614	-819	-758	-1011	-1910	-2547	-3638	-4851

MARINAS

* % of Base Development Cost of $75,000   1/2 - 1 1/2 Miles to Expressway Intersection

Distance to Nearest Road	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 20-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Unit Cost $115/lin. ft. Marsh Areas Requiring Piling & Fill	
1/2-1 1/2 mile	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no penalty included in site costs	+5	+7	+5	+7	+5	+7	+5	+7	+5	+7
2) 300 ft. - (100 yds) - 300 yds.	0	0	-1.5	-2	-2	-3	-14	-19	-32	-43
3) 300 yds. (3/16 mile) - 1/2 mile	-20	-26	-28	-37	-34.5	-46	-94.5	-126	-184.5	-246
4) 1/2 - 1 mile	-55	-73	-73	-97	-91	-121	-235	-313	-451	-601
5) 1 - 2 miles	-115	-153	-151	-201	-187	-249	-475	-633	-907	-1209
6) 2 - 4 miles	-235	-313	-307	-409	-379	-505	-955	-1273	-1819	-2425
7) > 4 miles	-475	-633	-619	-825	-763	-1017	-1915	-2553	-3643	-4857

MARINAS

* % of Base Development Cost of $75,000 1 1/2 - 3 1/2 Miles to Expressway

C. Distance to Nearest Road	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 20-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Unit Cost $115/lin. ft. Marsh Areas Requiring Piling & Fill	
1 1/2 - 3 1/2	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no penalty included in site costs	+2	+3	+2	+3	+2	+3	+2	+3	+2	+3
2) 300 ft. - (100 yds) - 300 yds.	-3	-4	-4.5	-6	-5	-7	-17	-23	-35	-47
3) 300 yds. (3/16 mile) - 1/2 mile	-22.5	-30	-31	-41	-37.5	-50	-97.5	-130	-187.5	-250
4) 1/2 - 1 mile	-58	-77	-76	-101	-94	-125	-238	-317	-454	-605
5) 1 - 2 miles	-118	-157	-154	-205	-190	-253	-478	-637	-910	-1213
6) 2 - 4 miles	-238	-317	-310	-413	-382	-509	-958	-1277	-1822	-2429
7) > 4 miles	-448	-637	-622	-829	-766	-1021	-1918	-2557	-3646	-4861

MARINAS

* % of Base Development Cost of $75,000 > 3 1/2 Miles to Expressway

D. Distance to Nearest Road	Unit Cost $15/lin. ft. Non flood Areas Good Load Bearing Sandy and Silty Soils 20-6 tons sq. ft. AASHO Ratings 1-5		Unit Cost $20/lin. ft. Non Flood Areas Fair Load Bearing Clay Soils 1-2 tons sq. ft. AASHO Ratings 6		Unit Cost $25/lin. ft. Non Flood Areas Poor Load Bearing Clay Soils <1 ton/sq. ft. AASHO Rating 7		Unit Cost $60/lin. ft. Non Marsh Flood Areas Requiring Av. 6' Depth of Fill		Unit Cost $115/lin. ft. Marsh Areas Requiring Piling & Fill	
1 1/2 - 3 1/2	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost	Cost in $1000s	% Cost
1) 0 ft. - 300 ft. no penalty included in site costs	0	0	0	0	0	0	0	0	0	0
2) 300 ft. - (100 yds) - 300 yds.	-5	-7	-7	-9	-7.5	-10	-19.5	-26	-37.5	-50
3) 300 yds. (3/16 mile) - 1/2 mile	-25	-33	-33	-44	-40	-53	-100	-133	-190	-253
4) 1/2 - 1 mile	-60	-80	-78	-104	-96	-128	-240	-320	-456	-608
5) 1 - 2 miles	-120	-160	-156	-208	-192	-256	-480	-640	-912	-1216
6) 2 - 4 miles	-240	-320	-312	-416	-384	-512	-960	-1280	-1824	-2432
7) > 4 miles	-480	-640	-624	-832	-1024	-1920	-1920	-2560	-3648	-4864

Channel Dredging Costs
Assuming that Mooring Areas are Dredged up to 5'
* % of base cost of $75,000

Unit Cost 50' channel:

. shallow water av. 5' - $45/lin. ft.
. marsh av. 8' - $75/lin. ft.
. floodprone av. 13' - $120/lin ft.
. upland av. 23' - $210/lin. ft.

. shallow water in mooring area $0 (inc. in development cost)
. marsh in mooring + 3' dredge = $30/lin. ft.
. flood prone in mooring +8' = $75/lin. ft.
. upland in mooring +13' = $120/lin. ft.
+ $75,000/bridge

	Shallow Water Av. 3' depth		0'		0 - 10' elev. av. 5'		10' + elev. av. 15'	
	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost*	Cost in $1000s	% Cost
1) 0-600'	0	0	-7.5	-10	-22.5	-30	-37.5	-50
2) 600'-1/2 mile	-45	-60	-75	-100	-120	-160	-214	-285
3) 1/2 - 1 mile	-150	-200	-247.5	-330	-405	-540	-705	-940
4) 1 - 2 miles	-330	-440	-547.5	-730	-877.5	-1170	-1538	-2050
5) 2 - 4 miles	-6855	-9140	-1144	-1525	-1830	-2440	-3202.5	-4270

ACCESS TO PORTS AND HARBORS

		Cost + = bonus − = penalty	% age cost
	view and access to desirable		

b) Access to minor harbor

	distance to harbor	Cost Units $1000s/ development	% age Cost
1)	0 ft.-300 ft. (100 yds.)	+75	+100
2)	100 yds.-300 yds. (3/16 mile)	+19	+25
3)	3/16 mile (300 yds.)-1/2 mile	0	0
4)	1/2-1 mile	0	0
5)	1-2 miles	0	0
6)	2-4 miles	0	0
7)	More than 4 miles	0	0

ACCESS TO SEWERS

	Distance to sewer	Unit Cost $15/lin. foot Cost Units $1,000s/ developement	% age cost
1)	On site	0	0
2)	0 ft.-300 ft. (100 yds.)	-2	-3
3)	100 yds.-300 yds. (3/16 mile)	-9	-12
4)	3/16 mile (300 yds.)-1/2 mile	-25	-33
5)	1/2-1 mile	-60	-66
6)	1-2 miles	-120	-160
7)	2-4 miles	-240	-320
8)	More than 4 miles	-480	-640

ACCESS TO PUBLIC WATER SUPPLY

		Cost + = bonus - = penalty Unit Cost $10/linear ft. water line complete Cost Units $1,000s/ development	% age cost
1)	On site	0	0
2)	0 ft.-300 ft. (100 yds.)	-1.5	-2
3)	100 yds.-300 yds. (3/16 mile)	-6	-8
4)	3/16 mile (300 yds.)-1/2 mile	-18	-24
5)	1/2-1 mile	-40	-53
6)	1-2 miles	-80	-106
7)	2-4 miles	-160	-213
8)	More than 4 miles	-320	-427

APPENDIX E 4.

