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#726

September 28, 1979

THE ESTUARINE STUDY
VOLUME 1
IMPACT AND MANAGEMENT REPORT

U.S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
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Prepared for: New Jersey Department of Environmental Protection
Division of Coastal Resources
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Contract A97146

This report was prepared in part with financial assistance from the
United States Department of Commerce
National Oceanic and Atmospheric Administration
Office of Coastal Zone Management
under the provisions of Section 305 of the Coastal Zone Management Act of 1972 (Public Law 92-583, as amended).

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HT393.N5 E885 1979 v.1 c.2
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EXECUTIVE SUMMARY

This report presents an analysis of the New Jersey estuarine environment and the coastal zone management framework. It was commissioned by the Office of Coastal Zone Management (now: Division of Coastal Resources, Bureau of Coastal Planning and Development, BCPD) in the Department of Environmental Protection.

The report draws upon the accumulated experience of the consultant's personnel who since about 1950 have studied, sought to protect, and advised clients on how, sensitively, to develop the environment of New Jersey. During the decade of the 1970's the consultant accomplished more than 100 contract environmental analyses throughout New Jersey for Federal, State, and local governments and regulatory agencies, for large and small developers from both the private and public sectors, and for an array of conservationist groups. The consultant has been at the forefront in advising legislative bodies on the need for new environmental regulatory authorities; in advising regulatory agencies including NJ-DEP on the technical bases for the effective administration of new, environmentally protective laws and in commenting on emerging regulations; and in guiding applicants to satisfy fully the changing regulatory requirements for increasingly comprehensive environmental reviews of proposed projects.

The Estuarine Study was prepared during 1978 and 1979. The Impact Management report constitutes Volume One. It consists of three principal parts. The introductory Executive Summary and Summary Recommendations make up the first part of Volume One.

The second part of Volume One addresses environmental impacts. It consists of eleven chapters which examine the basic environmental resources of the coastal zone, the kinds of facilities and activities that may be proposed in the future at various locations in the coastal zone, and the probable compatibility between each kind of facility or activity and each relevant environmental resource complex.

The third part of Volume One first addresses the institutional framework for coastal zone management in New Jersey. Then, upon the basis of the analysis of impacts and of management tools, the consultant presents recommendations for strengthening estuarine protection in the coastal zone.

Volume Two of the Estuarine Study is a Use Appendix which describes coastal uses by photographs and illustrations. A brief discussion of the uses and their associated impacting activities also is included in Volume Two.

Volume Three of the Estuarine Study presents the Environmental Impact Matrices. These matrices are the basis for a method of evaluating proposed coastal facilities that eventually is expected to be used by DEP when considering permit applications and coastal planning efforts.

Volume Four of this report presents additional documentation. It consists of the bibliography of about 2,000 references used by the consultant when preparing the report and a documentation matrix keyed to the matrixed intersections of land, edge, and water impacting activities and their resultant environmental changes. The matrix documentation is intended to be constantly updated by the BCPD and at this time has a number of intersection points which are not as yet documented.

The consultant began with the coastal administrative policies that resulted from several years of work by the New Jersey Office of Coastal Zone Management. Particular attention was paid to the management program described in the Bay and Ocean Shore Segment Final Environmental Impact Statement (NJDEP/NOAA 1978) and implemented during October 1978 and to the proposals made in Options for New Jersey's Developed Coast (NJDEP 1979). The consultant recognizes the major accomplishment embodied in these documents, which formalize State regulatory programs that affect the estuarine environment. This report looks ahead to the next generation of coastal zone management policies that will direct coastal developments during the 1980's.

Socioeconomic conditions and needs are not included in this analysis. Those aspects are of concern to the Department of Environmental Protection and to other agencies that regulate facilities and activities in the coastal zone. They will be addressed in another consultant report that is being considered by the Bureau of Coastal Planning and Development.

The objectives of this report are to highlight potential impacts, to focus on management aspects only partially addressed by existing DEP-OCZM documents, and to suggest ways that State policies protective of the estuarine environment can be strengthened. Special attention is paid to opportunities for enhanced interagency and intergovernmental coordination.

A number of suggestions are made for revision of text and for cross-references in the proposed DEP regulations, and several measures are recommended to consolidate or simplify the regulations and procedures without diminution of environmental protection. Other recommendations point out opportunities for DEP and other State agencies to support or propose new legislation, to enhance the effectiveness of surveillance and enforcement, and to continue the study of the coastal zone.

II. SUMMARY RECOMMENDATIONS

This Chapter summarizes recommendations discussed in Chapter XVI. It addresses first technical and procedural measures for general permit administration, followed by comments on key control regulatory programs. Then substantive coastal policies are addressed. Following recommendations on new legislation, ways of enhancing enforcement are suggested. The recommendations conclude with suggestions for further study. The rationale for the recommendations is presented in Chapter XVI.

A. Procedural and Technical Recommendations

1. General Recommendations

A-1. The Commissioner of DEP should assign a high priority to coordination of permit review responsibilities among DEP agencies.

A-2. DEP should complete the inventory of coastal zone resources in map series based on the USGS 1:24,000 topographic quadrangles or other geographic data system (such as a computerized system).

A-3. DEP should use the parameters (environmental changes) of potential concern for each type of special area or resource as identified in this report to require that each applicant for a State coastal permit, a State NPDES wastewater discharge permit, Section 201 certification, or Section 208 water quality approval demonstrate through site-specific data that his proposed project will avoid or minimize adverse effects on such areas.

A-4. DEP should sponsor original research to provide the basis for quantification of acceptable changes in parameters of environmental concern, and it should provide the staff expertise and data storage resource to keep abreast of new developments elsewhere, in order to avoid duplicative research and to focus on the most significant issues. (See also Recommendation E-3.)

A-5. DEP should establish a publications reference and retrieval system that catalogs, curates, and provides copies of DEP-funded reports, DEP-prepared reports, maps, EIS's, and other relevant reference information needed by DEP and the public.

2. Environmental Impact Statements and Permit Review Procedures

A-6. DEP should authorize and encourage pre-application conferences to be combined with the Federal pre-EIS scoping meetings authorized by the Council on Environmental Quality at 40 CFR 1501.7 (43 FR 230:55993, 29 November 1978) and combined Federal-State, issue-oriented EIS preparation to satisfy the needs of DEP as well as other Federal, State, and local agencies.

A-7. DEP should make certain that any EIS prepared for its review, inventories and assesses potential impacts on all nearby wetlands, as well as other significant resources.

A-8. DEP should promulgate all general EIS regulations in NJAC, and an entry for EIS regulations should be added to the NJAC general index.

A-9. Any EIS prepared for a project that is likely to affect air quality at the Brigantine National Wildlife Refuge (a Class I PSD area) should analyze fully the potential impact and demonstrate how all applicable requirements will be met.

A-10. Every EIS prepared for a DEP permit should be circulated to the applicable 208 Areawide Water Quality Planning Agency, if such agency is capable of reviewing and commenting on aspects of the EIS within its expertise or jurisdiction.

A-11. If any inland and/or coastal wetlands are to be filled as part of any project that DEP regulates, the applicant should be required to notify the appropriate office of the Army Corps of Engineers.

A-12. State permit approvals for projects that would involve filling of wetlands should be effective conditional upon either approval from the Corps of Engineers or a determination by the Corps that the project is outside its regulatory jurisdiction.

A-13. DEP should make certain that every EIS prepared for a State permit is made known and physically available to the concerned public.

A-14. DEP should direct applicants to be certain that EIS's are prepared by responsible persons qualified by education and experience for the topics they address, and should require that those persons responsible for the preparation of each EIS be identified in any EIS document submitted to the Department for review.

A-15. DEP should add (1) a list of other needed State, Federal, and local regulatory permits beyond waterfront development permits, together with the status of each, and (2) a documentation section, to all departmental EIS requirements, such as those currently required in CAFRA permit applications.

A-16. Any EIS submitted to DEP should identify and assess potential impacts on any historic or other cultural site in the vicinity that is potentially affected and that has been identified as significant by any county agency or that is listed on the New Jersey Inventory of Historic Sites.

A-17. DEP should retrieve systematically any original information developed in permit or other EIS's in order to assure its maximum use in ongoing management and regulatory undertakings.

3. Wetlands

A-18. DEP should promulgate immediately the 42 completed wetlands photomaps which have not yet been promulgated.

A-19. DEP should complete and publish the mandated inventory of tidal wetlands for the Hackensack Meadowlands, for the rest of the "Northern Waterfront", and for other heretofore neglected coastal regions of New Jersey and should promulgate the Wetlands Order for all coastal wetlands except those administered by the Hackensack Meadowlands Development Commission.

A-20. DEP should review past decisions defining narrowly the upper inland wetland boundary of regulated wetlands, and should reinterpret the boundary to include, in particular but not limited to, diked wetlands and forested or shrub-covered coastal wetlands "now or formerly connected to tidal waters whose surface is at or below an elevation of 1 foot above local extreme high water".

A-21. DEP should update the entire statewide coastal wetlands mapping at intervals no greater than ten years to reflect natural and man-made changes in this resource.

A-22. DEP should establish criteria and procedures for correcting wetlands maps during the intervals between map updates.

A-23. When a memorandum of record is prepared following a pre-application conference prior to Type B wetlands permit application submittal, DEP should send copies of the memorandum to the county, and municipal environmental commissions (if any) and to the county, municipal, and regional planning boards (if any) which subsequently may review the project.

A-24. DEP should distribute any memorandum of record for a prospective wetland permit application to the relevant District Offices of the Army Corps of Engineers.

A-25. DEP should require the applicant to send municipal and county environmental commissions (if any), municipal, county, and regional planning commissions (if any), and the soil conservation district and Areawide 208 Water Quality Planning Agency (if appropriate) copies of each Type B wetlands permit EIS.

A-26. Inland wetlands on or adjacent to each State-regulated project site should be required to be shown on coastal wetlands permit application maps, in addition to regulated coastal wetlands.

A-27. DEP should prepare two map series for use by coastal planners, applicants for permits, and the interested public, one showing the upper

inland wetland boundary at a scale of 1:24,000, and one showing the general distribution of regulated wetlands at a scale of 1:250,000.

A-28. NJ-DEP should review current information and conduct original research as appropriate for a review of the general Wetlands Order prohibition against the disposal of treated sewage effluent into regulated wetlands.

A-29. DEP should extend the Wetlands Order prohibition against pesticides to all stands of Olney threesquare.

4. Coastal Area Facility Review Act

A-30. A copy of the memorandum of record following a pre-application conference should be sent to the appropriate regional planning board, county environmental commission, and municipal environmental commission (if any).

A-31. CAFRA review of any project concurrently with Federal review explicitly should be authorized and specifically encouraged in the CAFRA regulations.

A-32. A copy of the CAFRA EIS should be supplied by the applicant to the State or Federal agency that administers Section 404 (Clean Water Act) permits, if any inland (shoreland) wetlands are likely to be affected by fill related to the proposed facility.

5. Waterfront Development Permits and the Natural Resource Council

A-33. Procedural and jurisdictional aspects of the waterfront development permit program should be reduced to written form.

A-34. Operational procedures and routine approval/disapproval criteria used by the Natural Resource Council should be reduced to written form.

6. Hackensack Meadowlands Development Commission

A-35. HMDC should revise its zoning regulations (NJAC 19:4-1.1 et seq.) to eliminate typographical errors.

A-36. HMDC should provide for publicly available copies of its zoning map, promptly reflecting the latest revisions, on a continuing basis.

A-37. HMDC should maintain and distribute a complete list of its publications, and should provide for the sale of its publications at cost.

A-38. HMDC should define in its regulations the following terms which are central to the implementation of the regulations: "tributary" and "major water courses".

A-39. HMDC explicitly should require identification of the extent and type of wetlands (if any) affected by every development decision authorizing construction in order to reduce Federal agency and applicant paperwork and to insure consistency of intergovernmental decisionmaking.

A-40. HMDC should require that evidence of notification of appropriate Federal agencies, if any Federal permits are likely to be necessary for a proposed project, be supplied by applicants prior to HMDC approval of preliminary subdivision plat, zoning certificate, or Implementation Plan, and HMDC approvals should be conditioned on the receipt of necessary Federal approvals.

A-41. HMDC should revise its Master Plan Zoning Ordinance, Zoning Map, and other regulations to conform with current Federal laws and policies.

A-42. The HMDC should request a general permit from the New York District for its amended Master Plan under Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act.

A-43. HMDC should adopt and enforce soil erosion and sedimentation control standards in consultation with the Soil Conservation Service and other appropriate agencies, and incorporate such standards in NJAC 19:4 Subchapter 6.

A-44. HMDC should revise the goals of its environmental performance (discharge) standards to correspond in so far as practicable with the uses designated by the DEP surface water designated uses and the goals of the Clean Water Act.

A-45. HMDC should specify clearly the methods that should be utilized in calculating waterway buffer strip and open space requirements.

A-46. HMDC should require source separation for all solid wastes disposed in the District in order to reduce the need for landfills in the immediate future as well as the long term.

A-47. HMDC should investigate the feasibility of generating and marketing centralized steam and chilled water from refuse for use by existing and anticipated new development in the Meadowland District, in order to reduce the need for landfills in the long term.

B. Recommendations on Substantive Coastal Policies

B-1. The purposes of the coastal policies should be stated to include coordination of State actions with Federal laws and regulations and with local regulatory approvals (Section 1.1.).

B-2. The Governor's Executive Order 71 (1979) and the Pinelands Protection Act of 1979 should be added to the list of authorities cited in Section 1.2.

B-3. Statutes and regulations administered by the DEP Divisions of Water Resources, Environmental Quality, and Fish, Game, and Shell Fisheries,

by the DEP Solid Waste Administration, by the Hackensack Meadowlands Development Commission, and by other relevant State agencies should be added to the list of authorities cited in Section 1.2.

B-4. DEP should state that it intends voluntarily to subject its own actions affecting regulated coastal wetlands to the established permit procedures applicable to others as an example, and to urge in so far as possible the same voluntary compliance upon the State and County Mosquito Control Commissions.

B-5. All now or formerly tidal waterways (and their tidal tributaries) should be included in the coastal zone, inland to the present or most probable former limit of tide.

B-6. The coastal zone boundary should be drawn to include the tidal wetlands now or formerly adjacent to all coastal waters, whether or not these wetlands are regulated under the Wetlands Act of 1970.

B-7. The coastal zone boundary should be drawn to include all land areas (now or) formerly flowed by the tides as soon as information becomes available from the ongoing State tidelands mapping program.

B-8. A procedure for expanding the coastal zone boundary should be developed for use if additional areas in the future are delineated as tidelands or as regulated coastal wetlands pursuant to the Wetlands Act.

B-9. Federal lands should be deleted from DEP jurisdictional boundaries on maps of the proposed coastal zone.

B-10. Section 1.3.4. should be revised to cite specifically Section 401 of the Clean Water Act and all actions noticed pursuant to OMB Circular A-95 with relevance to the coastal zone.

B-11. DEP should revise Section 2.6. to indicate that its staff will specify precisely the original information that an applicant is required to collect and the exact methods that are to be used, if an EIS is mandated on his project, following a voluntary pre-application conference.

B-12. DEP should rewrite the coastal location policies on special areas to indicate that it is the applicants burden to demonstrate that projects which could affect such areas adversely in fact will avoid or minimize adverse effects.

B-13. Section 3.1.3. should be revised to advise that applicants simply may show the requisite information on an overlay to the appropriate existing USGS 1:24,000 topographic map prior to the pre-application conference with DEP.

B-14. Section 3.2.9. should be relabeled as "Designated Sanctuaries" and should include both marine and estuarine sanctuaries, as they are designated.

B-15. The text of Section 3.2.11 on wetlands should be revised to incorporate Section 3.2.17 (whitecedar stands) and to protect other wetlands.

B-16. Section 3.2.15.1 should be revised to recognize historic place names and historic sites identified by County agencies or listed on the New Jersey Inventory as significant resources, in addition to historic places on the State or National Register.

B-17. The text of Section 3.2.16. should be revised slightly to enhance its precision.

B-18. The text of Section 3.2.18. should be revised to incorporate Sections 3.2.5. and 3.2.19.

B-19. A new policy should be inserted at Section 3.2.19. to protect scientific research sites.

B-20. A new interim policy on Pinelands should be inserted as Section 3.2.24.

B-21. Section 3.2.25. should cross reference the riverine and tidal flood hazard areas policies in Section 5.23., and these areas should be included in the special hazard area discussion.

B-22. Sections 3.4.3 and 3.4.4 should be revised to remove the 100 foot and first cultural feature limitations on the inland extent of retained water's edge and filled water's edge, but policies favoring water-dependent development within 100 feet of waterways (or within the first cultural feature) should be retained.

B-23. DEP should reexamine growth policies for those sections of the Central (high), Western Ocean (moderate), Barnegat Corridor (moderate), Absecon-Somers Point (high), and Southern (moderate) Coastal Regions which overlap the Pinelands Management District and bring those policies into consistency with the Governor's Executive Order 71 (1979) end the Pinelands Protection Act of 1979.

B-24. The first criterion of low sensitivity in Section 3.4.4.4 should be revised to reflect more clearly how sections of project sites are identified that, because of onsite paving or structures, qualify as low in sensitivity.

B-25. Section 3.5.6.2 should be revised either to require an ultimate minimum of 30% vegetation or to drop aquifer recharge and microclimate control as objectives of the policy.

B-26. Section 4.5.3. should be revised (or another section should be inserted) to encourage also the conversion of abandoned railway or other rights of way to public pathways in the coastal zone wherever possible.

B-27. The Section 4.6.3. policy should be revised to indicate that any sanitary landfill with a potential for release of toxic materials which is

proposed for development in an aquifer recharge area ordinarily will be denied.

B-28. The Section 4.6.3. policy on landfills should indicate that, whenever any active or inactive coastal zone landfill is reopened or disturbed as part of any proposed construction, surface water runoff and groundwater shall be tested periodically to determine the potential for environmental or human contamination, and the policy should inform prospective applicants that precautionary measures will be required as necessary to prevent contamination.

B.29. The Section 4.6.3. policy should specify that the extent and nature of all existing active or inactive landfill areas on sites proposed for uses that require a State coastal permit be identified as part of the permit application.

B-30. Section 4.10.6 should be revised to insure that inactive spoil piles that become revegetated by wetland species receive full protection under the Wetlands Act of 1970.

B-31. Section 5.8. should be revised to eliminate dogwood as a native Pinelands species and to encourage the planting of native ground-layer species as well as native trees.

C. Legislative Changes

C-1. In order to specify how the DEP proposal for a consolidated coastal law might operate, DEP should provide a series of topographic maps similar to maps in Appendix B (DEP-OCZM 1979) indicating where the three proposed tiers are to be situated.

C-2. DEP should state clearly that it would retain veto and conditioning powers over individual permits and that it would review every variance proposed for issuance by municipalities that elect to administer the program.

C-3. DEP should state approximately how many of the 237 municipalities in the coastal zone now have policies consistent with the proposed coastal policies, and should estimate the number of municipalities and of counties that probably would seek to acquire coast program delegation.

C-4. DEP should detail a mechanism for providing technical assistance to municipalities, if it pursues the notion of permit delegation.

C-5. DEP should explain how local-Federal policy coordination can be achieved most effectively if the coastal permit program should be delegated.

C-6. DEP should continue to support a strong State dune management act to protect this resource and to develop technical information that will facilitate the implementation of new legislation.

C-7. If an initiative for new legislation is decided by DEP to be worthwhile, serious consideration should be given to a comprehensive shoreland (inland) wetlands act to provide the same degree of protection for these wetlands as provided for coastal wetlands by the Wetlands Act of 1970.

C-8. Should an inland wetland permit program be established, its administration should be combined with that of the present coastal wetlands permit program.

C-9. DEP should sponsor new legislation to require the labeling and registration of fertilizers sold for non-commercial use and to provide the environmentally sensitive use of such materials expecially in the coastal zone.

C-10. DEP should support Assembly Bill 480 (1978 Session) or equivalent legislation to strengthen the legal status of conservation easements in New Jersey and to enact enabling legislation for historic preservation restrictions.

C-11. DEP should sponsor a New Jersey trails system act to authorize establishment of scenic and recreational trails.

C-12. DEP should consider the establishment of a Coastal Conservancy along the lines of the California agency established by the State Coastal Conservancy Act of 1976.

C-13. DEP should work with DOT to develop legislation that would authorize the control of highway advertising in the coastal zone.

D. Surveillance and Enforcement

D-1. DEP should foster surveillance for coastal laws by local law enforcement personnel; it should enhance the potential for a concerned public to help bring about compliance by undertaking public education campaigns, and it should inspect and inform interested persons on the enforcement measures taken on alleged violations.

D-2. DEP-OCZM should act as an intermediary between educators and surveillance and enforcement units in DEP to encourage internship and work-study programs whereby students can assist in surveillance activities.

D-3. DEP should continue its efforts to secure interagency reviews of coastal permits, and should enhance the review process by insuring feedback to reviewers.

D-4. DEP should request the New York District of the Army Corps of Engineers to increase its surveillance of filling operations in the Hackensack River basin, and to require full compliance with Section 404 of the Clean Water Act within the jurisdiction of the New York District in New Jersey.

D-5. DEP should insure that there are sufficient personnel for surveillance that each inspector knows his geographical region of responsibility intimately.

E. Further Study Needs

E-1. The resources of the coastal zone should be identified on a map series of uniform scale (such as 1:24,000), and the inventoried data should form a basic underpinning of the coastal permit review process.

E-2. DEP should encourage the collection of original resource data in the coastal zone so that additional currently unprotected resources are identified, and should publicize the availability of Federal assistance for such inventories.

E-3. DEP should foster and encourage the development of a formal, coordinated natural resources inventory and research effort in the New Jersey coastal zone.

E-4. DEP should assist the Hackensack Meadowlands Development Commission to designate valuable public and private wetlands in the District as part of the State Natural Areas System.

E-5. DEP-BCPD should assist the Division of Fish, Game and Shell Fisheries to identify public and private wetlands elsewhere in the coastal zone that merit listing as parts of the State Natural Areas System and should expedite their designation.

E-6. DEP should identify and publicize known and potential polluted areas and sources of pollution that affect the coastal zone in order to focus public and regulatory attention on such problems.

E-7. The boundary of the coastal zone should be expanded to include those watersheds from which runoff is known to cause direct and significant adverse impacts on the estuarine environment.

PART TWO

REPORT ON IMPACTS

I. INTRODUCTION

This investigation, which is entitled the "Estuarine Study," is addressed to the Bay and Ocean Shore Segment of the coastal zone of the State of New Jersey and to the urban waterfront areas along the Delaware River and in northeastern New Jersey that are expected to be included in the next segment of the coastal zone pursuant to the Federal Coastal Zone Management Act of 1972. This Study Area includes the Atlantic Ocean, to the limit of State jurisdiction, and those portions of the New Jersey Section of the Atlantic Coastal Plain physiographic province in which activities could have a direct and significant effect on the coastal waters. A direct impact is a change in the natural environment that is either the immediate result of an impacting activity or is linked to the impacting activity through an identified chain of cause and effect without further human intervention. A significant impact is a measureable change in the natural environment. In reality, most if not all of the New Jersey coastal plain is included by definition in the Study Area, because direct and significant impacts may be transferred widely due to the extensive connections of surface and groundwaters in the coastal plains. The Study Area also encompasses those sections of the Piedmont province, in northeastern New Jersey, that are located within 2,000 feet of Newark Bay, Upper New York Bay, Arthur Kill, Kill Van Kull, Raritan Bay, and their tidal tributaries. These tributaries consist principally of the Hudson River, the Hackensack River, the Passaic River, and the Raritan River. The entire Hackensack Meadowland District and the Palisades eastward from the ridge line to the Hudson River and westward downslope approximately to the 250 foot contour also are included by direction of DEP.

This investigation is composed of two principal and interrelated subprojects. The first part is the Report on Impacts. It consists of an examination of the basic resources of the coastal zone, a consideration of the kinds of facilities and activities that may be proposed in the future at locations in the coastal zone, and an analysis of the environmental compatibility between each kind of facility or activity and each relevant resource complex. Socioeconomic conditions and needs and development siting criteria are not included in the analysis. Those aspects, however, will be considered by the Department of Environmental Protection in a future phase of planning.

The second part of the "Estuarine Study" is the Management Report. It consists of a review of the activities of the relevant Divisions and Bureaus of the Department of Environmental Protection, and of the interrelations of their responsibilities and authorities in the coastal zone; a review of the responsibilities and authorities of other State agencies in the coastal zone and the degree to which they are coordinated with the activities and goals of the Department; and a similar review of local, regional, and federal agencies and the degree to which they do, or may be able to, coordinate with the Department. The Management Report concludes with recommendations for improvements in administrative arrangements and for legislation that will enhance the ability of the State to manage the coastal zone.

II. CHARACTERIZATION OF THE STUDY AREA

A basic understanding of the principal physical and biological resources of the Study Area is necessary before the problems, issues, impacts, and resource constraints to future uses can be assessed. The basic physical resources of the Study Area are water, land, and air. The basic biological resources are plants and animals. These physical and biological resources are interrelated intimately with one another in organizations that commonly are termed "ecosystems." An ecosystem consists of populations of organisms, pathways of cycling chemical elements, flows of energy, and various other organizational mechanisms which cause the parts to be interrelated. The physical components of these systems are described briefly in the following subsections to produce a basis for the subsequent characterization of the Study Area.

A. WATER

Water is the most prominent physical feature of the coastal zone segment of the Study Area. Three principal types of water; surface water, groundwater, and precipitation, are recognized in the Study Area. These types are cyclically related. For example, a particular molecule of water may be part of the surface water at one moment; it then may move into the air by evaporation and subsequently fall back to earth as precipitation; if it seeps into the soil it next can appear as groundwater; and, ultimately, it can seep back again into the surface water.

1. Surface Waters

Surface waters are defined as permanent, exposed bodies of water. In the Study Area, surface waters vary from saline (>30 ppt) to fresh (<.5 ppt), from tidal to nontidal, and from deep to shallow. Surface waters are usually contained within the part of the basin or channel that is at or below the mean high water line (tidal waters) or normal water level (nontidal waters). Although generally this statement adequately describes the extent of surface waters in the Study Area, "abnormal" weather conditions that characterize New Jersey's Coast often cause widespread inundation. Generalizations are not useful in characterizing surface waters under these conditions.

2. Groundwater

Groundwater is the water that moves between the grains of the unconsolidated sediments and through pores and/or crevices in consolidated rocks that lie beneath the surface of the land or below surface water bodies. The principal source of groundwater in the Study Area is precipitation that reaches the land surface and seeps into the soil.

Sediments and rocks that are porous enough to contain relatively large volumes of water and in which the water is able to move relatively rapidly are termed aquifers. Beds of clay and massive, poorly fractured hard rocks, such as basalt, hold relatively little water and they are not porous enough to allow rapid movement of the water they contain. These are known as aquicludes if the layers of material are effective in preventing groundwater movement and aquitards if these materials are less effective and only retard groundwater movement.

Groundwater is found in both an unconfined and confined state in the Study Area. The unconfined aquifer is formed by precipitation percolating downward until it reaches the zone of saturation. Here the water is stored in an unconfined state, rising in times of abundant precipitation or falling during drought.

The second type of groundwater, and the most important source of water in the Study Area, is in confined aquifers. These confined aquifers are formed by a series of alternating porous sands and clay layers. The porous sands hold water that is prevented from rising by an overlying layer of more impervious clay forming an aquitard. These aquifers are wedge shaped formations dipping eastward. The important water bearing sands include the Raritan-Magothy formation, Englishtown sand, Wenonah sand, Vincetown sand, Kirkwood formation, and the Cohansey sand (Nieswand 1970).

3. Precipitation

Precipitation, which may appear in the form of rain, sleet, hail, or snow, is the third principal type of water. It is of major concern as a source for surface waters and groundwaters, and is an important factor in regard to erosion, flooding, and other aspects of environmental assessment and management.

From a national perspective, New Jersey is a well-watered state with the average annual rate of precipitation ranging from less than 40 to over 48 inches. Within the Study Area, the Cape May area receives the least precipitation (<40 inches annually) and the Ocean County area the greatest (>48 inches annually; Cape May County Planning Board 1975).

B. LAND

The land is that part of the Study Area that normally is not affected directly by surface waters. Most of the activities of man that are conducted on specific sites in the Study Area are located on the land, and, therefore, most human impacts originate from the land. The contour of the land varies from virtually level, to rolling, to hilly in the Study Area. The unconsolidated surface material, or soil, ranges from sandy, throughout much of the Coastal Plain, to loamy, clayey, or stoney. The soils in some places are

highly suited for agricultural uses; in other places they are dry, infertile, or otherwise poorly suited for the growth of crops. In the major metropolitan areas, the preparation of sites for housing, industries, commercial facilities, transportation facilities, and other developments has altered the structure and composition of the soil, and much of the surficial material is composed of rubble and imported mineral fill.

Land on the barrier islands is contained within the area known as the "central barrier island corridor" (NJDEP/NOAA 1978). Except for such preserved areas as Island Beach State Park, much of the land that is included in the central corridor type has been developed for seasonal and permanent residences, for recreation uses, and for associated commercial uses.

C. EDGE

Transition and intertidal areas, such as salt marshes, wetlands, and beaches, occur between land and surface waters. These areas are important physical landforms that both are uniquely affected by the activities upon the land and influenced by the surface waters. In this study, the physical resources that lie adjacent to the coastal waters and shoreland waters and which are functionally related to the waters are considered to compose the "edge" type. The edge type also is defined to include coastal dunes and certain shoreland wetlands that cover soils with a seasonally high water table. Floodplains are a major part of the edge whether they are coastal or streamside and forested or covered by herbaceous vegetation. In particular, the numerous semicircular depressions on the Coastal Plain, which locally are known as dry ponds or bogs, and areas covered by forests of the pitch pine lowland vegetation type (McCormick and Jones 1973) are considered to be components of the edge.

The more familiar components of the edge are the beaches and the extensive coastal wetlands. The edge, thus, is a transitional component. It is partly land and partly water, and is developed best where the ground slopes gently from the boundary of the surface water to an area that is considered to be land.

D. AIR

The air resource, or atmosphere, is the gaseous mass that extends upward from the surfaces of the shoreland, water, and edge. Owing principally to variations in pressure over the face of the earth, solar heating, and the earth's rotation, the air constantly moves. The fluid state of the air also facilitates widespread mixing of its natural constituents as well as the pollutants which arise from human activities. The quality of the air generally is evaluated by measurements of the pollutants that are present, and the graduations in the scale of the air quality are interpretations of the relative potential for adverse effects on human beings as well as on other organisms.

III. LAND AND WATER SECTIONS OF THE STUDY AREA

The complexity of the relationships between the geographically distinguishable physical and biological resources of the Study Area begins to become evident when the physical resources are described as distinct land or water types.

The major lands and waters selected were derived from the Federal Coastal Zone Management Act of 1972 (CZMA). The Act recognized two major subdivisions of the coastal zone [Section 304(a)]:

> "Coastal zone" means the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder) ... The zone extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have direct and significant impact on the coastal waters. [Emphasis added].

One of the two major subdivisions recognized by CZMA has been modified to more fully describe the significance of New Jersey's major coastal resources. For the purposes of the present investigation, the category of "coastal waters (including the lands therein and thereunder)" is divided into two subcategories. Three basic land and water sections of the Study Area, therefore, are recognized:

Ocean section:	Ocean waters (saline, tidal surface waters), associated bottoms, central barrier island corridors, dune edges, and beach edges;
Estuarine section:	Estuarine waters (brackish to fresh, tidal surface waters), associated bottoms, and edge;
Shoreland section:	Land, groundwater, inland waters (fresh, nontidal surface waters), and edge.

A. OCEAN SECTION

The ocean section is the easternmost section of the New Jersey coastal zone. It extends from the barrier islands approximately 3 nautical miles seaward, to the limit of the jurisdiction of the State.

The complex of barrier islands effectively is a part of the ocean because it was formed, and is nourished and reshaped, by the longshore drift of sediments and by the forces of the ocean surf. This complex consists of an elongate spit that extends from Sandy Hook to Long Branch, where it joins a section of the mainland that fronts directly on the ocean. To the south, another spit and a series of barrier islands stretch from Manasquan to Cape May (Lewis and Kummel 1940).

The beaches that front on the ocean throughout the length of the coast are important as a recreational resource. As a natural resource, they absorb the energy of the waves and provide an intensively used wildlife habitat. The sediment of the upper beach, which is above the level of mean high water, also is the primary source of the wind transported materials that form the dunes that parallel the beach in undeveloped areas. The dunes are enbankments that serve as sand storage areas and can protect the areas to the landward against damage by storm waves. However, during severe storms, dunes may be overwashed by storm waves and, therefore, the barrier islands are considered to be a flood hazard area. They also provide grassy habitats that are utilized by birds and other terrestrial wildlife. In areas that have been protected from intensive human activities, the dunes also support shrub thickets and woodlands (Robichaud and Buell 1973).

The ocean section is important as a migratory pathway, as a breeding area, and as a feeding area for marine animals. The shallow nearshore waters, in particular, function as a mixing zone for nutrients and other constituents that flow from the estuaries.

The most important biological resources of the ocean, from a commercial point of view, are fish and shellfish. At least 132 species of fish appear in commercial catches with many of these and additional species sought by sport fishermen. The larval stages of nearly all fish and shellfish feed on plankton, which is composed of minute animals and plants, and/or on detritus. The adults of many species of fish prey on smaller fish. and many kinds of fish are opportunistic feeders. They will consume almost any type of suitable food that is available (Darnell 1961).

Mineral resources of potential commercial value in the ocean section of the coastal zone include sand and gravel in the bottom and various salts in the water. Sand from the ocean bottom has been dredged for use in beach replenishment along the barrier islands, but little other mining has been conducted in the ocean section. One industrial plant in New Jersey, located at Cape May Point, is known to extract magnesium from seawater.

Exploration for oil and gas now is being conducted on the Outer Continental Shelf, approximately 56 miles east from the limit of State jurisdiction in the Atlantic Ocean. Oil and gas are not expected to occur in the State's coastal zone, but facilities may be proposed for construction within the coastal zone to support drilling and production should exploitable energy sources be found on the nearby Outer Continental Shelf.

B. ESTUARINE SECTION

Estuaries are the open bays, backbays and parts of river systems in which saline waters from the Atlantic Ocean mix with freshwaters from the land and throughout which the level of the water rises and falls as a result of the oceanic tides. The estuarine waters and the associated edges form the most characteristic and the most productive section of the coastal zone. The estuarine section also includes numerous islands, causeways, and other natural and man-made features.

The New Jersey estuaries range in size from the large expanse of Delaware Bay, to the small backbays between the barrier islands and the shoreland. Owing to electrochemical gradients related to salinity, the patterns of circulation, and the tidal nature of the estuaries, the fine-grained sediments that are eroded from the land and transported by freshwater streams tend to settle rapidly when they reach the brackish zone of an estuary. These sediments accumulate in areas where the currents are minimal, and this deposition raises the elevation of the bottom in those areas. Ultimately, the areas may become shallow enough to support emergent plants, and they develop into coastal wetlands.

Inlets, which are narrow gaps between barrier islands through which the ocean is linked to the backbays, are vital passageways for fish and other aquatic organisms that move between the ocean and the estuaries to spawn, to grow, and to feed. As the water flows into and out of an estuary, the net movement is seaward, and the net discharge is approximately equal to the volume of freshwater that enters the estuary.

The waters within an estuary are mixed by winds, tidal flow, freshwater influx, and the consequent rate of movement of the fresh and saline waters. The rate of mixing also varies with the size and configuration of the estuary. The salinity of the water largely is dependent on the quantity of freshwater that enters the estuary and distance from an inlet.

The biological importance of estuarine waters is due, in part, to the diverse physical environment that is produced by spatial and temporal variations in salinity, turbidity, nutrients, and temperature. The estuarine system also provides a wide range of habitats in the form of submerged aquatic vegetation, beach edge, wetland edge, flats, bars, channels, and basins. In addition to their biological significance, these features also serve to dissipate the energy of storm waves, trap and retain sediment, and maintain water circulation patterns.

The populations of fish and shellfish that thrive in unpolluted estuaries are highly valuable resources. At least 90 percent of the commercially important species spend all or critical portions of their life cycles in the estuaries. Early life stages of these animals feed principally on zooplankton and phytoplankton in the water and on the plants of the estuary or on plant fragments, or detritus, that are flushed from the wetlands and seagrass beds and moved about by tidal currents.

The coastal, or tidal, wetlands of the estuaries occupy transitional sites called water's edge between the land and the water. These areas often serve an important function as floodplains during periods of extreme high tides and storms. In addition, during the seasonal peak of the vegetation, there is an average of 5 tons of plant material per acre in the coastal wetlands (Whigham et al. 1978; McCormick and Somes 1979). This high production reflects the ample supply of water that is available to the plants, and it also may indicate the frequent renewal of nutrients by tidal floodings. In any event, 20 percent or less of the plant material is consumed by herbivores, principally insects and seed-eating birds. Some plant material decomposes in place, but as much as 50 percent is transported by the tides into the adjacent waters. Dissolved organic matter from the

plants is absorbed rapidly by other organisms and is an important nutritional source. Much of the plant material, however, becomes fragmented into small particles. This detritus becomes coated with colonies of bacteria and protozoans and is another important item of food in the diets of many aquatic organisms.

Birds are the predominant wildlife of the coastal wetlands. Muskrats are abundant in many areas, particularly in the brackish and freshwater tidal wetlands. Except for the diamondback terrapin, reptiles and amphibians generally utilize only the uppermost parts of the saline wetlands. They are more frequent in the brackish and freshwater coastal wetlands, but seldom are as abundant as in inland wetlands.

Many of the large bays, backbays, rivers, and other areas of open water in the estuarine section are important feeding and resting habitats for migratory and wintering water birds. Typically the "bay ducks" or diving ducks, utilize these open water areas most intensively, numbering more than 100,000 annually.

C. SHORELAND SECTION

The shoreland section includes those areas of the Piedmont Province of northeastern New Jersey that are within 2,000 feet horizontally from the estuarine waters, are within the Hackensack Meadowland District, or are on the east-facing slope and upper west-facing slope of the Palisades Ridge (Figure 1). In the Coastal Plain Province, the shoreland section includes those areas of the mainland adjacent to or near the estuaries on which activities do or could have a direct and significant impact on the coastal (tidal) waters.

The shoreland is linked environmentally to the estuaries and the ocean most effectively by runoff. The term "runoff" is used here to include water that flows overland or as groundwater from a tract of land to a body of surface water. Runoff from shoreland tracts that are adjacent to the estuaries or to the ocean flows directly to tidal waters. Other shoreland tracts drain to nontidal freshwater streams, lakes, or ponds that discharge to tidal waters within a short distance downstream. The potential for direct and significant effects on coastal waters as a result of any particular activity in the shoreland section is correlated positively with the efficiency of its connection to the surface water system, with its stream-mile distance from coastal waters, and with the proportion of precipitation that leaves the site as runoff.

Runoff from the shoreland section of the coastal zone and from mainland areas farther inland is the principal source of the freshwater influx to the estuaries. The freshwater maintains the net seaward movement of water in an estuary and, thus, facilitates flushing. The mixing of saline water that moves into the estuary from the ocean with the freshwater that flows from the land results in a vertical and horizontal gradient of salinity in the estuary.

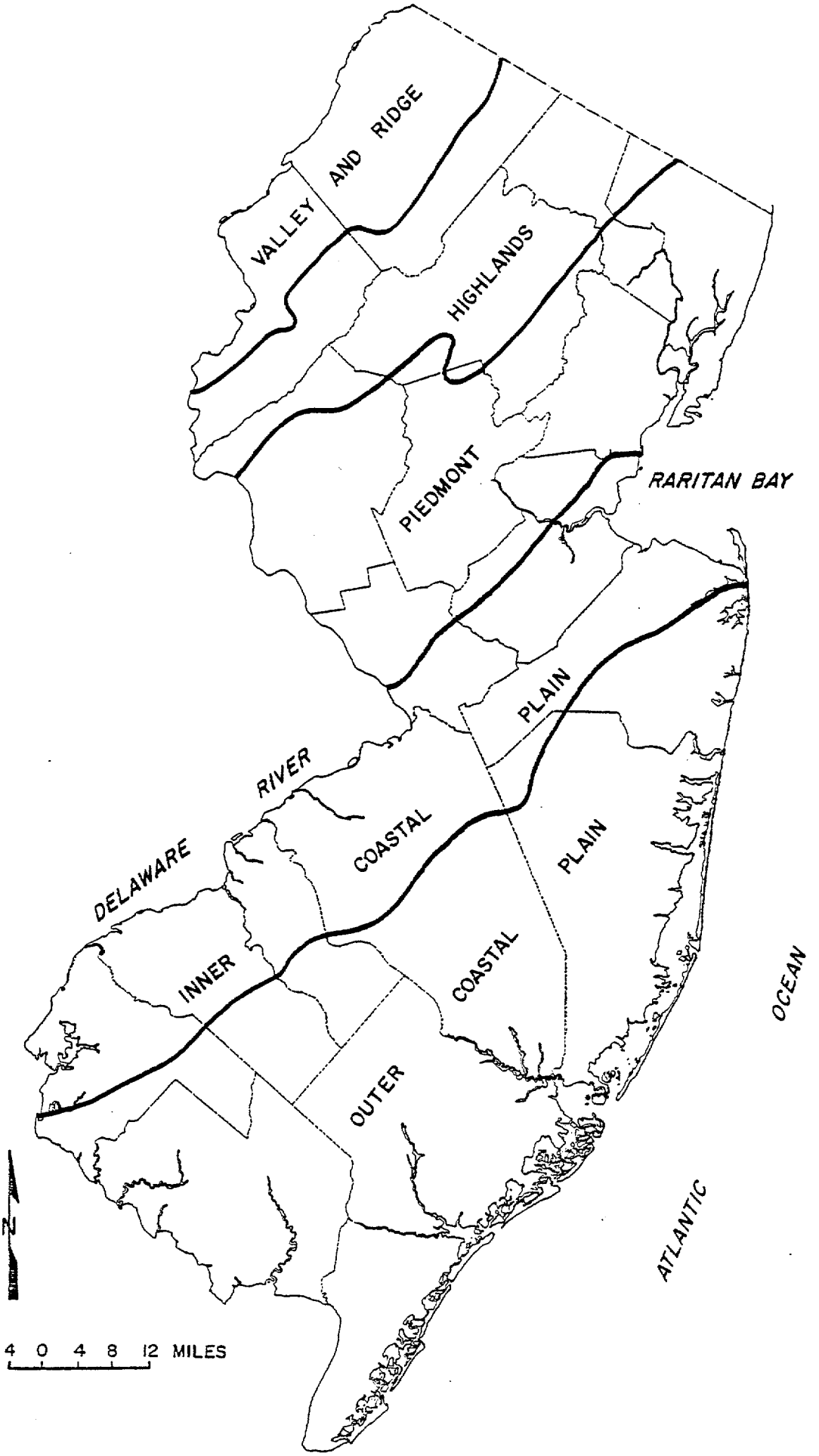


Figure 1. Physiographic regions of New Jersey.

Inland, or nontidal wetlands, in the Coastal Plain section of the Study Area include such swamp forest trees as southern or Atlantic whitecedar, red maple sweetbay, blackgum, pin oak, and sweetgum. Marshes, or herbaceous wetlands, are more restricted. Within the Study Area, there are few nontidal wetlands in the Piedmont region. The largest acreage is represented by diked marshes in the Hackensack Meadowland District. These formerly were tidal wetlands and, if the control structures were to fail, would return to that condition. The nontidal wetlands and swamp forests of the shoreland section make up for the most part the floodplains within this section. During periods of high rainfall these areas are inundated by runoff from uplands and store water until it can be drained off by streams or absorbed into the groundwater.

The mature upland forests of the Study Area are characterized by pitch pine and oaks on the Outer Coastal Plain (the Pine Barrens) and by oaks and hickories on the Inner Coastal Plain and Piedmont. Extensive clearing for agriculture and for development has eliminated forests from much of the Inner Coastal Plain and most of the Piedmont within the Study Area. Such clearing also has deforested extensive tracts on the Outer Coastal Plain, but forests still cover a large proportion of the land in that region.

Groundwater is an important resource of the shoreland. Particularly in the Coastal Plain, where aquifers of large volume lie beneath the surface, groundwater is the major source of stream flow and it is drawn upon as the principal source of potable and industrial supplies for human uses. Owing to the shallow depth to bedrock and the indurate nature of the bedrock, the supply of groundwater in the Piedmont is limited and varies significantly from one location to another. Groundwater discharge is important as the base (minimum) flow of streams in the Piedmont region, but surface water is the principal source of potable and industrial supplies.

Mining in the shoreland section is focused principally on the extraction of sand and gravel from pits in the Coastal Plain. Rock quarrying in the coastal zone currently is conducted only on a small outcrop of diabase in the southeastern part of the Hackensack Meadowland District.

IV. ENVIRONMENTAL ISSUES AND PROBLEMS

The major environmental issues in the Study Area focus on the types of activities that can be accommodated in the coastal zone, the intensity of use that is acceptable, and the density of population that can be supported without significant degradation of the resources. The amount of vacant land on the barrier islands that is environmentally suitable for development, for example, is limited. The demand for developable land, however, is great. If these demands are justifiable, the needs they represent might be accommodated by conversions of existing uses that will result in an intensification of the use or a change from one type of use to another. The needs also might be accommodated by the creation of new sites by filling estuarine waters or coastal or inland wetlands. There are proponents and opponents for each of the alternative actions, and thus, each is an issue.

As discussed in the following subsections, many environmental problems now exist in the Study Area. Water pollution is widespread, and there is a general recognition and agreement that this problem must be solved. In response to Federal law, most coastal communities have developed, or are developing plans for extensive regional sewage treatment systems. Such systems doubtlessly will abate many local sources of contamination. They also represent new infrastructures that may induce more intensive development (Bassett 1974). The designs of the systems, which require outfalls, result in the relocation of potential pollution problems from many small discharges to one or a few large ones. These systems also reduce the reclycling of nutrients which occurred when small streams received treated effluents and then emptied into estuarines with adjacent nutrient utilizing wetlands. Regulatory inertia, engineering reluctance to innovation, and estimated higher capital costs have resulted in general disregard for the need to conserve and reuse the limited volumes of freshwater that are available on the barrier islands and elsewhere in the coastal zone. The new sewage systems, therefore, are designed to collect wastewater, expose it to relatively expensive treatment to improve its quality to meet stringent regulations, and then discharge the treated water to the ocean or to the larger brackish estuaries from which it cannot be reclaimed.

A. ENVIRONMENTAL PROBLEMS IN THE OCEAN SECTION

Water pollution, depletion of the stocks of commercial and sport fish and shellfish, dredging, the construction of barriers to littoral drift, and alterations to the barrier islands represent the major environmental problems in the ocean section of the coastal zone. Future activities, such as those that may be required to support development of oil and gas on the Outer Continental Shelf, have the potential to intensify some or all of these problems.

Ocean water is subject to pollution from several sources. Discharges of solid and liquid wastes from sewage treatment plants and other facilities on the barrier islands directly affect the nearshore waters. Waters that flow from the estuaries may be entrained by longshore currents and their pollutant loads are added to nearshore waters. The relative importance of this estuarine source is greatest near inlets that drain heavily industrialized and/or intensively developed areas of the land. For example, a major source of organic loading is the New York City sewage treatment system. This system is set up with combined stormwater and sewage sewers and during high intensity or prolonged rainfall periods large amounts of untreated or poorly treated sewage enter the Hudson River estuary. Discharges from ships probably represent a minor source of pollutants, except that unauthorized discharges of ballast water or washwater may result in potentially damaging spills of oil. A more substantial source of pollutants is represented by dumping areas that have been designated for the disposal of sewage sludge and other wastes. Ocean disposal of sludge is scheduled to terminate by the end of 1981, so that source soon should be abated. Some municipal sewage districts, however, have not shown progress toward the 1981 cessation date. These include the Middlesex County Sewerage Authority and the Joint Meeting of Essex and Union Counties (USEPA 1979). Chemical pollutants that should receive the most attention were prioritized by a NOAA panel (Appendix 4).

The commercial harvesting of shellfish is prohibited in areas that surround known sewage discharges and dumping sites. These closings reduce the potential harvest, and adverse environmental conditions in the areas, particularly the low concentrations of dissolved oxygen, remove productive habitat and may result in actual loss of commercial stock. The overharvesting of shellfish and of some species of commercial fish also has depleted their populations. The regulation of commercial fishing within 200 miles from the coast is expected to allow the replenishment of most species of commercial and sport fish so that future harvesting may be directed toward sustained yields. Surf clams, which have supported major commercial activity along the New Jersey coast, generally occur in the nearshore waters or in the adjacent offshore waters within the State jurisdiction. The construction of long discharge lines from new regional sewage treatment plants will conflict with commercial shellfishing because areas around these outfalls will be closed. Knowledge of the life history and physiology of the surf clam is too limited to predict whether or not chronic low-levels of such toxic materials as heavy metals will accumulate in the tissues of the shellfish and affect their reproductive abilities or other physiological processes.

Dredging activities in the ocean section of the coastal zone principally have been conducted to create channels for navigation, to obtain sand and gravel for beach restoration, or to create trenches for pipelines and similar underwater facilities. Dredging activities produce short-term adverse conditions by the disruption of bottom habitats, by the destruction of macroscopic nonmotile organisms in the disrupted bottom, and by the resuspension of sediments which increase the turbidity of the water and generally settle in significant quantities on the bottom in areas within about 1,000 feet downcurrent from the dredge site. Nonmotile organisms in this depositional area may be smothered by the covering of sediment, but recolonization usually is rapid. Except where the contour of the bottom has been altered in a manner that creates deep pockets in which the water circulates poorly, and may become anaerobic, dredged areas commonly are recolonized within a few months (Ketchum 1972: 72-74).

Shore protection structures that have been installed at many places along the edge of the ocean have disrupted shoreline processes. The natural shoreline is a dynamic feature that continually is reshaped by the sea. The barrier islands, which form most of the shoreline, are moving, at least in terms of centuries, westward toward the mainland (Lewis and Kummel 1940). The early human activities along the shoreline, which were nomadic, were compatible with the dynamic, changing landscape. About a century ago, large scale development began along the shoreline. Houses, businesses, and recreational facilities were constructed; highways, roads, and streets were established; and water lines, sewers, and other utilities were installed. The natural changes in the shoreline became threats to human life and property, and thus, a continuing effort was begun to maintain a static condition in a resource that naturally is characterized by change.

Between Long Branch and Manasquan, where the mainland extends to the ocean edge as a headland, seawalls and groins were constructed to reduce erosion that was cutting back into the upland area (Lewis and Kummel 1940). This headland area, however, is the principal source of sand that is carried by the littoral currents northward to Sandy Hook and southward to Bay Head and beyond (McMaster 1954). Shore protection structures in the headland region, thus, have reduced the supply of sand that ultimately nourishes the beaches along the northern part of the Atlantic shore.

Along the complex of barrier islands, jetties and groins were constructed to stabilize inlets and to protect particular oceanfront properties from erosion. These structures project perpendicularly into the longshore current. At least for a time after they are installed, the structures trap sediment from the longshore drift on their upcurrent sides. More importantly, the structures deflect the current seaward and it may not return to its natural pathway for some distance in a downcurrent direction. Structural protection of an inlet or beach at one location, therefore, may "starve" beaches at locations downcurrent by trapping and deflecting the sediment that ordinarily would replenish them.

The development of the complex of barrier islands also destroyed or degraded thousands of acres of dune vegetation and maritime woodlands. Small remnants of these habitats are preserved on Sandy Hook, in Island Beach State Park, and at a few other locations. The intensive recreational use of the beaches and other areas of bare sand also has degraded their value as habitat for birds and other wildlife. Terns, for example, normally nest on bare sand. Recently, however, they have been observed to utilize sites that are covered by vegetation (Kane and Farrar 1976).

B. ENVIRONMENTAL PROBLEMS IN THE ESTUARINE SECTION

The principal environmental problems in the estuarine section of the coastal zone are water pollution and activities, particularly widespread dredging and filling, that alter the rates and patterns of the movement of water. These problems have been addressed by recent State and Federal legislation, and significant progress has been made toward their solution.

The waters in estuaries that are poorly flushed are particularly susceptible to degradation by pollutants. The freshwater influx to many of the backbays, for example, is small in proportion to their volumes, the circulation is restricted, and the residence time of pollutants can be long. Newark Bay and the estuarine sections of the Passaic River and Hackensack River have restricted connections to the sea through Kill Van Kull and Arthur Kill, and their freshwater influx is limited by substantial withdrawals of potable water from reservoirs above the head of tide. The net seaward movement of water in the Newark Bay system, therefore, is slow and very susceptible to degradation by pollutants.

The management of the backbays is complicated by the fact that most of their tributaries originate in the Outer Coastal Plain. These streams are small in volume, highly acid, and poorly buffered. The capacity of the streams to dilute or assimilate pollutants, therefore, is limited. The discharge of pollutants to these streams can alter their quality significantly and degrade the estuaries. Furthermore, the biota of the streams is adapted to the acid nature and nutrient-poor condition of the water. Even small changes in the quality of the shoreland waters can result in population shifts (NJ-DEP 1977f, McCormick 1970) and may jeopardize the survival of species, such as the Pine Barrens treefrog, that are considered to be endangered or threatened in the State.

Pollutants often originate from specific point-sources. These are discharges through pipes or other structures, and they generally represent treated effluents from public wastewater treatment plants or industries. Each discharger now is required to obtain a National Pollutant Discharge Elimination System (NPDES) permit from the United States Environmental Protection Agency. A particular permit can include quality standards which must be satisfied by the discharge. The information that is required from applicants who discharge to a particular estuary serves as a comprehensive catalog of the kinds and amounts of pollutants that are known to enter the waterway. A new permit must be obtained every 5 years, so the Agency will be able to adjust the limitations for all or any combination of the discharges to correct or reduce any problem with water quality that does not require immediate action.

Pollutants that enter waterways other than by discharges from point sources are considered to originate from nonpoint sources. This last category includes such activities as farming, pavement runoff, onsite septic tanks, solid waste landfills, suburban yard maintenance, and many others which may appear to be innocuous when they are considered individually. Cumulatively, however, the loadings of many types of pollutants from nonpoint sources that drain to an urbanized estuary may equal or exceed those from point sources. Nonpoint sources, of course, are the major contributors of pollutants to estuaries or sections of estuaries that receive few or no point discharges.

The quality of the water of an estuary also is affected by intensified stratification of saline and freshwaters, by increased salinity and/or altered patterns of salinity, and by changes in the distribution, dilution, and retention of pollutants. These shifts of water quality commonly result from alterations in the configuration of inlets, which may result in a poor mixing regime for an estuarine bay, from changes in the configuration of estuaries or changes in the contour of the bottoms of estuaries, or from reductions in the volumes or rates of freshwater influx.

Extensive dredging has been conducted in the estuaries to create and maintain channels for commerce and for pleasure boating, to obtain fill, and to obtain sand and gravel for concrete aggregate. Important, but poorly documented changes that have resulted from these activities are those associated with the construction of large channels in the Delaware River and other tidewater rivers to facilitate marine commerce.

The deepening of a natural channel allows saline water, which is more dense than freshwater and, therefore, flows along the bottom, to move farther upstream. Channel enlargement also increases the hydraulic efficiency of the channel, which results in a larger range of tides in the upstream section of the estuary, with lower low tides and higher high tides. These effects have been superimposed on the longterm, worldwide, progressive increase in the elevation of mean sea level. In combination, the environmental changes appear to have been responsible, in large part, for the elimination of southern white-cedar from swamp forests along the outer edge section of some estuaries and for the replacement of swamp forests by herbaceous marshes in the section of the edge nearest to the estuary.

The most drastic and permanent alteration of the estuarine environment is the result of the emplacement of fill to raise the elevation of the bottom or the elevation of a coastal wetland above the range of the tides. Such filling obliterates estuarine and edge habitats and transforms the areas they occupied to uplands. The surrounding estuarine and edge habitats also are affected to a greater or lesser degree by alterations in the pattern of circulation of the water, by sedimentation, and/or by intensified erosion.

A residential design that generally is known as "lagoon development" has been used to create 30,000 or more small building lots on at least 10,000 acres along the enclosed bays between Sandy Hook and Cape May Point (Nieswand, Stillman, and Esser 1972). The design minimizes the volume of imported fill required for construction, and it maximizes the number of lots with access to the water. In this plan a series of canals, or lagoons, is excavated, and the dredged material is placed on peninsulas, or "keys", between the canals to raise the elevation of the surface above the level of the tides. The wetlands, thus, are destroyed by dredging in the canal areas and by filling in the areas of the keys. A completed development features short sections of bulkheaded waterfront adjacent to most of the lots and an extensive system of dead-end canals. To obtain adequate supplies of fill, the developers generally dredged the canals to depths greater than the adjacent bottom of the estuary. As a result, circulation in the canals generally is poor; the deeper water is anaerobic; and the canals are poor habitats for most kinds of fish and other aquatic biota.

More stringent environmental regulations and increased charges for materials mined from State-owned riparian lands were imposed during the early 1970's, and these measures have reduced substantially the rate of loss of estuarine areas as a result of dredging and/or filling. Extraction of sand and gravel from the estuarine zone now is limited almost entirely to areas designated as navigation channels, turning basins, or anchorages. Moderate supplies of sand and gravel are available from inland sources at prices that generally are equivalent to, or less than, those now charged for materials from estuarine sources. However, very large volumes of sand are not readily available from inland resources.

The biological effects of the various physical alterations to the estuaries and their edges, particularly filling, generally have been adverse, and most have produced longterm or permanent changes in the kinds of organisms and/or the density of aquatic organisms in the affected areas. The most significant biological aspects of filling, dredging, and other activities are those that substantially alter or eliminate estuarine habitats and/or result in longterm reductions in water quality. In addition, sediments used for fill may contain potentially hazardous contaminants to which humans or the local fauna may be exposed.

Oxygen depletion is the most widespread type of water quality degradation that has a direct and measurable adverse effect on the aquatic biota. Most fish, shellfish, and benthic macroinvertebrates cannot survive in areas in which the concentration of dissolved oxygen is less than 3 or 4 ppm (parts per million) for prolonged periods. In the Hackensack River estuary, for example, the levels of dissolved oxygen frequently are less than 3 ppm, and no measurable dissolved oxygen is present in some places for hours or for days at a time. Mummichogs, or killifish, which can breathe at the surface, compose 99 percent or more of the total population of fish in the estuary, and edible shellfish were eliminated decades ago (Jack McCormick & Associates 1978b).

Bacteriological contamination that originates from the discharge of untreated or inadequately treated sanitary wastes also is widespread in the estuaries. Microorganisms that are associated with these discharges can have direct adverse effects on aquatic biota, such as causing fin-rot in fish. They are, however, of greater concern in regard to human health. Due to this concern, areas contaminated with fecal coliform bacteria are closed to shellfishing and to such water-contact recreation as swimming.

In the Piedmont section of the study area, discharges of heavy metals and persistent organic compounds have resulted in potentially hazardous accumulations of toxic materials in the estuarine sediment. Recent investigations led to the banning of fishing in parts of the Hudson River in New York State owing to severe contamination of the sediment by an organic compound known as PCB. Other investigations indicate that the sediment in Newark Bay, Kill Van Kull, Arthur Kill, and in parts of the Hackensack River estuary is grossly contaminated with mercury and that mercury is moving through the aquatic food chain (Cheng, Koepp, and McCormick 1978; Jack McCormick & Associates 1976, 1977, 1978a). The surficial sediment in at least one small section of the Hackensack River estuary recently was found to contain concentrations of arsenic, cadmium, chromium, copper, lead, nickel, and zinc that were 50 to 250 times as great as normal. Toxic concentrations of cyanide also were found in the water column in parts of the same area (Jack McCormick & Associates 1978b). Several major sources of these toxic materials have been eliminated, and others will be abated as they are identified. The material that already is contained in the sediment, however, poses a substantial, but still unquantified, threat to the environmental health of the estuaries for the present and the future.

C. ENVIRONMENTAL PROBLEMS IN THE SHORELAND SECTION

Most of the problems in the shoreland section that have a direct and significant effect on coastal waters were described, at least peripherally, in the preceding subsections. They are related principally to the release of pollutants directly into the coastal waters or into shoreland waters near the points at which they enter the estuaries.

The degradation of the quality of the water and sediment by activities on the land has been produced by pollutants from various sources. These include point discharges from industries; point discharges from sanitary sewers and sewage treatment plants; leachates and runoff from industrial waste heaps and solid waste or garbage dumps; leachates and runoff from developed areas, particularly from large urban complexes; runoff from agricultural lands, suburban yards, and other areas that are managed intensively with fertilizers, herbicides, pesticides, and other chemicals; and silt-laden runoff from construction sites and other barren, unpaved tracts. Erosion of the land degrades the quality of the water by increasing turbidity and the concentrations of constituents that adsorb to the particulate matter. Where the particles ultimately settle out, sedimentation is a problem, and may adversely affect benthic organisms and increase the cost of maintenance dredging.

State and Federal legislation during the last decade and a half has led to the establishment and strengthening of regulatory controls that have eliminated most indiscriminate discharges of pollutants from land-based activities. Certain discharges that still do not comply with the regulations, particularly publicly-owned facilities for the collection and treatment of sanitary wastes, currently are being redesigned and should be in compliance by 1983.

Strong controls over the disposal of solid wastes also have been established recently. Disposal sites now are subject to approval by the Department of Environmental Protection; the types of wastes that can be accepted by a particular operation are limited; and methods are prescribed to insure the proper placement and covering of wastes and to minimize the production and escape of leachates.

Construction sites on which more than about 0.1 acre of land is to be cleared now require the preparation and implementation of a plan to control erosion and the escape of sediments, debris, and related pollutants. The Hackensack Meadowlands Development Commission also requires the applicant to monitor the effectiveness of the control measures and to take corrective actions to improve them if the discharge fails to satisfy stringent standards. If these monitoring and corrective techniques were utilized throughout the coastal zone, the adverse effects on coastal waters of discharges from construction sites would be minimized.

Several municipalities require applicants for subdivisions and other authorizations to include plans for water quality management during the operation of proposed facilities. These plans commonly incorporate on-site sedimentation basins, natural or landscaped buffers adjacent to surface

water features, floodplain open space, stormwater systems which maximize the use of infiltration ditches, and condominium agreements that place the responsibility for landscape management in a community association that will seek advice from extension specialists to minimize the use of fertilizers and other chemicals.

The extensive development of structures, paving, and other impervious surfaces and the installation of large systems for stormwater drainage have greatly altered the hydrologic conditions in the urbanized areas that line the estuaries. Much of the water that falls as precipitation now flows over the surface and into storm sewers which lead directly to the estuaries or to streams that drain to the estuary. These alterations have increased substantially the volume and rate of surface runoff and have decreased the volume of water that percolates to the water table.

The increased velocity and volume of surface runoff has expedited the movement of urban pollutants to the coastal waters. Where the runoff is directed into tributary streams, it has resulted in the erosion of their channels and banks and, thus, in the release of sediment that may be carried to the coastal waters. The increased volume of freshwater during storm periods alters the natural gradient of salinity by blocking the upstream movement of saline water and by diluting the saline and brackish waters to a greater degree.

The reduction of recharge of aquifers results in smaller discharges of groundwater to the coastal waters and their tributaries throughout the year. As a result, the freshwater influx to the estuaries is reduced. This effect is most critical during periods of drought, when brackish water moves upstream in an estuary and flushing is at a minimum. Because the base flow of nontidal streams originates from groundwater discharges, the flow in these streams is reduced, and some that once were perennial now are dry during summer drought periods.

The construction of dams for water supply, flood control, or aesthetics on many of the major rivers and smaller streams in the estuarine section, shoreland section, or inland from the coastal zone study area has blocked access to spawning and nursery areas that formerly were used by shad, perch, striped bass, and other migratory fish (Power and Peck 1971). The impoundment of water behind these dams also results in higher temperatures of the freshwater influx to the estuaries. The flow of water through an impoundment is slower than that in a free-flowing stream. It is exposed, therefore, to solar radiation for a longer time and, as a result, is heated more.

Many water purveyors in the Piedmont region obtain at least part of their supplies from reservoirs on shoreland streams near the places where they enter the estuaries. The City of Philadelphia draws water from an impounded section of the Schuylkill River, in Pennsylvania, as well as from the freshwater section of the estuary of the Delaware River. These withdrawals reduce the freshwater influx to the estuaries, and, as indicated above, this is most critical during periods of seasonal or long-term droughts. The most drastic reduction of freshwater influx as a result of withdrawals for potable use occurs in the Hackensack River estuary. Long-term records indicate that little or no freshwater is released from a potable water reservoir near the head of tide for periods of several days during most years.

D. PROBLEMS WITH AIR QUALITY

Concentrations of ozone exceed the Federal primary and secondary air quality standards throughout the coastal zone. This condition reflects remote, upwind emissions of hydrocarbons that undergo reactions in the atmosphere to form ozone. The problem is common throughout the State and throughout most of the northeastern United States, and could best be solved by areawide control.

The Federal standards for the maximum concentrations of hydrocarbons, lead and of carbon monoxide (8 hour average) are exceeded at some locations in the larger coastal settlements and in the metropolitan regions. These pollutants are related principally to emissions from vehicles, and excessive concentrations of them commonly are produced by dense traffic. Emission controls that are required for all new automobiles and trucks are expected to reduce the concentrations of these pollutants. At locations where excessive concentrations are expected to occur in the future, they may be avoided by highway improvements and/or by various techniques for traffic management.

The Camden-Philadelphia-Wilmington metropolitan region and the Northeastern New Jersey-New York metropolitan region, which include parts of the coastal zone Study Area, include densely urbanized areas with numerous large, industrial sources of air pollutants. In parts of these areas, the levels of sulfur dioxide and total suspended particulates, in addition to ozone, exceed the relevant Federal standards.

Over most of the section of the coastal zone that extends along and includes the Atlantic Ocean, the quality of the air, except for ozone, satisfies the Federal standards. This section contains few large, stationary sources.

Chemical reactions between water vapor and oxides of sulfur and nitrogen produce acids in the atmosphere. The emissions of acid-forming pollutants have increased during the past several decades, and precipitation throughout most of the northeastern United States now is acidic (pH 4.0; Phram, Halverson, and Heisler 1978). Some shoreland streams, lakes, and ponds in the Northeast have become more acid, and no longer are suitable as habitats for certain kinds of fish and other aquatic organisms that once flourished in them. Seawater is well buffered, so acid rain would not appear to have a significant potential for chemical or biological effect on the ocean or on the brackish sections of the estuaries. The shoreland streams of the Outer Coastal Plain naturally are acidic, so they should not be degraded by acid rainfall, nor should there be any adverse effect on the freshwater sections of estuaries to which they drain. The potential for changes in water quality is greatest in the streams that drain the inner Coastal Plain and the Piedmont. No noticeable effect of acid precipitation, however, has been reported from those areas.

Although the potential for significant adverse effects from acid rainfall appears to be small, the possible effects of other airborne contaminants such as heavy metals, PCB's, and other hydrocarbon residues on coastal waters is unknown at present.

The Clean Air Act amendments of 1977 have established prevention of significant deterioration (PSD) increments to be met by growth in areas where the particulate and SO_2 ambient air quality standards are being met. The increments to be met in most of New Jersey are Class II, basically consistent with moderate growth, but at the Brigantine Wildlife Refuge wilderness area the stringent Class I increments must be met. In addition, limits of emissions with respect to visibility will be developed for the wilderness area. It is unknown at present the degree of problems inherent in this Class I designation or the development of visibility requirements.

V. ECOLOGICAL GOALS AND OBJECTIVES

A. ENVIRONMENTAL GOALS AND OBJECTIVES

The Congress of the United States declared through Section 303 of the Coastal Zone Management Act of 1972 that it is the national policy "to preserve, protect, develop, and where possible to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations" (PL 92-583 as amended by PL 94-370).

The Governor of New Jersey and the Commissioner of the Department of Environmental Protection have declared that the principal coastal zone management goal of the State of New Jersey is to "protect the state's coastal resources while accommodating needed future development" (NJDEP and NOAA 1978).

The difficulty with the New Jersey goal is the stated desire to accommodate future needed development. The definition of "needed" development and the resolution of the many conflicts inherent in the stated goal obviously have the potential for creating political fluidity. In order to "protect the state's coastal resources" it is necessary to establish a set of objectives which are grounded on firm ecological principles and supported by sound data. It is also necessary to gain the understanding and support of the public through clearly defined, resource-oriented decision making.

B. GENERAL ECOLOGICAL OBJECTIVES

A part of this study involved a review of the natural ecological objectives contained in a variety of documents prepared by the New Jersey Office of Coastal Zone Management. Some 44 stated objectives were identified which encompassed management, legislative, administrative, and locational purposes. We have refined and synthesized these into 23 general objectives based on natural environmental parameters which, if met, would ensure the attainment

of the stated overall goals for the coastal zone. These are listed in Table 1.

These objectives are largely tied to the maintenance, enhancement, or restoration of basic natural resources which are essential to the healthy functioning of the coastal ecosystem. It must always be remembered that natural resource objectives are not simply designed to protect the plants and animals, but rather to ensure that man's use of those resources is assured for the future. This point is particularly appropriate in the coastal zone setting where much of man's activities are recreational in nature and centered on natural resources. It is difficult to conceive of a future coastal zone meeting the basic recreational needs of society if the land is congested, the wetlands filled and developed, and the waters polluted and devoid of fish and shellfish. Uses and activities which singularly or cumulatively impinge on the objectives listed in Table 1 must be regarded as conflicts with a serious potential for impairment of urban society's basic need for open space and recreation. They should not be compromised piecemeal or through political expediency, but rather such conflicts and their consequences should be conveyed to the public in such a manner that the potential losses in societal values are clearly defined.

VI. SPECIAL COASTAL RESOURCES

Although natural scientists and government decisionmakers recognize that all the natural ecological resources of the coast are inseparably related to one another through a system of energy pathways (Odum et al. 1974), it is possible to identify special resources that are critical to goals and objectives. Thresholds for environmental changes could then be based on the protection, enhancement, or restoration of these special resources.

New Jersey initiated an attempt to identify special coastal resource areas during 1976 and 1977. Initially, the Department of Environmental Protection invited the public to identify areas with particular natural, cultural, or scenic importance, including depressed urban areas and urban infill/extension areas.

Replies that were received by the Department identified 176 specific sites, specific regions, or such general features as beaches. These were termed "Nominated Areas of Public Concern" (NJDEP 1977d). A more general listing of "Specially Valued Resources" was developed concurrently by the Department (NJDEP 1978a), and categories of "Environmentally Sensitive Lands" were recognized by several counties that include parts of the coastal zone (Conservation and Environmental Studies Center, Inc., and Burlington County Planning Board Staff 1978; Cumberland County Planning Board 1978; Gloucester County Planning Department 1978; Hudson County Office of Planning 1977; Lennon 1978; Middlesex County Planning Board 1978; Ocean County Planning Department 1978).

The initial compilations of nominated areas and specially valued resources were considered in the formulation of lists of 27 generic types of "Special Areas" and 11 "Geographic Areas of Particular Concern" in the Federally approved Final Environmental Impact Statement on the New Jersey Coastal Management Program. (NJDEP and NOAA 1978).

Table 1. General Objectives

- Maintain, or where necessary enhance, aquifer recharge rates on land and in wetlands.
- Regulate groundwater discharge to maintain or restore groundwater levels.
- Maintain and where needed restore the quality of water entering aquifers.
- Maintain gradients of salinity in coastal waters.
- Maintain or where possible restore surface water temperatures to their ambient range for each season.
- Control the turbidity of coastal waters where acceptable and restore to acceptable levels where excessive.
- Regulate the discharge of acutely toxic substances in water and air, and on land and edge. Eliminate the discharge of chronic toxicants which bio-accumulate.
- Maintain or where appropriate restore the natural nutrient gradients in land, edge, and water types.
- Control the discharge of pathogens in land, edge,and water types.
- Maintain or where appropriate restore the natural pH levels in fresh waters.
- Maintain adequate levels of dissolved oxygen (for faunal reproduction and survival) in all coastal waters.
- Preserve natural dissolved solids concentrations.
- Preserve, protect, and where possible restore or enhance the physical aquatic habitats of the coastal zone through regulation of changes in substrate particle size, bathymetry, water depth, sedimentation, and sediment chemistry.
- Preserve, protect, and where appropriate,restore or enhance the abundance and diversity of aquatic and/or terrestrial flora within the coastal zone.
- Preserve, protect, and where appropriate, restore or enhance the abundance and diversity of aquatic and/or terrestrial fauna within the coastal zone.
- Preserve, protect,and where appropriate, restore the natural levels of primary productivity for the coastal environment.
- Maintain or enhance the soil assimilative capacity of the coastal zone.
- Preserve, protect,and where appropriate, enhance or restore the natural shore protection capacity of the coast.
- Maintain, and where appropriate, restore the natural processes affecting the geomorphology of coastal land, edge,and water areas.

Table 1. General Objectives (concluded).

- Preserve, protect, and where appropriate, restore the natural volume, rate, and timing of flow of fresh waters.
- Preserve, protect, and where appropriate, restore the natural estuarine processes, including circulation, mixing, and tidal flushing.
- Regulate the quantity of noise within the natural environment so as not to disturb the fish and wildlife species present nor the enjoyment aspects of public recreation.
- Preserve, protect, and where possible, restore or enhance special resource areas.

In that program document, special areas were defined as areas which "merit focused attention and special management policies". The latest description of "Special Areas" appears in Options for New Jersey's Developed Coast, Appendix H (NJDEP 1979) which modified slightly the earlier lists.

As a part of this study, we reviewed the descriptions, policies, and rationale for "Special Coastal Resources" in an attempt to identify those physical and biological functions, processes, and resources which are critical to the achievement of the goals and objectives of New Jersey. The result of this evaluation is the following descriptions of special coastal resources. This list represents a further modification of the descriptions that appeared in Appendix H (NJDEP 1979).

Each special resource area listed is considered to be of a particular significance in maintaining the natural ecological goals and objectives of the State. Included in the following paragraphs is a description of each of the special coastal resources, a discussion of their functions, and an explanation of their importance to coastal New Jersey.

A. SHELLFISH AREAS

Definition: Shellfish areas are tidal bottom lands of the ocean, estuarine bays, or rivers, and shellfish reefs supporting commercially, recreationally or ecologically valuable quantities of ocean quahogs, sea scallops, hard clams, soft clams, surf clams, blue mussels, or oysters. In this report we have separated shellfish areas into ocean shellfish beds, estuarine shellfish beds, and shellfish reefs. Shellfish areas include areas for transplanting (relay) programs and depuration processing, as well as natural or artificial oyster seed (spot) setting beds. Maps of shellfish beds in the vicinity of the intracoastal waterway were published by USDOI (1963). A large scale map indicating more recent estuarine and ocean shellfish beds was prepared by NJDEP and the Bureau of Geology and Topography (1976), entitled the "Environmental Map of New Jersey".

Natural functions:

- Shellfish are primary consumers that perform a valuable function in the food chain.
- Oyster and blue mussel reefs alter water circulation patterns and current velocities resulting in diversified habitats for marine animals (Chestnut 1974).
- Shellfish reefs function as sediment and nutrient traps (Grave 1901).
- Shellfish reefs modify substrate particle size and create distinct reef and benthic communities (Laird 1961).

- Shellfish beds and flats support infaunal burrowing species that rework bottoms and, thereby, oxygenate sediments (Gray 1974).

- The reworking and oxygenation of shellfish beds recycles nutrients to the water and sediments (Gray 1974).

- Shellfish are a food source for many important species including: blue crabs, eels, striped bass, black seabass, sea trout, drum, winter and summer flounder, scup, and many species of waterfowl.

Value of Shellfish Areas:

Shellfish are harvested by both commercial and recreational fishermen. The sport group concentrates on hard clams. Surf clams, oysters, bay scallops, blue mussels, and soft clams are harvested principally by commercial shell fishermen. Commercial dockside landing values (wholesale) in New Jersey during 1976 were $3.17 million for estuarine species, and $10.8 million for surf clams. The commercial harvest is estimated to support employment of 3,000 persons in fishing, distribution, processing, and retail. Sport clammers numbered 17,000 in 1976. The above discussion only illustrates the direct commercial value of the shellfish resources. Their overall economic value and their natural ecological value are collectively much greater. The natural values of shellfish areas are their important place in the food web utilizing phytoplankton and detritus. In addition they filter large volumes of water removing and depositing suspended solids. Shellfish reefs also provide valuable habitats for ocean and estuarine fauna.

B. PRIME FISHING AREAS

Definition: Prime Fishing Areas within the Study Area include coastal waters and edge areas which have a demonstrable history of supporting a significant local quantity of recreational fishing activity within the State of New Jersey's 3 mile limit. The category includes jetties and groins and public fishing piers or docks, some of which structures may produce adverse effects on longshore sediment transport that outweigh their values as fishing sites. Many of the prime Fishing Areas in the Atlantic Ocean are shown by Freeman and Walford (1974).

Natural functions:

- Prime fishing areas represent congregating spots for fish where predator-prey relationships are actively performed. Therefore, the natural function of a prime fishing area is energy transfer within the food chain.

Value of prime fishing areas:

- Natural bathymetric features, such as the Shrewsbury Rocks, important sand ridges, and artificial structures act as concentration areas for many species of finfish, shellfish, and a diversity of invertebrate species which are essential to marine ecosystem functioning. These areas are heavily utilized by recreational and commercial fishermen. Over 2.7 million people annually participate in marine sport fishing and shellfishing in New Jersey. This represents the highest number of participants in any state from Maine to Maryland. Of that total, 1.6 million reside in New Jersey, with the remaining number coming mostly from Pennsylvania and New York (792,000 and 300,000 respectively). The Mid-Atlantic Regional Fisheries Management Council manages fishing activities seaward of the State coastal zone.

C. SUBMERGED VEGETATION

Definition: This special area includes estuarine water areas supporting rooted vascular seagrasses such as widgeon grass (Ruppia maritima) and eelgrass (Zostera marina). Eelgrass beds are limited to shallow portions of Sandy Hook Bay, Shrewsbury River, lower Barnegat Bay and Little Egg Harbor. Widgeon grass is for the most part limited to shallow areas of upper Barnegat Bay. Generalized maps of the distribution of the above species for the entire New Jersey Coast will be completed by Earth Satellite Corporation of Washington, D.C. for DEP-BCPD by October 1979.

Natural functions:

- Rooted aquatics such as eelgrasses are one of the chief contributors of detritus to the estuary (Carriker 1967).
- Submerged vegetation, as a primary producer, is an important base of the estuarine food chain (Phillips 1974). The plants serve as a food source to periwinkles, some crabs, fishes, and waterfowl (Day 1967).
- Submerged vegetation forms a distinct community, that includes: bacteria, epiphytic plants, molluscs, crustaceans, and small fish (Wood 1969).
- Submerged rooted aquatics stabilize unconsolidated muddy bottoms and provide organisms with quiet, silt-free water environments (Phillips 1974).
- The vegetation assimilates available nutrients and converts inorganic compounds to usable biomass (McRoy 1966; Boysen-Jensen 1914; Phillips 1974).

Value of submerged vegetation:

The estuarine waters of New Jersey are relatively shallow, rich in nutrients, and highly productive. The submerged vegetation of these shallow waters serves important functions as important winter forage for migratory waterfowl, nursery areas for juvenile finfish, bay scallops, and blue-claw crabs, and by producing food that is consumed either directly or as detritus by many species of fish and other aquatic organisms. The value of seagrasses was dramatically illustrated during the 1930's when a disease epidemic virtually eliminated eelgrass from the coastline of the Atlantic Ocean. The number of finfish, shellfish, and waterfowl drastically decreased. The bay scallop industry of the New Jersey coast was ruined. Bays became choked with silt, and new mud flats were formed (NJDEP 1977b).

D. WETLANDS

Wetlands are areas in which the substrate is "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Corps of Engineers 1977). This vegetation of wetlands is highly productive and wetland habitats may be utilized intensively by various species of waterfowl, shorebirds, songbirds, mammals, reptiles, amphibians, fish, and other forms of animal life. Tidal wetlands and nontidal wetlands are recognized.

Tidal Wetlands

Definition: Tidal wetlands are low-lying areas of relatively flat land that may be known as marshes, meadows, swamps, or by some other local name. Some herbaceous tidal wetlands is that part of the coastal zone from the south shore of Raritan Bay to Cape May Point and, hence, to Trenton have been delineated by NJ-DEP on official maps at a scale of 1:2,400 (1 inch = 200 feet, as listed at N.J.A.C. 7:7A-1.13). Forested wetlands extend landward from the herbaceous tidal wetlands at many locations, and are included in this category. Both herbaceous and forested tidal wetlands also occur in areas that have not been mapped officially. These areas are included in this category of special resources.

Extensive herbaceous coastal wetlands are a characteristic feature of the landscape in the Hackensack Meadowland District in Bergen and Hudson Counties. Although the District was excluded from the jurisdiction of the Wetlands Act of 1970, it is included in the coastal zone. The Hackensack Meadowlands Development Commission has promulgated a Wetland Open Space Plan and Wetland Order that are intended to preserve certain areas of the coastal wetlands in the District (HMDC 1972a, 1972b).

Coastal wetlands that are enclosed by banks or dikes that exclude the tides and may be drained by tide flaps, sluices, pumps or other devices, are included in the category of special resources. Impounded wetlands of this kind are distributed throughout the estuarine section of the coastal zone, and are most conspicuous along the edge of Delaware Bay and in the Hackensack Meadowland District.

Natural functions:

- Tidal marshes are efficient converters of sunlight energy into carbohydrates, amino acids, and proteins (Daiber 1974).
- Tidal marshes export considerable amounts of usuable biomass in the form of detritus (Massman 1971; Odum and de la Cruz 1967).
- Tidal marshes are effective in assimilating inorganic nutrients (Clark 1974).
- Rooted emergent vegetation of the marsh slow water currents and cause sediments to be trapped.
- Tidal wetlands trap sediment and bind the substrate with rhizomes and roots to form a erosion buffer for the shorelands.
- Tidal marshes provide food and protection for many juvenile fish, shellfish (Cooper 1974) and migratory waterfowl.

Value of tidal wetlands:

- Fish harvests from estuarine waters have been estimated as high as 125 lbs/acre for Atlantic estuaries--(McHugh 1967). Approximately two-thirds of the commercial fisheries landed on the Atlantic Coast are made up of species believed to be estuarine dependent (McHugh 1966). Tidal wetlands are an important source of available food to these estuarine dependent species. The primary biological productivity of New Jersey's coastal wetlands is greater than that of terrestrial corn and wheat fields on a per acre basis. The principal direct dietary beneficiaries of organic wetland detritus are bacteria and protozoans, which are in turn fed upon by larger invertebrates. Important finfish, shellfish, and waterfowl and other resources feed upon these invertebrates. New Jersey's coastal wetlands are annually prime wintering habitat for hundreds of thousands of migratory waterfowl.

  A major recent summary of wetlands values was prepared by McCormick and Somes (1979).

Nontidal Wetlands, Bogs, and White-Cedar Stands

Definition: Nontidal wetlands occupy areas adjacent to or near shoreland rivers and streams that are not affected by the diurnal rise and fall of tides and areas not associated closely with streams, but in which the water table is at or near the surface at least for several days during most years. The vegetation of most nontidal wetlands is characterized by trees and/or shrubs, but some wetlands are covered by herbaceous vegetation. These areas are known as swamps, spungs, cripples, bogs, marshes, savannahs, and by other local names. The general distribution of nontidal wetlands in the Pine Barrens, which includes parts of the bay and ocean shore segment of the coastal zone is shown on a map by McCormick (1978). The locations of white cedar swamp forests, hardwood swamp forests, pitch pine lowland forests, fresh marshes, and bogs in the Pine Barrens shown in more detailed maps prepared by McCormick and Jones (1973). Forest type maps available at the Bureau of Forestry in NJDEP also indicate the distribution of southern white cedar swamp forests and other wetland forest types.

Natural functions:

Nontidal wetlands are separated into bogs and herbaceous marshes, and white cedar stands and lowland wet forests.

Bogs and herbaceous marshes contribute the following natural values and functions:

- Support a distinct community of plants and animals. Bogs are the habitat for many threatened and endangered animal species (marsh hawk, vesper sparrow, short eared owl, upland plover, Henslow's sparrow, and short billed marsh wren, bog turtle, Pine Barren's treefrog, and the Eastern tiger salamander among other species). Endangered or threatened plant species, although not officially listed, are also found here.

- Removes inorganic nutrients from the water environment and converts material to useful biomass.