Next Steps In Opportunity Analysis

Next Steps in Opportunity Analysis

A major objective of coastal zone management is to balance the often conflicting requirements of development and conservation in a fair and reasonable way. The most comprehensive and flexible way of understanding development location requirements appears to be an opportunity analysis of the kind outlined in Section 6. The locational requirements of individual uses can be accurately specified by developers by listing the opportunity fators required. The weight that should be given to each factor can be linked to current costs with a reasonable degree of consensus. The amount of site modification that is economically feasible can be varied with scale of use by expressing site modification costs as a percentage of a base cost.

The problem with this method is the complexity. Opportunity rankings are not only use specific but scale specific as well. The maps of individual opportunity factors are not at present available. They are expensive to produce and update. The manual synthesis of opportunity variable maps is time consuming and requires considerable skill.

The success of this method in translating development needs into spatial recommendations with considerable objectivity is sufficiently great however that it is worth considering how the technique may be modified to the extent that it can be used as one of the criteria for setting policy.

The first simplification is to omit the maps. These are mainly of use in preparing recommendations for master plans or in setting policy that depends on an understanding of patterns or of the area within a particular opportunity level. The pilot study maps give a preliminary indication of the patterns that more extensive study would reveal and, while further mapping is desriable, general policy can be set without it.

The second simplification is to omit scale and analyse opportunity by use irrespective of size. This modification loses some of the sensitivity of the method since some penalty costs, for example building a new road to serve a development, occur only once per development and so represent a lower percentage cost of large developments than small and affect opportunity less.

Many opportunity factors however are not scale-dependent. It is considered that the results given from the analysis of uses without scale sub-types will be sufficiently accurate for the purposes of general policy-making.

Matrices are proposed that will express the level of opportunity of any location for any of the uses listed in the tables in Section 1, Coastal Uses under opportunity anlaysis.

These matrices will permutate the categories of all the selected opportunity factors for uses and assign a level of opportunity to each combination based on cost estimates. Both the opportunity factor specifications and the costs will, whenever possible come directly from use developers or be verified by them. Two contracts are currently proposed to collect this information.

The preliminary opportunity factors that are to be used in these matrices are listed below.

Figure ___: Proposed Opportunity Factors

Access to: Roads
Railroads
Bus service
Airports
Navigation channels
Ports and harbors
Surface water
Sewers
Public water supply
Soils suitable for septic tanks
Natural water supply
Schools
Shops
Health services
Churches
Employment
Consumer markets
Unpaved open space
Slope
Load bearing capacity
Drainage
Fertility
Depth to seasonal high water table
Flooding
Topographic types
Living resources
Water depth
Availability of mining minerals

APPENDIX F

Background for Section 7a

Opportunity-Constraint Conflict Resolution

Matrix Adjustment and Spatial Implications

Matrix Adjustment and Spatial Implications

The main policies that determine settlement patterns are linked to suitability rankings. The suitability rankings are obtained from the suitability matrices that combine rankings of opportunity with rankings of constraint. Rankings of opportunity are obtained from matrices that combine opportunity factors. Rankings of constraint are obtained from matrices that combine the constraint rankings between land and water subtypes (intertype levels) and these are obtained from matrices that combine constraint factors within minor land and water subtypes (intratype levels). These matrices may be summarized thus:

```
  "C"
Opportunity     Opportunity                                         "D"
Factor    ------>Rankings----------------->----------------->Suita-
Matrices                                                      bility      Suita-
  "A"           Intra type        "B"         Intertype---->Matrices---->bility
Intra type      Constraint      Intertype     Constraint                  Rankings
Constraint----->Rankings------>Constraint---->Rankings
Factor                          Matrices B
Matrices
```

The change of any ranking in matrices A, B, C or D will alter the recommended land use distribution but the nature of the alteration will be different depending which matrix is adjusted.

For the purposes of illustration preliminary rankings have been placed on all the matrices and maps prepared using these rankings. However, it is anticipated that these numbers will change during the process of debate.

It is intended that the structure of matrix combination outlined above should provide a structure for this debate and that tradeoffs between the needs of development and conservation should be recorded by the ranking placed in matrices. In order to do this it is necessary to understand what are the differing implications of changing the various matrices.

Opportunity Matrices

The opportunity matrices list possible combinations of opportunity factors, estimate the summary of cost bonus or penalty associated with each combination and assign a number from 1 to 10 to the cost.

Three sets of decisions are involved.

1) The opportunity variables relevant to a use.

These are, wherever possible, specified by developers. If additions are necessary, these should be suggested by developers.

The spatial effect of adding more opportunity factors may be to lessen the areas of prime opportunity, since these will depend on the coincidence of more factors. Since high opportunity may override constraint in Matrix "D" the addition of factors may reduce the acreage of acceptable sites. For this reason the basic minimum of opportunity factors known to be essential to a use will be set by NJOCZM from data gathered from developers and the inclusion of marginal factors discussed with developers.

2) The cost bonus and penalty associated with variations of opportunity factors.

These figures are also generated mainly from use developers and verified where possible with current cost data from contractors. Once agreement is reached that the costs are reasonable little change will occur unless market costs change relative to one another.

The effect of raising a cost penalty (the commonest type) will be to cluster areas of high opportunity more closely around the factor generating the opportunity (a road for example) and lessen the acreage of prime opportunity unless the costs of other factors raise by a comparable amount.

3) The assignation of opportunity rankings to costs.

In some cases this is straightforward. The cost difference between the combination of opportunity factors representing the best and worst situations is divided by ten and each combination sorted into the appropriate level. No controversial decision is involved.

In other cases, however, the worst situation is not one that would ever be considered, (a land-locked site for a water dependent use for example). A decision must be made in those opportunity factors on which a use is totally dependent as to what is the worst acceptable level.

To clarify by example, a marina depends absolutely on access to water. It is possible to construct an access channel to connect a land locked site to a water body, but expense quickly limits the length of channel feasible. A decision must be made setting a maximum distance to water beyond which areas will not be analyzed for opportunity for marinas.

The lower this level is set the larger the acreage that will be included in high opportunity levels. Therefore it is in a developer's interest to set these levels unrealistically low. To avoid this, data will be gathered from developers on minimum acceptable levels in opportunity factors on which uses are dependent and a minimum feasible opportunity level set for each.

In general, the opportunity levels are less liable to change than constraint or suitability levels, since less judgement is involved.

Intratype Constraint Matrices

These "A" matrices list possible combinations of constraint factors within each major land or water subtype. An intratype constraint ranking from 1 to 4 is assigned to each combination within each minor land and type that reflects the relative sensitivity to impact of the varying levels of constraint factors present in the combination.

Until the more detailed impact analyis specified in the Estuarine study is complete, these rankings are necessarily preliminary. The combinations setting the highest and lowest constraint are straightforward, but the rankings between these extremes involve judgement.