- Recharges groundwater aquifers in periods of low stream flow and rainfall.

- Marshes bordering flowing waters reduce the velocity of flood waters and provide areas for dispersion of high water.

- Nontidal marshes contribute organic material to the bordering streams and rivers which, in turn, transport the material to the estuary as detritus.

White cedar stands and lowland wet forests function in the following way:

- Lowland wet forests serve as important escape cover for deer and as forage and nesting areas for numerous small animals including squirrels, rabbits, ruffed grouse, and several species of waterfowl.

- White cedar is the most valuable timber tree in New Jersey. which grows in natural (distinct) single-species stands.

- Lowland swamps disperse flood waters and, consequently, slow water velocity, reduce maximum flood height downstream, and allow deposition of sediments in the slow moving waters (NJDEP 1977f).

- White cedar and other swamp trees bind the soil with roots and absorb water energy while minimizing shoreland erosion.

- Seasonally flooded swamps slow water currents and allow suspended solids to precipitate, forming alluvial soils.

- Swamps contain a unique community of plants and animals adapted to survival in a swamp environment; including bog turtles, Pine Barren's treefrog, carpenter frog, bald eagle, osprey, and yellow crowned night heron, each of which are endangered or threatened in New Jersey (NJDEP 1977b).

Value of nontidal wetlands, bogs, and white-cedar swamps:

Accumultions of peat that develop due to the decomposition of organic matter in freshwater wetlands are often mined as a fertilizer and soil conditioner. Nontidal wetlands provide usable organic material to the estuary in the form of detritus. Wetlands have been used to purify domestic wastewater. White-cedar swamps represent an important timber resource to the State. Finally, wildlife depends on the cover and food available in marshes, swamps and bogs for survival. Finally, nontidal wetlands can provide tertiary nutrient removal from treated sewage effluent and benefit surface and groundwater quality (Johnson et al. 1978, USEPA 1978, USEPA et al. 1977).

E. CRITICAL WILDLIFE HABITAT

Definition: Habitats are considered to be critical when they are essential to the survival of species of animals or plants that are endangered or threatened, when they are essential to regular and/or the seasonal movements of aquatic or terrestrial animals from one habitat to another, when they are utilized intensively as areas for reproductive activities, as areas for the congregation of animals on a seasonal basis, or when they are of a type that is present in the coastal zone in relatively limited supply. The degradation or destruction of critical habitats could result in decreases in the populations of the species that utilize them, and could result in the extinction of species whose existence in the State already is in jeopardy. Reductions in the populations of waterfowl and upland game will affect the success of hunters, birders, and other naturalists. Critical wildlife habitats are found in the Pine Barrens, oak, hickory, and pine forests, wetlands and many of the other special resource areas.

Natural functions:

- Critical Wildlife Habitats provide some of the State's present wildlife populations with food, cover and breeding sites to allow for effective population maintenance and their management is instrumental in increasing present populations of selected species.

- Critical Wildlife Habitats are important hunting, fishing, wildlife observing, and other nonintensive outdoor recreation areas.

- The areas provide an outdoor laboratory for the scientific investigation of wildlife and for natural resource management.

Value of critical wildlife habitats:

The State of New Jersey, as custodian of a particular portion of the national wildlife heritage, has the obligation of stewardship on behalf of the people of the State and nation to perpetuate species of wildlife within its borders for use, education, research, and enjoyment by future generations.

F. ENDANGERED OR THREATENED SPECIES HABITAT

Definition: Any area of land, edge, or water that is designated as official "critical habitat" for any species of animal or plant that has been designated as "endangered" or "threatened" by the Secretary of the Interior or by NJDEP or habitats of species that merit consideration for inclusion on the official listings, is considered to be a critical area. The definition also includes a sufficient buffer area to insure continued survival of the species. Dissemination of data that identify specific areas inhabited by endangered or threatened animals or plants should be restricted in order to protect the species. State of New Jersey endangered or threatened species as defined by NJDEP are presented in Table 2.

Table 2. ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

-ENDANGERED-

FISH	
Shortnose Sturgeon	*Acipenser brevirostrum*
AMPHIBIANS	
Tremblay's Salamander	*Ambystoma tremblayi*
Blue-spotted Salamander	*Ambystoma laterale*
Eastern Tiger Salamander	*Ambystoma tigrinum*
Pine Barrens Treefrog	*Hyla andersoni*
Southern Gray Treefrog	*Hyla chrysoscelis*
REPTILES	
Bog Turtle	*Clemmys muhlenbergi*
Timber Rattlesnake	*Crotalus horridus horridus*
BIRDS	
Bald Eagle	*Haliaeetus leucocephalus*
Peregrine Falcon	*Falco peregrinus*
Osprey	*Pandion haliaetus*
Cooper's Hawk	*Accipter cooperii*
Least Tern	*Sterna albifrons*
Black Skimmer	*Rynchops niger*
MAMMALS	
Indiana Bat	*Myotis sodalis*
SPECIAL CASE:	
MARINE REPTILES	
Atlantic Hawksbill	*Eretmochelys imbricata*
Atlantic Loggerhead	*Caretta caretta*
Atlantic Ridley	*Lepidochelys kempi*
Atlantic Leatherback	*Dermochelys coriacea*
MARINE MAMMALS	
Sperm Whale	*Physeter catodon*
Blue Whale	*Balaenoptera musculus*
Finback Whale	*Balaenoptera physalus*
Sei Whale	*Balaenoptera borealis*
Humpback Whale	*Megaptera novaeangliae*
Atlantic Right Whale	*Eubalaena glacialis*

Table 2. ENDANGERED AND THREATENED SPECIES IN NEW JERSEY (Contd.)

-THREATENED-

FISH	
Atlantic Sturgeon	*Acipenser oxyrhynchus*
American Shad	*Alosa sapidissima*
Brook Trout (native)	*Salvelinus fontinalis*
Atlantic Tomcod	*Microgadus tomcod*
AMPHIBIANS	
Long-tailed Salamander	*Eurycea longicauda*
Eastern Mud Salamander	*Pseudotriton montanus*
REPTILES	
Wood Turtle	*Clemmys insculpta*
Corn Snake	*Elaphe guttata*
Northern Pine Snake	*Pituophis melanoleucus*
BIRDS	
Pied-billed Grebe	*Podilymbus podiceps*
Great Blue Heron	*Ardea herodias*
Red-shouldered Hawk	*Buteo lineatus*
Marsh Hawk	*Circus cyaneus*
Merlin	*Falco columbarius*
Upland Sandpiper (Plover)	*Bartramia longicauda*
Roseate Tern	*Sterna dougallii*
Barred Owl	*Strix varia*
Short-eared Owl	*Asio flammeus*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Cliff Swallow	*Petrochelidon pyrrhonota*
Short-billed Marsh Wren	*Cistothorus platensis*
Bobolink	*Dolichonyx oryzivorus*
Savannah Sparrow	*Passerculus sandwichensis*
Ipswich Sparrow	*Passerculus sandwichensis princeps*
Grasshopper Sparrow	*Ammodramus savannarum*
Vesper Sparrow	*Pooecetes gramineus*
SPECIAL CASE:	
MARINE REPTILES	
Atlantic Green Turtle	*Chelonia mydas*

Source: Taken from "Endangered, Threatened, Peripheral, Undetermined, Declining and Extirpated Wildlife Species in New Jersey", Official list prepared by Endangered and Non-game Species Project, NJDEP Division of Fish Game and Shellfisheries, Russel A. Cookingham, Director, March 29, 1979.

Natural functions:

- Each species of animal and plant is composed of a unique genetic mixture. Endangered and threatened species provide the natural world with a rare combination of genes that are of particular value as an adaption to environmental conditions. If lost through extinction, the natural world loses the diversity of genetic material which promotes the stability and the survival of the natural system.

- Scientific investigation of endangered and threatened species provides the citizens of New Jersey with a better understanding of the natural world and its potential opportunities for utilization by man.

- The observation of endangered and threatened species provides an educational insight into the past condition of the natural environment and the challenge of the future in resource management.

- Endangered species are often found in relatively undisturbed or high quality habitats. Therefore, in addition to the intrinsic value of the species, endangered species serve as indicators of high quality habitats.

Value of endangered and threatened species habitat:

Endangered species are organisms which face possible extinction in the immediate future due to loss of suitable habitat, and past over-exploitation through human activities or natural causes. Threatened species are not in jeopardy of immediate extinction, but they could become endangered if conditions were to worsen. Extinction is an irreversible event and represents a loss; to future human use, and educational research; to the interrelationships of all living creatures with the ecosystem; and of irreplaceable genetic material.

The current (1979) official list of endangered species of animals in New Jersey (NJAC 7:25-11.1) includes the following species: Shortnose sturgeon, blue-spotted salamander, eastern tiger salamander, bog turtle, bald eagle, peregrine falcon, osprey, Cooper's hawk, and Indiana bat, as well as various marine mammals and marine reptiles. Additional species are designated as threatened. Currently, no official list exists of species of plants that may be endangered or threatened in New Jersey. Fairbrothers and Hough (1975), however, compiled an unofficial list, and 15 species of plants that occur in New Jersey were recommended by the Smithsonian Institution to the US Fish and Wildlife Service for addition to the Federal lists (40 FR 27863-27864, 1 July 1975).

G. MIGRATORY PATHWAYS AND SPAWNING AREAS

Definition: Waters which serve as passageways for migratory fish, crustaceans, and shellfish larvae to or from seasonal spawning areas, nursery areas, or feeding areas are critical habitats. Pathways of anadromous fish through rivers, streams, bays and inlets, as identified by NJDEP(1977a) are a major component of this type of critical habitat. Also included are ocean waters within the 3 mile territorial limit of New Jersey, through which a large number of species migrate.

Natural functions:

- Migratory pathways function as transportation routes for fish populations moving from one coastal system to another. Migration is necesary for spawning, juvenile development, and the survival of many important fisheries (Harry 1963; McHugh et al. 1959; Nichols 1967; and Merriman 1937).

- Migratory pathways distribute the fisheries throughout the coastal water sections in response to the energy pulses in each of the sections. In this way, the fisheries utilize the available energy sources of the coastal waters most efficiently (Copeland 1965).

- The migratory pathways serves as channels to distribute detritus from nontidal and tidal sources to the fisheries. The detritus forms the base for the food chain that supports the migrating fish populations.

Value of migratory pathways and spawning areas:

Striped bass are one of New Jersey's most prized sport fish and are actively sought wherever they occur in New Jersey. This species spawns in the Delaware, Hudson, and Maurice Rivers. American shad, once much more numerous and formerly an important commercial species, continue to make an annual spawning run in the Delaware and Hudson Rivers, where there is an active sport fishery. A much reduced commercial fishery exists in the Delaware Bay and River. Herrings are important forage species and spawn annually in many of New Jersey's tidal tributaries including the Raritan and Hackensack Rivers. Herrings are fished during spring runs, for direct human consumption, garden fertilizer and for use as bait. Shortnose and Atlantic sturgeon spawn primarily in the Hudson River and utilize various portions of the coastal zone during various life stages.

H. SHIPWECKS AND REEFS

Definition: This special resource includes all permanently submerged or abandoned remains of vessels [lying] which serve as a special marine habitat and are within the ocean waters of the State of New Jersey three mile territorial sea, but outside of navigation channels [whether sunk intentionally or unintentionally]. Known sites include those shown either on National Ocean Survey (N.O.S.) charts or listed in: W. Krotee and R. Krotee Shipwrecks Off the New Jersey Coast (1966). Also included in this category are artificial fishing reefs which serve the same natural function as a habitat for living marine resources.

Natural functions:

- Shipwrecks and reefs rapidly develop communities of attached organisms because of fast current renewal resulting from the the protrusion of the structure above the main friction layers of the bottom. The community that develops is adapted to the physical and biological conditions present.

- The structures serve as important cover to many fishes and crustaceans in an environment that naturally is devoid of such protection.

- Reefs concentrate marine life and are important as a prime fishing area (lobster, bluefish, striped bass and other species).

- Shipwrecks and reefs alter natural water currents and provide a variety of niches for species requiring modified water velocities and circulation patterns.

Value of shipwrecks and reefs:

Shipwrecks and other natural or artificial materials serve as habitat for benthic finfish and lobsters, and other invertebrates which prefer shelter in hard substrates otherwise uncommon in New Jersey's marine waters. These areas function as congregation areas for migratory species and support extensive recreational fishing by private boats, commercial party boats, and commercial lobstering. Shipwrecks are also fragile historic and cultural resources. Scuba diving club members from New Jersey and other states visit these resources.

I. BEACHES

Definition: Beaches are gently sloping areas of unconsolidated material, typically sand, that extend landward from the water to the area where a definite change takes place either in material or physiographic form, or to the line of vegetation. The upland limit of beaches is typically defined by the vegetation line or the first cultural feature, such as a road, seawall, or boardwalk. Beaches are divided into the "wet beach", the area at and below the mean high water line, and the "dry beach", the area above the mean high water line. The wet beach area is impressed with the Public Trust Doctrine and, therefore, available as public space.

Natural functions:

- Beaches develop a unique association of very specialized biota, the sand dwellers or psammon (Riedl and McMahon 1974).
- Beaches respond to wave energies and absorb much of the wave force of the ocean and bays.
- Beaches are both a source and sink for unconsolidated sediments moving in the littoral currents.
- Beaches are an important feeding, resting, and nesting area for thousands of shore birds and marine reptiles including least and common terns, black skimmers, piping plovers, Atlantic loggerhead turtle, and other species.

Value of beaches:

Undeveloped beaches are vital to the New Jersey resort economy. Unrestricted access for recreational purposes is desirable so that the beaches can be enjoyed by all residents and visitors of the state. Beaches are subject to coastal storms and erosion from offshore currents.

Public health and safety considerations require that structures be excluded from beaches to prevent or minimize loss of life or property from storms and floods, except for some shore protection structures and linear facilities, such as pipelines, when nonbeach locations are not prudent or feasible. Beaches perform, in conjunction with dunes, a valuable protective function to coastal development by absorbing the energy of the waves. Wet sand beaches have been designated a Geographic Area of Particular Concern (GAPC) under the Federal Coastal Zone Management Act.

J. DUNES

Definition: Dunes are formations of partially stabilized, vegetated, drifting sand roughly paralleling and upland from the beaches on ocean and bay shores. The inland limit of dunes is defined topographically. Typically, the land surface rises above a beach as a fore-dune, flattens on a ridge line, and then falls as a back dune. This is the primary dune. Sometimes the surface rises and falls again one or more times, creating secondary or tertiary dunes. The term dune includes all areas between the inland limit of the dry, sandy beach and the foot of the most inland dune slope. Two types of dune areas exist along the New Jersey shoreline: natural dunes and developed dunes. Natural dunes modified, but not totally destroyed by man, are defined as "developed dunes".

Natural functions:

- Dunes absorb much of the energy generated by abnormal wave climates by supplying the beach with unconsolidated material. The material is drawn offshore by the eroding waves and is returned to the beach and eventually the dunes in calmer wave periods.
- Dunes form a moderately effective barrier to flood waters depending upon the continuity and configuration of the dunes.
- Dunes deflect salt laden offshore winds and therefore protect the vegetation of the central barrier island corridor.
- Dunes provide a unique high energy and dynamic environment that is colonized by a distinct community of plants and animals.
- Dunes function as storage and recharge areas for freshwater that is held by osmotic pressure within the dune. If the groundwater is lowered drastically, the dune will become dessicated and severely eroded by coastal winds.

Value of dunes:

Dunes serve as valuable physical storm wave protection, groundwater recharge area, wildlife habitat, aesthetic and educational resources. The number and extent of dunes and barrier beach vegetation have diminished along

New Jersey's Atlantic coastline, due largely to extensive and intensive development on barrier islands. Most of New Jersey's dunes are located either in publicly-owned areas such as Sandy Hook (Gateway National Recreation Area), Island Beach State Park, Little Beach in the Brigantine National Wildlife Refuge, and Higbee Beach in Cape May County (proposed for state acquisition), as well as adjacent to the developed parts of barrier islands. Additional small but significant remaining dune areas are in public ownership at Sea Girt at the State Police Academy, Ocean Crest State Park (undeveloped) at Ocean City, Strathmere Natural Area at Corson's Inlet, and Cape May Point State Park. Avalon has a 10 block stretch of primary and secondary dunes with thick, mature barrier island vegetation (Photograph 22, Volume 3).

K. COASTAL BLUFFS

Definition: A coastal bluff is the seaward face or side of any elevated land form, other than a coastal dune, which lies at the landward edge of a coastal beach whose land is subject to tidal action, or other water-wave actions. The seaward limit of the bluff is the toe of the bluff slope. The landward limit of the bluff is the first major break in the face of the bluff. A bluff may be a steep or gently sloping surface composed of various fairly loose sediment. Coastal bluffs, exist primarily in Middlesex, Monmouth, Burlington, and Gloucester Counties.

Natural function:

- Coastal bluffs protect the upland from storm waves and flooding.
- Coastal bluffs provide a source of sediment for ocean and estuarine beaches.
- Coastal bluffs, because of the large amount of material present, retard horizontal erosion of the upland.

Value of coastal bluffs:

Coastal bluffs play an important role in storm damage protection. Bluffs also afford scenic vistas of coastal water and landscapes. For both reasons, coastal bluffs are preferred by many as homesites.

L. MARINE AND ESTUARINE SANCTUARIES

Marine Sanctuary

Definition: A marine sanctuary is a specific geographic area located within tidal waters, from the highest extent of tidal action seaward to the outer edge of the Continental Shelf. Under Title III of the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532), a marine sanctuary can be established for the purpose of preserving or restoring marine areas for various values. To date, there are no designated marine sanctuaries within New Jersey.

DEP-BCPD submitted six recommendations to NOAA in 1977, including the Hudson Canyon, Shrewsbury Rocks, Great Bay estuary, shipwrecks, inlets, and offshore sand ridges (Carlson 1979). Designation of one or more of these areas as marine sanctuaries in New Jersey's nearshore and offshore areas requires joint actions by the Governor of New Jersey and the US Secretary of Commerce, and could take place during 1980.

Estuarine Sanctuary

Definition: An Estuarine Sanctuary is a research area, or natural field laboratory, established pursuant to Section 312 of the Federal Coastal Zone Management Act of 1972, as amended. Such an area may include all or any part of an estuary and adjoining edge and shoreland areas in a manner so as to constitute, to the extent feasible, a natural unit. The Secretary of Commerce is authorized to provide grants of up to 50 percent of the costs of acquisition, development, and operation of an estuarine sanctuary, or of up to two million dollars, whichever is less.

Natural functions:

- Marine and estuarine sanctuaries are assembledges of landscapes and associated plants and animals. As such, the natural function of a sanctuary varies with the area and environment designated. Additional discussion about these areas can be found in Chapter XVII-B, 3.2.9 of this volume.

Value of estuarine and marine sanctuaries:

Certain portions of the Atlantic Ocean and adjacent estuaries are of special national and regional value in the production and maintenance of valued marine animals, and could be adversely impacted by development likely to take place in the future, especially activities related to offshore oil and gas development. It is in the long-term interest of the people of the nation to identify, protect, and manage these sanctuaries.

M. PINELANDS

Definition: Boundaries for the Pinelands have been recommended by the Governor's Pinelands Review Committee (1978). Subareas within these boundaries include a "Pinelands Protection Area" and a "Pinelands Preservation Area". These areas are regulated by the Pinelands Protection Act of 1979.

Natural functions:

- The Pinelands contain many natural environments that are critical to the continued existance of unique or endangered plants and animals.

- The Pinelands are an important groundwater recharge area.

- The Pinelands are an extensive wildlife habitat for animals requiring extensive range.

- The Pinelands contain a distinct group of vegetation types which occupy large areas as distinct vegetational communities only within its boundaries.

Value of the Pinelands

The Pinelands is a large area, greater than 1 million acres in extent, of essentially natural landscape in close proximity to the highly modified, man-dominated landscape of megalopolis. The Pinelands thus has particular value as a scientific, educational, and recreational resource for the citizens of New Jersey. This value consists principally of diverse plant and animal species present, including many endangered and threatened animal species, and a great number of non-game species. The Pinelands vegetation provides the habitats upon which the animals depend for food, cover, nesting, resting, and breeding. The plant communities range from bogs, freshwater marshes, and Atlantic white cedar stands to upland pitch pine, black jack and scrub oak forests. Streams are also an important part of the Pinelands. Because of their low nutrient concentrations and high acidity, their fauna are especially sensitive to minor changes in water quality. The value of the Pinelands is maintained and increased by the hunters, fishermen, bird-watchers, scientists, teachers and others who use the Pinelands without abusing them. The continued maintenance of the Pinelands will ensure that a significant part of the natural history of the State will be available to future citizens of New Jersey in the form of the plants, animals, and landscapes.

N. OPEN SPACE

Definition: Privately-owned open space and recreation facilities include all golf courses, campgrounds, parks and other facilities not owned by Federal, state, county or local governments. Publicly-owned open space constitutes land areas owned and maintained by Federal, state, county, and municipal agencies and dedicated to the conservation of natural resources, public recreation, or wildlife protection or management. Publicly owned open space includes State Forests, State Parks, and State Fish and Wildlife Management Areas and designated Natural Areas (NJSA 13:1B-15.12a et seq.) within DEP-owned and managed lands.

Natural functions:

- Open space provides a buffer between the natural elements of the environment and the man-made elements. This buffer is necessary for the survival of many sensitive natural elements of the environment.

- Open space provides, in degrees of value related to its characteristics, wildlife habitat, mitigation of pollutants, surface water quality protection, air quality protection and mitigation, and other important functions.

Value of open space:

As the rapid urbanization of New Jersey continues and leisure time increases, open space will play an increasingly important role in maintaining a desirable living environment for the residents of New Jersey. Even though the supply of open space has decreased under the growing pressure for development, the State's expanding population will require more public open space to satisfy its needs.

Not only is open space the basic resource for recreation facility development, it also performs other worthwhile functions. Open space can create public spaces in densely settled areas, shape urban growth, provide buffers for incompatible uses, retain contiguous farmland, insure the preservation of wildlife corridors, increase the economic value of adjacent land, and preserve distinct architectural, historic, and geologic sites.

The distribution of open space should not only be centered around the preservation of unique areas, but must also respond to the needs of people. Where possible, open spaces should be contiguous both visually and physically to promote a sense of continuity and to afford users continued uninterrupted movement.

O. FARMLAND CONSERVATION AREAS

Definition: Large, contiguous areas of 20 acres or more (in single or multiple tracts) with soils of classifications in the Capability Classes I, II, and III as mapped by the US Department of Agriculture, Soil Conservation Service, in National Cooperative Soil Surveys, and Special Soils for Blueberries and Cranberries, which are actively farmed, suitable for farming, or forested, and located in Cape May, Cumberland or Salem Counties are defined as Farmland Conservation Areas. The Farmland Conservation Areas should not be confused with the Farmland Preservation Demonstration Project in Burlington County which has been discontinued.

Natural function:

- Farmland Conservation Areas provide New Jersey with a productive land base to support the food and fiber demands of the population.

Value of farmland conservation areas:

Farmland Conservation Areas are an irreplaceable natural resource essential to the production of food and fiber. Conservation of large, contiguous areas of these lands for farming serves both private and public interests, particularly in terms of ready access to locally-grown food, jobs and open space preservation. At the same time, the policy here recognizes the desirability of minimizing conflicts between farm and urban areas.

Only the three southern counties within the Bay and Ocean Shore Region have significant Farmland Conservation Areas located in a manner generally compatible with present or future farming. In Cape May County, approximately 39.8 percent of the soils qualify as Capability Classes I and II (including areas outside of the coastal zone boundary). Some of these irreplaceable soil resources have already been converted to urban uses. Other areas which are of a sufficiently large scale to make farming feasible should be reserved for farming purposes.

P. CENTRAL BARRIER ISLAND CORRIDOR

Definition: The central barrier island corridor is that portion of barrier islands and spits or peninsulas (narrow land areas surrounded by both bay and ocean waters and connected to the mainland) that lies upland and between the coastal wetlands, beaches, and edge areas that line the ocean and bay sides of a barrier island or spit. The central barrier island corridor excludes dunes and begins at the foot of the most inland slope of dunes. The central barrier island corridor also excludes wash-over areas. Central barrier island corridor does not apply to the headlands of northern Ocean County, Monmouth County, and the tip of Cape May County, which are part of the mainland.

Natural functions:

- The Central Barrier Island Corridor contains a freshwater lens available as a potable source of water.
- The Central Barrier Island Corridor provides an environment for the formation of a distinct maritime community of plants and animals.
- The barrier island as a whole provides protection to the mainland from the damaging forces of the Atlantic.

Value of the Central Barrier Island corridor:

All of New Jersey's barrier islands and spits, except for Pullen Island in the Brigantine National Wildlife Refuge, are developed to varying degrees, largely as a result of incremental decisions made beginning more than 100 years ago. Because the public facilities (road and utilities) necessary to support urban and resort development exist, and because development pressure is intense, the main value of the Central Barrier Island Corridor is the provision of land for coastal development. The Central Barrier Island Corridor has been prized as an ideal site for second homes and residences by many citizens of the State. Many of the recent residents fail to recognize the sensitivity of the maritime environment and the hazardous nature of the coastal islands.

Q. OAK, HICKORY, AND PINE FORESTS

Definition: Forests are vegetated areas of varying age, species composition, and density where woody trees are dominant. In the Atlantic Coastal Plain landscape, upland and lowland forested sites are not distinguished sharply by topography but rather by the water tables. The oak, hickory, and pine forests of the New Jersey coastal zone include both lowland and upland forests and occupy areas in which the winter water table generally remains at least 1.5 feet below the ground surface (McCormick and Jones, 1973).

Natural functions:

- Forests provide cover, food, and other basic habitat requirements for a large variety of terrestrial wildlife.
- Forests serve as aesthetic, noise, and air pollution buffer zones for people and wildlife.
- Upland forests stabilize soils, retain surface precipitation, reduce surface runoff, and maintain aquafer recharge.
- Forests absorb air pollutants and produce large quantities of atmospheric oxygen.

Value of Oak, Hickory, and Pine Forests

The world's forests are being depleted at an alarming rate, and indications are that global climate could be adversely affected as a result. New Jersey's forests are, of course, a part of this global resource and contribute to a degree to this global atmospheric gaseous balance. Therefore, the clearing of forests should be done only after careful consideration of non-destructive alternatives. New Jersey's oak, hickory, and pine forests also provide important and diminishing habitat for a large variety of plants and animals, including a number of game species. They also serve an important function as buffers between competing land uses, and are important in reducing soil loss and maintaining groundwater flows.

VII. RELATIONSHIP OF SPECIAL COASTAL RESOURCES TO ENVIRONMENTAL GOALS AND OBJECTIVES

Special coastal resources are of particular significance to the State of New Jersey. These resources and their associated functions and processes are critical to the achievement of the natural ecological goals and objectives of the State. We have examined the relationship of the resources described in the previous section and the goals and objectives listed above. From this examination, it is obvious that alterations in the identified resources or their functions affects the ability of New Jersey to achieve or maintain the objectives of the coastal management program. In order to clearly define the objectives for special coastal resouces, a series of special objectives was developed (Table 3).

Table 3. Special Objectives (for Special Coastal Resources)

- Preserve, protect, and where possible, restore or enhance oyster and blue mussel reefs.
- Preserve, protect, and where possible, restore or enhance estuarine shellfish beds.
- Preserve, protect, and where possible, restore or enhance ocean shellfish beds.
- Preserve, protect, and where possible, restore or enhance prime fishing areas.
- Preserve, protect, and where possible, restore or enhance submerged vegetation.
- Preserve, protect, and where possible, restore or enhance tidal wetlands.
- Preserve, protect, and where possible, restore or enhance bogs and nontidal wetlands.
- Preserve, protect, and where possible, restore or enhance white cedar stands.
- Preserve, protect, and where possible, restore or enhance migratory pathways and spawning areas.
- Preserve, protect, and where possible enhance shipwrecks and reefs.
- Preserve, protect, and where possible, restore or enhance beaches.
- Preserve, protect, and where possible, restore or enhance dunes.
- Preserve, and protect coastal bluffs.
- Preserve, and protect the Pine Barrens.
- Preserve, protect, and where possible, expand and enhance open space.
- Preserve and protect large contiguous areas of prime farmland and specialty crop soils.
- Preserve, protect, and where possible restore or enhance the central barrier island corridor.
- Preserve, protect, and where possible restore or enhance upland oak, hickory, and pine forests.

The definition of the relationships between Special Coastal Resources and objectives provides a framework within which the implications of land or water use decisions can be evaluated. Future uses in the study area will modify, directly or indirectly, the natural functions of the Special Coastal Resources, thereby directly affecting the viability of the stated natural ecological objectives. Therefore, New Jersey should comtemplate this causal relationship of land and water use decisions to objectives when conducting an evaluation of proposed uses in the coastal zone. It is possible, through the use of cause and effect matrices, to translate these environmental changes into actions affecting the ability of the State to achieve natural ecological objectives. This complex relationship is established in the following sections of this report.

VIII. IMPACT RELATIONSHIPS IN THE COASTAL ZONE

A. EXPECTED FUTURE USES IN THE STUDY AREA

The initial step that is necessary to examine the consequences of land and water uses occurring in the Study Area is the assemblage of a listing of the land uses and water uses that exist or are likely to be proposed in the Study Area. Such a list was developed by combining the types of facilities that are regulated pursuant to the Coastal Area Facility Review Act of 1972 (CAFRA), the types of uses that were compiled previously in reports issued by the Office of Coastal Zone Management (NJDEP 1978a, 1978b) and from lists compiled by others (Battelle 1966; RFF 1967; Cosrel 1968; Ipon 1968; Teeters 1968; Ketchum 1969, 1972; USDOI 1969, 1970b; Lill 1970; Anon. 1972; Ellis 1973; Clark 1974; USEPA 1975; Cronin 1977). These entries were revised, supplemented, and regrouped for the present report.

The listing in Table 4 is intended to be comprehensive. This will insure, insofar as possible, that all existing and potential uses are considered in the development of the management plan. It also constitutes a record of the uses that were considered. When these uses were utilized in determining Impacting Activities which could occur in a given land, edge or water type, a standard size of each use was determined in order to evaluate comparable magnitudes of impacts. The chosen standard impact plot was 100 acres. If a use was considered whose lot size was normally smaller than 100 acres, such as rural housing, then the cumulative impact of as many rural houses that would normally occur on a 100 acre plot was considered. For uses covering areas larger than 100 acres, such as power plants, a representative 100 acre portion of the power plant site was considered. The water demand, waste production, etc. of the 100 acre site was considered the same proportion of the whole facilities water demand, etc., as 100 acres/total site size. For pipelines, transmission lines, roads and other linear uses, a 1 mile portion of their right-of-way was considered. For some uses such as those over water professional judgement was utilized to determine the magnitude of impacts.

B. IMPACTING ACTIVITIES

The potential land and water uses of the Study Area have impacting activities associated with the construction and operation of the uses. To understand the effects and environmental changes that may occur from land and water uses, it is necessary to examine the associated impacting activities and the environmental changes that may result from these activities.

The potential land and water uses were examined, and a comprehensive list of impacting activities resulting from the uses was prepared. Table 5 contains the impacting activities and associated definitions.

To understand the potential impacts that might result from a specific land or water use, the impacting activities were correlated with the selected uses (Matrix #1). A mark occurring within a specific use row identifies a particular impacting activity as normally occurring as a part of that use.

Table 4. Potential Land and Water Uses.

HOUSING

- Rural
- Single Family Detached
- Single Family Attached
- Urban High Density

COMMERCIAL

- Retail and service
- Wholesale and distribution

INSTITUTIONAL/PROFESSIONAL FACILITIES (office buildings, libraries)

INDUSTRIAL

- Fabrication and assembly
  - electrical equipment and supplies
  - metal products
  - transportation equipment
  - machinery except electrical
  - instruments and related products
  - furniture
- Chemicals and allied products
  - industrial inorganic chemicals (gases, acid, and salts) HSO_4, alumina, potassium and sodium compounds, HO_3
  - organic industrial chemicals (fluorocarbons, chlor-alkalies, activated carbon, and petrochemicals)
  - plastics and synthetics
  - pharmaceuticals and cosmetics
  - soaps and detergents
  - paints and allied products
  - agricultural chemicals
- Textiles
  - Apparel and other textile products
  - Weaving and knitting mills
  - Textile finishing
  - Leather and leather products
- Primary metals
  - iron and steel manufacturing
  - ferroalloy (involves silver, arsenic, cadmium, lead, nickel, chromium)
  - aluminum and aluminum alloys
  - copper, lead, zinc, and magnesium smelting and processing
  - metal plating
- Stone, clay, and glass products
  - glass manufacturing and products
  - cement
  - clay products
  - cut stone
  - concrete, gypsum, and plaster products
- Food and food byproducts
  - meat and poultry products (slaughtering, blanching, cooking, curing, pickling, packing of meats)
  - dairy products
  - preserved fruits and vegetables
  - grain mills products
  - fish and shellfish processing
  - bakeries
  - sugar refineries and confectioners
  - fats and oils
  - alcoholic beverages
  - soft drinks
- Printing and publishing
- Paper and allied products
  - pulp mills
  - paper and building board plants
- Extractive
  - hard rock quarrying
  - unconsolidated
- Lumber and wood products
  - saw mills and planing
  - millworks
  - wood containers
  - wood preservation
- Bulk storage, handling and transfer facilities
  - pipelines and pumping stations
  - storage tanks (hazardous, non-hazardous)
  - transfer facilities (hazardous, non-hazardous)
  - aerial transmission lines
  - buried transmission cables

Table 4. Potential Land and Water Uses (concluded).

- Petroleum and petroleum products
  - petroleum refining
  - facility for recovery of spent petroleum products
  - oils and greases
  - phenols, creosotes, and tars
  - synthetic gas manufacturing
  - liquified natural gas
  - gas processing

ENERGY GENERATION

- Nuclear electrical generation
  - cooling tower
  - once-through cooling intake and discharge structures
  - cooling ponds/lakes

RECREATION

- Large crowd gathering facility
  - outdoor (amusement park)
  - indoor (fieldhouses, casinos)
- Small crowd gathering facility
  - outdoor (tennis courts, golf, skeet range)
  - indoor (gymnasium, arcade)

PUBLIC FACILITIES

- Centralized water supply, treatment, and distribution
- Centralized sewage collection, treatment, and disposal
- Solid waste management
  - incinerator
  - landfill/overboard dumping
  - compost

TRANSPORTATION

- Auto transportation
  - expressway
  - collector
  - local road
- Rail
- Ship
  - port (large)
  - marina (medium)
  - dock (small)
- Navigation
- Aircraft
  - airport
  - small landing field

NATURAL RESOURCE UTILIZATION

- Shellfishing
  - commercial
  - recreational
- Aquaculture
- Forestry
- Agriculture
  - row crops
  - salt hay
  - nurseries
  - orchards
  - livestock
    - lot
    - range
- Mosquito control ditching

Table 5. Definitions of Impacting Activities.

Air Waste Disposal: The exhausting of superfluous diffused matter or gases in the atmosphere.

- Particulates: Finely divided solid or liquid particles. These include dust, smoke particles, sprays, and mists.
- Gases: The vapor component of air waste emissions including CO_2, NO_2, CO, SO_2, and other compounds.

Compaction: Physical compression of soil.

Channelization: Containment of waterways within man-made troughs to restrict and direct streamflow.

Clearing: Removal or elimination of vegetation from the land surface.

Culverting: Containment of waterways within man-made pipes.

Diking: Creation of an earthen embankment for the retention or exclusion of water, on or from an edge or land area.

Drainage: Removal of water from the land surface by gravity flow.

Dredging: Mechanical removal of unconsolidated materials from beneath the water.

Excavation: Mechanical removal of unconsolidated materials from the land.

Fertilizing: Application of nutrient materials to the soil to increase vegetation growth.

Filling - Consolidated: Placement of solid materials, the units of which are generally greater than 10 centimeters in diameter, upon or in land, edge, or substrate below water in site preparation.

Filling - Unconsolidated: Placement of solid materials, the units of which are generally smaller than 10 centimeters in diameter, upon or in land, edge or substrate below water in site preparation.

Hazards - Catastrophic: The potential for causing an unplanned action which would pose a severe threat to the survival of a natural coastal community.

Hazards - Limited - The potential for causing an unplanned action which would be detrimental to the productivity or expansion but not the existence of a natural community.

Herbiciding: Application of chemicals that are toxic to selected or all forms of vegetation.

Table 5. Definitions of Impacting Activities (continued).

Impervious Surfacing: Placement of an impermeable layer on the surface of the land.

Insecticiding: Application of chemicals that are toxic to selected or all forms of insects.

Inundation: Covering of the land or earth surface with water.

Irrigating: Application of water for use by or to increase vegetation growth.

Landscaping/Right of Way Management: Modification of vegetation by quantitative or qualitative alteration of plant cover.

Liquid Waste Disposal: The disposal of superfluous non-gaseous fluid material usually produced during the operational aspects of a use.

- Pesticides: Waste products from the manufacture or use of insecticides and herbicides.
- Heavy Metals: Any metal with a density at least five times greater than water.
- Nutrients: Nitrogen and phosphorus; the major causes of water eutrophication.
- Thermal Effluent: Water used for the dissipation or provision of heat.
- Organic: Compounds natural or synthesized which contain carbon atoms.

Pedestrian Traffic: The movement of people off pavement.

Plowing/Discing: Physical disturbance of the soil.

Solid Waste Disposal: The disposal of superfluous semisolid or solid waste usually produced during the operational aspects of a use.

- Hazardous: Materials which would pose a severe or limited threat to the survival or productivity of a natural coastal community.
- Non-Hazardous Unconsolidated: Materials, the units of which are generally smaller than 10 cm in diameter, and which do not pose a threat to the productivity of a natural coastal community.
- Non-Hazardous Consolidated: Materials, the units of which are generally greater than 10 cm in diameter, and which do not pose a threat to the productivity of a natural community.

Structural Support: Vertical columns and walls that may elevate or bear a structure such as a building or a road.

Table 5. Definitions of Impacting Activities (concluded).

Vehicular Traffic: Movement of motor vehicles.

Water Demand: Use or consumption of water.

- Surface: Water obtained from surface water bodies.
- Subsurface: Water obtained from an aquifer.

Water Transfer/Diversion: Geographical relocation of surface water, including pumping.

C. LAND AND WATER TYPES OF THE STUDY AREA

Impacts cannot be evaluated for uses abstracted from their environment. Therefore, the study area's land and waterscapes were classified into a variety of land and water types that represent logical geographic categories based on a sensitivity to disturbance and inherent natural functions. Preliminary analysis of land and water types resulted in a large number of disaggregated types. This preliminary list was then consolidated into a useable and logical assemblage in order to more succinctly deal with the large magnitude of required impact analyses. This consolidated list of land and water types is presented in Table 6. Definitions for the respective land and water types are presented in Table 7.

The water types were defined by evaluation of floral and faunal assemblages, water quality, and waste assimilative capacity characteristics. The basic separation into tidal and nontidal waters generally recognizes the inherent differences in saline and fresh waters, although portions of the tidal sections of major coastal rivers are freshwater. A tidal separation basis also makes biological sense in that several important coastal fishes, such as striped bass and American shad, utilize basically freshwater tidal river reaches for spawning, while juvenile and adult life stages place primary habitat resource demands on estuarine and marine waters.

The subtypes within the tidal and nontidal categories are based primarily on waste assimilative capacity differences. For example, the discharge of a given volume of treated wastewater into a well-flushed open bay would have a lower potential impact on living resources, such as hard clam beds, than the discharge of the same volume of wastewater to a poorly-flushed semi-enclosed bay or back bay area. This latter situation has occurred throughout much of the coastal zone and has resulted in the closure of many shellfishing areas.

The water's edge types were defined by geographical association with major water types and by vegetation. Land types were defined primarily by examination of the differences in groundwater and surface water secondary impacts which would result from development on the land surface. For example, certain sand and gravel soils serve as recharge areas for groundwater. The paving of these areas in addition to the removal of plant cover and animal habitats would result in a lowering of surface water percolation to the groundwater and a higher rate of surface water runoff. Decreased percolation could result in a reduction in drinking water supply during drought years and increased runoff could result in increased suspended solids and fluctuations in water levels in nearby surface waters.

D. IMPACTING ACTIVITIES/ENVIRONMENTAL CHANGES

The identification of land and water uses and the associated impacting activities establish a basis for analyzing the environmental changes that may result from each use. To accomplish the assessment of environmental changes resulting from uses, environmental changes that may result from impacting activities were identified in each land and water type. A list of descriptions of possible environmental changes and their associated definitions are found in Table 8. Most of the listed environmental changes could represent either an increase or decrease in the stated parameter.

Table 6. Land and Water Types

1. WATER

- Tidal

  Ocean
  nearshore MLW to average annual wave base depth ∿ 18 feet
  offshore AAWB to 3 mile limit

  Open bay

  Semi-enclosed and back bay

  Guts, inlets, and canals

  Tidal rivers

- Non-tidal

  Inland basins

  Rivers

2. WATER'S EDGE

- Ocean beaches and foredunes
- Estuarine beaches and bars
- Tidal wetlands
- Non-tidal wetlands
- Wet forest - o to 1' to seasonal high water (maple and white cedar)

3. LAND TYPES

- Central barrier island corridor
- Lowland - 1 to 3 feet to seasonal high water table

  Coarse texture soils (basically sands and gravels)

  Medium texture soils (basically loams)

  Fine texture soils (basically silts, clays, and organic sediments)

- Upland - >3 feet to seasonal high water table

  Coarse texture soils

  Medium texture soils

  Fine texture soils

Table 7. Definitions of Land, Edge and Water Types

This classification was developed by initially reviewing the proposed land and water type classification contained in Appendix 2 of the 1 June 1977, request for proposals issued by and documents prepared by OCZM -- particularly the final EIS on the coastal management program for the bay and ocean shore segment (August 1978) and the pilot study of Lower Cape May County - a method for coastal resource management (June 1978). We also reviewed classification systems and definitions developed by other authors and agencies -- particularly the functional classification of coastal ecological systems of the United States by Odum and Copeland (1972; in Environmental Framework of Coastal Plain Estuaries, Geological Society of America memoir 133, B. W. Nelson-editor), the classification of wetlands and deep-water habitats of the United States by the US Fish and Wildlife Service (1977, operational draft), and the glossary of geology by the American Geological Institute (1972; M. Gary, R. McAfee, Jr., and C. L. Wolf - editors). Topographic quadrangles of the US Geological Survey, nautical charts of the National Ocean Survey, and topographic series atlas sheets., the geological map, and the drainage basin map of the NJ Bureau of Geology and Topography also were inspected.

After lengthy internal staff discussions, and informal reviews with the BCPD staff, a three-part classification system was developed.

The three principal components of this system are defined as follows:

Water types - water areas and submerged lands and associated features which are below the elevation of mean low water as calculated on an annual basis.

Water/Land Edge types - submerged lands, lands, and associated features that are at or between the elevations of mean low water and extreme high water as calculated on an annual basis, (excluding surface waters), or lands which have a seasonal high water table within one foot of the surface. (Includes foredunes as an exception to this definition).

Land types - land and associated features that are above the elevation of extreme high water as calculated on an annual basis and with a seasonal high water table more than one foot below the ground surface.

Additional definitions of land and water subtypes are as follows:

Table 7. Definitions (Cont.)

Water

TIDAL - Surface waters subject to an alternate rising and falling surface elevation due to the gravitational forces of the sun and moon.

Ocean: large body of salt water which covers 3/4 of the earth's surface.

Nearshore: Ocean waters extending from the beach or inlet mouths toward the open ocean to the line of average wave base (~18 feet) on an annual basis, and the submerged lands from the mean low water line to the average annual wave base.

Offshore: Ocean waters and submerged lands extending from the line of average annual wave base (~18 feet) to the state 3 mile limit.

Open Bay: Tidal water body and submerged bottom (below mean low waterline) around which land is more or less continuous and which has a direct open inlet connection to the ocean. (Lower New York Bay/Raritan Bay and Delaware Bay).

Semi-Enclosed and Back Bay: Tidal water body and submerged bottom (below MLW line) around which land is more or less continuous and which has either a confined direct connection (Great Bay) or indirect connection to the ocean through guts or other bays.

Guts, Inlets, Canals: Tidal waterways and their substrates (below the MLW line) which connect two bodies of water such as; ocean-bay, bay-river, bay-bay (not found in rivers).

Tidal Rivers: Waterway of considerable volume, having permanent or seasonal flow, and moving in or having a definite, continuous channel to the ocean.

Table 7. Definitions (Cont.)

NONTIDAL - Surface waters not subject to the alternate rising and falling surface elevation due to the gravitational forces of the sun and moon.

Inland Basins: Nontidal surface waters of considerable volume whose greater part is non-flowing (lakes, ponds, and impoundments).

Rivers: Nontidal surface waters moving in a definite continuous channel to the ocean.

WATER/LAND EDGE - Soils and substrate from the mean low water line to the extreme high water line or having a seasonal high water table within one foot of the surface, or being a foredune.

Ocean Beaches and Foredunes: Soils and substrate from the MLW line to the extreme high water line and wind blown mounds of sand adjacent from the first landward peak downslope to the nearshore ocean waters.

Estuarine Beaches and Bars: Soils and substrate from the MLW line to the extreme high water line which are non-vegetated and adjacent to the tidal non-oceanic waters.

Tidal Wetlands: Fully or partially vegetated soils and substrate which extend from the MLW line to the extreme high water line adjacent to tidal water.

Non-Tidal Wetlands: Fully or partially vegetated soils and substrate which; extend from the MLW line to the extreme high water line or have a seasonal high water table within one foot of the surface; and are not flowed by tidal waters nor dominated by forest.

Wet Forest: Fully or partially vegetated soils and substrate which; extend from the MLW line to the extreme high water line or have a seasonal high water table within one foot of the surface; and are dominated by forest and not flowed by tidal waters.

Table 7. Definitions (Concluded).

LAND - Soils and substrate with a seasonal high water table more than one foot below the earth's surface and which compose the area above the extreme high water line.

Central Barrier Island Corridor: Land located on sands which are essentially protected from wave action by dunes and separated from the headlands by wetlands or tidal bays; includes backdunes.

Lowland: Lands apart from the Central Barrier Island Corridor which have a seasonal high water table from 1 to 3 feet below the surface.

Coarse Soils: Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission.

Medium Soils: Soils having moderate to slow infiltration rates when wetted thoroughly and consisting of a range of soils from well-drained to those with a layer that impedes downward movement of water. These soils range from moderately coarse to fine textures and have moderate to slow rates of water transmission.

Fine Soils: Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

Upland: Lands apart from the Central Barrier Island Corridor which have a seasonal high water table more than 3 feet below the surface.

Coarse Soils: Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission.

Medium Soils: Soils having moderate to slow infiltration rates when wetted thoroughly and consisting of a range of soils from well-drained to those with a layer that impedes downward movement of water. These soils range from moderately coarse to fine textures and have moderate to slow rates of water transmission.

Fine Soils: Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a claypan over nearly impervious material. These soils have a very slow rate of water transmission.

Table 8. Environmental Changes - Definitions

Aquifer Recharge: Change in the rate of infiltration of precipitation or surface water into an aquifer.

Bathymetry Variability: Change in the bottom depth and contours beneath surface water.

Circulation/Mixing: Change in the rate of interaction of water masses and the rate of diffusion of molecules in surface waters.

Dissolved Oxygen: Reduction in the concentration of gaseous oxygen within surface water.

Dissolved Solids: Change in the concentration of non-gaseous substances within fresh water which are not filterable.

Erosion Scouring: Change in the rate whereby earth materials are dissolved or loosened from the land or substrate of surface water and carried away by the action of water or wind.

Faunal Abundance: Change in the number of animals present within a community or area.

Faunal Diversity: Change in the number of animal species or groups of species within a community or area.

Faunal Reproductive Potential: Change in the intrinsic ability of an animal population to reproduce.

Flora Abundance: Change in the number of plants present within a community or area.

Flora Diversity: Change in the number of plant species or groups of species within a community or area.

Flood Frequency: Change in the annual number of times extreme high stream flow occurs.

Flood Intensity: Change in the height and duration of extreme high stream-flow.

Flow Regime: Change in the movement of water through or over the land, edge or bottom.

Groundwater Discharge: Change in the rate of flow of groundwater from an aquifer into surface water. May also include pumping for consumption.

Groundwater Salinity: Change in the concentration of dissolved sea salts in groundwater.

Table 8. Environmental Changes - Definitions (continued)

Littoral Drift: Change in the speed, quantity, or direction of movement of unconsolidated materials (e.g. sand, gravel, shell) in estuarine and nearshore marine water by wave-direction currents.

Noise: Acoustical disturbance of the natural environment due to man's activities.

Nutrients: Change in the concentration of nitrogen or phosphorus compounds, which are directly available for plant growth.

Pathogens (increase): Greater number of disease-causing organisms (i.e., viruses, bacteria, and fungi).

pH: Change in the measured value of hydrogen ion concentration in water; measured values less than 7 are acid, greater than 7 are alkaline, and equal to 7 is neutral.

Primary Productivity: Change in the rate of production of organic matter by plants.

Runoff: Change in the volume of precipitation that flows overland before entering surface water.

Sedimentation: Change in the rate of deposition of earth materials onto the substrate of surface water.

Sediment Chemistry: Change in the chemical make-up of substrate.

Shoreline Changes: Change in the size or configuration of the waters edge.

Shore Protection Capacity (increase or decrease): Change in the intrinsic ability of the substrate in the water/land edge to dissipate wave or current energy, and to resist erosion.

Soil Assimilative Capacity: Change in the ability of soil to absorb water and filter and dispose of organic matter.

Substrate Particle Size: Change in the size of particles that constitute the substrate in surface water.

Sunlight Penetration: Change in the irradiation of a water mass by sunlight.

Surface Water Salinity: Change in the concentration of dissolved sea salts in the entire water column.

Suspended Solids: Change in the concentration of substances within water which are filterable and increase turbidity.

Toxic Substances (increase): Greater concentration of substances that are poisonous to plants or animals.

Table 8. Environmental Changes - Definitions (concluded)

Water Depth: Change in the elevation of the substrate of surface water.

Water Temperature: Change in the temperature of surface water.

E. IMPACT ANALYSIS

A major part of the estuarine study was the identification of impact relationships in the New Jersey coastal zone. There is a state-of-the-art limitation on the extent to which these relationships are understood, and the quantification of such relationships is only possible for a limited number of impacting activities. Despite the limited technical basis, a contractural agreement was made to lay a broad based conceptual framework and to begin an evolutionary process of impact identification and impact management. The matrix method was selected as the most logical format for impact relationship identification. The matrix format is also easily computerized, and it is the eventual goal of the Bureau of Coastal Planning and Development to computerize at least a portion of the impact review and regulatory management process. A matrix flow chart is provided in Figure 2.

Eighty separate complex matrices were developed to identify impacts in the coastal zone. A few of these are presented as illustrative examples of the method of analysis possible through the use of the matrix system. A complete set of the matrices is contained in Volume 3 of this report along with a discussion of resource uses, impacting activities, environmental changes, objectives, assumptions, and notes concerning the use of the matrices. It must be remembered when reviewing the examples that these matrices represent the system prototype. As in any prototype, changes and refinements through use and study are expected and are desirable. The matrices will be used repeatedly as permit applications for various uses are received by BCPD and changes will be incorporated by the system users over time. In addition, it is hoped that the use of this matrix system will lead to an orderly prioritization of study needs in the coastal zone, and that through additional basic and applied research the quantification of impact relationships can become more definitive.

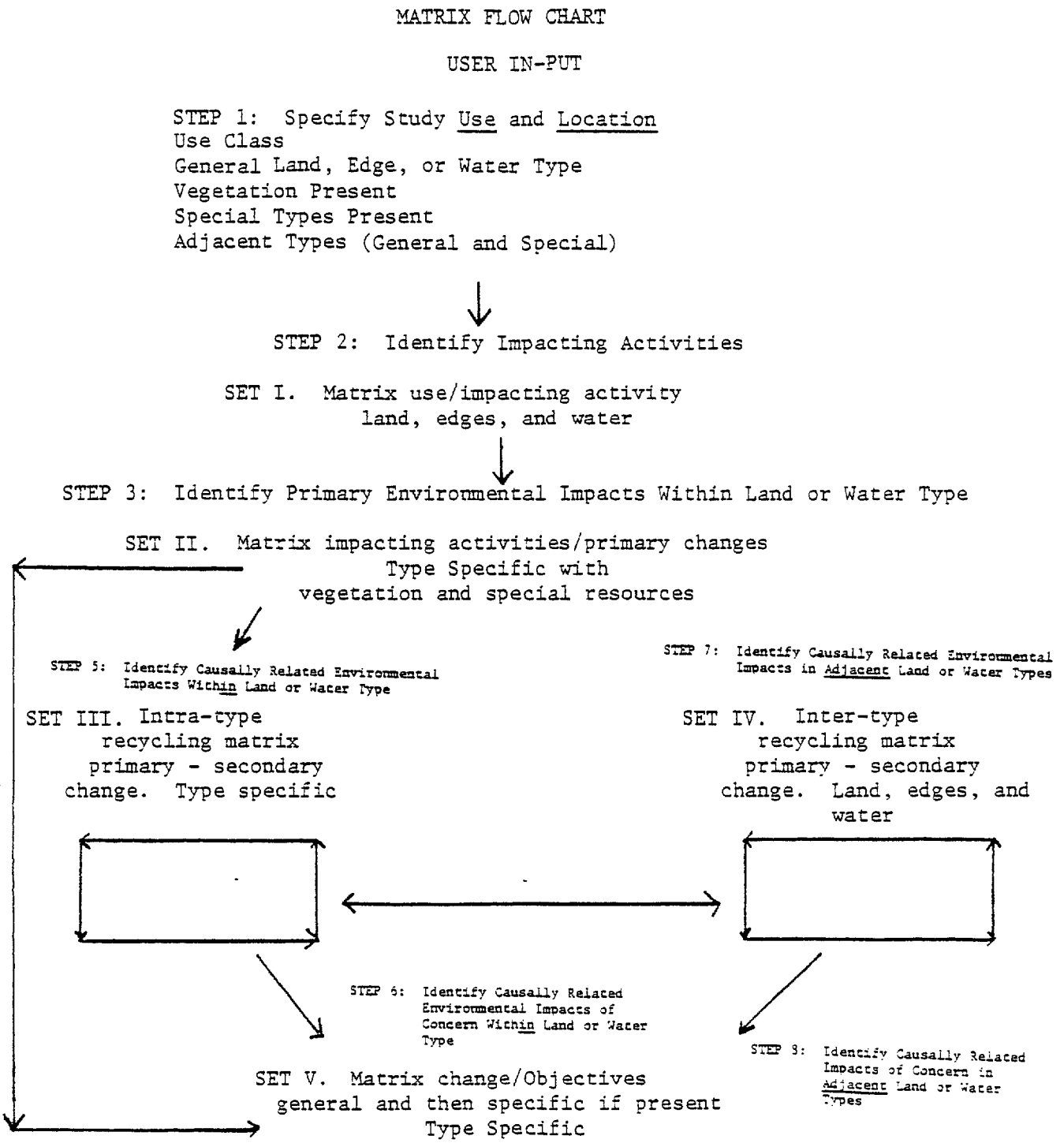


Figure 2.

MATRIX FLOW CHART

Step 1: The impact identification process begins with the listing of input data specifying the proposed use, its site, and adjacent sites. Step 2: Impacting activities which are associated with a proposed use are identified. Matrix 1 opposes uses and impacting activities and is an example of the 4 matrices in Matrix Set I (Volume 3). The impacting activities are described as major (X), variable (V), or minor (O). The time sequence of impacting activities is divided into preparation (PR), construction (CO), and operation (OP) phases. The example which has been chosen is the proposed siting of a fossil fuel electric generation facility (power plant) in a lowland , coarse soil area adjacent to a back bay which contains a commercially valuable shellfish bed. The following discussion demonstrates through the sequential application of differing matrices how a proposed use such as a power plant can potentially impact an objective for a special coastal resource (estuarine shellfish bed). This is further illustrated in Figure 3, a Flow Chart specifically highlighted for this example.

In Step 2 Matrix 1 is entered from the use (top) side by first locating the use category "Fossil Fuel Electrical Generation". This use category is further subdivided into the subcategories "cooling tower", "cooling ponds/lakes", and "once through cooling". For this example the category "once through cooling" will be used. The use category was subdivided to take into account the differing potential water effects caused by the application of differing cooling water treatment technology. Proceeding down the page from the entry point, we find that the following major (X) impacting activities are likely to occur as a result of building and operating a once through cooling fossil fuel electrical generating facility:

PREPARATION	CONSTRUCTION	OPERATION
Diking	Diking	Diking
Water Transfer/ Diversion	Water Transfer/ Diversion	Water Transfer/Diversion
		Landscaping/ROW Management
		Drainage
		Surface Water Demand
		Subsurface Water Demand
	Culverting	Culverting
	Channelization	Channelization
		Thermal Effluent
	Unconsolidated Non-Hazardous	(Liquid waste disposal)
	(Solid waste disposal)	Unconsolidated Non-Hazardous (Solid waste disposal)
		Particulates (Air waste disposal)
		Gases (Air waste disposal)

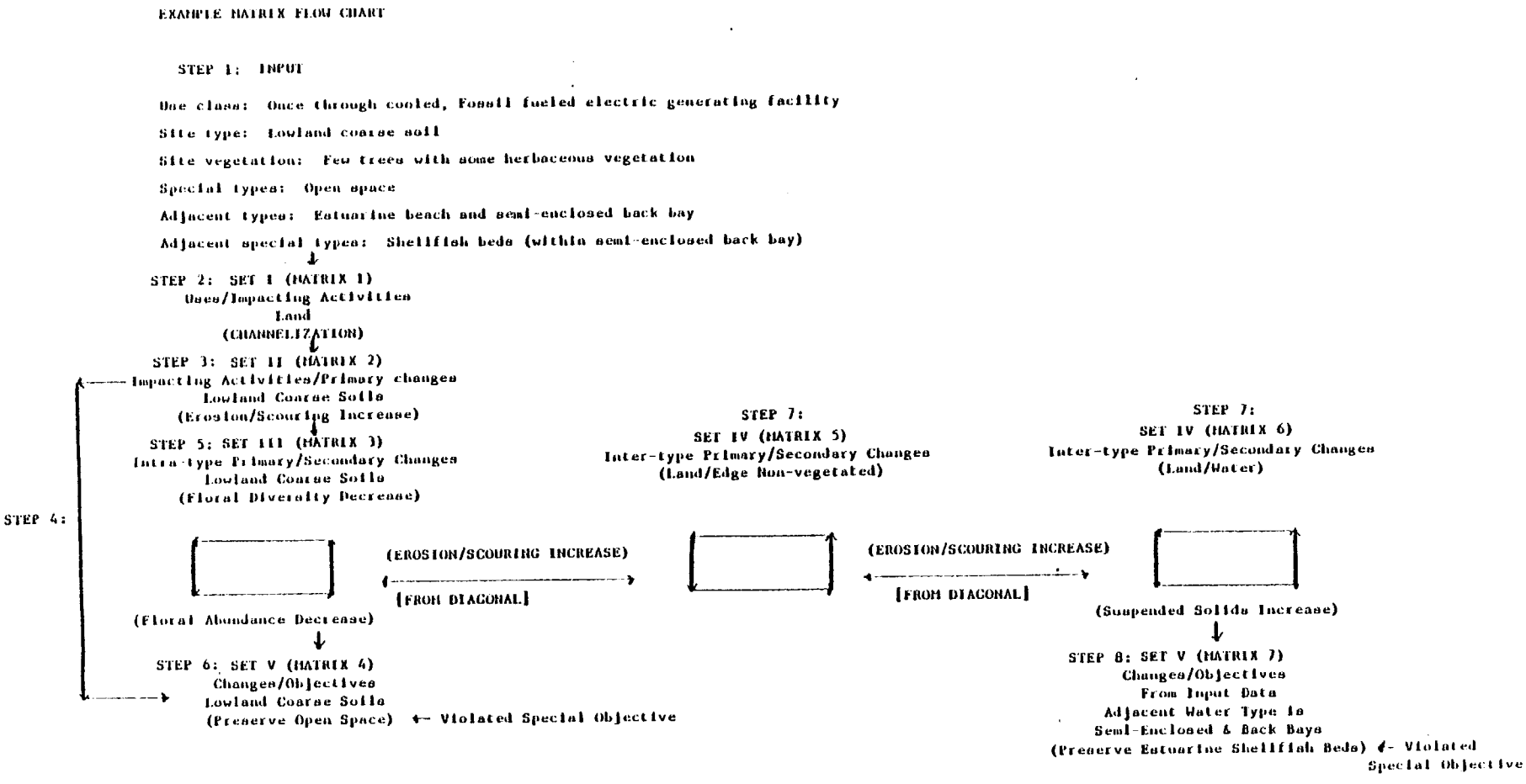
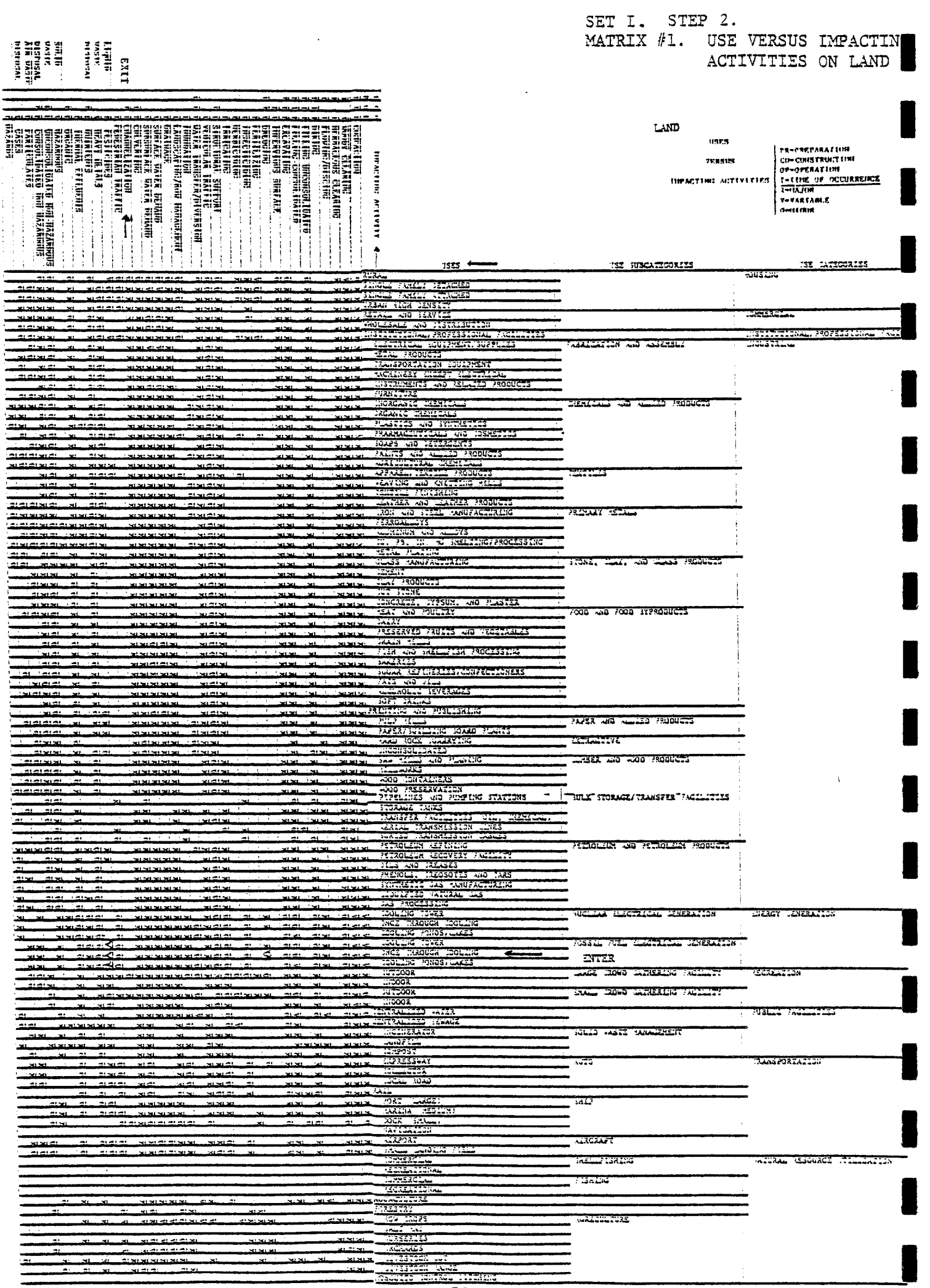


Figure 3. Example Matrix Flow Chart

SET I. STEP 2.
MATRIX #1. USE VERSUS IMPACTIN
ACTIVITIES ON LAND



In addition to this checklist, some potential major impacting activities are listed as variable, such as woody clearing, which could be major if, the proposed site were heavily forested. In any case, for the sake of simplicity of example, only major impacting activities will be followed through the matrix sequencing.

Matrix 2 is an example of the matrices in Set II (Volume 3) which for Step 3 lists the primary environmental changes projected to occur as a result of the identified impacting activities (IA). In normal usage, all of the impacting activities which may occur in a major or variable capacity as a consequence of a use, would be checked through the matrices to determine their primary and secondary environmental changes. However, for this example we shall address only a minimal number of the impacting activities and resultant environmental changes. If we take the IA "channelization" and enter the matrix from the top, we find listed the following major (X) primary environmental changes projected to occur:

- Increase in groundwater discharge
- Increase in erosion/scouring
- Major change in flow regime

Next, we proceed to Step 5, which is to identify the secondary changes which may occur on the land (lowland coarse soils) as a result of the primary environmental changes. Matrix 3 is labeled "Intra-Type Environmental Change Linkages - Lowland Coarse Soils" and is an example of the matrices in Set III (Volume 3). By entering this matrix from the primary change (left) side for the primary change "erosion/scouring (I)", we develop a list of the following secondary changes projected to occur on the land:

- Decrease in Faunal Abundance
- Decrease in Faunal Reproductive Potential
- Decrease in Faunal Diversity
- Decrease in Floral Diversity
- Decrease in Floral Abundance
- Decrease in Primary Productivity

Matrix 3 is a recycling matrix and tertiary changes may be identified by re-entering the primary change side again--this time using the above secondary changes. In this manner, if we re-enter the matrix at "Decrease in Floral Diversity," we find the following additional potential environmental changes:

- Decrease in Faunal Abundance
- Decrease in Faunal Reproductive Potential
- Decrease in Faunal Diversity

So, channelization can cause an increase in scouring/erosion which can directly alter the types and numbers of animals present or it can indirectly affect the animals by altering the vegetation of the site. By re-entering

SET II. STEP 3.
MATRIX #2. IMPACTING ACTIVITIES VERSUS ENVIRONMENTAL CHANGES - LOWLAND COARSE SOILS

LOWLAND COARSE SOILS

IMPACTING ACTIVITIES VERSUS ENVIRONMENTAL CHANGES

PRIMARY ENVIRONMENTAL CHANGES ←

EXIT

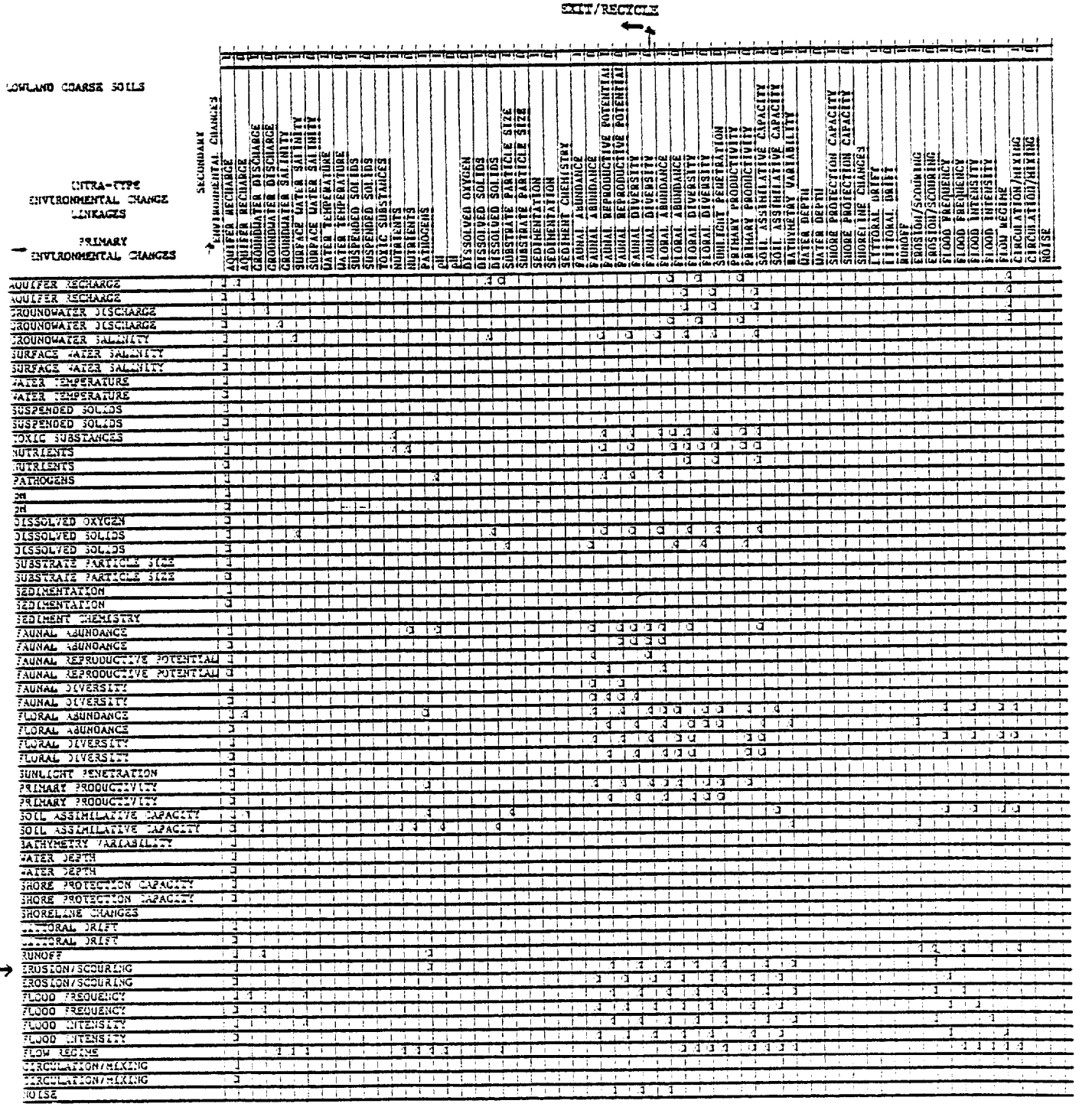
PRIMARY ENVIRONMENTAL CHANGES	IMPACTING ACTIVITIES ← COMPACTION	WOODY CLEARING	HERBACEOUS CLEARING	PLOWING/DISCING	DIKING	FILLING-UNCONSOLIDATED	FILLING-CONSOLIDATED	EXCAVATING	IMPERVIOUS SURFACE	DREDGING	FERTILIZING	INSECTICIDING	HERBICIDING	IRRIGATING	STRUCTURAL SUPPORT	VEHICULAR TRAFFIC	WATER TRANSFER/DIVERSION	INUNDATION	LANDSCAPE/ROW MANAGEMENT	DRAINAGE	SURFACE WATER DEMAND	SUBSURFACE WATER DEMAND	CULVERTING	CHANNELIZATION ←	PEDESTRIAN TRAFFIC	PESTICIDES	HEAVY METALS	NUTRIENTS	THERMAL EFFLUENTS	ORGANIC	HAZARDOUS	UNCONSOLIDATED NONHAZARDOUS	CONSOLIDATED NONHAZARDOUS	PARTICULATES	GASES	HAZARDS
																								ENTER							SOLID WASTE DISPOSAL		AIR WASTE DISPOSAL	
																									LIQUID WASTE DISPOSAL										
AQUIFER RECHARGE	O													I			I	I								O	O	O	O	O					
AQUIFER RECHARGE	O	O	O	O			O	O		O							I			O	O		O	O								O	O		O
GROUNDWATER DISCHARGE	O								O								I				O	O		O											O
GROUNDWATER DISCHARGE	X																O																		
GROUNDWATER SALINITY	O																																		
SURFACE WATER SALINITY	O																																		
SURFACE WATER SALINITY	O																																		
WATER TEMPERATURE	O																																		
WATER TEMPERATURE	O																																		
SUSPENDED SOLIDS	O																																		
SUSPENDED SOLIDS	O																																		
TOXIC SUBSTANCES	O					O	O					O	O			O									O	O	O		O	O	O		O	O	O
NUTRIENTS	O					O	O				O					O											O			O	O	O	O	O	O
NUTRIENTS	O					O	O	O	O											O										O	O				
PATHOGENS	O					O																							O	O		O		O
pH	O																																		
pH	O																																		
DISSOLVED OXYGEN	O																																		
DISSOLVED SOLIDS	O																																		
DISSOLVED SOLIDS	O																																		
SUBSTRATE PARTICLE SIZE	O																																		
SUBSTRATE PARTICLE SIZE	O																																		
SEDIMENTATION	O																																		
SEDIMENTATION	O																																		
SEDIMENT CHEMISTRY																																			
FAUNAL ABUNDANCE	O																			O															
FAUNAL ABUNDANCE	O	O	O	O	O	O	O	O	O	O					O	O		O					O	O	O						O	O			
FAUNAL REPRODUCTIVE POTENTIAL	O																			O															
FAUNAL REPRODUCTIVE POTENTIAL	O	O	O	O	O		O	O	O	O					O			O							O							O	O		
FAUNAL DIVERSITY	O																			O															
FAUNAL DIVERSITY	O	O	O	O	O		O	O	O	O					O			O							O							O	O		
FLORAL ABUNDANCE	O		O	O	O		O							O				O	O										O			O			
FLORAL ABUNDANCE	O	O	O	O	O	O	O	O	O	O					O			O	O	O			O	O	O					O			O	O		
FLORAL DIVERSITY	O						O							O					O	O										O			O			
FLORAL DIVERSITY	O	O	O	O	O		O	O	O	O					O			O	O	O					O					O			O	O		
SUNLIGHT PENETRATION	O																																		
PRIMARY PRODUCTIVITY	O		O	O	O		O							O					O	O										O			O			
PRIMARY PRODUCTIVITY	O	O	O	O	O	O	O	O	O	O					O			O	O	O			O	O	O					O			O	O		
SOIL ASSIMILATIVE CAPACITY	O				O																														
SOIL ASSIMILATIVE CAPACITY	O	O				O	O	O	O	O								O															O	O		O
BATHYMETRY VARIABILITY	O																																		
WATER DEPTH	O																																		
WATER DEPTH	O																																		
SHORE PROTECTION CAPACITY	O																																		
SHORE PROTECTION CAPACITY	O																																		
SHORELINE CHANGES																																			
LITTORAL DRIFT	O																																		
LITTORAL DRIFT	O																																		
RUNOFF	O	O	O	O	O		O	O		O									O	O													O	O		
EROSION/SCOURING ←	O								O									O						O											
EROSION/SCOURING	O				O	O	O	O		O					O			O						O									O	O		
FLOOD FREQUENCY	O																																		O
FLOOD FREQUENCY	O					O	O	O																											
FLOOD INTENSITY	O																																		O
FLOOD INTENSITY	O					O	O	O																											
FLOW REGIME		O	O	O		O	O	O	O	O								O			O	O	O	O	O		O	O	O	O	O		O	O	O
CIRCULATION/MIXING	O																																		
CIRCULATION/MIXING	O																																		
NOISE																	O																		

I=INCREASE
D=DECREASE
X=MAJOR
V=VARIABLE
O=MINOR

SPECIAL RESOURCE AREAS WITHIN THIS TYPE

PINE BARRENS
OPEN SPACE
OAK, HICKORY AND PINE FORESTS

SET III. STEP 5.
MATRIX #3. INTRA-TYPE ENVIRONMENTAL CHANGE LINKAGES - LOWLAND COARSE SOILS



I=INCREASE
D=DECREASE
M=MAJOR
V=VARIABLE
m=MINOR

POTENTIAL FOR INTERTYPE LINKAGE SHOWN ON DIAGONAL

the matrix again and again at each appropriate entry line it is possible to identify complex causal impact chains thoroughly and sequentially. This is how the matrices are intended to be used following their placement in a computer data bank.

The next step (Step 6) in this simplified example is an evaluation of the effects of the projected environmental changes on both general and special coastal resource objectives. Matrix Set V (Volume 3) was prepared for this purpose. This step is illustrated by Matrix 4. We also could have arrived at Step 6 utilizing Step 4 which would bypass Step 5 (Figures 2 and 3) and give us only the primary environmental changes caused by the use. In Step 6 all the environmental changes (primary, secondary, and tertiary) which have been identified are used to enter the matrix from the top. If, by way of example, we enter at "Floral Abundance - D" the following objectives would be potentially violated:

General Objectives

- Regulate groundwater discharge and levels
- Preserve faunal abundance and diversity
- Preserve floral abundance and diversity
- Preserve natural primary productivity
- Maintain natural geomorphological profile
- Preserve freshwater flows

Special Objectives
(Objectives for Special Coastal Resources)

- Preserve Pine Barrens
- Preserve open space
- Preserve oak, hickory, and pine forests

Obviously, one has to know where the site is located in relation to special coastal resources. Because our input information in Figure 2 indicates the site is not located in the Pine Barrens or in a forest, then those special objectives will not be violated. A notation at the bottom of Matrix 2 indicates that the potential for all three of the above special coastal resources to occur in the lowland coarse soil land type, and it would be up to the matrix system user to identify such areas at the input stage.

The central point to make about the matrix process is that it ties each use to coastal objectives through the identification of impacting activities and their directly or indirectly associated environmental changes. The matrix process does not guarantee that each of the identified changes will occur, but it does identify causally related event sequences which have a high probability of occurrence. The DEP and the applicant can then examine the identified potential impacts in an organized and logical fashion and arrive at a management scheme to avoid or mitigate potential environmental problems.

SET V. STEP 6.
MATRIX #4. ENVIRONMENTAL CHANGES VERSUS OBJECTIVES - LOWLAND COARSE SOILS

LOWLAND COARSE SOILS

ENVIRONMENTAL CHANGES VERSUS OBJECTIVES

OBJECTIVES ←

ENVIRONMENTAL CHANGES →

OBJECTIVES	ENVIRONMENTAL CHANGES
GENERAL	
MAINTAIN RECHARGE RATES	AQUIFER RECHARGE
REGULATE GROUNDWATER DISCHARGE AND LEVELS	AQUIFER RECHARGE
	GROUNDWATER DISCHARGE
MAINTAIN AQUIFER QUALITY	GROUNDWATER DISCHARGE
MAINTAIN GRADIENTS OF SALINITY	GROUNDWATER SALINITY
MAINTAIN AMBIENT WATER TEMPERATURES	SURFACE WATER SALINITY
CONTROL TURBIDITY	SURFACE WATER SALINITY
REGULATE TOXIC SUBSTANCE DISCHARGES	WATER TEMPERATURE
MAINTAIN NATURAL NUTRIENT GRADIENTS	WATER TEMPERATURE
CONTROL PATHOGEN DISCHARGES	SUSPENDED SOLIDS
MAINTAIN NATURAL pH LEVELS	SUSPENDED SOLIDS
MAINTAIN DISSOLVED OXYGEN LEVELS	TOXIC SUBSTANCES
REGULATE DISSOLVED SOLIDS CONCENTRATIONS	NUTRIENTS
PRESERVE AQUATIC HABITATS	NUTRIENTS
PRESERVE FAUNAL ABUNDANCE AND DIVERSITY	PATHOGENS
PRESERVE FLORAL ABUNDANCE AND DIVERSITY	BB
PRESERVE NATURAL PRIMARY PRODUCTIVITY	BE
MAINTAIN SOIL ASSIMILATIVE CAPACITY	DISSOLVED OXYGEN
PRESERVE NATURAL SHORE PROTECTION CAP.	DISSOLVED SOLIDS
MAINTAIN NATURAL GEOMORPHOLOGICAL PRO.	DISSOLVED SOLIDS
PRESERVE FRESH WATER FLOWS	SUBSTRATE PARTICLE SIZE
PRESERVE ESTUARINE CIRCULATION/MIXING	SUBSTRATE PARTICLE SIZE
REGULATE NOISE	SEDIMENTATION
	SEDIMENTATION
SPECIALLY TO PRESERVE.....	SEDIMENT CHEMISTRY
SHELLFISH BEDS	FAUNAL ABUNDANCE
ESTUARINE SHELLFISH BEDS	FAUNAL ABUNDANCE
OCEAN SHELLFISH BEDS	FAUNAL REPRODUCTIVE POTENTIAL
FRIME FISHING AREAS	FAUNAL REPRODUCTIVE POTENTIAL
SUBMERGED VEGETATION	FAUNAL DIVERSITY
TIDAL WETLANDS	FAUNAL DIVERSITY
ROCK AND BEACH WETLANDS	FLORAL ABUNDANCE
WHITE CEDAR STANDS	FLORAL ABUNDANCE ← ENTER
MIGRATORY FAIRWAYS AND SPAWNING AREAS	FLORAL DIVERSITY
SHIPWRECKS AND REEFS	FLORAL DIVERSITY
BEACHES	SUNLIGHT PENETRATION
DUNES	PRIMARY PRODUCTIVITY
COASTAL BLUFFS	PRIMARY PRODUCTIVITY
FINE BARRENS	SOIL ASSIMILATIVE CAPACITY
OPEN SPACE	SOIL ASSIMILATIVE CAPACITY
PRIME FARMLAND AND SPECIALLY SOILS	BATHYMETRY VARIABILITY
CENTRAL BARRIER ISLAND CORRIDOR	WATER DEPTH
OAK, HICKORY AND PINE FORESTS	WATER DEPTH
	SHORE PROTECTION CAPACITY
EXIT ←	SHORE PROTECTION CAPACITY
	SHORELINE CHANGES
	LITTORAL DRIFT
	LITTORAL DRIFT
	RUNOFF
	EROSION/SCOURING
	EROSION/SCOURING
	FLOOD FREQUENCY
	FLOOD FREQUENCY
	FLOOD INTENSITY
	FLOOD INTENSITY
	FLOW REGIME
	CIRCULATION/MIXING
	CIRCULATION/MIXING
	NOISE

PROBABILITY TO VIOLATE OBJECTIVES

X-HIGH

The above example is a simple sequence which related changes on the land to land-based objectives. The matrix process can also be used to identify impacts to water areas, and, hence, to water-based objectives Matrix 3 shows the degree of potential for impact transmission from the low-land coarse soil type to the next adjacent land and water type. This potential intertype linkage is shown on the diagonal. For example, if an entry is made on Matrix 3 on the left at "erosion/scouring - I" and if one follows that horizontal column over to the matrix diagonal, an "X" is found in the vertical column "erosion-souring - I". This means that there is a high potential for the effects of erosion/scouring to pass from the land to an adjacent edge or water type. If we now assume that our hypothetical power plant is separated from the back bay by a "nonvegetated-high load" edge type (estuarine beach), then for Step 7 we can utilize Matrix 5 to evaluate impacts passed through the lowland type to the edge. Matrix 5 is an example of the matrices in Set IV (Volume 3) which indicate general intertype environmental change linkages.

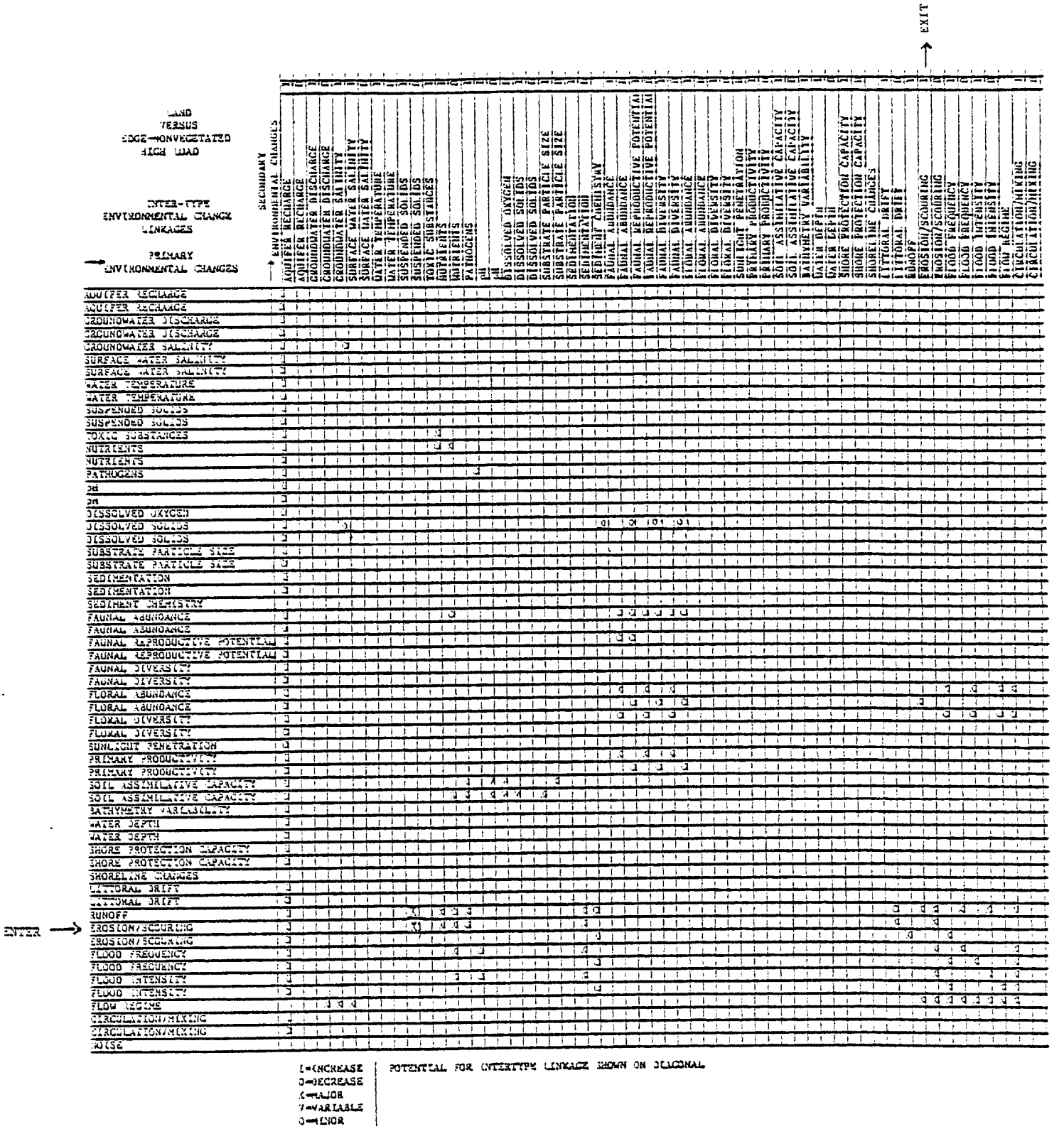
If we now enter Matrix 5 at the left at "erosion/scouring - I", the impacts of which we have just determined could be easily transmitted from the land to the edge, the following secondary environmental changes projected to occur in the edge are indicated as major:

- Increase in suspended solids
- Increase in toxic substances
- Increase in nutrients
- Increase in sedimentation
- Increase in littoral drift

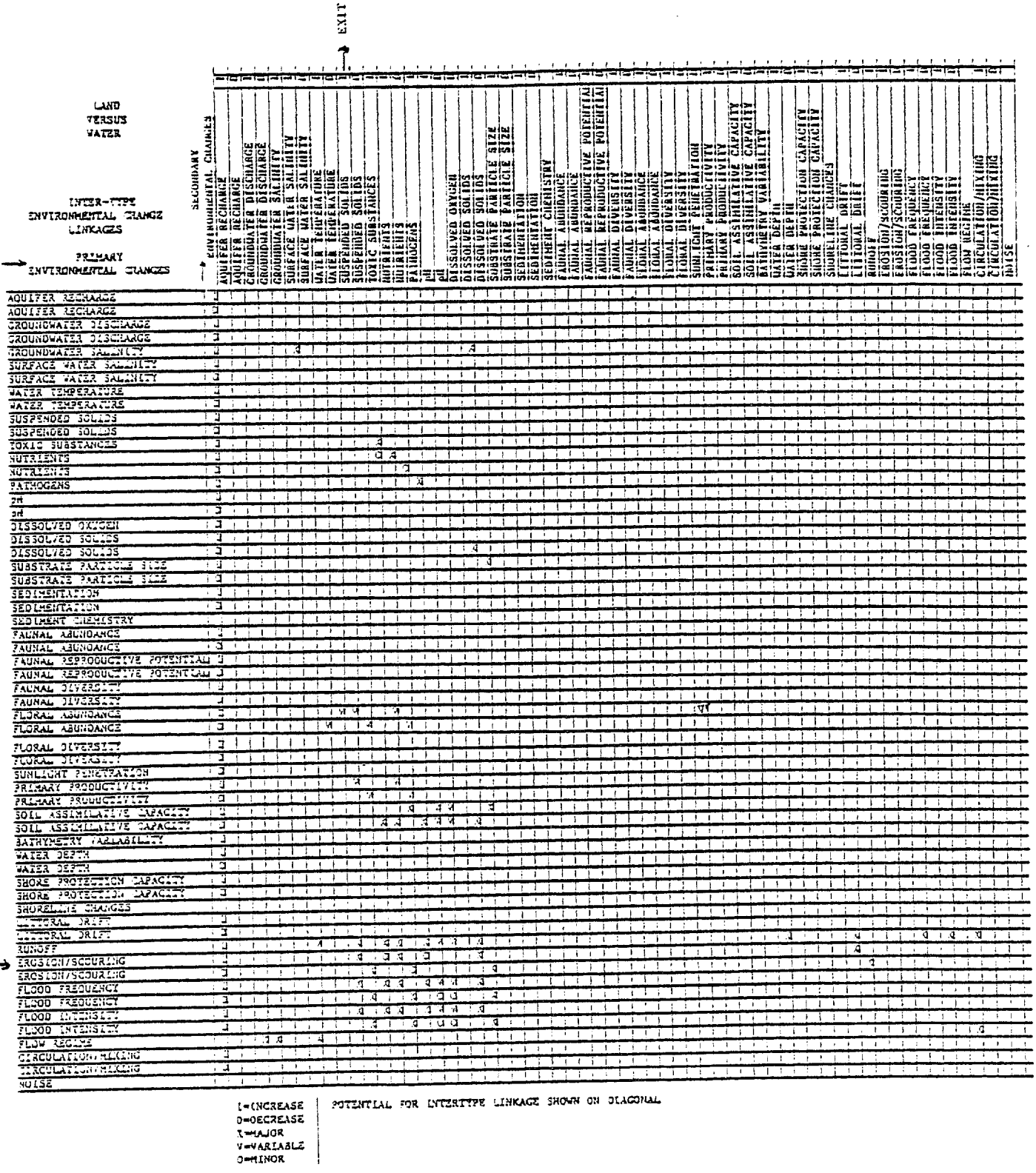
We also note that on the diagonal an "X" appears again in the column "erosion-scouring - I". This "X" in the diagonal indicates that a high potential remains that the effects of erosion/scouring will not stop at the edge but could be passed through to the adjacent water body.

We consequently do not stop at the edge for identification of potential objectives violations, but proceed on the diagonal indication that erosion/ scouring effects will be passed through to the adjacent back bay, we then arrive at Matrix 6 and repeat Step 7. This matrix shows the secondary changes which occur in water as a result of erosion/scouring effects on the land. The reader should remember at this point that we have started with the impacting activity "channelization" and proceeded through the change "erosion/scouring" to identify changes on the lowland coarse soil land type which were subsequentially passed to the estuarine beach (as indicated on the diagonals of Matrices 3 and 5) and now finally passed to the back bay water type (as indicated on Matrix 6's diagonal). We will now demonstrate that the changes associated with erosion/scouring in the back bay potentially violate several general and special coastal resource objectives.

SET IV. STEP 7.
MATRIX #5. LAND VERSUS EDGE, INTER-TYPE ENVIRONMENTAL CHANGE LINKAGES



SET IV. STEP 7.
MATRIX #6. LAND VERSUS WATER, INTER-TYPE ENVIRONMENTAL CHANGE LINKAGES



I=INCREASE
D=DECREASE
J=MAJOR
V=VARIABLE
O=MINOR

POTENTIAL FOR INTERTYPE LINKAGE SHOWN ON DIAGONAL

If we now enter Matrix 6 on the left at the column titled "erosion/ scouring - I", the following major potential secondary changes are identified:

- Increase in suspended solids
- Increase in nutrients
- Increase in dissolved solids
- Increase in littoral drift

Matrix 7 shows the relationship of environmental changes in semi-enclosed and back bays to general and special coastal resource objectives. If we now enter this matrix at the top at the column entitled "suspended solids - I" we find (Step 8) that a high potential exists to violate the following objectives:

General Objectives

- Maintain ambient water temperatures
- Control turbidity
- Maintain natural nutrient gradients
- Maintain dissolved oxygen levels
- Preserve faunal abundance and diversity
- Preserve floral abundance and diversity
- Preserve natural primary productivity
- Maintain natural geomorphological processes

Special Objectives

- Preserve shellfish reefs
- Preserve estuarine shellfish beds
- Preserve prime fishing areas
- Preserve submerged vegetation
- Preserve migratory pathways and spawning areas

Again, the matrix system user needs to utilize the input information to determine the presence of a special coastal resource in the affected water-body. The reader will recall that our example input information (Step 1) indicated the presence of an estuarine shellfish bed in the adjacent back bay. Therefore, the environmental change of increased suspended solids violates the special objective to preserve estuarine shellfish beds (Step 8).

In summary, the matrix system has linked the building of a new power plant to the potential for adversely affecting a special coastal resource. The BCPD should require, based on the identified impact relationship, that the applicant break that particular causal chain through the use of appropriate mitigation measure(s), in order to avoid violating a coastal objective and destroying a valued resource, i.e., a productive hard clam bed. Numerous other possible specific impacts of the proposed plant could be identified through the use of this matrix system and an overall management and mitigation scheme developed for the proposed project. The proper and thoughtful application of this process could insure use compatibility with natural resource coastal objectives.

SET V. STEP 8.
MATRIX #7. ENVIRONMENTAL CHANGES VERSUS OBJECTIVES SEMI-ENCLOSED AND BACK

SEMI-ENCLOSED AND BACK BAYS

ENVIRONMENTAL CHANGES

VERSUS

OBJECTIVES

OBJECTIVES ←

ENVIRONMENTAL CHANGES →

OBJECTIVES	AQUIFER RECHARGE	AQUIFER RECHARGE	GROUNDWATER DISCHARGE	GROUNDWATER DISCHARGE	GROUNDWATER SALINITY	SURFACE WATER SALINITY	SURFACE WATER SALINITY	WATER TEMPERATURES	WATER TEMPERATURES	SUSPENDED SOLIDS	SUSPENDED SOLIDS	TOXIC SUBSTANCES	NUTRIENTS	PATHOGENS	pH	DISSOLVED OXYGEN	DISSOLVED SOLIDS	DISSOLVED SOLIDS	SUBSTRATE PARTICLE SIZE	SUBSTRATE PARTICLE SIZE	SEDIMENTATION	SEDIMENTATION	SEDIMENT CHEMISTRY	FAUNAL ABUNDANCE	FAUNAL ABUNDANCE	FAUNAL REPRODUCTIVE POTENTIAL	FAUNAL REPRODUCTIVE POTENTIAL	FAUNAL DIVERSITY	FAUNAL DIVERSITY	FLORAL ABUNDANCE	FLORAL ABUNDANCE	FLORAL DIVERSITY	FLORAL DIVERSITY	SUNLIGHT PENETRATION	PRIMARY PRODUCTIVITY	PRIMARY PRODUCTIVITY	SOIL ASSIMILATIVE CAPACITY	SOIL ASSIMILATIVE CAPACITY	BATHYMETRY (MORPHOLOGY)	WATER DEPTH	WATER DEPTH	SHORE PROTECTION CAPACITY	SHORE PROTECTION CAPACITY	SHORELINE CHANGES	SHORELINE CHANGES	LITTORAL DRIFT	LITTORAL DRIFT	RUNOFF	RUNOFF	EROSION/SCOURING	EROSION/SCOURING	FLOOD FREQUENCY	FLOOD FREQUENCY	FLOOD INTENSITY	FLOOD INTENSITY	FLOOD DEPTH	FLOOD DEPTH	TRANSMISSION/MIXING	TRANSMISSION/MIXING	NOISE	NOISE
GENERAL																																																						
MAINTAIN RECHARGE RATES		X																																																			
REGULATE GROUNDWATER DISCHARGE AND LEVELS				X																																																	
MAINTAIN AQUIFER QUALITY																																																					
MAINTAIN GRADIENTS OF SALINITY																																																				
MAINTAIN AMBIENT WATER TEMPERATURES																																																				
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MAINTAIN NATURAL pH LEVELS																																																				
MAINTAIN DISSOLVED OXYGEN LEVELS																																																				
REGULATE DISSOLVED SOLIDS CONCENTRATIONS	X																																																				
PRESERVE AQUATIC HABITATS																																																					
PRESERVE FAUNAL ABUNDANCE AND DIVERSITY																																																				
PRESERVE FLORAL ABUNDANCE AND DIVERSITY																																																				
PRESERVE NATURAL PRIMARY PRODUCTIVITY																																																				
MAINTAIN SOIL ASSIMILATIVE CAPACITY																																																				
PRESERVE NATURAL SHORE PROTECTION CAP.																																																				
MAINTAIN NATURAL GEOMORPHOLOGICAL PRO.																																																				
PRESERVE FRESH WATER FLOWS	X		X																																																		
PRESERVE ESTUARINE CIRCULATION/MIXING																																																				
REGULATE NOISE																																																				
SPECIAL TO PRESERVE.....																																																				
SHELLFISH BEDS																																																				
EXIT ← ESTUARINE SHELLFISH BEDS																																																				
OCEAN SHELLFISH BEDS																																																				
PRIME FISHING AREAS																																																				
SUBMERGED VEGETATION																																																				
TIDAL WETLANDS																																																				
BOGS AND BOTTOMAL WETLANDS																																																				
WHITE CEDAR STANDS																																																				
MIGRATORY PATHWAYS AND SPAWNING AREAS																																																				
SHIPWRECKS AND REEFS																																																				
BEACHES																																																				
DUNES																																																				
COASTAL BLUFFS																																																			
PINE BARRENS																																																			
OPEN SPACE																																																			
PRIME FARMLAND AND SPECIALTY SOILS																																																			
CENTRAL BARRIER ISLAND CORRIDOR																																																			
OAK, HICKORY AND PINE FORESTS																																																			

I-INCREASE
D-DECREASE

PROBABILITY TO VIOLATE OBJECTIVES
X-HIGH
V-VARIABLE
O-LOW

IX. ENVIRONMENTAL CHANGE PARAMETERS REQUIRING QUANTITATIVE THRESHOLDS

The acceptable level of change in an environmental parameter should ultimately be related to an important coastal resource. Important coastal resources represent a high degree of placed societal value, and many of these resources are very sensitive to environmental change. Therefore, change thresholds which are based on the maintenance and enhancement of important coastal resources will be an effective method of meeting the stated goals and objectives. In addition, management which is basically oriented to important coastal resources will meet with higher scientific and public community support and, hence, less legislative and political inertia. The strict regulation of a use and its associated impacting activities which has been shown to have the non-mitigated potential to reduce shellfish production, reduce fishing success in a prime fishing area, or render a beach unsuitable for swimming will likely have a high level of public support. Vague, amorphous planning dictates take on a readily perceived meaning when they are directly related to coastal resources which are valued by the general public.

A few examples should serve to illustrate the value of such an approach. Table 9 lists the conceptual parameter boundaries for estuarine shellfish beds, a highly valuable special coastal resource with substantial commercial, recreational and ecological value in New Jersey.

The first conceptual parameter boundary is "a parameter level or value or a rate of change in a parameter level or value which lowers direct shellfish survival rates within various age groups or which reduces the expected average longevity of individuals within a specified commercially, recreationally or ecologically valuable population". Table 9 also lists for each conceptual parameter boundary those environmental parameters which have a direct potential to adversely affect the maintenance of the stated conceptual boundary and for which quantitative thresholds need to be established. A proposed new power plant which proposed in a permit application to discharge heated effluent of over 100°F to a major shallow water estuarine shellfish bed would violate the threshold by exceeding an acceptable level for water temperature (86°F - 92°F depending on size and life stage) for several life stages of the hard clam (Mercenaria mercenaria). This portion of the permit application would then be objected to on the basis that a special objective, i.e., the maintenance of estuarine shellfish beds, would be violated by an exceedance of one of the established thresholds (i.e., water temperature).

In order for the utility company to gain approval for the thermal effluent portion of the permit application it would be necessary to mitigate the exceedance to levels below the established threshold. This could be done by the application of a treatment technology such as cooling towers or by simply moving the effluent offshore in deeper oceanic waters where proper mixing by diffuser would rapidly lower temperatures to acceptable levels. This latter proposed new discharge location would, of course, be located by study to minimize locational impacts on oceanic special coastal resources and designed to meet established thresholds for such oceanic resources where location could not completely avoid the resource.

Another conceptual parameter boundary which has been established for estuarine shellfish beds is "a parameter level or value which adversely affects the edible quality of marketable shellfish". Therefore, an applicant which proposed to discharge inadequately treated sewage into an estuarine shellfish bed would be rejected on the basis that pathogens or other toxins would accummulate in the tissue of marketable shellfish such that the health and welfare of human shellfish consumers would be threatened and the waters "closed" to shellfishing. The development of quantitative thresholds might involve designating numerical limits for fecal coliforms and potentially a variety of heavy metals and chlororganic compounds. The exceedence of one or more of these quantitative thresholds would result in a violation of the conceptual parameter boundary and a permit application for such a discharge would either have to be modified to improve the effluent characteristics to below threshold level or moved to a less sensitive lcoation where the thresholds might be less stringent.

Table 22 is a list of parameters requiring quantitative thresholds for migratory pathways and prime spawning areas. The first conceptual parameter boundary in this table deals with the survival rates within various age groups of important recreational or commercial finfish or motile crustacean species. Listed among the parameters for this conceptual boundary are toxic substances. One such substance exhibiting toxic effects at certain concentrations is chlorine. Chlorine is widely used as a disinfectant for treated sewage effluents and as an antifouling agent for once-through power plant cooling systems. The following discussion will illustrate the complexities inherent in the development of thresholds.

When chlorine is introduced into sea water it undergoes decay by means of a two-phase process. Much of the initial fast decay involves the simple conversion of hypochlorite to hypobromite without loss of oxidizing capacity. The ultimate product of the second phase of decay depends on pH, salinity, ammonia nitrogen concentration, temperature, and chlorine dose. In normal sea water (i.e., high salinity, high concentrations of bromide, and low concentrations of ammonia nitrogen) the conversion of hypochlorite to hypobromite precludes the formation of chloramines. In dilute sea water (low concentrations of bromide) or in ammonia enriched waters, amine formation becomes more important. In addition, halogenated hydrocarbons will be formed in small quantities to the extent dissolved organic material is present (Envirosphere 1978).

Very limited information is available on chlorine-induced reactions in estuaries. However, because sea water is diluted in such areas, and because organic inputs from autochthonous production and allochthonous terrestrial sources could be expected, some differences are predicted. Increased concentrations of organic compounds and associated ammonia would be expected to favor the formation of haloamines and halogenated hydrocarbons. The fewer competing anions will result in a decreased dissociation of hypochlorous acid. Dilution of the bromide ion will reduce the chlorine demand of the water, reduce the formation of bromine, and lessen the importance of bromine reactions (Envirosphere 1978).

As a result of the chemistry of chlorine in fresh water and the different categories of chlorine compounds which can be detected by typical chlorine test procedures, a certain terminology has developed. The term free residual chlorine (also known as free available chlorine) is used to refer to molecular chlorine, hypochlorous acid, and/or the hypochlorite ion. The term combined residual chlorine is used to refer to the three forms of chlorinated amines (NH_2Cl, $NHCl_2$, and NCl_3). Total residual chlorine is used to refer to the summed concentrations of combined and free residual chlorine (Envirosphere 1978).

In sea water bromine compounds analogous to these chlorine compounds are also formed. Standard methods for the measurement of chlorine-induced oxidants cannot clearly differentiate the various categories of halogen compounds formed in marine systems. Only the terms total residual oxidants and chlorine induced oxidants are appropriate for use in describing measured halogen concentrations resulting from chlorination of sea water (Envirosphere 1978).

A toxicity graph (Figure 4) was developed by Envirosphere using data points representing lethal responses. A factor to convert median population responses to no effect responses was calculated from data on marine species. The slope of the acute lines was derived by determining the regression equation for all data points. Location of the acute line was based on the average distance from the regression line of data points representing the most sensitive species. The resulting acute effects line extending, approximately, through 0.12 ppm total residual oxidant (TRO) for 100 minutes and 0.09 ppm TRO for 1000 minutes was determined to represent the threshold of lethal effects (Envirosphere 1978).

A review of the toxicity data used to develop this toxicity threshold line indicated a large variation among species in sensitivity to chlorine-induced oxidants. A more accurate threshold could be made by considering only the important species found at a given location. However, the number of species for which data are available are too small at present for this. Any thresholds which are developed, however, should permit such site-specific evaluations as an alternative to the application of the generalized graph when sufficient data become available in the future (Envirosphere 1978).

The above discussion indicates some of the complexities and details which must be involved in the development of quantitative thresholds for the parameters listed in Tables 9 through 26. In very few cases will it become possible to list a single number which will be adequate to protect all resources in all habitats at all times. Tables 9 through 26 should serve as a conceptual mold for incorporating and integrated new data as they become available. The development of meaningful quantitative thresholds will be a challenging and continually evolving process with a high potential for successful results if properly managed.

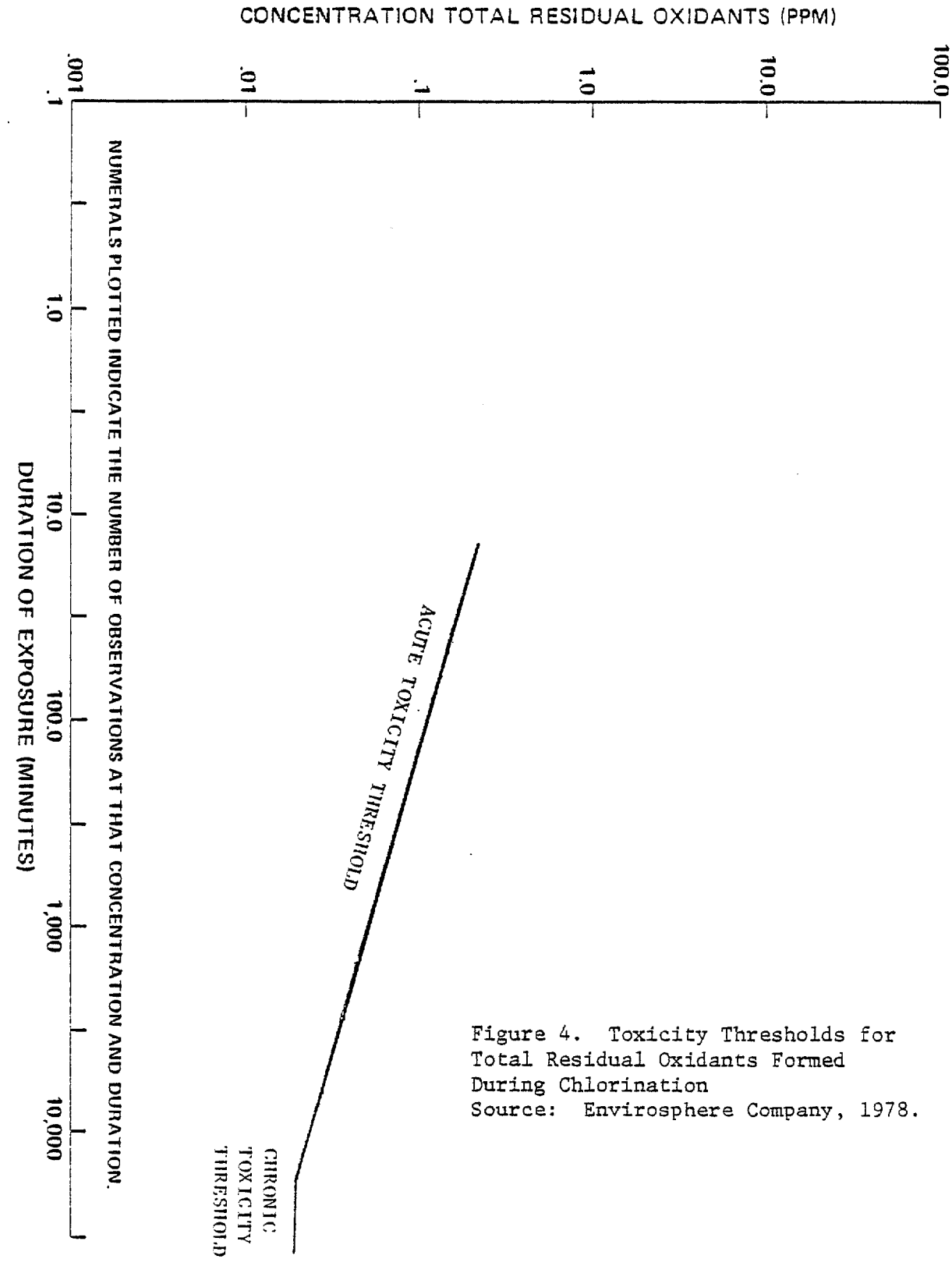


Figure 4. Toxicity Thresholds for Total Residual Oxidants Formed During Chlorination
Source: Envirosphere Company, 1978.

Table 9.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
ESTUARINE SHELLFISH BEDS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers direct shellfish survival rates within various age groups or which reduces the expected average longevity of individuals within a specified commercially or recreationally valuable population.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- faunal abundance
- primary productivity
- bathymetry variability
- shoreline changes
- floral abundance
- floral diversity
- shore protection capacity
- pathogens

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the various life stages of the shellfish species of interest.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- floral abundance
- floral diversity
- light penetration

- primary productivity
- flood frequency
- flow intensity
- flow regime
- circulation/mixing
- sedimentation

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value which adversely affects the edible quality of marketable shellfish.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- human pathogens
- sediment chemistry

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which increases the rate of predation on shellfish adults, larvae, or early "seed" stages.

Parameters of potential concern requiring quantitative thresholds:

- salinity
- temperature
- dissolved oxygen
- substrate particle size
- sedimentation
- faunal abundance
- faunal diversity
- floral abundance
- floral diversity
- primary productivity
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- bathymetry variability
- water depth
- erosion/scouring

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects public access or the public enjoyment aspects of recreational resource use.

Parameters of potential concern requiring quantitative thresholds:

- noise
- shoreline changes
- water depth
- faunal abundance
- floral abundance
- toxic substances

- pathogens
- substrate particle size
- bathymetry variability
- sediment chemistry
- suspended solids
- shore protection capacity
- flood frequency
- flood intensity
- circulation/mixing

* * * *

Table 10.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
SHELLFISH REEFS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers direct shellfish survival rates within various age groups or which reduces the expected average longevity of individuals within a specified commercially valuable population.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- faunal abundance
- primary productivity
- floral abundance
- shoreline changes
- shore protection capacity
- pathogens

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the various shellfish life stages.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- floral abundance
- floral diversity
- sunlight penetration
- primary productivity
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- sedimentation

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value which adversely affects the edible quality of marketable shellfish.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- pathogens
- sediment chemistry

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which increases the rate of predation on shellfish adults, larvae, or spat.

Parameters of potential concern requiring quantitative thresholds:

- salinity
- temperature
- dissolved oxygen
- substrate particle size
- faunal abundance
- faunal diversity
- floral abundance
- floral diversity
- primary productivity
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- bathymetry variability
- water depth

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the community of plants and animals characteristically associated with shellfish reefs.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- faunal reporductive potential
- faunal/floral abundance/diversity
- sunlight penetration
- primary productivity
- bathymetry variability
- water depth
- shoreline changes

- erosion/scouring
- flood intensity/frequency
- flow regime
- circulation/mixing
- pathogens
- shore protection capacity
- littoral drift

* * * *

Table 11.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
OCEAN SHELLFISH BEDS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers direct shellfish survival rates within various age groups or which reduces the expected average longevity of individuals within a specified commercially valuable population.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- water temperature
- suspended solids
- toxic substances
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- water depth
- erosion/scouring
- circulation/mixing
- bathymetry variability
- faunal abundance
- floral abundance
- floral diversity
- primary productivity
- shore protection capacity
- pathogens

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the various life stages of the shellfish species of interest.

Parameters of potential concern requiring quantitative thresholds:

- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- floral abundance
- floral diversity
- light penetration
- primary productivity
- circulation/mixing
- sedimentation

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value which adversely affects the edible quality of marketable shellfish.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- pathogens
- sediment chemistry

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which increases the rate of predation on shellfish adults, larvae, or early "seed" stages.

Parameters of potential concern requiring quantitative thresholds:

- water temperature
- dissolved oxygen
- substrate particle size
- sedimentation
- faunal abundance
- faunal diversity
- circulation/mixing
- erosion/scouring
- bathymetry variability

Table 12.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
SUBMERGED VEGETATION

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers the growth rate of submerged vegetation and consequently the contribution of detritus to the estuarine and ocean ecosystems.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved solids
- substrate particle size
- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- sunlight penetration
- bathymetry variability
- water depth
- shoreline changes
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pH
- primary productivity
- shore protection capacity

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the characteristic epiphytic community resident on the surfaces of the submerged vegetation.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- substrate particle size

- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- sunlight penetration
- bathymetry variability
- water depth
- shoreline changes
- pathogens
- pH
- faunal reproductive potential
- primary productivity
- shore protection capacity
- flood frequency
- flood intensity
- erosion/scouring
- flow regime
- circulation/mixing

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the sediment stabilization, sedimentation, and nutrient cycling functions of submerged vegetation beds.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- substrate particle size
- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- sunlight penetration
- bathymetry variability
- water depth
- shoreline changes
- littoral drift
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pH

Table 13

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
TIDAL WETLANDS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which alters the species composition or lowers the growth rate of the existing species assemblage such that the contribution of detritus to the estuarine and ocean ecosystems is lowered.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- substrate particle size
- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- sunlight penetration
- bathymetry variability
- water depth
- shoreline changes
- littoral drift
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- groundwater discharge
- shore protection capacity

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the sediment stabilization, sedimentation, storm buffering capacity, and nutrient cycling functions of tidal wetlands.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- light penetration

- bathymetry variability
- water depth
- shore protection capacity
- primary productivity
- soil assimilative capacity
- shoreline changes
- littoral drift
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- aquifer recharge
- groundwater discharge
- runoff

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the community of animals characteristically associated with tidal wetlands.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- substrate particle size
- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- bathymetry variability
- water depth
- shoreline changes
- littoral drift
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- groundwater discharge
- faunal reproductive potential
- shore protection capacity
- primary productivity
- runoff
- noise

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the public enjoyment aspects of recreation and study.

Parameters of potential concern requiring quantitative thresholds:

- noise
- shore protection capacity
- faunal/floral abundance/diveristy
- flood frequency/intensity
- toxic substances
- pathogens
- erosion/scouring

Table 14.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
DUNES

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the vegetation characteristic of dunes such that the stability, and hence, the shore protection capacity, is reduced.

Parameters (Environmental Changes) of potential concern requiring quantitative thresholds:

- dissolved solids
- groundwater salinity
- toxic substances
- substrate particle size
- sedimentation
- floral/abundance/diversity
- sediment chemistry
- primary productivity
- shoreline changes
- littoral drift
- runoff
- erosion/scouring
- flow regime (adjacent waters)
- shore protection capacity
- flood frequency/intensity

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the public enjoyment aspects of recreation and study.

Parameters of potential concern requiring quantitative thresholds:

- shore protection capacity
- noise
- faunal/floral abundance/diversity
- flood frequency/intensity
- toxic substances
- pathogens
- erosion/scouring

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the aquifer recharge or groundwater discharge functions of dunes.

Parameters of potential concern requiring quantitative thresholds:

- runoff
- aquifer recharge
- groundwater discharge

- floral abundance
- soil assimilative capacity
- flow regime

* * * *

Table 15.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
CENTRAL BARRIER ISLAND CORRIDORS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the remaining areas which support maritime forest vegetation and its associated characteristic wildlife.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- dissolved solids
- groundwater discharge
- groundwater salinity
- toxic substances
- nutrients
- floral/faunal abundance/diversity
- runoff
- erosion/scouring
- flood frequency/intensity
- noise
- flow regime
- pathogens
- faunal reproductive potential
- primary productivity

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the quanitity or quality of groundwater.

Parameters of potential concern requiring quantitative thresholds:

- groundwater discharge
- aquifer recharge
- groundwater salinity
- toxic substances
- pathogens
- runoff
- nutrients
- dissolved solids
- floral abundance
- soil assimilative capacity
- flood frequency/intensity
- flow regime

Table 16.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
WHITE CEDAR STANDS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the vegetation, its associated characteristic wildlife, and its functions in retarding run-off and in purifying water in coastal streams.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- groundwater discharge
- toxic substances
- dissolved solids
- floral/faunal abundance/diversity
- primary productivity
- flood frequency/intensity
- aquifer recharge
- flow regime
- pathogens
- erosion/scouring
- nutrients
- sediment chemistry
- groundwater salinity
- soil assimilative capacity
- shore protection capacity
- shoreline changes
- runoff

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the public enjoyment aspects of recreation in white cedar stands.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- pathogens
- faunal/floral/abundance/diversity
- noise

Table 17.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
OPEN SPACE

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the habitat buffering and wildlife corridor functions of existing open space.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- pathogens
- floral/faunal abundance/diversity
- primary productivity
- noise
- flood frequency/intensity
- flow regime
- groundwater salinity
- toxic substances
- nutrients
- dissolved solids (groundwater)
- sediment chemistry
- shore protection capacity
- shoreline changes
- erosion/scouring
- runoff

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the public enjoyment aspects of recreation on open space.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- pathogens
- floral/faunal abundance/diversity
- noise
- shoreline changes
- flood frequency/intensity
- erosion/scouring
- shore protection capacity
- littoral drift

Table 18.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
PRIME FARMLANDS AND SPECIALTY SOILS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the present or future potential for production of essential food and fiber products.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- aquifer recharge
- groundwater discharge
- groundwater salinity
- toxic substances
- nutrients
- pathogens
- floral/faunal abundance
- primary productivity
- soil assimilative capacity
- runoff
- erosion
- flood frequency/intensity
- noise
- dissolved solids
- flow regime

Table 19.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
BOGS AND NON-TIDAL WETLANDS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the growth or species composition of the vegetation in a particular bog or non-tidal wetland.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- aquifer recharge
- groundwater discharge/flow
- suspended solids
- toxic substances
- nutrients
- pH
- substrate particle size
- sedimentation
- sediment chemistry
- primary productivity
- bathymetry variability
- water depth
- shoreline changes
- runoff
- flood frequency/intensity
- flow regime
- groundwater salinity
- dissolved solids
- faunal/floral abundance/diversity
- shore protection capacity
- erosion/scouring

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the aquatic and terrestrial plants and animals characteristically associated with bogs and non-tidal wetlands.

Parameters of potential concern requiring quantitative thresholds:

- groundwater discharge/flow
- suspended solids
- toxic substances
- nutrients
- pH
- substrate particle size
- sedimentation
- sediment chemistry
- noise

- primary productivity
- bathymetry variability
- water depth
- shoreline changes
- runoff
- flood frequency/intensity
- flow regime
- groundwater salinity
- dissolved solids
- floral/faunal abundance
- shore protection capacity
- erosion/scouring
- faunal reproductive potential

* * * *

Table 20.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
COASTAL BLUFFS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which accelerates the natural erosion rates, reduces sediment stability, or alters natural beach sediment contributions.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- toxic substances (direct effect on floral abundance/diversity)
- floral abundance/diversity
- runoff
- erosion/scouring
- flood frequency/intensity
- flow regime

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the terrestrial plants and animals characteristically associated with coastal bluffs.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- nutrients
- pathogens
- faunal/floral abundance/diversity
- faunal reproductive potential
- runoff
- erosion/scouring
- flood frequency/intensity
- flow regime

Table 21.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
BEACHES

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the survival rates within the psammo-littoral community and of nearshore recreational and commercial fish and motile crustacean species.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- shore protection capacity
- surface water salinity
- water temperature
- suspended solids
- toxic substances
- pH
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- water depth
- shoreline changes
- littoral drift
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pathogens
- dissolved solids

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the psammo-littoral community and of nearshore recreational and commercial fish and motile crustacean species.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- faunal abundance/diversity
- shoreline changes
- littoral drift

- primary productivity
- flood frequency (estuarine beaches only)
- flood intensity (estuarine beaches only)
- flow regime
- circulation/mixing
- floral abundance/diversity (algae and adjacent rooted flora)
- faunal reproductive potential
- erosion/scouring

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value which adversely affects the edible quality of nearshore fish and motile crustaceans.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- pathogens
- sediment chemistry

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects public access or the public enjoyment aspects of recreational resource use.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- noise
- suspended solids
- substrate particle size
- sedimentation
- bathymetry variability
- water depth
- shoreline changes
- pathogens
- sediment chemistry
- shore protection capacity
- floral/faunal abundance/diversity
- faunal reproductive potential
- erosion/scouring
- flood frequency/intensity

Table 22.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
MIGRATORY PATHWAYS AND PRIME SPAWNING AREAS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers the survival rate within various age groups of important recreational or commercial finfish or motile crustacean species.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- pH
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- water depth
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pathogens
- dissolved solids
- floral/faunal abundance/diversity
- primary productivity
- bathymetry variability
- shore protection capacity
- groundwater discharge

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the larvae and juveniles of important finfish and motile crustaceans which utilize these areas as nurseries.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- floral/faunal abundance/diversity

- sunlight penetration
- primary productivity
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pH
- pathogens
- shoreline changes
- erosion/scouring
- shore protection capacity
- water depth
- groundwater discharge
- substrate particle size
- sedimentation
- sediment chemistry
- faunal reproductive potential

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which increases the rate of predation on the eggs, larvae, or juveniles of important finfish or motile shellfish species.

Parameters of potential concern requiring quantitative thresholds:

- salinity
- water temperature
- dissolved solids
- pH
- pathogens
- toxic substances
- sediment chemistry
- water depth
- dissolved oxygen
- substrate particle size
- sedimentation
- faunal/floral abundance/diversity
- bathymetry variability
- primary productivity
- flood frequency
- flood intensity
- flow regime
- circulation/mixing

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which limits organisms access to prime spawning areas.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- toxic substances (avoidance thresholds) interference with "homing"
- dissolved oxygen
- water depth
- shoreline changes
- erosion/scouring
- flood intensity/frequency
- flow regime
- circulation/mixing
- groundwater discharge
- suspended solids
- pathogens
- pH
- dissolved solids
- sediment chemistry
- floral abundance

* * * *

Table 23

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
SHIPWRECKS AND REEFS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers the survival rate within various age groups of important recreational finfish or motile crustacean species characteristic of shipwrecks and reefs.

Parameters (environmental changes) of of potential concern requiring quantitative thresholds:

- water temperature
- suspended solids
- toxic substances
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- water depth
- erosion/scouring
- circulation/mixing
- pathogens
- floral/faunal abundance/diversity
- faunal reproductive potential

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the various important finfish or motile crustacean species.

Parameters of potential concern requiring quantitative thresholds:

- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- floral/faunal abundance/diversity
- sunlight penetration
- primary productivity
- circulation/mixing
- faunal reproductive potential
- sediment chemistry
- bathymetry variability
- water depth
- erosion/scouring
- pathogens
- sedimentation

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter or value which increases the rate of predation on the adults of juveniles of important finfish or motile crustacean species.

Parameters of potential concern requiring quantitative thresholds:

- water temperature
- dissolved oxygen
- substrate particle size
- sedimentation
- faunal abundance
- faunal diversity
- primary productivity
- circulation/mixing
- erosion/scouring
- bathymetry variability

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the community of plants and animals characteristically associated with shipwrecks and reefs.

Parameters of potential concern requiring quantitative thresholds:

- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- faunal reproductive potential
- faunal/floral abundance/diversity
- sunlight penetration
- primary productivity
- bathymetry variability
- water depth
- shoreline changes
- littoral drift
- erosion/scouring
- circulation/mixing
- pathogens

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the public enjoyment aspects of recreational resource use.

Parameters of potential concern requiring quantitative thresholds:

- faunal abundance/diversity

- suspended solids
- toxic substances
- pathogens
- water depth
- dissolved oxygen
- substrate particle size
- bathymetry variability
- circulation/mixing

* * * *

Table 24.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
PRIME FISHING AREAS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which lowers the survival rate within various age groups of important recreational finfish or motile crustacean species.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- pH
- dissolved oxygen
- substrate particle size
- sedimentation
- sediment chemistry
- water depth
- erosion/scouring
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pathogens
- bathymetry variability
- faunal/floral abundance/diversity
- dissolved solids

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the primary food supply of the various important finfish or motile crustacean species.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- floral/faunal abundance/diversity
- sunlight penetration
- primary productivity
- flood frequency
- flood intensity

- flow regime
- circulation/mixing
- substrate particle size
- pathogens
- pH
- sedimentation
- sediment chemistry
- water depth

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value which adversely affects the edible quality of the important finfish or motile crustacean species.

Parameters of potential concern requiring quantitative thresholds:

- toxic substances
- pathogens
- sediment chemistry

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which decreases the rate of production of the adult eggs, larvae, or juveniles of important finfish or motile crustacean species.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- dissolved oxygen
- substrate particle size
- sedimentation
- faunal/floral abundance/diversity
- faunal reproductive potential
- primary productivity
- flood frequency
- flood intensity
- flow regime
- circulation/mixing
- pH
- dissolved solids
- toxic substances
- pathogens
- sediment chemistry

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely alters the favored relative abundance of important finfish or motile crustacean species characteristically or historically associated with a particular prime fishing area.

Parameters of potential concern requiring quantitative thresholds:

- surface water salinity
- water temperature
- suspended solids
- toxic substances
- nutrients
- dissolved oxygen
- dissolved solids
- substrate particle size
- sedimentation
- sediment chemistry
- faunal/floral abundance/diversity
- primary productivity
- bathymetry variability
- water depth
- shoreline changes
- littoral drift
- erosion/scouring
- flood intensity/frequency
- flow regime
- circulation/mixing
- pathogens
- pH
- shore protection capacity
- noise

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the public enjoyment aspects of, or access to prime fishing areas.

Parameters of potential concern requiring quantitative thresholds:

- suspended solids
- pathogens
- noise
- air quality
- faunal abundance/diversity
- toxic substances
- dissolved oxygen
- circulation/mixing
- bathymetry variability
- water depth
- shore protection capacity
- shoreline changes
- erosion/scouring
- flood frequency/intensity
- floral abundance

Table 25.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
PINE BARRENS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which alters the acidic nature of the waters characteristic of the Pine Barrens.

Parameters (environmental changes) of potential concern requiring quantitative thresholds:

- water temperature
- aquifer recharge
- groundwater discharge
- suspended solids
- nutrients
- pH
- dissolved solids
- sedimentation
- sediment chemistry
- primary productivity
- runoff
- flood frequency/intensity
- flow regime
- circulation/mixing
- dissolved oxygen
- toxic substances
- surface water and groundwater salinity

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which alters the vegetation characteristic of the Pine Barrens and associated wetlands and waters.

Parameters of potential concern requiring quantitative thresholds:

- frequency and intensity of fire
- aquifer recharge
- groundwater discharge
- toxic substances
- nutrients
- substrate particle size
- sediment chemistry
- floral abundance/diversity
- primary productivity
- flood frequency/intensity
- soil assimilative capacity
- flow regime
- pH
- shore protection capacity
- groundwater salinity
- dissolved solids

- sunlight penetration
- water depth
- suspended solids
- erosion/scouring
- shoreline changes
- circulation/mixing

* * * *

Table 26.

ENVIRONMENTAL CHANGE PARAMETERS
REQUIRING QUANTITATIVE THRESHOLDS
OAK, HICKORY, AND PINE FORESTS

CONCEPTUAL PARAMETER BOUNDARY: A parameter level or value or a rate of change in a parameter level or value which adversely affects the forest woody vegetation and its associated characteristic wildlife.

Parameters of (environmental changes) of potential concern requiring quantitative thresholds:

- toxic substances
- nutrients
- floral/faunal abundance/diversity
- primary productivity
- runoff
- erosion/scouring
- flow regime
- groundwater salinity
- faunal reproductive potential
- soil assimilative capacity
- flood frequency/intensity
- noise

X. USE CONSTRAINTS AND PRIORITY USE RECOMMENDATIONS FOR WATER, EDGE, AND LAND USE TYPES

A. USE CONSTRAINTS

The impact relationships of each land and water type were studied and related to environmental changes and goals and objectives. Through this process, carrying capacity constraint categories within each land and water type for each use were prepared.

These are:

1. Low Potential Risk to Natural Resources: Potential uses of the land and water types having impacts and causal chains with an insignificant effect on objectives. Uses with only these types of impacts would be acceptable without special management requirements.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation: Potential uses in the given type having impacts and causal chains that adversely affect objectives but which 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 advisable provided stated precautions are taken that contain impacts within specified limits during construction and operation.

3. High Potential Risk to Natural Resources: Potential uses that generate impacts or causal chains of impact adversely affecting natural resource objectives in a way impossible to reduce to low potential risk levels by impact control measures using available technology.

The interrelated and sensitive nature of the special coastal resources argues for the placement of stringent conditions on most coastal uses which generate impacting activities. This general statement applies even to such compatible water based activities as recreational fishing and shellfishing. Without some form of regulation, for example, most of the nearshore coastal shellfisheries would soon be depleted through over harvesting and the decimation of important reproductive stocks.

The only generally negative category, however, is the "high potential risk to natural resources" classification. This category includes uses which when placed in certain land or water types produce impacts which are adverse and which cannot be mitigated to low potential risk levels through the application of currently available practical technology.

An example would be the placement of a sewage outfall on a public beach. Since even with tertiary treatment no sewage treatment plant is without the potential for equipment breakdown or human error and since the potential exists for adverse human health effects directly from water contact recreation or indirectly through shellfish contamination during such a breakdown situation, the potential hazard is simply too great to allow such a use under any present day practical circumstance. An application for such a sewage outfall would thus place the use in the high risk category, and the permit request would be denied on the grounds of public health risk and natural resource impairment. An alternative applicant might be the discharge of treated wastes in offshore tidal ocean waters at such a location that rapid dilution would occur and pollution of public recreation beaches averted.

The examples cited above can be found in Table 27 under "Tidal Ocean Offshore" and "Ocean Beach". Table 27 also places all major uses into the three basic categories of "low risk natural resource", "low risk to natural resources with mitigation", and "high risk to natural resources". The criteria for placement were primarily ecological, and the placement was determined by a task force consisting of terrestrial and aquatic ecologists (R. Bogardus, J. Andrea, M. Black, and S. Bach). The maintenance and enhancement of natural coastal resources and processes was the orientation of the group and socio-economic/opportunity considerations were specifically excluded in the decision-making. The purpose of this study is to look at the coastal zone from the natural ecological perspective. The opportunity and socio-economic analyses are being conducted by another BCPD contractor. This dichotomous study design is set up to clearly identify conflicts between ecological objectives and opportunity/socio-economic considerations. These inherent conflicts will be identified by BCPD and resolved through future public debate and policy refinement. This report exclusively addresses the natural resources which are valued in the coastal zone, and hence those uses which have been identified through the professional evaluation process to adversely impact natural resource objectives are placed in restrictive categories.

The placement procedure was not quantitative and did not involve a formal summation and valuation of identified impacting activities and environmental changes. Such an exercise would presently be practical for only a handful of uses in a few well studied coastal habitats and clearly is beyond the present day state of knowledge for most uses and for most coastal habitats. Instead, the reasons for category inclusion generally centered on a few key environmental change parameters. The above sewage outfall example centered ultimately on the human health implications of a beach outfall. Obviously, many other changes such as increased scouring/erosion, increased nutrients, changes in water temperature, etc. are possible when a sewage outfall is located on a beach, but these were not given equal weight in the final decision which placed the use in the "high risk" category for the ocean beach land and water type. Brief rationales for the use categorization decisions are also presented in Table 27.

Table 27. Use Constraint and Priority Use-Type Recommendations and Rationales

TYPE: TIDAL OCEAN NEARSHORE

Risk Categorization:

1. Low Potential Risk to Natural Resources

Navigation

Rationale:

Navigation by all but very large ships with drafts approaching the water depth of nearshore waters is an environmentally safe use in the well-mixed nearshore ocean waters. Large ships with drafts which could cause scouring of the bottom substrate and adverse impacts on benthic animal populations do not operate in this water type due to significant navigational risk.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Extraction - Unconsolidated
Bulk Storage, Handling and Transfer Facilities (BSHTF)
- Pipelines
- Buried Transmission Cables
- Cooling/Process Water Intake
- Thermal Discharges

Recreation
- Large Crowd Gathering Facilities
  - Outdoor
  - Indoor
- Small Crowd Gathering Facilities
  - Outdoor
  - Indoor

Stormwater Outfall
Overboard Dumping (Non Hazardous)
Shellfishing (Commercial, C)
Fishing (Commercial and Recreational, C&R)
Aquaculture
Dock

Rationale:

All of these uses have an aspect or aspects which would require mitigation to prevent serious violation of the general and special objectives for this water type. Any of these uses which require filling may cause a reduction in faunal abundance for a prime fishing area, or decrease faunal reproductive potential by increasing suspended solids and eventually impacting a spawning area or ocean shellfish bed.

Fishing and shellfishing to an extreme may reduce faunal abundance below a self-sustaining level. Therefore, they should be required to follow mitigative measures such as quotas and size restrictions.

Table 27. (Contd.)

3. High Potential Risk to Natural Resources

Sewage Outfall
Industrial Outfall
Overboard Dumping (Hazardous)
Port
Marina

Rationale:

Sewage outfalls, industrial outfalls, and overboard dumping of hazardous solid wastes are uses which are not feasible to mitigate in nearshore ocean waters. These uses can contribute large amounts of toxic wastes directly to waters which are important nursery areas, migratory pathways, contain valuable shellfish beds, and which flow longshore in a manner which would spread these wastes in a band along downdrift beaches. Additionally, these nearshore waters are major water sport contact recreational areas, and the potential presence of pathogens due to accident or storm events involves an unacceptably high risk.

Ports and marinas are included as unacceptable because of their need for the construction of extensive breakwaters for their protection. These breakwaters would severely alter the nearshore environment from its natural state due to alterations in flow patterns, longshore drift, and shoreline (dune) sand replacement. In addition, non-point source pollutants from ocean going vessels would accumulate at these sites, further degrading them. Extensive dredging operations would also be required, further impairing the environmental quality. Several violations of the general and special objectives for this type would occur should these uses be allowed.

TYPE: TIDAL OCEAN OFFSHORE

Risk Categorization:

1. Low Potential Risk to Natural Resources

Navigation

Rationale:

Navigation by all but very large ships with drafts approaching the water depth of offshore waters is an environmentally safe use in the well-mixed offshore ocean waters. Large ships with drafts which could cause scouring of the bottom substrate and adverse impacts on benthic animal populations do not operate in this water type due to significant navigational risk.

Table 27. (Contd.)

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Extraction - Unconsolidated
Bulk Storage, Handling and Transfer Facilities (BSHTF)
- Pipelines
- Transfer Facilities
- Buried Transmission Cables
- Cooling/Process Water Intake
- Thermal Discharges

Fossil Fuel Electrical Facility
Sewage Outfall
Stormwater Outfall
Overboard Dumping (Non Hazardous)
Port
Marina
Shellfishing (Commercial)
Fishing (Commercial and Recreational)
Aquaculture

Rationale:

Mitigation for these uses may include avoiding known shellfish beds, using state-of-the-art methods when dredging or constructing offshore structures to prevent excessive turbidity, requiring treatment of liquid wastes prior to disposal by outfall, and specifying fishing gear types and catch quotas for recreational and commercial fishing and commercial shellfishing.

Mitigation would be necessary to limit or prohibit violation of general and special objectives for this type.

3. High Potential Risk to Natural Resources

Nuclear Electrical Facility
Overboard Dumping (Hazardous)
Industrial Outfall

Rationale:

Nuclear power plants, with their inherent potential for the spread of radioactivity due to accidents or major storm events, were felt to involve a high degree of damage potential to the marine resources of the offshore zone. Although it may be true that the risk of catastrophic accident is remote, the potential for serious long-term damage is large, should such an accident occur. This potential damage would severely violate general and special objectives and is unfeasible to mitigate for this type. Nuclear power plants should best be located in upland areas where the water related impacts of accidental radioactive releases can be better contained.

Table 27. (Contd.)

TYPE: TIDAL OPEN BAY

Risk Categorization:

1. Low Potential Risk to Natural Resources

   -No Uses

Rationale:

No uses. All potential uses should be subject to some degreed mitigation within these important nursery, feeding, spawning, and migration areas in order to prevent violation of general and specified objectives. Even excessive small boat traffic can result in adverse impacts to benthic organisms and fish spawning substrates due to prop wash,scour,and general disturbance.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

   BSHTF
   - Pipelines
   - Transfer Facilities
   - Aerial Transmission Lines
   - Buried Transmission Cables
   - Cooling/Process Water Intake
   - Thermal Discharges

   Recreation - Small Outdoor (Pier)
   Sewage Outfall
   Stormwater Outfall
   Overboard Dumping (Non-Hazardous)
   Expressway
   Rail
   Port
   Marina
   Dock
   Navigation
   Small Landing Field (Floating Pad)
   Shellfishing (Commercial and Recreational, C&R)
   Fishing (Commercial and Recreational, C&R)
   Aquaculture

Rationale:

The rationale for placing the listed uses in this category are the same as given for these uses in tidal ocean nearshore and tidal ocean offshore waters. With the exception of navigation the construction activities and siting of these uses must be controlled to protect the general and special objectives of open bays. For navigation, the dredging associated with it must be located so as not to violate general and special open bay objectives.

Table 27. (Contd.)

3. High Potential Risk to Natural Resources

Housing
Commercial
Industry
Extraction Unconsolidated
Energy Generation Facilities (Nuclear and Fossil Fuel, N&FF)
Recreation - Large, and Small Indoor
Overboard Dumping (Hazardous)
Airports
Industrial Outfall

Rationale:

Housing, commercial, industry, energy generation facilities, recreation (indoor facilities, large and small) and airports have been placed in the high risk category, because their siting in an open bay area would occupy space valuable to the estuarine plant and animal community, their construction would be disruptive and detrimental to the estuarine environment through such impacting activities as dredging, filling, and water transfer/diversion, and their operations would produce waste products which could adversely affect the estuarine environment. Extraction of sand, overboard dumping of hazardous wastes, and industrial outfalls are considered high risk because of their potential large adverse impacts on estuarine communities. All of these uses have a high potential for harming estuarine shellfish beds and reefs, prime fishing areas, submerged vegetation and intefering with migratory pathways and spawning areas. These uses also have a high potential for violating many of the established general objectives.

TYPE: TIDAL SEMI-ENCLOSED AND BACK BAYS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

No uses. All potential uses should be subject to some degreed mitigation within these important nursery, feeding, spawning, and migration areas in order to prevent violation of general and specified objectives. Even excessive small boat traffic can result in adverse impacts to benthic organisms and fish spawning substrates due to prop wash scour and general disturbance.

Table 27. (Contd.)

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
- Pipelines
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation - Small Outdoor (Pier)
Transportation
- Auto
- Rail

Marina
Dock
Navigation
Shellfishing (C&R)
Fishing (C&R)
Aquaculture

Rationale:

The rationale for the reduced number of uses identified as low risk with mitigation for this type as compared with the tidal open bay category is due to the increased sensitivity of these waters to the various impacting activities. This increased sensitivity is due to smaller water volumes available for dilution, slower and less complete flushing, and their more extensive use as spawning, nursery, and migratory areas.

3. High Potential Risk to Natural Resources

Housing
Commercial
Industry
Extraction - Unconsolidated
BSHTF
- Cooling/Process Water Intake
- Thermal Discharges

Energy Generation Facilities (N&FF)
Recreation Large, and Small Indoor
Sewage
Industrial Outfall
Stormwater Outfall
Overboard Dumping (H&NH)
Port
Airport Facilities

Rationale:

The uses considered as high risk for siting in tidal open bays are again listed as high risk in this water type for the same reasons. The additional uses placed in this category; cooling process water, intakes, thermal discharges, sewage and stormwater outfalls and ports, have been placed here because their occurrence in semi-enclosed and back bays was felt to be unfeasible to mitigate due to the limited

Table 27. (Contd.)

waste assimilation capacity of back bays as compared to open bays and the extensive occurrence of special coastal resources such as shellfish and prime spawning areas.

TYPE: TIDAL GUTS, INLETS AND CANALS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

No uses. All potential uses should be subject to some degreed mitigation within these important nursery, feeding, spawning, and migration areas in order to prevent violation of general and specified objectives. Even excessive small boat traffic can result in adverse impacts to benthic organisms and fish spawning substrates due to prop wash scour and general disturbance.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
- Pipelines
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation - Small Outdoor (Pier)
Transportation
- Auto
- Rail

Marina
Dock
Navigation
Shellfishing (C&R)
Fishing (C&R)
Aquaculture

Rationale:

The rationale for the reduced number of uses identified as able to be feasibly mitigated for this water type is due to the limited extent of these waters and their importance as migratory pathways into estuarine waters or between estuarine water bodies.

3. High Potential Risk to Natural Resources

Housing
Commercial
Industry
Extraction Unconsolidated

Table 27. (Contd.)

BSHTF
- Cooling/Process Water Intake
- Thermal Discharge

Energy Generation Facilities (N&FF)
Recreation Large, and Small Indoor
Sewage Outfall
Industrial Outfall
Stormwater Outfall
Overboard Dumping (H&NH)
Port

Rationale:

The listed uses are considered as high risk for many of the same reasons listed for tidal semi-enclosed and back bays. However, the main reason for their listing as high risk is the essential use of these water types for migratory fauna, and the likelihood of these uses interferring with the special objective of preserving migratory pathways.

TYPE: TIDAL RIVERS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

No uses. All potential uses should be subject to some degreed mitigation within these important nursery, feeding, spawning, and migration areas in order to prevent violation of general and specified objectives. Even excessive small boat traffic can result in adverse impacts to benthic organisms and fish spawning substrates due to prop wash,scour,and general disturbance.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
- Pipelines
- Transfer Facilities
- Aerial Transmission Lines
- Buried Transmission Cables
- Cooling/Process Water Intake
- Thermal Discharges

Recreation, Small Outdoor (Pier)
Centralized Water Supply Intake (Potable)
Sewage Outfall
Stormwater Outfall

Table 27. (Contd.)

Transportation
- Auto
- Rail

Port
Marina
Dock
Navigation
Shellfishing (C&R)
Fishing (C&R)
Aquaculture

Rationale:

Rationale is same as that for tidal bays, recognizing that tidal rivers range in size from the Delaware River to small streams and therefore thin-size may intensify the impacts of the uses within this category over a smaller area than in an open bay. Mitigation would, therefore, be required to prevent impacts associated with these uses from violating general and special objectives for these types of waters.

3. High Potential Risk to Natural Resources

Housing
Commercial
Industrial
Extraction - Unconsolidated
Energy Generation Facilities (N&FF)
Recreation Large, and Small Indoor
Industrial Outfall
Overboard Dumping (H&NH)
Airports

Rationale:

The listed uses were placed within this category for the same reasons as listed for tidal open bays. Tidal rivers may also contain centralized water supply intakes, since their upper tidal reaches may be predominantly freshwater. This use would be conditional on not reducing stream flow so as to impair the general objectives concerning surface water salinity and freshwater flows, and such special objectives of tidal rivers as migratory pathways, shellfish beds and reefs, and spawning areas.

Table 27. (Contd.)

TYPE: NONTIDAL INLAND BASIN

Risk Categorization:

1. Low Potential Risk to Natural Resources

   -No Uses

Rationale:

No uses. All potential uses should be subject to some degreed mitigation within these important nursery, feeding, spawning, and migration areas in order to prevent violation of general and specified objectives. Even excessive small boat traffic can result in adverse impacts to benthic organisms and fish spawning substrates due to prop wash scour and general disturbance.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

   BSHTF
   - Pipeline
   - Aerial Transmission Lines
   - Buried Transmission Cables
   - Cooling/Process Water Intake
   - Thermal Discharge

   Recreation Small Outdoor (Pier)
   Centralized Water Supply Intake (Potable)
   Stormwater Outfall
   Marina
   Dock
   Navigation
   Fishing (C&R)
   Aquaculture

Rationale:

The listed uses for non-tidal inland basins under the mitigable category were placed here for the same reasons as listed for tidal open bays. Centralized water intakes would be low risk in this water type provided that spawning areas, prime fishing areas, and areas with submerged vegetation were avoided.

Table 27. (Contd.)

3. High Potential Risk to Natural Resources

Housing
Commercial
Industrial
Extraction - Unconsolidated
Energy Generation Facility (N&FF)
Recreation Large, and Small Indoor
Sewage Outfall
Industrial Outfall
Overboard Dumping (H&NH)
Transportation
    Auto
    Rail
    Airport

Rationale:

The uses listed for this category were placed here for the same reasons as those listed for semi-enclosed and back bays. Auto and rail transportation would still require valuable aquatic habitat as space for siting, and therefore, should be routed so as to avoid these water types.

TYPE: NONTIDAL RIVERS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

No uses. All potential uses should be subject to some degreed mitigation within these important nursery, feeding, spawning, and migration areas in order to prevent violation of general and specified objectives. Even excessive small boat traffic can result in adverse impacts to benthic organisms and fish spawning substrates due to prop wash scour and general disturbance.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
    Pipeline
    Aerial Transmission Lines
    Buried Transmission Cables
    Cooling/Process Water Intake
    Thermal Discharge
Centralized Water Supply Intake
Sewage Outfall
Stormwater Outfall

Table 27. (Contd.)

Transportation
- Auto
- Rail

Marina
Dock
Navigation
Shellfishing (R)
Fishing (C&R)
Aquaculture

Rationale:

The rationale for placing the listed uses in this category are the same as given for these uses in tidal ocean nearshore and tidal ocean offshore waters. With the exception of navigation the construction activities and siting of these uses must be controlled to protect the general and special objectives of non-tidal rivers. For navigation, the dredging associated with it must be located so not to violate general and special non-tidal river objectives.

3. High Potential Risk to Natural Resources

Housing
Commercial
Industry
Extraction - Unconsolidated
BSHTF - Transfer Facilities
Energy Generation Facilities (N&FF)
Recreation (all Large & Small)
Industrial Outfall
Overboard Dumping (H&NH)
Port

Rationale:

Same as for tidal open bays with the addition of transfer facilities and ports. These facilities would require extensive dredging and present a serious threat of violation of such special objectives as prime fishing areas, submerged vegetation, and migratory pathways and spawning areas. Many of the general objectives for non-tidal rivers would also be violated by these uses.

Table 27. (Contd.)

TYPE: EDGE - OCEAN BEACH, FOREDUNES

Risk Categorization:

1. Low Potential Risk to Natural Resources

   -No Uses

Rationale:

No uses are allowed upon the ocean beaches without mitigation, since these areas provide a nesting, resting, and feeding area for many species of shorebirds, including the least tern and black skimmer, both of which are endangered. These areas also provide valuable open space for recreational use, and, therefore, pollution of these areas could directly affect human well-being. These areas are also subject to storm surges and continuous coastal erosional forces. Beaches are simply not compatible with most uses and are best left in a natural state.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

   BSHTF
   - Pipelines and Pumping Stations
   - Buried Transmission Cables

   Recreation - Large and Small Outdoor (Swimming, Pier)
   Overboard Dumping - Non-Hazardous
   Shellfishing (R)
   Fishing (C&R)

Rationale:

Uses which are listed here as low risk with mitigation are those which are compatible with direct human and wildlife contact. Pipelines and transmission cables would be required to be buried so as not to impede access to or movement along beaches. Overboard dumping could be low risk if the materials were found suitable for beach nourishment, and the dumping activity occurred during low beach use periods. Fishing, shellfishing, and outdoor recreation should be the major uses of this edge area, and these activities should be conditioned so as to allow important wildlife species some areas which are restricted from direct human access.

Table 27. (Contd.)

3. High Potential Risk to Natural Resources

All Buildings (Housing, Commercial, Institutional, Industrial)
Extraction - Unconsolidated
BSHTF
    Storage Tanks
    Transfer Facilities
    Aerial Transmission Lines
Energy Generation Facilities
Recreation Large, Small Indoor
Centralized Sewage Treatment Plant (STP)
Sewage Outfall
Stormwater Outfall
Industrial Outfall
Overboard Dumping - Hazardous
Port
Marina
Airport

Rationale:

The uses in this category are unfeasible to mitigate for beaches because of the extensive areas which would be occupied by the uses, the pollution potential involved with these uses, and the hazards involved with storm surges, which would require that beach "protection" devices such as seawalls, groins, and breakwaters be constructed. Extraction was placed within this category, because it has a major potential to decrease the natural shore protection capacity and violates the special objectives of beaches and open spaces.

TYPE: FOREDUNES

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

The same rationale may be used for listing uses in this category as was used for ocean beaches. Foredunes are very important in providing protection for the central barrier island corridor, and, therefore, structural or vegetational alteration of the dunes may increase erosion and significantly harm natural shore protection capacity.

2. Low Potential Risk to Natural Resources with Appopriate Mitigation

BSHTF
    Pipelines
    Buried Transmission Cables
Recreation - Elevated Public Walkways

Table 27. (Contd.)

Rationale:

Two of the three uses listed as low risk with mitigation pipelines and transmission lines, would be buried and the third recreation along elevated walkways, would also not be a threat to the extremely important shore protection capacity of the foredunes. Additional reasons for listing uses in this category are the same as for ocean beaches.

3. High Potential Risk to Natural Resources

All Buildings and Other Potential Uses

Rationale:

Other uses that could possibly locate on foredunes could not be feasibly mitigated, because of the shifting erosional nature of these areas.

TYPE: ESTUARINE BEACHES AND BARS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

Estuarine beaches and bars contain a greater diversity of fauna than do ocean beaches and bars, including valuable estuarine shellfish beds. These shellfish beds are the major reasons for the exclusion of unmitigated uses from this type.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
- Pipelines and Pumping Stations
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation - Small Outdoor (Pier)
Transportation
- Auto
- Rail

Marina
Dock
Shellfishing (C&R)
Fishing (C&R)
Aquaculture

Table 27. (Contd.)

Rationale:

The uses listed for this type must be mitigated because of their possible impacts on estuarine shellfish beds, their occupation of open spaces and beaches, and, for some of these uses, the potential to produce wastes which could degrade the environment.

3. High Potential Risk to Natural Resources

All Buildings
Extraction - Unconsolidated
BSHTF
    Storage Tanks
    Transfer Facilities
    Thermal Discharge
Energy Generation Facilities (N&FF)
Recreation Large, Small Indoor
Centralized STP
Sewage Outfall
Stormwater Outfall
Industrial Outfall
Overboard Dumping (H&NH)
Port
Airport

Rationale:

The uses listed as high risk for this type would occupy large areas of estuarine beach or bar, would disrupt shellfish beds and shore bird nesting, resting, and feeding areas during construction, and would also have a major potential to expose estuarine shellfish beds to polluting wastes. Special objectives violated by these uses would include the preservation and enhancement of estuarine shellfish beds, open space, and beaches.

TYPE: TIDAL WETLANDS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

No low risk uses are suggested for this type due to its special values for open space, wildlife habitat, nutrient assimilation, and primary production.

Table 27. (Contd.)

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
    Pipelines and Pumping Stations
    Aerial Transmission Lines
    Buried Transmission Cables
Recreation - Small-Scale Outdoor (Walkways, Piers)
Sewage Outfall
Stormwater Outfall
Transportation
    Auto
    Rail
Marina
Dock

Rationale:

The uses listed here could be mitigated by minimizing (a) the area of tidal marshland disturbed, (b) the discharge of non-biodegradable wastes, and (c) the nutrients and organic wastes released from these uses (including stormwater and sewage outfall).

3. High Potential Risk to Natural Resources

All Buildings
Extraction - Unconsolidated
BSHTF
    Storage Facilities
    Transfer Facilities
    Thermal Discharges
Energy Generation Facilities (N&FF)
Recreation Large, Small Indoor
Industrial Outfall
Overboard Dumping (H&NH)
Port
Airport
Aquaculture
Agriculture - Salt Hay
Mosquito Ditching

Rationale:

The major values of tidal marshes include waste assimilative capacity, primary productivity, and wildlife habitat. Dredging, filling, and the disposal of industrial wastes are generally very harmful to tidal wetlands and decrease these intrinsic values. All of the uses listed as high risk for tidal wetlands would require a large amount of dredging, filling, or site area.

Table 27. (Contd.)

TYPE: NONTIDAL WETLANDS

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

Same as for tidal wetlands.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
- Pipelines and Pumping Stations
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation - Small-Scale Outdoor (Walkways, Piers)
Stormwater Outfall
Transportation
- Auto
- Rail

Marina
Dock
Agriculture - Row Crops

Rationale:

Same as for tidal wetlands with the additional rationale that row crops should be restricted to bogs and wetlands which have previously been disturbed and excluded from forested wetlands and stream side wetlands, where the environmental damage by the site preparation for this use would be extensive.

3. High Potential Risk to Natural Resources

All Buildings
Extraction - Unconsolidated
BSHTF
- Storage Facilities
- Transfer Facilities
- Thermal Discharges

Energy Generation Facilities (N&FF)
Recreation Large, Small Indoor
Sewage Outfall
Industrial Outfall
Overboard Dumping (H&NH)
Port
Airport
Aquaculture
Mosquito Ditching

Table 27. (Contd.)

Rationale:

Same as for tidal wetlands.

TYPE: WET FOREST

Risk Categorization:

1. Low Potential Risk to Natural Resources

-No Uses

Rationale:

Wet forests are valuable and sensitive environments and provide a variety of animals with habitat. All uses locating in this land type would require mitigation to be considered low risk.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

BSHTF
- Pipelines and Pumping Stations
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation Small Outdoor
Stormwater Outfall
Forestry

Rationale:

The uses listed here would be required to minimize the clearing of vegetation, with the exception of forestry, which would be expected to maintain a self-sustaining wet forest through selected cutting.

3. High Potential Risk to Natural Resources

All Buildings
Extraction - Unconsolidated
BSHTF - Storage Tanks
Energy Generation Facilities
Recreation Large, Small Indoor
Centralized Water Supply Intake
Centralized STP
Sewage Outfall
Industrial Outfall
Transportation
- Auto
- Rail
- Airport

Agriculture
Mosquito Ditching

Table 27. (Contd.)

Rationale:

Many of the listed uses would require extensive clearing, which would be unmitigatable within the wet forest. Waste outfalls would be undesirable because of the high water table and moderate assimilative capacity of wet forest. Since wet forests are dependent upon the high water table, any use which could lower the water table would also be undesirable in this type.

TYPE: CENTRAL BARRIER ISLAND CORRIDOR

Risk Categorization:

1. Low Potential Risk to Natural Resources

   -No Uses

Rationale:

This type is an important natural feature of the New Jersey coastal zone and serves as a natural barrier to storm surges. It also supports an important and noteworthy plant and animal community in undeveloped areas, therefore, no uses were considered low risk in this setting without mitigation.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

   Housing - Rural
   Retail and Service (Small)
   Institutional and Professional (Small)
   Fish and Shellfish Processing (Small, Local)
   BSHTF
      Pipelines and Pumping Stations
      Storage Tanks (Water, Propane)
      Aerial Transmission Lines
      Buried Transmission Cables
   Recreation - Small, Indoor and Outdoor
   Centralized Water Supply, Treatment, and Distribution
   Centralized STP
   Transportation
      Auto
      Rail
   Aquaculture

Rationale:

Uses in this setting must be carefully mitigated because of the sensitivity of the dunes to erosion, the water table to salt water intrusion, and the vegetation and fauna to disturbance. Uses, therefore, should not increase erosion of the dunes or impede their migration in response to natural erosional/depositional patterns. Nor should uses which place demands on water supply cause groundwater levels to be lowered so that saltwater intrusion occurs. Siting of any of these uses must also consider valuable vegetation and breeding, resting, and concentration areas for important species of wildlife.

Table 27. (Contd.)

3. High Potential Risk to Natural Resources

Housing
- Single Family Detached
- Single Family Attached
- Urban High Density

Retail and Service (Large)
Institutional/Professional (Large)
Fish and Shellfish Processing (Large Distributional)
Extraction
BSHTF
- Storage Tanks (Large Tank Farm)
- Transfer Facilities

Petroleum and Petroleum Products
Energy Generation Facilities
Recreation Large Crowd Gathering Facilities (Indoor, Outdoor)
Solid Waste (All Types)
Airports

Rationale:

Considering the extensively developed state of New Jersey's barrier islands at present, further development by uses with large site requirements, such as single family detached and attached housing, large retail and service buildings, airports, and others is considered as a high risk for the natural environment. Since this type is in essence, a natural protective feature of the coast, the extraction of sand would also be undesirable. The disposal of solid waste would be high risk due to the probable involvement with groundwater and the potential of dispersement due to major storm events.

TYPE: LOWLAND FINE SOILS

Risk Categorization:

1. Low Potential Risk to Natural Resources

None

Rationale:

Within this type there may be located such special resource areas as prime farmland and specialty soils, open space, and oak, hickory, and pine forests. Therefore all uses at a minimum must be mitigated to avoid harm to these areas.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Housing
Commercial
Institutional/Professional Facility

Table 27. (Contd.)

*Industrial
Fossil Fuel Energy Generation
Recreation
*Public Facilities
Transportation
Natural Resource Utilization

*except as in (3) below

Rationale:

Mitigation is required in some form for any use sited within this type. In particular this mitigation should prevent environmental damage to special resource areas. However, uses should also be designed so as not to decrease aquifer recharge, degrade the quality of groundwaters, decrease groundwater flows, decrease surface water flows, or contaminate water supplies with toxic substances, excess nutrients, or pathogens.

3. High Potential Risk to Natural Resources

Chemicals and Allied Products
Inorganic Chemicals
Organic Chemicals
Agricultural Chemicals
Petroleum and Petroleum Products
Petroleum Refining
Nuclear Electric Generation
Solid Waste Landfill

Rationale:

The uses listed for this type as high risk are those which have major potential hazards associated with their operations. Uses in lowlands are by definition located in proximity to streams or estuaries and are often constructed in areas with high water tables. The potential for highly toxic materials to reach the very valuable edge or water types due to major storm events or accidents is the major reason for the high risk category placement.

TYPE: LOWLAND MEDIUM SOILS

Risk Categorization:

1. Low Potential Risk to Natural Resources

None

Rationale:

Same as for lowland fine soils noting, however, the addition of the Pine Barrens and the exclusion of prime farmlands and specialty soils as special resource areas within this type.

Table 27. (Contd.)

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Housing
Commercial
Institutional/Professional Facility
*Industrial
Fossil Fuel Energy Generation
Recreation
*Public Facilities
Transportation
Natural Resource Utilization

*except as in (3) below

Rationale:

Same as for lowland fine soils with additional consideration due because the special resource Pine Barrens area is partially included within this type.

3. High Potential Risk to Natural Resources

Chemicals and Allied Products
    Inorganic Chemicals
    Organic Chemicals
    Agricultural Chemicals
Petroleum and Petroleum Products
    Petroleum Refining
Nuclear Electric Generation
Solid Waste Landfill

Rationale:

Same as for lowland fine soils, with the additional sensitivity to nutrients of the Pine Barrens constituting an added consideration for the listed uses.

TYPE: LOWLAND COARSE SOILS

Risk Categorization:

1. Low Potential Risk to Natural Resources

None

Rationale:

Same as for lowland fine soils noting, however, the addition of the Pine Barrens and the exclusion of prime farmlands and specialty soils as special resource areas within this type.

Table 27. (Contd.)

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Housing
Commercial
Institutional/Professional Facility
*Industrial
Fossil Fuel Energy Generation
Recreation
*Public Facilities
Transportation
Natural Resource Utilization

*except as in (3) below

Rationale:

Same as for lowland fine soils and the changes in special resource areas as pointed out above for this type. In addition, coarse soils will allow a greater transference of changes in groundwater quality to adjacent types and must be more carefully mitigated.

3. High Potential Risk to Natural Resources

Chemicals and Allied Products
    Inorganic Chemicals
    Organic Chemicals
    Agricultural Chemicals
Petroleum and Petroleum Products
    Petroleum Refining
Nuclear Electric Generation
Solid Waste Landfill

Rationale:

Same as for lowland medium and fine soils, with the added consideration for groundwater impact transference as noted above.

TYPE: UPLAND COARSE SOILS

Risk Categorization:

1. Low Potential Risk to Natural Resources

None

Rationale:

Lands of this type may have special resource areas, such as coastal bluffs, Pine Barrens, open space, and oak, hickory and pine forests located within them. Therefore, to preserve these special areas and other plant and animal communities, no uses should be allowed to site within this type without mitigative measures being taken.

Table 27. (Contd.)

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Housing
Commercial
Institutional/Professional Facility
Industrial
Energy Generation
Recreation
Public Facilities
Transportation
Natural Resource Utilization

Rationale:

All uses that can locate on uplands have been placed within this category as mitigatable. Mitigation will again be similar to that discussed for lowland fine soils, with the additional caution that the coarse soils have a greater infiltration rate than do fine soils. Uses with hazards are considered to be mitigatable within this type because ground and surface waters are less accessible from this type than from lowland types by definition. Mitigative measures should, therefore, be able to protect adjacent types from hazards if these measures are stringent enough.

3. High Potential Risk to Natural Resources

None

Rationale:

See above explanation.

TYPE: UPLAND MEDIUM SOILS

Risk Categorization:

1. Low Potential Risk to Natural Resources

None

Rationale:

Same as upland coarse soils part 1 with the addition of prime farmland and specialty soils in considering special resources.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Housing
Commercial
Institutional/Professional Facility
Industrial
Energy Generation
Recreation
Public Facilities

Table 27. (Concluded)

Transportation
Natural Resource Utilization

Rationale:

Same as discussed for lowland fine soils with additional rationale added for upland coarse soils.

3. High Potential Risk to Natural Resources

None

Rationale:

See above explanation.

TYPE: UPLAND FINE SOILS

Risk Categorization:

1. Low Potential Risk to Natural Resources

None

Rationale:

Same as upland coarse soils with the exclusion of the Pine Barrens and the addition of prime farmlands and specialty soils to the special resources which were of major concern.

2. Low Potential Risk to Natural Resources with Appropriate Mitigation

Housing
Commercial
Institutional/Professional Facility
Industrial
Energy Generation
Recreation
Public Facilities
Transportation
Natural Resource Utilization

Rationale:

Same as the discussion for upland coarse soils and the mitigation discussion for lowland fine soils.

3. High Potential Risk to Natural Resources

None

Rationale:

See above explanation.

B. PRIORITIZATION OF USES

The use constraints as listed in Table 27 lead naturally to the elimination of certain high risk uses from certain land and water types in the coastal zone. The task of ranking preferred or priority uses within categories 1 and 2 involves deciding among a mixture of necessary and optional uses. The process basically involved ranking the uses in order of compatibility with the stated goals and objectives based on a consideration of each use and its potential environmental impact on coastal resources through the specified use's impacting activities. Also considered in the ranking process was the preferred land-water type location for a certain use. Such preferred locations were inherent in the use constraints analysis. For example, sewage outfalls were relegated to the high risk category in water types "tidal ocean nearshore", "tidal semi-enclosed and back bay", "tidal guts, inlets and canals", and "nontidal inland basin" due to low assimilative capacity and a high potential for adverse effects for several coastal resources (shellfish beds, migratory pathways and prime spawning areas). The prioritized uses are listed in Table 28. The major prioritization categories are "Preferred" and "Acceptable with Mitigation". Brief rationales are presented following each categorical listing.

The prioritization of uses was developed by a task force of terrestrial and aquatic ecologists. The orientation was decidedly towards the protection and enhancement of natural resources, and the ecologists viewed the coast of New Jersey as an ecological entity which best serves as a recreational resource and producer of valued commercial food products.

A scenario of impacts on the natural processes and functions associated with each land and water type was then developed for each use. Those uses with the least severe impacts on natural coastal objectives were then ranked as "Preferred". Those with more severe potential impacts on objectives were placed in the "Acceptable (with mitigation)" category.

Again, no formal quantification or formal valuation of impacts was attempted for each use in each land and water type in the ranking process. Rather, those key impacts which could be identified from the matrix process as having the highest potential for adversely affecting the natural resource objectives weighed heavily in the final prioritization decisions.

Table 28. Prioritized Uses

TYPE: TIDAL OCEAN NEARSHORE

Categorization:

1. Preferred:

Navigation
Recreation
  Small Crowd Gathering Facilities
Shellfishing (Commercial, C)
Fishing (Commercial and Recreation, C&R)
Aquaculture

Rationale:

This type best serves as a producer of valuable natural and recreational resources and valued fish and shellfish stocks. The listed uses, if properly managed, are compatible with this natural resource enhancement, public enjoyment, and thoughtful utilization viewpoint.

2. Acceptable (with Mitigation):

Extraction - Unconsolidated
Bulk Storage, Handling and Transfer Facilities (BSHTF)
Recreation
  Large Crowd Gathering Facilities
Stormwater Outfall
Overboard Dumping (Non-Hazardous)
Dock

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: TIDAL OCEAN OFFSHORE

Categorization:

1. Preferred:

Navigation
BSHTF
  Cooling/Process Water Intake
  Thermal Discharges
Shellfishing (C)
Fishing (C&R)
Aquaculture

Table 28. (Contd.)

Rationale:

Same as for Tidal Ocean Nearshore, except that the recognized need for cooling/process intake water and thermal discharges is also preferred in this type over other potential locational choices. If properly sited and engineered, these additional uses should have a minimal impact on the habitats and resources present in this type.

2. Acceptable (with Mitigation):

Extraction - Unconsolidated
BSHTF
  Pipelines
  Transfer Facilities
  Buried Transmission Cables
Fossil Fuel Electrical Facility
Sewage Outfall
Stormwater Outfall
Overboard Dumping (Non-Hazardous)
Port
Marina

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: TIDAL OPEN BAY

Categorization:

1. Preferred:

Recreation
  Small Outdoor (Pier)
Marina
Dock
Navigation
Shellfishing (C&R)
Fishing (C&R)
Aquaculture

Rationale:

The rationale is the same as for Tidal Ocean Nearshore. This type best serves as a producer of valuable natural and recreational resources and valued fish and shellfish stocks. The listed uses, if properly managed, are compatible with this natural resource enhancement, public enjoyment, and thoughtful utilization viewpoint. The reader should note that support facilities for recreational pursuits are also preferred.

Table 28. (Contd.)

2. Acceptable (with Mitigation):

BSHTF
- Pipelines
- Transfer Facilities
- Aerial Transmission Lines
- Buried Transmission Cables
- Cooling/Process Water Intake
- Thermal Discharges

Sewage Outfall
Stormwater Outfall
Overboard Dumping (Non-Hazardous)
Expressway
Rail
Port
Small Landing Field (Floating Pad)

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: TIDAL SEMIENCLOSED AND BACK BAY

Categorization:

1. Preferred:

Recreation
- Small Outdoor (Pier)

Shellfishing (C&R)
Fishing (C&R)

Rationale:

The rationale is the same as for Tidal Ocean Nearshore. The reader will note, however, that due to the shallow nature of this type, navigation is not a preferred use. Excessive boat traffic and the maintenance of navigation channels for oversized craft can have an adverse effect on the plant and animal communities present in this type. In our view navigation in these areas should be restricted to smaller, shallow-draft boats, and the prevailing practice of providing for over-sized craft should be re-examined.

Table 28. (Contd.)

2. Acceptable (with Mitigation):

BSHTF
- Pipelines
- Aerial Transmission Lines
- Buried Transmission Cables

Transportation
- Auto
- Rail

Marina
Dock
Navigation
Aquaculture

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: TIDAL GUTS, INLETS AND CANALS

Categorization:

1. Preferred:

Recreation
- Small Outdoor (Pier)
- Marina
- Navigation
- Shellfishing (C&R)
- Fishing (C&R)

Rationale:

The rationale is the same as for Tidal Open Bay. This type best serves as a producer of valuable natural and recreational resources and valued fish and shellfish stocks. The listed uses, if properly managed, are compatible with this natural resource enhancement, public enjoyment, and thoughtful utilization viewpoint. The reader should note that support facilities for recreational pursuits are also preferred.

Table 28. (Contd.)