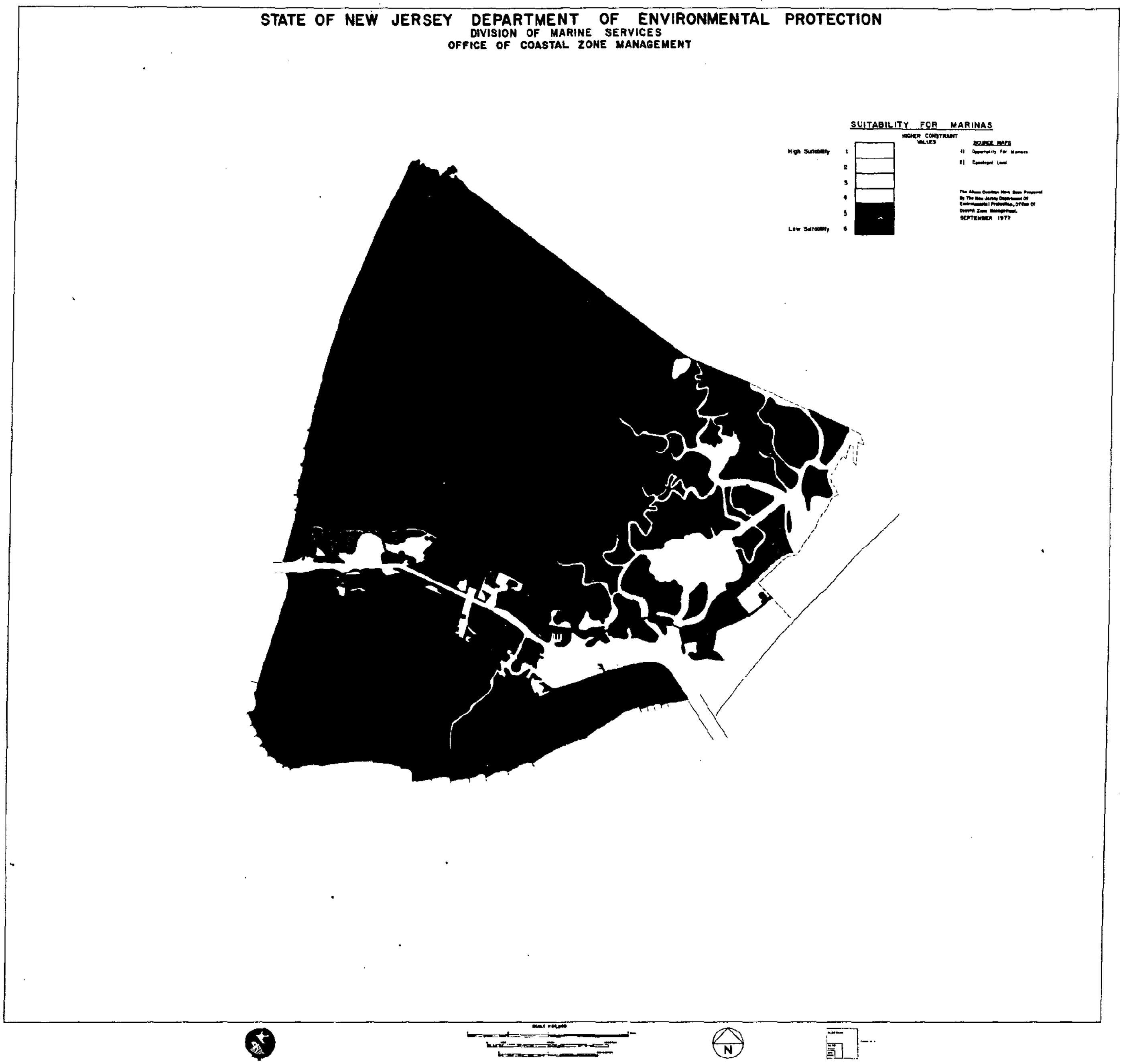
The intra type constraint rankings are combined in the "C" matrices to form intertype rankings and these go forward to the "D" matrices and combine with opportunity. By raising or lowering rankings in the "A" matrices, the suitability levels may be changed for these specific constraint types.

An example of the implications of this kind of adjustment can be seen in the two marina suitability maps. In Map 1, the constraint level for all marshes is set at 9 in the "A" matrices. No amount of opportunity affects constraint this high in the "D" matrices, so the disturbed marsh areas around the harbor are assigned a suitability level 5 which allows no structures and therefore no marinas.

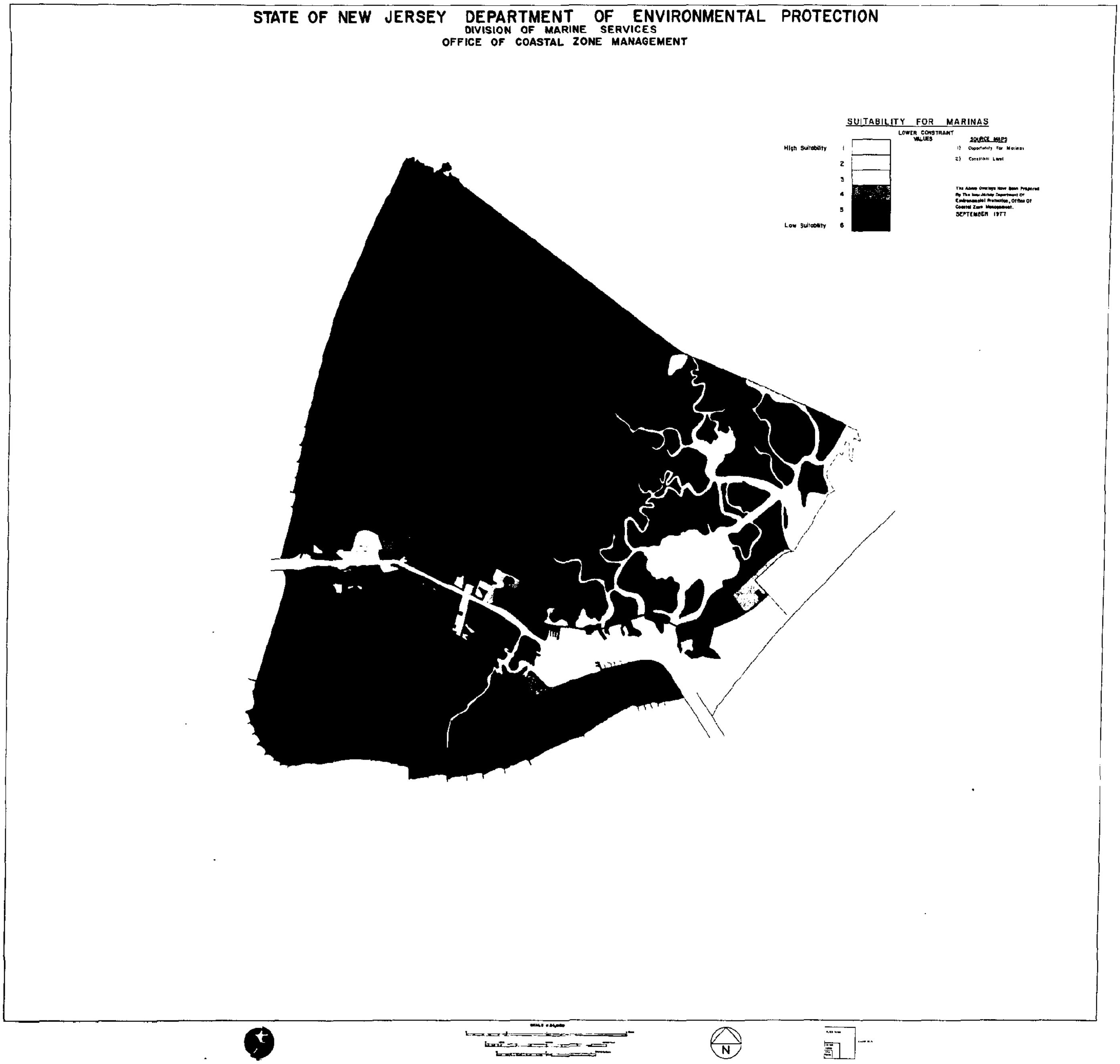
From study of the map, it seemed desirable to allow the harbor shores to be developed intensively from marinas but to prevent further development in the less disturbed marshes and channels to the north.

Map 2 shows the spatial implications of altering one constraint type, moderately disturbed back bay marshes with ambient water quality above a low standard, from level 9 to level 8 in the "A" matrices. By doing this, the highest opportunity levels for water-dependent uses override constraint in Matrix "D" and intensive marina development in the harbor areas becomes acceptable.

When alterations are made in the "A" matrices it is essential to follow through to the "B" and "D" matrices to understand the implications. In the example cited the adjusted constraint level in Matrix "A" means a limited loss of marshland to water-dependent development, a tradeoff that is debatable particularly if no alternative productive marshland is created. However, without it marina development is almost totally precluded in all estuarine bay systems. A policy decision must be made and recorded in the matrices.


STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
SUITABILITY FOR MARINAS
HIGHER CONSTRAINT VALUES
High Suitability
1
2
3
4
5
Low Suitability
6
SEPTEMBER 1977

Map 1


STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
SUITABILITY FOR MARINAS
LOWER CONSTRAINT VALUES
High Suitability 1
2
3
4
5
Low Suitability 6
SOURCE MAPS
1) Opportunity For Marinas
2) Constraint Level
SEPTEMBER 1977
N

Map 2

Intertype Constraint Matrices

In these two matrices the intratype constraint rankings of each minor land or water type are combined to make intertype land and water constraint rankings.

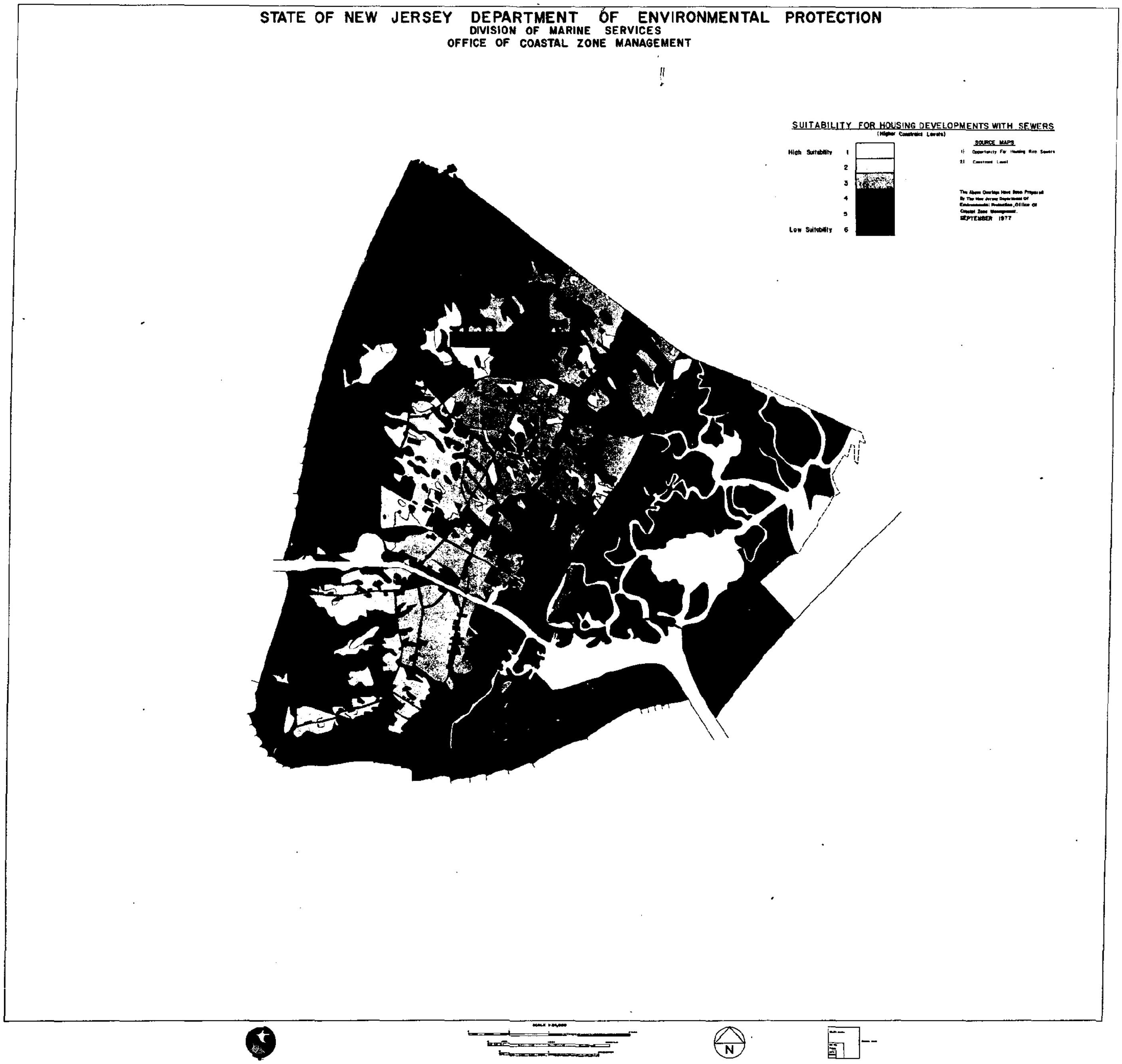
The positioning of intratype constraint rankings along the principal land constraint gradient of moisture and water gradient of assimilative capacity contributes to the setting of suitability levels in matrix "D". Alteration of the position of an intratype constraint ranking on the intertype constraint gradient will cause considerable changes in patterns of development.

An example of this type of matrix adjustment is shown in the housing suitability maps 3 and 4. In map 3 only small areas are shown suitable for housing because of high constraints associated with marsh, flood plain, prime forst and prime agricultural land. This may indeed by the desirable answer, and the whole township should become a low-growth area, however if more housing land is required the matrices may be used to assess the least sensitive and most opportune areas.