2. Acceptable (with Mitigation):

BSHTF
- Pipelines
- Aerial Transmission Lines
- Buried Transmission Cables

Transportation
- Auto
- Rail

Dock

Aquaculture

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: TIDAL RIVERS

Categorization:

1. Preferred:

Recreation
- Small Outdoor (Pier)

Marina

Dock

Navigation

Shellfishing (C&R)

Fishing (C&R)

Aquaculture

Rationale:

The rationale is the same as for Tidal Open Bay. This type best serves as a producer of valuable natural and recreational resources and valued fish and shellfish stocks. The listed uses, if properly managed, are compatible with this natural resource enhancement, public enjoyment, and thoughtful utilization viewpoint. The reader should note that support facilities for recreational pursuits are also preferred.

2. Acceptable (with Mitigation):

BSHTF
- Pipelines
- Transfer Facilities
- Aerial Transmission Lines
- Buried Transmission Cables
- Cooling/Process Water Intake
- Thermal Discharges

Table 28. (Contd.)

Centralized Water Supply Intake (Potable)
Sewage Outfall
Stormwater Outfall
Transportation
  Auto
  Rail
Port

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: NONTIDAL INLAND BASIN

Categorization:

1. Preferred:

Recreation
  Small Outdoor (Pier)
Dock
Fishing (R)

Rationale:

The rationale is the same as for Tidal Ocean Nearshore. The reader will note, however, that due to the shallow nature of this type, navigation is not a preferred use. Excessive boat traffic and the maintenance of navigation channels for oversized craft can have an adverse effect on the plant and animal communities present in this type. In our view navigation in these areas should be restricted to smaller, shallow-draft boats, and the prevailing practice of providing for over-sized craft should be re-examined.

2. Acceptable (with Mitigation):

BSHTF
  Pipeline
  Aerial Transmission Lines
  Buried Transmission Cables
  Cooling/Process Water Intake
  Thermal Discharge
Centralized Water Supply Intake (Potable)
Stormwater Outfall
Marina
Navigation
Shellfishing (R)
Fishing (C)
Aquaculture

Table 28. (Contd.)

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: NONTIDAL RIVERS

Categorization:

1. Preferred:

Dock
Fishing (R)

Rationale:

The rationale is the same as for Tidal Ocean Nearshore. The reader will note, however, that due to the shallow nature of this type, navigation is not a prefered use. Excessive boat traffic and the maintenance of navigation channels for oversized craft can have an adverse effect on the plant and animal communities present in this type. In our view navigation in these areas should be restricted to smaller, shallow-draft boats, and the prevailing practice of providing for over-sized craft should be re-examined. In addition, small outdoor pier-based recreation facilities are not compatible with fishing and small boating. Small docks which are properly sized for the river width and which do not involve extensive shoreline alteration are the preferred support facilities for fishing pursuits on these rivers.

2. Acceptable (with Mitigation):

BSHTF
- Pipeline
- Aerial Transmission Lines
- Buried Transmission Cables
- Cooling/Process Water Intake
- Thermal Discharge

Centralized Water Supply Intake
Sewage Outfall
Stormwater Outfall
Transportation
- Auto
- Rail

Marina
Navigation
Shellfishing (R)
Fishing (C)
Aquaculture

Table 28. (Contd.)

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: EDGE - OCEAN BEACH, FOREDUNES

OCEAN BEACH

Categorization:

1. Preferred:

Shellfishing (R)
Fishing (C&R)

Rationale:

These are the only preferred uses, because they fit the basic rationale as stated above in Tidal Ocean Nearshore and they do not involve alteration of the beach or changes in the dynamic erosion/accretion beach development process.

2. Acceptable (with Mitigation):

BSHTF
  Pipelines and Pumping Stations
  Buried Transmission Cables
Recreation
  Small Outdoor (Pier)
Overboard Dumping - Non-Hazardous

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

FOREDUNES

1. Preferred:

None

Rationale:

Foredunes are best left in their natural state - free to advance or retreat as a result of natural erosion/accretion processes.

Table 28. (Contd.)

2. Acceptable (with Mitigation):

BSHTF
- Pipelines
- Buried Transmission Cables

Recreation
- Elevated Public Walkways

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: ESTUARINE BEACHES AND BARS

Categorization:

1. Preferred:

Shellfishing (C&R)
Fishing (C&R)

Rationale:

Same as Ocean Beach. These are the only preferred uses, because they fit the basic rationale as stated above in Tidal Ocean Nearshore and they do not involve alteration of the beach or changes in the dynamic erosion/accretion beach development process.

2. Acceptable (with Mitigation):

BSHTF
- Pipelines and Pumping Stations
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation
- Small Outdoor (Pier)

Transportation
- Auto
- Rail

Marina
Dock
Aquaculture

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

Table 28. (Contd.)

TYPE: TIDAL WETLANDS

Categorization:

1. Preferred:

None

Rationale:

Tidal wetlands are best left in a natural state due to the importance of their functions in the estuary and the rapid decrease in wetland acreage in New Jersey over the past several decades.

2. Acceptable (with Mitigation):

BSHTF
- Pipelines and Pumping Stations
- Aerial Transmission Lines
- Buried Transmission Cables

Recreation
- Small Scale Outdoor (Walkways, Piers)

Sewage Outfall

Stormwater Outfall

Transportation
- Auto
- Rail

Marina

Dock

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: NONTIDAL WETLANDS

Categorization:

1. Preferred:

Agriculture (standard water based row crops where presently practiced)

Rationale:

The only use which is preferred is the continuation of water-based row crops. Nontidal wetlands which are not currently in production or which have not historically been in production should be maintained in the natural state because of its value as wildlife habitat.

Table 28. (Contd.)

2. Acceptable (with Mitigation):

Agriculture (standard water based row crops - new development)
BSHTF
  Pipelines and Pumping Stations
  Aerial Transmission Lines
  Buried Transmission Cables
Recreation
  Small Scale Outdoor (Walkways, Piers)
Stormwater Outfall
Transportation
  Auto
  Rail
Marina
Dock

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: WET FOREST

Categorization:

1. Preferred:

Forestry (where presently practiced and with good management)

Rationale:

The only use which is preferred is the harvesting of commercial forestry products where such activity is presently practiced. Forestry activities should be well managed and result in a continuation of wet forest habitat. Otherwise, the wet forest is best left in a natural state, because of its value as wildlife habitat.

2. Acceptable (with Mitigation):

Forestry (new development areas)
BSHTF
  Pipelines and Pumping Stations
  Aerial Transmission Lines
  Buried Transmission Cables
Recreation
  Small Outdoor
Stormwater Outfall

Table 28. (Contd.)

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: CENTRAL BARRIER ISLAND CORRIDOR

Categorization:

1a. Preferred:

(Existing Developed Corridor)
Recreation
  Small - Indoor and Outdoor
Fish and Shellfish Processing
  Small, Local

Rationale:

This type best serves as a producer of valuable natural and recreational resources and valued fish and shellfish stocks. The listed uses, if properly managed, are compatible with this natural resource enhancement, public enjoyment, and thoughtful utilization viewpoint.

1b. Preferred:

(Undeveloped Corridor)
None

Rationale:

Undeveloped central barrier island corridors are best left in their natural state because of the treacherous nature of major storm events and because of its value for mainland shore protection and habitat for a distinct maritime plant and animal community.

2. Acceptable (with Mitigation):

Housing - Single Family Detached
Retail and Service (Small)
Institutional and Professional (Small)
BSHTF
  Pipelines and Pumping Stations
  Storage Tanks (Water, Propane)
  Aerial Transmission Lines
  Buried Transmission Cables
Centralized Water Supply, Treatment, and Distribution
Centralized STP

Table 28. (Contd.)

Transportation
  Auto
  Rail
Aquaculture

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: LOWLAND COARSE SOILS

Categorization:

1. Preferred:

Recreation
Natural Resource Utilization
(Agriculture only where presently practiced)
Rural Housing

Rationale:

The coast of New Jersey is viewed from the natural ecological perspective as an entity which best serves as a recreational resource and producer of valued commercial food products. The preferred uses of recreation, agriculture where practiced, and rural housing are compatible with this view and if properly managed would result in attainment of the general and special objectives for the coast of New Jersey.

2. Acceptable (with Mitigation):

Housing (except Rural above)
Commercial
Institutional/Professional Facilities
Industrial (excluding those hazardous categories constrained as unacceptable)
Fossil Fuel Generation
Public Facilities (except solid waste landfills)
Transportation

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

Table 28. (Contd.)

TYPE: LOWLAND MEDIUM SOILS

Categorization:

1. Preferred:

Recreation
Natural Resource Utilization
(Agriculture only where presently practiced)
Rural Housing

Rationale:

The coast of New Jersey is viewed from the natural ecological perspective as an entity which best serves as a recreational resource and producer of valued commercial food products. The preferred uses of recreation, agriculture where practiced, and rural housing are compatible with this view and if properly managed would result in attainment of the general and special objectives for the coast of New Jersey.

2. Acceptable (with Mitigation):

Housing (except Rural above)
Commercial
Institutional/Professional Facilities
Industrial (excluding those hazardous categories constrained as unacceptable)
Fossil Fuel Generation
Public Facilities (except solid waste landfills)
Transportation

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: LOWLAND FINE SOILS

Categorization:

1. Preferred:

Recreation
Natural Resource Utilization
(Agriculture only where presently practiced)
Rural Housing

Rationale:

The coast of New Jersey is viewed from the natural ecological perspective as an entity which best serves as a recreational resource and

producer of valued commercial food products. The preferred uses of recreation, agriculture where practiced, and rural housing are compatible with this view and if properly managed would result in attainment of the general and special objectives for the coast of New Jersey.

2. Acceptable (with Mitigation):

Housing (except Rural above)
Commercial
Institutional/Professional Facilities
Industrial (excluding those hazardous categories constrained as unacceptable)
Fossil Fuel Generation
Public Facilities (except solid waste landfills)
Transportation

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: UPLAND COARSE SOILS

Categorization:

1. Preferred:

Recreation
Natural Resource Utilization
(Agriculture only where presently practiced)
Rural Housing

Rationale:

The coast of New Jersey is viewed from the natural ecological perspective as an entity which best serves as a recreational resource and producer of valued commercial food products. The preferred uses of recreation, agriculture where practiced, and rural housing are compatible with this view and if properly managed would result in attainment of the general and special objectives for the coast of New Jersey.

2. Acceptable (with Mitigation):

Housing (except Rural above)
Commercial
Institutional/Professional Facilities
Industrial
Energy Generation
Public Facilities
Transportation

Table 28. (Contd.)

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

TYPE: UPLAND MEDIUM SOILS

Categorization:

1. Preferred:

Recreation
Natural Resource Utilization
(Agriculture only where presently practiced)
Rural Housing

Rationale:

The coast of New Jersey is viewed from the natural ecological perspective as an entity which best serves as a recreational resource and producer of valued commercial food products. The preferred uses of recreation, agriculture where practiced, and rural housing are compatible with this view and if properly managed would result in attainment of the general and special objectives for the coast of New Jersey.

2. Acceptable (with Mitigation):

Housing (except Rural above)
Commercial
Institutional/Professional Facilities
Industrial
Energy Generation
Public Facilities
Transportation

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

Table 28. (Concluded)

TYPE: UPLAND FINE SOILS

Categorization:

1. Preferred:

Recreation
Natural Resource Utilization
(Agriculture only where presently practiced)
Rural Housing

Rationale:

The coast of New Jersey is viewed from the natural ecological perspective as an entity which best serves as a recreational resource and producer of valued commercial food products. The preferred uses of recreation, agriculture where practiced, and rural housing are compatible with this view and if properly managed would result in attainment of the general and special objectives for the coast of New Jersey.

2. Acceptable (with Mitigation):

Housing (except Rural above)
Commercial
Institutional/Professional Facilities
Industrial
Energy Generation
Public Facilities
Transportation

Rationale:

The uses listed here could be acceptable in this type if proper mitigation measures were incorporated into the planning process. The listed uses have aspects to their location, construction, or operation which would need to be carefully regulated in order to avoid damaging the integrity of the habitats and resources present within this type.

XI. RECLAMATION

New Jersey's coastal zone encompasses a variety of highly sensitive and valuable ecocystems including the dune, beach, barrier island; the estuarine wetlands and the shoreland lakes and rivers. Portions of these and other types within the coastal zone have been impacted by man's activities. The following section will address these impacted areas, (citing specific examples of each), potential mitigating measures, existing and potential values, and the cost and feasibility of reclamation where possible. These sites have been ranked into three groups by suitability for reclamation when considering all the previously discussed parameters. These groups are; priority I for most feasible and suitable, priority II for very suitable, and priority III for moderately suitable for reclamation.

A. PRIORITY I

Beaches and Dunes:

New Jersey's dunes and beaches from Sandy Hook to Cape May have suffered serious erosion due to man's construction activities. The dune system normally provides a source of sand to the beach during erosional periods and serves as a sand storage area during accretionary periods; this means the dune line naturally shifts its position. Man's construction on the dunes and behind them has halted this movement. Subsequent erosional periods may severely erode the dunes or destroy them altogether. Examples of these types of impacts have taken place at Avon-by-the-Sea and Sandy Hook.

Beaches also follow erosion and accretion cycles, normally in a summer accretion, winter erosion pattern. However man's construction of shore protection structures such as groins, jetties, and breakwaters causes net losses in the volume of littoral drift sands. Shore stabilization structures, in particular seawalls; accentuate erosion of beaches on the oceanside of the structures by increasing the turbulence of waves in that area. Examples of areas with beaches impacted by these kinds of construction activities include Monmouth Beach and Sandy Hook.

Mitigating measures for beach and dune degradation depend on the extent of damage to the system. If dunes are not breached or entirely gone, snow fencing or other types of fencing placed parallel to the shoreline on the foreslope of the primary dunes and spaced fifty feet apart may help to restore the sand reservoir of the dunes.

Dunes may also be stabilized and augmented through revegetation with dune grass, Ammophila breviligulata. This operation is discussed in detail by Jagschitz and Wakefield (1971), Woodhouse and Hanes, (1968) and Simonds (1978) with costs per acre reaching $2,200.00 for plants alone or $4,500.00 for plants and professional emplacement (1977 prices, verbal communications Mr. Church, Church's Greenhouse and Nursery, Cape May, NJ; and Mr. Raley, R and R Beachgrass, Lewes, Delaware, October 1977).

Additional measures that should be taken to restore and preserve damaged dunes are restricted access, the use of elevated walkways, and a development construction setback area either 50 feet from present dunes or at the predicted 50 year back edge of the dunes (Clark 1977). Dune restoration may also be accomplished through nourishment with sand. Usually this involves finding a source with acceptable grain size sand, transporting it to the site, grading it into dunes and an expanded beach, and revegetating or fencing the dune to help stabilize it.

The value of the beach-dune areas of the coastal zone is mainly to the resort industry which generates over $2.6 billion annually in New Jersey (Yasso and Hartman 1975). The loss of beach area invariably leads to a reduction in resort use. Beach and dune restoration will not only benefit the resort industry on restored sites but also those sites downdrift which will receive an increased supply of sand through longshore transport. Dune restoration will also help protect development that is properly placed a moderate distance from the dunes. CCES (1978b) and Yasso and Hartman (1975) have found this technique to be less expensive, and more beneficial than structural (groin, seawall) solutions to beach and dune erosion. Beach and dune restoration, therefore, should be considered a very feasible and environmentally sound reclamation project for damaged areas.

Wetlands:

When the State Wetlands Act of 1970 virtually stopped the filling of estuarine wetlands, many areas were left partially filled and covered with dredge spoils, or partially dredged and diked for lagoon developments.

Several measures should be taken to restore these areas to wetland status. Unfinished lagoon developments should have their channels filled to just below 'natural' marsh elevation with materials from previously filled areas thereby leveling them. The whole system then should be planted with Spartina alterniflora or Spartina patens. Diked spoil areas and fill areas should have their dikes breached in a number of places, spoil piles leveled, tidal flushing of site restored where possible by creating shallow canals. High elevation areas also should be planted with American holly, red or white cedar, bayberry, beach plum and Ammophila sp.

The existing value of these sites in their degraded condition is mainly as a possible roosting and nesting site for shorebirds. Often they are covered with Phragmites communis which eliminates most of their wildlife habitat value and provides good mosquito breeding grounds. Planting Spartina after leveling will increase the waste and suspended solids assimilative capacity of the wetlands, and contribute to the overall productivity of the estuarine environment. Spartina would have a special value to wildlife, shellfish, and finfish as a basic food source and habitat.

The feasibility of estuarine wetland reclamation is very good in a total ecosystem analysis. However, as separate sites, the value of the restored wetlands to the site owner is difficult to show. Increased fish, shellfish, and wildlife numbers will generally benefit the recreational and commercial users of the estuarine and ocean waters. Public funds would, therefore, seem the most appropriate source for reclamation. In addition, reclamation of these sites could be tied into conditionally acceptable development projects in nearby areas as one of the permit conditions.

Surface Waters:

Water quality has been degraded in many surface waters due to man's activities. These areas include the lower portions of the Hackensack, Hudson, Raritan, Passaic and Delaware Rivers; Newark, Raritan, Shrewsbury and Navesink bays, and at times such as during the fishkill of 1976, small areas of the Atlantic Ocean.

Restoration of surface water quality in large part involves the enforcement of the Federal Water Pollution Control Act of 1972. Virtually all point discharge sources are required to follow the regulations of this act in which case they are not, or by 1985 should not be polluting. In addition, all dredging projects must obtain a US Army Corps of Engineers permit before they may proceed, which involves public discussion and coordination with the US Fish and Wildlife Service to determine if the project is essential and to minimize impacts on fish and wildlife.

An important source of pollution in the Hudson River, New York Bay, and Raritan Bay is the discharge of untreated or poorly treated sewage. A major source of this organic loading is the New York City sewage treatment system. This system is set up with combined stormwater and sewage sewers and during high intensity or prolonged rainfall periods large amounts of untreated or poorly treated sewage enter the Hudson River estuary. The State of New Jersey should continue to work with the State of New York to solve this persistent and pervasive problem.

Another significant factor which needs to be controlled in order to improve the water quality in degraded surface waters is runoff from nonpoint pollution sources. The man-disturbed lands within the coastal zone contribute large amounts of suspended solids, nutrients, biocides, BOD (biological oxygen demand), acids, salts, petroleum products and at times heavy metals (Clark 1977, NJDEP 1978c; Parnell 1976).

Clark (1977) and McKenzie (1978) suggest a variety of schemes which should be followed to improve the quality of surface waters through runoff reduction. These include: For agriculture, encourage the reduced use of biocides, encourage moderate fertilizer use, encourage contour farming of all sites where runoff occurs and strip cropping with close growing crops such as alfalfa in areas of high erosion potential, use vegetated buffers and grassed outlets to catch sediments in runoff that does occur,

use biological controls for pests such as sex attractants rather than chemical controls, for lowland farming grow crops which do not require drainage, locate feedlots on high ground and on impermeable surfaces and treat effluent.

For developments the following policies should be incorporated; detention basins should be utilized for catchment of watershed runoff and be located as far horizontally and vertically from surface waters as possible, perferably in uplands; prevent excessive paving and reduce amounts of existing paving particularly in recharge areas, prevent alteration of natural configurations of shorelines, restrict the excavation of canals in coastal floodplains and the margins of coastal water basins, and conserve ground and surface waters to avoid saltwater intrusion and the removal of suspended life.

Several other control measures should be incorporated in order to improve the water quality of degraded surface waters. These are: the minimization of accidental spills, the restoration of natural surface and groundwater flow rates, the control of boat speeds in shallow or narrow estuarine areas prone to erosion, sewering of outdated and poorly functioning septic systems, prohibition of the offshore dumping of wastes, and the control of thermal effluents in surface waters.

The existing value of the degraded coastal waters of New Jersey is in terms of the plant and animal species diversity and abundance in spite of the pollution, the large water areas accessable to millions of residents for non-contact recreation, these same large water areas that protect the lands from the force of the sea, and the capacity of these waters to assimilate at least partially the immense waste loads they receive. The potential value of these degraded areas is given perspective by noting the economic losses incurred in the summer of 1976 due to the formation of a thermocline and a man-induced algae bloom in the ocean waters off the New Jersey coast (NJDEP 1977c).

Estimated Cost of the 1976 Fishkill

Dollars in Millions	
25.000	Loss in sport fishing revenues
1.445	Loss in commercial finfish stocks (over 4-year period)
2.070	Loss in commercial lobster catch (over 4-year period)
65.000	Loss in commercial sea clam stocks (over 7-year period*)
171.300	Loss in associated economy due to reduced commercial landings
264.815	TOTAL

* based upon estimate that only 70% of lost stocks are harvestable.

In the absence of ocean dumping of solid waste and the release of liquid wastes, this fishkill probably would not have occurred.

Improvements in the water quality of polluted surface waters would benefit the fish and shellfish populations by increasing breeding, nursery and feeding areas and food supplies, thereby increasing commercial and sport harvests. It would also increase the recreational areas open to primary contact water sports, and increase the resort industry in these areas. Improved water quality may also allow the recovery of surrounding wetlands which may increase water quality through waste assimilation.

Although no direct cost analyses are available for reclamation of degraded surface water's quality through runoff control and other measures, many of these measures could be inexpensively incorporated into agricultural techniques, boating and shipping regulations and development site runoff and drainage guidelines. Comparing these basically short-term costs against the long-term benefits of improved surface water productivity and recreational and resort revenues, the proposed improvements should be a very cost effective reclamation project.

Submerged Vegetation:

Eelgrass (Zostera marina) is suggested by CCES (1978a) as the most important submerged rooted aquatic plant in New Jersey's estuarine waters. According to NJDEP (1977b), New Jersey's eelgrass beds were virtually wiped out by an epidemic of a parasitic slime mold during the 1930's. Subsequent recovery of this submerged aquatic has re-established it well only in Barnegat Bay and Little Egg Harbor. In this instance man's activities have not caused the decline in eelgrass but may be a factor in impeding its recovery in New Jersey's estuaries by increasing turbidity and salinity in many areas.

Reclamation for submerged eelgrass beds should take the form of replanting shallow barren areas where light intensities, substrates, salinities (10-40 $^{o}/_{oo}$), and wave actions are suitable for growth. Generally only depths between 0.5 m and 1.6 m at low tide are suitable due to the high turbidity of New Jersey's Bays while substrates may range from soft mud to gravel or coarse sand (CCES 1978a). Areas where plantings may be feasible include non-vegetated portions of estuarine bays which fulfill the above environmental criteria. Specific examples include the Shrewsbury River, Shark River, Manasquan River, Little Bay, Reed Bay, and Absecon Bay in areas determined by on-site inspections. Additional sites may include trenching sites for sewer and water lines or various cables.

The existing value of shallow non-vegetated estuarine bottomlands is for benthic habitat. Shellfish beds are often located in these areas even though heavy suspended solids loads absorb algae species and are commonly associated with these barren shallows. Finfish and crabs may feed in these areas but the lack of cover exposes them to predation and food supplies are not normally plentiful.

The potential value of these areas is many times the existing value. They could provide important breeding and/or nursery habitat for a large variety of finfish and shellfish including eels, bluefish, spot, weakfish, flounder, blue claw crabs, soft shelled clams, and bay scallops. Bay scallops would particularly benefit from an eelgrass establishment project, since eelgrass provides their major breeding and nursery habitat. Waterfowl such as Brant and Black ducks are dependent upon eelgrass as a food source. Eelgrass is also valuable as a substrate stabilizer, a wave cushion, a contributor to the food chains of the ecosystem and as a substrate for epiphytic algae and associated fauna.

Eelgrass is also viewed by some as an undesirable weed, washing up on beaches in masses, fouling boat propellers, and interfering with some of man's recreation activities. Commercial harvest of eelgrass has also been conducted at times in New Jersey.

No cost data are available for planting eelgrass and the possible returns, but increased finfish, shellfish, and waterfowl populations and improved water quality should make large projects economically feasible.

B. PRIORITY II

Diked Wetlands:

Wetland areas in New Jersey which were diked and leveed between 1953 and 1973 were recorded by (NJDEP 1973). These man-made alterations eliminated most of the fish and shellfish values and many of the wildlife values of these areas totaling 11% of the total marshland available in 1953 (NJDEP, 1973). The major alteration types and the acreages involved were; salt hay, 10,679 acres, other agriculture, 5,996 acres, muskrat impoundments 3,876 acres, mosquito control impoundments 2,481 acres, road embankments 2,991 acres and waterfowl impoundments 2,781 acre These areas are located in various regions of the coastal zone. In general, salt hay farming is common in the central Delaware Bay wetlands, agricultural and muskrat impoundments are found on the upper Delaware area, mosquito control impounding is common in the lower Delaware Bay area of Cape May County, while roads and waterfowl impoundments have impacted wetlands on many federal and state-owned conservation lands.

Two basic reclamation techniques have been suggested by Ferrigno et al. (1969). These are: 1) to restore the periodic tidal flows over the marshlands by multiple breaching of dikes or culverting roadways or dikes; this technique should be utilized where roadways block marsh circulation and on diked low marshes (substrate level below mean high tide). 2) Emplacement of spillways in high marsh areas flooded utilizing open water management techniques for waterfowl and muskrat propagation. These spillways should allow spring tides to inundate marshes and maintain their tidal productivity, provide killifish populations for mosquito control, and improve wildlife food and habitat.

The existing and potential values of the diked and leveed wetlands mentioned here are: a) for salt hay and agricultural areas the existing values are for the production of salt hay while providing very poor wildlife habitat and good mosquito breeding grounds; the potential values when restored as recommended would be increased estuarine productivity, good fish and wildlife habitat, and poor mosquito habitat; b) for blocked marshes and those diked and pumped out for mosquito control, the existing values are moderate breeding habitat for fish and wildlife. The potential value of these areas following the utilization of the above reclamation methods is as highly productive estuarine wetland providing good fish and wildlife habitat and poor mosquito breeding habitat; c) for waterfowl and muskrat impoundment areas, the existing values are the area's good wildlife habitat, although Phragmites communis tends to dominate non-flooded areas eliminating some food supplies, and the decreased estuarine productivity. The potential value of these areas with lower dikes to permit some spring tide inundation is good wildlife habitat and food supplies (by keeping the Phragmites minimized) and improved estuarine productivity by spring tide and storm flows to and from the marshes and the estuaries (Ferrigno et al. 1969).

The major problem of these reclamation schemes is that the majority of the lands are under private ownership and the reclamation does little to directly benefit the landowner with the exception of the waterfowl and muskrat impoundment management techniques. State or federal purchase of the impacted land then is usually a prerequisite for practicing the restoration techniques and may be unfeasible in most cases.

Stream Flows:

The stream flow of many coastal streams has been altered by man through excessive water withdrawal, decreased groundwater recharge and increased runoff due to development, and increased evaporation by damming. These impacting activities may increase floodflows or decrease low flows especially during drought periods. Streams which have been impacted in this way include Cedar Creek near Cedarville, the Cooper River in Camden, and others.

Measures which should be taken for the restoration of these streams are: the installation of street swales, retention basins and check dams (in headwater swales), the removal of impervious surfaces where feasible, revegetation of barren areas, elimination of existing obstacles to water passage in stream channels, utilization of groundwater recharge in proper soils for disposal of sewage effluents, control of groundwater withdrawals, and conservation of water withdrawn from groundwaters, reservoirs, and streams (USEPA, 1976 Clark 1977).

The existing value of streams where flows have become intermittant due to damming, overuse, limited recharge or other factors, is minimal. Their contribution to the tidal flushing of the estuaries is small except during flood flows when they carry large silt and debris loads. Fauna in these streams are not highly diverse nor unique because of the streams highly variable flow regime. The potential value of these streams, with flows regulated and augmented by comprehensive minimization of land runoff and maximization of recharge, would be much greater than the existing values. In the upper reaches freshwater fauna would be diverse and abundant and in the lower tidal areas anadromous fish might spawn or migrate. Other fish and shellfish would benefit from the constantly reduced salinities and tidal flushing at the estuarine confluences of these streams.

Restoration of stream flows in highly developed areas would be difficult and expensive as room for recharge areas may not exist or would be considered prime real estate. However, restoration of dammed streams or streams in moderately or sparsely populated areas would be much less expensive and therefore much more feasible.

C. PRIORITY III

Dredge Holes:

Dredge holes in New Jersey's estuarine waters were studied extensively by Murawski (1969), and found to often have anoxic (containing no dissolved oxygen) waters in their lower levels. These waters prohibit benthic growth and may cause H_2S gas production. The locations of some of these holes are in Great Thorofare near Atlantic City, in Collins Cove of the Mullica River, in northwestern Absecon Bay, in Silver Bay (2), and in Barnegat Bay near Harvey Cedars and near Mantoloking Estates.

The best measure to restore the lost benthic habitat and correct the H_2S and low dissolved oxygen concentrations would be to fill anoxic areas flush to surrounding substrates, possibly using inexpensive, clean, coarse, dredge spoils. The existing value of these areas is only during the winter months when fish may congregate in the warmer waters found in the hole while attempting to avoid the anoxic and H_2S saturated areas. The potential value of these areas would be as increased benthic habitat providing additional yearround productive bottomlands for the estuary. The loss of the marginally beneficial congregation areas should not significantly affect the estuarine fish of these areas.

Since dredge spoil disposal areas are always in demand, a request from the State of New Jersey to the US Army Corps of Engineers, asking to have these holes filled flush to surrounding areas should not require any financial contribution from the state. Therefore filling of anoxic or H_2S saturated dredge holes should be a very feasible reclamation project. Also to be considered, is the cost of monitoring dredged spoil to insure that water quality standards are met.

Land:

The lands of the coastal zone are exposed to a variety of uses including agriculture, development, industry and recreation. Often during the use of the land the natural plant species are destroyed and the animal species are displaced. Favorable reclamation areas on the land may include abandoned rail lines, agricultural lands, developments, industrial sites or land fills. Two sites that have been filled which are examples of areas that could be reclaimed are the abandoned menhaden factory on Seven Island and the abandoned Coast Guard station near Little Beach., both on public lands in Great Bay.

Reclamation should include grading to near natural contours and planting with native species utilizing an integrated landscaping plan (Clark 1977). The Green Acres program provides an excellent tool for this type of reclamation.

The existing value of these types of sites is based on their real estate values, and in the case of abandoned farmlands in particular, on their wildlife habitat value. Potentially these areas when reclaimed could enhance upland wildlife diversity and abundance in depressed areas, provide movement corridors through developed areas and increase recreational and aesthetic values.

Costs for renovation are important considerations in determining the feasibility of this program. In many cases where real estate values are high, this program may be promoted by making site restoration a contingency for receiving a development permit (Clark 1977). The restoration will also benefit the landowner by increasing the area's appeal and real estate value. The direct purchase and reclamation for wildlife habitat is likely to be feasible only in depressed areas of low real estate value and when public funds such as the Green Acres program funds, are used.

PART THREE

MANAGEMENT REPORT

XII. Institutional Framework for Coastal Zone Management by the State of New Jersey

New Jersey for many years has been involved in the management of selected environmental resources of the coastal area for the benefit of the citizens of the State and of the Nation. This chapter outlines the bases for and the extent of State regulatory and technical activities relating to the environment of the coastal areas of New Jersey. These activities are the foundation for future State actions pursuant to the New Jersey Coastal Management Program in accordance with the Federal Coastal Zone Management Act of 1972.

A. Context of the Federal Legislation

The Coastal Zone Management Act (Public Law 92-583) was signed into law by the President on 27 October 1972. In this Act Congress recognized the important values and resources of the coastal zone of the Nation, and the need for strengthening existing public controls over development that threatens those resources. According to Section 302 (h) of the Act:

> The key to more effective protection and use of the land and water resources of the coastal zone is to encourage the states to exercise their full authority over the lands and waters ... in cooperation with Federal and local governments ... for dealing with land and water use decisions of more than local significance.

In order to assist the states in exercising their full authority, the Coastal Zone Management Act authorized Federal cooperation, technical assistance, and funding to the states. Section 305 authorized grants to defray as much as 66% (later increased to 80%) of a coastal state's expenditure to develop management programs over a four-year period. Programs subsequently approved in accordance with Section 306 are eligible for continuing Federal grants to offset as much as 80% of the costs of their administration. Specific minimum requirements set by Congress in Sections 305 and 306 must be met before a state program can be funded with the administrative grants under Section 306.

The Federal review and funding of state coastal zone management programs is accomplished by the Office of Coastal Zone Management in the National Oceanic and Atmospheric Administration (NOAA), a part of the United States Department of Commerce. Detailed approval criteria, procedures, and policies appear at 15 CFR 923 (43 FR 41:8378-8431, 1 March 1978). In general, every state program eligible for funding must be demonstrated to (1) offer comprehensive protection for the spectrum of coastal zone resources threatened by development, (2) provide a clearly articulated and predictable regulatory procedure, and (3) possess sufficient legal authority to insure its enforceability.

A Section 308 was added to the Coastal Zone Management Act by Public Law 94-370 on 26 July 1976. This section established additional mechanisms for Federal assistance to state and local governments that must cope with the impacts of outer continental shelf petroleum and other forms of energy development by creating a Coastal Energy Impact Program (CEIP). Eligible states are those already receiving development (Section 305) or administration (Section 306) grants. The amendment also authorized grants and Federal technical assistance for interstate planning (Section 309) and for research on coastal zone problems (Section 310). Federal matching funds were authorized for state estuarine sanctuaries, island preservation, and beach access efforts (Section 315).

These several Federal assistance programs provide a major incentive for coastal states to participate in coastal zone management. A second important incentive for state development of a coastal management program is that an approved program gives a state additional influence over Federal actions and outer continental shelf lands. Both direct Federal actions on Federal lands and elsewhere, and Federally licensed, approved, or funded actions in the coastal zone, are to be consistent with the state program to the maximum extent practicable, once the state plan has been approved [Section 307(c)]. Hence the states can insure that a wide variety of Federal actions is coordinated with state policies by implementing coastal programs. This consistency provision gives a state an opportunity to have its views considered by Federal agencies that regulate the development of outer continental shelf (OCS) lands [Section 307(c)(3)(B)], which otherwise are not subject to state jurisdiction. The consistency provision also may allow the state to recover some control over facilities otherwise subject to Federal preemption, such as natural gas facilities. The state-managed coastal zone, however, does not include Federal lands, that is, lands subject solely to the discretion of the Federal Government because of lease or ownership or held in trust by the Federal Government [Section 304(1)]. Major Federal lands excluded from the state-managed New Jersey coastal zone include military bases, arsenals, and depots; National Recreation Areas; and National Wildlife Refuges (Figure 5).

The President's environmental message of August 1979 announced three initiatives to continue and enhance coastal resource protection. First, the Administration will submit proposed legislation to extend Federal assistance for continuing support of State management programs. Second, amendments are to be recommended for the Coastal Zone Management Act to establish a National coastal protection policy. The goals of the policy, to be implemented by the States, are:

- to protect significant natural resources such as wetlands, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife;

- to management coastal development to minimize loss of life and property from floods, erosion, saltwater intrusion, and subsidence;

- to provide predictable siting processes for major defense, energy, recreation, and transportation facilities;

- to increase public access to the coast for recreation purposes;

- to preserve and restore historic, cultural, and aesthetic coastal resources; and

- to coordinate and simplify government decisionmaking to ensure proper and expedited management of the coastal zone.

Third, NOAA is to review Federal programs that affect the coastal zone and propose any additional legislation needed to achieve the coastal goals.

B. Strategic Option Selected by New Jersey

The Coastal Zone Management Act offers states a choice among three general techniques for the control of land and water uses in the coastal zone (Section 306[e]). First, a state may establish criteria and standards for local government implementation, subject to state administrative review and backup enforcement of compliance. Second, a state may undertake land and water use planning and regulation directly. Third, a state may review individual proposals, development projects, land and water regulations, and variances or exceptions to regulations on a case by case basis, with approval or disapproval after public notice and opportunity for comment.

New Jersey has opted for direct State control under the existing State laws which entrust the Department of Environmental Protection and other Departments with control over selected areas and selected uses of coastal resources of greater than local significance. The direct State control in many situations is in addition to independent controls by local and by Federal agencies. The State does not intend to regulate all development activities in all parts of the coastal zone under its management program, but only those of greater than local importance for which there is now or is in future legislative authority.

The Bureau of Coastal Planning and Development has produced a number of documents for public review as it developed its management program. Special attention was given by the consultant to the 1978 Final Environmental Impact Statement on the Bay and Shore Segment (NJ-DEP/NOAA 1978) and to revisions proposed during March 1979 for adapting policies to the developed sections of the New Jersey coastal zone (NJ-DEP 1979). This report dwells particularly on those coastal management agencies and procedures which are relatively briefly remarked or are neglected in existing BCPD documents in an attempt to supplement those reports.

C. Bases for State Controls in the New Jersey Coastal Zone

The State of New Jersey regulates directly a number of specific activities and specific locations within the coastal zone. Existing statutes selectively give the State authority over new construction, land and water uses, and State lands in the coastal zone.

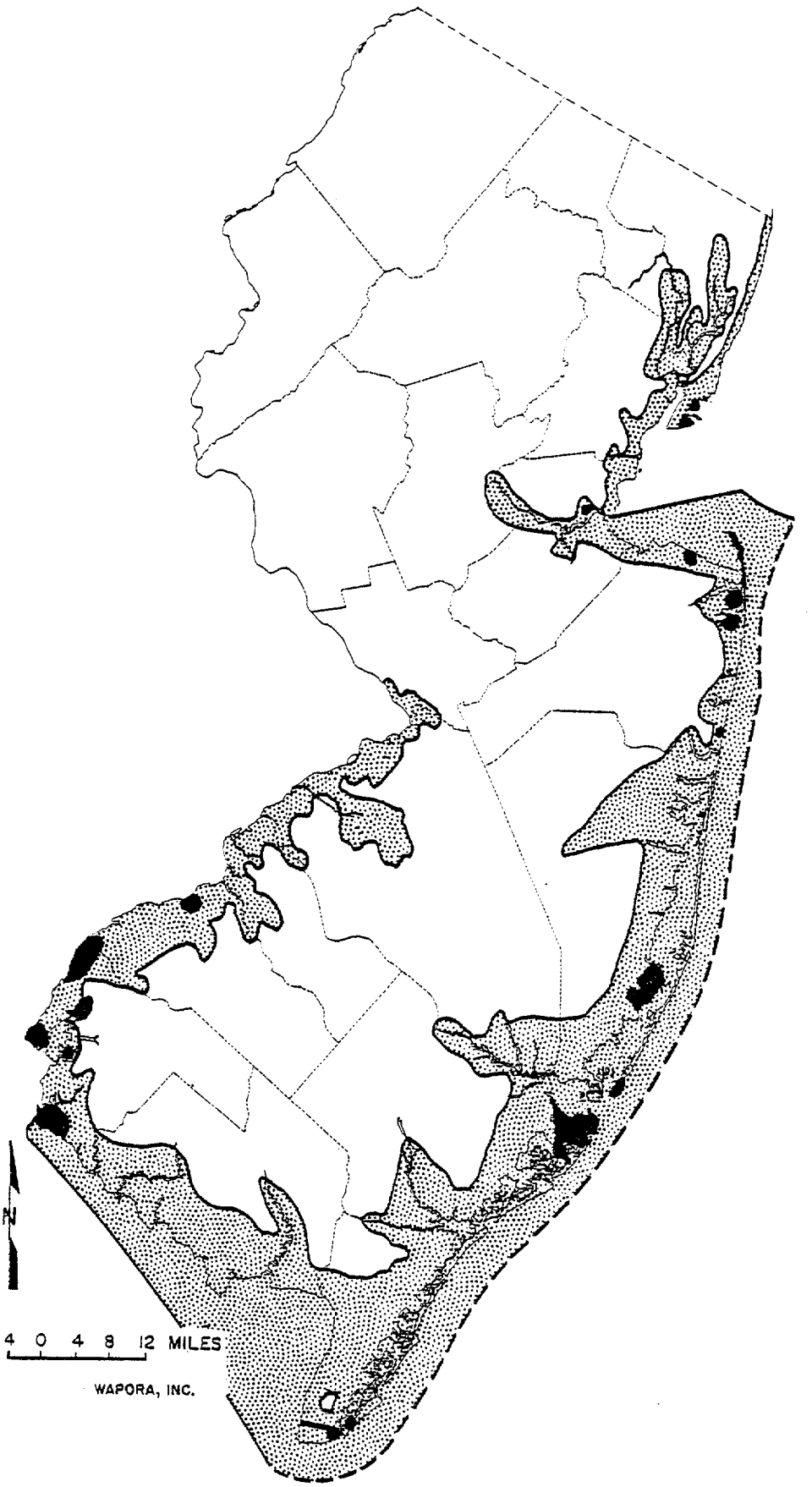


Figure 5. Federal facilities that are to be excluded from the New Jersey Coastal Zone (shown in black). Zone boundaries (stippled) are those proposed by DEP-OCZM during March 1979.

1. Department of Environmental Protection

The Department of Environmental Protection (DEP) performs a host of functions regulating land use and pollution control. It also is responsible for implementing the New Jersey Coastal Management Program, and for continued coastal planning. Created by the Legislature in 1970, the Department was given broad authority to "formulate comprehensive policies for the conservation of the natural resources of the State ..." (NJSA 13:1D-9). The organizational structure of DEP is indicated in Figure 6.

The Division of Coastal Resources, which includes the key regulatory and planning agencies for implementing the State Coastal Zone Management Program, is one of four units of DEP which report to the Assistant Commissioner for Natural Resources. The others are the Division of Fish, Game, and Shell Fisheries; the Division of Parks and Forestry; and the Green Acres and Recreation Program. These agencies are mentioned first in the ensuing paragraphs. Then other regulatory and planning agencies are described which are administered by the Assistant Commissioner for Environmental Management and Control (Division of Water Resources, Division of Environmental Quality, Solid Waste Administration) and the Assistant Commissioner for Science and Research (Environmental and Historic Sites Review, Environmental Analysis, Bureau of Geology and Topography, Environmental Cancer Research and Toxic Substances, and Environmental Disaster Response).

a. Division of Coastal Resources

Formerly, the Division of Marine Services, this unit includes five offices that discharge coastal regulatory responsibilities. The Division is specifically responsible for the development and implementation of the New Jersey Coastal Management Program. Detailed analyses of key regulatory programs of the Division, together with the activities of the Natural Resource Council, are presented in Chapter XIV of this report. The following paragraphs provide a brief overview of the activities of the Division.

The Division of Coastal Resources replaced the former Division of Marine Services (established during 1971) during June 1979 as a result of Commissioner's Administrative Order 17. The names of its constituent offices were changed at the same time, to reflect a reorganization of functions that is expected to contribute to more effective and efficient operations (Figure 7). The Office of the Director oversees administration of the Division. The Office of Coastal Zone Management (DEP-OCZM) in the Bureau of Planning and Development is the lead agency for coastal planning.

A new Bureau of Coastal Project Review consolidates the administration of three major project review authorities. It administers the 1973 Coastal Area Facility Review Act (CAFRA) permit program (NJSA 13:19-1 et seq.). CAFRA gives authority for regulating specified facilities, outside mapped wetlands, that are proposed for construction within a defined coastal area. It also administers the permit program for coastal wetlands pursuant to NJSA 13:9A-1 et seq. The 1970 Wetlands Act provides the authority to regulate uses of coastal wetlands that have been formally mapped and made subject to Wetlands Orders following public notice and hearings. Finally, this Bureau now administers the waterfront development permit program (NJSA 12:5-3). The Bureau of Tidelands provides staff to an appointed body, the Natural

DEP ORGANIZATIONAL STRUCTURE

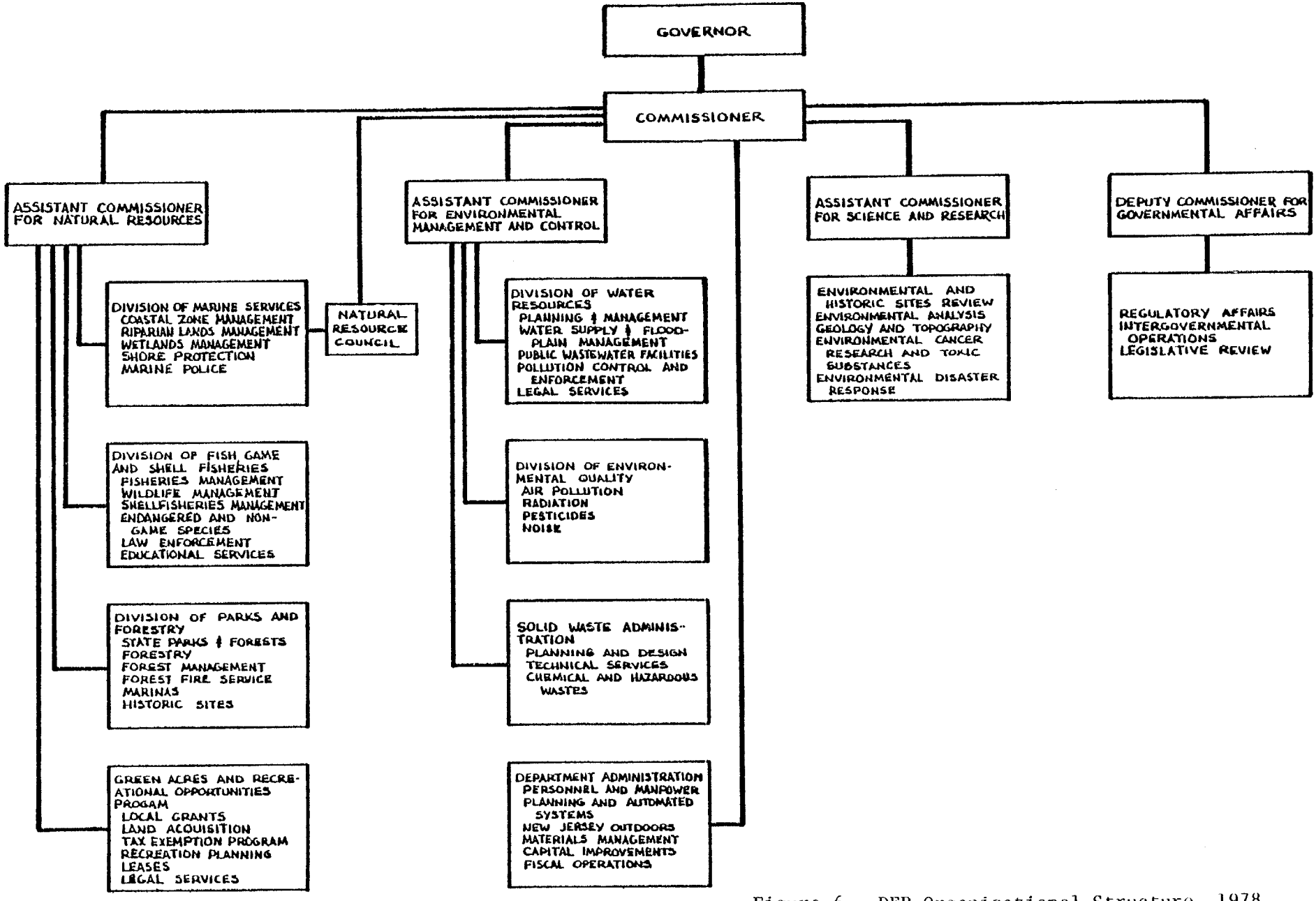


Figure 6. DEP Organizational Structure, 1978.

Resource Council, which must approve the sale or lease from the State of tidally flowed lands prior to development, and which hears appeals on waterfront development permits. Implementation of the regulatory programs of the Division and monitoring encroachments upon State-owned lands now are the responsibility of the Bureau of Coastal Enforcement and Field Services.

Decisions made under CAFRA, wetlands, and waterfront development permit programs are signed by the Director of the Division of Coastal Resources. The "90-Day Construction Permit Regulations" (NJAC 7:1C-1 et seq.) apply to all three permit programs, and they insure that coastal permit decisions will be made in a timely manner. Real estate decisions of the Natural Resource Council are reviewed by the Commissioner of DEP, who must sign the minutes of the Council. Administrative appeals of CAFRA and wetlands permit decisions are made to the Commissioner of DEP.

The Bureau of Coastal Engineering is in charge of the beach erosion control program in cooperation with other Federal, State, and municipal agencies. It controls the expenditure of bond monies for erosion control. It is also responsible for cooperation with the Corps of Engineers in dredging tributaries to the Intracoastal Waterway from Manasquan Inlet to the Cape May Canal and for providing dredged spoil disposal sites.

The Bureau of Marine Law Enforcement administers and enforces marine-oriented state laws, commercial and sport fishing laws, and laws prohibiting shellfish harvesting from condemned waters. The Bureau also is responsible for placing and maintaining navigational aids in the inland water channels. A basic boatman's safety course is offered by this Office to acquaint boaters with the fundamentals of safe boating practices.

The Office of the Assistant Director for Policy, Regulation, and Management supervises the Bureaus of Coastal Planning and Development, of Coastal Enforcement and Field Services, and of Coastal Project Review. The Office of the Assistant Director for Engineering and Tidelands supervises the Bureaus of Tidelands and of Coastal Engineering.

b. Division of Fish, Game, and Shell Fisheries

The Division of Fish, Game, and Shellfisheries is responsible for managing the fish and wildlife resources of the State in accordance with statutes collected into Title 23 of NJSA. This includes research and educational programs as well as enforcement of State fish and game laws and maintenance of State fish and wildlife management areas. The Division also administers the 1973 Endangered and Nongame Species Conservation Act which provides funds for the purchase or management of land for research and for other activities to protect wildlife other than game species (NJSA 23:2A-1 et seq.).

The Division of Fish, Game, and Shellfisheries plays an important role in commenting on the probable effects of actions regulated by other divisions within the Department of Environmental Protection. When environmental impact statements are prepared by other State agencies, or are issued by Federal agencies, the Division comments on impacts within its sphere of expertise and jurisdiction. Comments routinely are provided on riparian grants or leases, waterfront development permits, and CAFRA

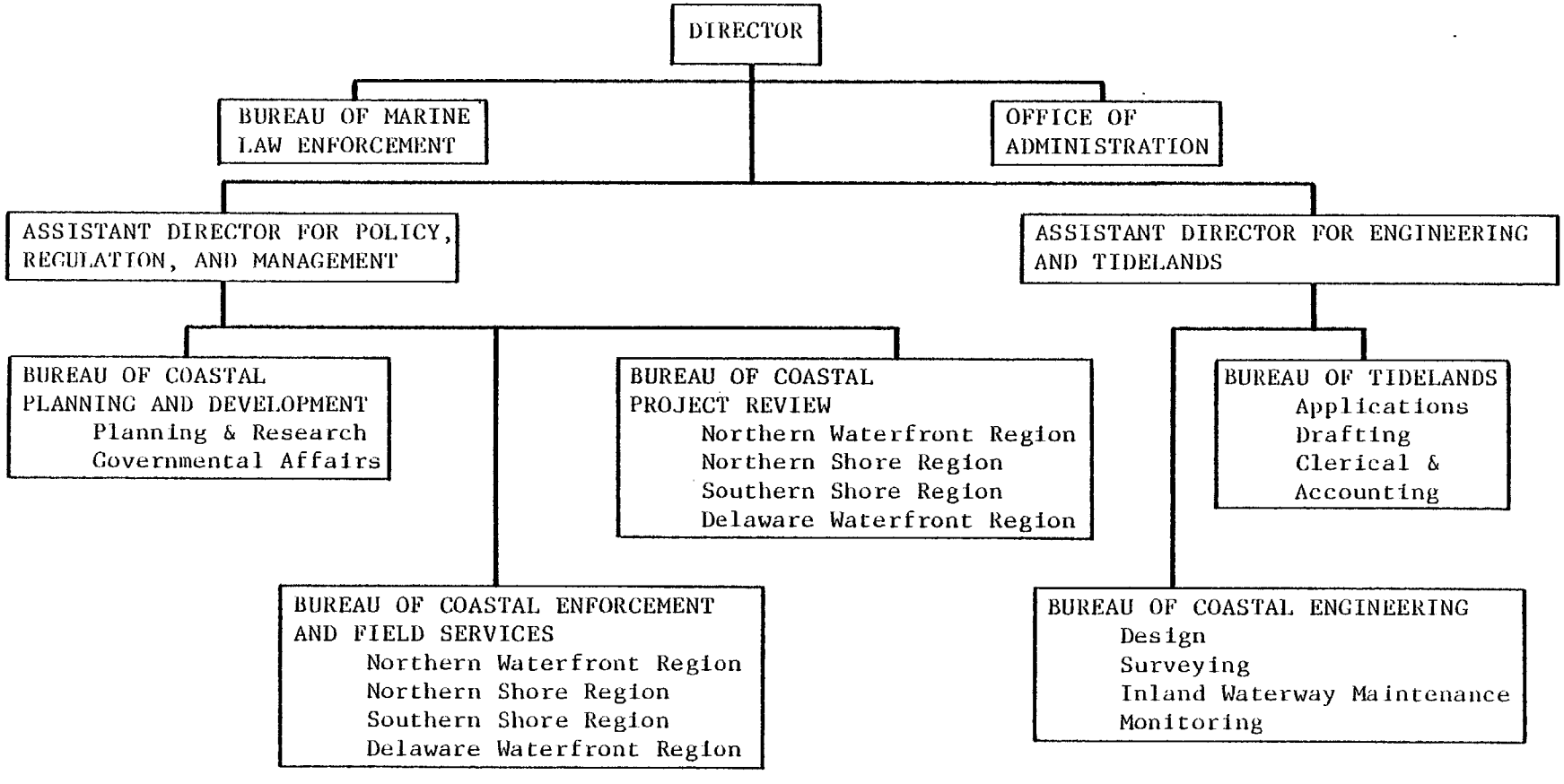


Figure 7. NJ-DEP Division of Coastal Resources organization, 22 June 1979.

permits; wetlands, stream encroachment, solid waste landfill, and other permit applications occasionally are commented upon by the Division when requested. The Division also consults with the US Fish and Wildlife Service and comments on proposed Federal permits and other actions through the Fish and Wildlife Coordination Act (16 USC 661 et seq.).

In the coastal zone the Bureau of Fisheries Management maintains seed oyster beds from which oysters are transplanted to State-leased grounds by shellfishermen. In addition, hard clams are transported from condemned waters to leased grounds in cleaner waters. The Bureau surveys and maps all bay scallop, oyster, and clam lease grounds and issues licenses to harvest hard and soft clams, mussels, and oysters. With regard to finfish, the Bureau conducts research on both the marine and freshwater fisheries. It operates the State fish hatchery stocking program and issues all finfishing and shellfishing licenses.

The Bureau of Wildlife Management coordinates a number of programs designed to further the preservation and protection of wildlife in New Jersey. The Bureau is involved with the continuing survey, propagation, and stocking of game birds, game animals, surf clams, and fish; developing land and water areas to be used for public hunting and fishing grounds; and conducting basic research to determine fish and game seasons, limits, and regulations.

The Bureau of Fish and Game Coordination and Law Enforcement is responsible for enforcing State fish and game laws. It has identified the current head of tide of many coastal streams for regulatory purposes.

The Nongame and Endangered Species program is assigned to the Office of the Director. This program is charged with developing the State List of Endangered and Threatened Species, and it has received DEP-OCZM funding for a colonial bird survey.

c. Division of Parks and Forestry

The Division of Parks and Forestry manages State parks and forests. It is responsible, also, for acquiring, operating, and maintaining historic sites and marinas. The Division reviews CAFRA permit applications in addition to coordinating with DEP-OCZM on park and recreation policies. It comments on State and Federal environmental impact statements that affect its jurisdiction.

The Office of Historic Preservation within the Division evaluates the potential impact of CAFRA permit applications on cultural resources. This Office maintains the State Register of Historic Places and recommends to the Commissioner nominations to the National Register of Historic Places for transmittal to the Heritage Conservation and Recreation Service. The Office also maintains a more extensive inventory of historic sites throughout New Jersey, some of which have been evaluated professionally. This inventory can be consulted in Trenton.

The Bureau of Parks is responsible for the management and administration, as well as the protection and improvement of all the State parks in New Jersey. There are six state parks within the coastal zone -

Liberty, Cheesequake, Island Beach, Barnegat Light, Double Trouble, and Cape May Point. Other State parks are under development in the Hackensack Meadowland District through the cooperative efforts of the DEP and the Hackensack Meadowlands Development Commission. These include the Losen Slote and the Richard DeKorte State Parks in Bergen County. The Marina Section is responsible for maintaining and operating the three State marinas which are located in Leonardo, Forked River, and Atlantic City.

The Bureau of Forestry is responsible for a number of conservation activities including supervising forest management practices, operating State forest tree seedling nurseries, and researching improved tree stocks. The three State forests in the coastal zone are the Bass River, Wharton, Belleplain Forests. The Bureau also is developing a coordinated multiple use program for the State forests. The Bureau offers an examination once a year to arboriculturists who seek certification as tree experts.

The Forest Management Section within the Bureau provides a statewide staff of professional foresters who offer technical assistance for both private and State woodland management projects. This section offers (in coordination with the United States Department of Agriculture and Soil Conservation Service) a forest pest program, a rural environment program, a forest incentive program, a forest products utilization program, assistance with tree planting and reforestation, and watershed protection.

The main responsibility of the Forest Fire Service Section is to protect the forests and salt marshes of New Jersey from fires. The section also provides information about forest fire hazard control and offers protection plans to woodland owners.

d. The Green Acres and Recreational Opportunities Program

This program determines where and how State funds should be spent for park and open space acquisition, development, and maintenance. DEP can purchase land under this program and through the Division of Parks and Forestry, by condemnation if necessary. DEP-OCZM reviews for the coastal zone proposed expenditures of Green Acres funds pursuant to NJSA 13:8A-19 et seq. The New Jersey Comprehensive Outdoor Recreation Plan (SCORP) developed pursuant to the Federal Land and Water Conservation Fund Act of 1965 (PL 94-422), addresses the adequacy of open space for existing and projected demands, and the accessibility of recreation resources for all segments of the population. The plan directs New Jersey expenditures of State Green Acres bond funds and funds granted under the Federal Land and Water Use Conservation Fund Program. It also includes inventories of Federal, State, county, municipal, and private recreation resources. The major goals of SCORP include open space in urban areas, recreation facility development, increased public access to recreation resources through mass transit, and additional barrier-free recreation facilities. The Green Acres Program also administers the New Jersey Natural Areas System (heretofore confined to State-owned lands), the Wild and Scenic Rivers System, a program for urban waterfronts, a Heritage Program, and a Trails Master Plan.

e. Division of Water Resources

This Division has authority for planning and regulating water supplies, water quality, wastewater treatment, and floodplain land uses throughout New Jersey. Its functions are diverse, and its statutory authorities are numerous. The organization of the Division is depicted in Figure 8. The four major line elements are described first; then staff units are noted. This account is based on the Division's program for fiscal year 1977-78 (DWR 1977). Practices and procedures of the Division now are addressed at NJAC 7:8-1.1 et seq.

(1) Appointed Councils

The Water Policy and Supply Council assists the Division of Water Resources as a quasi-judicial body. Its members are appointed by the Governor. The Council approves applications for the diversion of surface and groundwaters for public and private use; serves as an appellate body in hearing appeals to stream encroachment permit denials; holds hearings on stream delineation; establishes reviews of water supply functions; and approves the use of eminent domain by holders of water diversion permits. The Water Policy and Supply Council meets at least monthly and participates actively in the administration of Division responsibilities.

The Clean Water Council is an advisory body established by NJSA 26:2E-9 et seq. It holds public hearings on water quality at least annually, and it advises the Division concerning water pollution control programs. The Council recommends ways of improving water quality, including more stringent water quality standards, technological means of water pollution control, and revised regulations for the Division of Water Resources.

(2) Water Resources Planning and Management Element

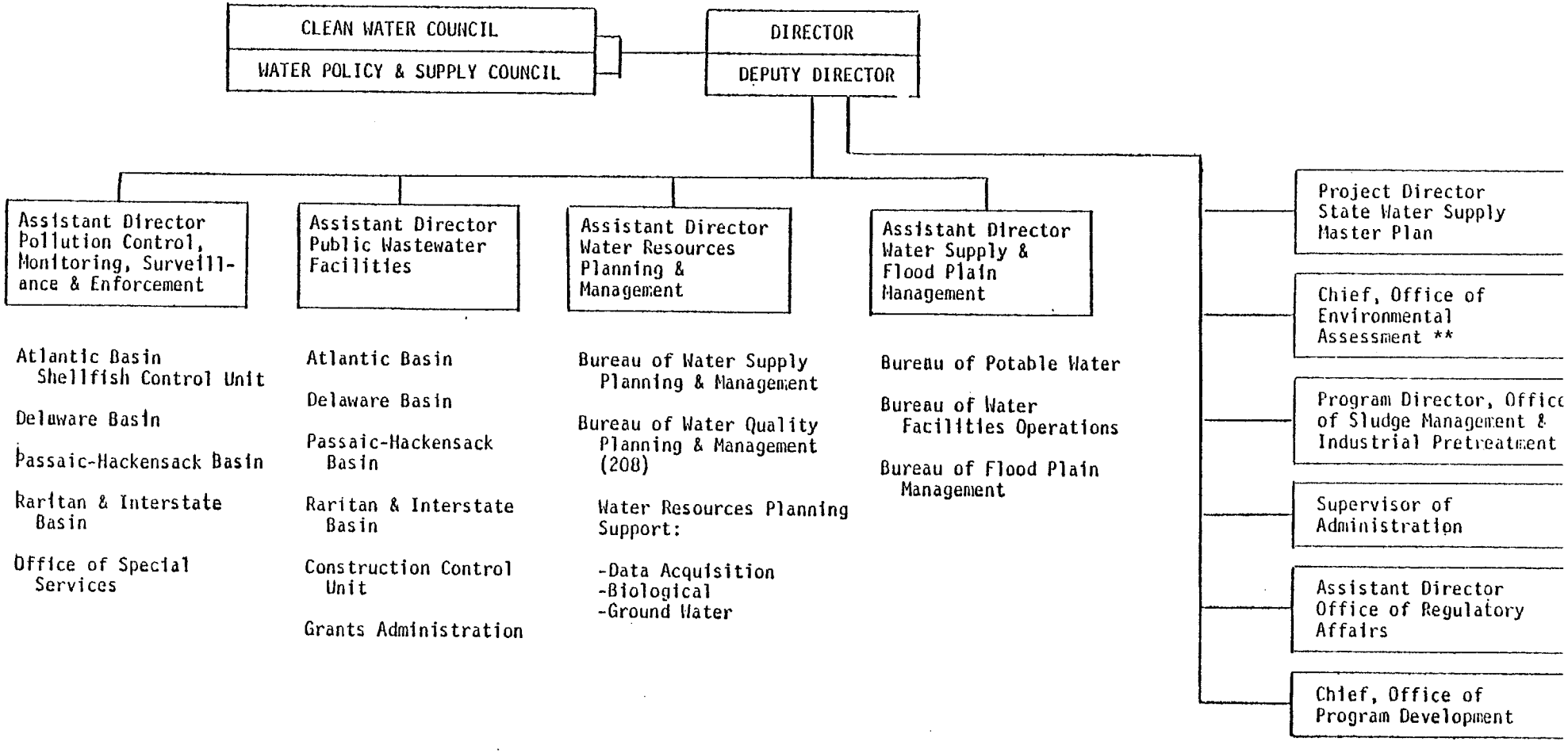
The Water Resources Planning and Management Element is responsible for the planning and management of not only water supply development and allocation but also water quality. The water supply, water quality, and technical support sections of the Element are described in turn.

(a) Bureau of Water Supply Planning and Management

The Bureau of Water Supply Planning and Management is responsible for developing water supplies. It controls the diversion of surface and underground waters, and identifies water resource study needs for specific areas.

The Bureau of Water Supply Planning Management is involved in both the technical and the intergovernmental aspects of water supply development. It participates in preparation of the long-term Water Supply Master Plan, and it is designing surface water facilities to meet short-term supply needs. It cooperates with the US Geological Survey on groundwater modeling, and it provides staff assistance to the Water Policy and Supply Council. The Water Allocation Unit processes applications for public and private diversions of surface and groundwater, issues well drilling permits, inspects wells and diversion facilities, and inspects abandoned wells to insure compliance with sealing requirements. The Unit also maintains records of diversions and computes excess diversion charges.

Figure 8. DIVISION OF WATER RESOURCES ORGANIZATIONAL CHART (DWR 1977).



(b) Bureau of Water Quality Planning and Management

The Bureau of Water Quality Planning and Management is responsible for surface and groundwater monitoring, biological monitoring, and the revision of water quality standards. The Office of Areawide Planning Statewide is responsible for areawide water quality planning to achieve fishable and swimmable waters in accordance with the Clean Water Act (PL 92-500, as amended) and the New Jersey Water Pollution Control Act (NJSA 58: 10A-1 et seq.). The Office is responsible for developing an overall water quality management plan and regulation plan for the State. Planning must identify pollution problems to be resolved or prevented, prioritize the problems, examine short-term and long-term options for problem resolution, and develop needed regulation and legislation to implement these goals. The effectiveness of historic efforts by the Water Resources Division is being reviewed, including

- Wastewater construction grant programs to upgrade publicly owned treatment works
- Federal-State permits to control point-source wastewater discharges
- Regulation of sewer extensions and sewer connection bans
- Spill prevention and cleanup requirements
- Shellfish harvesting regulations
- Water quality certification of activities requiring a Federal permit pursuant to Section 401 of the Clean Water Act
- Sludge management plan review
- Septic tank review in critical areas or where 50 or more dwelling units are proposed

The Office is responsible directly for Clean Water Act Section 208 areawide water quality management plans in five areas, and it provides guidance to the counties and regional agencis that are preparing 208 plans elsewhere (Figure 9). The 208 plans will evaluate alternatives and arrive at a strategy for each area that will control point sources and non-point sources of pollution by 1983. All construction grants for public wastewater treatment facilities and State permits for construction that may affect waterways must conform with approved 208 plans. As of the end of calendar 1978 the Middlesex County 208 Plan had been certified by the Governor; the Mercer and Tri-County Plans were awaiting his certification; and draft plans were being completed for the Lower Delaware and the Northeast planning areas.

(c) Support Section

The Support Section of the Element engages in monthly monitoring to collect original field data in cooperation with other agencies from a

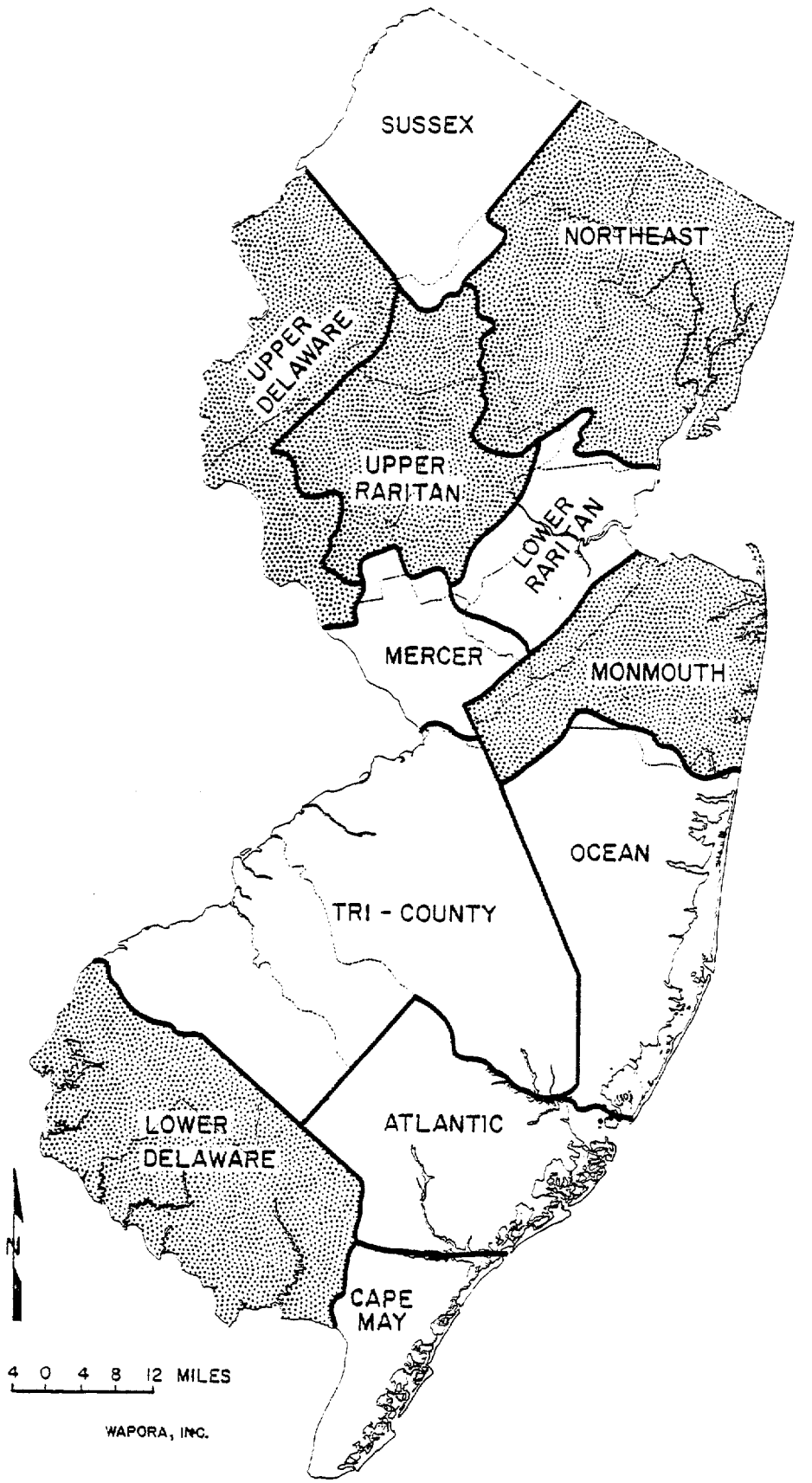


Figure 9. Areawide water quality management (Section 208) planning areas in New Jersey. Plans for stippled areas are being prepared directly by the Division of Water Resources in NJ-DEP.

primary baseline network of 250 stations.[1] Additional parameters are measured monthly at selected stations.[2] These data form the basis of biennial reports that update water quality assessments in accordance with Section 305(b) of the Clean Water Act. Ongoing surveys are made to identify lakes exhibiting eutrophication (enrichment), and to analyze the causes and controlability of the eutrophication process. A mobile bioassay capability is being developed to assist in compliance monitoring of permitted wastewater discharges. Moreover, biological monitoring is being conducted at about 30 stations in selected freshwater and estuarine locations that are part of the primary monitoring network. The biological monitoring aims to determine the habitat suitability of the aquatic environments for aquatic organisms. The baseline ambient data are to provide information adequate to detect and characterize changes in aquatic communities, the effects of effluents on receiving water communities, the presence and buildup of toxic substances in the biota, and the current status of eutrophication. The New Jersey program is part of the National Minimum Ambient Biomonitoring Program, and it will use plankton chlorophyll as an index of productivity. Data are being stored in the US-EPA STORET system, and a State Model Information System is being developed through the Department of Transportation computer facilities.

Water use classifications are being reexamined by personnel of the Element to insure that water quality criteria assure that degradation of existing high water quality will not occur. New, more stringent criteria were established for a designated critical area in the Pine Barrens during 1977 (Figure 10). Water quality criteria are being supplemented by including maximum limits on toxic substances. The remaining critical areas, outside the Central Pine Barrens, have not been mapped.

Groundwater management support has been established in the Element by transfer of the Geological Services Unit previously in the Office of Hazardous Substances Control. Groundwater quality and water level monitoring networks are maintained in cooperation with the US Geological Survey, with special attention to areas with salt water intrusion and suspected subsidence resulting from groundwater pumpage. Enforcement of groundwater pollution control authority under the 1976 Spill Compensation and Control Act (NJSA 58: 10-23.11 et seq.) and the 1977 Water Pollution Control Act (NJSA 58: 10A-1 et seq.) is accomplished by this unit. The staff also reviews all proposals for land disposal of wastewater and for the operation of landfills, and is assuming responsibility for the review of septic tank systems for developments with 50 or more dwelling units.

(3) Public Wastewater Facilities Element

This Element is a key part of New Jersey water pollution control efforts because it administers Federal funds for the design and construction of public wastewater treatment facilities. The Office of the Division Assistant Director for the Element prepares the annual list of priority for

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[1]Parameters measured monthly (March-November): physical parameters, microbiological parameters, residues, nutrients, and oxygen.

[2]Parameters include heavy metals, pesticides, and PCB's in bottom sediments; heavy metals, cyanide, and phenols in the water column.

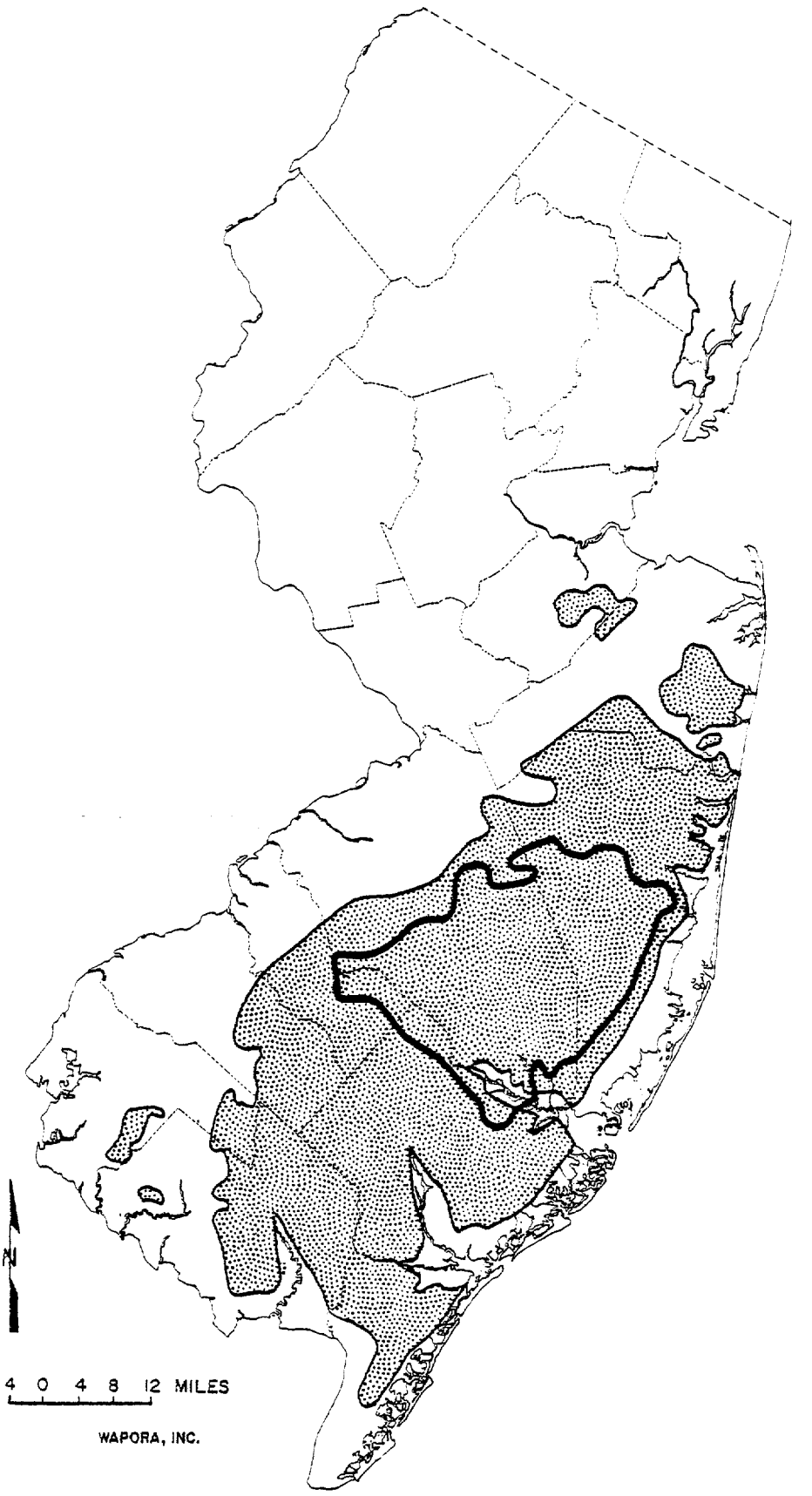

Figure 10. The Pinelands Critical Area for water quality review and stringent discharge standards. Pipelines are excluded from this area under proposed coastal zone policies. Pine barrens vegetation, exclusive of oak-pine fringe areas and stands of Virginia pine, is stippled. Vegetation boundaries are those of McCormick (1970).

Federal construction grant funds. Operational units in the Element deal with grants management, construction control, and project review. The Grants Management Unit processes administrative paperwork to assure the approval and flow of funds for both publicly funded and privately funded wastewater treatment projects. The Construction Control Unit oversees construction and startup operations at Federally funded treatment facilities. It also insures that environmental restoration (erosion control and landscaping) is accomplished after construction.

The Project Review and Management Unit provides oversight of the detailed design of wastewater collection, treatment, and disposal facilities eligible for Federal grants. Design must be in accordance with the applicable Federal regulations, which currenty base sewer planning on existing population and needs rather than on future growth expected to be stimulated by the new infrastructure. The Unit is organized into four major basins. Wastewater facilities not funded by Federal or State grants also are reviewed technically, and permits for their construction are issued as warranted. Non-grant permits issued by the Element (except wastewater treatment plant permits) are subject to the provisions of the 90-Day Act (C. 232, L. 1975) that limit administrative review periods for permit applications.

(4) Water Pollution Control, Monitoring, Surveillance, and Enforcement Element

This Element is responsible for administration and endorsement of discharge permits in accordance with surface water quality regulations. It is the agency which is taking over administration of the National Pollutant Discharge Elimination System (NPDES) permit program (pursuant to Section 402 of the Clean Water Act) from US-EPA in accordance with the 1977 Water Pollution Control Act (NJSA 58: 10-23 et seq.).[1] The NPDES permit program is to be taken over in stages from US-EPA Region II. US-EPA is to retain NPDES enforcement responsibility for Federal facilities, but other NPDES enforcement is to be assumed by the four units in the Element. During 1978 the Division proposed procedures and a schedule of penalties for violations of water quality standards by dischargers. These regulations are to be inserted at NJAC 7:14-8.1 (Docket No. DEP-051-78-11).

The four basic operating units in the Element are delineated in accordance with major drainage basins. The basin units are responsible for NPDES/NJPDES permit processing and for regulation of non-municipal wastewater treatment plants. This responsibility includes compliance evaluation, investigation of complaints, enforcement actions, and sewer bans. The units also are responsible for:

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[1]Along the northern part of the Salem County shoreline of the Delaware River, the location of the State boundaries is such that facilities located in New Jersey actually may discharge into the water of the State of Delaware. In such situations, new US-EPA regulations will require that Delaware issue the NPDES (Section 402) permits and provide the Section 401 water quality certification for Federal permits (40 CFR 123.11, 43 FR 162:37106, 21 August 1978).

- Preliminary Facilities Approval for building, installing, or modifying any factory, workshop, other place of manufacture, industrial plant, utility, or warehouse used for the collection, treatment, discharge, or storage of pollutants.

- Final Treatment Works Approval before building, installing, modifying, or operating any treatment works to control or abate water pollution.

- Water quality certifications for Federal permits for projects that may result in a discharge to navigable waters of the United States (except for Clean Water Act Section 404 permits, which are handled by the Review Coordinator in the Division).

- State and Federal tax exemption certification for water pollution abatement facilities, and assistance to the Division of Environmental Quality for certifications of industrial pollution control financing.

- Incorporation of discharge standards for toxic substances into permits and assuring compliance with those standards.

In addition, the Atlantic Coastal Basin Unit includes the Shellfish Control Unit. This unit surveys, classifies, and monitors shellfish growing areas in coastal bays, estuaries, and the Atlantic Ocean within the State three-mile jurisdiction. Inspections and effluent sampling at wastewater treatment plants are performed as part of pollution source evaluations during shellfish sanitary surveys. These surveys are the basis for approving or condemning waters where shellfish can be harvested. The Unit also controls the commercial harvest of shellfish from condemned areas under special conditions whereby the shellfish are allowed to purge themselves of contaminants prior to marketing.

(5) Water Supply and Floodplain Management Element

This Element includes the diverse functions accomplished by the three bureaus responsible for potable water, water facilities operations, and floodplain management. The role of each bureau is highlighted in turn.

(a) Bureau of Potable Water

The basic objective of the Bureau of Potable Water is to assure safe drinking water for the citizens of New Jersey and adequate water supply systems to meet consumer needs. The Bureau's goal is to ensure that potable water of the highest quality is delivered, and that adequate prime source, pumpage, storage, transmission, and distribution facilities are provided to maintain sufficient volume and pressure to consumers.

The Bureau will assume primary enforcement responsibility in accordance with the provisions of the Federal Safe Drinking Water Act (PL 93-523) when the appropriate requirements have been achieved. New regulations are being drafted to enable State takeover of the Safe Drinking Water Act administration from US-EPA in accordance with the 1977 New Jersey Safe Drinking Water Act (NJSA 58: 12A-1 et seq.). Initial priority will be given to the inspection of the approximately 600 "community public water systems"

that serve approximately 87% of New Jersey residents. This will be extended to supervising the numerous "non-community public water systems" on a progressive basis. Such systems have not previously been subject to direct State jurisdiction. Their numbers and locations are not yet known; there are estimated to be more than 10,000 non-community public water systems in New Jersey as defined in the Federal Act.

The Bureau is developing laboratory capability to support its enforcement of safe drinking water requirements, and is developing an emergency contingency plan for drinking water supply. Quarterly bacteriological and annual chemical monitoring is being expanded to cover the non-community public systems. Special quarterly sampling to monitor groundwater that may be contaminated by chemical waste landfills is ongoing at 13 water supply systems. A data management system is being developed to handle the increasing quantity of data and the additional data now required from water purveyors under Federal regulations. The Bureau also certifies commercial bacteriological and chemical analytical laboratories.

Permits are processed by the Bureau for water supply facilities. New community water supplies must meet Bureau specifications. Standards for non-community water supplies are being revised and will be implemented by municipal boards of health. Every physical connection between an approved public water supply and an unapproved supply must receive permit review annually. The Bureau also licenses operators of public water supply systems and public wastewater treatment plants.

The Bureau of Potable Water cooperates with other Bureaus and Sections of the Department of Environmental Protection in the review of projects as they pertain to water supply: A-95 projects, realty development projects submitted in accordance with the Realty Improvement Sewerage and Facilities Act and the Coastal Area Facilities Review Act, projects submitted to the Bureau of Flood Plain Management with respect to stream crossings by water supply mains, and projects submitted to the Water Pollution Control Monitoring, Surveillance, and Enforcement Element with respect to wastewater treatment facilities for potable water treatment plants. The Bureau also issues Water Potability Certificates as required by the US Department of Agriculture and the Federal Housing Administration.

(b) Bureau of Water Facility Operation

The Bureau of Water Facility Operations maintains and operates the State-owned raw water supply facilities under contract to customers, and to supplement the natural flows of the Raritan Basin. The facilities consist of the Spruce Run and Round Valley Reservoirs, the Hamden Pumping Station which transfers water from the Raritan River into the Round Valley Reservoir, the release pipeline from the Round Valley Reservoir, and the Delaware and Raritan Canal. This Bureau administers contracts for the sale of water from these facilities, and in coordination with the Department's Land Management Section administers leases and special use permits involving the reservoirs, State-owned lands purchased for future reservoir sites, and canal lands and facilities.

(c) Bureau of Flood Plain Management

The Bureau of Flood Plain Management is charged with the responsibility of minimizing potential damage to life and property caused by flooding. Its general objectives include planning and coordinating the design and construction of flood control works, regulating encroachments along streams, delineating and regulating flood-prone areas, and regulating the construction of dams. This Bureau coordinates implementation of the Federal Flood Insurance Program, and also serves as the State flood disaster coordinator during flood emergencies. The three sections of the Bureau deal with stream encroachment, floodplain studies, and dam analysis.

[1] Stream Encroachment Section -- Under the Stream Encroachment Law (NJSA 58:1-26 et seq.) all projects along a stream within the 100-year flood level, regardless of the drainage area involved, must be submitted for review and approval. Drawings and plans must be prepared by a licensed engineer. Review encompasses calculations of the 100-year flood flow and the flow characteristics of the channel and structure.

Under the 1975 90-Day Law the Section administers stream encroachment permits (instead of the Water Policy and Supply Council). The law allows a fee to be charged for making a review, determined by the particular project involved.

The Bureau also enforces the Stream Encroachment Law. The majority of violations involve fill placed along a channel and/or within the floodplain to expand usable land. If the area necessary for the passage of flood waters and retention of flood waters is reduced, flood conditions may be created or exacerbated in other areas upstream or downstream.