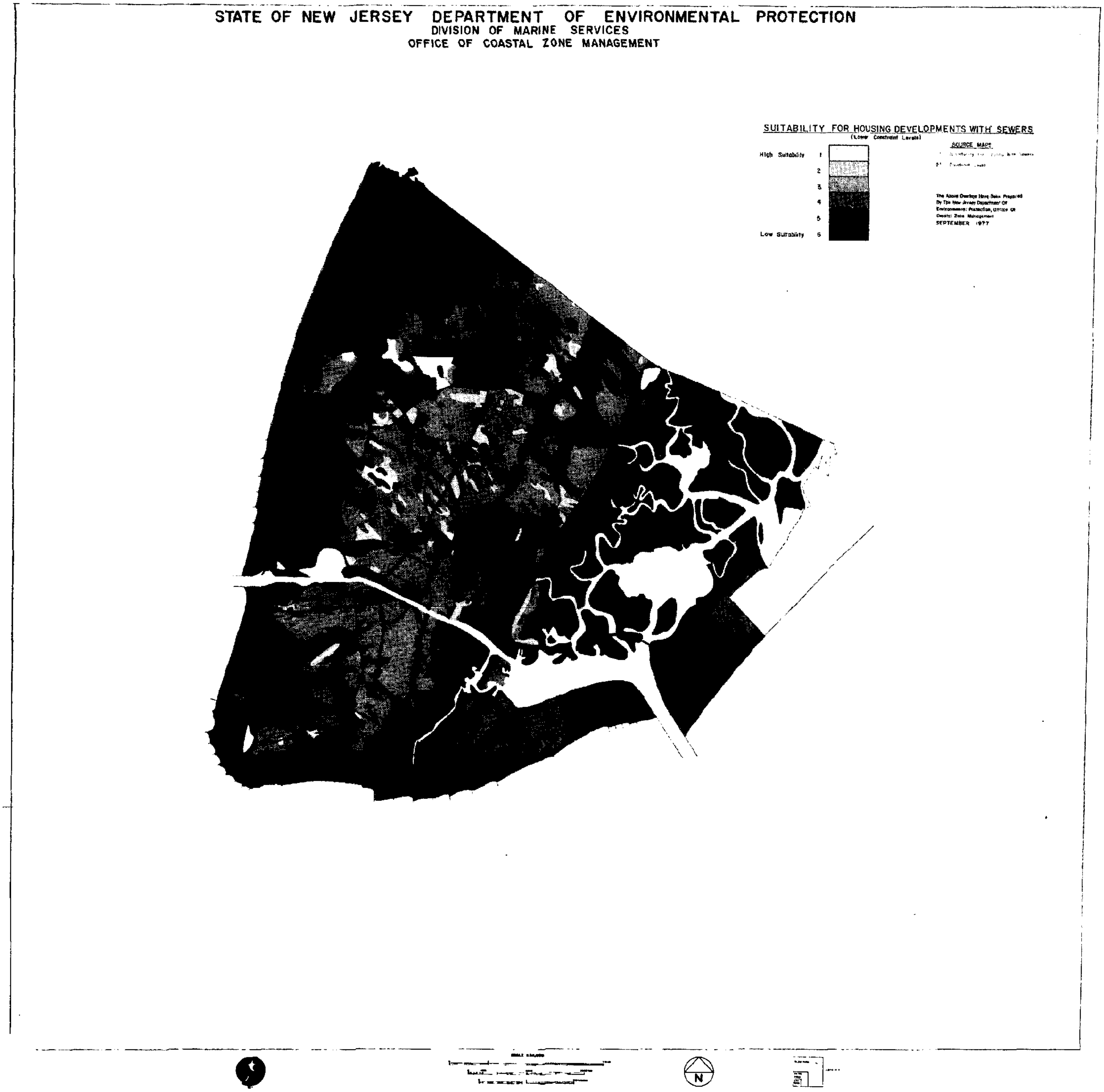
By study of the opportunity-constraint overlay maps for housing it became clear that some of the high opportunity areas fell into upland constraint types with a constraint rank 7. The values that produce this constraint were associated with prime agricultural land and forest, primarily by values held towards upland resources. Since uplands have the lowest capacity to transfer impacts to coastal waters it can be argued that thse uplands are over constrained.

By moving intratype upland constraint rank 4 from intertype land constraint rank 7 to rank 6 in Matrix "B", high opportunity for housing may override the lowered upland constraint in Matrix "D" to produce map 4 showing additional acreage suitable for housing. This addition is obtained at the expense of all the upland constraint types assigned an upland constraint level 4 that occur within the high opportunity areas.

When making changes in the "B" matrices it is essential to consult both the "A" and "D" matrices in order to understand both what constraint types are affected (Matrix "A") and how they will be affected (Matrix "D").


STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
SUITABILITY FOR HOUSING DEVELOPMENTS WITH SEWERS
High Suitability
1
2
3
4
5
Low Suitability
6
SOURCE MAPS
SEPTEMBER 1977
N

Map 3


STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF MARINE SERVICES
OFFICE OF COASTAL ZONE MANAGEMENT
SUITABILITY FOR HOUSING DEVELOPMENTS WITH SEWERS
High Suitability 1
2
3
4
5
Low Suitability 6
SOURCE MAPS
SEPTEMBER 1977
N

Map 4

Suitability Matrices

The two suitability matrices are the most important in the entire method. Each of ten levels of opportunity and constraint represent large areas of land or water and decisions as to how these should interact are the working core of the balance between development and conservation.

The preliminary patterns illustrated show constraint overriding opportunity in the constraint level 9 and 10 columns in order to protect the most sensitive water's edge areas. Opportunity level 1 and 2 lines override all but the highest constraint to allow development in limited high opportunity areas typically in and around existing settlement. In the remainder of the matrix the patterns reflect OCZM policy to concentrate further disturbance by limiting development in low opportunity areas irrespective of constraint and lowering constraint in high opportunity areas.

When adjusting these matrices it is essential to understand what land or water types are present in each constraint level. The balance that must be struck is between providing adequate acreages of high opportunity areas to provide for essential gorwth without destruction of unacceptable amounts of valued high constraint areas.

Weighting opportunity over constraint will produce tightly clustered settlements around opportunity generators, roads, sewers, water bodies, shops etc. and will involve some loss of highly valued areas.

Weighting constraint over opportunity will tend to disperse settlement into patterns that do not respond to opportunity. Although this involves less primary disturbance of valued areas, the dispersed settlement will have higher secondary disturbance and the lack of opportunity will cause conflict.

The optimum weighting lies between these extremes.

APPENDIX G

Background for Section 8

Suitability Resolution

Tranquillity Park Case Study

TRANQUILLITY PARK CASE STUDY:

Comparison Between CAFRA Permit Application Process and Planning Method Recommendations

Introduction

In order to assess the usefulness of the OCZM planning method a CAFRA application was analyzed using the method. The method recommendations were compared with the CAFRA decision and conclusions drawn as to the relevance and ease of use of the method. The CAFRA application called Tranquility Park was chosen due to its location in Lower Township, its' proposal for a single family dwelling complex, and its history as a denial and subsequent approval.

The format of this section will list all pertinent information about Tranquility Park, obtained from Opinions 27 and 36 and the E.I.S. in the left column, and all planning method data in the right column.

Description of Area

The application describes Lower Township with a population of 6,332 (1960), 10,154 (1970), and 12,000 (projected). The population is concentrated on the Delaware Bay. The coastally unique ecological features of the area are listed as; beaches, wetlands, dunes, freshwater swamps, prime faunal and floral habitats, and the canal.

A subdivision moritorium was adopted by the township based on the lack of ability to appropriately guide development.

The socio-economic analysis, which is not completed, will describe the area and class it as specific zone with specific socio-economic policies. Without quantitative support the township is classed as a resort based zone, seasonal and retirement, buffered by agriculture and open space, with a strong service core.

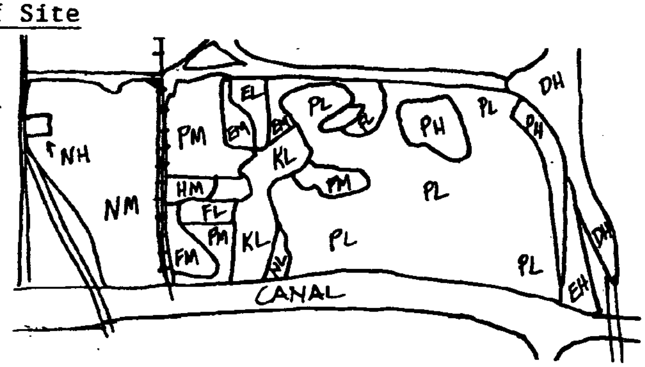
Description of Site

The site is a 144.3 acre parcel with the following list of land and water types:

(1) Moderately wooded forest
(2) Cultivated farmland
(3) Open farm land
(4) Hedgerows
(5) Regulated wetlands

The land use is primarily agriculture with scattered homes, a minor subdivision, and no major development.

The zoning is R-3, which is moderately high density residential, with a minimum building lot of 7,500 square feet.



LAND AND WATER TYPES AND DISTURBANCE

Key
P=Flood Prone

	DSHWT (ft)	Permeability (inch/hr)
D	1-3	0.2"-2.0"/
E	1-3	2.0"-6.0"
F	1-3	6.0"
H	3-5	2.0"-6.0"
K	5+	0.2"-2.0"
N	5+	6.0"

L - Low Disturbance
M - Medium Disturbance
H - High Disburbance

The site is predominately flood prone-low disturbance in the western half (PL), with scattered medium and high level disturbance (PM, PH) in the central portion. The central portion also has low and medium disturbance for areas of low water table and low to high permeability (KL, HM, FL) (see method for complete explanation).

Proposed Facility

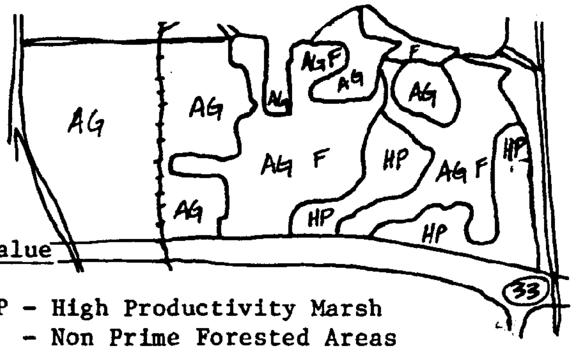
1) 341 one and two bedroom homes
2) 7,500 square feet/lot
3) Sale price $30-$35,000
4) 40% seasonal (developers' data support figure)
5) 35 acres of regulated wetland remain untouched
6) one acre donated to township for recreation
7) 6-8 year staging plan, with roads and utilities first
8) no major earth moving
9) lots to be higher than streets
10) minimum filling to preserve trees
11) buffer between wetlands and uplands
12) tree preservation plan

Site Plan

The entire site is gridded with development except for the regulated wetlands (see site plan below).

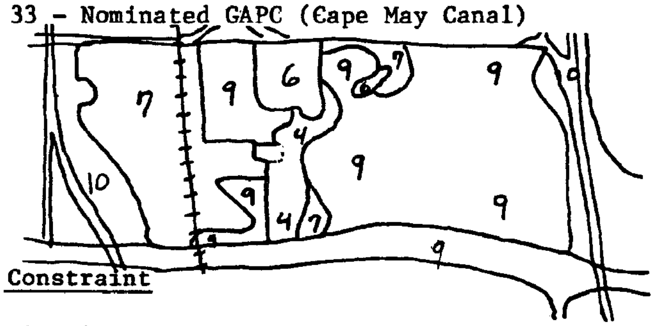
Proposed Use

1. b. i) Low density (1-3 DU/a)
Suburban housing
(No data given on sewage treatment)



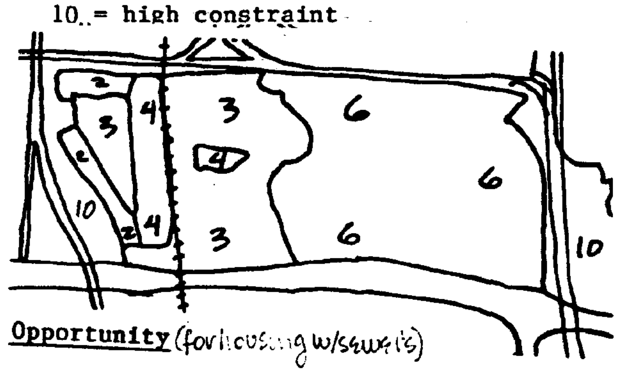
Value

HP - High Productivity Marsh
F - Non Prime Forested Areas
AG - Agricultural Capability Classes I-III
33 - Nominated GAPC (Cape May Canal)



Constraint

1 = low constraint
10 = high constraint



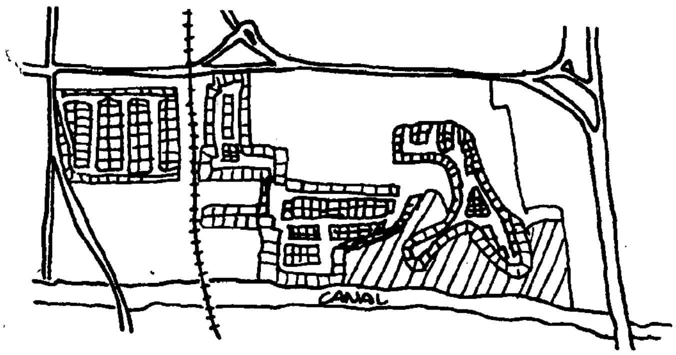
Opportunity (for housing w/sewers)

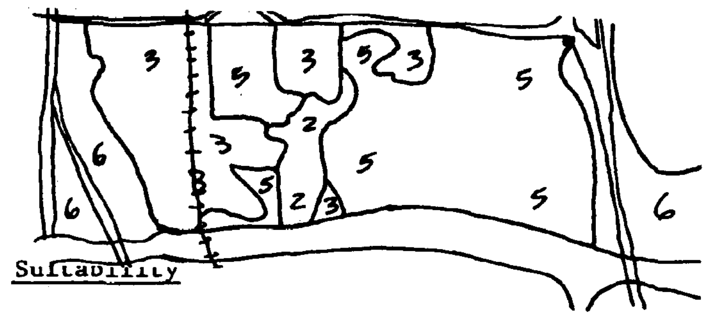
1 = high opportunity
10 = low opportunity

Opportunity

The map indicates low opportunity for housing with sewers to the east with medium high opportunity in the center and west. There is a small amount of marina opportunity along the canal. Generally the site is a poor site for intensive development.