[2] Flood Plain Study Section -- This section generates data to be used for the control of the use of the land adjacent to rivers and streams under the authority of NJSA 58:16A-50 et seq. Flood plains are being delineated and subdivided into floodways and flood fringe areas. The status of delineations is indicated in Figure 11.

Major contracts have been initiated and implemented between the State and the Federal Emergency Management Administration, wherein the Bureau through outside consultants will delineate streams that satisfy the criteria for both the implementation of the Federal Flood Insurance Program and the Statewide Flood Plain Management Program. Contracts will be let for restudy of streams and communities where present studies are not satisfactory. The Section also coordinates implementation of the Federal Flood Insurance Program. The Bureau has assumed an active role in the review of applications for municipal eligibility into the program and in technical review of studies sponsored by the Federal Emergency Management Administration. In the Passaic Basin an analysis by the Army Corps of Engineers is underway to determine optimal measures to minimize future flood damage.

The Section coordinates and reviews flood control programs and facilities proposed by other agencies and assists in the administration of other DEP programs such as CAFRA, Green Acres, Solid Waste, Wetlands, and Riparian Lands in the review of applications that affect other agencies.

Section personnel serve as consultants to the Department of Civil Defense during the time of flood emergencies, and coordinate damage inspections with Federal personnel when a natural disaster is declared by the President.

[3] Dam Analysis Section -- Under the Dam Law (NJSA 58:4-1 et seq.) all dams that raise the normal water level 5 feet or more, and where the drainage area is larger than 0.5 square mile, must be reviewed by the State. This review takes into account the capacity of the structure to pass the 100-year flood safely and insures that the dam is structurally sound so as reasonably to preclude its failure. All dams are inspected by staff members during construction; when completed, no dam may be placed in operation until a final inspection is made and approval given. Drawings and other information must be prepared and construction must be supervised by a licensed professional engineer.

(6) Office of Sludge Management and Industrial Pretreatment

This staff unit was established during 1977 to develop a Statewide plan for sludge and a Statewide strategy for pretreatment. The unit is developing technical background for regulations that will implement these plans. It also is responsible for reviewing sludge management plans for municipal wastewater treatment plants.

(7) Office of Environmental Assessment

This staff unit was established during 1975 to assist the staff of the Division in assessing the environmental effects of all activities. The prime responsibilities of the unit include preparation of environmental reviews and assessments on wastewater facility construction projects (the Clean Water Act Section 201 projects), on Division construction projects such as water supply facilities, on stream encroachment permit applications, on Section 208 areawide water quality management plans, on Pine Barrens water quality protection measures, and on regulations for on-site sewage disposal units. The unit coordinates Division environmental review of other Departmental regulatory and construction activities, as well as reviews of impact statements prepared by other State and Federal agencies.

(8) Office of Prgram Development

This staff was established during 1976 to assist in evaluating the effectiveness of the Division's programs. In addition this unit acts as a clearinghouse for permits issued by the Division. This unit currently is the key point f coordination for State water quality approval of projects undertaken by the Army Corps of Engineers with respect to Section 404 of the Clean Water Act. The Corps cannot process permits for its own dredging and filling activities without State approval. Such Corps activities are essential to maintain navigation, and they may produce material suitable for beach maintenance and for the rehabilitation of beaches and dunes. At present the State regulation of dredged material is an ad hoc activity with respect to staffing, organizational structure, and permit processing to assure compliance with State water quality standards.

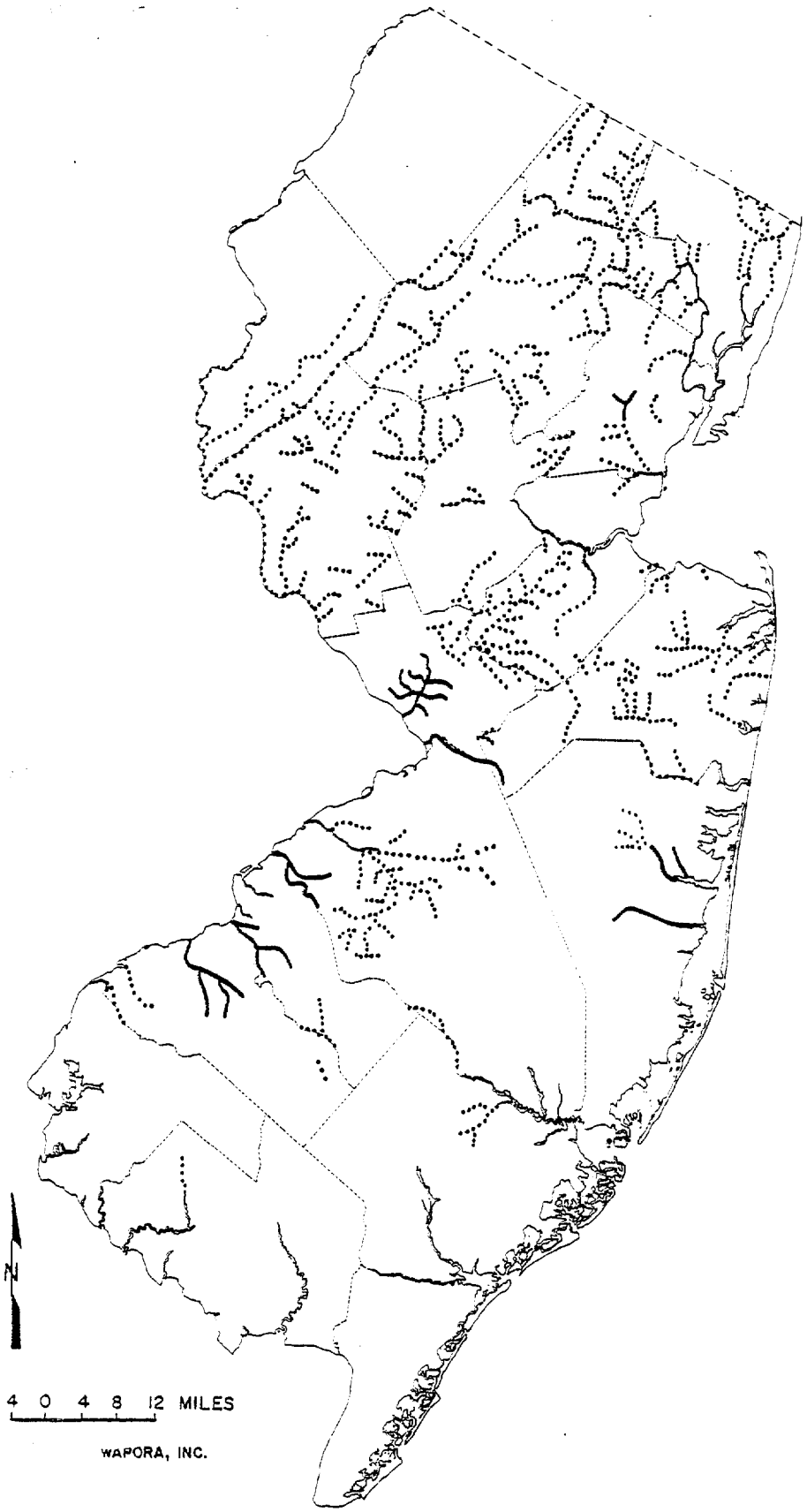

Figure 11. Flood hazard areas delineated by the DEP Division of Water Resources. Solid lines indicate pre-1979 delineations; dotted lines indicate mapping to be adopted during 1979 (DEP-OCZM 1979).

(9) Office of Regulatory Affairs

This office provides in-house legal assistance for the operations and activities of the Division.

f. Division of Environmental Quality

The Division of Environmental Quality includes four units which regulate various types of facilities and plan for pollution abatement.

The Bureau of Air Pollution Control develops and enforces regulations needed to control air pollution and to meet Federal air quality standards in accordance with the Clean Air Act. Under the 1967 Air Pollution Control Act (NJSA 26:2C-1 et seq.) it investigates air pollution from both mobile (automobiles, etc.) and stationary (factories, power plants, etc.) sources; issues permits to construct and certificates to operate equipment which (a) produces, or (b) is designed to prevent air pollution; certifies tax exemption for abatement facilities; collects fees and penalties; evaluates the impact on air quality of proposed new facilities; and is responsible for air emergency control strategies.

It is responsible also for statewide air quality monitoring and periodic reports and for maintenance of current pollution control information. The Bureau assists local governments in developing air pollution control programs and ordinances. It also participates in the transportation and air quality planning process with metropolitan and other planning agencies, provides information and comments on the probable air quality effects of transport improvements, models air quality and assists local agencies to model air quality as affected by local traffic, and promotes carpooling and vanpooling.

Permits are required to construct, and certificates are necessary to operate, the following types of facilities (NJAC 7:27-8.2):

Air pollution control apparatus
Painting and surface coating operations that use more than 10 pounds of material per hour
Manufacturing operations that emit air contaminants from open tanks of capacity greater than 100 gallons (degreasing, etching, pickling, plating, etc.)
Other manufacturing operations that emit air contaminants for which materials introduced into one source operation is greater than 50 pounds per hour
Tanks with volatile liquids larger than 10,000 gallons capacity
Containers for solid particles in excess of 2,000 cubic feet capacity
Stationary material handling equipment that emits air contaminants (conveyors, etc.)
Equipment burning commercial fuel at a heat input rate of 1 million BTU per hour or more
Equipment that burns non-commercial fuel, crude oil, or by-products
Incinerators, except those in 1- or 2-family dwellings or owner-occupied dwellings with six or fewer dwelling units

The Bureau may approve open burning under narrowly defined circumstances, and issues minimum performance standards for the operation and maintenance of pollution equipment in motor vehicles. The Bureau also reviews air quality aspects of various projects that require environmental review by the Department.

The Bureau of Radiation Protection is concerned with preventing or prohibiting unnecessary radiation emissions, developing programs for determining and evaluating hazards associated with radiation usages; licensing and registering sources of radiation; continuing surveillance of the environment to determine the compliance of sources of radiation with applicable regulations; and with maintaining an emergency force capable of insuring public safety. The Bureau has jurisdiction over nuclear power generators, nuclear medicine, and industrial radiation.

The Office of Pesticide Control is responsible for implementing the New Jersey Pesticide Control Act of 1971 which places restrictions on the use and method of application of several pesticides. Dealers in and applicators of restricted pesticides must register and qualify through examination to administer pesticides.

The Office of Noise Control carries out monitoring tasks and law enforcement procedures pursuant to the Noise Control Act of 1971 (NJSA 13:1G-1 et seq.). The Office conducts research programs for the purpose of determining the causes, effects, and hazards of noise. In the coastal zone, monitoring of motorboat noise is an active part of the joint noise control program of this Office and the Division of Coastal Resources.

g. Solid Waste Administration

Pursuant to the Solid Waste Management Act (NJSA 13:1E-1 et seq.), the Solid Waste Administration is responsible for the development of a Statewide plan to maximize resource recovery and minimize the adverse environmental impacts of solid wastes. Each county (plus the Hackensack Meadowland District) is designated as a solid waste management district. Each district is responsible for developing a ten-year plan to meet the solid waste needs for each municipality within the region. The Solid Waste Administration is responsible for coordinating district planning through the development of the statewide plan and for providing guidelines, especially for hazardous wastes. The current State planning for solid waste facilities offers an opportunity to reverse a long trend of locating sources of toxic wastes indiscriminately, and can in particular ban new landfills from aquifer recharge areas. Thick outcrops of clay are the preferred location for new solid waste landfills.

The Solid Waste Administration also administers direct regulatory programs. Persons and vehicles engaged in the collection and haulage of solid or liquid waste must renew their registration annually. Motor vehicle junk businesses require a license, renewable annually. Solid waste processing and disposal facilities also are subject to annual registration, and to the payment of fees that cover the costs of inspection. Plans based on comprehensive engineering and environmental analyses must be provided for

new solid waste facilities, and an environmental impact statement may be required from the applicant. The operators of solid waste facilities are required to maintain records of materials received, and to conduct groundwater monitoring; data are to be forwarded to the Division. During late 1978 new regulations for the registration, operation, and monitoring of chemical and hazardous waste disposal facilities were proposed. New Jersey is considered to have about 10% of the Nation's toxic waste production.

h. Office of the Commissioner

This office is responsible for general administrative supervision of the Department of Environmental Protection. The Office also is responsible, through the Assistant Commissioner for Science and Research, for five specialized agencies.

The Office of Environmental Review coordinates the comprehensive review of and the Department's comments on major environmental impact statements on projects in New Jersey that are undertaken by the State or that require Federal environmental impact statements under the National Environmental Policy Act. The Office looks not only for a thorough description of impacts, but also for the project sponsor's awareness of all NJ-DEP permits that are likely to be necessary for the proposed project. It also seeks to accomplish post-impact statement followup of projects and to institute environmental monitoring. State environmental impact statements must be filed on any project which involves State funds of $1,000,000 or more and on any environmentally sensitive State project of less than $1,000,000 pursuant to the Governor's 1974 Executive Order 53 (unless a Federal impact statement is prepared on the project).

This Office also performs staff archaeologic aspects review for historic sites That may be affected by projects submitted to the Commissioner, who is the State Historic Preservation Officer, pursuant to Section 106 of the National Historic Preservation Act (16 USC 470 et seq.). The Office does not participate routinely in impact statement review related to permit programs such as CAFRA, wetlands, solid waste landfills, and stream encroachments, other than for cultural resources. The Office serves as a liaison with other agencies that frequently produce environmental analyses (such as the Department of Transportation and the New Jersey Sports and Exposition Authority), and it receives notice of pending Federally sponsored projects through the State A-95 review agency (Department of Community Affairs).

The Bureau of Geology and Topography is responsible for executing geological surveys, publishing maps and bulletins on various topics, issuing well driller licenses and permits, conducting shore erosion studies, preparing and disseminating geological atlas sheets and aerial photos, and operating a data bank system with information on soils, rainfall, geology, lakes, historic sites, wells, and other items. This Bureau issues permits for the underground storage of oils, gas, and chemicals.

The Office of Environmental Analysis delineates New Jersey's legal claim to lands presently or formerly flowed by tidal waters to the mean

high tide line. Delineation is based on air photo interpretation, field investigations, and information from published maps and other historic sources. The Natural Resource Council is charged with delineating the State tidelands claim, and it sets priorities for the sequence of map production (NJSA 13:1B-13.2 et seq.). Mapping is based on 1977 and 1978 aerial photography and on a statewide tidal gaging program.

The tidelands delineation project ultimately will produce more than 1,000 photomaps, each at a scale of 1:2,400, depicting in total about 2,700 square miles. The base photomaps meet National map accuracy standards. The first 37 maps (of the Hackensack Meadowlands) and one map of the Elizabeth-Newark meadows are complete. About 70 additional maps were expected to be completed during fiscal 1978 in Monmouth and Middlesex Counties. A set of reference indexes which relate the photomap locations to the approximately 100 US Geological Survey topographic quadrangles is expected to be issued during 1979.

The Office of Cancer-Causing and Toxic Pollutants is investigating the location of major sources of known and potential cancer-causing substances in the State, and analyzing their implications for human health. The Office of Environmental Disaster Response is responsible for prevention of and response to spills of oil and other hazardous substances in accordance with the 1976 Spill Compensation and Control Act (NJSA 58: 10-23.11 et seq.). This mandate includes emergency response to natural disasters, alleviation and prevention of groundwater contamination, review and inspection of spill prevention plans for industrial facilities, technical review of water quality certifications, and review of riparian grant and waterfront development permit applications pertaining to dredging and to construction of facilities that handle hazardous substances.

2. State Mosquito Control Commission

Mosquito control is a continuing activity in coastal New Jersey which is the responsibility of public agencies. The effects of mosquitoes on public health were demonstrated during the 1890's (JMA 1977, Appendix XI, p.26 ff.). The State Legislature passed an act appropriating some $10,000 to the State Agricultural Experiment Station during 1902 to investigate the mosquito problem and its relationship to the sanitary, agricultural, and other interests of the State. Presently, the County Mosquito Control Commissions, the State Mosquito Control Commission, and the New Jersey Agricultural Experiment Station are responsible for mosquito control (NJSA 26:9-2 as amended by L.1975 c 9s1, L.1973 c 295s1, and L.1977 c 366s1.)

The State Mosquito Control Commission can require county mosquito projects to obtain applicable State and Federal environmental permits in order to obtain State financial aid, vehicles, or equipment. The State Mosquito Control Commission consists of ten members and now is located in the Department of Environmental Protection.

The Commission consists of the Commissioner of the Department of Environmental Protection, the Commissioner of the Department of Health, the Secretary of Agriculture (or their designated representatives), and the

Director of the New Jersey Agricultural Experimental Station, ex officio, plus six members appointed by the Governor (NJSA 26:9-12.3 as amended by L.1977 c 366s1).

The duties of the State Mosquito Control Commission are:

- To study mosquito control and extermination in the state
- To recommend legislative changes needed to enforce and carry out mosquito control
- To recommend appropriations for the State program
- To administer State aid to the counties for mosquito control through the New Jersey State Agricultural Experiment Station
- To act as an advisor in all areas regarding mosquito extermination and control (NJSA 26:9-12.6)

The State Commission also coordinates regional mosquito management projects.

The Mosquito Control Office links the State Mosquito Control Commission with DEP. It is under line supervision of the Director of the Division of Fish, Game, and Shell Fisheries. It serves as a liaison between the Commissioner, various divisions of DEP, other State departments, the State Experiment Station, and the county commissions. There is also an advisory Pesticide Control Council in DEP.

According to the Pesticide Control Act (NJSA 13:1F-1 et seq.) and the implementing regulations (NJAC 7:30-1 et seq.), in order to apply any pesticide commercially, restricted pesticides privately, or any pesticides in public places, the applicator or the direct supervisor must be registered and certified by the Office of Pesticide Controls in DEP. In order to use mosquito pesticides, additional certification is required in the category Public Health Control, subcategory Mosquito Control. Under the New Jersey Economic Poison Act (NJSA 4:8A-1 et seq.), every economic poison including substances which destroy or repel insects must be registered with the Office of Pesticide Control in the Division of Environmental Quality.

The New Jersey Agricultural Experiment Station is the principal research agency for mosquito control in the State. The Director of the New Jersey Agricultural Experiment Station (NJSA 26:9-2 et seq.) must:

- Survey and map the location of mosquito breeding areas in the State
- Investigate the life history, habits, and control for mosquito extermination
- Distribute information concerning the nature and results of mosquito extermination
- Indicate adopted extermination methods and probable cost

The Agricultural Experiment Station reviews the budgets of the county mosquito commissions. It reviews the pesticide proposed for use by the county mosquito commission and other agencies responsible for mosquito control on the basis of safety, economy, efficiency, and environmental considerations. State and county aerial spraying programs also must meet FAA and State aeronautical safety standards.

Regulatory approvals that may be required to legitimate mosquito control activities, in addition to the pesticide approvals discussed above, may include Division of Water Resources approvals in accordance with Section 208 areawide water quality planning, stream encroachment and floodplain alteration approvals for impoundments and channels, waterfront development permits for alterations of tidelands, plans for compliance with soil erosion and sediment control standards, and Corps of Engineers permits for work in navigable waters (Section 10 of the River and Harbor Act) or placement of dredged spoil or fill in wetlands (Section 404 of the Clean Water Act). In the past, mosquito control efforts have brought major changes to coastal wetlands through the construction of thousands of miles of dikes and ditches as well as pesticide application. It is appropriate that proposed mosquito control actions receive the same degree of regulatory and public scrutiny that are applied to other channelization, dredging, and diking in the coastal zone under applicable statutes. Mosquito control activities specifically are exempted from the Wetlands Act of 1970 (NJSA 13:9A-7), and they ordinarily do not involve the construction of facilities regulated under CAFRA (NJSA 13:19-1 et seq.).

3. Department of Energy

The Department of Energy Act of 1977 (NJSA 52:27F-1 et seq.) grants this Department a shared authority over all energy related decisions in the State. This Department also administers the Coastal Energy Impact Program (CEIP) under the Federal Coastal Zone Management Act. The Department of Energy (DOE) and the Department of Environmental Protection have implemented a memorandum of understanding for cooperation in regulatory functions of overlapping jurisdiction to maximize and consistent policies between the two departments. The memorandum has not been formalized as a regulation in NJAC.

DEP decisions on wetlands, CAFRA, and waterfront development permits that affect energy facilities in the coastal zone must consider the views of the Division of Energy Planning and Conservation in DOE. If the views of DOE in its Energy Report on an application and the DEP decision on the application differ, resolution of the conflict is by the Energy Facility Review Board. If appeal by the applicant is made through one of the alternative channels in DEP, DOE may participate as an interested party. DOE is guided by the Coastal Management Program in preparation of its Energy Reports, as well as by the State Energy Master Plan.

DEP works cooperatively with DOE in administration of the Federal CEIP grants program. This includes participation in grant allocations to local governments, review of individual applications, and receipt of copies of final reports and other work products.

Both agencies consider the national interests in energy facility siting. Both agencies also participate in determinations of consistency with State policy for coastal energy facilities pursuant to Section 307 of the Federal Coastal Zone Managment Act.

4. Department of Community Affairs

This Department includes three divisions which provide planning services and assistance to communities with special impact on municipal planning and housing. The main interactions of these divisions with coastal management programs is through intergovernmental coordination and reviews. The Hackensack Meadowlands Development Commission (HMDC), an independent agency in, but not of, this Department, regulates land uses and environmental quality directly in the Hackensack Meadowland District of northeastern New Jersey.

The HMDC regulatory procedures for the direct control of development and land use are described at length in Chapter V. The HMDC reports to a seven-member Commission appointed by the Governor (its ex officio chairman is the Commissioner of the Department of Community Affairs). It has been responsible since 1969 for overseeing the development of the Hackensack Meadowland District, an area of almost 20,000 acres transcending municipal boundaries in Hudson and Bergen Counties. The Commission has broad power to regulate development, and its authority generally overrides conflicting local land use controls in parts of fourteen municipalities. It may exercise eminent domain. It has a specific mandate to provide for the disposal of solid waste, and it is charged with considering environmental protection and the delicate balance of nature in the meadowlands. Municipal input to the Commission is provided by an advisory committee whose members are mayors of the constituent municipalities. The Commission also is empowered to distribute the financial benefits and liabilities of development in the District among the municipalities through a formula and intermunicipal fund established by the Hackensack Meadowland Reclamation and Development Act (NJSA 13:17-1 et seq.).

The Division of State and Regional Planning acts as a statewide planning agency. It can review the consistency of proposed actions with the State Development and Guide Plan, which it prepared under Section 701 of the Federal Housing and Community Development Act and pursuant to Chapter 47 of the New Jersey Laws of 1961. The Plan outlines in general terms areas that are suitable for future development, areas unsuitable for future development, and places where natural resources should be preserved. The Plan suggests that priority for future State capital investments be given to existing growth areas. This Division routinely has reviewed CAFRA permit applications as requested by the Office of Coastal Zone Management in NJ-DEP. The Division also serves as the State A-95 clearinghouse for notification of Federal and Federally assisted activities in New Jersey.

Pursuant to the Municipal Land Use Law (NJSA 40:55D-1 et seq.), copies of local applications for developments of at least 150 acres or 500 units are to be filed with the Division. Pursuant to the Governor's Executive Order 35, a fair-share allocation to municipalities of the needs for low and moderate income housing has been developed by the Division.

The Division of Local Government Services provides financial and technical assistance to local governments, including assistance in planning and site reviews. The Division assists coastal municipalities in interpreting the effects of CAFRA and other State coastal laws which can be coordinated with local municipal land use laws.

The Division of Housing and Urban Development inspects new construction, administers relocation assistance to dislocated low-income families, sponsors neighborhood preservation grant programs, and provides construction mortgages for assisted housing.

5. Department of Agriculture

Within the Department the Division of Rural Resources seeks to preserve agricultural lands in New Jersey. Together with the US Soil Conservation Service, the Division is active in dune planting and maintenance.

Through the State Soil Conservation Committee (which includes the Commissioner of NJ-DEP), the Division cooperates with DEP in implementing the 1975 Soil Erosion and Sediment Control Act (NJSA 4:24-1 et seq.). Standards have been set by the Committee for the control of erosion and sedimentation during construction. In accordance with coastal policy, DEP permits require applicants to conform to the erosion and sedimentation standards of the Committee in the Bay and Ocean Shore Segment.

Municipalities must condition their approvals of specified development projects on certification from the local soil conservation district that erosion and sedimentation will be controlled. Projects covered are those (other than a single family house) that disturb more than 5,000 square feet of land and for which the State Uniform Construction Code requires a building permit.

6. Department of Labor and Industry

The Office of Economic Research in the Division of Planning and Research reviews CAFRA permit applications in the context of economic growth. It has also prepared economic studies under contract to the Office of Coastal Zone Management in NJ-DEP. The Economic Development Authority sponsors loans for commercial and industrial redevelopment. The Office of Business Advocacy assists business interests to identify and apply for required permits. It circulates a master permit information form for DEP permits. One-day, over-the-counter service from NJ-DEP is arranged through this Office for:

- minor stream encroachment permits for projects which do not reduce floodway water carrying capacity, increase erosion or sedimentation

in the stream, or require substantial channel modification or relocation;

- o minor waterfront development permits for construction in man-made lagoons and maintenance, repair, or replacement of lawful existing structures; and

- o minor sewer extension projects that are less than 1,000 feet long, cost less than $25,000, have sewage flow no greater than 12,000 gallons per day, have no pump station, force main, syphon, or holding tanks, and are not in areas under sewer ban, administrative order, or litigation.

7. Department of the Public Advocate

This Department is authorized to intervene in regulatory proceedings and to intervene or bring legal actions to protect the public interest. The Department determines when to intervene in cases that have broad policy implications that otherwise would not be addressed. Coastal issues in which the Department has been active include public beach access, siting of nuclear powerplants, and solid waste disposal.

8. Department of Transportation

The Department of Transportation sponsors highway, airport, heliport, rail, and other projects in the coastal zone that frequently require multiple permits from NJ-DEP. Its powers include eminent domain. The construction of transportation facilities may have profound secondary effects on surrounding land uses. The Department also requires a permit for proposals to construct various facilities within or that affect State highway rights of way (NJSA 27:7-1 et seq.).

9. Intrastate Regional Agencies

Several State agencies function in multiple county and municipal jurisdictions, but on less than a Statewide basis in New Jersey. Their functions and authorities vary widely.

a. Hackensack Meadowlands Development Commission (HMDC)

The HMDC was described briefly in the previous discussion of the Department of Community Affairs. Its regulatory procedures for the direct control of development and land use are described at length in Chapter XIV.

b. Pinelands Enviromental Council (Historic Note)

This Council was established during 1972 as an independent agency in DEP to protect water resources and other natural assets in the Pinelands Region from misuse and pollution, to encourage the continuation and development of land uses compatible with the resources and values of the Region, to improve environmental quality in the Region, and to promote its agriculture. The Council was to adopt a comprehensive plan for the Region,

and it could review development proposals within the Region. The Council could require applicants to prepare environmental impact statements. It revised its draft EIS guidelines several times. The views of the Council were not binding, however, on municipalities in the Pinelands. Projects not approved by the Council could be delayed for as much as 90 days, and the Council could bring legal action to prevent violation of the enabling Act (NJSA 13:18-1 et seq.).

The Pinelands Region included all or part of seven townships in Ocean County and seven townships in Burlington County. The Act did not apply to State-owned lands. The Governor terminated State funding for the Council during 1975, and subsequently its work was supported only by the Counties. The Council generally was regarded as having been ineffectual, and it was abolished by the Pinelands Protection Act of 1979. The story of the Council serves as a reminder of what may eventuate, if the current Pinelands Commission mandate is not implemented effectively.

c. Pinelands Planning Entity (Pinelands Planning Commission)

Section 502 of the National Parks and Recreation Act of 1978 (PL 95-625) provides Federal support for planning in the Pinelands National Reserve defined in the Act (Figure 12). The Reserve is established to assist the State of New Jersey and local governments to protect the fragile and high-value resources of the Pinelands. As much as $3 million of Federal funds are authorized to support a master planning effort upon request of the Governor. The Plan is to be ready for review by the Secretary of the Interior within 18 months from the beginning of Federal funding. Following the acceptance of the Master Plan by the Secretary of the Interior, as much as $26 million are authorized to pay 75% of plan implementation costs. During the development of the Plan, the Secretary is authorized to make grants to the State for acquisition of lands and waters (both fee simple and lesser interests) within the National Reserve that he determines (in consultation with the planning entity) to have critical ecological values that are in immediate danger of degradation or destruction. All proposed Federal actions and applications for Federal assistance within the Pinelands National Reserve, listed in OMB Circular A-95, involving construction of housing, industrial parks, highways, and sewer or water treatment facilities are to be reviewed by the planning entity during the development of the Plan. The planning entity is to refer proposed actions with adverse effects to the Secretary. Any Federal action in which the Secretary determines to have significant adverse effects is not to proceed while the Plan is being developed.

The regional planning and management entity is to consist of seven members appointed by the Governor, seven members appointed by constituent counties, and one Federal Representative appointed by the Secretary of the Interior. During preparation and implementation of the Master Plan, the planning entity is to review all proposed Federal actions in the region for their potential impacts on the environment, and bring proposals with adverse effects to the attention of the Secretary of the Interior.

The Plan is to establish permanent mechanisms for integrated Federal, State, and local coordination to protect the fragile ecosystem of the region. Should the Plan not be approved by the Secretary of the Interior within 36 months after the date Federal funds are provided, then all Federal funds must be returned to the Federal Government by the State.

By Executive Order 71 (1979) the Governor established a Pinelands Planning Commission to accomplish the purposes of the Federal Act. The region to be analyzed includes the Pinelands National Reserve plus additional areas recommended during 1978 by the Governor's Pinelands Review Committee for protection. These areas include much, but not all, of the typical Pinelands vegetation, plus selected coastal estuaries and barrier islands outside the area of the Pinelands vegetation (Figure 13). Some of the lands addressed by Executive Order 71 overlap lands regulated under the Wetlands Act of 1970 and under the Coastal Area Facility Review Act of 1973.

Executive Order 71 also established a moratorium on State approvals for new and pending requests for State financial assistance, grants, permits, certificates, licenses, or other approvals within the Pinelands during the planning process (or for 18 months, whichever is shorter), unless two thirds of the Commission members determine that a compelling public need for the approval exists or the denial of the approval would produce extraordinary hardship and there will be no substantial impairment of resources in the Pinelands. Until the Commission could process certifications, existing State agencies processed certifications in accordance with the Executive Order. In the "Protection Area" section of the Pinelands which overlaps the CAFRA area, development and construction approvals are to be processed by the CAFRA section of DEP in accordance with CAFRA policies plus those of the Executive Order and the Federal Act.

The Governor also established an ad hoc Pinelands Development Review Board to assist the new Pinelands Commission with moratorium exemption certifications until the Master Plan is developed. This Board consists of the Commissioner of the Department of Community Affairs, the Commissioner of DEP, and the Secretary of Agriculture (or their designated representatives). Staff assistance to the Board currently is provided by DEP through the Office of the Commissioner.

The Pinelands Protection Act of 1979 was signed into law by the Governor on 28 June 1979. It adopted generally the boundaries recommended by the Governor's Committee. No official map was available during September 1979. The State moratorium on new construction is scheduled to expire on 8 August 1980.

d. South Jersey Port Corporation

This agency was established during 1968 as a New Jersey agency for port development along the Delaware River (NJSA 12:11A-1 et seq.). The Corporation is a part of the Department of Labor and Industry. The South Jersey Port District includes Mercer, Burlington, Camden, Gloucester, Salem, Cumberland, and Cape May Counties, together with all New Jersey lands and waters in and under the Delaware River and Delaware Bay. The agency may

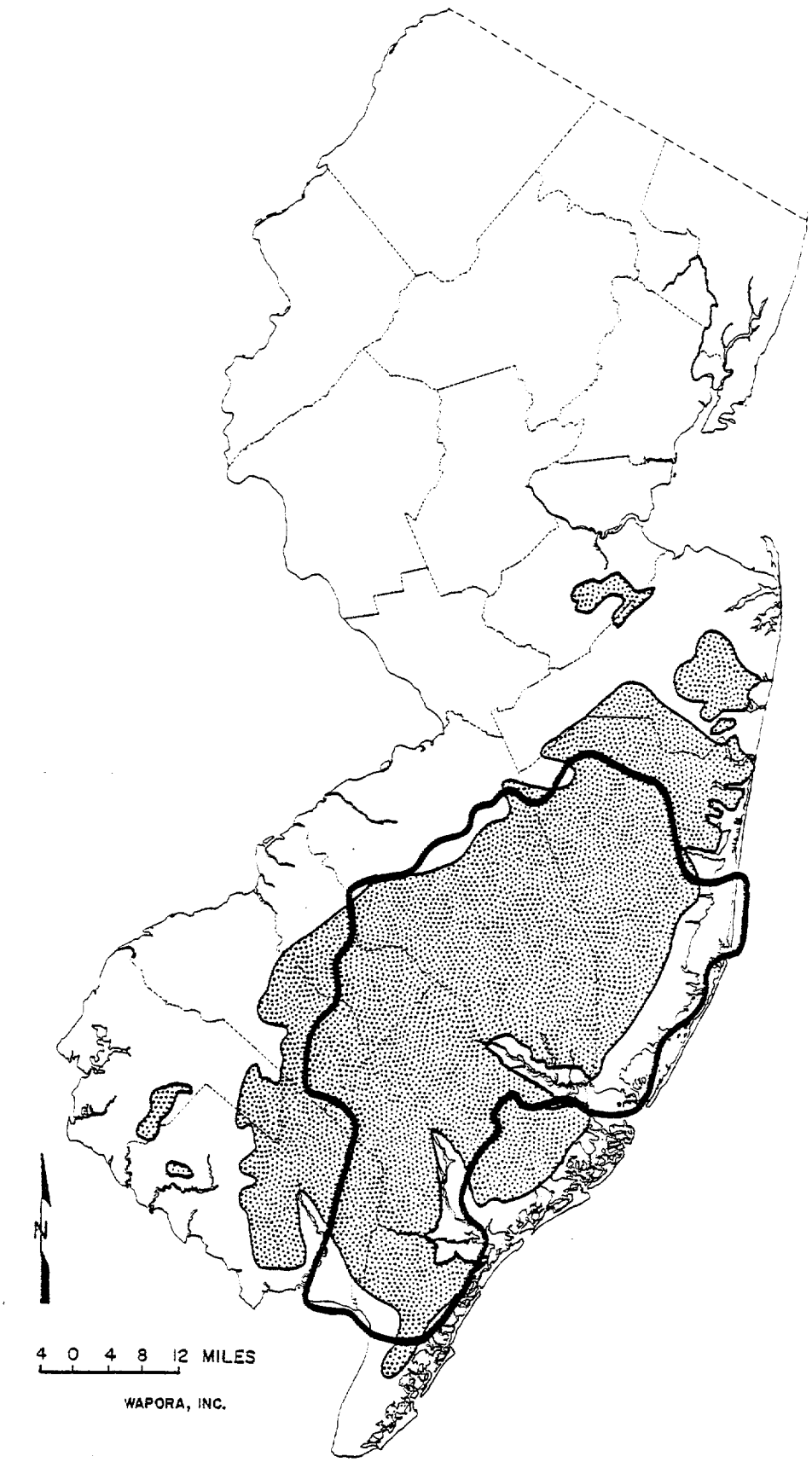

Figure 12. The Pinelands National Reserve boundary (PL 95-265). Pine barrens vegetation, exclusive of oak-pine fringe areas and stands of Virginia pine, is stippled. Vegetation boundaries are those of McCormick (1970).

promote the use of the Delaware River port facilities in the District and may cooperate with other agencies in developing and operating port facilities. At present the Corporation operates and is expanding port facilities in the City of Camden.

e. Delaware and Raritan Canal Commission

This Commission was established in DEP during 1974 to prepare and amend a master plan and to review State projects and State and local permits affecting the State-owned lands that comprise the Delaware and Raritan Canal State Park (NJSA 13:13 A-1 et seq.). The Delaware and Raritan Canal extends about 60 miles through 17 municipalities in Hunterdon, Somerset, Mercer, and Middlesex Counties. Commission jurisdiction includes all State-owned lands and waters, except that part of the canal system between the Landing Lane Bridge and its confluence with the Raritan River. All projects approved by municipalities within a review zone established by the Commission are subject to a binding review by the Commission, which may condition or reject the proposal on the grounds of non-compliance with the Commission's Master Plan. The Act directs that the Master Plan consider (1) the function of the Canal as a major water supply facility, (2) the need to provide recreational facilities, (3) historic sites preservation and restoration, (4) potential Canal uses in old urban environments, and (5) preservation of wilderness areas in undeveloped environments. A Master Plan was adopted during 1977.

The Commissioner reviews all proposed projects within 0.5 miles of the Park for potential drainage, visual, and other environmental impacts. Within the more distant sections of watersheds tributary to the Canal, selected projects are reviewed for hydrologic and water quality impacts. Reviewed projects here are to include new or redeveloped residential construction of 25 or more dwelling units, projects with 1 acre or more of impervious surface, or various industrial facilities including petroleum and chemicals distribution systems, liquid and solid waste facilities, livestock feed lots, and mining operations.

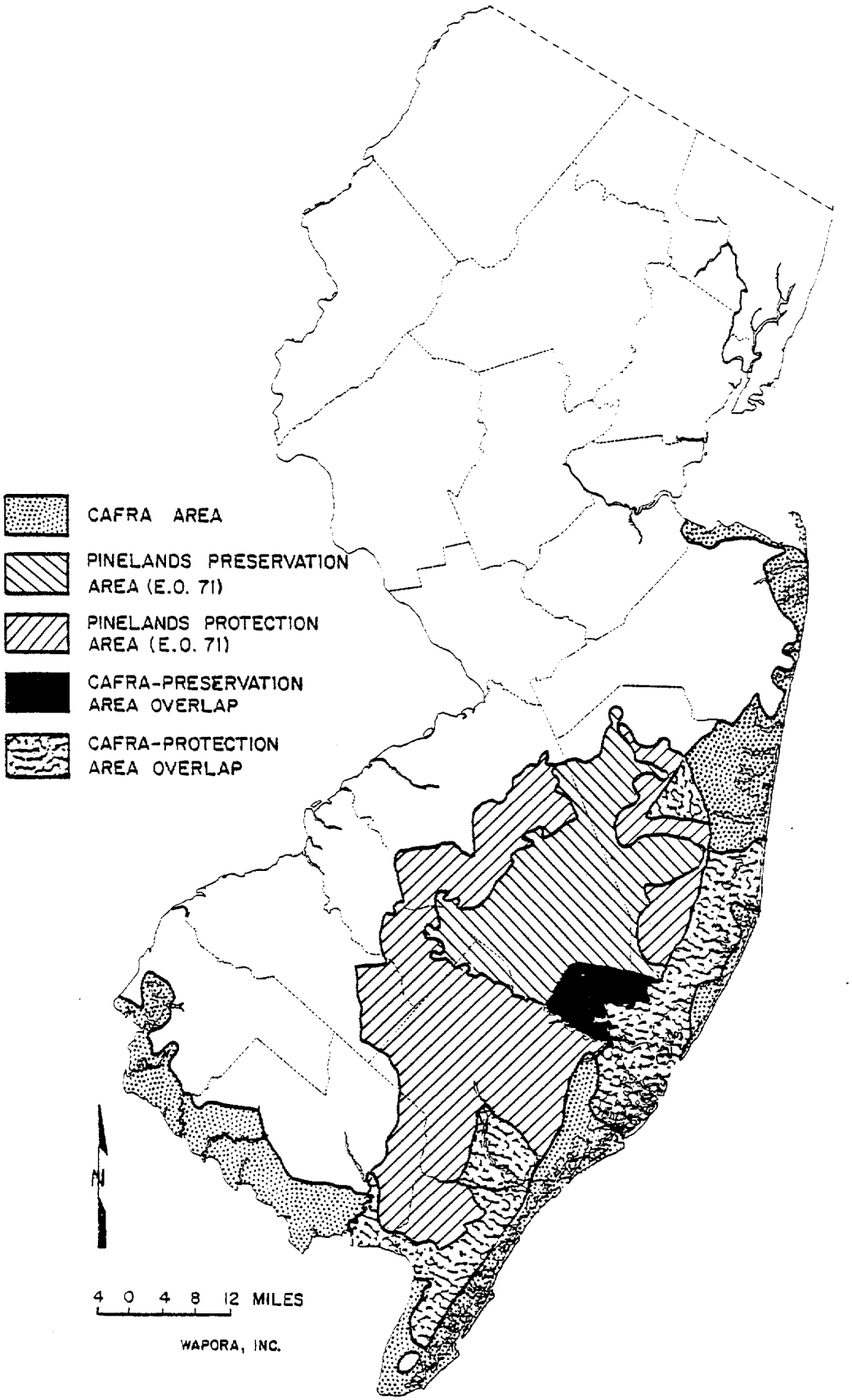

Figure 13. CAFRA and Pinelands administrative overlap in southern New Jersey.

XIII. OTHER GOVERNMENTAL AGENCY RESPONSIBILITIES

This chapter addresses first Federal and interstate regulatory programs. Then it outlines county and municipal authorities in New Jersey.

A. Federal Agency Responsibility

Federal Agency actions can be categorized generally into three classes. These include development actions undertaken directly by Federal agencies themselves, permit approvals by agencies for actions undertaken by others, and Federally funded actions.

1. Direct Federal Actions

Development undertaken directly by Federal agencies is to be coordinated with New Jersey coastal zone management policies in several ways. First, Federal agencies are required directly to make certain that their actions are consistent with the approved State management program pursuant to Section 307 of the Federal Coastal Zone Management Act. Second, Federal agencies must apply for Federal approvals under a variety of Federal regulatory programs that affect the coastal zone. As discussed in a subsequent section, several Federal regulatory programs require State certification that permitted activities will be consistent with State environmental policies. Third, major Federal actions that may affect the human environment significantly must be reported in environmental impact statements which analyze the nature of the impacts and afford the State an opportunity for comment, pursuant to the National Environmental Policy Act (PL 91-190). The regulations of the Council on Environmental Quality specifically authorize Federal environmental impact statements to address issues of concern to State and local governments, and they encourage early interagency participation during the scoping of EIS's (40 CFR 1500; 43 FR 230:55978-56007, 29 November 1978). Fourth, the system of clearinghouses established pursuant to OMB Circular A-95 provides early notification to the State (through the Division of State Planning in the Department of Community Affairs) that proposed Federal actions are being developed, and hence facilitate State interaction during Federal project planning. Likely Federal actions that may affect the coastal zone and that will be subject to New Jersey consistency determinations are listed in Table 29.

The agency with the broadest authority directly to undertake water resource development in New Jersey is the Army Corps of Engineers. Corps responsibilities throughout the State recently were summarized comprehensively (Army Corps of Engineers 1977). There are about 80 Corps projects completed, underway, or not started in New Jersey. More than half were undertaken by the Philadelphia District.

2. Federally Licensed and Permitted Activities

The regulatory actions of the Federal Government generally are subject to the same public notice and comment procedures as direct Federal actions. In addition, there are specific requirements that some Federal regulatory actions cannot be completed without opportunity for timely State comment

Table 29. Direct Federal activities likely to require State consistency determinations in the New Jersey coastal zone.

General Services Administration	Property acquisition Building design and construction Disposal of surplus lands
Army, Navy, Air Force (Department of Defense, Military responsibilities)	Acquisition and design of new or enlarged installations Actions on Federal lands with potential impact on coastal lands or waters
Army Corps of Engineers (Department of Defense, Civil Works)	Navigational dredging and spoil disposal projects. Breakwaters and erosion control projects Beach nourishment projects Reservoir and dam projects Emergency coastal rehabilitation projects Harbor drift clearance projects
Fish and Wildlife Service (Department of the Interior)	Acquisition and management of wildlife refuges
National Park Service (Department of the Interior)	Seashore, recreation area, and park acquisition and management[1] Management of Federal historic and cultural sites
Federal Highway Administration (Department of Transportation)	Highway construction and improvement

[1]National Park Service jurisdiction is expected to increase in the Pine Barrens as Federal land is acquired under PL 95-625, which was signed into law on 10 November 1978 as the National Park and Recreation Act of 1978.

and/or certification for consistency with State policies and plans. Some of the Federal permit jurisdictions overlap State jurisdiction under CAFRA, wetlands, or waterfront development permits. Others extend beyond the jurisdiction of existing State authorities to regulate inland wetlands within and beyond the coastal zone. Two of the Federal permit programs are designed for voluntary administration by the States, once the Federal requirements for program takeover have been satisfied. The following sections discuss those permit programs of greatest significance to evironmental management in the coastal zone.

a. Army Corps of Engineers

The Army Corps of Engineers administers several permit programs that directly affect development in or adjacent to New Jersey waterways. Northeastern New Jersey is under the jurisdiction of the New York District. Those river basins that drain to the Atlantic Ocean from the Manasquan River and Metedeconk River drainages southward, and all tributaries to the Delaware River, are under the jurisdiction of the Philadelphia District (Figure 14).

1. Authorities and Policies

The River and Harbor Act of 1899 (33 USC 401 et seq.) is one of the principal authorities for Corps regulatory jurisdiction. Section 9 requires a permit to construct any dam or dike in a navigable waterway of the United States. If the water is interstate, the consent of Congress also is required; if the water is intrastate, the consent of the State Legislature is necessary. Permits under Section 9 are drafted at the Department of the Army level, not by local Districts.

Section 10 of the River and Harbor Act allows persons desiring to improve any navigable river at their own expense to do so, provided plans and specifications are approved by the Secretary of the Army and the Chief of Engineers. Such improvements remain subject to Federal control and supervision thereafter.

Section 10 identifies structures (including bulkheads, piers, revetments, power lines, and navigation aids) and activities (dredging, stream channelization, excavation, and filling) that are prohibited in navigable waters unless permitted by the Corps. Any work outside a navigable waterway that limits its navigable capacity also may require a Section 10 permit. Processing of Section 10 permits is a major responsibility of District Offices.

Section 11 authorizes the establishment of harbor lines. These lines now serve as guides for determining the offshore limits of piers, wharves, and bulkheads from the standpoint of navigation. Corps permits are required irrespective of the location of proposed work in waterways with reference to harbor lines.

Section 13 commonly is known as the Refuse Act (33 USC 407). It prohibits the discharge of refuse matter into navigable waters of the United States or of their tributaries, or onto the banks of such waters if the

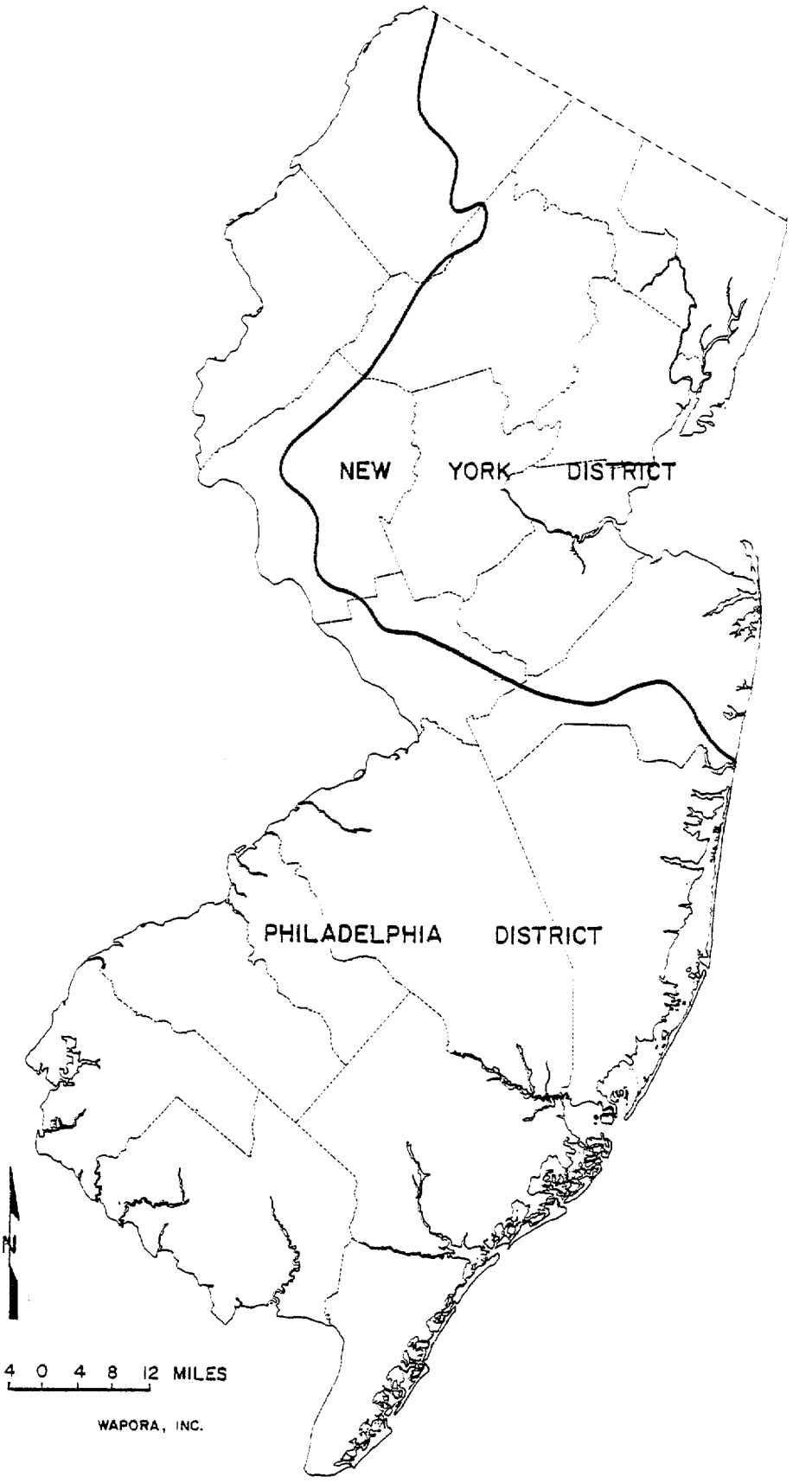

Figure 14. Administrative jurisdictions of the Army Corps of Engineers (North Atlantic Division) in New Jersey.

refuse matter is likely to be washed into the navigable water. Refuse Act prohibitions can be lifted by the issuance of an NPDES permit by US-EPA or by an authorized State pursuant to Section 402 of the Clean Water Act, as discussed subsequently. Although there is no current Refuse Act permit program, it remains a viable enforcement mechanism for Federal control over matter discharged into waterways.

These authorities were administered primarily to protect navigation and the navigable capacity of the Nation's waters from 1899 to 1968. The permit requirements during that period were applied to waters in use for the transportation of interstate and foreign commerce. Subsequently Corps regulatory responsibility and geographical jurisdiction were expanded substantially.

On 18 December 1968 Department of the Army policy was revised to include the following factors in addition to navigation that would be considered during permit review: fish and wildlife, conservation, pollution, aesthetics, ecology, and the general public interest (33 CFR 209.120). Work in waterways landward of established harbor lines was specifically included in the permit program as of 27 May 1970 (33 CFR 209.150); formerly such work did not routinely require a Corps permit under Section 10. Corps regulations were revised again during 1974 to add additional public interest factors during permit review (economics, historic values, flood damage prevention, land use classification, recreation, water supply, and water quality), to require consideration of alternatives and cumulative local impacts, and to adopt a policy protecting wetlands within Corps jurisdiction from unnecessary destruction (33 CFR 209.120).

Current policy is presented in the regulations issued on 19 July 1977 (33 CFR 320-329; 42 FR 138:37121-37164), which form the basis for this discussion. New factors that must be considered during public interest reviews include energy needs, safety, and food requirements, and additional attributes of wetlands. The jurisdiction of permit authority under Sections 9 and 10 of the River and Harbor Act generally extends to navigable waters of the United States, as defined administratively by the Corps. This area includes both those waters subject to tidal action shoreward to the mean high water mark and those that are, have been, or may be used to transport interstate or foreign commerce.

Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (the Ocean Dumping Act, 33 USC 1413) creates another Corps permit program to regulate the ocean dumping of dredged material. The Corps must evaluate using US-EPA criteria the dredged material proposed to be dumped into the ocean, and must use EPA-designated dump sites to the maximum extent feasible. When US-EPA criteria that would prohibit dumping are exceeded, the Corps must make an independent determination of the need for the proposed dumping, based on the effects of permit denial on navigation, economic development, and commerce. A determination of available alternative disposal methods also must be made by the Corps. Following Corps public notice, US-EPA may indicate that a permit should not be issued. If the Corps certifies that no economically feasible alternative method or

site is available, US-EPA must grant a waiver unless it finds that the proposed dumping will create an unacceptable impact on municipal water supplies, shellfish beds, wildlife, fisheries, or recreational areas. Approved interim dumping sites in the New York Bight off New Jersey are outside the New Jersey coastal zone, except for dumping grounds for sand dredged from various inlets, as authorized by 40 CFR 228.12.

The 1972 and 1977 Amendments to the Federal Water Pollution Control Act (now commonly called the Clean Water Act) affect Section 404, which establishes a Corps permit program to regulate the discharge of dredged material and of pollutants that comprise fill material into the waters of the United States. Evaluation of the impact acceptability of the proposed discharge in the aquatic ecosystem is according to the criteria of US-EPA. The Corps may issue a permit inconsistent with US-EPA guidelines only if the interests of navigation require. The US-EPA may restrict or prohibit discharge of dredged or fill material that may cause an unacceptable adverse effect on municipal water supplies, shellfish beds, fishery areas (including spawning and breeding areas), wildlife, or recreational areas.

Section 404 significantly broadened the geographical jurisdiction of the Corps to additional waters--including wetlands--not regulated under other permit programs. Following litigation concerning the extent of waters to which Section 404 jurisdiction is applicable, and after widespread public review of proposed regulations for its permit programs, the Corps issued an administrative definition of its jurisdiction during 1977 (33 CFR 323.2). In general, however, the lands subject to Corps jurisdiction have not been mapped. The waters of the United States now include, with respect to fill material regulated under Section 404:

(1) The territorial seas

(2) Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including adjacent wetlands.

(3) Tributaries to navigable waters of the United States including adjacent wetlands (exclusive of manmade nontidal drainage and irrigation ditches excavated on dry land)

(4) Interstate waters and their tributaries including adjacent wetlands

(5) All other waters of the United States not identified above, such as isolated wetlands and lakes ... and other waters that are not part of a tributary system to interstate or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

Discharges of fill into waters listed in (1) through (4) generally require a general or individual permit authorization unless the discharge occurs upstream from the point where mean annual flow is 5 cubic feet per

second (that is, in headwaters areas) or into natural lakes less than 10 acres in surface area (including their adjacent wetlands). Discharges of fill into Category 5 waters generally are allowed by nationwide permit authorization, unless case-by-case information indicates the need for an individual permit.

Wetlands subject to regulation under Section 404 also are defined by the Corps. They include those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The conduct of normal farming, forestry, and ranching operations, so long as they do not involve discharges of dredged or fill material, are not regulated under Section 404. Plowing, seeding, cultivating, and harvesting for the production of food, fiber, and forest products are excluded from the Corps definitions of discharges of dredged and fill material.

Any project reviewed by the Corps ordinarily is reviewed concurrently for the approvals necessary under the River and Harbor Act, the Ocean Dumping Act, or Section 404 of the Clean Water Act. Corps policies are applied whether authorization is required under one or more than one statute. The general Corps policies for permit evaluation include the considerations abstracted in Table 30.

Several classes of permits are authorized by the regulations in addition to individual permits on proposed actions. Nationwide permits for activities considered to have insignificant adverse effects were issued with the regulations, as noted below. General permits were authorized to be issued by Districts and Divisions following public notice and review for classes of actions that have insignificant individual and cumulative effects, given compliance with appropriate attached conditions. There is a general permit for the construction of private residential docks in New Jersey under Section 10 within the Philadelphia District jurisdiction. Letters of permission for actions subject to Section 10 of the River and Harbor Act, but not for ocean dumping or discharge of fill, can be issued when the action is judged to be minor, the environmental impact insignificant, and opposition unlikely. Letters of permission do not require public notice, but do require prior coordination with State and Federal fish and wildlife agencies. Nationwide permits for which individual applications are not needed so long as general conditions are met (unless

Table 30. Considerations to be weighed during public interest review of applications for permits to perform work in waters of the US regulated by the Army Corps of Engineers (33 CFR 320-329; 42 FR 138:37 121-37164, 19 July 1977).

GENERAL SUBJECT	MANDATORY CONSIDERATIONS
Public Interest	1. Weigh protection and utilization of important resources (conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production, public welfare in general)
	2. Consider extent of public and private need for proposed work
	3. Consider desirability of alternative locations and methods to accomplish the object of the proposal
	4. Consider extent and permanence of beneficial and detrimental effects on public and private uses of sites
	5. Weigh cumulative effects relative to existing and planned nearby structures or work
Wetlands	1. Identify significant wetlands that support aquatic and terrestrial biota; provide study areas, sanctuaries, or refuges; preserve natural drainage, sedimentation, salinity, flushing, current, or other patterns; shield other areas from waves, erosion, or storms; store storm and flood waters; provide prime groundwater recharge; or naturally purify water.
	2. Discourage unnecessary destruction or alteration of wetlands
	3. Include cumulative effects[1] when evaluating whether necessary adverse effects are outweighed by benefits, considering need for proximity to aquatic environment and available alternative sites

[1]The District Engineer may consult US-FWS, NMFS, US-EPA, SCS, and the appropriate State resource agency to assess cumulative effects on wetlands.

Table 30. Corps permit review considerations (continued).

GENERAL SUBJECT	MANDATORY CONSIDERATIONS
Fish and wildlife	1. Consult Regional Director, US Fish and Wildlife Service; Regional Director, National Marine Fisheries Service; and head of State fish and wildlife agency for measures to prevent direct or indirect loss of resources.
	2. Urge applicant voluntarily to modify proposal to avoid or mitigate adverse effects, and condition permit if necessary.
Water quality	1. Review application for compliance with effluent limitations, water quality standards, and management practices during proposed construction, operation, and maintenance.
	2. Consider Section 401 Clean Water Act certification of compliance (by Division of Water Resources, NJ-DEP) conclusive, unless US-EPA advises of other considerations.
	3. Condition permit if necessary to protect water quality.
Historic, scenic, recreational values	1. Evaluate effects on such values
	2. Use Federal, State, regional, and local land use classifications to identify such resources, and avoid adverse effects on goals of those controls or policies
	3. Specifically consider
	a. Designated or proposed Wild and Scenic Rivers and recreational rivers established by Federal, State, and local action
	b. Historic, cultural, or archaeological sites, especially those listed or eligible for the National Register of Historic Places

Table 30. Corps permit review consideration (continued).

GENERAL SUBJECT	MANDATORY CONSIDERATIONS
	c. Sites listed or eligible for the National Registry of Natural Landmarks
	d. Sites acquired or developed with assistance of Land and Water Conservation Fund or Recreational Demonstrations Projects Act of 1942 and other parks and recreational areas
	e. Any other areas named in Acts of Congress or Presidential Proclamations as National Rivers, National Wilderness Areas, National Seashores, National Recreation Areas, National Lakeshores, National Parks, National Monuments, Estuarine or Marine Sanctuaries, or similar designations.
Territorial sea	1. Review for effects on measurement base of territorial sea.
	2. If any change would occur, coordinate with Attorney General and with Solicitor, Department of the Interior
Adjacent property and projects	1. Receive favorably a landowner's effort to protect his property from erosion in general.
	2. Ascertain significant probable adverse effects on neighboring property, advise applicant of alternative measures, and condition or deny permit to avoid significant adverse effects.
	3. Review effects on access to waterway by nearby landowners and on public right of navigation; deny undue interference with access to or use of navigable waters.
	4. Advise applicant of potential conflict with authorized Federal projects and lack of Federal responsibility for any future damage that may result.

Table 30. Corps permit review considerations (continued).

GENERAL SUBJECT	MANDATORY CONSIDERATIONS
	5. Ascertain compatibility of proposal with existing and planned Federal projects nearby
Coastal zone	1. Require certification by Federal applicants of consistency with approved State coastal management program
	2. Require certification of consistency from non-Federal applicant to be approved by State coastal management agency (OCZM, NJ-DEP), unless agency waives certification, or fails to act within three months, or unless the Secretary of Commerce certifies consistency with Federal Coastal Zone Management Act or necessity for national security
Marine sanctuaries	1. Evaluate impact on marine sanctuary
	2. Require applicant to provide certification by Secretary of Commerce of consistency with Title III of Marine Protection, Research, and Sanctuaries Act of 1972, and condition permit as required by Secretary of Commerce
Floodplains	1. Evaluate alternatives to avoid adverse effects of construction in floodplains
	2. Seek to reduce flood losses and adverse impacts, and to preserve and restore natural and beneficial values of floodplains
Proposed impoundment	1. Condition permit to require applicant to operate and maintain structure so as to insure public safety
	2. Condition permit to require periodic inspection unless inspections are required or will be performed by another Federal agency

Table 30. Corps permit review considerations (concluded).

GENERAL SUBJECT	MANDATORY CONSIDERATIONS
Other agency requirements	1. Process application concurrently with other required approvals.
	2. Deny permit if another agency denies a required approval (but the application may be reinstated if the required approval subsequently is received).[1]
	3. Consider State, regional, and local agency views on the application as reflecting local factors of the public interest.
	4. Consider State, regional, and local land-use classifications and controls as reflecting local factors of the public interest.
	5. Request the Governor to resolve conflicting comments from several agencies within the State, unless a single State coordination agency has been designated.
	6. Issue permit applications favorably determined by the State in the absence of overriding national factors of the public interest, provided Corps policies and applicable Federal laws have been followed and considered.
	7. Proceed to process the application if a responsible Federal, State, or local agency fails to take action on authorization or furnish comments within three months.

[1]State and local certifications are not applicable to Federal Agency applicants, unless compliance is required by Federal law or Executive policy [33 CFR 322.3(c)(2)]. The 1977 Amendments to the Clean Water Act (PL 95-217) require that the Corps itself receive State water quality certification under Section 401 during regulatory review of Corps-sponsored projects.

the District Engineer determines otherwise) include the following:

SECTION 10 (33 CFR 322.4)

Aids to navigation placed by US Coast Guard
Structures in artificial canals in residential developments where the connection of the canal to a navigable waterway was authorized previously
Repair or replacement of previously authorized structures according to the original plans and for any originally approved uses
Devices for harvesting marine biota (pound nets, crab traps, eel pots, lobster traps) that do not interfere with navigation
Staff gages, tide gages, water quality testing devices, and other scientific structures that do not interfere with navigation
Survey activities including core sampling
Work completed before 18 December 1968 in waterways over which Corps jurisdiction has not been asserted, provided there is no interference with navigation

SECTION 404 (33 CFR 323.4)

Discharges accomplished prior to the effective dates of phasing in regulations (the latest such date was 1 July 1977)

Discharges[1,2] into:

Non-tidal streams, impoundments, and wetlands above headwaters
Natural lakes (including adjacent wetlands, if any) less than 10 acres in extent that are fed or drained by a non-tidal stream above its headwaters (generally, point of mean annual flow less than 5 cubic feet per second)
Natural lakes (including adjacent wetlands, if any) less than 10 acres in extent, isolated from surface streams
Other non-tidal waters that are not part of surface streams tributary to interstate or navigable waters

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[1]Such discharges should use, to the extent practicable, these management practices to minimize adverse aquatic impacts: (a) minimize quantity discharged to waterway by employing upland disposal sites, (b) avoid discharges in spawning areas during spawning seasons, (c) do not restrict movement of aquatic biota, impede normal or expected high flows of water, or cause relocation of waterway (except impoundments), (d) minimize adverse effects from impoundments that speed or slow water flows, (e) avoid discharges in wetlands, (f) place heavy equipment working in wetlands on mats, (g) avoid discharges into waterfowl breeding and nesting areass, and (h) remove all temporary fills entirely.

[2] Such discharges must: (a) not destroy a species or critical habitat for a species listed as threatened or endangered under the Endangered Species Act, (b) consist of suitable material free from toxic pollutants in other than trace quantities, (c) be maintained to prevent erosion and other non-point sources of pollution, and (d) not occur in a component of a National or State wild or scenic river system.

Discharges[1,2] classed as:

Backfill in utility line waterway crossings[3], provided there is no change in preconstruction bottom contours

Bank stabilization[3] less than 500 feet long averaging less than 1 cubic yard per running foot, outside wetlands, and not impairing surface flow of wetlands

Road crossings[4] with less than 200 cubic yards of fill below plane of ordinary high water on non-tidal stream, provided culvert on bridge does not restrict expected high flows and that discharges into wetlands do not extend more than 100 feet on either side of the ordinary high water mark

Fills incidental to bridges across tidal waters (cofferdams, abutments, foundation seals, piers, and temporary construction and access fills), not including bridge approach fills and causeways[5]

Repair or replacement of previously authorized fills or those constructed before authorization was required, according to the orginal plans and for any originally approved uses

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[1]Such discharges should use, to the extent practicable, these management practices to minimize adverse aquatic impacts: (a) minimize quantity discharged to waterway by employing upland disposal sites, (b) avoid discharges in spawning areas during spawning seasons, (c) do not restrict movement of aquatic biota, impede normal or expected high flows of water, or cause relocation of waterway (except impoundments), (d) minimize adverse effects from impoundments that speed or slow water flows, (e) avoid discharges in wetlands, (f) place heavy equipment working in wetlands on mats, (g) avoid discharges into waterfowl breeding and nesting areass, and (h) remove all temporary fills entirely.

[2] Such discharges must (a) not be located proximate to a public water supply intake, (b) not occur in areas of concentrated shellfish production, and (c) not disrupt the movement of biota indigenous to the waterway, in addition to satisfying all the requirements in footnote 2 above.

[3] The activity will require a Section 10 permit if it is in navigable waters of the United States.

[4] The fill will require a US Coast Guard permit if located in navigable waters (33 USC 401).

[5] The approach fills will require a general or individual Section 404 permit if in navigable waters; both the approach fills and the bridge require a US Coast Guard permit.

The sole general permit in New Jersey was issued by the Philadelphia District under Section 10 on 2 October 1978. It expires on 31 December 1983. At that time the cumulative impacts of work performed under the permit will be reviewed prior to reissuance of the general permit. Structures authorized by the permit are characterized as follows:

- Open-structure docks supported by floats, pilings, or cantilevers on bulkheaded, privately owned, residential properties in residential areas for which the bulkhead previously was authorized by the Corps.

- No more than one dock per residential lot.

- Maximum dock dimensions are no greater than 5 feet channelward from the existing bulkhead and no less than 5 feet distant from adjacent properties on each side.

The permit is not applicable to

- Historic, cultural, or achaeological sites as provided in the National Historic Preservation Act of 1966.

- Sites eligible for or listed in the National Registry of Natural Landmarks.

- Any other areas named in Acts of Congress or Presidential Proclamations, as National Rivers, National Wilderness Areas, National Seashores, National Recreation Areas, National Lakeshores, National Parks, National Monuments, or similar areas such as estuarine and marine sanctuaries.

- Sites identified by the District Engineer as controversial or environmentally sensitive.

Anyone desiring to undertake work under the authority of the general permit must notify the District by letter, describing the scope of the project, exact location of project site, and approximate dates of proposed construction. (A copy of the DEP waterfront development permit application normally will provide sufficient information.) Each letter of notification is reviewed by the Corps to ascertain compliance with the criteria of the general permit. If compliance is confirmed, then a copy of the general permit and special conditions is forwarded to the applicant. No work can commence legally until the copy of the general permit is received by the applicant. Special conditions include the following:

1. Dock may be used only for non-commercial purposes.

2. Only placement of the open-structure dock is authorized. Dredging, filling, and other activities are not authorized. In particular, placement of structures on the docks, storage of

pollutants on the docks, and placement of sheathing or breakwaters on the docks are not authorized.

3. Each proposed dock must receive an approved NJ-DEP permit or DEP waiver of permit.

4. If any archaeologic or historic artifact is discovered in the project area, the permittee must cease work immediately and contact the District.

5. Permittee must preserve the integrity of the permitted structure and the safety of boats moored to it against damage from wave wash from passing boats, and the United States cannot be held liable for damage from wave wash.

6. The permittee must restore the waterway to its former condition upon receipt of a notice from the Department of the Army, within the time and manner specified, and at no expense to the United States. If the permittee fails to comply, the Corps may restore the waterway (by contract or otherwise), and recover the cost of restoration from the permittee.

(2) Enforcement

District offices of the Corps are charged with enforcing the regulatory programs. Cease and desist orders may be issued when unauthorized work is discovered. During the Corps investigation of unauthorized activities, views of US-EPA, US-FWS, NMFS, and other appropriate Federal, State, and local agencies are to be solicited. Should voluntary compliance with Corps requirements not be achieved, legal action may include criminal and civil prosecution leading to substantial fines, modification of the unauthorized work previously accomplished, removal of the unauthorized activity, and restoration of the area to its original or comparable condition. District offices may refer various types of cases to the local US Attorney for legal action; other classes of cases must be referred to the Office of the Chief of Engineers (33 CFR 326.4). After-the-fact authorizations may be processed and issued or denied following public notice and review, if such actions are judged to be in the public interest.

(3) Transfer of Program Administration to States

The 1977 Amendments to the Clean Water Act (PL 95-217) authorize the States to administer the Section 404 program for discharges of dredged and fill material into certain inland waters (including wetlands) of the United States. The States are not authorized to assume the Section 404 permit program, however, for those waters here described as navigable waters (together with their adjacent wetlands) in accordance with Corps

definitions.[1] A program for administering Section 404 permits may be authorized by US-EPA after the State has demonstrated that it possesses sufficient jurisdiction and enforcement authority to administer the program, and has provided for the public notice, interagency coordination, and other procedural requirements mandated for State programs by the Clean Water Act.

During 1978 US-EPA drafted procedures for approving State 404 permit programs, and the regulations were expected to be published during 1979 as 40 CFR parts 123, 126, 127, and 230 (43 FR 231:56167, 30 November 1978). In general, the statutory requirements for Section 404 closely parallel requirements for State NPDES permits under Section 402 of the Clean Water Act. Transfer of the program will be accomplished by a Memorandum of Understanding between US-EPA and the State. Such memoranda must be updated at least every third year. A memorandum of agreement between the State and the Corps also will be required by US-EPA. The Corps will continue to administer Section 404 permits for navigable waters and their adjacent wetlands. New Jersey currently lacks the authority to administer a Section 404 program for waterways subject to delegation. US-EPA will retain the authority to object to any State-issued Section 404 permit for violations of the Act, violations of US-EPA guidelines, and objections raised by other Federal agencies (including, but not limited to the Corps of Engineers, Fish and Wildlife Service, and National Marine Fisheries Service).

b. Environmental Protection Agency

All of New Jersey is included in Region II of the US Environmental Protection Agency, which has headquarters in New York City. The National Pollutant Discharge Elimination System (NPDES) permit program established by Section 402 of the Clean Water Act is administered by US-EPA, but New Jersey is in the process of applying for approval to administer the program. State authority to administer the NPDES program is provided by the 1977 Water Pollution Control Act (NJSA 58:10A-1 et seq.). US-EPA will retain the authority to veto State-issued permits after transfer of the program to the State. Proposed revision to US-EPA regulations that cover the NPDES permit programs were published on 21 August 1978 (43 FR 162:37077-37134).

The NPDES permit program establishes effluent self-monitoring requirements for point sources of wastewater. Existing sources also must be scheduled for compliance with any nationwide minimum effluent limitations established to protect State-designated water quality and uses. New sources generally are subject to more stringent limitations than existing sources. As mentioned previously, certification by the State (Division of Water Resources in DEP) pursuant to Section 401 is a mandatory element of Section 402 NPDES permit processing by US-EPA, along with public notice and

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[1]Here navigable is used in the traditional sense of the Corps of Engineers, that is, waters actually used for navigation. This includes all tidal waters and their adjacent wetlands. Only shoreland wetlands are eligible for delegation of Section 404 permit authority to the States.

interagency review. This certification provides the State with an opportunity to recommend conditions more stringent than nationwide minimum conditions, if appropriate to maintain or enhance water quality, particularly in waterways designated as water quality limited (a class that includes most New Jersey waters). Each NPDES permit is valid for no longer than five years. There currently are about 1,400 permits in New Jersey. There is to be no discharge of pollutants from 1985 onward.

Under US-EPA administration, new sources also must have received permit approval following comprehensive environmental review before their construction can begin. The review considerations are not limited to water quality aspects of the proposed new sources, but must include all Federal environmental protection responsibilities (40 CFR 6.900-6.924; 42 FR 7:2449-2459, 11 January 1977). The review of new sources may result in formal environmental impact statements. Federal NEPA review is not mandated when NPDES permits are issued by States.

Clean Water Act programs similar to NPDES may be assumed by the States for regulating aquaculture (Section 318) and sewage sludge (Section 405), as well as dredged or fill material (Section 404, as previously noted). The Section 318 and 405 programs are combined with the Section 402 program. All State-administered US-EPA programs must conform with current Federal laws. Proposed US-EPA regulations incorporate requirements of the Clean Water Act of 1977 (PL 95-217) into the State program requirements. (40 CFR 123; 43 FR 162:37077 et seq., 21 August 1978).

US-EPA also administers an ocean dumping permit program pursuant to Section 102 of the Ocean Dumping Act (PL 96-532, 33 USC 1411-1421). This program is coordinated with the related Section 103 permit issued by the Corps of Engineers. Public notice and interagency review includes opportunity for State certification under Section 401 of the Clean Water Act for proposed dumping in or that might affect the State waters in the contiguous territorial sea. State certification for dumping proposed outside the contiguous territorial sea is not required unless the State can demonstrate that the proposed dumping will violate water quality standards within its jurisdiction (40 CFR 222.3). Various substances are subject to differing degrees of strictness in regulation, depending on their potential for environmental effects on the marine ecosystem. Dumping must be at sites approved by US-EPA for interim use. Ocean dumping is expected to be terminated entirely by the mid 1980's.

US-EPA review of Section 404 permits issued by the Corps is based on authority mandated directly by the Clean Water Act in Section 404. US-EPA can condition or deny permits for the discharge of dredged or fill material. Existing regulations are at 40 CFR 230 (40 FR 173:41291-41298, 5 September 1975), and new regulations are expected by the end of 1978. Section 10 review authority and procedures for administrative referral upward of disputed permits from Corps District Offices to higher authority are derived from the 1967 Memorandum of Understanding between the Departments of the Army and the Interior, when the Federal Water Pollution Control Administration (now US-EPA) was a part of the Department of the Interior. The Meadowlands implements the Fish and Wildlife Coordination Act.

US-EPA also exercises air quality responsibility under the Clean Air Act. The DEP Bureau of Air Pollution Control has prepared a State Implementation Plan for New Jersey. Unless the Plan is not approved by US-EPA, air quality permits will remain a State responsibility, and the primary US-EPA roles will continue to include permit overview and establishment of minimum standards. Section 118 of the Clean Air Act states that all Federal facilities are subject to State air pollution control laws.

Pursuant to the Clean Air Act Amendments of 1977 (PL 95-95 and PL 95-190) US-EPA administers a permit program to insure the prevention of significant deterioration (PSD) in addition to compliance with other applicable regulations (40 CFR 51; 43 FR 118:26379-26410, 19 June 1978). PSD regulations are applied to any stationary source of air pollutants in one of twenty eight categories listed in the June 1978 regulations that has the potential to emit 100 tons or more annually of a pollutant regulated under the Act (currently, particulate matter and sulfur dioxide). They also are applied to any stationary source that is considered to be a major emitting facility because it is capable of emitting 250 tons per year or more of any regulated pollutant. One full year of ambient monitoring data, together with the results of modeling, is required as part of a PSD application, and US-EPA must issue its permit decision within one year of acceptance of a complete application. PSD review is slated to become a State responsibility when appropriate revisions are made to the State Implementation Plan.

Section 162 of the Clean Air Act establishes certain classes of Federal lands as mandatory Class I areas with respect to the prevention of significant deterioration. All new sources near the Brigantine National Wildlife Refuge wilderness area, and major new sources throughout southern New Jersey, may require limitations to preserve air quality in this mandatory Class I area.

c. Department of the Interior

The Department of the Interior, through the Bureau of Land Management, has primary responsibility for managing Federal lands of the Outer Continental Shelf (OCS). It controls lease sales and sets the conditions according to which leases are issued. Permits and licenses for the geophysical exploration of leased Federal lands are the responsibility of the US Geological Survey. Corps of Engineers review of Section 10 permits for OCS mineral leases are limited to impacts on navigation and national security; environmental reviews are the responsibility of the Department of the Interior.

Other agencies in the Department, notably the Fish and Wildlife Service and the National Park Service, have no direct regulatory responsibility outside the Federal lands managed directly by them. Both the Fish and Wildlife Service and the National Park Service review public notices and impact statements, and they regularly comment on actions that affect their sphere of expertise and jurisdiction.

The Heritage Conservation and Recreation Service administers a $5 million matching grants program for maritime heritage preservation. The funds are part of an appropriation under the National Historic Preservation Act of 1966. Grant applications are processed for properties listed on the National Register of Historic places, and funds are granted also for surveys that lead to National Register listings.

The Fish and Wildlife Service has specific statutory responsibility pursuant to the Fish and Wildlife Coordination Act (16 USC 661-667e; 48 Stat. 401, as amended) to comment on permits issued by the Corps of Engineers for work in waterways, and it routinely consults with the DEP Division of Fish, Game, and Shell Fisheries when preparing its comments on projects in New Jersey. Fish and Wildlife Service policies that it uses in project reviews under its several statutory authorities regarding work in waterways are summarized in guidelines that became effective during 1975 (40 FR 231:55809-55824, 1 December 1975). General policy guidelines for proposals involving new work (Section 5.2 of the Guidelines) include the following considerations:

1. Encroachments into waterways and wetlands are discouraged where biologically productive wetlands and shallows would be damaged significantly or public rights of access, use, and enjoyment would be unreasonably infringed upon.

2. Sites and designs are encouraged to comply with comprehensive regional and statewide land-use plans that balance public needs (including coastal zone management plans).

3. Any proposal that in combination with other developments will have adverse cumulative effects that would unreasonably degrade environmental resources or diminish human satisfactions from the waterway are not acceptable to US-FWS and will be strongly discouraged.

4. Structures, facilities, or activities not dependent on the waterway will be considered unacceptable unless the applicant demonstrates that the proposed use is in the public interest and no alternative site is available.

5. Proposals for sewage treatment lagoons that require filling of wetlands will be discouraged.

6. US-FWS will object to or request denial of Federal permits for any proposed project not designated or located to avoid preventable significant damages and to minimize and mitigate for unavoidable losses to fish, wildlife, and other environmental values.

More detailed policies and recommendations are listed for fourteen categories of activities in Section 5.3 of the Guidelines. Apartments, shops, and restaurants are named as examples of non-water dependent facilities.

Six specific situations that may lead to a recommendation of permit denial or objection to the authorization of a Federal project involving work in waterways are:

1. The project or activity will directly destroy, damage, or degrade fish and wildlife, their habitat, or other significant environmental values, including part or all of a natural functioning ecosystem.

2. The project will lead to, encourage, or make possible the destruction, damage, or degradation of fish and wildlife, habitat, or other significant environmental values, including part or all of a natural functioning ecosystem.

3. Public use of a natural or other environmental resource will be restricted or curtailed.

4. Public benefits will not clearly exceed public losses, ignoring any private gains not clearly related to health, safety, or protection of property.

5. The project purposes are not water related or dependent.

6. Alternative upland sites are available for the proposal which would involve less environmental cots and generally better satisfy the public interest.

It is the policy position of US-FWS that there is a national recognition that wetland and shallow water habitats have such high ecological and social values as to admit of their destruction or degradation only where there is no question that the public interest demands it. Detailed investigations that demonstrate projects to be environmentally sound and in the public interest are the responsibility of project sponsors. US-FWS evaluates specific projects individually on their merits for compliance with the policy guidelines in their particular ecosystem settings. Special permit conditions may be suggested to the regulatory agencies as a means of providing that authorized work actually is carried out as promised.

Pursuant to a 1967 Memorandum of Understanding between the Secretary of the Interior and the Secretary of the Army, Corps District Engineers cannot override objections of Regional Directors of the Fish and Wildlife Service regarding permit actions. Unresolved cases are referred to Washington for further review and ultimate disposition by the Secretaries, if necessary. These procedures insure that the concerns of the Fish and Wildlife Service receive thorough consideration in accordance with the Fish and Wildlife Coordination Act.

In addition to its permit review responsiblities, the Fish and Wildlife Service assists other agencies in carrying out surveillance to identify and investigate unauthorized work. Its personnel cooperate as appropriate in enforcement actions. US-FWS staff may conduct followup monitoring to ascertain whether projects are conducted in accordance with permit

conditions and in a manner that avoids or minimizes adverse impacts. US-FWS also provides technical guidance and assistance to government agencies and to others concerning the environmental management of water and wetlands. Coastal biota of particular concern to US-FWS include migratory birds, anadromous fish, and species identified as endangered with extinction or threatened with endangerment.

d. Department of Commerce (National Marine Fisheries Service)

The National Marine Fisheries Service (NMFS) a unit of the National Oceanic and Atmospheric Administration in the Department of Commerce, is the agency primarily responsible for marine fisheries research, management, and protection. It actively reviews Federal permits for effects on marine fisheries. This agency routinely coordinates closely with FWS, and its comments typically urge environmentally protective measures. NMFS has no regulations governing its review of permits and Federal agency actions, but its procedures generally resemble those of FWS, with which the agency predecessor of NMFS formerly was associated in the Department of the Interior. The memorandum of agreement between the Departments of Interior and Army is being revised and is expected to include the Department of Commerce and to recognize specifically the role of NMFS in referring disputed Corps permits from District level to higher authority.

e. Department of Transportation

Two agencies of the Department of Transportation have regulatory responsibilities that frequently may affect development in the coastal zone. These are the Coast Guard and the Federal Aviation Administration. The Coast Guard issues permits for deepwater ports under the Deepwater Port Act of 1974 (PL 93-627).

The US Coast Guard also administers a permit program under Section 9 of the River and Harbor Act of 1899 and pursuant to the Department of Transportation Act (PL 89-270) and the General Bridge Acts of 1906 and 1946 (33 USC 491; 33 USC 595) that parallels the program of the Corps of Engineers. Coast Guard authority comprehends bridges and causeways proposed for construction in navigable waters. Minor road crossing fills in navigable waters also are included in Coast Guard responsibilities. Interagency reviews following public notices are part of the Coast Guard permit procedures. When another Federal agency is responsible for lead agency compliance under NEPA (for example, a Federal Highway Administration Project), the Coast Guard review is concerned primarily with navigation. When the Coast Guard is the sole responsible Federal agency, however, it must evaluate all environmental aspects of the project during public interest review. Coast Guard Section 9 permit regulations are under revision and are expected to be republished during 1979. The new regulations will include procedures for coordination with DEP-OCZM for State certification of consistency of proposals from non-Federal applicants. All of New Jersey is within the Third Coast Guard District, based at Governor's Island, New York City.

The Federal Aviation Administration (FAA) reviews proposed construction in the flight paths of airports and advises concerning painting and lighting requirements for structures to insure visibility to pilots. It also permits and licenses the construction, operation, and alteration of airports. Notification to the Eastern Regional Office of FAA is required for all proposed construction in New Jersey that is to extend more than 200 feet above ground level, unless it is shielded by terrain or by other buildings in urban areas (FAA Regulations Part 77, Subchapter B). This Office is at JFK International Airport Federal Building, Jamaica, New York. FAA review is based on air safety considerations. Marking and lighting standards appear in Advisory Circular 7/74-60-1E dated November 1976.

f. Department of Energy

The Department of Energy was organized during 1977 to provide more nearly centralized Federal planning and regulation of energy facilities. Regulatory programs that may affect the New Jersey coastal zone include energy pricing and allocation actions by the Federal Energy Administration, interstate wholesale electricity rate setting and natural gas regulation by the Federal Power Commission, the setting of economic terms for outer continental shelf leasing (formerly under Department of the Interior control), regulation of interstate oil pipelines and rate setting (formerly under the Interstate Commerce Commission), and energy conservation standards for new buildings (formerly under the Department of Housing and Urban Development).

g. Nuclear Regulatory Commission

This independent agency is responsible for the regulation of nuclear reactors. It has issued detailed regulations for the licensing of nuclear power plants, including environmental assessment procedures, and it sets standards for the safe use of radioactive materials. Regulations of the Nuclear Regulatory Commission appear at Title 10 of the Code of Federal Regulations in Chapter I (Parts 0-199).

h. Department of Housing and Urban Development

The Federal Emergency Management Agency is responsible for administration of the Federal flood insurance program. This agency publishes interim flood hazard boundary maps and permanent flood insurance rate maps. Municipal regulations must meet minimum Federal standards in order for eligibility for Federal flood insurance and for loans from Federally regulated lending institutions. Some 540 local governmental entities in New Jersey were participating in the National Flood Insurance Program during 1979 under either the regular program (178 communities) or the emergency program (362). Ten municipalities were not in the program, although their flood hazard areas had been identified for more than one year. No communities were suspended for non-compliance (FEMA 1979).

3. Federal Assistance to State and Local Government Agencies

Several mechanisms exist for coordinating Federal assistance to State and local agencies with coastal zone management. As in the case of direct Federal actions, Federal assistance is subject to notice procedures of the Office of Management and Budget Circular A-95. The Department of Community Affairs serves as the A-95 clearinghouse for the State. Many assisted activities require Federal or State permits, and thus are subject to the regulatory controls and interagency reviews discussed previously. Major Federal assistance actions with significant environmental effects are subject to EIS procedures under the National Environmental Policy Act of 1969.

DEP-OCZM will continue to use the A-95 review process and other mechanisms to become aware of Federal assistance actions affecting the coastal zone. It may comment on the consistency of the proposed actions with coastal policies, if a consistency determination previously has not been made in response to a direct request. When alternative measures to reduce inconsistencies with coastal policies are not adopted voluntarily by applicants, DEP-OCZM may use the A-95 procedures and coastal zone appeal procedures of NOAA and Secretary of Commerce (15 CFR 930; 43 FR 49, 13 March 1978) to enlist the support of the sponsoring Federal agency.

Substantial Federal financial assistance typically is a part of major wastewater treatment facilities and highway projects. US-EPA grants for planning and constructing publicly owned wastewater treatment works under Section 201 of the Clean Water Act are channeled to local agencies through the Division of Water Resources in DEP. US-EPA administers a host of programs which provide municipalities with assistance in environmental matters. These programs cover the general topics of air quality, noise, pesticides, toxic substances, radiation, solid waste, and water quality (US-EPA 1979b). Proposed facilities must be compatible with the areawide management plans (Section 208 plans) which now are being developed, and which are required by US-EPA to be coordinated with coastal zone management plans. Population estimates must be approved by the State and by US-EPA before wastewater management works are funded by US-EPA, because Federal policy precludes the use of Federal funds for the construction of new facilities that will stimulate growth, as opposed to meeting the backlog of existing waste disposal needs. Highway projects and mass transit construction are likely to be addressed in environmental impact statements prepared jointly by the New Jersey and United States Departments of Transportation. Federal financial asistance programs subject to consistency review are listed in Table 31.

B. Interstate Responsibilities

Several interstate agencies have been established to carry out water quality management, comprehensive regional planning, and the planning, construction, operation, and management of river crossings, port facilities, and interstate parks. These agencies were formed by New Jersey in cooperation with New York, Delaware, and/or Connecticut, and have received Congressional approval. These agencies generally have policymaking bodies appointed by the State governors, with Executive Directors responsible for staff implementation of agency programs.

Table 31. Federal financial assistance programs subject to consistency with coastal zone policies (USDOC-OCZM and Hawaii Department of Planning and Economic Development 1978). Reference numbers are those of the US Office of Management and Budget. Asterisks (*) indicate an unclassified program.

Federal Grants, Loans and Guarantees in the Coastal Zone[2]

1. Grants for Planning and Management

AGRICULTURE

*	Rural development planning grants

COMMERCE

11.302	EDA planning assistance
11.418	NOAA CEIP grants

DEFENSE

12.600	Community economic adjustment

HEALTH, EDUCATION & WELFARE

13.206	Areawide comprehensive health planning

HOUSING & URBAN DEVELOPMENT

14.203	Comprehensive planning assistance
14.702	State disaster plans and programs

INTERIOR

15.401	Outdoor recreation State planning
15.904	Historic preservation

TRANSPORTATION

20.103	Airport planning grants
20.205	Highway research, planning and construction
20.505	Urban mass transportation studies grants

WATER RESOURCES COUNCIL

65.001	Water resources planning

ENVIRONMENTAL PROTECTION AGENCY

66.001	Air pollution control program grants (planning)
66.005	Air pollution survey and demonstration
66.302	Solid waste planning grants
*	Areawide waste treatment planning and water quality implementation plans (Sec. 208)
*	Statewide continuing planning process for water pollution control

2. Grants for State, Local and Private Development

AGRICULTURE

10.409	Irrigation, Drainage, and Other Soil and Water and Conservation Loans
10.414	Resource conservation and development loans.
10.418	Water and waste disposal systems for rural communities
10.419	Watershed protection and flood prevention loans
10.901	Resource conservation and development
10.904	Watershed protection and flood prevention (Exception: small projects costing under $7,500 for erosion and sediment control and land stabilization and for rehabilitation and consolidation of existing irrigation systems.)
*	Rural Development Act of 1972 -- loans and grants for essential rural community facilities (Sec. 104), rural industrialization assistance (Sec. 118), watershed protection and flood prevention (Sec. 201 e, f, g), water storage facilities (Sec. 301)

Table 31. Federal assistance programs (continued).

COMMERCE

11.300	EDA grants and loans for public works and development facilities
11.304	EDA public works impact projects
11.407	NOAA commercial fisheries research and development
11.411	NOAA fishery cooperative service
*	NOAA grants to purchase and operate estuarine sanctuaries under Coastal Zone Management Act of 1972
11.501	Maritime development and promotion of ports and intermodal transport systems
11.508	Maritime capital construction fund

DEFENSE

12.101	Corps beach erosion control projects
12.102	Corps flood control works and Federally-authorized coastal protection works, rehabilitation
12.105	Corps protection of essential highways, highway bridge approaches and public works
12.106	Corps flood control projects
12.107	Corps navigation projects
12.108	Corps shagging and clearing for flood control
12.109	Corps shagging and clearing for navigation

HOUSING AND URBAN DEVELOPMENT

14.207	New communities--loan guarantess
14.211	Surplus land for community development
14.307	Urban renewal projects
14.607	Public housing--modernization of projects
14.701	Disaster assistance

INTERIOR

15.400	Outdoor recreation--acquisition and development
15.501	Irrigation distribution system loans
15.503	Small reclamation projects
15.600	Anadromous fish conservation
15.602	Conservation law enforcement training assistance
15.603	Farm fish pond management
15.604	Fishery research-information
15.605	Fish restoration
15.608	Sport fish management
15.609	Wildlife enhancement
15.610	Wildlife research information
15.611	Wildlife restoration
15.904	Historic preservation

TRANSPORTATION

20.102	Airport development aid program
20.201	Forest highways
20.204	Highway beautification-landscaping and scenic enhancement
20.209	Public lands highway
20.500	Urban mass transportation capital improvement grants
20.501	Urban mass transportation capital improvement loans

TREASURY

*	General revenue sharing

ENVIRONMENTAL PROTECTION AGENCY

66.001	Air pollution control program grants
66.015	Construction grants for wastewater treatment works
66.017	Water pollution control-State and interstate program grants
66.504	Solid waste research grants
66.505	Water pollution control demonstrations
66.000	Environmental protection-consolidated program grants
*	Programs under Federal Water Pollution Control Act Amendments of 1972

Table 31. Federal assistance programs (concluded).

3. Operational, Service and Research Grants

AGRICULTURE

10.902	SCS soil and water conservation
10.903	SCS soil surveys
10.906	River basin surveys and investigations

COMMERCE

11.303	EPA technical assistance
11.417	NOAA sea grant
11.400	NOAA geodetic control surveys
11.401	Nautical charts and related data (NOAA)

DEFENSE

12.100	Corps aquatic plant control
12.104	Corps flood plain management service

HOUSING AND URBAN DEVELOPMENT

14.214	Urban systems engineering demonstration grants
14.216	Governmental management--technical assistance and information services

INTERIOR

15.800	USGS geologic and mineral resource surveys and mapping
15.801	USGS map information
15.802	USGS minerals discovery loan program
15.803	USGS topographic surveys and mapping
15.804	USGS water resources investigations
15.950	OWRR additional water resources research
15.951	OWRR water resources research-assistance to States for institutes
15.952	OWRR water resources research-matching grants to State institutes
15.953	OWRR water resources scientific information center

NATIONAL SCIENCE FOUNDATION

47.036	Intergovernmental science and research utilization
*	Research applied to national needs (RANN) program

1. Delaware River Basin Commission (DRBC)

This agency was created by the Delaware River Basin Compact of 1961. Section 3.8 of the Compact requires that any project with significant impact on water resources in the Delaware River Basin receive approval from the Commission prior to its construction. Section 11 provides further that any public water resources project must be approved by the Commission as consistent with its Comprehensive Plan for the Basin before funds can be spent on its construction. The Commissioner of DEP is the representative of the Governor on the Commission representing New Jersey. The DRBC is headquartered in Trenton.

Docket approval for projects under Section 3.8 or Section 11 may be received from the Commission following review according to the Comprehensive Plan and Rules of Practice and Procedure. The rules specify threshold sizes of projects that require Commission review, and the multiple factors that must be considered, including the applicable water quality classifications and discharge standards of the Commission.

Resolution 78-10 amended the rules of the Commission by adding a policy on wetlands effective 28 June 1978. The Commission seeks to preserve and protect all wetlands, including swamps, marshes, and bogs, within the four-state Basin, in recognition of the public benefits provided by wetlands. Projects that propose alteration of wetlands 25 acres in extent or larger will be reviewed by DRBC. Projects that affect less than 25 acres of wetlands can be reviewed by DRBC (1) if the project is determined to be of major regional or interstate significance and no State or Federal permit review applies, or (2) if a Commissioner or the Executive Director determines that the final action of the State or Federal permitting agency may not reflect adequately the Commission's wetlands preservation policy. The Commission will pay special attention to identifying feasible alternatives and to reducing adverse impacts from wetlands projects that it reviews.

The DRBC definition of wetlands includes areas inundated by surface or groundwater with a frequency sufficient to support a prevalence of aquatic life that requires saturated soil conditions for growth and reproduction, as well as wetlands delineated by a signatory State. Hence DRBC review can extend to many wetlands not delineated as coastal wetlands by the State of New Jersey.

2. Interstate Sanitation Commission (ISC)

The Interstate Sanitation Commission, headquartered in New York City, began operations during 1936. It has issued effluent standards for discharges into waters under its jurisdiction in the New Jersey - New York - Connecticut metropolitan area. The Commission is established under a compact between the three States (New Jersey approval is in RS 32:18; NJSA 32:18-1 to 18-23 and 19-1 to 19-10). New Jersey waterways under Commission jurisdiction include:

the Hudson river and New York upper bay and estuaries and tidal waters thereof between the New York-New Jersey boundary and Constable Point on Constable Hook, the Kill Van Kull and Arthur Kill to the mouths of the rivers entering into the Kills; Newark bay and the estuaries thereof up to the mouth of the Passaic river; and up to the mouth of the Hackensack river; Raritan bay together with the Raritan river up to the Victory bridge on said river between Pert Amboy and South Amboy; together with the Cheesequake creek up to the New York and Long Branch Railroad bridge on said creek at Matawan; Sandy Hook bay; together with the Shrewsbury river up to the passenger railroad bridge between Navesink Light and Highland Beach on said river.

The ISC does not operate a permit program. It reviews public notices and applications for State or Federal discharge permits and Section 401 State water quality certifications to insure that ISC requirements will be met. Its standards are enforceable independently of other State and Federal water quality authorities.

3. Tri-State Regional Planning Commission

The Tri-State Regional Planning Commission is responsible for continuing advisory comprehensive regional planning in the New Jersey - New York - Connecticut metropolitan region. It operates under an interstate compact pursuant to Chapter 12 of the New Jersey Laws of 1965 (as amended by C.11 L.1969, C.14 L.1970, and C.161 L.1971) and similar enabling legislation in New York and Connecticut, with Federal funds and matching State monies. Its jurisdiction in New Jersey includes the Counties of Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union. The Commission reviews applications for Federal aid in the region pursuant to Section 204 of the Demonstration Cities and Metropolitan Development Act of 1966, and furnishes information to Federal agencies concerning the consistency of proposed actions with regional development plans. It also acts as the regional clearinghouse for transmitting notice of future Federal actions to local governments pursuant to OMB Circular A-95. It regularly comments on environmental impact statements and participates in the planning of transportation and other infrastructure. It also collects planning data on its region, and it is headquartered in New York City.

4. Delaware Valley Regional Planning Commission (DVRPC)

The Delaware Valley Regional Planning Commission is established by the 1965 compact between Pennsylvania and New Jersey as a continuing advisory comprehensive regional planning agency. Its region in New Jersey includes Burlington, Camden, Gloucester, and Mercer Counties. The Commission reviews application for Federal aid in the region pursuant to OMB Circular A-95. It regularly comments on environmental impact statements and participates in the planning of transportation projects and other infrastructure. It is preparing the 208 areawide water quality managment plan for Camden, Burlington, and Gloucester Counties and for Mercer County, and it is

developing regional plans for the year 2000. It is headquartered in Philadelphia.

5. Palisades Interstate Park Commission

This Commission administers the Palisades Interstate Park along the Hudson River in Bergen County and other parks in New York State. Headquartered at Bear Mountain, New York, the Commission was established during 1937 in cooperation with New York State pursuant to New Jersey L. 1937 C. 148. It also administers the Fort Lee Historic Park near the western terminus of the George Washington Bridge.

6. Port Authority of New York and New Jersey

This agency is a major provider of terminal, transportation, and related commercial facilities in the New Jersey - New York metropolitan region. It was established during 1921 by action of New York and New Jersey (New Jersey L.1921 C.151), and has operated under its present name since 1972. The Authority is responsible for operating six interstate tunnels and bridges between New Jersey and New York, four airports (including Newark International Airport and Teterboro Airport) and two heliports, seven marine terminals (including terminals at Newark, Elizabeth, and Hoboken) a bus terminal, a bus station, two union truck terminals (one in Newark), and the World Trade Center. A rapid transit system operated by the Port Authority Trans Hudson Corporation (PATH) links Newark, Jersey City, Hoboken, and Manhattan. In New Jersey the Port of New York District in which the Authority may operate includes an area described roughly by an area of about 25 miles radius centered on the Statue of Liberty. All of Hudson County is included, together with parts of Bergen, Passaic, Morris, Essex, Union, Somerset, Middlesex, and Monmouth Counties. Outlying municipalities in the District include Paterson, Plainfield, New Brunswick, Matawan, and Atlantic Highlands. The precise lines of latitude and longitude are described in Article II of the compact. The undertaking of major activities by the Authority requires the consent of the Governors and Legislatures of the two States. During 1978 the mandate of the Port Authority was increased to include industrial redevelopment in the Port District.

7. Delaware River and Bay Authority

This agency was organized during 1963 pursuant to an interstate compact between New Jersey (C.66 L.1961) and Delaware. Its responsiblities generally are to construct and operate crossings of the lower Delaware River between the two States, to study and develop transportation and terminal facilities along the River as needed for economic development, and perform such other functions as may be mandated by the Legislatures of the two States. In New Jersey the jurisdiction of the Authority includes the Delaware River and Bay southward from the Pennsylvania-Delaware boundary, together with adjacent areas needed for crossing approaches or for terminal facilities. Major facilities currently operated by the Authority include the Delaware Memorial Bridge and the Cape May - Lewes Ferry. An analysis of transportation needs for future River crossings is underway during 1979.

8. The Delaware River Port Authority

This bi-state agency is established by a 1952 compact between New Jersey and Pennsylvania (New Jersey approval is at RS 32-3-1 et seq.). It is authorized to construct and operate river crossings and port facilities, to provide commuter rail rapid transit within a 35-mile radius centered on the City of Camden, to study the need for future port improvements, and to promote commerce on the Delaware River. It also is to cooperate with other agencies engaged in similar activities. The Port District in New Jersey includes all of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean, and Salem Counties. The agency is supported from its own revenues, and new construction activities require the consent of the Governors of New Jersey and Pennsylvania. At present its major facilities include the Benjamin Franklin, Walt Whitman, Commodore Barry, and Betsy Ross Bridges; and the PATCO (Port Authority Transit Corporation) high speed rail line between Philadelphia and New Jersey communities.

C. County Responsibilities

Counties have relatively little direct control over land use in general in New Jersey. They are responsible for some road construction and maintenance activities, and they may review and approve or deny proposed subdivisions that affect county roadways or drainage facilities (NJSA 40:27-1 et seq.). County health departments in some counties review proposed on-lot sewage disposal facilities, and they typically provide inspection and sampling support to NJ-DEP.

County boards of freeholders typically are the County governing bodies in New Jersey. The freeholders fund the County planning agencies, environmental agencies, and County engineers. They also control the siting of County facilities.

Counties are authorized to engage in advisory comprehensive planning, and they have more extensive planning capabilities than most municipalities. County planning departments are to review municipal plans and ordinances proposed under the 1975 Municipal Land Use Law (NJSA 40:55D-1 et seq.), and they may review applications to the DEP Division of Coastal Resources for permits. County agencies also maintain lists of cultural resources (primarily historic sites) that are of county or wider significance. County planning departments primarily have permissive rather than mandatory review responsibilities. They typically function as clearinghouses and keep track of physical and socioeconomic developments countywide.

County mosquito commissions are agencies that have direct impact on the coastal zone in New Jersey. There currently are sixteen county mosquito commissions (authorized by NJSA 26:9-14 et seq.). Their operations are supervised generally by the State Mosquito Control Commission. Each has two ex officio members (the Director of the State Agricultural Experiment Station and the Director of Health), at least three members who are or have been employees of boards of health, and one member chosen by the county Board of Freeholders, for a total of seven. County mosquito commissions submit plans for exterminating mosquitoes or eliminating their breeding

places to the State Commission (NJSA 26:9-30). County Boards of Freeholders are obligated to raise the funds needed by the commissions to implement approved plans. The State Commission may assist the county commissions with State funds, vehicles, or equipment. The four counties which do not have mosquito commissions accomplish mosquito control through their Departments of Public Works (Atlantic, Mercer, and Union Counties) or Public Resources (Hudson County). Some Counties have established environmental agencies. These advisory bodies provide technical assistance to the planning board on environmental matters.

D. Municipal Responsibilities

The 567 New Jersey municipalities have been delegated broad powers to control land use within their boundaries, subject to the New Jersey and United States constitutional limitations on the taking of private property without just compensation or due process of law. There are no unincorporated lands in the State. Statutes granting municipalities the authority to make and enforce ordinances are found generally in Title 40 of the New Jersey Statutes Annotated. Municipalities typically use subdivision, zoning, and setback ordinances and variances to control land use.

The Municipal Land Use Law of 1975 (NJSA 40:55D-1 et seq.) revised a number of previous statutes. New, comprehensive zoning ordinances were required by 1 February 1977, by which time existing ordinances were to expire. Before a new comprehensive zoning ordinance can be enacted, a land use plan must have been prepared and adopted by the municipal planning board. Interim zoning ordinance enactment is allowed until February 1979 (subsequently extended through May 1979) in municipalities where the municipal master plan is incomplete. All proposed municipal ordinances regulating land uses must be submitted to the municipal planning board (and to the appropriate county planning agency) for review and recommendations. Each municipal master plan, to which zoning must be tied, is to be compared with County and State plans, and is to be reviewed and updated every six years. Thus municipal planning and zoning currently are being tied together by State mandate in New Jersey.

Advisory environmental commissions or committees have been established in about half of the State's municipalities (pursuant to NJSA 40:56A.1-5 as amended by Chapter 35, Laws of 1972). These bodies generally compile environmental information and recommend measures to protect environmental resources. Some commissions may review environmental impact statements mandated by local ordinance for proposed developments.

Municipalities may enact various environmental controls in order to protect the public health, safety, and welfare in accordance with their traditional police powers. Many municipalities have ordinances governing individual and semi-public water suppliers (pursuant to the authority granted in NJSA 26:3-69.1 through 69.6) and regulating the disposal of sewage. Local requirements may be more stringent than Statewide regulations, although those municipalities seeking new development may be reluctant to require more than State-imposed minimum standards.

Municipalities also may establish, alone or jointly, community agencies to construct or operate facilities for such purposes as regional planning, water supply, sewerage and solid waste disposal, housing construction, redevelopment, drainage and shore protection, improvement of navigation, port development, and alleviation of flood damage. A number of sewerage authorities have been established in New Jersey. They are politically diverse, and their jurisdictions generally do not correspond with watersheds. Such agencies have major effects on water quality and land use in the State by virtue of their control of existing and new wastewater systems.

There are several restrictions on municipal land use control in New Jersey, and others have been proposed. Municipalities have no or little control over State actions on State-owned lands and over Federal actions on Federally owned lands. Public utilities may appeal adverse municipal land-use decisions to the New Jersey Board of Public Utilities (NJSA 40:50-55; 55D-19), and the Board may overrule the municipality if all State requirements are met. The public utility category includes a wide range of facilities as defined in NJSA 48:2-13. The NJ-DEP has the authority to overrule local disapproval of solid waste facilities under NJSA 13:1E-1 et seq. Eminent domain is available to the State for military defense installations and for airports (NJSA 20:1-3.1), for State highways (NJSA 27: 7-44.6), and for Green Acres parks and open spaces (NJSA 13: 8A-24). Finally, municipalities may face legal challenge if they deny permits to construct the local fair share of low and moderate income housing, as determined by the Department of Community Affairs, or unreasonably restrict public access to beaches. During 1978 bills were under consideration in the Legislature to provide the New Jersey Department of Energy with additional power to overrule municipal disapproval of major energy facility sites, but they were not approved.

Municipal governing bodies exercise final approval over most planning decisions in New Jersey. They must approve developments that affect water demand, wastewater disposal, runoff, and a host of other factors of the natural and socioeconomic environment. They also control the siting of municipal facilities, subdivision and site plan regulations, and the protection of watersheds. They also fund municipal staff agencies.

Municipal planning boards typically provide expert and citizen input into planning decisions. Zoning boards of adjustment likewise tend to combine citizen and expert inputs to decisionmaking. Local boards of health are organized under the recent Local Health Services Act, and they ordinarily work closely with County health departments. Some municipalities contract with the County to provide health services.

XIV. PRINCIPAL ESTUARINE REGULATORY PROGRAMS AND THEIR IMPLEMENTATION

Three regulatory programs in DEP form the backbone of the existing coastal zone management program in New Jersey. These are the coastal wetlands, coastal area facility (CAFRA), and waterfront development (riparian) programs. Waterfront development permits are administered in close coordination with grants, leases, and licenses of State-owned tidelands. As part of the June 1979 reorganization of the Division of Coastal Resources, administration of the three permit programs was assigned to the Bureau of Coastal Project Review. Tidelands real estate transactions are administered by the Bureau of Tidelands under the direction of the Natural Resource Council.

Another permit program addresses proposed stream encroachments. It is administered by the Division of Water Resources, but uses the same CP-1 application form as the three key DEP permits. Hence this program also is described briefly.

In northern New Jersey the estuarine wetlands along the Hackensack River are within the jurisdiction of the Hackensack Meadowlands Development Commission, an independent State agency with extensive land-use control powers and a legislative mandate to preserve the delicate environmental balance of the District. The operations of the HMDC are examined in some detail in this chapter to show their role in estuarine protection.

Because it is the principal New Jersey law specifically intended to protect the estuarine ecosystem, the discussion begins with the Wetlands Act of 1970.

A. THE WETLANDS ACT OF 1970

This section addresses first the provisions of the Act, then administrative interpretations of the mandated wetlands inventory. Next the procedures for regulation of activities affecting wetlands are described. Finally provisions are noted for enforcement.

1. Provisions of the Act

Assembly Bill 505 was introduced on 9 February and approved by the Governor on 5 November 1970 to become Chapter 272 of the Laws of the 1970 (NJSA 13:9A-1 et seq.). It became effective on the date of approval. This act requires the Commissioner of Environmental Protection to inventory tidal wetlands in New Jersey and to regulate (after public hearing) the alteration of certain coastal wetlands. Because of the many values provided by the estuarine zone between sea and land, the Legislature found that further deterioration and destruction of the estuarine zone must be prevented by regulating activities that include dredging, filling, removing, or otherwise altering or polluting the estuarine zone (Section 1.a.).

The Commissioner of Environmental Protection was directed to conduct "an inventory and maps of all tidal wetlands within the State. The

boundaries of such wetland shall generally define the areas that are at or below high water" (Section 1.b.). Each map was to be filed in the county in which the wetlands are located. No exception is placed on the "inventory and maps of all tidal wetlands within the State" under the language of Section 1.b. There is no exclusion of tidal wetlands in any geographic section of the State, no exclusion of freshwater tidal wetlands, and no limitation to selected vegetation types or species combinations. There also is no specific requirement that vegetation types within the wetlands be distinguished from one another. The inventory was to be completed by 5 November 1972.

Section 2 of the Act describes the authority of the Commissioner of Environmental Protection to regulate alteration of certain "coastal wetlands". The term "coastal wetlands" is defined to include various subaerial landscape types

> any bank, marsh, swamp, meadow, flat, or other low land subject to tidal action

within stated geographical limits that encompass the coastal zone

> in the State of New Jersey along the Delaware bay and Delaware river, Raritan bay, Barnegat bay, Sandy Hook bay, Shrewsbury river including Navesink river, Shark river, and the coastal inland waterways extending southerly from Manasquan Inlet to Cape May Harbor, or at any inlet, estuary or tributary waterway o[f] any thereof

below an inclusively defined local water elevation not restricted to the mean high tide limit of State-owned tidelands

> including those areas now or formerly connected to tidal waters whose surface is at or below an elevation of 1 foot above local extreme high water

and that may be inhabited by 19 named species of characteristic plants

> and upon which may grow or is capable of growing some, but not necessarily all, of the following: salt meadow grass (Spartin[a] patens), spike grass (Distichlis spicata), black grass (Juncus gerardi), saltmarsh grass (Spartina alterniflora), saltworts (Salicornia [e]uropaea, and Salicornia bigelovii), Sea Lavend[e]r (Limonium carolinianum), saltmarsh bulrushes (Scirpus robustus and Scirpus paludosus var. atlanticus), sand spurrey (Spergularia marina), switch grass (Panicum virgatum), tall cordgrass (Spartina pectinata), hightide bush (Iva frutescens var. oraria), cattails (Typha angustifolia and

> Typha latifolia), spike rush (Eleocharis rostellata), chairmaker's rush (Scirpus american[us], bent grass (Agrostis palustris), and sweet grass (Hierochloe odorata).[1]

The Section 2 definition of "coastal wetlands" is silent regarding the inclusion or exclusion for regulatory purposes of some of the lands which presumably must be inventoried as "tidal wetlands" in accordance with Section 1.b. The estuaries of the Hudson River, Upper New York Bay, Hackensack River, Passaic River, Newark Bay, Kill Van Kill, Arthur Kill, and their tributaries — all of which have some associated tidal wetlands and are ultimately tributary waterways of Raritan Bay through the Arthur Kill and Lower New York Bay — are not mentioned. Had all these waterways in northern New Jersey actually been excluded in the intent of the Legislature, however, it would have been unnecessary and superfluous to indicate that the land subject to the jurisdiction of the Hackensack Meadowlands Development Commission also was excluded from the term "coastal wetlands," as Section 2 states. Furthermore, tidal wetlands that support only plant species other than the 19 named species were not mentioned in the definition of "coastal wetlands". Examples of such tidal wetlands include the whitecedar and red maple stands of tidal swamp forests and also those tidal swamps with predominant shrub vegetation.

Before exercising his broad authority to regulate, restrict, and prohibit alteration of coastal wetlands, the Commissioner of Environmental Protection must hold within the county where the wetlands are located a public hearing on his proposed order, after giving notice to owners of record and after locally advertising the hearing. Adopted orders are to be recorded in the office of the county clerk or register of deeds and filed as a judgment against the deed of each wetland owner of record. Copies also are to be sent to known affected owners (Section 3). The Act does not affect State or private ownership or other rights or obligations concerning the mapped wetlands (Section 8).

Section 4 identifies regulated activities which are not to be conducted without a permit. Such activities include, but are not limited to,

> draining, dredging, excavation or removal of soil, mud, sand, gravel, aggregate of any kind or depositing or dumping therein any rubbish or similar material or discharging therein liquid wastes, either directly or otherwise, and the erection of structures, driving of pilings, or placing of obstructions, whether or not changing the tidal ebb and flow.

Two classes of activities are not regulated by the Act. One is the "continuance of commercial production of salt hay or other agricultural crops". The other is

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[1]Species names in this section follow the usage of the Wetlands Act unless otherwise noted.

> the exercise or performance of the powers and duties conferred or imposed by law on the State Department of Environmental Protection, the Natural Resource Council, and the State Mosquito Control Commission in said Department, the State Department of Health, or any mosquito control or other project or activity operating under or authorized by the provisions of chapter 9 of Title 26 of the Revised Statutes (Section 7).

In granting, denying, or imposing conditions on any permit, the Commissioner is to consider the effect of the proposal on

> the public health and welfare, marine fisheries, shell fisheries, wildlife, the protection of life and property from flood, hurricane, and other natural disasters, and the public policy set forth in Section 1.a. of this act.

Provisions for enforcement were made in Sections 5 and 7. Challenge by aggrieved landowners is to be made in the Superior Court (Section 6).

2. Administrative Delineation of Regulated Wetlands

During 1971 the NJ-DEP began the process of inventorying the tidal wetlands with the assistance of consultants. Black and white, color, and color infrared photographs were taken during June and July 1971 and August and September 1972. The photographs cover the coastal region generally from the mouth of the Raritan River eastward and southward along the Atlantic coast and tributary waterways, then along the Delaware estuary and its tributaries to the vicinity of Trenton. Tidal wetlands generally along the north bank of the Raritan River were not photographed. Wetland vegetation types then were delineated on the photo maps on the basis of photographic interpretation supplemented by field checks.

The procedure used to map wetlands[1] was described in Chapter 1 of the Basis and Background paper issued by NJ-DEP during April 1972. The "major species associations" were delineated to encompass "those natural groups ... of plant species occurring as mappable units; also, they have unique tones on aerial-type photographic film." Alphabetical designators were assigned to the plant species of "salt water" wetlands; numberical designators were applied to species of freshwater areas. Designators that include both salt water and freshwater species indicate brackish wetlands, according to the Basis and Background paper. The order of designators in the mapped species association units has no significance.

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[1]The Basis and Background paper drops the adjectives "tidal" and "coastal" describing wetlands. Presumably only "coastal wetlands", in the language of the Act, were addressed.

In saline wetlands, the designators used to label a species association indicate that those species are present on at least 25% of the acreage circumscribed by the inventory line. Species considered to be of "possible minor ecological significance" were not mapped separately. In some freshwater wetlands the lines are stated to encompass sparsely vegetated areas and open water.

Naturally occurring species groups whose area equals or exceeds 5 acres were delineated. Smaller areas were delineated if the areas contained wild rice (Zizania aquatica), a species not mentioned in the Act but considered to have high food value for wildlife. Areas smaller than 5 acres also were designated where convenient reference points facilitated field inspections by contractor personnel.

The administrative rationale for delineating vegetation types ("major species associations") was not spelled out in the Basis and Background Paper. Possibly the intent was to regulate different vegetation types differently; Section 6.3 of the Basis and Background Paper notes that the Wetlands Order prohibits the use of pesticides by persons regulated under the Act where there are significant mapped stands of high vigor saltmarsh grass, wild rice, cattail, chairmaker's rush, or Olney threesquare (Scirpus olneyi). (In fact Olney threesquare was omitted from the pesticides-regulating section of the Orders [Section 5.2.3.], wherein only the other four types are named [NJAC 7:7A-1.2 (d) 3].)

Forty-one species were listed by the contractor as characteristic wetland indicator species in the two test areas for the pilot mapping project (Earth Satellite Corporation and Mark Hurd Aerial Surveys, Inc. 1972: Appendix V):

Acnida cannabina	Pluchea camphorata	Zizania aquatica
Atriplex patula	Polygonum pensylvanicum	
Baccharis halimifolia	Polygonum punctatum	
Bidens laevis	Pontederia cordata	
*Distichlis spicata	Rumex verticillatus	
Echinochloa [w]alteri	Ruppia maritima	
Eleocharis olivacea	*Salicornia europaea	
*Eleocharis rostellata	*Spergularia marina	
Hibiscus palustris	*Scirpus americanus	
Impatiens biflora	Scirpus cyperinus	
Iris versicolor	Scirpus [o]lneyi	
*Iva frutescens	*Scirpus robustus	
Juncus effusus	Sparganium americanum	
*Juncus [g]erardi	*Spartina alterniflora	
Leersia oryzoides	Spartina cynosuroides	
*Limonium carolinianum	*Spartina patens	
Myrica pensylvanica	Solidago sempervirens	
*Panicum virgatum		
Peltandra virginica	*Typha angustifolia	
Phragmites communis	*Typha latifolia	

*Listed in the Act.

Twenty-seven (66%) of the indicator species are not named in the Act; five[1] species named in the Act were not included by the contractor in his list of indicators for the pilot area.

A list of all the type categories depicted symbolically (either alone or in combination) on wetlands photomaps is available from NJ-DEP (Table 32). It shows a total of 33 categories, 25 labeled by numbers ("freshwater" types) and 8 labeled by letters ("saline" types). A bare ground category appears among both the saline and the freshwater types. Two "vigor" categories of saltmarsh grass were distinguished on the basis of infrared color photographic returns. Nine species named in the Act were found not to be mappable categories; ten named species were shown as mapped categories. Twenty-one species not named in the Act were mapped as types either alone or in combinations. With the exception of two "saline" shrub types (hightide bush and groundsel shrub), one "freshwater" shrub type (roses), and the two bare ground categories, all of the mapped types are characterized by emergent herbaceous species. An administrative decision not to map tidal swamp forests and shrub swamps is reflected in the absence of their characteristic species from the contractor's list of indicators and from the DEP list of mapped types.

The upper (inland) wetland boundary, above which Wetlands Orders do not apply, was indicated as a continuous line. The position of the line was determined variously, depending on local conditions. No reference is made in the Basis and Background paper or on the maps to the statutory "1 foot above local extreme high water." The seaward extent of jurisdiction under the Wetlands Act is the seaward extent of lands mapped as wetlands.

Where the local relief change was considered to be abrupt, the upper (inland) wetland boundary was placed at the toe of the slope. Plant species occurring at[2] this boundary were stated to include salt meadow grass, hightide bush, switch grass, cattails, common reed, and groundsel shrub. On uplands considered dry as compared with wetlands, common species frequently were noted to include arrowwood, cedar[3], pine, oak, tulip, poplar, hickory, red maple, black gum, and sweet gum. (None of these is listed in the Act.)

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[1]Salicornia bigelovii, Scirpus paludosus var. atlanticus, Spartina pectinata, Agrostis palustris, and Hierochloe odorata.

[2]Here "at" apparently means "generally seaward of".

[3]Presumably, white cedar (Chamaecyparis thyoides); possibly also red cedar (Juniperus virginiana).

Table 32. Mapped categories of coastal wetlands in New Jersey. List provided by Office of Wetlands Managment, NJ-DEP, and edited to conform with terminology of this report. The symbol (X) means that two or more species are named in the Wetlands Act.

Map Symbol	Common Name	Scientific Name	Listed in Wetlands Act
	SALINE WETLANDS		
A	Saltmarsh grass ("high-vigor")	Spartina alterniflora	
B	Saltmarsh grass ("low-vigor")	Spartina alterniflora	X
C	Salt meadow grass	Spartina patens	X
D	Spike grass	Distichlis spicata	X
E	Hightide bush	Iva frutescens	X
F	Black grass	Juncus gerardi	X
H	Groundsel shrub	Baccharis halimifolia	
J	Predominantly bare ground		
	FRESHWATER WETLANDS		
1	Cattails	Typha spp.	(X)
2	Wild rice	Zizania aquatica	
3	Yellow water lily	Nuphar advena	
4	Arrow-arum	Peltandra virginica	
5	Common reed	Phragmites communis	
6	Cutgrass	Leersia oryzoides	
7	Pickerel weed	Pontederia cordata	
8	Water smartweed	Polygonum punctatum	
9	Marsh mallow	Hibiscus palustris	
10	Bare ground		
11	Water millet	Echinochloa walteri	
12	Salt reed grass	Spartina cynosuroides	
13	Chairmaker's rush	Scirpus americanus	X
14	Switch grass	Panicum virgatum	X
15	Olney bulrush (threesquare)	Scirpus olneyi	
16	Burmarigold	Bidens laevis	
17	Sedges	Carex spp.	
18	Sweet flag	Acorus calamus	
19	Jewelweed	Impatiens biflora	
20	Tearthumb	Polygonum arifolium	
21	Spike grass	Eleocharis spp.	(X)
22	Rushes	Juncus spp.	
23	Roses	Rosa spp.	
24	Marsh fleabanes	Pluchea spp.	
25	Arrowheads	Sagittaria spp.	

Where the transition from wetland to upland was considered to be gradual, the upper (inland) wetlands boundary was placed at the junction between stands of upland and wetland species. Mixtures of black grass, salt meadow grass, high tide bush, groundsel shrub, and switchgrass were distinguished as wetlands from adjoining upland stands of cedar[1] and hardwoods. Similarly mixtures of salt meadow grass, bulrush, and cattails were distinguished from mixtures of red maple, willow, alder, and hardwoods, according to the Basis and Background paper.

In artificially disturbed areas (such as roads, dikes, spoil piles, and occupied or unoccupied bare areas) the upper boundary was drawn to exclude most of these areas from regulation. This consciously conservative position was adopted by NJ-DEP in recognition of "the reduced biological value of most disturbed wetlands," which were reported no longer to support the kinds of vegetation listed in the Act. Similarly, where natural bare ground (such as salt pans) crossed an otherwise established section of wetlands boundary, the upper boundary was defined at the seaward edge of the bare ground.[2]

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[1]Presumably, white cedar (Chamaecyparis thyoides); possibly also red cedar (Juniperus virginiana).

[2]Areas where coastal wetland vegetation was growing or was capable of growing at the time of the inventory, but whose tidal flow was considered to have been reduced or cut off by some form of dike (for example, muskrat impoundments, waterfowl impoundments, hay meadows, or salt meadow grass stands), apparently were mapped as uplands. Some specific examples of this practice are known to the authors of this report, but whether it was customary throughout the inventoried region is uncertain. It is the experience of the authors of the present report that many characteristic coastal wetland species are capable of growing on lands that have been diked, impounded, or otherwise artifically disturbed. The mapping contractor's report (as discussed subsequently) implies that diked areas customarily were regarded as uplands. The general Basis and Background Paper is silent on this question, but Section 3.4 of the Basis and Background Paper attached to the initial Wetlands Order for Ocean and Salem Counties suggests that several thousand acres of coastal wetlands may have been excluded by conservative DEP policy from the protection afforded by the Wetlands Act (Goldshore, 1979:A-100 through A-102). Because many dikes are relatively ephemeral features unless maintenance is performed repeatedly, it is not unusual for tidal flow to become reestablished in diked areas in New Jersey. Moreover, coastal wetlands vegetation can persist indefinitely in the absence of tidal inundation, as the Legislature indicated in Section 2 of the Act when recognizing coastal wetlands as "including those areas now or formerly connected to tidal waters whose surface is at or below an elevation of 1 foot above local extreme high water." The US Fish and Wildlife Service (1965) noted that about 10,000 acres of marshes in southern New Jersey had been diked for the production of salt hay. Continuing habitat values were recognized in such areas.

Further definition of the upper wetlands boundary was provided by the contractor in his final report on the New Jersey Wetlands Pilot Project (Earth Satellite Corporation and Mark Hurd Aerial Surveys, Inc. 1972:4).

> The boundary between wetland and dryland [is] usually characterized by either a rapid rise in elevation with forested or agricultural ground as the wetlands border or ground rise in elevation producing a succession of plant communities from wetland to dryland. Plant species typical of N.J. wetlands as defined in the Wetlands Act of 1970, U.S. Fish and Wildlife Service inventory of N.J. wetlands, 1954, and this final report were used to identify the boundary.[1]

The contractor's definition appears to depart substantially from the language of the Act. No mention is made of land within the statutory "areas now or formerly connected to tidal waters whose surface is at or below an elevation of 1 foot above local extreme high water." Rather, a "rapid rise in elevation with forested or agricultural ground" is stated to characterize the border in many places. Agricultural ground is not defined by the contractor; agricultural lands were recognized explicitly by the Legislature to occur within the wetlands, and their continued cultivation without permits was expressly authorized (Section 4.2.). Excluding such lands from the mapping, however, precludes DEP regulation if their use changes from agriculture to activities that otherwise would require a permit. Forested ground apparently was assumed by the contractor to be a reliable demarcation of upland from tidal wetlands. The hypothesis that swamp forests (and shrub swamps) are not flowed by the tides in New Jersey was not substantiated by the contractor in his pilot project report, and it contradicts the findings

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[1]It is significant to note the contractor's claimed reliance on 1954 US-FWS data. The 1954 survey concerned marshes deemed important to waterfowl. During 1959 the US-FWS resurveyed all of the wetlands of New Jersey, including additional wetlands of low or negligible value to waterfowl. These were included because of the growing scientific recognition of the importance of all coastal wetlands to shellfish, finfish, and many wildlife species in addition to waterfowl. The contractor and DEP elected to ignore two US-FWS categories of coastal wetlands that represented about 4% of the 1954 inventory, namely shrub swamps and wooded swamps. In 1954 US-FWS reported 950 acres of shrub swamps and 8,530 acres of wooded swamps in coastal New Jersey. The New Jersey mapping contractor prepared no final report on the statewide project; hence reliance must be placed on the pilot mapping project report.

of the US Fish and Wildlife Service.[1] Whether swamp forests or shrub swamps exist within the statutory "elevation of 1 foot above local extreme high water" also was not addressed. Tidal swamp forests and shrub swamps presumably fall within the statutory phrase "any bank, marsh, swamp, meadow, flat, or other low land subject to tidal action."

Yet another boundary, the "biological high water line", was mandated by NJ-DEP to be determined by the contractor. This line may have been intended to reflect the Section 1.b. general language of the Act pertaining to tidal wetlands "that are at or below high water". The contractor's final report on the pilot mapping project does not define "biological high water line". The contractor does explain how a biological high water line was determined (Earth Satellite Corporation and Mark Hurd Aerial Surveys, Inc. 1972: 43-45).

Where there are saline wetlands, the biological high water line was distinguished in either of two ways. In some areas the line was depicted at the break between "high vigor" (alleged to be below high water) and "low vigor" (alleged to be above high water) stands of saltmarsh grass. These stands were distinguished using photographic images on color infrared film; they do not conform to tall and short growth forms distinguishable in the field. In other areas the line was established at the more readily identifiable boundary between saltmarsh grass (below high water) and salt meadow grass (above high water). In saline marshes the biological high water line apparently was mapped seaward of the upper inland wetlands boundary.

In fresh and brackish wetlands, the biological high water line was placed at the inland edge of stands of cattail, saltmarsh grass, wild rice, and arrow-arum. Here the biological high water line was reported generally to coincide with the upper inland wetlands boundary.

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[1]Nevertheless, the exclusion of swamp forests and shrub swamps was mandated by NJ-DEP to the contractor for the main wetlands mapping effort (Contract 2P-301, Section 3.2.1.1.):

> The upper WETLANDS boundary shall be defined as a continuous line formed by the uppermost boundaries of low growing herbaceous species and shrubs in wetlands to principally woody upland species, often accompanied by an abrupt rise in local relief.

The maps showing the biological high water line are not generally available[1], and the term is not used in the Basis and Background Paper that accompanies the Wetlands Order. Apparently the line was intended to depict a biological approximation of the average extent of flow by mean high tide.[2]

Wetland boundary lines are considered by NJ-DEP to be accurate within 10 feet of their true position on the ground. The scale of the filed photomaps is 1:2,400. Each sheet measures 3 feet by 3.5 feet and depicts an area 7,000 feet long north-south by 6,000 feet wide east-west. Each sheet thus represents about 964 acres (1.5 square miles). The photomaps are referenced to the New Jersey State Plane Coordinate grid system. Universal Transverse Mercator and latitude-longitude indications were computed and shown with reference to the New Jersey grid. Paper copies of vegetation type maps and of ownership overlays are available at cost from NJ-DEP. The maps also may be consulted both in Trenton and at county courthouses.

The wetland inventory is considered by NJ-DEP to be complete. Altogether 914 photomaps have been produced. All but 42 of these photomaps were promulgated following notice and public hearing at various times between 10 January 1973 and 5 August 1977. The Commissioner's Wetlands Order is in effect only for the mapped and promulgated wetlands. The remaining photomaps (not yet promulgated) cover areas in Burlington County (18 maps), Camden County (14 maps), and Gloucester County (10 maps).

Several categories of coastal wetlands, apparently, were excluded administratively from the inventory mandated by the Wetlands Act. First, most of the wetlands along the Raritan River have not been mapped or regulated through apparent oversight in taking the original photographs. Second, none of the tidal wetlands along waterways north of Raritan Bay has been inventoried under the Wetlands Act. Third, an unknown expanse of wetlands smaller than 5 acres in extent may have been omitted within the inventoried region. Fourth, tidally flooded swamp forests[3] and shrub

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[1]The line is shown on a set of maps kept by NJ-DEP wetlands management staff in Trenton and which can be consulted by the public there. It is not shown on the paper copies of photomaps which can be purchased from NJ-DEP staff for general use.

[2]The wetlands mapping may have been intended by NJ-DEP staff as a means of accomplishing part of the work to establish tidelands to which the State has a title claim. Mapping of tidelands was mandated by the Legislature during 1968 (NJSA 13:1B-13.2). Vegetation types distinguishable from aerial photographs, however, at best only imperfectly reflect tidal elevations, particularly where woody vegetation types are ignored. Woody vegetation types, in contrast, were mapped from aerial photographs when the coastal wetlands of Maryland were inventoried recently (McCormick and Somes 1979).

[3]Typical species could include red maple (Acer rubrum) and black gum (Nyssa sylvatica).

swamps[1] have been omitted entirely. Fifth, some diked coastal wetlands may have been excluded, particularly in the vicinity of Delaware Bay (but the Office of Wetlands Management is aware of only one instance in which a diked wetland was omitted).

The extent of inventoried and regulated coastal wetlands on the 914 maps produced by NJ-DEP has not been determined precisely. The total extent of regulated wetlands was estimated by NJ-DEP on 4 March 1976 to be 242,000 acres, based on 32% of each promulgated map being wetlands (Memorandum, Director D. T. Graham to Commissioner D. J. Bardin)[2]. Maps promulgated during 1976 and 1977 increased the total by 1,536 acres. The DEP-estimated extent of additional wetlands on the 42 photomaps not yet promulgated as of 1979 is 500 acres. Thus the total extent of land that is expected to be regulated by the Act, assuming no accretion and no alteration prior to map promulgation, is 244,036 acres (estimate from Office of Wetlands Management, 30 June 1978).

The wetland inventory recorded on the 914 photomaps essentially is a static representation of conditions at the time of the 1971-1972 photography. The prohibitions and restrictions imposed under the Act, however, did not become effective prior to map promulgation for any given parcel of land. If, for example, a landowner completed the placement of fill upon inventoried wetlands prior to promulgation of the wetlands map

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[1]A typical species is buttonbush (Cephalanthus occidentalis).

[2]The accuracy of this estimate is difficult to determine in the absence of measurements. Vegetation mapping in coastal Maryland at the same scale involved approximately 2,000 sheets and covered wetlands measured to occupy about 261,000 acres, giving an average of about 9% of each sheet as wetlands (McCormick and Somes 1979). The DEP estimate of protected acreage may be too high.

covering his land, his fill is not regulated under the Wetlands Act.[1] When consultation of aerial photographs and field inspections following inquiries identify such lands, it is the practice of the Office of Wetlands Management to inform the landowner that the subject land is outside the jurisdiction of the Wetlands Act and Wetlands Order. (Such lands in that part of the coastal zone within the CAFRA boundary thereupon become subject to the CAFRA regulations if a regulated facility is proposed.)

The Office of Wetlands Management (now part of the Bureau of Coastal Project Review) also has responded to a relatively small but increasing number of landowner inquiries concerning inventoried wetlands that may have undergone changes in elevation by natural processes since the date of photography, such that they no longer support or are deemed capable of supporting coastal wetland vegetation. Where field inspections confirm that the present relatively high elevation of a specific area appears to have been the result of natural processes and that the area in question no longer satisfies the administrative criteria used in the initial inventory, the landowner is informed that the specific area is no longer subject to the

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[1]Type B activities (as defined in a subsequent paragraph) in progress on the date of promulgation require approval of a permit before they can be continued or completed, according to Section 9.1 of the Wetlands Order. Commissioner R. J. Sullivan interpreted the intent of Section 9.1 as follows (Memorandum to Acting Director T.M. O'Neill, 29 January 1974):

> The intent of this section is to regulate encroachments upon wetlands which are truly wetlands as of the effective date of the Order. The section should not be interpreted to mean that placing fill on top of fill deposited prior to regulation requires a permit. Neither should it be taken to mean that the deepening of an excavation existing on the date of regulation should require a permit.
>
> The proper interpretation of the section is that only projects which contemplate the expansion of existing fill or an existing excavation onto wetlands require a permit before being allowed to proceed. In such cases, any work the applicant wished to do on the already filled or excavated area should be allowed to continue as long as it involves no expansion of the filling or excavation onto existing wetlands.

The position was upheld in Loveladies Property Owners Association vs. Max Rabb and David Bardin, Superior Court Docket A-2015-74.

Wetlands Act and Wetlands Order. The specific area defined by the Office may be either the same as or different from the area requested by the landowner for reconsideration.[1]

To date such determinations of diminution of wetland boundaries and resultant jurisdictions have been entered only in the files of the Bureau of Coastal Project Review. The desirability of entering these data graphically onto overlays to the wetlands photomaps is recognized, but limitations of staff have precluded map annotations heretofore. The file data on boundary determinations are open to inspection by the public, but the process does not lend itself readily to public scrutiny because no public notice or hearing is necessary.

No effort to date has been made to update the inventory in the opposite direction; that is, to add now-extant wetlands that were omitted from the historic inventory for whatever reason. In contrast to the process of deleting areas from the wetlands inventory and from Wetlands Order jurisdiction, whenever a wetlands map is amended to include land owned by someone not previously given notice, a public hearing must be held (Attorney General's Formal Opinion 16, 30 July 1975). In practice, the notice and hearing requirements (above and beyond any technical work necessary to identify additional wetlands) would pose a significant obstacle to expansion of the wetlands inventory by updating, just as they currently, in effect, prevent promulgation of the last 42 maps prepared during the initial inventory.

3. Regulation of Coastal Wetlands

Identical regulations have been promulgated in Wetlands Orders for each of the eleven counties which contain inventoried coastal wetlands. The Orders prohibit certain activities and establish a two-track permit procedure for regulated activities. Codified regulations for wetlands are found at NJAC 7:7A-1.1 et seq. Prohibited activities are the following:

- Placing, depositing, or dumping any solid waste, garbage, refuse, trash, rubbish, or debris.
- Dumping or discharging treated or untreated sewage or industrial wastes, either solid or liquid.
- Applying any pesticide on areas with significant stands of high vigor saltmarsh grass, wild rice, cattail, or chairmaker's rush as shown on wetlands maps (except by exempted agencies).

[1]Where there has been no apparent natural change in elevation, even though the vegetation may have died out or may have been replaced by species not named in the Act, the land is considered to be still capable of supporting wetland vegetation, and is not exempted from the Wetlands Order. No formal criteria or procedures for making such revisions to wetlands boundaries have been reduced to writing.

- Storing or disposing pesticides.[1]

- Applying persistent pesticides.[2]

Type A (abbreviated procedure) permits are required for the following relatively minor types of activity on regulated wetlands:

- Newly begun cultivation and harvest of naturally occurring agricultural or horticultural products.

- Excavation of a small boat mooring slip.

- Maintenance or repair of bridges, roads, highways, railroad beds, or other municipal or utility facilities (except in emergency situations, which merely require notice to NJ-DEP within 7 days of their initiation).

- Construction on pilings of catwalks, piers, docks, landings, footbridges, and observation decks, provided that the width of such structures is no more than twice the clearance between the structure and the wetlands.

Applications for Type A permits must include completed application forms; the established fee; written explanation of the need for the proposed activity and measures that will be taken to reduce detrimental environmental effects; detailed description of proposed structures, filling, and excavation; a map showing the location and boundaries of the area and the specific location of proposed structures, filling, excavation; names and addresses of owners of record of adjacent lots; and evidence of applicant's application for or receipt of all required riparian instruments and waterfront development permits.

Type B (full procedure) permits are required for other activities:

- Installation of utilities.

- Excavation for boat channels and mooring basins.

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[1] "'Pesticides' mean[s] any substance or mixture of substances labeled, designed, intended for or capable of use in preventing, destroying, repelling, sterilizing or mitigating any insects, rodents, nematodes, predatory animals, fungi, weeds and other forms of plant or animal life or viruses except viruses on or in living man or other animals; also any substance or mixture of substance[s] labeled, designed, or intended for use as a defoliant, dessicant or plant regulator" (NJAC 7:7A-1.3).

[2] "'Persistent pesticides' means pesticides whose residues and metabolic products persist in the environment over extended periods of time, including but not limited to DDT, Aldrin, Dieldrin, Chlordane, Endrin, Lindane, BHC, Heptachlor and lead or mercury compounds" (NJAC 7:7A-1.3).

- Construction of impoundments.
- Construction of seawalls.
- Diversion or appropriative use of water.
- Use of pesticides (except those insect repellents applied to skin or clothing of individuals), other than by exempted agencies.
- Driving machinery over wetlands which may alter the natural contour or impair the natural vegetation.
- Construction of any structure,[1] filling, or excavation.

Applications for a Type B permit must include generally all of the items for a Type A permit, plus detailed plans for future land uses, proof of notification of the county planning board and the Army Corps of Engineers, and an environmental impact statement covering topics specified in NJAC 7:7A-1.6(b). A public hearing is no longer mandatory for Type B permits.

For either type of permit, NJ-DEP must find that the activity for which a complete application has been filed meets the following four criteria of fact:

(1) It requires water access or is water oriented as a central purpose of the basic function of the activity.

(2) It has no prudent or feasible alternative on a non-wetland site.

(3) It will result in the minimum feasible alteration or impairment of natural tidal circulation.

(4) It will result in the minimum feasible alteration of the natural contour or impairment of the natural vegetation of the wetlands.

Type B permits are transferable when land is rented, leased, or sold, so long as the land use as set forth in the original application does not change.

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[1] "'Structure' means any assembly of materials above or below the surface of land or water, including but not limited to buildings, fences, dams, pilings, breakwaters, fills, levees, bulkheads, dikes, jetties, embankments, causeways, culverts, pipes, pipelines, roads, railroads, bridges and the facilities of any utility or governmental agency. Trees or other vegetation shall not be considered to be structures" (NJAC 7:1C-1.4). Duck blinds also are not considered to be structures (NJAC 7:7A-1.4).

A public hearing may be held on any wetlands permit application at the discretion of NJ-DEP. Local ordinances more restrictive than State permit conditions are not to be superseded.

Decisions to approve, approve conditionally, or deny wetlands permits are recommended by the Office of Wetlands Management to the Director, Division of Marine Services. The Director was delegated wetlands permit decisionmaking authority by Commissioner's Administrative Order 12 on 8 December 1977. Administrative appeals are made to the Commissioner.

Administrative interpretation of the first finding of fact regarding water access or orientation for proposed activities hsa been formalized (Memorandum, Director D. T. Graham to T. F. Hampton, 25 March 1976):

> The intent of these sections is to preserve and protect the characteristic shoreline on a body of water for its best use, environmentally. It should not be interpreted to mean that any project proposed on Wetlands should require water access or be water oriented. Projects on mapped Wetlands located at a considerable distance from the waterway may not, in all probability, be able to satisfy this finding. The proper interpretation of these sections is that only projects proposed on or adjacent to waterways be water oriented or require water access. Those activities located at a considerable distance from a body of water do not have to meet this finding.

This policy is restated more briefly in the Coastal Resource Policies [at 3.2.11.2.(a)(1); 3.4.2.2.(a); and 3.4.3.2.; 3.4.4.].

During Type B permit reviews twelve additional factors are to be considered pursuant to the Wetlands Order for any proposed activity to which they apply:

- "The degree to which the proposed activity serves the public need and interest and the free public access to beaches and navigable waters."
- "The degree to which marine and/or land traffic generated by the proposed activity will give rise to traffic flow and safety problems."
- "The degree to which any aspect of food chain or plant, animal, fish, or human life processes are affected adversely within or beyond the activity area."
- "The degree to which filling and excavation activities can be minimized."
- "The degree to which excavation and filling creates [sic] stagnant water conditions, fish entrapments, and deposit sumps."

- "The degree to which the proposed activity controls erosion."
- "The degree to which the proposed activity provides facilities for the proper handling of litter, trash, refuse, and sanitary and industrial wastes."
- "The degree to which the proposed activity alters natural water flow or water temperature."
- "The degree to which irreplaceable land types will be destroyed."
- "The degree to which the natural, scenic, and aesthetic values at the proposed activity site can be retained."
- "The degree to which the proposed activity ecologically enhances the estuarine environment."
- "The degree of danger arising from hurricanes, floods, or other determinable and periodically recurring natural hazards."

The evaluation of Type B permit applications and the conditions attached to approved permits center about these twelve considerations and the four findings of fact.

Each applicant is encouraged to meet with NJ-DEP personnel in a preapplication conference before he submits a wetlands permit application. The conference provides an opportunity for the applicant to test initial and informal NJ-DEP reaction to his proposal, to ascertain key issues to be analyzed in his environmental impact statement, and to make certain that he is aware of all necessary approvals. Wetlands permit inquiries and permit decisions prior to July 1979 were distributed routinely to the Riparian Lands Management Section (now Tidelands Bureau) and CAFRA Section (now part of the Coastal Project Review Bureau) of the Division of Coastal Resources, to the Division of Water Resources, to municipal planning boards and building inspectors, and to the Army Corps of Engineers.[1] Projects that require wetlands permits are likely to require other approvals as well. Representatives of Federal and other State agencies may be invited by the Bureau of Coastal Permit Review to preapplication conferences for the purpose of facilitating the review of projects with multiple permits. Conversely, if a project sponsor first approaches another regulatory agency,

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[1]When a decision has been made to approve a permit, only the text of the permit (including conditions) is distributed to the applicant and other agencies. When the decision is to deny the application, the summary report on the application is forwarded to the applicant and other agencies. The summary report is a public file document and is prepared for every application, but it is not published or distributed widely. Notice of the status of wetlands applications is published in the DEP Weekly Bulletin.

staff from the Coastal Permit Bureau may participate in a pre-application conference held by that agency, if requested by the agency organizing the conference.

Interagency coordination is possible through contact with the review personnel of other agencies. Recommendations initiated by other agencies may be implemented by wetlands permit conditions, at the discretion of the Bureau of Coastal Permit Review subject to the concurrence of the Director of the Division of Coastal Resources. It is operating policy that the appropriate Army Corps of Engineers District office be contacted during the review of every wetlands permit application (Wetlands Management Policy Memorandum 29, 25 July 1977). Meetings, joint field inspections, and exchange of file copies of comments received on the Corps public notice for a project are encouraged. A standard wetlands permit condition states that the wetlands activity is authorized subject to permit and conditions of the Army Corps of Engineers (Wetlands Management Policy Memorandum 45, 1 September 1978). County planning boards may be requested to review complete wetlands permit applications under funding by the Office Coastal Zone Management (Wetlands Management Policy Memorandum 42, 23 June 1978). When a wetlands permit is issued prior to issuance of a pending waterfront development (riparian) permit, the wetlands activity is authorized subject to the issuance of the waterfront development permit and its conditions (Wetlands Management Policy Memorandum 16, 9 September 1976).

Finally, the wetlands permit program is subject to the coastal resource and development policies formulated under the New Jersey Coastal Management Program. These policies became effective for the Bay and Ocean Shore Segment, which includes coastal wetlands except along the Delaware River and tributaries and along Raritan Bay, on 28 September 1978 (NJAC 7:7E-1.1 et seq.). The coastal policies (at Section 3.2.11-3) encourage the restoration of degraded wetlands and the creation of new wetlands in non-sensitive areas as mitigation for approved wetlands development. (New housing development is prohibited in water areas and in natural water's edge areas under Section 4.2.2. New housing apparently is not prohibited, however, in coastal wetlands landward of the first cultural feature, by Section 4.2.2.) No provision has yet been made for extending the official wetlands mapping and Wetlands Orders to include restored or created areas, if such extensions are necessary to extend protection to the newly restored or created wetlands under the Wetlands Act.

As of 30 June 1978, 221 applications for wetlands permits had been filed with NJ-DEP. Of these 143 (65%) were approved, 8 (4%) were denied, 46 (21%) were withdrawn, and 24 (11%) were pending. None of the 83 Type A applications has been denied. Virtually every permit contains specific, environmentally protective conditions. The extent of coastal wetlands lawfully disturbed under pemits from the times of program implementation through the first half of 1978 was reported as 422 acres, of which 391 acres of wetlands vegetation were permanently destroyed and 31 acres were considered short-term disturbances (for example, pipeline installation with subsequent restoration of wetlands vegetation). Two permits account for 43% of the total acreage (Hope Creek Generating Station, 140 acres; Atlantic County Sewage Treatment Facilities, 40 acres). The remaining 141 approved

permits averaged 1.4 acres of wetlands destroyed apiece. A breakdown of wetlands permit applications by status and by county is presented in Table 33.

There are no accurate data for comparison of the rate at which coastal wetlands were being filled prior to implementation of the Wetlands Act, but there is widespread agreement that the rate has slowed considerably in regulated areas since the Wetlands Orders were promulgated. The US Fish and Wildlife Service (1965) estimated that 9.6% of the New Jersey marshes rated as most valuable to waterfowl were destroyed during the 1954-1964 decade, almost 25,000 acres. Based on a New Jersey Division of Fish, Game and Shell Fisheries estimate of the extent of tidal wetlands that were cut off from tidal flow during the period 1953-1973, the Office of Wetlands Management during 1978 estimated that about 1,900 acres of wetlands were lost annually in now-regulated areas during the twenty years prior to implementation of the Wetlands Act. There are no data on the rate of continuing loss of tidal wetlands currently unregulated under the Act. In the judgment of the authors of this report, such losses now occur primarily in the Hackensack Meadowland District and elsewhere in the Northern Waterfront section of the coastal zone, where relatively little Federal attention is focused on wetlands and development is proceeding rapidly in the absence of State Wetlands Act implementation.

4. Enforcement

A wetlands permit is revocable for violations of the Act, the applicable regulations, or conditions in the specific permit. A copy of the permit must be posted prominently at the worksite. Changes in land use to uses not approved by NJ-DEP in the original application may constitute grounds for revocation of a permit, but no such revocation yet has been made.

The Office of Wetlands Management traditionally devoted relatively little staff effort to compliance monitoring of permitted construction. Post-completion inspections of permitted projects were made to determine compliance with permit conditions. When in the field, staff members of the Office of Wetlands Management made notes on possible encroachments into regulated wetlands. Violations were brought to wetlands staff attention by the field enforcement personnel of the Office of Riparian Lands Management, by review of applications for State permits other than wetlands permits, and by the public. Public notices issued by the Army Corps of Engineers that may affect regulated wetlands were brought to the attention of the wetlands staff by the Office of Riparian Lands Management. During the first ten months of 1978, twenty-two new violations were discovered, and twenty-seven previously discovered violations were resolved. Field implementation and inspection to assure compliance with permit conditions and to detect unauthorized activity now are the responsibility of the Bureau of Coastal Enforcement and Field Services.

B. Waterfront Development Permit Program

Waterfront development permits are authorized by a statute enacted during 1914 to protect navigation and waterfront facilities. Prior to commencement of construction, a review by the Department of Environmental Protection is required of all

> plans for the development of any water front upon any navigable water or stream of this State or bounding thereon, which is contemplated by any person or municipality, in the nature of individual improvement or development or as part of a general plan which involves the construction or alteration of a dock, wharf, pier, bulkhead, bridge, pipeline, cable, or any other similar or dissimilar waterfront development ... (NJSA 12:5-3).

NJ-DEP also is authorized to prevent encroachment and trespass upon waterfront lands and through court action may require removal of construction that affects the flow of navigable waters or that is detrimental to navigation (NJSA 12:5-2).

Applications for revocable waterfront development permits are processed in accordance with the Ninety Day Law (NJSA 13:1D-29 et seq.) and the corresponding administrative regulations (NJAC 7:1C-1.1 et seq.). The coastal regulations and policies (NJAC 7:7E-1.1 et seq.) were applied to this permit program in the Bay and Ocean Shore Segment beginning in October 1978. The proposed coastal policies are to be applied to this permit program throughout the coastal zone. Applications for waterfront development permits are processed concurrently with applications for other permits from the Division, if a project requires multiple permits. Issuance of a permit is at the discretion of NJ-DEP following a review to determine the public interest.

Applications must contain drawings of the proposed development prepared by a licensed professional engineer, and the intended use of the structures must be indicated. The general location of the site must be specified, and upland property lines, roads, sewer lines, utilities, riparian conveyances, mean high water lines, elevations, and soundings must be detailed. The estimated cost of the work also must be indicated, so that the appropriate application fee can be assessed. The applicant must show title to the land of the project site, and he must have the owner's consent to construct the project if he is not the owner. The names and addresses of adjoining property owners within 500 feet must be reported. Environmental impacts must be assessed by the applicant. Standard environmental aspects which are expected to be addressed by the applicant (if applicable) include:

- Season when work is to be done; time required to perform work; expected durationd of construction period.
- Photographs of the project site and characteristics of area surrounding.
- Types of adjacent marine structures and distances to them from the proposed project.

Table 33. Status of Wetland Permit Application As Of 30 June 1978 (Data From NJ-DEP Office of Wetlands Management).

COUNTY	DECISION	USES							
		Residential	Utility	Recreation	Piers & Docks	Bulkheads	Bridges & Roads	Other	Total
Middlesex	Approved	0	0	0	0	0	0	1	1
	Denied	0	0	0	0	0	0	0	0
	Pending	0	0	0	0	0	0	0	0
	Withdrawn	0	0	0	0	0	0	1	1
	Total	0	0	0	0	0	0	2	2
Monmouth	Approved	1	3	2	8	1	1	3	19
	Denied	0	0	0	0	0	0	0	0
	Pending	0	0	1	1	1	0	0	3
	Withdrawn	3	3	1	0	0	0	0	7
	Total	4	6	4	9	2	1	3	29
Ocean	Approved	6	11	2	0	1	1	8	29
	Denied	1	0	0	0	0	1	0	2
	Pending	1	1	2	0	0	1	0	5
	Withdrawn	3	4	0	0	1	0	0	8
	Total	11	16	4	0	2	3	8	44
Burlington	Approved	0	2	0	1	0	1	1	5
	Denied	0	0	0	0	0	0	0	0
	Pending	0	0	0	0	0	0	0	0
	Withdrawn	0	1	1	0	0	1	1	4
	Total	0	3	1	1	0	2	2	9
Atlantic	Approved	3	12	2	11	4	1	4	37
	Denied	0	0	0	0	0	0	1	1
	Pending	0	1	1	1	1	0	0	4
	Withdrawn	2	0	0	0	3	1	1	7
	Total	5	13	3	12	8	2	6	49
Cape May	Approved	5	7	1	15	2	1	6	37
	Denied	0	0	1	0	0	1	1	3
	Pending	2	0	3	1	1	0	1	8
	Withdrawn	3	1	1	1	4	1	1	12
	Total	10	8	6	17	7	3	9	60
Cumberland	Approved	0	1	0	6	0	1	1	9
	Denied	0	0	1	0	0	0	0	1
	Pending	0	0	0	0	0	0	0	0
	Withdrawn	0	0	1	0	0	1	0	2
	Total	0	1	2	6	0	2	1	12

Table 33. Wetland Permits (concluded).

COUNTY	DECISION	USES							
		Residential	Utility	Recreation	Piers & Docks	Bulkheads	Bridges & Roads	Other	Total
Salem	Approved	0	2	0	0	0	0	0	2
	Denied	0	0	0	0	0	0	0	0
	Pending	0	0	0	0	0	0	0	0
	Withdrawn	0	0	0	0	0	0	0	0
	Total	0	2	0	0	0	0	0	2
Gloucester	Approved	0	1	0	1	0	1	1	4
	Denied	0	0	0	0	0	0	1	1
	Pending	0	0	0	0	0	0	1	1
	Withdrawn	0	2	0	0	0	0	2	4
	Total	0	3	0	1	0	1	5	10
Camden	Approved	0	10	0	0	0	0	0	0
	Denied	0	0	0	0	0	0	0	0
	Pending	0	0	0	0	0	1	2	3
	Withdrawn	0	0	0	0	0	0	0	0
	Total	0	10	0	0	0	1	2	3
Mercer	Approved	0	0	0	0	0	0	0	0
	Denied	0	0	0	0	0	0	0	0
	Pending	0	0	0	0	0	0	0	0
	Withdrawn	0	0	0	0	0	1	0	1
	Total	0	0	0	0	0	1	0	1
TOTALS	Approved	15	39	7	42	8	7	25	143
	Denied	1	0	2	0	0	2	3	8
	Pending	3	2	7	3	3	2	4	24
	Withdrawn	11	11	4	1	8	5	6	46
	Total	30	52	20	46	19	16	38	221

- Distance to sensitive noise receptors.
- Types and numbers of construction equipment to be used.
- Specific location of spoil disposal site.
- Age of man-made canal.
- Demonstration of how project will serve the public interest.
- Summary of deleterious adverse effects.

The probable environmental effects of, and the degree of public interest served by, the project are subject to independent evaluation and analysis by NJ-DEP. Applicants are advised to make simultaneous application to the appropriate District of the Army Corps of Engineers (much of the same application data is required by both the Office of Riparian Lands Management and by the Corps), and applicants are reminded that Section 401 Clean Water Act certification from the New Jersey Division of Water Resources is required before a Corps permit can be issued.

The permit application is not considered complete for review unless the applicant landowner (or his predecessor in title) has obtained the appropriate riparian land instrument of conveyance (that is, a grant or lease or license from the Natural Resource Council or its predecessor agencies). Appeals from the decisions of the Division of Marine Services on waterfront development permits are made to the Natural Resource Council.

Annually there are about 1,000 waterfront development permit applications. Most permits are requested for private residential docks and bulkheads along waterways. Available data on a sample of applications are presented in Table 34. State agencies must secure waterfront development permits on their own actions, but the US Coast Guard is statutorily exempt from State permits. The Army Corps of Engineers has never been required to obtain waterfront development permits on its own actions.

Where an applicant has a lawful grant or lease of riparian land, no permit currently is required by NJ-DEP for the repair or reconstruction of lawful existing structures. Rebuilding of bulkheads within 18 inches seaward of existing lawful bulkheads is regarded as "without encroachment" on State-owned tidelands. Jurisdiction usually is waived for non-controversial backyard docks in manmade lagoons that are designed to be consistent with neighboring structures, but such informal approvals are granted only after the submission of formal plans and surveys by the applicant and field inspection by the NJ-DEP staff. Such approvals can be granted without fee to the applicant, and can be made by field offices, as well as through the main office in Trenton. There were 52 informal approvals granted during the month of June 1978. The DEP staff is to be notified when repair work is begun and when it is completed.

Table 34. Characteristics of selected New Jersey waterfront develoment permit applications. The first 276 applications filed during 1978 are the basis for this tabulation.

Geographical Region	Number	%
Bay and Ocean Shore Segment	248	90
Delaware River Area	14	5
Northern Waterfront Area	14	5
	276	100
Type of Applicant		
Private residential	162	59
Commercial marina, community ramp, or yacht club	53	19
County Government	12	4
Local Government	9	3
Electric utility	7	3
Oil industry	7	3
Commercial (stores, malls, wholesale fishing)	7	3
Commercial recreation	5	2
Port facilities	4	1
State Government	3	1
Other industrial	3	1
Dredging company	2	1
Telephone utility	1	<1
Railroad	1	<1
	276	100

Type of Work Proposed	No. Permits Requesting	% of Permits Requesting
Repairs to docks, piers, pilings	107	39
Repairs to bulkheads	65	24
New docks, piers, pilings	48	17
Maintenance dredging	28	10
New bulkheads	23	8
Filling	15	5
New and repairs to boat ramps	14	5
Repairs to large fenders and dolphins	13	5
New and repairs to stormwater drains	10	4
New house/boat house or repairs	10	4
New dredging	6	2
Underwater cable	6	2
Use of dredged spoil basin	2	1
Utility poles	1	<1

Until June 1979 the Office of Riparian Lands Management staff (about 25 persons) included field enforcement personnel who inspected proposed permit sites, examine completed work, and identified unlawful violations. Field enforcement now is the responsibility of the Bureau of Coastal Enforcement and Field Services. Waterfront development permits are processed by the Bureau of Coastal Project Review.

Applicants may be requested to provide environmental information. Permit review ordinarily is coordinated closely with the Army Corps of Engineers, because projects which require waterfront development permits are almost certain also to require Federal approvals under Section 10 of the River and Harbor Act or other statutes. Local governments seldom participate in waterfront development permit review. The Division of Fish, Game and Shell Fisheries and the Division of Water Resources typically review waterfront development permit applications to ascertain whether other approvals may be necessary and to comment on environmental aspects. The Law Enforcement Bureau (Marine Police) staff examines proposals for marinas or offshore mooring buoys, and the Hackensack Meadowlands Development Commission reviews applications from its District at the request of the project review staff.

It is the practice of the NJ-DEP to review entire projects under the waterfront development permit, even if only one part of the project (such as a wharf or dock) is situated along a waterfront, if this is the only required State approval for the project. The landward extent of the regulatory authority of the State under the waterfront development permit statute is not well-defined.

C. Riparian Grants, Leases, and Licenses (Natural Resource Council)

Lands now or formerly flowed by the tides in New Jersey are held in trust by the State for the common benefit. It has long been State policy to convey fee ownership, long-term leases, or shorter-term use licenses of tidelands to individual owners in order to promote the use of waterfront areas for various purposes. The current legal framework for alienation of riparian lands dates from the 1860's, but such conveyances during the past quarter century have become subject to increasingly stringent tests of public interest. There is a complex and longstanding doctrine of public trust in tidelands based on English and American statutory and common law, which recently was summarized by Goldshore (1979) and will not be elaborated in this report. It is sufficient to note here that the proceeds of conveyances of interest in riparian lands in New Jersey are dedicated by the State Constitution solely to a Fund for the Support of Free Public Schools, which provides a minor part of the annual State financing of public schools. The Fund must receive full market value for all lands alienated from the public domain, whether they are used for public or private purposes.

The exclusive right to tidelands can be obtained in several forms. A grant to land conveys a permanent, absolute fee interest, typically in return for a one-time payment to the School Fund. Leases are term agreements (generally for 10 years or longer) which involve annual payments

for the use of the land. Licenses are essentially short-term leases and also involve an annual fee.

Conveyances of tidelands generally are made to owners of the adjoining upland. The upland owner must be given a six month notice and opportunity to apply for the conveyance if the application is from another party[1] (NJSA 12:3-23). The State may condition conveyances in the public interest.

Each application for a riparian instrument must include the following information:

- Metes and bounds description of the adjoining upland owned by the applicant, together with a certified survey that includes current property lines, mean high and mean low water lines, depth and width of the waterway at mean high water, Federal pierhead and bulkhead lines (if any), and general location of the site.

- Description of exisitng improvements, proposed uses, and fishing rights in the property.

- Certified copy of the deed by which the applicant claims title of the adjacent upland, together with a certificate of title.

- Disclosure statement of the identity, controlling interests, and tax status of the applicant, if the applicant is a corporation.

- Application fee.

- Statement concerning environmental aspects (these are the same as those discussed in the preceding section on waterfront development permits).

If there is a plan for development of the lands for which the conveyance is sought, a waterfront development application ordinarily is reviewed concurrently with the application for the conveyance. Approval of a conveyance does not carry any commitment subsequently to approve a waterfront development or other State permit for any improvement that requires such a permit. Approved conveyances are recorded in the appropriate County and municipal real estate records. Bureau of Tidelands also maintains atlases that identify riparian conveyances, licenses, and permits administered by the Bureau.

The basic decision to approve conveyances of lands under water in New Jersey currently is vested in the Natural Resource Council, whose twelve

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[1]An exception to the notice requirement is made if the application is from a State or municipal agency for a public park or street purpose (NJSA 12:3-33).

citizen members are appointed by the Governor with the advice and consent of the State Senate for four-year terms. The Council is established in the Division of Marine Services within the Department of Environmental Protection, and the Department provides staff to the Council. The prime staff functions are performed by the Bureau of Tidelands; other Department personnel assist the Council as needed. The Office of the Attorney General provides legal staff to the Council.

The Natural Resource Council is responsible for determining the public interest in approving or denying applications for conveyances of underwater lands pursuant to Chapter 383 of the Laws of 1869, as amended (NJSA 12:3-5 et seq.). The Council also approves licenses to dredge sand and gravel from underwater lands (NJSA 12:3-21 et seq.) and to construct pipes beneath tidal waters (NJSA 12:3-26). The Council fixes the value of lands conceptually approved for sale or lease, and it establishes the price of dredged material. The Council also has been designated to oversee the mapping of all lands to which the State lays riparian claim (NJSA 13:1B-13.1 et seq.).[1] As indicated in the previous section, the Council also hears appeals on waterfront development permits administered by the Bureau of Coastal Project Review. Other duties of the Council include advisory functions for the Department of Environmental Protection (NJSA 13:1B-11 et seq.).

Cases are presented to the Council, together with recommendaitons for action, by NJ-DEP riparian staff. Applicants and the public are afforded an opportunity to comment on each case. To ascertain fair market value, especially for lands to be used for commercial purposes, the Council relies on expert appraisers from within the State government and from outside firms. Valuation can be especially complex when title is disputed and the Council is requested to grant a quit claim deed releasing the State's interest. In this case the strength of the State claim and its chance of success if litigation occurs are factors considered when the Council fixes the value of the lands to be conveyed. Council meetings usually are held at least monthly, after public notice, and they are open to the public. An absolute majority approval (seven votes) is needed for affirmative action. Council minutes must be signed by the Chairman and by the Director of the Division of Coastal Resources and must be approved by the Commissioner of DEP to take effect. Riparian land conveyances must be approved by the Commissioner of NJ-DEP and by the Governor (NJSA 13:1B-13). The Attorney General and the Secretary of State attest the conveyance.

The Council operates in accordance with an extensive and complex body of riparian statutory and case law (see Goldshore 1979). Challenges to State administrative decisions on riparian issues are made in the courts. The public trust doctrine which affects State tidelands is an issue of continuing legal interest. The authority of the Council apparently does not extend offshore.

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[1]Staff for tidelands delineation is provided by the Office of Environmental Analysis, a unit in the Office of the Commissioner of DEP.

The Council is not required by law to provide reasons for its determinations of the public interest, and it has prepared no compilation of its operating policies. The written minutes of the Council do not reflect fully the Council's deliberations, although they record the Council's decisions. Because the minutes of the Council must be approved by NJ-DEP officials, there is an opportunity for assurance that Council decisions comply with adopted coastal zone management policies, as mandated by the Governor and the Commissioner of NJ-DEP.

On the basis of observations made at Council meetings, it is evident to the authors of this report that Council members strive to maintain consistent policy positions, developed over a period of years with the assistance of NJ-DEP staff, by which to decide equitably the cases which come before them. Several illustrative Council policies are summarized here with the assistance of the current Chairman of the Council, Mr. David Moore:

- The Council prefers to issue riparian leases or licenses rather than fee simple grants of land. Conveyances of limited-term interest in riparian lands preserve a greater measure of future State discretionary control over these lands than the irrevocable sale of a grant. Provisions for rental adjustment at stated intervals generally are included in long-term leases, and lease or license terms can be revised at each renewal.

- Bulkheads in developed areas are required to be constructed no farther channelward than, and in alignment with, adjoining bulkheads so as to maximize tidal circulation. The preferred location for bulkheads is landward of wetland vegetation, because environmental values are maximized while structural protection is achieved.

- The placement of fill on tidelands is to be minimized. Docks and boardwalks on pilings are preferred to solidly filled piers, in order to preserve benthic habitat while allowing water access.

- Access to docks along existing channels via boardwalks is preferred to dredging of boat slips.

D. Coastal Area Facility Review Act of 1973 (CAFRA)

The Coastal Area Facility Review Act became effective on 19 September 1973 (NJSA 13:19-1 et seq.). The Legislature found that the estuarine environment of New Jersey and adjoining land areas constitute an exceptional and irreplaceable environmental resource. Some parts of the coastal area are experiencing serious adverse impacts from existing facilities, but multiple uses are in the best long-term interests of all people of the State. Hence the State is to assist in the assessment of impacts of future facilities on the delicately balanced, fragile environment

of the coastal area to assure adequate environmental safeguards during the construction of new facilities.

1.Regulated Facilities

The term facility is defined in considerable detail in the Act (NJSA 13:19-3.c.). It includes industrial operations, utilities, public infrastructure, and those new housing developments or housing additions with 25 or more dwelling units. DEP interprets the term facility broadly to apply to all major facilities in the CAFRA area. Minor construction and reconstruction activities, however, generally are excluded administratively from review under CAFRA (NJAC 7:7D-2.2).[1] Modifications and additions to otherwise exempt ("grandfathered") facilities may be determined to be subject to the permit requirement of the Act [NJAC 7:7D-2.6(a)4].

2. Geographic Jurisdiction

The boundaries of the coastal area are defined by reference to readily identifiable landscape features (NJSA 13:19-4). The CAFRA area extends inland from the limit of offshore State jurisdiction in the Atlantic Ocean, from Raritan Bay, and from Delaware Bay to named roads and railroads. The area extends generally from Cheesequake Creek in Middlesex County around the Atlantic coastline generally seaward of the Garden State Parkway, and then up the Delaware estuary to central Salem County (Figure 15). Included in this area are all or part of 127 municipalities in eight counties. The final CAFRA inland boundary followed intensive debate and deliberation by the Legislature. Regulated coastal wetlands are excluded from CAFRA jurisdiction, but the division of regulated lands between the two Acts has not been indicated on regional-scale maps.

3. Regulatory Authority

Within the CAFRA area no facility can be constructed without a permit from DEP (NJSA 13:19-5). Construction in progress on or prior to the September 1973 effective date of the Act was exempted. On-site construction which requires a CAFRA permit is defined by DEP as "all physical activity

[1]Administratively excluded activities consist of repaving previously paved surfaces, widening roadways where the number of through lanes is not increased, extensions of roads less than 1,200 linear feet (provided that the cumulative total of 1,200 feet is not exceeded in any one municipality at any one site during any one year), construction of a new driveway to an existing single house, construction of new roads in a new housing development of less than 25 units, new parking facilities for less than 300 vehicles, elementary and secondary school facilities, sewer line extensions less than 1,200 linear feet (provided that the cumulative total of 1,200 feet is not exceed in any one municipality at any one site during any one year) with a design capacity less than 9,600 gallons per day, sewer pipe and system repairs or upgrading where there is no increase in effluent volume or design flow, and sewer extensions to new housing developments of less than 25 dwelling units.