SITE PLAN





Suitability

1 = suitable for intensive development
2 = suitable for moderate intensity
3 = suitable for land use without structures
4 = suitable for moderate intensity rec.
5 = suitable for low intensity rec.
6 = unsuitable for human use

CAFRA-Developer Conference

A conference with developer emphasized the following points on the necessity for a more enviornmentally sensitive site plan;

1) increased open space
2) increased recharge areas
3) increased wildlife habitats
4) increased cultivated prime land
5) improve aesthetics
6) limit construction in floodplain

The developer ammended his plan by:

1) eliminating 37 houses
2) eliminating 1,770 feet of road

The following alternates to the proposed facility were presented by the developer without supporting evidence;

1) lagoon development
2) Townshouses
3) sanitary landfill
4) mobile home park
5) marina
6) farm

Site Plan Critique by CAFRA (denial of permit)

Unique Land Types (Agriculture)

Twenty seven acres of cultivated fields provided valuable open space, buffers from urban areas, recreational use, and vegetables for local consumption. The use of this land for development causes a degradation of a unique and irreplaceable land type and existing scenic and aesthetic resources.

Floodplain Management

The applicant has made no attempt to limit development from the flood prone areas. This endangers human life and property and impairs public health, safety and welfare.

The Canal is public open space, an aesthetic amenity that must be maintained. Since the development is out of character with the canal the project would adversely impact the aesthetics.

Location Policy of Plan

Agriculture Land on this site is classified as Conservation-high maintenance open space - group II (upland-moderate water table-prime agricultural). The recommended use is medium intensity development, (agriculture or recreation) without structures, except for limited agricultural or recreational structures.

Floodplain is classified as Preservation on which low intensity recreation such as nature study, walking for pleasure shall be encouraged, structures and paving shall be discouraged.

The Canal and its right of way is a Preservation area of special value where uses that interfere with existing use are discouraged and where low impact activities shall be encouraged which maintain the existing quality and quantity of the resource.

Potable Water Aquifer Recharge

1) Salt water intrusiǒn is occuring based on three independant studies in Cape May County.

2) The waters are becoming unsuitable for public water supply.

3) More impermeable surface in the township will result in the loss of valuable recharge areas.

Therefore the prime recharge areas must be preserved.

4) The plan specifies that 70% of the storm water will be emptied into the canal. If detention and recharge are going to occur a dry well drainage system will be necessary unless clustering can be accomplished to preserve recharge areas.

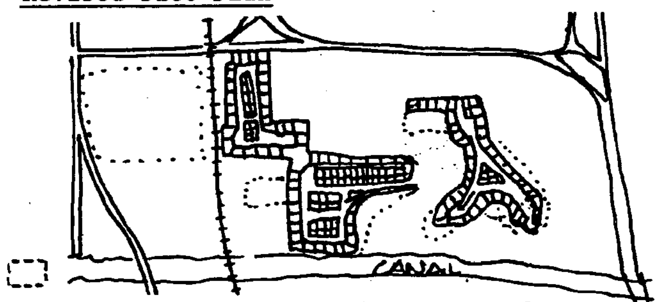
This is an impairment of the regenerative capacity of water.

The permit was denied based on the fact that structures were built on:

1) the flood plain
2) Agricutlural land
3) recharge areas

The developer then submitted a revised plan.

Revised Site Plan



Proposed areas for development in first but not second submission.

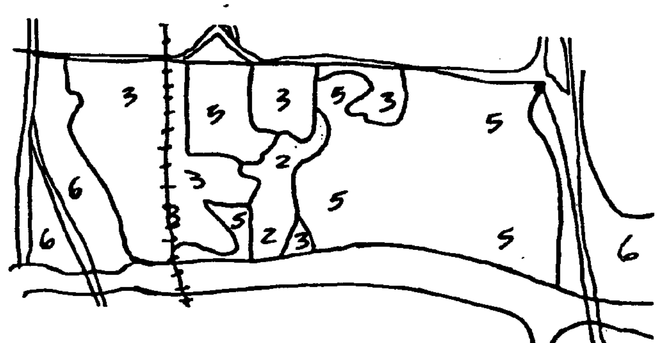
Proposed Facility (revised)

1) 242 homes (reduced from 376)
2) selling price $30-$50,000
3) mostly retirement
4) 24.3 acres returned to agriculture
5) lots eliminated near canal

In the pilot area (coastal plain) the entire permeable surface acts as a recharge area for the Pleistocene acquifers, whereas only upland with a medium to high (5'+) are considered prime recharge areas. These do not occur on the site.

The OCZM Planning Method also rejects the application based on the fact that the site consists of:

1) Presevation lands
   a) canal
   b) flood plain
2) Conservation areas
   a) agricultural land
   b) recharge areas



Suitability

The application was accepted with the following conditions:

1) Conservation Easement for the 24.3 acre agricultural tract.

2) Construction on the floodplain must have finished first floors below the 10 foot mean sea level, with the structure designed to prevent lateral movement, flotation, and collapse.

3) The completion of a tree preservation and planting plan.

4) The construction of channels between the storm sewer outfalls and canal utilizing blocked mosquito control ditches in order to enhance tidal flushing.

Although the planning method would not accept the application since CAFRA did accept Tranquillity Park it is an important excercise to apply the planning method's policies to the development.

Comments in this column reflect the level of conformance to uses in the right hand column.

1) No adequate attempt was made to give priority to recreational development.

2) The conservation easement was an excellent mechanism to protect agricultural land.

3) Clustering adjacent to the wetlands was mandatory due to the lack of land available for housing, however, single family units are dispersed house type not encouraged.

4) No attempt was made to deal with gravel pits, as an opportunity location.

5) One acre was donated to township for recreation.

According to the plan the application would still be unaceptable due to the development of the flood plain area. On examining the suitability maps there is only a small portion of land in the central part of the site that is suitable for development.

Coastal Use Policies

1) All proposed non recreational development immediately adjacent to the water must demonstrate that the proposed use is more appropriate or necessary than recreation.

2) The maintenance of prime agricultural land will be encouraged.

3) Housing developments which cluster units will be encouraged.