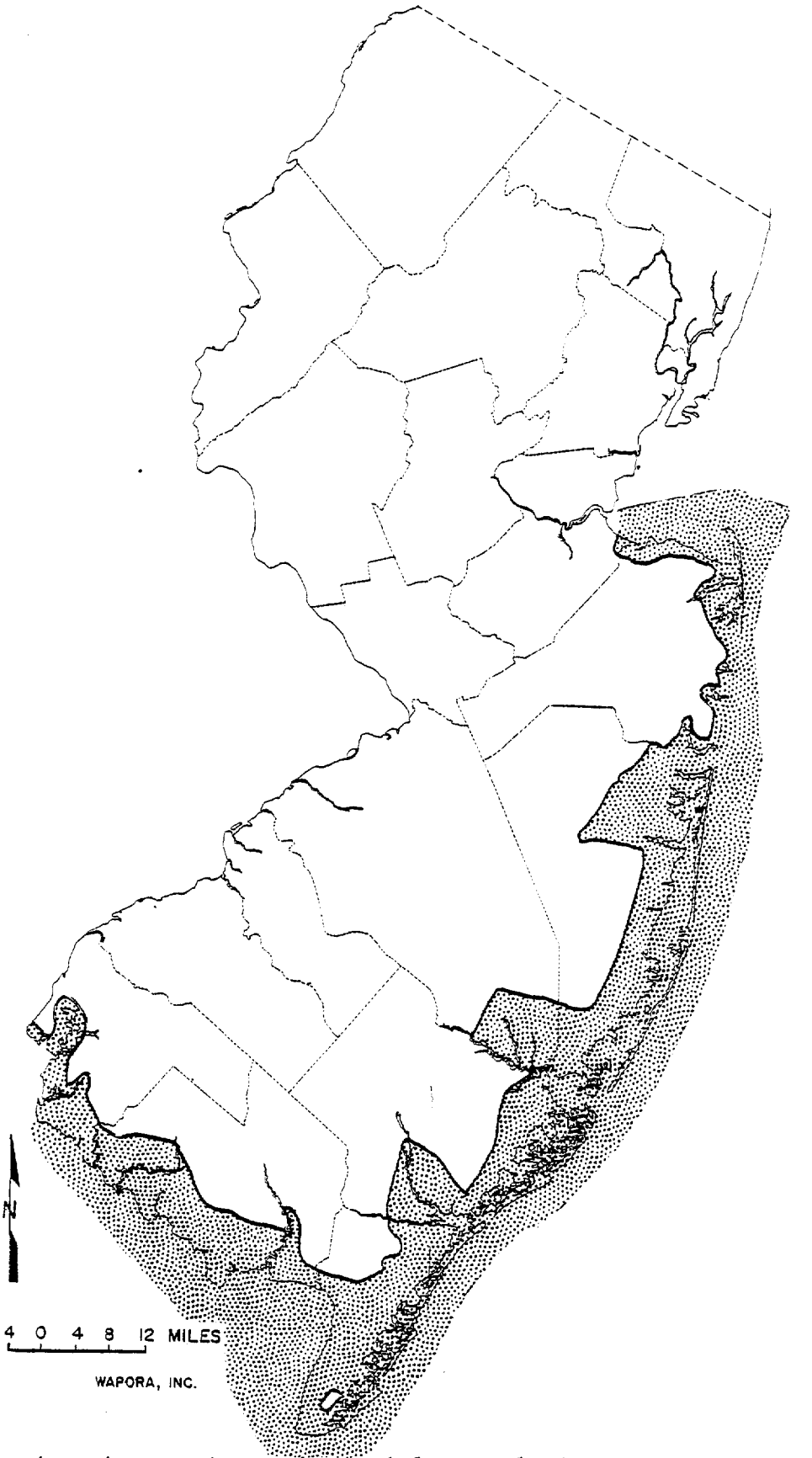


Figure 15. Lands and estuaries authorized for regulation pursuant to the 1973 Coastal Area Facility Review Act (CAFRA). Coastal wetlands regulated under the Wetlands Act of 1970 are not subject to CAFRA, but they are not differentiated here from CAFRA lands.

necessary to begin and complete a particular facility and the total development of its site" (NJAC 7:7D:2.2). Potential applicants are urged to discuss proposed facilities at the earliest opportunity during project planning. (The clearance of timber or other modifications of a site prior to an applicant's public declaration of plans to construct a facility or his submission of an application for municipal approvals, however, may occur before CAFRA review, and may limit the opportunities for environmentally sensitive design on the site.)

DEP has authority to approve, approve conditionally, or deny CAFRA permits. Approval can be given only if DEP finds affirmatively that any proposed facility meets the following criteria (NJSA 13:19-10):

a. It conforms with all applicable air, water, radiation, and effluent standards, water quality criteria, and air quality standards.

b. It prevents air pollutant emissions and water effluents in excess of the existing dilution and assimilative capacities at the site and in the surrounding region.

c. It provides for the handling and disposal of litter, trash, and refuse so as to minimize adverse effects and threats to public health, safety, and welfare.

d. It would result in the minimum feasible impairment of the regenerative capacity of ground or surface water supplies.

e. It would cause the minimum feasible interference with plant, animal, fish, and human life processes at the site and in the surrounding region.

f. It is located or constructed so as neither to endanger human life or property nor otherwise to impair public health, safety, or welfare.

g. It would result in the minimum practicable degradation of unique or irreplaceable land types, historical or archaeological areas, or existing scenic and aesthetic attributes at the site or in the surrounding region.

Specific authority is granted for conditioning permits in order to promote public health, safety, and welfare; to protect public and private property, wildlife, and marine fisheries; and to preserve, protect, and enhance the natural environment (NJSA 13:19-11). Nuclear power plants cannot be approved unless the proposed plans for disposal of radioactive wastes are judged satisfactory by DEP in removing danger to life and to the environment and in conforming to Federal standards.

The CAFRA regulatory program supplements but does not supersede the need for facilities to be approved under other statutes. If a new facility would affect regulated wetlands, a wetlands permit is necessary for that

part of the facility. If existing or former tidelands are involved, a riparian instrument is necessary, and a waterfront development permit may be required. In the event that a proposed facility must be reviewed under both CAFRA and the Wetlands Act, provision has been made for combined EIS preparation to serve the needs of the two statutory mandates in the Bureau of Coastal Project Review [NJAC 7:7D-2a.4(e)].

4. Permit Procedures

Prospective applicants for CAFRA permits are encouraged to schedule a preapplication conference with DEP personnel. The conference is an opportunity for the applicant to gauge informal DEP staff reactions to his initial proposal, to gain information on the construction permit review process, and to ascertain the level of detail and emphasis necessary in the EIS that must be submitted. Approval or disapproval of a proposed facility cannot be made at a preapplication conference. If a proposed project is determined not to require a CAFRA or other DEP construction permit, however, DEP is to issue a written statement of such finding to the applicant [NJAC 7:1C-1.3(a)].

Following the preapplication conference, DEP issues a memorandum of record to the applicant. This memorandum summaries apparent strengths and weaknesses of the proposed facility, the apparent sensitivity of land and water resources at the project site, and the subjects of emphasis and levels of detail necessary in the CAFRA EIS. Copies of the memorandum are distributed to the appropriate municipal and county planning boards (NJAC 7:7D-2.3).

The applicant for each proposed facility must provide an environmental impact statement with information on

a. Existing environmental conditions at the project site and its surrounding region

b. The proposed construction, construction methods, and operations practices

c. All other permits, licenses, and approvals needed, together with the status of applications for such approvals

d. Probable impacts of the project on the environment

e. Unavoidable adverse impacts

f. Steps taken to avoid or minimize adverse impacts

g. Alternatives to all or part of the proposed project, with reasons for their acceptance or rejection

h. Documentation of references

Detailed regulations for permit applications and for the contents of CAFRA EIS's have been promulgated by DEP (NJAC 7:7D-2.3 et seq.; NJAC 7:1C-1.1 et seq.; see also CAFRA Permit Section Procedure and Policy Manual).

Formal application is made to DEP by filing a completed form CP-1, appropriate fee, and 20 copies of the EIS. Copies of the CP-1 form also must be sent by the applicant to the appropriate municipal clerk, municipal environmental commission (if any), county environmental commission (if no municipal commission), and municipal planning board. The applicant must provide a copy of the EIS to the county planning agency, county environmental commission (if any), soil conservation district, and (in Burlington County) to the Delaware Valley Regional Planning Commission or (in Monmouth County) to the Tri-State Regional Planning Commission. Local agenices may make a copy of the EIS available to the public during normal working hours upon request. Notice of the filing of each application and its status is published in the DEP Weekly Bulletin.

Within 20 working days of the receipt of an application, the application must be (1) accepted as complete for filing, or (2) accepted for filing with a request for additional information necessary to complete the application, or (3) rejected with an explanation of why the application is unacceptable for filing (the fee is to be returned, if the applicant does not intend to reapply). Amended applications are to be distributed to the recipients of originally filed material.

The Bureau of Coastal Project Review staff prepares a preliminary analysis of each complete application prior to the public hearing on the application. Comments from other agencies received within 20 days of the date when an application is declared complete for filing are incorporated in the preliminary analysis. The preliminary analysis is released to the applicant and to any person requesting a copy.

A non-adversary public hearing is scheduled within 60 days after the application was declared complete for filing. The hearing generally is held in the municipality of the proposed facility. Within 15 days following the hearing, additional information may be requested from the applicant. When additional information is received, the application can be declared complete for review. The DEP decision on the permit must be made within 60 days of the public hearing or (if additional information was required) within 90 days of the declaration of completeness for review. Should the DEP fail to act within the required time, the application is deemed to be approved, subject to the standard conditions applicable to CAFRA permits (as listed in NJAC 7:7D-2.5). The time limits do not apply to proposed electric generating facilities or petroleum storage or processing facilities (including liquified natural gas facilities) with storage capacity greater than 50,000 barrels (NJAC 7:1C-1.2).

At present, the views of some 17 review agencies are solicited during the review of a CAFRA permit. The DEP staff independently verifies information furnished by the applicant and scrutinizes his assessment of impacts. As of December 1978, formal, written opinions had been issued on

48 CAFRA permit applications, and about 40 applications were in some stage of the review process. Nearly 70% of the CAFRA applications have been for residential subdivisions. Other facilities have included casino hotels, motels, sewerage treatment systems, a surface mine for sand used in glass manufacture, a nuclear electric generating station, a campground, and a sanitary landfill.

Each CAFRA decision that sets a precedent is accompanied by a formal, written opinion signed by the Director of the Division of Coastal Resources. The opinions are substantive documents summarizing the project file. Recent opinions have utilized the following format:

I. Introduction
II. Administrative History of Application
III. Description of Region, Municipality, Site, and Project
IV. Analysis of the Impact of the Proposed Project on the Site and Surrounding Land Uses
V. Conclusion

The opinion reports special conditions that are part of the permit, and may append additional information.

Permits are transferable when the ownership of facilities changes, so long as the permit conditions are met and the original facility remains unchanged. The applicant must accept the permit conditions before construction can begin, and the approved permit must be filed with the appropriate county clerk for recording in the book of deeds within 45 days of its receipt.

Any person who considers himself aggrieved by a CAFRA decision may utilize either of two avenues of administrative appeals. First, within 21 days of publication of a notice of decision in the DEP Weekly Bulletin, the aggrieved party may appeal to the Commissioner of DEP by filing a written request for appeal with the Commissioner, with copies to the municipal clerk, the county clerk, and the applicant (if the appellant is not the applicant). Following public notice of the request for appeal, the Commissioner may schedule a plenary hearing. Any person may answer a request for an appeal to the Commissioner. The Commissioner may accept or reject the recommendations of the hearing officer, which generally must be filed within 14 days of the hearing. The Commissioner must issue a decision within 21 days following the plenary hearing or the filing of any exceptions to the recommendations of the hearing officer. The Commissioner has broad discretion to confirm, reverse, or modify a CAFRA decision upon appeal.

Second, an aggrieved party may appeal to the Coastal Area Review Board (CARB) established by the Act (NJSA 13:19-13), either before or after an appeal to the Commissioner. The CARB consists of the Commissioners of DEP, Labor and Industry, and Community Affairs (or their designed representatives). The CARB may confirm or reverse the decision of the DEP with respect to any part of a CAFRA permit.

Environmental Design Strategy

The Commissioner of DEP was mandated by CAFRA to inventory the environmental resources and existing facilities in the coastal area within two years, and to estimate the capability of coastal regions to absorb future development. Subsequently alternate environmental management strategies for the CAFRA area were to be developed, and a recommended environmental design for the area was to be selected (NJSA 13:19-16). These statutory requirements were completed minimally by DEP within the alloted time. This planning process is reflected in the coastal zone management policies which became effective in the Bay and Ocean Shore Segment of the New Jersey Coastal zone during October 1978 (NJAC 7:7E-1.1 et seq.) and in the numerous background reports produced by the Office of Coastal Zone Management.

6. Enforcement

Until July 1979 one CAFRA staff was assigned full time to enforcement and received assistance from other staff. CAFRA personnel attempted to inspect constructed projects to ascertain compliance with permit conditions and the success of mitigating measures. Field inspectors of the Office of Riparian Land Management and members of the public also could bring suspected CAFRA violations to the attention of the CAFRA staff. The field inspectors could act on their own volition or at the request of the CAFRA staff. The staff also relied for surveillance on general circulation newspapers and on its own field inspections incidential to public hearings. Field inspection now is the responsibility of the Bureau of Coastal Enforcement and Field Services.

When violations are identified, DEP is authorized to institute civil action in the Superior Court for injunctive relief (NJSA 13:19-18). Fines are authorized to be levied for violations of the Act or of rules or regulations issued by DEP pursuant to the Act. Permits may be suspended if conditions are not met or if facility plans are changed significantly. Revocation is available where major alterations in facility plans or construction are undertaken, where misrepresentation in plans is discovered, or where a suspended permit is not remedied within one year.

E. Stream Encroachment Permits

The construction, installation or alteration of any kind of structure or permanent fill in, along or across the channel or floodway of any stream, or any alteration of the stream itself (as by dredging or filling), within the natural and ordinary high water mark, requires a permit from DEP through the Division of Water Resources (DWR). The requirement for a permit may be waived by the Division when the drainage area above an encroachment is less than 320 acres in extent.

Applications for permits for stream encroachment are processed by the Bureau of Flood Plain Management in the Water Supply and Flood Plain Management Element. According to Item U. of the permit application form

used as of early 1979, an environmental impact statement is necessary for channel relocation and major fill projects. The mid-1979 revised CP-1 form makes no mention of possible EIS requirements for stream encroachment permits. Guidelines for stream encroachment impact statements have been prepared. The procedures and fees described in the 90-day construction permit regulations are applicable (NJAC 7:1C-1.1 et seq.). All applications must include Form CP-1, which also is used for wetlands, CAFRA, and waterfront development, and other Water Resources Division permits.

Persons who propose to build or conduct an activity in or near a stream must consult the Bureau of Flood Plain Management to determine whether or not the proposed site falls within the design flood zone in which an encroachment permit is required. Maps that define the lands subject to this permit are not available.

Proposed stream encroachments involving petroleum product pipelines are referred to the Office of Hazardous Substances Control in the Office of the Commissioner for review of structural soundness and spill hazard potential. A permit for such pipeline may be denied, or issued subject to conditions, based on the Office of Hazardous Substances Control evaluation of spill hazard, in addition to any other criteria usually employed by the Bureau of Flood Plain Management in the DWR (NJSA 58:10-25).

Appeals from the actions of DWR on an application for stream encroachment are made to the Water Policy and Supply Council, according to procedures described in NJAC 7:1C-1.9 and in the rules of the Water Policy and Supply Council (NJAC 7:21-1.1 et seq.).

Activities requiring stream encroachment permits frequently also require the issuance of permits issued by the Division of Coastal Resources, Department of Environmental Protection. In particular, a waterfront development permit may be required when an activity is to be located on lands now or formerly flowed by the tide. Applicants are advised to consult the Division of Coastal Resources to determine the need for regulatory approvals by agencies in that Division. (The stream encroachment permit apparently can be waived for a project that requires a waterfront development permit, but such waivers are not mentioned in the current stream encroachment permit regulations at NJAC 7:8-3.15.)

During fiscal year 1978 the Bureau of Flood Plain Management received 595 stream encroachment permit applications. The number issued during the year was 569; 36 were denied; and 6 were withdrawn. Following hearings on appeal, the Water Policy and Supply Council approved 6 and denied 7 applications.

No statistics are kept on the number of EIS's generated by this permit program. According to Bureau personnel, the preparation of an EIS is at the discretion of the Bureau, and there have been few EIS's on stream encroachment permits. At least one comprehensive EIS has been prepared (JMA 1973a).

Surveillance and enforcement activities during fiscal 1978 involved 532 site inspections. There were 294 complaint investigations, 163 reinspections, 177 possible violations identified, and 127 needed inspections backlogged into fiscal 1979. Cases with permit violations or needing after-the-fact permit applications totaled 54, and there were 27 cases of flood damage investigated. Following inspection, 146 violation notices were issued. Of the violations, 13 cases were referred to the Attorney General. Thirteen fines were levied, and payments of four fines were received.

F. Hackensack Meadowlands Development Commission (HMDC)

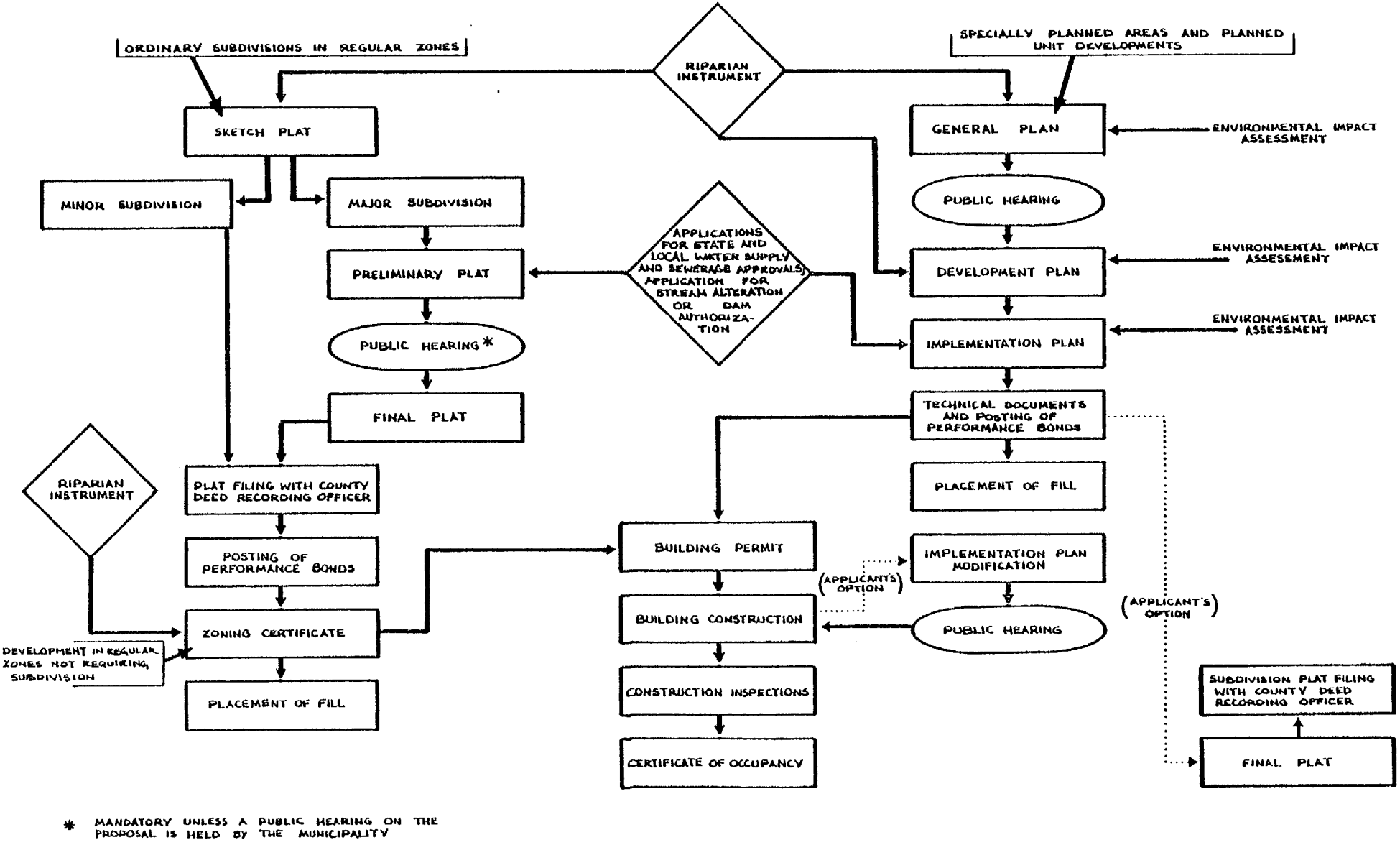
The Master Plan Zoning Regulations for the Hackensack Meadowland District (NJAC 19:4-1.1 et seq.) establish allowable land uses, mandate procedures for the approval of proposed developments, and establish minimum environmental performance standards. First adopted during 1972 following a 2-year moratorium on new development, the Zoning Regulations have been revised several times. Several other HMDC documents affect development in the District. These include the Official Zoning Map proposed during 1971 and subsequently amended several times; subdivision, building code, and foundation regulations adopted during 1969; sanitary landfill regulations adopted during 1971; a wetlands order and open space map adopted during 1972; and the environmental impact assessment guidelines for specially planned areas adopted during 1973 and revised during 1978.

1. New Construction Approvals

There are two basic pathways by which HMDC approval can be obtained for new construction (Figure 16). In the ordinary zones of the District, subdivision regulations apply, and must be satisfied prior to the issuance of zoning certificates, authorization of fill, or issuance of building permits. Subdivision review is performed by the Office of the Chief Engineer, with the assistance of other offices of HMDC as requested. In the designated Specially Planned Areas, special procedures apply. Review of such applications is the responsibility of a Development Board, which consists of the Executive Director and Chief Engineer of HMDC, a mayor selected by the Meadowlands Municipal Committee, and two members of the Commission selected by the Commission. The Board is assisted by the HMDC staff.

Variances and special exceptions to requirements in the regular zones are decided by the Executive Director after review by the Office of the Chief Engineer. Variations from Specially Planned Area requirements are decided by the Development Board. The regulations grant broad authority for special conditions to be placed on approvals of special exceptions, variances, and variations. Appeals from decisions of the Office of the Chief Engineer, the Executive Director, and the Development Board are to the Commission. A majority of the Commission may affirm, revoke, modify, or remand decisions of the Development Board on General, Development, and Implementation Plans. The HMDC regulations mandate the development and consideration of environmental information and impacts during the review of

Figure 16. HACKENSACK MEADOWLANDS DEVELOPMENT COMMISSION MAJOR STEPS IN NEW CONSTRUCTION REVIEW



* MANDATORY UNLESS A PUBLIC HEARING ON THE PROPOSAL IS HELD BY THE MUNICIPALITY

both ordinary subdivision and specially planned area applications. New development in the regular zones that does not require subdivision approval gets environmental review at the zoning certificate stage.

a. Subdivision Procedures

The applicant for municipal approval of a proposed subdivision must furnish a sketch plat (minimum scale, 1:2,400) to the Office of the Chief Engineer of HMDC, together with a general description of the proposed subdivision and existing site conditions. The Office within 45 days must approve, conditionally approve, or reject the sketch plat, following a review for compliance with applicable regulations including environmental effects and land use conflicts. Minor subdivisions with not more than three building plots and that are in conformance with all applicable HMDC regulations need no HMDC subdivision approval beyond the sketch plat. The applicant must file his subdivision with the county recorder of deeds within 90 days of sketch plat approval. The sketch plat must be accompanied by evidence that the applicant has received a State riparian instrument, if any of the land is mapped as subject to tidal claim by the State of New Jersey.

Major subdivisions must pass through more extensive preliminary and final plat review procedures. Plats must be signed by a professional engineer licensed to practice in New Jersey. Within 18 months after submission of the sketch plat to HMDC, the applicant must submit a preliminary plat (minimum scale, 1:1,200) with extensive accompanying data, as described in Article 6 Part 2 of the subdivision regulations, to HMDC. With this submission there must be proof that the applicant has filed for State and local approvals of proposed water supply and sewerage disposal facilities. Evidence of application to the Division of Water Resources, NJ-DEP, for approval of proposed alteration, improvement, or relocation of any watercourse, or a proposed drainage structure on a stream with drainage 320 acres (0.5 square mile) or greater, also must be submitted to HMDC.

A decision must be made by the Chief Engineer within 90 days of the filing of complete information required for the preliminary plat. Unless the municipality holds a public hearing on the application, the HMDC must do so. The Chief Engineer has broad authority to condition the approval to require compliance with HMDC regulations. The applicant may submit all or parts of an approved preliminary plat for final approval within three years of the date of preliminary approval, during which period the general terms and conditions of the tentative approval cannot by changed by HMDC. Failure by HMDC to act on a complete preliminary plat application within 30 days of its receipt (unless the applicant consents to an extension) entails automatic approval of the preliminary plat.

A complete final plat submitted within three years of preliminary plat approval must be approved or disapproved by HMDC within 45 days of its filing. Detailed engineering drawings of proposed required improvements must be filed at least 60 days prior to the request for final approval. Review must insure compliance with HMDC regulations and any conditions of the preliminary approval. The HMDC decision is to be reported to the

municipal approval authority. If HMDC fails to act within the 45-day period (unless the applicant consents to an extension), the plat must be recorded as if approved. No part of the land in the subdivision may be sold prior to final plat approval. If an application is denied, the applicant must be advised promptly in writing of the reasons for such disapproval.

Following the posting of any performance bonds required by HMDC, action can be taken by the Office of the Chief Engineer on a zoning certificate application for the proposed development. Escrow deposits may be required as part of a zoning certificate. After the zoning certificate has been issued, fill may be placed, and building permits can be processed as subsequently described.

The zoning certificate application requires, among other details of the proposed plans, sufficient information for HMDC to determine that there will be compliance at all times with HMDC environmental performance standards. The applicant must certify that the proposed structure or use will conform to such standards in future. If the parcel has been mapped by NJ-DEP as subject to a State riparian interest, either a waterfront development permit, or a riparian instrument, or a final court judgment terminating the State's claim, must be submitted by the applicant. The zoning application must be approved within two weeks if it complies with applicable HMDC regulations, and if the plans for traffic and drainage and the effects on adjoining tracts are deemed acceptable. HMDC must notify the applicant and the municipality upon approval, and construction must start within one year of the date of issuance of the zoning certificate.

b. Specially Planned Area Procedures

Special procedures, rather than the subdivision regulations, apply to the approval of proposed development in Specially Planned Areas. Essentially the same special procedures also apply if the applicant seeks to develop a parcel of land larger than 5 contiguous acres in a regular zone as a Planned Unit Development (PUD). Approval is granted via a multi-stage process with General, Development, and Implementation Plans as increasingly specific review stages (Figure 16.). Such large projects typically are built in sections over a period of years. If a development is staged, all regulations applicable to the entire area must be satisfied by each stage.

First, the applicant must file a General Plan covering the entire Specially Planned Area. An environmental and socioeconomic impact assessment in accordance with HMDC guidelines must accompany the applicant's General Plan, and a public hearing on the General Plan must be held. Action must be taken by a Development Board on the complete General Plan application within twelve weeks from the acceptance of the submission as complete, unless the applicant consents to additional time.

Subsequent to General Plan approval, a Development Plan must be filed within the period specified in the General Plan approval covering in greater detail that section of the area to be developed first. This plan, too, must be accompanied by an environmental assessment, which is expected to be more

detailed and site-specific than the General Plan assessment because more detailed engineering data are now available. Evidence of a State-approved riparian ownership instrument, waterfront development permit, or final court judgment terminating the State's ownership claim must be provided, if any of the land is mapped by NJ-DEP as subject to State riparian interest.

The Development Board must act on the complete Development Plan application within twelve weeks. The Board may condition approval to insure compliance with applicable regulations and General Plan conditions, and it may grant variations from Specially Planned Area regulations if requested by the applicant. The Board must find that variations (1) do not affect the quality of the environment on the Specially Planned Area, (2) do not affect the comprehensive plan for the District adversely, and (3) do not impair the intent and purposes of the Specially Planned Area regulations. Disapproval is mandatory if the Development Plan is not in compliance with the previously approved General Plan or if riparian status has not been established as required. If the Board requests an advisory Environmental Design Committee appointed by the Commission to review the Development Plan, conditions may be imposed by the Development Board to implement recommendations of the Committee. The applicant must indicate his acceptance of the conditions of the approval within six weeks of the Development Board's decision, or the Development Plan is deemed to be disapproved. If the applicant notifies HMDC within six weeks of the Development Plan decision that he elects to refile a revised Development Plan, he may do so within four weeks of the notification date (or within the time authorized by the General Plan decision, whichever is later). The Board must decide upon the revised application within six weeks of the refiling. The Development Plan approval must set a maximum time limit for filing an Implementation Plan.

An Implementation Plan must show in great detail the applicant's plans for construction of any part of an approved Development Plan. Once again an applicant's environmental impact assessment is required, with informatin permitting a determination that the facility most probably will comply with HMDC environmental standards. Proof of submittal of sewerage and water supply plans to appropriate State and local agencies must accompany the Implementation Plan, together with evidence of any relevant application to the Division of Water Resources, NJ-DEP, for any proposed alteration, improvement, or relocation of any watercourse or proposed drainage structure on any stream with a drainage area of 320 acres or more. Twelve weeks are allowed for review and decisionmaking by the Development Board. As with the Development Plan, the applicant may file a revised plan within the specified time limits, whereupon the Board has an additional six-week period for decisionmaking. The applicant must accept the Board's conditions within six weeks of the Board's decision, or the Implementation Plan is disapproved.

Each Implementation Plan decision is to specify the times when construction is to commence and to be completed. A building permit application is to be made within three months of the decision.

Within two weeks of the Implementation Plan approval, all bonds or escrow deposits as well as engineering drawings and a final plat of the subdivision, if the applicant elects to subdivide, must be filed with the HMDC. Engineering drawings are to be approved within eight weeks by the Chief Engineer. The Development Board has 45 days to approve or disapprove the bonds, deposits, and plat, and no building permit can be issued prior to Board approval of these documents. Upon Board approval of the final plat, notification is made to the municipal approval authority, and the plat may be recorded. If construction does not begin within 18 months of Board approval of these documents (unless the Board grants an extension), approval of the Implementation Plan and the subsequent technical documents is deemed to be revoked. No improvements can be made prior to approval of the technical documents, including the placement of fill (except for existing sanitary landfills). Fill can be placed after all technical documents have been approved.

After the development has commenced, the Development Board may grant modifications to an Implementation Plan following a public hearing. Such modifications must be found (1) not to alter the character of the Implementation Plan, (2) to be necessary for preservation of the Specially Planned Area, and (3) not to confer a special benefit on any person. The Development Board may use various means to enforce the Implementation Plan, including use of performance bonds to modify or complete the development.

2. Building Permits, Inspections, and Certificates of Occupancy

At the conclusion of the subdivision process (through issuance of the zoning certificate) or the specially planned area process (through approval of the technical comments), including posting of required performance bonds and escrow deposits, building permits can be approved by the Office of the Chief Engineer. During construction all improvements are subject to inspection by the Office of the Chief Engineer. The applicant must give HMDC notice 48 hours before beginning to surface any roadway, install curbing or gutters, backfill or grade utility trenches, or join pipes under roadways. The applicant is responsible for the cost of such inspections. As-built drawings must be supplied by the applicant prior to final inspection. The applicant's liability for proper construction extends for two years beyond the date of final certification of the improvements by HMDC. The certified improvements become the property of the municipality.

Action on a certificate of occupancy application can be taken by the Office of the Chief Engineer after final inspection. Among other information, the application must show compliance with the zoning certificate and building code, and that applicable HMDC environmental performance standards most probably will be met during project operation. For developments in Specially Planned Areas, the Development Board must certify completion before the certificate can be issued by the Office of the Chief Engineer.

Every time the occupancy of a structure changes (except for residential structures) or a change of use is proposed, a certificate of occupancy must

be obtained from HMDC. The Office of the Chief Engineer must inspect the premises and issue or deny the certificate within one week after the filing of an application.

3. Operations of HMDC

It is apparent that HMDC has comprehensive regulatory authority over new construction in the District. HMDC has compiled a number of statistics which suggest the extent of its operations since 1970. Almost two thirds of the more than $680 million in new construction Districtwide that had been undertaken through 1978 were the result of private enterprise (Table 35). In excess of 1,700 residential units for more than 2,700 people were constructed, and employment space for more than 25,000 people was created. More than 4,300 development decisions were made, of which one third were for building permits, one third were for certificates of occupancy, one fifth were for zoning certificates, and the remainder were for variances and subdivisions (Table 36). Since 1973, the first full year during which the Master Plan zoning ordinance was effective, 459 variance decisions have been made (Table 37). More than 82% of requests for variances of bulk requirements were granted, and about 74% of requests for variances of required uses were granted.

During the 1970-1977 period HMDC reported the abatement or prevention of more than 1.4 billion gallons of wastewater discharges, of which about 92% were industrial discharges and the remainder were sewage and miscellaneous wastes. No new sanitary landfills in the District have been authorized by HMDC. Some landfills have been terminated; others have expanded vertically but not horizontally, according to HMDC. Alternative waste management facilities have been studied, and a baler operation is the first HMDC solid waste facility to be constructed. The baler is expected to begin operation during 1979, if approval is granted by the New Jersey Board of Public Utilities.

4. HMDC Master Plan and Wetlands Protection

In the long term, wetlands protection is a major necessity for protection of the estuarine environment. The HMDC Master Plan recognizes other goals, such as the encouragement of development and the disposal of solid wastes, that sometimes conflict with wetlands protection.

Historically almost the entire Hackensack Meadowland District consisted of estuarine waterways and tidal wetlands. During the past two centuries human activity has reduced the extent of the vegetated wetlands and of the waterways. Dikes and culverts have eliminated or almost eliminated the semi-diurnal flow of the tide from extensive areas; on other areas fill has raised the surface to form uplands. The HMDC estimate of the current acreage of wetlands and waterways in the District, as of 1 January 1979, is 4,662 acres. About 6,900 $\pm$ 690 acres in the District were estimated by DEP during 1972 to be vegetated wetlands at that time in a review of the HMDC Master Plan and Zoning Ordinance on the basis of "Wetlands Ecological Value Overlay"

Table 35. New development in the Hackensack Meadowland District, New Jersey, 1970-1977. HMDC data are from certificates of occupancy, except that new residential units data are from building permits.

YEAR	New Employees	New Residents	New Residential Units	Total Cost of Construction (million $)
1970	0	128	13	105.0
1971	920	42	73	20.8
1972	4,918	212	51	60.3
1973	5,914	298	38	65.2
1974	3,255	128	33	88.9
1975	2,773	347	264	41.7
1976	3,070	662	665	190.3
1977	1,734	908	34	39.6
1978	2,980	509	578	69.4
TOTAL	25,564	2,740	1,712	681.2

Table 36. Hackensack Meadowlands Development Commission decisions by type, 1970-77 (HMDC data).

Year	Zoning Certificate	Variance	Subdivision	Building Permit	Certificate Occupancy	Other	Total
1970	14	5	1	18	10	0	48
1971	77	27	13	87	37	3	244
1972	95	36	36	120	100	5	392
1973	96	64	19	142	139	8	468
1974	123	61	30	231	168	10	628
1975	74	47	25	191	203	5	545
1976	111	45	18	232	226	9	641
1977	130	49	29	209	221	12	650
1978	189	55	13	254	190	2	703
TOTAL	909	389	184	1,484	1,294	64	4,324
%	21	9	4	34	30	1	99

Table 37. HMDC variance decisions by type and outcome, 1970-77 (HMDC data).

Year	Bulk		Use	
	Approved	Denied	Approved	Denied
1970	5	0	4	0
1971	10	4	15	0
1972 (Master Plan 8/11/72)	11	6	18	2
1973	77	16	8	3
1974	74	15	13	2
1975	63	13	9	5
1976	58	12	12	5
1977	47	12	11	4
1978	88	11	12	1
TOTAL	433	89	102	22
%	83	17	82	16
1973-1978 TOTAL	407	79	65	14
%	84	16	82	18

maps produced for the purpose of tidelands determinations[1], indicating a decrease of 4,295 acres (57%) to 2,921 acres (47%) of wetlands over the period 1972-1979. HMDC reports 1,440 acres of open waterways in the 19,730-acre District.

According to HMDC data, the HMDC Master Plan Zoning Ordinance, Wetlands Order, and other regulations currently protect about two thirds of the

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[1]As indicated in the previous section on Wetlands Act implementation, DEP prepared no maps of the Hackensack Meadowlands District pursuant to the Wetlands Act of 1970. Wetland vegetation types in the District were delineated, however, by the DEP mapping contractor as part of the tidelands ownership investigation conducted for the Natural Resource Council by the Office of Environmental Analysis. The resulting maps show vegetation types that correspond in part with the Wetlands Act maps for other parts of the State, but they lack upper inland wetland boundaries. The Meadowland District vegetation maps can be consulted only at the Office of Environmental Analysis in Trenton. The ownership claims to tidelands in the Meadowland District are a subject of continuing controversy and litigation. The authors of the present report have found various major technical flaws in the claims of the DEP vegetation mapping contractor, as summarized at length elsewhere (see JMA 1978: Appendix VIII).

remaining wetlands in the District[1]. As discussed subsequently, the current HMDC requirements are less protective of wetlands than DEP policies in coastal wetlands that are regulated under the Wetlands Act (NJSA 13:9A-1 et seq.). They are less protective also than State laws which apply and DEP coastal management policies that are proposed for those sections of the coastal zone outside the Meadowland District.

The basic mechanisms by which wetlands in the Meadowland District are protected consist of (1) "marshland preservation" zoning for the Hackensack River and its tributaries (totaling 1,400 acres of open water)[1] and for selected marsh areas totaling 3,051 acres[1], a zoning category in which the few allowable uses mandate preservation of natural conditions throughout the zone; (2) interneighborhood common open space requirements that include marsh preservation in a varying percentage of the twelve major tracts zoned as Specially Planned Areas; (3) wetlands buffer strip preservation requirements along the Hackensack River and its "tributaries" (totaling 50 acres)[2]; (4) mandatory compliance with environmental performance standards which includes limitations on effluent discharges to waterways; (5) sanitary landfill regulations which are described by HMDC as having prevented the horizontal expansion of landfills since the implementation of HMDC regulations during 1971; (6) detailed environmental assessment requirements (for Specially Planned Areas and for PUD's) which will identify wetlands that are to be protected; and (7) procedural requirements that DEP consent must be given for development of any land in which the State has a tidelands claim before HMDC applications can be approved.

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[1]Acreages are those reported in the HMDC Open Space Plan, as revised by HMDC during 1979 to reflect current zoning:

VEGETATED WETLANDS PROTECTED BY ZONING	ACRES
Sawmill Creek Wildlife Management Area (tidelands in DeKorte State Park)	1,186
Other State-owned tidelands in the Marsh Preservation Zone	271
Privately owned tidal wetlands in the Marsh Preservations Zone	114
Protected tidal wetlands in Specially Planned Areas	819
Protected non-tidal wetlands in Specially Planned Areas	661
TOTAL	3,051

According to 1979 HMDC data, protected wetlands (3,051 acres), waterways (1,400 acres), and waterway buffer strips (50 acres) together form 70% of the 6,395 acres of open space planned for the District. HMDC during 1977 increased by 446 acres the extent of open space (including some wetlands) protected by zoning at the Sawmill Creek Wildlife Management Area (Mattson 1978). The focus of the HMDC Open Space Plan is the Hackensack River, along and outward from which extends a network of proposed wetland open space corridors.

How much acreage is to be preserved as waterways and wetlands, given full implementation of the Master Plan, is not certain.[1] According to the HMDC Wetlands Order (p. 5), the District eventually is to include at least 3,210 acres of wetlands and 1,400 acres of open water. Hence, by subtraction from the 1972 estimates by DEP, some 3,000 to 4,300 wetland acres ultimately will have been filled during implementation of the Master Plan, if the DEP and HMDC estimates are indicative approximations. This is a loss ranging from 48% to 58% of vegetated wetlands reported by NJ-DEP as present in the District during 1972. Almost one third of the existing 4,662 acres of marsh during 1979 will be lost when the 3,210 acres minimum protected by the Wetlands Order are reached. The open water total acreage is to remain constant at 1,400 acres.

Half of the land in Island Residential Areas is to be preserved as marsh and open water. Lesser percentages are required to be preserved as wetlands in other Specially Planned Areas. Generalized schematic representations of the location of preserved wetlands are indicated on the small-scale HMDC Open Space Map, but actual development to date has not followed the Map precisely. The Open Space Map was reported to be under revision during mid-1979.

In the twelve development zones of the District generally, the only wetlands that are expected to be preserved are wetlands in the waterway buffer strips (HMDC Wetlands Order, page 1). The HMDC-estimated, 50-acre total to be preserved as 50-foot wide waterway buffer strip may be an underestimate, considering that the total length of 50 acres of such strips is only about 8 miles of streambanks (4 miles if along both banks). Because the streams that have buffer-strip requirements have not been defined explicitly, it is not possible to report the total length of such streams or to recalculate the associated wetland acreage.

There is no mandatory HMDC requirement that tidal wetlands be identified or assessed by the applicant or by HMDC prior to development, except when an environmental assessment is mandated in the Specially Planned Areas (or in the event of a proposed PUD in the development zones). There is no counterpart to the findings that must be made by DEP in order to

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[1] Whether land zoned for marsh preservation but now used for industrial purposes (such as the LNG facility in East Rutherford) still is included in the HMDC total of wetlands that are protected is not known. All of the available data reported here are regarded as approximate.

approve development in regulated coastal wetlands, namely, that (1) the proposal requires water access as a central function, (2) has no prudent or feasible alternative on a non-wetland site, (3) will result in the minimum feasible alteration of the tidal circulation, and (4) will result in minimum feasible alteration of surface elevations and wetlands vegetation.[1] In contrast, for the development zones HMDC ordinances mandate only that relatively narrow buffer strips are to be preserved along some "tributaries" which have not been identified fully. Additional wetland preservation may be volunteered by applicants or mandated by HMDC in specific cases following review of individual applications. In the Specially Planned Areas, the HMDC Master Plan and Open Space Plan are more stringent concerning the extent and location of preserved wetlands, but half or more of the land is mandated for development nonetheless.[2]

Section 404 of the Clean Water Act provides that no fill material can be placed legally in the waters of the United States or their adjacent wetlands prior to issuance of a general or individual permit by the Army Corps of Engineers.[3] Federal policy on permits for fill and for construction in waterways is to restrict wetlands filling to projects which have no feasible site alternative, and to require minimum feasible wetlands alteration. As implementation and enforcement of Section 404 permit requirements by the New York District of the Corps are intensified, it is reasonble to expect that all new developments that both require filling and receive HMDC approval will require Corps permits. Corps authorizations also will continue to be needed for work in and along waterways pursuant to Section 10 of the River and Harbor Act of 1899, and Coast Guard approvals

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[1] For further discussion of the Wetlands Act, see the appropriate section of this Chapter.

[2] The precise method for calculating preservation requirements in Specially Planned Areas has not yet been established clearly. Presumably the same land cannot be counted both as a waterway or buffer strip and as the mandatory interneighborhood wetland open space. Thus, the required marsh preservation area conceivably could total more than 50% in the Island Residential Specially Planned Areas. To illustrate, consider a hypothetical 1,000-acre Specially Planned Area with an Island Residential 50% wetland preservation requirement. If none of the land is a waterway or buffer strip zoned as marsh preservation, then 500 acres are developable and 500 acres are to be preserved. Now assume that 100 acres of the site are in the Hackensack River and its 50-foot buffer, and 10 more acres are a tributary stream with its buffers. In this case the developable land is only 445 acres [(1,000 - 110) x 0.5 = 445], and the preservation area is 545 acres (445 + 100 + 10 = 545).

[3] For further discussion of the Corps and Coast Guard permit programs and wetlands protection policies of Federal agencies, see the appropriate section of this report. Wetlands have been included as waters of the United States by the Corps for regulatory purposes since July 1975 pursuant to court order (NRDC vs. Calloway, 392 F. Supp. 685; D.D.C. 1975).

will be needed for bridges and for minor road culverts that affect most waterways in the Meadowland District under Section 9 of the River and Harbor Act. To date, few Section 404 (Clean Water Act) permits have been issued for projects in the Hackensack Meadowland District, and Sections 9 and 10 (River and Harbor Act) permits have not always been obtained for alterations in the minor tidal waterways. After-the-fact applications for such permits in the future, therefore, may be required for now-extant facilities constructed without permits, especially for the numerous fills placed since the 1975 implementation of the Section 404 program. There is no statutory time limitation governing the need for such permits.

At present, HMDC regulations do not require that developers notify the Corps or Coast Guard of needed authorizations (or obtain statements of exemption from Federal jurisdiction) during the HMDC review process, nor are HMDC approvals conditional upon subsequent Federal approvals or exemptions. Hence, projects approved following the elaborate HMDC review procedures could be denied critical Federal permits. Project removal with site restoration or other mitigation could be imposed after the fact, if a Federal permit were denied pursuant to broad public-interest review after a project was constructed. There is no question that Federal law allows such measures (for example, see US vs. Keevan, S.D. Fl., 1974; US vs. Sexton Cove Estates, S.D. Fl., 1975), should the Federal regulatory agencies voluntarily commence enforcement or be compelled by court order to enforce their authorities fully in the Meadowlands. It is probable that individual applicants increasingly will bear the brunt of the conflict between current HMDC and Federal policies concerning Wetlands, unless steps are taken to resolve the conflicting requirements. The New York District could be requested to review the HMDC Master Plan and to issue a general permit authorizing development according to the Master Plan. If such a permit were granted, presumably following completion of an areawide Federal EIS, individual development actions in accordance with the Plan could be approved rapidly by the Corps following negative declarations, whereas variance applications would require thorough Federal scrutiny and possibly individual Federal EIS's. Such a framework would provide a significant backup incentive for compliance with the Federally approved HMDC Master Plan, and a concurrent incentive to minimize or avoid variances.

5. HMDC Water Quality Standards

The HMDC zoning regulations provide minimum standards for a number of water quality parameters that must be met by (1) discharges into central sewage systems, (2) discharges into the Hackensack River or any of its tributaries (NJAC 19:4-6.14). Sanitary wastes are not to be discharged to District waterways if sewers are available, and new sewage treatment plants are to discharge only to the Hackensack River itself, not to its tributaries.

The 1972 zoning regulations (pre-FWPCA) have as their objective "that the waters of the Hackensack Meadowlands District be made suitable for secondary contact recreation but not primary contact recreation" as well as for other purposes [NJAC 19:4-6.14 (f)]. This objective is less stringent

than that announced by Section 101 of the Clean Water Act, which requires fishable and swimmable waters by 1983 and zero discharge of pollutants by 1985. HMDC does require, however, that heavy metals and other toxic substances "be kept to as low a value as is consistent with current technological practice representing the highest state of the art and levels consistent with recreational and primary contact water" [NJAC 19:4-6.14 (g) 11].

HMDC has no control over pollutants or discharges that enter the District from outside sources. HMDC long opposed, for example, the construction of a new sewage treatment plant in North Bergen which is to discharge to Cromskill Creek. The facility was underway during 1979 with Urban Development Action Grant funding from the US Department of Housing and Urban Development without coordination with the Hudson County 201 Facilities Plan. Nevertheless, HMDC has achieved water quality improvements in the District. The surface water of the Hackensack River basin generally is ranked as poor by NJDEP, but improving trends are noted for two of six rated parameters (Division of Water Resources 1978).

6. Solid Waste Management

The disposal of solid wastes has been a major factor affecting the environment of the Hackensack Meadowland District for more than a century. The HMDC is mandated to exercise control over solid wastes disposed in the District (NJSA 13:17-10). The 50,000 tons of garbage received weekly from nearly 80 municipalities by the District represent about one quarter of the solid waste stream for New Jersey as a whole (Sheehan 1979), and the massive landfills dominate the landscape of the District.

On the basis of numerous studies during the past decade, HMDC (1979) has drafted a solid waste management plan for the District pursuant to NJSA 13:1E-1 et seq. A dozen general technological systems were reviewed for their applicability in the District, including composting, pyrolysis, local sanitary landfills, remote sanitary landfills, baling, shredding with direct disposal, wet separation (hydropulping), conventional incineration, waterwall incineration, resource recovery, energy recovery, and materials recovery alternatives.

A 1,000 tons per day baling facility was completed under a $6.9 million grant from the Economic Development Administration (Department of Commerce) in North Arlington (Bergen County) during 1978. The baler had not yet been approved by the Board of Public Utilities as of September 1979, and there was substantial controversy concerning the proposed fee structure. The baler compresses refuse, reducing its volume and providing a material which can form developable land when used to cover existing landfills. The bales initially are to be used to construct the proposed DeKorte State Park in Lyndhurst, North Arlington, and Kearny from old landfills and wetlands.

The central proposals of the solid waste plan are two resource recovery systems, one a 3,000 tons per day unit to be built in Ridgefield and the other a 2,500 tons per day unit to be built in Newark. HMDC hopes these units

can shred and then separate mixed refuse into several fractions: salable ferrous metals and aluminum, refuse-derived industrial boiler fuel, and inorganic residue. Glass could be separated, but its resale value currently is judged not to justify the effort (Sheehan 1979).

To date HMDC has given relatively little attention to requiring that wastes which enter the facilities of the District be separated at the source, favoring instead engineering solutions to process the mixed waste stream. It also has given little attention to the possibility of generating energy from refuse in the District and then marketing steam and chilled water to existing and planned developments in the District.

XV. COASTAL RESOURCE PRESERVATION

This Chapter focuses on several aspects of resource preservation in the coastal zone that receive relatively little attention in the 1978 and 1979 DEP-OCZM policy documents. The chapter begins with a discussion of open space preservation techniques for the coastal zone. It then provides brief commentary on selected legal issues of significance to coastal zone management efforts. Then it remarks on public participation in the coastal zone management efforts. Then it remarks on public participation and associated opportunities for public education in the coastal zone management enterprise.

A. Open Space Preservation Techniques

In this section alternative open space preservation techniques are described. Some of these techniques are appropriate as ways of increasing the quantity of land in public ownership. Others are applicable to land that remains in private ownership but offers public benefits.

1. Methods to Achieve Public Ownership

The largest single block of public lands in New Jersey is the lands flowed by the tides, which are held in trust for all citizens of the State. Although State ownership is unbroken offshore to the 3-mile limit, certain shorelands now or formerly flowed by the tides have been alienated into private ownership. State policy increasingly has restricted the alienation of State tidelands (Goldshore 1979).

Historically, the principal method of adding to the stock of public land is by acquisitions in fee simple, either through open market purchase, bargain sale at less than fair market value, donation, or condemnation. Acquisition of land by purchase insures public access and the highest degree of public control. Public purchase of fee-simple ownership implies both the availability of funds for land purchase (both a local share and matching contributions from State funds such as those created by the 1974 and 1978 Green Acres bond issues in New Jersey) and the existence of a land management agency to insure that each specific parcel is used for its intended purpose. Land condemned for public use in New Jersey must be paid for at fair market value. Donated lands generally create local eligibility for matching funds to the extent of their fair market value.

Land may be donated for public purposes either in full fee simple or in a lesser interest. Federal tax policies have been formulated to encourage such donations, and therefore donations and bargain sales typically are made to provide the donor with a deduction from Federal income and inheritance taxes. Charitable donations are acknowledged for public-purpose gifts or land to local, State, and Federal agencies and to qualified charitable organizations. Lands transferred at death are deductible from the decendent's estate at the current market value.

Land may be restricted from future landscape alteration such as by tree cutting, mining, and housing construction, by the terms of covenants in deeds. Covenants in deeds, like the easements discussed subsequently, can provide positive public rights or can specify negative prohibitions concerning the use of the land and preservation of its features. A covenant can be attached to a deed by a private landowner on his own volition or upon receipt of payment from the benefiting public (for example, from a municipality). Alternatively a public agency can buy property, insert the covenant, and then resell the property. When a covenant addresses only future contingencies, it is likely to have little or no effect on the current value of the land which the agency seeks to resell.

Covenants in deeds of lands donated for public purposes may require the reversion of title, if the terms of the gift are breached. Provision for the reversion of interest can assure that donated lands are used in the manner specified by the donor, but the reversion generally should be to an alternative public agency or conservation organization rather than to the donor, if he is to assure his tax benefit.

Easements are the principal mechanisms for transfer of a less-than-fee-simple interest in land to the public body. An easement is a formal, recorded, less than fee-simple title interest in land, which typically runs with the land in perpetuity. Positive easements allow public uses otherwise not available, such as access for biking, hunting, or fishing. Negative easements prevent otherwise allowable private uses, such as the destruction of scenic vistas, damage to environmentally sensitive areas, or alterations in the facade or interior of an historic building. The fee-simple owner may sell or donate development rights and may restrict future development. As with fee-simple gifts, landscape change may be forestalled. The most protective easements are those given or sold in perpetuity. For achieving open space preservation, easements generally are less costly than outright acquisitions for the local government or other public body.

The easement technique is especially useful where the owner is interested in preserving and using land in its existing state, but he does not want to donate it entirely. Municipalities may acquire easements by condemnation. The landowner who sells or donates an easement may receive income tax benefits or a reduction in local property taxes, but New Jersey law and court decisions historically did not require local tax assessors to reduce assessments on land because of public easements. The reduction in local tax liability as a result of a conservation easement recently was mandated by the Division of Tax Appeals in the case of Fincher and Parsons vs. Township of Bethlehem, County of Hunterdon, et al. in a precedent-setting case with broad implications in New Jersey discussed in the following section.

Easements offer various advantages and disadvantages to landowners and to the public as compared with fee-simple public acquisition. The specific terms of easements and deed restrictions must be negotiated by landowner grantors and public agency or public-interest organization grantees in each

instance. Useful presentations of general principles are those of Stover (1976), Gove (1977), HCRS (1978), and various publications of the Nature Conservancy. In general, easements and deed restrictions are much less widely understood than direct public fee-simple land acquisition by market or condemnation purchase or by donation. They are compared in Table 38 and discussed in the following paragraphs.

In general, landowner advantages from the granting of easements include the ability to insure the future conservation of historic, scenic, or natural values, while preserving the owner's remaining fee-simple rights concerning the use, sale, and lease of the land, subject to the conditions of the easement. State and/or Federal income and estate tax benefits, together with local property tax savings, may be sufficient to allow a landowner to retain land that he otherwise would have to sell. Most transfer (settlement or closing) costs may be assumed by the municipality or other grantee. The establishment of easements also offers an opportunity for neighbors to assure mutual benefits in resource conservations.

Potential disadvatages to landowners also may result from easements. The reduction in future development rights may entail a monetary loss greater than the income realized from the sale or tax benefit realized from the donation of the easement. The number of future buyers willing to accept the easement-restricted property may be smaller than the number of buyers interested in the unrestricted property. To obtain tax benefits, the landowner may have to grant public access, and thereby may incur public liability unless the grantee provides liability insurance.

Community advantages from easements include the accomplishment of legally enforceable rights in public access, scenic vistas, environmentally sensitive areas, and historic structures at a lower initial capital cost than fee-simple purchase of the land. Maintenance costs may remain a private responsibility, saving ongoing costs to the community. Some local property tax revenue ordinarily will continue to be produced, as opposed to none from fee-simple publicly owned land. If it is perpetual, public rights vested in the easement are less likely to be changeable by temporary political pressure than those guaranteed only by local zoning and subdivision regulations. Finally, public benefits may be realized even without physical public access, especially where easements concern private lands that surround public lands.

Community disadvantages also may arise from easements. When easements are acquired by condemnation, the community generally has to pay all transfer and settlement costs. The community may incur continuing administrative and financial obligations for the periodic inspection of land, for enforcement of the terms of the easement, and for land maintenance, which may reduce the advantage of capital cost savings. Public access is not acquired automatically by an easement, as it is with fee-simple acquisition. Public rights and benefits in each case must be explained to the pbulic, because they differ from easement to easement. Easements in gross (as for example where adjacent land is not publicly

owned) may not run with the land. Finally, easements can be used for exclusionary purposes.

DEP-OCZM can encourage counties to sponsor local bond issues to acquire scenic easements or to accomplish preservation of environmentally important shore areas. Such local efforts are eligible for matching funds from the State Green Acres bond issue. The Burlington County Pinelands bond issue, for example, is being used to purchase conservation easements on lands of exceptional environmental value. These easements prevent future development.

Municipalities also are empowered to issue bonds for the purchase of easements. Moorestown currently is considering a local bond issue to purchase easements on farmlands in order to preserve the agricultural nature of the community. State enabling legislation allows local governments to issue bonds for the purchase of easements.

Local governments may utilize revolving funds to buy large tracts using general property tax revenues, and then resell selected parcels to developers as land values increase. Profits can be returned to the fund to purchase additional open space. Such measures enable a municipality to control the rate and location of growth and to protect environmentally sensitive areas.

2. Federal and State Assistance Programs

The Land and Water Conservation Fund is administered by the Heritage Conservation and Recreation Service in the Department of the Interior. Grants are made to local governments through the Green Acres Program in DEP. Grants can be made for matching as much as 50% of land acquisition costs. lands purchased with Federal Conservation Funds must be kept perpetually in the public uses for which they were acquired.

The New Jersey Green Acres program can be used for acquisition of interests (both fee and easements) in real property, riparian rights, and water rights (NJSA 13:8A-3d). Land to be acquired must constitute a logical recreation and/or conservation unit. The land must be acquired within a set period of time, and it must provide a net increase in outdoor recreation or conservation activity.

Property tax relief for private owners of wetlands, with offsetting State compensation of municipalities, can be investigated by DEP-OCZM. Minnesota eliminated all property tax on privately owned wetlands during 1979. In addition, a property tax credit was established for every acre of wetland that a landowner agrees not to drain. The credit was established at 0.75% of the value of the highest valued cropland on the farm for every acre enrolled in the program. Some such program might be of benefit in preserving inland wetlands in New Jersey

Table 38. Comparative tax effects of various methods of protecting public interests in open space (HCRS 1978:20).

INTEREST	WHEN	TRANSACTION	IMPACTS ON GRANTOR	IMPACTS ON GRANTEE
Fee Simple	Public use would conflict with any other use. A lesser interest cannot be acquired	Sale	Generates taxable income. Decreases taxable estate by amount of value of property sold. Eliminates property tax.	Decreases property tax base. Increases operations and maintenance costs.
		Bargain Sale	Generates taxable income. Generates income tax deduction for charitable contribution in amount of difference between the fair market value of the property and the sale price. Decreases taxable estate by amount of the fair market value of the property. Eliminates property tax.	Decreases property tax base. Increases operations and maintenance costs. Provides local matching share for grant from Land and Water Conservation Fund in amount of the charitable contribution.
		Donation	Generates income tax deduction for charitable contribution in amount of the fair market value of the property. Decreases taxable estate in amount of the fair market value of the property. Eliminates property tax.	Decreases property tax base. Increase operations and maintenance costs. Provides local matching share for grant from Land and Water Conservation Fund in amount of the charitable contribution.
Conservation Easement	Public use would not conflict with other uses of property. Scenic or other public values protected without public use of property.	Sale	Generates taxable income Decreases taxable estate by amount of the fair market value of the easement. May reduce property tax.	Preserves property tax base.
		Bargain Sale	Generates taxable income. Generates income tax deduction for charitable contribution in amount of difference between the fair market value of the easement and the sale price. Decreases taxable estate in amount of the fair market value of the easement. May reduce property tax.	Preserves property tax base. Provides local matching share for grant from Land and Water Conservation Fund in amount of charitable contribution.
		Donation	Generates income tax deduction for charitable contribution in amount of the fair market value of the easement. Decreases taxable estate in amount of the fair market value of the easement. May reduce property tax.	Preserves property tax base. Provides local matching share for grant from Land and Water Conservation Fund in amount of fair market value of easement.
Leasehold	Grantor desires to retain ownership but is willing to permit public use and administration for a term of years.	Donation of less than perpetual lease	May eliminate property tax for term.	May decrease property tax base for term. Increases operations and maintenance costs. Provides local matching share for grant from Land and Water Conservation Fund in amount of the fair market value of donated term interest.
		Donation of perpetual easement before June 30, 1977	May eliminate property tax for term. Generates income tax deduction for charitable contribution in amount of the fair market value of donated interest.	

As Deardorff (1977) has pointed out, the quality of the Nation's waters is expected to improve dramatically during the decade of the 1980's. Hence water-oriented greenways can be expected to appreciate dramatically in value, particularly along currently polluted urban and suburban water courses. DEP has a prime opportunity for spearheading the coordination of public and intergovernmental efforts to acquire waterfront land in the New Jersey coastal zone.

3. Alternate Zoning

Uncommon methods of zoning include transfer of development rights and the now increasingly popular cluster zoning. Each of these allows the construction of additional development on certain lands in exchange for the preservation of other lands in open space.

Transfer of development rights is aimed at preserving environmentally sensitive areas by prohibiting development in such areas but allowing the landowner to transfer the right to develop to other lands. The development rights become marketable interests that can be bought and sold. New Jersey currently lacks enabling legislation that would authorize municipalities to institute the transfer of development rights or to establish a public authority to buy and sell the development rights.

The transfer mechanism, by allowing higher density than local zoning otherwise would permit, may encourage large developers to enter areas which formerly were of little interest. Development of large-scale subdivisions may induce significant population growth at a rate much faster than is likely under traditional zoning for low-density housing.

Cluster zoning involves the relaxation of zoning regulations governing lot sizes, setbacks, frontage, sideyards, and other aspects of development, resulting in a rearranged pattern of development at a total gross density no greater than that allowable under the conventional zoning. Because the dwellings are clustered on a relatively small percentage of the land, relatively large areas of open sapce can be maintained.

Clustering provides advantages in the construction of infrastructure and in some parts of structures (for example, common walls between units). The suitability of land for clustering varies, with on-lot sewerage and soil considerations as important limitations. Clustering is permitted by State enabling legislation for those municipalities that elect to establish ordinances permitting it.

B. Selected Legal Issues

This section addresses several legal issues that have bearing on the implementation of the New Jersey coastal zone management program. First there is a brief commentary on the so-called "taking issue". Then several key court decisions are cited under pertinent topics. The thrust of this review is to provide support for the regulatory programs of NJ-DEP. Finally,

recognition is given to the significance of the New Jersey Environmental Rights Act of 1974.

1. The Taking Issue

The coastal zone management program in New Jersey is designed primarily to use existing State laws which entrust State agencies with the power to exercise some measure of control over selected areas and selected uses of those coastal resources with greater than local significance. These State regulatory controls are in addition to other controls exercised at the local and Federal levels of government. The program also aims to achieve coordinated policies among the several levels of government with respect to individual projects and facilities.

The power to regulate construction and other activities stems from the inherent power of governments to regulate the conduct of their citizens for the common good in order to assure the public health, safety, and welfare. The power to regulate is delegated from the people by the Constitution of the United States and by the New Jersey Constitution to the Federal and State governments, respectively. The Tenth Amendment to the US Constitution provides that the powers not delegated to the Federal Government by the Constitution, nor prohibited by it to the States, are reserved to the States or to the people. The New Jersey Legislature, in turn, has delegated extensive powers to its creatures, the counties and municipalities of the State. The State nevertheless retains a substantial measure of power to regulate for the purpose of assuring public health, safety, and welfare.

The regulatory powers of government must be exercised within reasonable limits. The Fifth Amendment to the US Constitution provides that no person is to be deprived of liberty or property without due process of law, and that no private property is to be taken for public use without just compensation. The Fourteenth Amendment further mandates that no State shall deprive any person of property without due process of law or deny any person within its jurisdiction the equal protection of the laws. These limitations form the basis for the "taking issue," namely, whether a regulatory action (1) deprives a property owner of liberty or property without due process of law, (2) takes private property for public use without payment, or (3) regulates a person unfairly with invidious discrimination. Environmental laws and regulations that diminish the value of private lands may be struck down by the courts, if they are judged to constitute an unconstitutional taking. When a challenge is raised, the courts must weigh the public interest being served by regulations in the specific instance against the specific diminution of property value.

The taking issue historically proved to be a formidable obstacle to environmental regulation. When a regulation has the effect of completely destroying the value of private property, it may be declared unlawful, even if it otherwise can be proved reasonably to be related to the public health or welfare. During recent decades, however, both the Federal and the State courts have established a record of upholding environmental regulations even in cases where that regulation results in a substantial reduction in the

value of private land, provided that the reasons why the regulation is necessary to insure the public health, safety, and welfare are identified in the regulation process and are demonstrated in court (Bosselman, Callies, and Banta 1973). Where a cause and effect relationship between the restricted behavior or use and some significant potential environmental detriment to the safety, health, or welfare of others can be demonstrated, the regulation of the behavior or use is very likely to survive legal attack. Objective environmental values and demonstrated ecological relationships in principle form a highly defensible rationale for land use controls by virtue of their regional (as opposed to parcel-specific) nature and their relationship to human safety, health, and welfare. The greater the public necessity for a law, the greater the reduction in property values which the courts are likely to uphold without finding a taking (for further discussion, see Haughey and Goldshore, 1977; CEQ 1973; and Rathkopf 1975).

The taking issue can be illustrated by several cases which concern floodplains and wetlands. In an important case in New Jersey, Morris County Land Improvement Co. vs. Parsippany-Troy Hills (40 NJ 539, 1963), the New Jersey Supreme Court struck down a municipal zoning ordinance provision that was intended to preserve inland wetlands in their natural condition until such time as they could be acquired as part of a public flood control project. The court found that no productive use could be made of the land by its owner under the ordinance, which essentially created a public park on private land. Several more recent decisions, however, have taken a different view.

In Sands Point Harbor, Inc., vs. Richard J. Sullivan (Docket No. A-765-73, App. Div. 1975), the New Jersey Superior Court found that the regulations of the New Jersey Wetland Act of 1970 did not violate the State or Federal Constitution. The court noted that the Legislature has broad discretion to classify and treat lands differently, so long as the classification is reasonable and is related to the basic object of the Legislation. The only activities prohibited under the Wetlands Act were the dumping of solid waste, the discharge of sewage, and the storage and application of pesticides. The effects of other proposed uses were to be scrutinized by DEP before a permit could be issued, but the act did not constitute a taking of property.

The Appellate Division of the Superior Court again upheld the Wetlands Act against the change of a taking and denied the contention that the Act was vague, unreasonable, or unconstitutional in the case of Carton et al. vs. State of New Jersey (Docket No. A-638-73, 1978). This decision cited Sands Point Harbor; a petition for appeal was denied by the New Jersey Supreme Court. Likewise, the Chancery Division of the Superior Court held that a prohibition of spoil disposal on 80 acres of State-delineated tidal wetlands, which constituted only 3% of a 2,500-acre tract along the Delaware River was not unreasonable and did not constitute a taking. The mere diminution of economic value of the land was stated not to be an excessive use of the police power (American Dredging Co. vs. State, 161 N.J. Super. 504, 1978). The Appellate Division upheld the lower court, noting that local zoning limited development in any case to 50% of the tract, and the wetlands might in future be used to benefit the upland part of the tract (169 N.J. Super. 18 Appell. Div., 1979).

Justice Hall, the author of the Morris County decision, himself offered a revised view of that decision in 1974 (A. G. M. Associates vs. Springfield Township, 65 NJ 101, 1974):

> The approach to the taking problem, and the result, may be different where vital ecological and environmental considerations of recent cognizance have brought about rather drastic land use restrictions in furtherance of a policy designed to protect important public interests wide in scope and territory, as for example, the Coastal Wetlands Act, NJSA 13:9A-1 et seq. and various kinds of flood plain use regulation. Cases arising in such a context may properly call for a reexamination of some of the statements 10 years ago in the largely locally limited Morris County Land case...

There were a number of cases in other states during the 1970's which parallel the cited New Jersey decisions. A Maryland case, Potomac Sand and Gravel Co. vs. Governor of Maryland (266 Md. 358, 293 A. 2d 241, 1972, cert. den. 409 US 1040, 93 S. Ct. 525, 34 L. Ed. 490, 1972) upheld the stringent coastal wetland statute in that State by reference to the substantial harm which would result from abuse of the wetlands. In Turnpike Realty Co. vs. Town of Dedham (24 N.E. 2d 891, 1972) the Massachusetts Supreme Court upheld a township floodplain zoning ordinance which reduced the value of plaintiff's land to 12% of its previous value. The Wisconsin Supreme Court also upheld prohibitions on filling against the charge of taking (Just vs. Marinette County, 65 Wis. 2d 7, 201 N.W. 2d 701, 1972):

> It seems to us that filling a swamp not otherwise commercially usable is not in and of itself an existing use, which is prevented, but rather is the preparation for some future use which is not indigenous to a swamp. Too much stress is laid on the right of an owner to change commercially valueless land when that change does damage to the rights of the public.

As previously mentioned, there are several examples of the Federal courts having upheld Federal statutes protecting wetlands. A major precedent was set by the "public interest review" denial of a permit, which was sustained by the court in Zabel vs. Tabb (430 F. 2d. 199, 15th Cir., 1970; cert. den. 401 US 910,1972). The Corps regulatory jurisdiction was broadened by US vs. Holland (373 F. Supp. 665, M. D. Fla., 1974); by US vs. Stoeco Homes, Inc. (498 F. 2d. 597, 3rd. Cir., 1974; cert. den. 420 US 927, 1975); and NRDC vs. Calloway (392 F. Supp. 635, D. D. C., 1975). Other significant permit denials by the Corps of Engineers, which also entailed restoration of the natural conditions that prevailed before illegal work was undertaken, include US vs. Keevan (S. D. Fl., 1974) and US vs. Sexton Cove Estates (S. D. Fl., 1975).

It is the conclusion of the consultant that the taking issue need not be a factor of undue concern for the implementation of the DEP management program for the New Jersey coastal zone. None of the key statutes to date has been struck down. It is apparent that the staff of NJ-DEP can read the statutes liberally and can strive for the fullest protection of the environment of the coastal zone without fear of legal challenge, so long as the regulation is done in a manner soundly based on environmental information, ecological science, and explicit criteria for decisionmaking. To the extent that the taking issue reflects Constitutional safeguards that require the fair and soundly conceived administration of environmental laws, it should serve as a salutary incentive for responsible decisionmaking.

2. Commentary on Cases

The cases mentioned here include challenges to several State coastal zone management plans, to the New Jersey Coastal Area Facility Review Act, to the New Jersey general stream encroachment statute (NJSA 58:1-26), and to State water quality standards. Other cases are mentioned which concern tidelands and riparian ownership, public access to beaches, and conservation easements. Challenges to the Wetlands Act of 1970 were discussed previously as examples of the taking issue.

a. Federal Coastal Zone Management Act

On the Federal side of the law Federal courts in California and Washington DC rejected broad attacks by major oil companies on the coastal protection laws in California, Massachusetts, and Wisconsin. The oil companies claimed the coastal programs did not meet the requirements of the Coastal Zone Management Act and sought an injunction against further Federal funding of the coastal programs and their application to any offshore drilling activities on the Federal Outer Continental Shelf. The principal claims asserted by the oil companies were 1) the State programs were not specific enough in relation to the companies' proposed activities, 2) the programs did not accommodate the "national interest" in the siting of energy facilities, and 3) improper adoption and review procedures were followed.

On 31 August 1978 the US District Court in Los Angeles gave the companies standing to challenge the California program but found their claims to be without merit. The US District Court for the District of Columbia ruled that the oil companies lacked standing to sue Massachusetts and Wisconsin, because they failed to show any injury to their interests from the coastal program implementation and their claims were not ripe. The California court noted that the Federal law "was first and foremost a statute directed to and solicitous of environmental concerns" and rejected the notion that California must make a blanket commitment to accept the energy facilities proposed by the companies. The affirmation of these coastal programs is especially significant in light of the new emphases in facilitating energy sources and the continuing controversy over siting energy facilities and sewer plants in the coastal zone.

b. New Jersey Coastal Area Facility Review Act

Toms River Affiliates vs. Department of Environmental Protection, 140 NJ Super. 135, 355 A 2d 679 (App. Div. 1976) cert. den. 71 NJ 345, 364 A. 2d 1077 (1976), deals with the constitutionality of CAFRA and the validity of a DEP decision under CAFRA. Appellants were denied permission by the Deputy Commissioner to build a ten-story condominium in Toms River. The Coastal Area Review Board upheld the Commissioner's decision because the proposed development would have precluded options at a time when DEP had not yet completed statutory planning standards and designs for the coastal area. The Court restrained the developer in order to assure proper environmental protection through comprehensive planning.

c. Tidelands and Riparian Ownership (see also Goldshore 1979)

O'Neill vs. State Highway Department, 50 NJ 307 (1967), deals with lands along the Hackensack River to which the State claimed title. The Court found that the State owns in fee simple all lands flowed by the tide up to the high water line or mark.

The high water line or mark is formed by the intersection of the tidal plane of mean high tide with the shore. In finding the high water line, the Court suggested using the average of all the high tides over a period of 18.6 years.

The State cannot gain more land by building artificial works such as ditches which extend the tide ebb and flow on lands naturally beyond the tide. A riparian owner likewise cannot gain land by excluding the tide. Whoever challenges the existing stituation must satisfy the court that the tidelands area was changed artificially.

Leonard vs. State Highway Department of New Jersey, 29 NJ Super 188 (App. Div. 1954), lays out the rules of erosion by natural means. Generally, a landowner loses title to the State where there is erosion. If there is accretion, a landowner can gain title at the expense of the State. An owner does not suffer loss if the erosion is an event of a sudden and perceptible loss of land.

d. Stream Encroachment

Deskovick vs. Water Policy and Supply Council, 157 NJ Super 89 (App. Div. 1978). Deskovick wished to place a sanitary landfill on land along a river. He was denied a stream encroachment permit by DEP because filling the property would lead to a loss of flood retention capacity, and sediment and debris might enter the river from the newly filled area as it had from adjacent lands previously filled. The Appellate Court reversed the Council and remanded the case saying that the agency had read its jurisdiction too broadly.

There is no formal Attorney General's opinion clarifying the Deskovick case. Some feel that new legislation is needed to clarify stream encroachment jurisdiction. In the meantime, the Division of Water Resources

is using a memorandum from the Attorney General's office which gives stream encroachment jurisdiction over anything which affects the channel.

In Parkway Mall vs. Water Policy and Supply Council, 157 NJ Super 169 (App. Div. 1978), the court found that the DEP could issue a stream encroachment permit subject to conditions and rescind the permit when the applicant did not satisfy the conditions within three years.

e. Water Quality

In New Jersey Builders et al. vs. New Jersey Department of Environmental Protection, a three-judge appellate court found that DEP had authority under the state water planning law and water pollution control act to set water quality standards and also had the power to implement anti-degradation standards.

f. Public Access to Beaches

In Borough of Neptune vs. Borough of Avon-by-the-Sea, 61 NJ 296 (1976), Avon wanted to charge a higher fee for non-resident users of the Avon beach. The Court held that a coastal municipality in the maintenance and operation of a beach could not discriminate in any respect between residents and non-residents. The New Jersey Supreme Court read the Public Trust doctrine to include recreational use in addition to the traditional rights of navigation, commerce, and fishing. Under Avon, the public owns tidal lands between the mean high and mean low water marks as well as beneath the ocean seaward from the beach. The municipality had dedicated the beach front to the public, and the court forbade the municipality from charging the public a discriminatory fee for using the beach, saying that such a fee was equivalent to a physical barrier.

The Deal case, Van Ness vs. Borough of Deal, 78 NJ 175 (1978), involved a club which was adjacent to the beach and consisted of a swimming pool, cabanas, and related recreational facilities. The club had been built by the municipality, and its membership was limited to residents of the municipality. The beach in front of the club had not been dedicated to public use. Nevertheless, the New Jersey Supreme Court found that a municipally owned open beach on which permanent improvements had not been built and as to which no claim of private ownership had been asserted was subject to the Public Trust doctrine. Therefore, all had a right to use and enjoy the beach, and the municipality could not frustrate the public right by restricting its use to residents of the municipality. The Court pointed out that Deal could not alienate from the public their rights on a limited basis when, under the doctrine of Public Trust, the public inherently possessed these rights in full.

In Hyland vs. Borough of Allenhurst, 78 NJ 190 (1978), the New Jersey Supreme Court found that where municipal toilet facilities exist adjacent to a public beach area, it is an abuse of municipal power and authority to bar users of the public beach from access to such basic accommodations. The Court cited the restriction of toilet facilities to Allenhurst Club members

as an arbitrary and unreasonable exercise of municipal power, but it let the municipality restrict access to other club facilities provided for changing to bathing attire. Toilet facilities were found related to health and welfare, but changing facilities were not.

g. Conservation Easements

In Ernest B. Fincher and Robert R. Parsons vs. Township of Bethlehem, County of Hunterdon, the court dealt with the value of vacant land affected by a conservation easement granted by the property owner to the New Jersey Conservation Foundation, a non-profit organization. It underlined the fact that a conservation easement limiting development on property should be reflected in the assessment of the property. The Court noted that no monetary benefit from the conservation easement accrued to the owner and that the lands serve the needs of the public, even though there is no public access. Therefore, the lands subject to conservation easement have no monetary value to either the present or future owner so long as the easement is in effect. Where the land has no practical economic value, the value of the land is nominal. The public cannot have it both ways; it cannot obtain the non-use of the parcel in totality and yet demand that the property owner pay real estate taxes based upon the value which the land would have otherwise.

h. Scenic and Historic Preservation

The protection of cultural, historical, aesthetic, and architectural assets is an aspect of public welfare that the states are empowered to protect under their police powers. This view is supported by People vs. Goodman, 31 N.Y. 2d 262 290 N.E. 2d 139 338 N.Y.S. 2d 47 (1972). People vs. Stoner, 12 N.Y. 2d 462, 191 N.E. 2d 272,240 N.Y.S. 2d 734, app. dis., 375 U.S. 42 (1963); opinion of the Justices to the Senate 333 Mass. 773, 128 N.E. 2d 557 (Mass. 1955); Penn Central Transportation Co. vs. City of New York, 46 L.W. 4856, 4863 (Sup. Ct. 1978) (dictum); and Berman vs. Parker, 348 U.S. 26, 33, 75 Sup Ct. 98, 102-103 (1954) (dictum). Hence DEP can exercise the power to identify and regulate scenic areas and corridors. It also can encourage historic landmark districts.

The recent opinion of the United States Supreme Court on Penn Central Transportation Co. vs. City of New York upholding the application of the New York City Landmark Preservation Law strengthens historic preservation regulations. Landmarks recognized in New York City are those that possess (1) a special character, (2) special historic or aesthetic interest, or (3) value as part of the development, heritage, or cultural characteristics of the city, state, or nation.

3. The New Jersey Environmental Rights Act of 1974

The Environmental Rights Act is a relatively unknown and little used statute that may take on increasing significance during the 1980's. Because the State's environment is continually threatened by pollution, impairment, and destruction, the Legislature found that every person has a substantial

interest in minimizing such threats, and that the public interest is served by facilitating ready access to the courts to remedy such abuses. Accordingly, the Act authorizes any person to sue any other person (including agencies) to enforce statutes, regulations, and ordinances protective of the environment. In situations where no statutes or standards are applicable, the court may decide equitable and declaratory relief, including temporary and permanent injunctions and conditions, and performance bonds may be required. The court may dismiss suits deemed to be frivolous, harrassing, or lacking in merit.

The rights granted by this Act are in addition to any other available remedies under other statutes. The Act expressly provides that the prevailing party in appropriate cases may be awarded reasonable counsel and expert witness fees, not to exceed a total of $2,500.

It is reasonable to expect an increase in litigation to insure the full enforcement of existing and future environmental laws, as the concerned public becomes increasingly knowledgeable of pollution problems. DEP administrators have not always been successful in acquiring the staff and financial resources to implement fully their legislative mandates. This problem may become more severe as the deadlines for compliance with National air and water quality standards approach. A current example is the difficult problem of toxic wastes disposal. Their disposal by clandestine means is financially lucrative, and the severe environmental damages that result on the coastal waterfront, in the Pinelands, and elsewhere are currently the subject of considerable public attention (see, for example, the series of news articles in the Philadelphia Inquirer beginning at Vol. 301, No. 86, p. 1, 24 September 1979). DEP should welcome litigation under the Act as a potential tool for acquiring additional support for its programs.

C. Public Participation and Public Education

DEP has given substantial attention to the encouragement of public participation in the process of developing its coastal zone management program. It has held numerous meetings throughout the proposed coastal zone, and it has provided copies of successive versions of regulations for public comment.

As the coastal zone management program is implemented, other opportunities for encouraging public participation in management activities will arise. These will include opportunities to advise local government groups and agencies concerning open space preservation, encouraging public participation in coastal celebrations focusing on known coastal resources and identifying new ones, and providing basic tools and educational curricula for appreciation and surveillance of coastal resources.

DEP can provide an activist stimulus for local governments to utilize existing opportunities to secure State and Federal assistance for protecting scenic areas, critical environmental sites, bikeways and pedestrian paths,

and other resources that are recognized as important locally. Local governments virtually always need assistance in developing and administering zoning, acquisition, and funding techniques to protect open space with significant environmental values. DEP can take the initiative in cooperating with the Department of Community Affairs to help coastal communities. It would be particularly appropriate for DEP to provide coordination for projects such as bikeways that cross several municipal boundaries.

DEP can utilize the opportunity provided by State government to publicize coastal or marine heritage festivals through means such as Governor's Proclamations or Executive Orders. Technical assistance can be provided to municipalities not only to stage festivals that celebrate public pride in known resources, but also to motivate local groups to identify natural and cultural resources peculiar to specific places.

DEP can take the lead in working with other agencies, including the New Jersey Department of Education and the National Oceanic and Atmospheric Administration, to develop imaginative educational programs soundly based on knowledge of the estuarine environment and its values. Coastal field trip itineraries suitable for school groups interested in ecological and/or cultural aspects of the region can be developed. An environmental education center to explain and interpret the coastal resource ecosystems and values of the Hackensack Meadowlands must be constructed and operated in the Hackensack Meadowland District by the New Jersey Sports and Exposition Authority in partial mitigation for the filling of several hundred acres of wetlands for the Sports Complex in East Rutherford. DEP can make certain that exhibitions developed at this new facility are suitable for reproduction and use at nature centers throughout the coastal zone with cooperative funding under the New Jersey Environmental Education Act as well as coastal zone funds.

DEP can develop a set of tools to help the public better understand the location of coastal zone resources, regulatory programs for their protection, and how each citizen can participate in environmental surveillance. Foremost among tools for public understanding are maps showing lands subject to special regulatory protection. Flyers that remind the public of the kinds of activities that require permits, and notices of offices to which suspicious, environmentally damaging activities should be reported can be designed and circulated. Coastal zone regulation should be understood -- the "why" as much as the "how" -- by the public, so that the regulatory process continues to receive public support.

DEP also can earmark Federal coastal funds directly for support of public participation in coastal environmental impact statement review. In California, funds were allocated during 1979 for public participation in the environmental review of the Channel Islands Marine Sanctuary proposal to encourage those who otherwise might be unrepresented to participate. Applications were processed for compensation for salaries, consultant fees, attorney fees, travel expenses, and document reproduction.

XVI. RECOMMENDED MEASURES TO STRENGTHEN ESTUARINE PROTECTION

The recommendations presented in this Chapter address first various technical and procedual improvements that, in the professional judgment of the consultant, could improve the regulatory processes described previously. Then recommendations for substantive policy changes are described in a commentary on the coastal zone management policies that were proposed by DEP during March 1979. Next the opinions of the consultant are reported concerning the need for, and possible ways to enhance, enforcement of regulatory requirements. Then the need for new State legislation is addressed, and the Chapter closes with comments on topics suitable for further study.

A. Technical and Procedural Improvements

The recommendations in this section are for administrative actions to implement fully certain legal authorities that are not yet protecting the estuarine environment adequately and for other actions to improve the procedures now used in administering key programs. No legislative changes are needed to adopt these reforms. Following several general recommendations, the recommendations are grouped which concern specific regulatory programs.

1. General Recommendations

A-1. The Commissioner of DEP should assign a high priority to coordination of permit review responsibilities among DEP agencies.

DEP has numerous and complex authorities over proposed construction that may affect the environment of the coastal zone. Any project that requires one DEP approval is likely to require others. Two purposes of interagency review are to assist applicants to identify the full spectrum of applicable State approvals at the earliest possible time, and to inform applicants of the kinds of evaluations that will be made of their proposals. The written coastal zone management policies, the optional pre-application conference, and the consolidated Water Resources/Coastal Resources permit application form (as required during mid 1979) are valuable steps toward achieving these purposes. Interagency review also can provide guidance to applicants on ways to develop in an environmentally sensitive manner, enforced if necessary by permit conditions, to achieve full implementation of current legal requirements that protect sensitive resources.

The formal procedures of the CAFRA permit staff for circularizing applications among other State agencies are a model for other permit programs in the Division of Coastal Resources, Division of Water Resources, Division of Environmental Quality, and Solid Waste Administration that may affect the estuarine environment significantly. Coordinated interagency permit review requires that the responsibility for review be defined clearly in each administrative unit, that adequate staff resources be assigned to the review function, and that a mechanism exist whereby the effects of a review agency's comments on permit decisions by the administering agency (including recommended mitigating conditions) are made known to the review

agency before the permit is issued. The need for timely feedback to commenting agencies is recognized by numerous staff reviewers in DEP. It would facilitate the referral of policy differences among agencies on specific applications upward through the administrative hierarchy of the several divisions, and thereby foster thorough consideration of interagency policy differences.

To maximize estuarine protection, primary concern must be given to the special areas which contain high-value resources, as the current DEP coastal policies recognize. The consultant recommends a threefold effort to strengthen the protection afforded by DEP to special coastal resources in the coastal zone.

A-2. The first step in this process is for DEP to complete the inventory of coastal zone resources in map series based on the USGS 1:24,000 topographic quadrangles or other geographic data system (such as a computerized system).