4) Mine reclamation - agreements that exposed mining areas will be put to useful purpose.

5) The inclusion of recreational areas within proposed residential development will be encouraged.

Comments on policies in right column	Planning Method Policies
1) Waterfront access was not indicated in plan.	1) Waterfront access: public access both visual and physical must be provided.
2) There is a ground and surface water problem in the area but only recharge was dealt with.	2) Fertilizers, herbicides and pesticides use will not be permitted if it can be demonstrated that ground or surface water degradation will occur.
3) Air impacts are not discussed	3) Air conditions are to be considered.
4) The lots will be higher than the streets and 70% of storm drainage will go into the canal. This is not sufficient to handle the problem.	4) Runoff: Increase in the amount of runoff beyond natural conditions will not be permitted.
5) No heavy earth moving will occur. However, no calculations were provided indicating erosion control technique.	5) Erosion: soil loss must be restricted during construction and operation to natural levels.
6) The plan was sensitive to vegetation loss in certain areas as wetlands and hedgerows. A planting and preservation plan were submitted.	6) At least 10% of the site's vegetation should be left undisturbed.
7) Energy consumption was not specifically addressed.	7) Energy Consumption shall be minimized.
8) SFD is a discouraged type.	8) Settlement Patterns: sprawl is discouraged.
9) The site plan is insufficient information to judge aesthetics.	9) Aesthetics: proposals with unacceptable aesthetic impacts shall be denied.
10) Areas were left in natural habitat condition but techniques were not discussed.	10) Wildlife Management techniques to promote species diversity will be encouraged.

APPENDIX H - MAPPING

1. Cost and Time Records for Pilot Area Mapping

2. Flow Chart for Map Overlay Procedure

Figure 4: List of Pilot Maps

Map No.	Map Title	Section 2 Coastal Locations (Land and Water Types	Section 3a Environmental Impact Analysis	Section 4 Value Analysis	Section 5 Constraint Synthesis	Section 6 Opportunity Analysis	Section 7 Opportunity-Constraint Synthesis	Section 8 Suitability Resolution
1.	Flood Prone Areas	x				x		
2.	Depth to Seasonal High Water Table	x						
3.	Permeability of Soils	x						
4.	Vegetation and Living Resources	x		x		x		
5.	Geomorphology and Bathymetry	x						
6.	Surface Water and Salinity	x						
7.	Land and Water Types	x	x		x			
8.	Land and Water Use	x						
9.	Disturbance Levels	x						
10.	Surface Water Quality	x						
11.	Land and Water Types with Disturbance Levels	x	x		x			
12.	Agricultural Capability			x				
13.	Nominated Areas of Concern			x				
14.	Value Synthesis			x	x			
15.	Constraint Levels				x		x	
16.	Unpaved Open Space					x		
17.	Access to Roads					x		
18.	Access to Railroads and Airports					x		
19.	Access to and View of Water					x		
20.	Access to Sewer and Water Supply					x		
21.	Access to Shops and Schools					x		
22.	Soil Suitability for Septic Tanks					x		

Map No.	Map Title	Section 2 Coastal Locations (Land and Water Types	Section 3a Environmental Impact Analysis	Section 4 Value Analysis	Section 5 Constraint Synthesis	Section 6 Opportunity Analysis	Section 7 Opportunity-Constraint Synthesis	Section 8 Suitability Resolution
23.	Land Drainage					x		
24.	Access to Navigation Channels					x		
25.	Opportunity for Housing with Sewers					x	x	
26.	Opportunity for Housing with Septic Systems					x	x	
27.	Opportunity for Marinas					x	x	
28.	Opportunity Constraint Conflict Housing with Sewers						x	
29.	Suitability for Housing with Sewers (Higher Constraint)						x	x
30.	Suitability for Housing with Sewers (Lower Constraint)						x	x
31.	Suitability for Housing with Septic Systems (Higher Constraint)						x	x
32.	Suitability for Housing with Septic Systems (Lower Constraint)						x	x
33.	Suitability for Marinas (Higher Constraint)						x	x
34.	Suitability for Marinas (Lower Constraint)						x	x
35.	Use Competition Conflict						x	x

The following is a list of maps and man hours involved in research and drafting of the Pilot Study. In addition, the cost of photographic reproductions, reductions, enlargements, slides, films, mylars, etc. is included.

Map No.	Map Title	Drafting & Research Involved in hours
1	Flood Prone Areas	6
	Soil Types (base map)	4
2	Depth to Seasonal High Water Table	8
3	Permeability of Soils	3
4	Vegetation and Living Resources	30
5	Geomorphology and Bathymetry	31
6	Surface Water and Salinity	10
7	Land and Water Types	21
8	Land and Water Use	43
9	Disturbance Levels	12
10	Surface Water Quality	5
11	Land and Water Types with Disturbance Levels	6
12	Agricultural Capability	5
13	Nominated Areas of Concern	4
14	Value Synthesis	34
15	Constraint Levels	102
16	Unpaved Open Space	6
17	Access to Roads	10
18	Access to Railroads and Airports	5
19	Access to Surface Water	5
20	Access to Sewer and Water Supply	8
21	Access to Shops and Schools	12
22	Soil Suitability for Septic Tanks	4
23	Land Drainage	3.5
24	Access to Navigation	12
25	Opportunity for Housing with Sewers	157
26	Opportunity for Housing with Septic Systems	81
27	Opportunity for Marinas	88
28	Opportunity-Constraint Conflict with Sewers	82
29	Suitability for Housing with Sewers (Higher Constraint)	40
30	Suitability for Housing with Sewers (Lower Constraint)	4
31	Suitability for Housing with Septic Systems (Higher Constraint)	40
32	Suitability for Housing with Septic Systems (Lower Constraint)	4
33	Suitability for Marinas (Higher Constraint)	12
34	Suitability for Marinas (Lower Constraint)	2.5
35	Use Competition Conflict	24
	Total Hours	921

921 person hours x $10 per hour = $9,210.00

Drafting Supplies & Materials
$ 858.79

Reproductions & Graphic Preparation
$4,651.25

Film, Slides, Visual Presentation
$ 201.00

Total Cost Without Manhours
$5,711.04

Total cost with person hours = $14,921.04

In the similar but less comprehensive Boonton Quadrangle study the following environmental constraint factors and the synthesis map were produced: Soil Types, Depth to Seasonal High Water Table, Hydrologic Soil Groups, Permeability, K-Factor, Land Capability Units, Land Cover, Slope, Depth to Bedrock, Surface Hydrology, Vegetation, Historic Sites, Watershed Properties, Water of Sewerage Facilities, Existing Zoning, Well Locations, Highly Erodable Soils, Prime Infiltration, Potential Rapid Runoff, Floodway, Flood Fringe, Flood Prone, Prime Agricultural Land, Inland Wetlands Prime Aquifer Recharge, Synthesis-Environmental Response. The total cost excluding the 1 year 5 man team hours was $10,000.

FLOW CHART FOR MAP OVERLAY PROCEDURE