This effort was initiated by DEP in its pilot study of a part of Cape May County (DEP-OCZM 1978). Existing information on the location of sensitive areas should be supplemented continuously by original data developed by university scholars, ongoing agency research efforts (for example, 208 and 201 water resources planning efforts, studies by the Division of Fish, Game and Shell Fisheries, and data collection by other DEP agencies), and original investigations by applicants for coastal permits.

A-3. The second step in maximizing protection of special areas is to use the parameters (environmental changes) of potential concern for each type of special area or resource as identified in this report to require that each applicant for a State coastal permit, a State NPDES wastewater discharge permit, Section 201 certification, or Section 208 water quality approval demonstrate through site specific data that his proposed project will avoid or minimize adverse effects on such areas.

Parameters of potential concern were identified for each class of special areas in Chapter XI of this report. Given the current state of scientific knowledge, quantitative values will not be available for thresholds of acceptable changes in most such parameters during the near future. Hence it should be up to the applicant to demonstrate why he should be allowed to affect special areas, rather than receive a permit denial or especially stringent condition. It is the experience of the consultant that this procedure is being used successfully by a growing number of states, for example Michigan, Wisconsin, and Minnesota, particularly in conjunction with their NPDES programs. It is essential that New Jersey DEP, like the corresponding agencies in these States, develop the in-house expertise to specify definitive original research methodology so that applicants for permits accomplish the minimum appropriate investigations to allow informed permit decision making.

Another example of this procedure was developed recently by the consultant for use by the Army Corps of Engineers in the Kenai River Basin of Alaska. The central features of the process are illustrated in Appendix

1 of this report. The New Jersey coastal zone, of course, is substantially more developed than the Kenai River Basin, and the State's regulatory authority is more comprehensive than that of the Corps in much of the New Jersey coastal zone, but the principles used in the Kenai Basin can serve as a regulatory model in this respect.

If an EIS is prepared on the permit application, the applicant's original findings and methods should be presented in the EIS. If no EIS is prepared, the data should be presented in a formal report which accompanies the application for the permit.

A-4. Third, DEP should sponsor original research to provide the basis for quantification of acceptable changes in parameters of environmental concern, and it should provide the staff expertise and data storage resources to keep abreast of new developments elsewhere, in order to avoid duplicative research and to focus on the most significant issues.

The long-term objectives of this research should be to develop explicit criteria on which to base regulatory decisionmaking and to augment current knowledge of impact-reducing and mitigative techniques for permit conditioning. Applicants who seek to build new facilities frequently will find it to their advantage to demonstrate the absence of adverse impacts in specific instances. DEP should pay special attention to the methodology and results of such demonstrations, and should mandate in detail what information is needed, how it is to be collected, and how it expands the body of already existing information on the topic elsewhere in the coastal zone. Duplicative and unnecessary data gathering should be avoided.

A-5. DEP should establish a publications reference and retrieval system that catalogs, curates, and provides copies of DEP-funded reports, DEP-prepared reports, maps, EIS's, and other relevant reference information needed by DEP and the public.

At present DEP has no library facility. Numerous reports are developed by and for DEP on a wide range of subjects and programs. Responsibility for preservation of records should be identified, and resources should be provided to organize the records for easy retrieval by DEP staff and the public. Coastal zone managers; fish, game, and shellfisheries managers; and other DEP personnel have a continuing need for the numerous reports produced by their own and other DEP programs. Consideration should be given to consolidating DEP archival functions. The establishment of a bureaucratic memory is a task that requires sustained administrative attention, in order to increase staff efficiency and maximize the value received from reference materials collected for various purposes. The coastal information center established by DEP-OCZM is a positive step.

2. Environmental Impact Statements and Permit Review Procedures

A-6. DEP should authorize and encourage pre-application conferences to be combined with the Federal pre-EIS scoping meetings authorized by the Council on Environmental Quality at 40 CFR 1501.7 (43 FR 230:55993, 29 November 1978) and combined Federal-State, issue-oriented EIS preparation

to satisfy the needs of DEP as well as other Federal, State, and local agencies.

Some projects require environmental review at more than one level of government. It is to the advantage of all concerned to consolidate environmental review to the extent possible. Simplification of EIS preparation and paperwork should benefit both DEP, applicants, and other interested parties. The language of NJAC 7:1C-1.3 (a) should be revised specifically to encourage Federal participation in voluntary pre-application conferences. DEP staff should mandate in detail for each EIS the scope and methods for use by applicants in developing original information regarding significant issues in accordance with an overall coastal research strategy.

A-7. DEP should make certain that any EIS prepared for its review, inventories and assesses potential impacts on all nearby wetlands, as well as other significant resources.

Currently the EIS regulations for various permit programs do not specifically require the inventory and assessment of inland wetlands. For example, the CAFRA EIS regulations refer only to [State-] regulated [coastal] wetlands [NJAC 7:7D-2.9(b)7], and the 1976 "Guidelines for the Preparation of an Environmental Impact Statement for Solid Waste Facilities" do not mention wetlands in outlining the EIS which may be required on a proposed solid waste landfill (NJAC 7:26-2.12.2.20).

A-8. DEP should promulgate all general EIS regulations in NJAC, and an entry for EIS regulations should be added to the NJAC general index.

As of mid-1979, the most detailed EIS guidelines for some DEP permit programs (e.g., stream encroachment permits) were not promulgated in NJAC. There was no general cross reference to EIS regulations in the NJAC index.

A-9. Any EIS prepared for a project that is likely to affect air quality at the Brigantine National Wildlife Refuge (a Class I PSD area) should analyze fully the potential impact and demonstrate how all applicable requirements will be met.

A-10. Every EIS prepared for a DEP permit should be circulated to the applicable 208 Areawide Water Quality Planning Agency, if such agency is capable of reviewing and commenting on aspects of the EIS within its expertise or jurisdiction.

This can be accomplished by inserting "Applicable 208 Agency" in the distribution list in the 90-day permit regulations at NJAC 7:1C-1.3 (b).

A-11. If any inland and/or coastal wetlands are to be filled as part of any project that DEP regulates, the applicant should be required to notify the appropriate office of the Army Corps of Engineers.

At present only the wetlands permit program (Division of Marine Services) requires formally that the applicant notify the Army Corps of Engineers as part of the State permit process. The applicant for a

waterfront development permit is advised by the application form to apply to the Corps. Other permit programs do not mention Federal approvals.

A-12. State permit approvals for projects that would involve filling of wetlands should be effective conditional upon either approval from the Corps of Engineers or a determination by the Corps that the project is outside its regulatory jurisdiction.

At present, only wetlands permit approval routinely is conditioned upon Corps of Engineers approvals when a project needs multiple approvals (Wetlands Management Policy Memorandum 45). Other permits may be conditioned on other State permit approvals [NJAC 7:1C-1.8(c)]. The authorization at NJAC 7:1C-1.8(c) to condition permits should be broadened to include Federal permits, and such condition also should be authorized for solid waste landfill permits.

A-13. DEP should make certain that every EIS prepared for a State permit is made known and physically available to the concerned public.

Notification of the submittal of regulatory EIS's to DEP for review should be made in the DEP Weekly Bulletin on the same page as notification concerning Federal EIS's. (At present only the status of selected permit applications is indicated, not the existence of EIS's.) EIS's must accompany applications for Type B wetlands permits, all CAFRA permits, and selected riparian grants, waterfront development permits, stream encroachment permits, and solid waste permits.

When an EIS is prepared, the applicant should be required to file at least one complete copy in the local public library nearest the project site. This measure would enhance the opportunity for public review while imposing a minimal additional burden on the applicant and no additional burden on the State agency personnel. Filing copies with agencies is not a substitute for filing at least one copy for the permanent collection of the local library.

A-14. DEP should direct applicants to be certain that EIS's are prepared by responsible persons qualified by education and experience for the topics they address, and should require that those persons responsible for the preparation of each EIS be identified in any EIS document submitted to the Department for review.

There are several potential purposes served by this recommendation, which parallels the guidelines of the DEP Office of Environmental Analysis and the Federal requirements in the Council on Environmental Quality regulations (40 CFR 1502.17; 43 FR 230:559.96. 26 November 1978). First, it insures that each EIS will be prepared by appropriate individuals who recognize and understand resources and impacts. EIS's are mandated by DEP only when there is a strong probability that sensitive resources will be damaged. Hence the EIS should be prepared by knowledgeable persons trained in appropriate disciplines. Second, EIS preparers should be responsible for their work, and this is not possible given anonymous documents. Some EIS's already contain full documentation of authorship; others do not. Third,

such a recommendation allows reviewers to identify authors and address questions directly to them.

A-15. DEP should add (1) a list of other needed State, Federal, and local regulatory permits beyond waterfront development permits, together with the status of each, and (2) a documentation section, to all departmental EIS requirements, such as those currently required in CAFRA permit applications.

Whenever an EIS is required, the permit compilation should be mandated to the applicant, so that he does not neglect to satisfy other applicable laws. The listing also serves conveniently to alert reviewers to the current status of the various applications. The documentation section is necessary to support the credibility of the EIS. These requirements can be inserted at NJAC 7:7A-1.6 (b) in the wetlands permit regulations, and at appropriate points in the stream encroachment, solid waste landfill, and waterfront development regulations as well.

A-16. Any EIS submitted to DEP should identify and assess potential impacts on any historic or other cultural site in the vicinity that is potentially affected and that has been identified as significant by any county agency or that is listed on the New Jersey Inventory of Historic Sites.

At present the coastal policies recognize only those historic places that are listed on the State or Federal Register. Such sites doubtless should receive the attention of DEP reviewers. Numerous other sites, however, have been identified by county agencies, other local groups, or are listed in the New Jersey Inventory, and such sites should be mentioned in any EIS that is prepared for DEP. (The Inventory may be consulted at the Office of Historic Preservation in the Division of Parks and Forestry of NJDEP in Trenton.) Such sites should be identified in the vicinity of proposed developments, and the significance of any adverse effects on them should be estimated.

A-17. DEP should retrieve systematically any original information developed in permit or other EIS's in order to assure its maximum use in ongoing management and regulatory undertakings.

This recommendation is in addition to the recommendation for a general library facility. Its acceptance presupposes at the minimum an identification and indexing procedure for significant new information in individual EIS's.

3. Wetlands

The Wetlands Act of 1970 is a powerful tool for the protection of the estuarine environment. It affords no protection, however, to coastal wetlands that have not been mapped and promulgated as subject to a Wetlands Order. DEP hitherto has used its administrative discretion in interpreting narrowly the legislative mandate to map wetlands. The effect is to have restricted significantly the area of wetlands which in fact are protected

under the Act. Implementation of the following recommendations, in the opinion of the consultant, would expand significantly the wetlands protected under the Act by adding several thousand acres in the coastal zone.

A-18. DEP should promulgate immediately the 42 completed coastal wetlands photomaps which have not yet been promulgated.

No protection is afforded by the Act to a coastal wetland until the map which shows it has been promulgated. DEP should make available the staff resources to examine the appropriate municipal tax maps as quickly as possible in order to permit the required notice and hearings to be accomplished for promulgation. DEP should accept the proffered assistance of local government agencies or others in compiling lists of affected landowners so that the promulgation can be expedited, if it lacks resources to compile the lists. As of September 1979, there was no expected date for this promulgation. Meanwhile, at least one proposal to fill a high-quality, partially mapped, but not promulgated wetland was active during 1979 (JMA 1979).

A-19. DEP should complete and publish the mandated inventory of tidal wetlands for the Hackensack Meadowlands, for the rest of the "Northern Waterfront", and for other heretofore neglected coastal regions of New Jersey and should promulgate the Wetlands Order for all coastal wetlands except those administered by the Hackensack Meadowlands Development Commission.

All tidal waterways in New Jersey north of Raritan Bay should be recognized as estuaries tributary to Raritan Bay through the Arthur Kill, Kill Van Kull, and Upper and Lower New York Bays. Section 1b. of the Act mandates "an inventory and maps of all tidal wetlands within the State." Only lands controlled by the HMDC are excluded from regulation as coastal wetlands by Section 2 of the Act. The DEP, in short, should read the Act as broadly as possible to maximize estuarine protection. In this way DEP-OCZM policies and Wetlands Act protection of coastal wetlands can be asserted along the "Northern Waterfront" estuaries except for the Hackensack Meadowland District, as well as in additional areas in the Bay and Ocean Shore Segment and in the Delaware River basin.

A-20. DEP should review past decisions defining narrowly the upper inland wetland boundary of regulated wetlands, and should reinterpret the boundary to include, in particular but not limited to, diked wetlands and forested or shrub-covered coastal wetlands "now or formerly connected to tidal waters whose surface is at or below an elevation of 1 foot above local extreme high water".

Rough estimates of the extent of areas hitherto excluded from regulation by narrow administrative interpretation should be made by DEP. Priority should be given to promulgation of maps that will protect the the largest acreage of now extant wetlands and that will protect wetlands where development is considered most imminent. Particular attention should be given to extensive wetland areas that may have been diked for muskrat production, salt hay production, mosquito control, and other agricultural

purposes, as well as to shrub swamps and swamp forests in areas that have an elevation within 1 foot above the highest local water level, and to areas initially excluded because they were considered to be spoil piles. Diked areas were excluded, at least in some coastal areas, during the initial wetlands mapping, even though the dikes may have had little or insignificant effect on the qualification of the wetlands for protection under the Act. Spoil piles were excluded even in instances where they were of low surface elevation and were capable of supporting wetland vegetation. Extensive unprotected coastal wetlands should be mapped in the Rancocas Creek basin.

A-21. DEP should update the entire statewide coastal wetlands mapping at intervals no greater than ten years to reflect natural and man-made changes in this resource.

Coastal wetlands are a dynamic resource. Their extent and composition change in response to storms and to changes in sea level and sedimentation rates, as well as to construction activities. Recognition of this fact should be expressed in provisions for periodically updating the maps, particularly in backbarrier bays where natural changes are especially rapid. Emphasis should be placed on the determination of the inland extent of regulated wetlands, rather than the relation of vegetation types to tidal elevations. The updating could be accomplished in sections, with different counties in a logical geographic sequence being updated during different years.

In the State of Maryland about twice as many maps of coastal wetlands were produced as in New Jersey. Acreages were measured for each wetland type, by county and by watershed, and habitat values were reviewed in detail. A methodology for comparing individual parcels was developed, based on the ecosystems affected (McCormick and Somes 1979). The entire Maryland wetlands work was completed for about $1 million, as compared with the New Jersey maps alone for about $2 million.

A-22. DEP should establish criteria and procedures for correcting wetlands maps during the intervals between map updates.

Explicit administrative criteria for adding and deleting areas to and from maps for regulation under the Act should be developed by the Office of Wetlands Management and published for public comment. There should be a mechanism for recognizing changes in the wetlands between updates and for correcting errors that are discovered. At present, no formal written criteria for changing photomaps have been developed. As indicated in the Chapter XIV discussion of the Wetlands Act, several requests for local changes in the mapping already have been processed. Particularly if a periodic general updating of wetlands maps is not undertaken, requests for changes can be expected to increase.

At present, only additions to regulated wetlands are subject to public scrutiny by virtue of the required notice and hearing procedures in the Act; deletions are not publicized, and the areas deleted from wetlands jurisdiction are not annotated on the DEP's existing maps. Over a period of years, the current practices are likely to prove detrimental to equitable

administration of the Act, given inevitable changes in regulatory personnel. The DEP Weekly Bulletin could be used to give public notice of proposed boundary changes that would delete areas from regulation.

A-23. When a memorandum of record is prepared following a pre-application conference prior to Type B wetlands permit application submittal, DEP should send copies of the memorandum to the county and municipal environmental commissions (if any) and to the county, municipal, and regional planning boards (if any) which subsequently may review the project.

The pre-application conference serves to outline important concerns to be addressed by the applicant in his EIS. Because the EIS must accompany the CP-1 form as part of a formal application, the distribution of the CP-1 form to such agencies pursuant to NJAC 7:1C-1.3 comes after the EIS probably has been completed. Although the review agency concerns subsequently can be addressed by the applicant, it would be most expeditious for him to cover the concerns in the EIS.

A-24. DEP should distribute any memorandum of record for a prospective wetland permit application to the relevant District Office of the Army Corps of Engineers.

Current written policy of the Office of Wetlands Management is to contact the appropriate Corps District Office during initial project review (Policy Memorandum 29, 25 July 1977). To facilitate the applicant's early consideration of Federal concerns, the Corps should be given the opportunity to comment at the earliest period of contact between the applicant and DEP.

A-25. DEP should require the applicant to send municipal and county environmental commissions (if any), municipal, county, and regional planning commissions (if any), and the soil conservation district and Areawide 208 Water Quality Planning Agency (if appropriate) copies of each Type B wetlands permit EIS.

At present only the CP-1 form must be sent to these agencies pursuant to NJAC 7:1C-1.3. Although the form constitutes a notification, early project review would be facilitated by distribution of the more informative EIS document as well.

A-26. Inland wetlands on or adjacent to each State-regulated project site should be required to be shown on coastal wetlands permit application maps, in addition to the regulated coastal wetlands.

Placement of fill in inland wetlands of the coastal zone is likely to require a permit under Section 404 of the Clean Water Act. The applicant should become aware early of this possibility, so all inland wetlands (especially forested wetlands) should be identified on the applicant's preliminary drawings. The applicant can be directed explicitly to identify all wetlands (whether regulated as coastal wetlands or not) on and adjacent to the project site as part of his EIS [NJAC 7:7A-1.6(b)].

A-27. DEP should prepare two map series for use by coastal planners, applicants for permits, and the interested public, one showing the upper inland wetland boundary at a scale of 1:24,000, and one showing the general distribution of regulated wetlands at a scale of 1:250,000.

The existing wetlands photomaps (scale, 1:2,400) do not allow regional or statewide interpretation of the extent of coastal wetlands regulated under the Act. The upper inland wetland boundary line should be shown on a series of overlays that fits the USGS topographic quadrangle base (scale, 1:24,000), because photomaps contemporary with the wetlands photography are available at this scale, and the topographic maps are basic environmental management and planning tools. Reduction of the general distribution of regulated wetlands to the USGS 1:250,000 base used by OCZM and other agencies will provide a workable map for many planning uses involving the coastal zone. At present, the CAFRA and Wetlands Section personnel have no means of determining their respective jurisdictions except at the individual-project (1:2,400) scale.

The level of effort required for a graphics technician visually to generalize and transfer the upper boundary for the existing 914 photomaps is estimated as 30 man-days for the 1:250,000 scale map (1% of original size) and 50 man-days for the 1:24,000 scale quadrangles (10% of original size.) Photoreduction would be an inappropriate method to accomplish such wide changes in scale.

A-28. NJ-DEP should review current information and conduct original research as appropriate for a review of the general Wetlands Order prohibition against the disposal of treated sewage effluent into regulated wetlands.

Research increasingly is being directed to documenting the benefits from disposal of treated secondary effluent in vegetated wetlands under the sponsorship of US-EPA and other agencies. DEP may find it appropriate to revise the Wetlands Order to allow case-by-case determinations of proposals to dispose treated effluent into wetlands.

A-29. DEP should extend the Wetlands Order prohibition against pesticides to all stands of Olney threesquare.

This vegetation type was omitted from the list in NJAC 7:7A-1.2(d)3. The cited section should be amended by formal modification of the Wetlands Order for all regulated counties.

4. Coastal Area Facility Review Act

Several procedural recommendations apply to the CAFRA permit program. They can help accomplish interagency coordination.

A-30. A copy of the memorandum of record following a pre-application conference should be sent to the appropriate regional planning board, county environmental commission, and municipal environmental commission (if any).

At present, copies are sent to the municipal and county planning board [NJAC 7:7D-2.3(c)5]. The other agencies which will have an opportunity to review the EIS also should have a chance to express their preliminary concerns prior to completion of the EIS, so that the applicant can address those concerns in the EIS.

A-31. CAFRA review of any project concurrently with Federal review explicitly should be authorized and specifically encouraged in the CAFRA regulations.

To this end, the term "Federal" should be inserted as appropriate in NJAC 7:7D-2.3(b). The intent is to speed project review and minimize duplication of effort by review staff in various agencies, particularly where major facilities (such as electric generating stations or highways) are proposed.

A-32. A copy of the CAFRA EIS should be supplied by the applicant to the State or Federal agency that administers Section 404 (Clean Water Act) permits, if any inland (shoreland) wetlands are likely to be affected by fill related to the proposed facility.

This step already is taken during permit processing for State coastal wetlands permit approvals. At present the 404 agency is the appropriate District Office of the Army Corps of Engineers. The additional distribution of one copy of the EIS could be mandated to applicants by an insertion into NJAC 7:7D-2.3(d)4.

5. Waterfront Development Permits and the Natural Resource Council

Two recommendations can be made concerning the administration of waterfront development permits and the responsibilities of the Natural Resource Council. Both recommendations are for written accounts of procedures.

A-33. Procedural and jurisdictional aspects of the waterfront development permit program should be reduced to written form.

A relatively complex body of procedures for determining what kinds of developments require permits under NJSA 12:5-3 has evolved over the more than 65 years that this program has been in operation. Yet there is no account of regulations for this permit program in Chapter 7 of NJAC. Only the general 90-Day Law regulations (NJAC 7:1C-1.1 et seq.) together with the coastal policies for the Bay and Ocean Shore Segment (NJAC 7:7E-1.1 et seq.) address this program in written form. It would be of benefit to the public, and should reduce the staff time needed for explanations, if the central features of this program were codified for NJAC. The coastal and inland

navigable waterways subject to this program should be defined explicitly, and the overlap or division of jurisdiction between this program and the stream encroachment program administered by the Division of Water Resources (NJSA 58:1-26 et seq.; NJAC 7:8-3.15) should be indicated.

A-34. Operational procedures and routine approval/disapproval criteria used by the Natural Resource Council should be reduced to written form.

The discussions and explanations that occur at Council meetings indicate that the Council, with the assistance of DEP staff and the Attorney General, has evolved consistent policies for approving, conditioning, and denying applications that concern riparian lands. The coastal management policies also now apply to actions of the Council in the Bay and Ocean Shore Segment (NJAC 7:7E-1 et seq.), and Goldshore (1979) reviewed legal aspects of the framework in which the Council operates. Nevertheless, there is no set of written regulations that describe the procedures used by the Council to provide equitable decisions on the numerous applications which come before it. There currently are no rules of practice and procedure for riparian cases at NJAC 7:7-1.1 et seq.

To accomplish the goal of public understanding of decisions made by the Council, policies and procedures that routinely are used should be recorded and published, either as a handbook or at NJAC 7:7-1 et seq., or as additional sections in the coastal management policies. Written policies undoubtedly would be useful also to Council members in discharging their statutory obligations.

The principal policy concern of the ensuing recommendations regarding the HMDC is the need for resolution of apparent conflicts between the current HMDC Master Plan and other current State and Federal laws and policies. Other recommendations address steps that HMDC can take to promote public understanding of its activities and requirements. The recommendations are presented here in a general sequence from items that need immediate attention to items that necessarily must take a longer period to implement.

6. Hackensack Meadowlands Development Commission

A-35. HMDC should revise its zoning regulations (NJAC 19:4-1.1 et seq.) to eliminate typographical errors.

The numerous typographical errors, including but not limited to cross-references, lead to an erroneous presentation of HMDC requirements in the codified version of the regulations as revised through 24 July 1978. Other errors were transferred to the codified version from previous versions of the zoning regulations published directly by HMDC, including errors of

language and errors of fact.[1] All of the zoning regulations should be reviewed immediately by HMDC, and appropriate changes should be made to reflect the intent of HMDC, in the interest of facilitating ongoing compliance with the regulations.

A-36. HMDC should provide for publicly available copies of its zoning map, promptly reflecting the latest revisions, on a continuing basis.

The Zoning Map is an integral part of the zoning regulations of HMDC, and the written regulations cannot be understood without constant reference to the Map. For about six months, copies of the most recent, but obsolete, printed version have been unavailable, although a current wall map could be consulted at the HMDC office during business hours. The Map is a part of the regulations according to NJAC 19:4-6.28, but the Map itself is conspicuously absent from the codified regulations in NJAC.

A-37. HMDC should maintain and distribute a complete list of its publications, and should provide for the sale of its publications at cost.

At present there is no published list of the numerous publications (including both regulatory documents and analytical reports and studies) that HMDC has issued or has required to be prepared. For users of such material to become aware of its existence requires consultation with HMDC professional staff, unnecessarily consuming the time of both the user and the HMDC staff. A publications list should be prepared immediately. Sales of copies of HMDC documents at cost should be made a responsibility of the clerical, not the professional, staff of HMDC.

A-38. HMDC should define in its regulations the following terms which are central to the implementation of the regulations: "tributary" and "major water courses".

The Hackensack River and its tributaries are zoned for marshland preservation, and 50-foot wide buffer strips with natural vegetation are to be preserved wherever development abuts the "Hackensack River and its tributaries."[2] The distinction between or synonymy of "tributaries" with "streams, brooks ... and drainage ditches" [NJAC 19:4-5.8(a)2. i(6)] and with "existing watercourses" [NJAC 19:4-5.10(a)2.xii] should be identified. Likewise, clarification should be made of "major watercourses" to be

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[1]For an example, NJAC 19:4-53(d)14 should be deleted as an error of fact, and the first sentence of sections 19:4-5.9(a)3.iv. and 14:4-5.10(a)3.iv apparently contains the same drafting error in all versions of the regulations.

[2]NJAC 19:4-3.3(c), 4.24, 4.32(c), 4.40(b), 4.50(b), 4.60(b), 4.71(b), 4.81, 4.89(b), 4.99(b), 4.108(b), 4.120, 4.130(b), 5.2(d)5, 5.3(d)5, 5.4(d)6.iii.

preserved in their natural state [NJAC 19:4-5.2(d) 3(iii) and 5.3(d)3(iii)]. The acreage of buffer strips that are to be preserved should be recalculated by HMDC after the language is clarified. HMDC staff have both the knowledge of the intent of the original regulations and the field experience necessary to produce comprehensible regulations. To maximize estuarine protection, the terms "tributary" and "major water courses" should be defined as broadly and inclusively as possible. HMDC staff have indicated that 50-foot buffer strip requirements were not intended to be applied to man-made ditches, and that such ditches will be shown not to have buffer strip requirements in the 1979 version of the Open Space Plan.

A-39. HMDC explicitly should require identification of the extent and type of wetlands (if any) affected by every development decision authorizing construction in order to reduce Federal agency and applicant paperwork and to insure consistency of intergovernmental decisionmaking.

Many proposed developments in the Meadowland District will require placement of fill or other alteration of wetlands. The specific identification of wetlands to be affected (if any) should be a mandatory part of the review process for all HMDC construction approvals, both in the regular zones and in the Specially Planned Areas. Applicants should be required to identify wetlands in order to plan their projects to have minimum adverse impact and in order to become aware of their need for a filling permit in accordance with Section 404 of the Clean Water Act. HMDC has ample authority in its regulations to require identification of wetlands.

A-40. HMDC should require that evidence of notification of appropriate Federal agencies, if any Federal permits are likely to be necessary for a proposed project, be supplied by applicants prior to HMDC approval of preliminary subdivision plat, zoning certificate, or Implementation Plan, and HMDC approvals should be conditioned on the receipt of necessary Federal approvals.

Such permits may be required for placement of fill in waterways or wetlands under Section 404 of the Clean Water Act (Army Corps of Engineers), activities affecting navigable waterways and their tidal tributaries under Section 10 of the River and Harbor Act of 1899 (Army Corps of Engineers), activities involving bridges over or culverts in navigable waterways or their tidal tributaries under Section 9 of the River and Harbor Act of 1899 (US Coast Guard), discharges of pollutants to waterways under Section 402 of the Clean Water Act (US Environmental Protection Agency; NJDEP if delegated in future), or other agencies in specific cases. At present there are requirements for State-level interagency coordination of riparian grants and waterfron development permits, of water supply and sewerage disposal approvals, and stream alteration or dam construction permits at the appropriate places in the HMDC regulatory process. Notification of relevant Federal agencies similarly should be mandated by the HMDC zoning and subdivision regulations.

A-41. HMDC should revise its Master Plan Zoning Ordinance, Zoning Map, and other regulations to conform with current Federal laws and policies.

The HMDC Master Plan was developed during the 1960's and early 1970's and adopted during late 1972, with several amendments thereafter. Finally, Federal permit requirements under Section 404 of the Clean Water Act for the placement of fill were extended by the Corps of Engineers during June 1975 to include wetlands adjacent to all waters of the United States. Federal policies on filling of wetlands are protective of the natural environment, and they anticipate substantial mitigations if wetlands are destroyed for development. The potential Federal support of HMDC wetland open space preservation policies now available should be reflected in the amended Master Plan developed pursuant to NJSA 13:17-9(a).

A-42. The HMDC should request a general permit from the New York District for its amended Master Plan under Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act.

An areawide Federal EIS probably would be required to assess the cumulative effects of implementing the Plan. Once the permit for the Plan is approved, individual development proposals in accordance with the Plan would require minimal Corps and interagency review. Proposals in conflict with the Plan and requiring variances, however, probably would require full review including a Federal EIS.

The result would be a full coordination of HMDC and Federal policies, and the HMDC Master Plan could with justification be adopted as the State coastal policy for the Meadowland District. The expectation of timely Federal approval would be a major factor influencing developers to act in accordance with the Plan.

A-43. HMDC should adopt and enforce soil erosion and sedimentation control standards in consultation with the Soil Conservation Service and other appropriate agencies, and incorporate such standards in NJAC 19:4 Subchapter 6.

These standards should implement effectively the 1975 New Jersey Soil Erosion and Sediment Control Act (NJSA 4:24-1 et seq.) for the Meadowland District, because the Soil Conservation Service is not staffed adequately to oversee new construction in the Meadowlands.

A-44. HMDC should revise the goals of its environmental performance (discharge) standards to correspond in so far as practicable with the uses designated by the DEP surface water designated uses and the goals of the Clean Water Act.

The HMDC standards currently do not have equally protective goals as the relevant DEP surface water use designations (NJAC 7:9-4 et seq.) and Section 101 of the Clean Water Act. The HMDC discharge standards should be reviewed by HMDC, DEP and US-EPA to determine whether they should be altered

in order to attain the stated goals. HMDC should continue to focus public attention on the serious pollution problems in theDistrict, and should continue to seek State and Federal assistance in meeting the State and National goals for water quality.

A-45. HMDC should specify clearly the methods that should be utilized in calculating waterway buffer strip and open space requirements.

As discussed in the section on open space preservation in the Hackensack Meadowland District, there currently is ambiguity in the method for calculating HMDC requirements. Because the HMDC staff have substantial experience in making such calculations, they should specify the basic principles for the benefit of applicants and the concerned public in written form.

A-46. HMDC should require source separation for all solid wastes disposed in the District in order to reduce the need for landfills in the immediate future as well as in the long term.

HMDC has ample authority in its enabling legislation to regulate solid waste in the Meadowland District. Materials that have economic value and can be kept separate from mixed refuse should be prohibited from disposal in landfills in the District. This would force municipalities and private contractors to keep materials separate, rather than allow them to be mixed upon collection. The HMDC should seize the opportunity to keep materials that are salable when homogeneous out of mixed refuse, rather than concentrating solely upon resource recovery from mixed waste streams.

A-47. HMDC should investigate seriously the feasibility of generating and marketing centralized steam and chilled water from refuse for use by existing and anticipated new development in the Meadowland District, in order to reduce the need for landfills in the long term.

The most economically rewarding urban market for energy derived from refuse is centralized steam and chilled water. Such systems are not uncommon in Europe, and the new facility at Nashville, Tennessee, is successfully demonstrating the use of urban refuse to meet urban heating and cooling needs (Reisch 1978). Air emissions initially posed difficulties in Nashville, but they have been overcome successfully. The cogeneration of electricity and subsequent utilization of low-pressure steam is a compatible mode of using refuse to derive energy. HMDC has an exceptional opportunity to supply energy to the massive new development slated for the District, and to avoid the serious economic costs associated with shipping refuse derived fuel to remote users outside the District. To the extent that the refuse derived energy replaces fossil fuel, air and water quality can be expected to benefit.

B. Recommendations on Substantive Coastal Policies

This section of the report is organized as a critique of proposed DEP coastal policies as presented in the March 1979 options document at Appendix H. The proposed policies are to be applied to State regulatory activities throughout the New Jersey coastal zone.

The format of this section includes first a brief identification of each policy which the consultant finds capable of improvement to enhance estuarine protection, then a statement and discussion of the views of the consultant, and finally a recommendation for change in the policy. The sequence of the commentary follows the sequence of the proposed policies. Reference to other sections of the options document is made as appropriate. The consultant has followed the evolutionary process by which the proposed policies were evolved and recognizes the overall accomplishment of DEP in bringing the policies to their present state.

In Section 1.1. the purpose of the regulations is stated. No explicit reference is made to the potential purposes of coordinating State regulatory policies with current Federal laws and regulations or of coordinating State and local regulatory policies. Such coordination could enhance estuarine resource protection substantially, and reference is made to such coordination at various places in the body of the policies.

B-1. The purposes of the coastal policies should be stated to include coordination of State actions with Federal laws and regulations and with local regulatory approvals (Section 1.1.).

In Section 1.2. DEP states the authorities pursuant to which the coastal policies are adopted. No reference is made to the January 1979 mandate of the Governor's Executive Order 71 that the CAFRA staff of DEP should perform interim certification of new construction sought during the 18-month moratorium on such approvals while a Master Plan for the Pinelands is developed. The Order is applicable to those sections of the Pinelands Protection Area which overlap lands regulated under CAFRA. The administration of this mandate must consider additional policies to maximize environmental protection in the Pinelands, over and beyond those of the coastal zone in general.

B-2. The Governor's Executive Order 71 (1979) and the Pinelands Protection Act of 1979 should be added to the list of authorities cited in Section 1.2.

The authorities for the policies also fail to mention other statutes and regulations through which the coastal zone policies can be implemented. These authorities are not unique to the coastal zone, but they are essential for estuarine protection within the coastal zone.

B-3. Statutes and regulations administered by the DEP Divisions of Water Resources, Environmental Quality, and Fish, Game, and Shell Fisheries, by the DEP Solid Waste Administration, by the Hackensack Meadowlands

Development Commission, and by other relevant State agencies should be added to the list of authorities cited in Section 1.2.

In Section 1.3.1. the actions of DEP itself in the coastal zone are stated to be subject to the coastal policies. The actions of DEP and of the State and County Mosquito Control Commissions are exempt from the Wetlands Act of 1970 (but not from other State coastal permit programs when applicable or from Federal regulatory programs).

B-4. DEP should state that it intends voluntarily to subject its own actions affecting regulated coastal wetlands to the established permit procedures applicable to others as an example, and to urge in so far as possible the same voluntary compliance upon the State and County Mosquito Control Commissions.

The DEP Commissioner ex officio is a member of the State Mosquito Control Commission, and the State Commission exerts substantial control over County Commissions. DEP should make maximum use of its influence with the mosquito control agencies to minimize dredging, filling, diking, and pesticide application in favor of the open marsh management techniques advocated by the Division of Fish, Game, and Shell Fisheries.

The coastal zone boundaries are proposed in Section 1.3.2. to include (1) the CAFRA area, (2) all other coastal waters to the limit of tidal influence, (3) shorelands adjacent to those waters inland to the first public road or railroad track, (4) State-regulated coastal wetlands landward of the foregoing, and (5) the Hackensack Meadowland District. The consultant believes that the proposed coastal zone should be expanded to include other areas where development potentially poses direct and significant impacts to, and is exposed to impacts from, coastal waters. Several recommendations address specific expansions of the proposed coastal boundaries, and reference should be made to the maps in Appendix B of the March 1979 DEP-OCZM options document in weighing the recommendations.

B-5. All now or formerly tidal waterways (and their tidal tributaries) should be included in the coastal zone, inland to the present or most probable historic limit of tide.

In many areas the DEP has elected to use current tidal limits as the preferred initial boundary criterion (with the 20-foot stream elevation as an alternative). Various tidal streams appear to have been omitted from the

March 1979 maps[1]. The tidelands delineations of the Office of Environmental Analysis should be used as they become available to extend the coastal zone boundary to include all of tidal or historically tidal waterways. Actions that affect such waterways inevitably have a direct and significant impact on estuarine water quality because runoff from them flows directly to tidal waters, and such actions should be consistent with coastal policies.

B-6. The coastal zone boundary should be drawn to include the tidal wetlands now or historically adjacent to all coastal waters, whether or not those wetlands currently are regulated under the Wetlands Act of 1970.

The current DEP proposal is to recognize only regulated coastal wetlands as part of the coastal zone landward of the first public road or rail line. Existing tidal and formerly tidal wetlands all should be included in the coastal zone, whether or not they have been afforded protection heretofore by administrative action under the Wetlands Act. The currently proposed boundary in the Hackensack River basin, for example, follows the political boundary of the Hackensack Meadowland District (as established by NJSA 13:17-4), which was not based on tidal streamcourses and their adjacent wetlands. In particular, the District boundary excludes fringing wetlands along the upper part of tidal Berrys Creek in Wood-Ridge, where serious industrial contamination of the estuary long has originated, and it does not include extensive wetlands west of the District (mostly in Kearny) between the Erie-Lackawanna Railroad and Schuyler Avenue. Other probable tidal or formerly tidal wetlands appear from an inspection of the 1979 boundary maps to qualify for inclusion in the coastal zone. Whether or not they currently are regulated under the Wetlands Act, the following areas should be reviewed for inclusion in the coastal zone:

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[1]The following probable examples were noted during an examination of the 1:24,000 quadrangles:
Upper Berrys Creek tributaries in Wood-Ridge and Upper "Sack Creek" (formerly the northern watershed of Division Creek) in Secaucus (Weehawken Quadrangle).
Drainage ditch encircling the southern half of Newark Airport (Elizabeth Quadrangle).
Streams south and southwest of South Amboy (South Amboy Quadrangle).
Delaware River Between the Toll Bridge and the Calhoun St. Bridge (Trenton West Quadrangle).
Pompeston Creek (Frankford Quadrangle) — apparently a drafting error by reversal of pattern; presumably the intent was to put the Creek in the coastal zone, not the Palmyra and Cinnaminson developed areas.
Pennsauken Creek (North Branch) from Penn Central RR Bridge at least to Kings Highway (Moorestown Quadrangle).
North Branch Rancocas Creek from the Vincentown Dam to Smithville Lake (Mount Holly Quadrangle).
Cooper River to historic head of tide (Camden Quadrangle).
Streams in Woolwich and East Greenwich Townships (Bridgeport Quadrangle).

In the general vicinity of Tennent Pond (South Amboy Quadrangle).
Newbold Island (Trenton East, Trenton West, and Bristol Quadrangles).
Along Pennsauken Creek between the Penn Central (Conrail) RR Bridge and Kings Highway (Moorestown Quadrangle).
Along the Rancocas Creek (Mount Holly and Pemberton Quadrangles).
Vicinity of Oldmans and Five Points (Marcus Hook Quadrangle).
Upper Little Timber and Pargey Creeks (Bridgeport Quadrangle).
Big Timber Creek south of Blenheim (Runnemede Quadrangle).
Pennsville Township east of Central Park and southwest of Glenside (Wilmington South and Penns Grove Quadrangles).
Oldmans Township southeast of Perkintown and Penns Neck Township between NJ Turnpike and US 40 (Penns Grove Quadrangle).
Upper Raccoon Creek (Woodstown and Pitman West Quadrangles).
Oldmans Creek east of Porches Mill (Woodstown Quadrangle).

The inland limit of regulated wetlands in the Bay and Ocean Shore Segment has not been mapped at a useful regional scale and is not commented upon here.

B-7. The coastal zone boundary should be drawn to include all land areas (now or) historically flowed by the tides as soon as information becomes available from the ongoing State tidelands mapping program.

Tidelands at present are being mapped throughout the State. Filled tidelands are by definition adjacent to tidal waters. They are likely sites for flood damages and particular concern should be attached to filled areas with a current surface elevation of less than 10 feet. The activities conducted on filled areas are likely to have direct and significant effects on tidal water quality. Examples, based on inspection of the 1979 boundary maps, are:

Vicinity of Moonachie, Little Ferry, South Hackensack, and southeastern non-HMDC section of Secaucus (Weehawken Quadrangle).
Newark Airport and vicinity, and tank farms in Linden (Elizabeth Quadrangle).
Tank farms in Linden and Carteret (Arthur Kill Quadrangle).
Burlington Island (Bristol Quadrangle).
Tank farm (Bridgeport Quadrangle).
Tank farm and other filled areas at National Park (Woodbury Quadrangle).
Penns Beach (Wilmington South Quadrangle).
Penns Grove (Penns Grove Quadrangle).

B-8. A procedure for expanding the coastal zone boundary should be developed for use if additional areas in the future are delineated as tidelands or as regulated coastal wetlands pursuant to the Wetlands Act.

As discussed at length in the analysis of Wetlands Act implementation in Chapter XIV, there are additional wetlands in Northern New Jersey and elsewhere which meet the criteria of the Act, but which DEP has elected neither to map nor to regulate. As these areas are mapped in the future,

the coastal zone boundary should be expanded to include them wherever necessary. The process of amendment to the coastal zone boundary should include, but not be confined to, considerations of expanded tideland claims, as implied by Appendix B of the March 1979 options document (p.80). The elevational criteria for regulating coastal wetlands are far less stringent than the criteria for claiming tideland ownership, and coastal wetlands should be identified if they exist outside the lands claimed as present or former tidelands.

B-9. Federal lands should be deleted from DEP jurisdictional boundaries on maps of the proposed coastal zone.

Review of the proposed boundary maps indicates that the Killcohook National Wildlife Refuge (Wilmington South and Delaware City Quadrangles).

Section 1.3.4. lists consistency decisions to which the coastal policies apply.

B-10. Section 1.3.4. should be revised to cite specifically Section 401 of the Clean Water Act and all actions noticed pursuant to OMB Circular A-95 with relevance to the coastal zone.

Section 2.6. lists generally the environmental and development information requirements for which applicants for State approvals are responsible. This section and the remainder of the policies suggest the topics an applicant must consider in permit applications and EIS's. Some of those topics can be discussed appropriately from existing data. DEP must provide the staff expertise to identify those topics for which original research is needed and to specify precisely the scope and methods to be employed by the applicant, so that the results have the greatest utility for both the individual permit review and for coastal zone management generally.

B-11. DEP should revise Section 2.6. to indicate that its staff will specify precisely the original information that an applicant is required to collect and the exact methods that are to be used, if an EIS is mandated on his project, following a voluntary pre-application conference.

Such a commitment by DEP will assist applicants to produce original data essential to DEP decisionmakers, while relieving them from the burden of developing data unnecessary for specific applications. The specific requirements should be detailed in the memorandum of record following the conference.

Section 3. presents the DEP-OCZM location policies for the coastal zone.

B-12. DEP should rewrite the coastal location policies on special areas to indicate that it is the applicant's burden to demonstrate that projects which could affect special areas adversely in fact will avoid or minimize adverse effects.

Section 3.1.3. specifies what information should be mapped by the applicant at the pre-application phase.

B-13. Section 3.1.3. should be revised to advise that applicants simply may show the requisite information on an overlay to the appropriate existing USGS 1:24,000 topographic map(s) prior to the pre-application conference with DEP.

It is not necessary that the applicant prepare original base maps at this earliest step in his contact with NJ-DEP. Implementation of other recommendations will produce wetlands maps at the 1:24,000 scale, and should assist applicants in accomplishing the mandate of Section 3.1.3. Appropriate maps should be mandated as part of every EIS required by NJ-DEP. The most recent available aerial photograph of the project site also should be brought to a pre-appplication conference.

Section 3.2.9. identifies marine sanctuaries as a special area. It does not mention estuarine sanctuaries established pursuant to Section 312 of the Coastal Zone Management Act.

B-14. Section 3.2.9. should be relabeled as "Designated Sanctuaries" and should include both marine and estuarine sanctuaries, as they are designated.

Proposed language for such a section is as follows:

3.2.9. Designated Sanctuaries

Marine Sanctuary

Definition: A marine sanctuary is a specific geographic area located within ocean waters, from the highest extent of tidal action seaward to the outer edge of the Continental Shelf, which has been designated by the Secretary of Commerce after approval by the President of the United States. Any sanctuary within the New Jersey coastal zone would not become effective, if within 60 days of designation the Governor disapproved. Under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972 (PL 92-532), a marine sanctuary can be established for the purpose of preserving or restoring marine areas for various values. To date, there are no designated marine sanctuaries within New Jersey. The Office of Ocean Management within NOAA presently is reviewing all recommendations, including those within the Mid-Atlantic states. DEP-OCZM submitted six recommendations to NOAA in 1977, including the Hudson Canyon, Shrewsbury Rocks, Great Bay estuary, shipwrecks, inlets, and offshore sand ridges. Designation of one or more of these areas as marine sanctuaries in New Jersey's nearshore and offshore areas requires joint actions by the Governor of New Jersey and the US Secretary of Commerce, and could take place during 1979.

Estuarine Sanctuary

Definition: An Estuarine Sanctuary is a research area, teaching area, or natural field laboratory, established pursuant to Section 312 of the Federal Coastal Zone Management Act of 1972, as amended. Such an area may include all or any part of an estuary and adjoining edge and shoreland areas in a manner so as to constitute, to the extent feasible, a natural unit. The Secretary of Commerce is authorized to provide grants of up to 50% of the costs of acquisition, development, and operation of an estuarine sanctuary or of up to two million dollars, whichever is less.

Policy: Management principles in the selected sanctuary areas should serve to preserve and protect the areas, as well as indicate what actions are not permissible in the area. Non-permissible uses in any designated estuarine sanctuaries will be dependent on the five basic purposes for designation, which include:

habitat areas, species areas, research areas, recreational and esthetic areas, and unique or exceptional areas. After designation, activities not compatible with the basic purposes will be prohibited or restricted, but in general all other uses are allowed. Final policy in marine and estuarine sanctuaries must be approved jointly by the Governor of New Jersey and the US Secretary of Commerce.

Rational: Certain portions of the Atlantic Ocean and adjacent estuaries are of special national and regional environmental value, and could be adversely impacted by development likely to take place in the future, especially activities related to offshore oil and gas development. It is in the long-term interest of the people of the Nation to identify, protect, and manage these sanctuaries.

B-15. The text of Section 3.2.11 on wetlands should be revised to incorporate Section 3.2.17 (whitecedar stands) and to protect other wetlands.

The following revised text is recommended:

3.2.11. Wetlands

Wetlands are areas in which the substrate is "inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (US Army Corps of Engineers 1977). The vegetation of wetlands is

highly productive, and wetland habitats may be utilized intensively by various species of waterfowl, shorebirds, songbirds, mammals, reptiles, amphibians, fish, and other forms of animal life. On the basis of the water regime, two categories of wetlands (estuarine, or tidal, wetlands and shoreland, or non-tidal wetlands) are recognized.

Coastal Wetlands

Definition: Coastal wetlands are low-lying areas of relatively flat land that may be known as marshes, meadows, swamps, or by some other local name. Many herbaceous tidal wetlands in that part of the coastal zone from the south shore of Raritan Bay to Cape May Point and, hence, to Trenton have been delineated by DEP on official maps at a scale of 1:24,000 (as listed at NJAC 7:7A-1.13). Forested wetlands extend landward from the herbaceous coastal wetlands at many locations, and are included in this category. Both herbaceous and forested coastal wetlands also occur in areas that have not yet been mapped officially. Extensive meadows, which are herbaceous wetlands, are a characteristic feature of the Hackensack Meadowland District, an area that was excluded from the jurisdiction of the Wetlands Act of 1970 (NJSA 13:9A-1 et seq.).

This category also includes areas of wetland that formerly were flowed by the tides but now are enclosed by embankments or other structures. Such impounded wetlands are distributed throughout the coastal zone, and they occupy extensive areas along Delaware Bay and in the Hackensack Meadowland District.

Policy

(a) In general, development of all kinds is discouraged in wetlands, unless it is found that the proposed development meets the following four conditions:

(i) Requires water access or is water oriented as a central purpose of the basic function of the activity (this condition applies only to development proposed on or adjacent to waterways),

(ii) Has no prudent or feasible alternative on a non-wetland site,

(iii) Will result in minimum feasible alteration or impairment of natural tidal circulation, and

(iv) Will result in minimum feasible alteration or impairment of natural contour or the natural vegetation of the wetlands.

(b) In particular, the dumping of solid of liquid wastes, the application of persistent biocides, or the storage of any biocides on wetlands is prohibited.

(c) Under State law, the activities of the DEP State Mosquito Control Commission, and county mosquito control commissions are exempted from the coastal wetlands policy (a) above. Voluntary administrative compliance with regulations established pursuant to the Act, however, is not precluded by the Act. The continuation of agricultural activities exempted by the act will not be regulated by DEP under the Wetlands Act.

Rationale: The environmental values and fragility of coastal wetlands have been recognized officially in New Jersey since the passage of the Wetlands Act of 1970 (NJSA 13:9A-1 et seq.). Coastal wetlands are the most environmentally valuable land areas within the coastal zone.

Coastal wetlands contribute to the physical stability of the coastal zone by serving as: (a) a transitional area between the forces of the open sea and upland areas that absorbs and dissipates wind-driven storm waves and storm surges, (b) a floodwater storage area, and, (c) a sediment and pollution trap. Also, wetlands naturally perform the wastewater treatment process of removing phosphorus and nitrogenous water pollutants, unless the wetlands are stressed.

The biological productivity of New Jersey's coastal wetlands is enormous and critical to the function of estuarine and marine ecosystems. The emergent cord grasses and associated algal mats convert inorganic nutrients into organic plant material through the process of photosynthesis. In this way, the primary base for estuarine and marine food webs is provided. The principal direct dietary beneficiaries of organic wetland detritus are bacteria and protozoans, which are in turn fed upon by larger invertebrates. Important finfish, shellfish, waterfowl, and other resources feed upon these invertebrates. New Jersey's coastal wetlands are prime wintering habitat annually for hundreds of thousands of migratory waterfowl. Approximately two-thirds of marine fish and shellfish are known to be estuarine, and, therefore, wetlands-dependent.

Both the restoration of degraded wetlands as a mitigation measure for certain types of approved wetlands development and the creation of new wetlands in non-sensitive areas are

encouraged. The Division of Marine Services previously has required restoration of temporarily disturbed wetlands and will continue to do so on a case-by-case basis.

Shoreland Wetlands

Definition: Shoreland wetlands occupy areas adjacent to or near shoreland rivers and streams and areas not associated closely with streams, but in which the water table is at or near the surface at least for several days during most years. The vegetation of most shoreland wetlands is characterized by trees and/or shrubs, but some wetlands are covered by herbaceous vegetation. These areas are known as swamps, spungs, cripples, bogs, marshes, savannas, and by other local names. The general distribution of shoreland wetlands in the Pine Barrens, which includes parts of the Bay and Ocean Shore Segment of the coastal zone is shown on a map by McCormick (1978). The locations of white cedar swamp forests, hardwood swamp forests, pitch pine lowland forests, fresh marshes, and bogs in the Pine Barrens are shown in more detailed maps prepared by McCormick and Jones (1973). Forest type maps available at the Bureau of Forestry in NJ-DEP also indicate the distribution of southern whitecedar swamp forests and other wetland forest types.

DEP has the authority to regulate development directly only on those wetlands which have been formally delineated and adopted under the requirements of the Wetlands Act of 1970. The Wetlands Act does not give DEP authority to manage development in shoreland wetlands. New Jersey's ability to protect wetlands not regulated under the Wetlands Act is based upon its authority to regulate point-source and non-point wastewater discharge CAFRA facilities affecting such wetlands, the policies and actions of the Delaware River Basin Commission and Hackensack Meadowlands Development Commission, the authority to protect the Pinelands mandated at present by the Pinelands Protection Act of 1969, and on DEP's comments to the Army Corps of Engineers on applications for Corps permits to fill wetlands under Section 404 of the Clean Water Act. Such permits may not be issued without a Section 401 certificate from the DEP Division of Water Resources, and DEP has broad authority to condition such certifications.

Policy: Development that would degrade or diminish the size of a shoreland wetland shall be authorized only upon the applicant's demonstration of overriding considerations in the public interest, following full coordination with responsible agencies and opportunity for public notice and comments. Approvals to degrade or diminish the size of a shoreland

wetland shall be effective conditional upon approval by all Federal agencies with jurisdiction.

Rationale: Shoreland wetlands play an important role in regulating the quality of water in shoreland streams that slow to the estuaries; they retard runoff and store storm waters; they are critical habitats for several species of plants and animals that are endangered or threatened, and, they are productive habitats for other game and non-game animals, such as deer and waterfowl. These wetlands also serve as fire breaks, and may limit the spread of forest, brush, or grass fires. They are inappropriate development sites due to poor drainage and load bearing capacity of the underlying soils. The white cedar, which is a characteristic species of streamside wetlands on the Coastal Plain and formerly was predominant in the Hackensack Meadowland District, is considered to be the most valuable timber tree in the State. The wood has a long tradition of use for shipbuilding and in local crafts. The present distribution of the white cedar in New Jersey, however, is less extensive than its former range, and large, nearly pure stands now are rare.

Section 3.2.15. addresses historic resources. At present it recognizes only those historic places that are listed on the State or National Registers.

B-16. Section 3.2.15.1 should be revised to recognize historic place names and historic sites identified by County agencies or listed on the New Jersey Inventory as significant resources, in addition to historic places on the State or National Register.

Section 3.2.15.2(c) then can be revised to apply specifically to those sites listed on the State or National Register. In this way all known historic resources will receive some measure of recognition, but the highest level of protection will be afforded only to those sites with recognized State or National significance.

B-17. The text of Section 3.2.16. should be revised slightly to enhance its precision.

The recommended text is as follows:

3.2.16. Specimen Trees

Definition: Specimen trees are the largest (diameter at 4.5 feet above ground) known individual trees of each species in New Jersey as listed by the DEP Bureau of Forestry in Porcella (1977). A specimen tree site is the area directly beneath the crown, that is, within the drip line. Large trees that are within 10% of the diameter of the known

largest individual of the same species also shall be considered specimen trees.

Policy: Development is prohibited that would significantly reduce the amount of light reaching the crown, alter drainage patterns within the site, adversely affect the quality of water reaching the site, cause erosion or deposition of material in or directly adjacent to the site, or otherwise injure the tree. The site of the tree should extend to the outer limit of the buffer area necessary to avoid adverse impacts, or 50 feet from the tree, whichever is less.

Rationale: Many interested citizens have assisted NJ-DEP during the past several decades in locating specimen trees. This process includes reporting large trees that can be considered specimens even though they may not be the largest in New Jersey of a species. Specimen trees are an irreplaceable scientific resource. Often these trees have also been associated with historical events.

Section 3.2.18. addresses imperiled species and Section 3.2.19. addresses critical wildlife habitats.

B-18. The text of Section 3.2.18. should be revised to incorporate Sections 3.2.5. and 3.2.19.

The following revised text is recommended:

3.2.18. Critical Habitats

Habitats are considered to be critical when they are essential to the survival of species of animals or plants that are endangered or threatened, when they are essential to regular and/or the seasonal movements of aquatic or terrestrial animals from one habitat to another, when they are utilized intensively as areas for reproductive activities, as areas for the congregation of animals on a seasonal basis, or when they are of a type that is present in the coastal zone in relatively limited supply. The degradation or destruction of critical habitats could result in decreases in the populations of the species that utilize them, and could result in the extinction of species whose existence in the State already is in jeopardy. Reductions in the populations of waterfowl and upland game will affect the success of hunters, birders, and other naturalists.

Endangered or Threatened Species Support Areas

Definition: Any area of shoreland, edge, or water that serves as habitat for any species of animal or plant that has been designated as "endangered" or "threatened" by the

Secretary of the Interior or by NJ-DEP is considered to be a critical area. The definition also includes a sufficient buffer area to insure continued local survival of the species. Dissemination of data that identify specific areas inhabited by endangered or threateded animals or plants should be restricted in order to protect the species.

Policy: Development that would affect the habitats of endangered or threatened species adversely is prohibited. Review of proposals shall be on a case-by-case basis.

Rationale: Endangered species are organisms which face possible extinction in the immediate future due to loss of suitable habitat, past over-exploitation through human activities, or natural causes. Threatened species are not in jeopardy of immediate extinction, but they could become endangered if conditions were to worsen. Extinction is an irreversible event and represents a loss to future human use, educational research, and to the interrelationship of all living creatures with the ecosystem.

The current (1979) official list of endangered species of animals in New Jersey (NJAC 7:25-11.1) includes the following species:

Shortnose sturgeon, Tremblay's salamander, blue-spotted salamander, eastern tiger salamander, pine barrens treefrog, southern gray treefrog, bog turtle, timber rattlesnake, bald eagle, peregrine falcon, osprey, Cooper's hawk, least tern, black skimmer and Indiana bat, as well as six marine mammals and four marine reptiles. Additional species are designated as threatened, peripheral, undetermined, declining, and extirpated.

Currently, no official list exists of species of plants that may be endangered or threatened in New Jersey. Fairbrothers and Hough (1975), however, compiled an unofficial list, and 17 species of plants that occur in New Jersey were recommended by the Smithsonian Institution to the US Fish and Wildlife Service for addition to the Federal lists (40 FR 27863-27864, 1 July 1975). Until a Federal or State list of endangered plants is adopted officially, the species recommended by the Smithsonian Institution shall be covered by this policy.

Special Wildlife Support Areas

Definition: Special Wildlife Support Areas are critical habitats that serve one or more essential roles in the maintenance of wildlife. Rookeries for colonial nesting birds such as herons, egrets, ibis, terns, gulls, and

skimmers; stopovers for migratory birds, such as the Cape May Point region; and natural corridors for wildlife movement merit a special management approach through designation as Critical Habitats. This designation also applies to areas of water and edge that serve as wintering areas for waterfowl, to areas in which individuals of a particular species, such as the muskrat, are concentrated, to freshwater ponds and lakes, which are relatively scarce habitats in the coastal zone, and to spawning grounds of identified species of fish.

Policy: Development that would adversely affect special wildlife support areas shall be discouraged, unless: (a) minimal feasible interference with the habitat can be demonstrated, (b) there is no prudent or feasible alternative location for the development, and (c) the proposal includes appropriate mitigation measures. Proposals shall be reviewed on a case-by-case basis.

Rationale: The State of New Jersey, as custodian of a particular portion of the national wildlife heritage, has the obligation of stewardship on behalf of the people of the State and Nation to perpetuate species of wildlife within its borders for use, education, research, and enjoyment by future generations.

Migratory Pathways for Aquatic Organisms

Definition: Waters which serve as passageways for migratory fish and shellfish to or from seasonal spawning areas, nursery areas, or feeding areas are critical habitats. Pathways of anadromous fish through rivers, streams, bays and inlets, as identified by Zich (1977), are a major component of this type of critical habitat. Also included are ocean waters within the 3-mile territorial limit of New Jersey, through which many species migrate.

B-19. A new policy should be inserted at Section 3.2.19. to protect scientific research sites.

Such sites should be cataloged by DEP-OCZM during its detailed inventory of the coastal zone on the basis of the published literature and communications from the academic and research community. The recommended text for such a policy is as follows:

3.2.19. Scientific Research Sites

Definition: Scientific Research Sites are locations in the ocean, estuarine, or shoreland sections of the coastal zone in which notable scientific studies have been conducted and/or where concentrated inventigations currently are being conducted.

Policy: Development that would destroy, degrade, or block access to a scientific research site shall be prohibited.

Rationale: Substantial bodies of scientific information have been developed for areas defined as scientific research sites. These sites now serve as valuable baseline areas in which future studies can be conducted to evaluate natural and man-induced changes.

B-20. A new interim policy on Pinelands should be inserted as Section 3.2.24.

The policy should be revised if necessary when a Comprehensive Management Plan for the Pinelands has been adopted.

The recommended text for such a policy follows:

3.2.24. Pinelands Planning and Management District

Definition: The boundaries of the Pinelands Planning and Management District, as recommended by the Governor's Pineland Review Committee (1978) and adopted in Executive Order 71(1979), are indicated in Figure 13. The District is divided into a "Pinelands Protection Area" and a "Pinelands Preservation Area". Certifications of projects for exemption from the Governor's moratorium, which was confirmed through mid 1980 by the New Jersey Pinelands Protection Act of 1979, in the Protection Area where it overlaps lands regulated under CAFRA, are to be processed by DEP-OCZM under the policies of the National Parks and Recreation Act of 1978 (PL 95-625) and the State Pinelands Act, in addition to coastal policies that are consistent with the goals of the Act and the Executive Order. The Pinelands Planning Commission and DEP are directed to make consistent long-range plans for all areas of overlapping jurisdiction. Certifications for exemptions in any overlapping Preservation Area lands are being processed by the Pinelands Planning Commission[1].

Policy: The following policies were established by the the Pinelands Protection Act of 1979 for the Pinelands Protection Area:

No application for financial assistance or for a grant, permit, certificate, license, or other approvals for any

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[1]If a revised map of the Pinelands protection and preservation areas is issued by the Pinelands Commission, its boundaries should be used rather than those of Executive Order 71.

development or construction shall be approved unless the applicant demonstrates that

(1) there exists a compelling public need for the development or construction,
(2) the denial of the approval would result in extraordinary hardship, or
(3) the development or construction is consistent with the intent, goals, and objectives of the Executive Order and the Federal Act.

In no case is development to be certified if the development could result in substantial impairment of the natural resources of the Pinelands.

Rationale: The following goals were established by the Governor's Pinelands Review Committee (1978) for the Pinelands Protection Area, and they provide the basis for the policy of DEP in overlap areas administered by DEP until a Comprehensive Management Plan is adopted by the Pinelands Commission:

1. To maintain, through minimal disturbance, the essential vegetative character in order to afford existing and prospective residents the opportunity to live in a Pinelands environment.

2. To protect and maintain existing surface and ground water quality for the region's current and prospective users.

3. To discourage piecemeal and scattered development.

4. To encourage settlement patterns that will accommodate agriculture, as well as appropriate commercial, residential, and other development which is compatible with the protection of the Preservation Area and the maintenance of a Pinelands living environment and reflective of the economic forces in and surrounding the Area.

5. To accommodate in an orderly way existing and future regional growth influences while being particularly sensitive to the potential cumulative adverse impacts of growth and development on the residents and the environment which includes one of the last unpolluted shellfish beds in the State.

The following goals were established by the Governor's Pinelands Review Committee (1978) for the Pinelands Preservation Area, and are to be implemented by the Pinelands

Planning Commission for areas of Preservation Area overlap with the coastal zone:

1. To preserve an extensive and contiguous undeveloped land mass in its natural state which would have as its purpose the preservation of a Pinelands wilderness containing the unique ecological features which have distinguished the Pinelands as being more than a large expanse of undeveloped forest.

2. To promote compatible agricultural, forestry, and recreational land uses within the framework of maintaining a wilderness area.

3. To prevent all development which is incompatible with the preservation of lands which are primarily undeveloped.

4. To provide a sufficient amount of undevloped land to accommodate specific wilderness management practices, such as selective burning, which are necessary to ensure the maintenance of the area's ecology.

5. To protect and preserve the quantity and quality of existing surface and ground water for the citizens of the State.

Section 3.2.25 identifies special hazard areas.

B-21. Section 3.2.25. should cross reference the riverine and tidal flood hazard areas policies in Section 5.23, and these areas should be included in the special hazard area discussion.

Sections 3.4.3. and 3.4.4. address retained water's edge and filled water's edge areas, respectively. The farthest inland limit of such areas is proposed to be set judgmentally at 100 feet from the existing waterway, and it is less than 100 feet if there is a closer public road, boardwalk, or railway.

B-22. Sections 3.4.3 and 3.4.4 should be revised to remove the 100 foot and first cultural feature limitations on the inland extent of retained water's edge and filled water's edge, but policies favoring water-dependent development within 100 feet of waterways (or shoreward of the first cultural feature) should be retained.

Water's edge areas, even after they are filled or retained, continue to have direct and significant interactions with the other parts of the coastal zone. They are near the water, and are subject to flooding, especially during hurricanes. The uses of such areas may generate wastes that find their way directly to the nearby coastal streams (lawn fertilizers and petroleum products are two common examples). Hence such areas should be

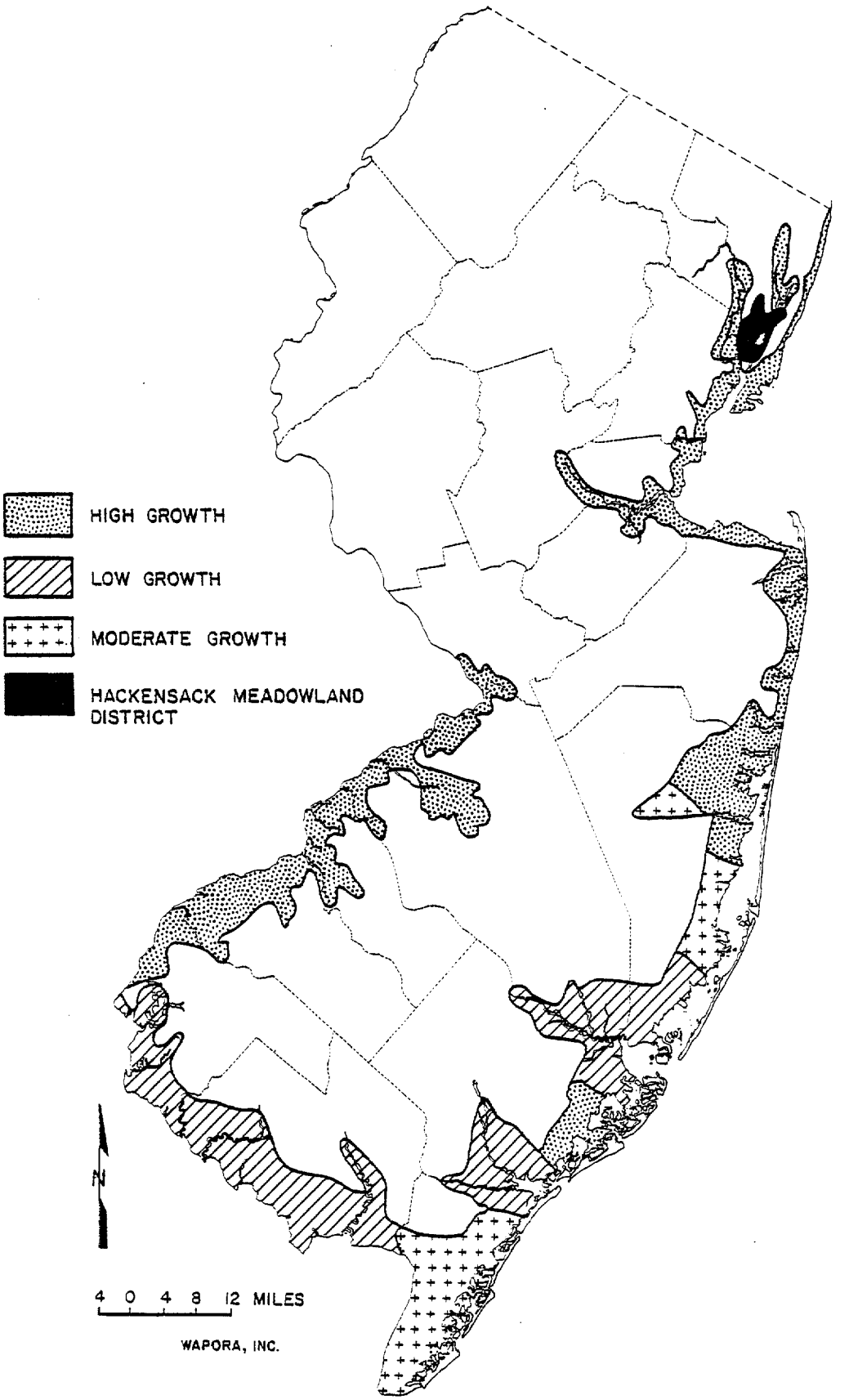

Figure 17. Proposed shoreland growth policies in the New Jersey coastal zone (DEP-OCZM 1979).

part of the coastal zone at least to the extent that they formerly were flowed by the tides, as shown on DEP tidelands maps and riparian atlases.

Section 3.5.3 presents the DEP growth policies for the coastal zone. Growth regions are identified in Figure 17, and areas of overlap with Pinelands jurisdiction are identified in Figure 13. Comparison of the proposed growth policies (and the currently promulgated policies for the Bay and Ocean Shore Segment) with Pinelands policies mandated by the Governor in accordance with the National Park and Recreation Act of 1978 (see Recommendation B-20) shows a high probability of conflict in areas designated for moderate and high growth. The rationale for the designation of the several growth categories is not provided in detail, and the method for delineating the boundaries of the growth areas was not identified by NJ-DEP in the 1978 BOSS Impact Statement or the 1979 Options document.

B-23. DEP should reexamine growth policies for those sections of the Central (high), Western Ocean (moderate), Barnegat Corridor (moderate), Absecon-Somers Point (high), and Southern (moderate) Coastal Regions which overlap the Pinelands Management District and bring those policies into consistency with the Governor's Executive Order 71 (1979) and the Pinelands Protection Act of 1979.

Growth policies in areas of overlap with the Mullica-Southern Ocean (low) and Great Egg Harbor River (low) Coastal Regions are expected to have less of a policy conflict, but they, too, should be reviewed by DEP for consistency with the Governor's Executive Order 71 and the Pinelands Protection Act. The Pinelands Comprehensive Management Plan, expected to be issued during 1980, eventually should be the basis for coordination between DEP and the Pinelands Commission in areas of regulatory overlap.

Section 3.5.4.4 defines areas ranked as having low environmental sensitivity.

B-24. The first criterion of low sensitivity in Section 3.5.4.4 should be revised to reflect more clearly how sections of project sites are identified that, because of onsite paving or structures, qualify as low in sensitivity.

Section 3.5.6.2 addresses high intensity development. The minimum requirement for land that must be covered by forest is judgmentally established at 5%, and that by herbland (or shrubs), also at 5%. These percentages are inadequate to achieve significant modification of microclimate or aquifer recharge. Forest is not defined, particularly in contrast to scattered shade trees with mowed undergrowth. If the area of tree boles on the site is to be at least 5% of the site, then the section should be reworded. Precise amounts of vegetation are not possible to specify, but significant, beneficial effects on microclimate and recharge are unlikely when vegetation covers less than 30% of a property (Figure 18). Preservation of existing forest should be preferred to promised replanting by applicants for coastal approvals.

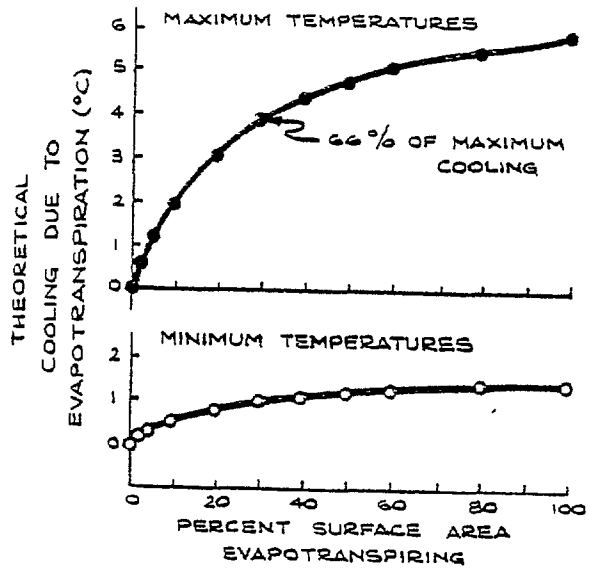

Figure 18. Microclimatic effect of vegetation in relation to percentage of surface area covered by vegetation (Schmid 1975, after Oke 1972). Oke showed by a theoretical calculation that, when one third of the surface was covered by plants, two thirds of the maximum effect on afternoon temperatures was expected. As the proportion of green space decreases, the effect on temperatures drops rapidly to insignificance.

B-25. Section 3.5.6.2 should be revised either to require an ultimate minimum of 30% of the site to be shaded by vegetation or to drop aquifer recharge and microclimate control as objectives of the policy.

Section 3.5.6.3. addresses moderate intensity development. At least 20% of the project site arbitrarily is mandated to be devoted to forest, but the height and the minimum density of tree planting are set at half the minimum required for high-intensity development. It is the expectation of the consultant that the stated policy favoring native herbs and shrubs may be difficult to implement in the long term, even if developers follow the mandates of DEP, because residents tend to install ornamental plants traditionally associated with suburban housing, even in areas where considerable environmental manipulation (e.g., watering, fertilizing) is necessary (Schmid 1975).

Section 4.5.3. encourages pathways for pedestrians and cyclists in the coastal zone.

B-26. Section 4.5.3. should be revised (or another section should be inserted) to encourage also the conversion of abandoned railway or other rights of way to public pathways in the coastal zone wherever possible.

Section 4.6.3. concerns solid waste landfills.

B-27. The Section 4.6.3. policy should be revised to indicate that any sanitary landfill with a potential for release of toxic materials which is proposed for development in an aquifer recharge area ordinarily will be denied.

B-28. The Section 4.6.3. policy on landfills should indicate that, whenever any active or inactive coastal zone landfill is reopened or disturbed as part of any proposed construction, surface water runoff and groundwater shall be tested periodically to determine the potential for environmental or human contamination, and the policy should inform prospective applicants that precautionary measures will be required as necessary to prevent contamination.

Implementation of this recommendation presupposes that applicants for coastal approvals will have to identify all areas of landfill on project sites.

B-29. The Section 4.6.3. policy should specify that the extent and nature of all existing active or inactive landfill areas on sites proposed for uses that require a State coastal permit be identified as part of the permit application.

Section 4.10.6 addresses dredged spoil disposal. Disposal is described as conditionally acceptable on formerly spoiled wetland areas that have revegetated. If the new vegetation consists of wetland species, as frequently can be observed on old spoil piles in coastal New Jersey, then such areas should be mapped and regulated as coastal wetlands and should be

subject fully to the protection offered by the Wetlands Act, which discourages placement of spoil on wetlands.

B-30. Section 4.10.6 should be revised to insure that inactive spoil piles that become revegetated by wetland species receive full protection under the Wetlands Act of 1970.

Paragraph 2 of the "Policy" section should read: Dredge spoil disposal is prohibited on natural undisturbed wetlands and on formerly spoiled wetland areas on which wetland vegetation has become reestablished. Replanting of wetland vegetation in general is encouraged.

NJ-DEP should establish a procedure for the formal delineation of such areas as wetlands. See recommendations A-21 and A-22.

Section 5.8. addresses appropriate coastal vegetation.

B-31. Section 5.8. should be revised to eliminate dogwood as a native Pinelands species and to encourage the planting of native shrub and herbaceous species as well as native trees.

Appropriate species native to the Pine Barrens were listed by McCormick (1970:50-52). Section 5.8 also appropriately might indicate that native vegetation has become a specialty of some landscape architects in the mid-Atlantic region, and that it is no longer necessary to rely on exotic nursery-supplied species for ornamental purposes.

C. Legislative Changes

This section first comments on the legislative changes proposed by DEP in its March 1979 options document. Then it comments on other legislative changes that could enhance State-level protection of the estuarine environment.

DEP finds that the coastal wetlands, waterfront development, and CAFRA permit programs could be combined into one, because all three now are being administered under a single set of policies in the Bay and Ocean Shore Segment, and they are proposed for administration under uniform policies throughout the coastal zone (DEP-OCZM 1979:43ff.). The differences between the programs are viewed by DEP as less significant than the similarities between them.

DEP would include water's edge areas in a first tier of wetlands, along with beaches, dunes, floodprone areas, and all other areas between the waterways and the first inland road or railway. Barrier islands are not mentioned. Virtually all proposed developments in the first tier would require a coastal permit. A second tier would consist of most remaining uplands in the coastal zone. Here only major facilities would require a coastal permit. A third tier would include the Palisades Ridge along the Hudson River , where authority would be sought to prevent new development from obstructing the view from the Palisades. The map and sketches provided by DEP do not illustrate clearly how the proposed regulatory tiers would be established or administered.

C-1. In order to specify how the DEP proposal for a consolidated coastal law might operate, DEP should provide a series of topographic maps similar to maps in Appendix B (DEP-OCZM 1979) indicating where the three proposed tiers are to be situated.

This recommendation cannot be implemented readily by DEP. At present, there is no consolidated, regional map of regulated coastal wetlands; there is no map showing shoreland wetlands, and official state floodplain maps of non-tidal areas are only beginning to be promulgated. No State flood hazards are known to be in preparation for tidal areas. Interim HUD-FEMA flood hazard boundary and permanent flood insurance rate maps, however, could be used for floodplains, and USGS topographic maps could be used for a first approximation of wetlands.

DEP envisions a county and/or municipal option to take over administration of the coastal permit program. Delegation would not be accomplished until DEP certifies local ordinances as consistent with the State coastal policies; DEP could supply partial funding for administration of local programs. It would re-certify each municipal program biennially.

C-2. DEP should state clearly that it would retain veto and conditioning powers over individual permits and that it would review every variance proposed for issuance by municipalities that elect to administer the program.

C-3. DEP should state approximately how many of the 237 municipalities in the coastal zone now have policies consistent with the proposed coastal policies, and should estimate the number of municipalities and of counties that probably would seek to acquire coastal program delegation.

It is the expectation of the consultant that few municipalities currently have the ordinances necessary to implement proposed State coastal zone policies. The transition period from State permits to local permits could be of long duration. It is probable that some municipalities will not opt to administer the program, and even some counties may not elect to participate. Unless full delegation occurs, DEP still will have to administer coastal permits.

DEP proposes that the three permit programs administered by the Divison of Coastal Resources in DEP would be subject to delegation. Hence delegation could exacerbate the existing difficulties of coordination apparent already within the single level of State government. It is probable that few municipalities have the interdisciplinary technical staff able to administer the three permit programs with full consideration of affected resources. For example, there is no municipal equivalent to the DEP Division of Fish, Game and Shell Fisheries which can predict impacts on biological resources. Hence there is a reasonable probability that biological impacts will be underestimated systematically by municipal administrators. To counteract this probability, the consultant believes that a State technical assistance mechanism would have to be developed.

C-4. DEP should detail a mechanism for providing technical assistance to municipalities, if it pursues the notion of permit delegation.

Finally, DEP should address the problem of local-Federal cooperation in the context of permit delegation. At present there is a mixed record of State-Federal permit coordination. It is difficult to envision closer contact between Federal agencies and 237 municipalities than between the Federal agencies and one set of State counterparts. As indicated in other sections of this report, the proposed State policies are not fully consistent with Federal policies. At the municipal level, local political consideration tend to weigh more heavily than Federal laws and regulations, and the potential for conflict in specific cases appears to be great.

C-5. DEP should explain how local-Federal policy coordination can be achieved most effectively if the coastal permit program were to be delegated.

Other legislative initiatives mentioned by DEP include a dune management act and a regional commission to manage the coastal zone. Given the extent of the coastal zone, the consultant sees little value in creating a regional commission to replace statewide agencies. Coordination is difficult enough at present, without adding additional agencies.

C-6. DEP should continue to support a strong State dune management act to protect this resource and to develop technical information that will facilitate the implementation of new legislation.

The consultant concurs with the DEP preference for a bill that recognizes the dynamic nature of the dune resource (Kinsey and Wiener 1979). We recommend that any bill provide explicitly that DEP would retain an oversight and veto power over permits issued by approved municipalities, and that DEP would review all variances granted by municipalities under the prospective act.

C-7. If an initiative for new legislation is decided by DEP to be worthwhile, serious consideration should be given to a comprehensive shoreland (inland) wetlands act to provide the same degree of protection for these wetlands as provided for coastal wetlands by the Wetlands Act of 1970.

Any such legislation should be comprehensive in scope and should be based on the accurate delineation of inland wetlands. The passage of such legislation would pave the way for State administration of Section 404 Clean Water Act permits for placement of fill in inland wetlands. New State legislation would be necessary before this program could be delegated by US-EPA. Any proposed new legislation should be developed in coordination with the Section 208 Areawide Water Quality Planning Process administered by the Division of Water Resources.

C-8. Should an inland wetland permit program be established, its administration should be combined with that of the present coastal wetlands permit program.

C-9. DEP should sponsor new legislation to require the labeling and registration of fertilizers sold for non-commercial use and to provide the environmentally sensitive use of such materials especially in the coastal zone.

Currently this segment of the fertilizer industry is not subject to regulation under NJSA 4:9-15.1 et seq.

C-10. DEP should support Assembly Bill 480 (1978 Session) or equivalent legislation to strengthen the legal status of conservation easements in New Jersey and to enact enabling legislation for historic preservation restrictions.

Historic preservation zoning may be an important consideration in acquiring Federal funds and tax credits for the redevelopment of urban waterfront areas and the encouragement of concern for the New Jersey marine heritage. Historic preservation and open space preservation logically can be combined in legislation such as the bill proposed by Assemblyman Froude. The legislation would allow municipalities to establish historic districts in which architectural features would be subject to controls. Such legislation has proved successful in Massachusetts.

C-11. DEP should sponsor a New Jersey trails system act to authorize establishment of scenic and recreational trails.

The trails may traverse State-owned lands as well as private lands acquired by fee-simple, lease, conservation easement, or other means. Such an act has been enacted in North Carolina. DEP also may seek to nominate a coastal scenic trail as a National Trail. Such designation by the Heritage Conservation and Recreation Service (Department of the Interior) could provide access to Federal funds.

C-12. DEP should consider the establishment of a Coastal Conservancy along the lines of the California agency established by the State Coastal Conservancy Act of 1976.

Such an agency could (1) award grants to local public agencies for the restoration and rehabilitation of urban coastal areas, (2) award grants to local and State agencies to enhance coastal resources that have experienced degradation in the past, (3) award grants for acquisition of buffer zones around sensitive special resource areas, (4) provide loans for public acquisition of key resource areas that otherwise would be unlikely to be preserved, and (5) award grants for public accessways. The creation of such a Coastal Conservancy could enable DEP to take an activist role in shaping the future New Jersey coastal zone, rather than relying primarily on its regulatory role to respond to the initiative of others.

C-13. DEP should work with DOT to develop legislation that would authorize the control of highway advertising in the coastal zone.

At present DOT has authority to restrict billboards along certain highways including those of the Interstate System. In Massachusetts an Outdoor Advertising Board can prohibit advertising along primary roads in areas that are not zoned for commercial or industrial use. Such a measure in New Jersey would help preserve the scenic integrity of the coastal zone.

C-14. DEP should sponsor legislation to delete the 24-unit threshold from housing developments regulated under the Coastal Area Facility Review Act.

The 24-unit exemption should be eliminated so that the coastal zone management program can exercise control over cumulative impacts, which were shown in the matrices prepared for this report to be adverse even for low-density housing. Moreover, control over low-density housing is needed by DEP to enable it to enforce the coastal policies favoring moderate-density housing and preserving open space.

C-15. DEP should sponsor legislation providing that structures in barrier island and shorefront areas that are destroyed or extensively damaged by wind or wave action should not be rebuilt at the same location unless there is a compelling public need or purpose.

This provision should be supported by DEP whether or not the proposed dune legislation is adopted. DEP already has developed the appropriate rationale (Kinsey and Wiener 1979:20):

> This firm stance should be taken for three reasons: (a) the inevitable reoccurrence of a destructive storm, (b) the

cost to the public for clean up and protective measures, and (c) the cost to the public of subsidizing development at hazardous locations, without commensurate public benefits. A standard of 50% destruction of fair market value is proposed as the threshold for prohibiting the rebuilding of structures. ... The Rhode Island Coastal Management Program already has a similar policy prohibiting the restoration of structures reduced to 50% or less of market value by fire, flood or other such catastrophe if the structure is located in an identified developed coastal flood hazard area.

D. Surveillance and Enforcement

Surveillance and enforcement are critical elements in coastal zone management, and are essential to insure protection of estuarine resources. Unauthorized activities are detected by two principal mechanisms: (1) field observation and air photo surveillance of such activities by State enforcement personnel on their own initiative or following inquiries from the concerned public, and (2) interagency permit review for necessary approvals. DEP should be concerned with enhancing both types of surveillance and enforcement. The record of achievement in enforcing the three principal coastal regulatory programs should be maintained and enhanced.

The New Jersey coastal zone is a large area, encompassing parts of 17 counties and all or part of 257 municipalities. It is unrealistic and costly for State inspectors to cover the whole of the coastal zone at all times. Moreover, surveillance should not be the exclusive burden of State bureaucrats charged with this single function.

D-1. DEP should foster surveillance for coastal laws by local law enforcement personnel; it should enhance the potential for a concerned public to help bring about compliance by undertaking public education campaigns; and it should inspect and inform interested persons on the enforcement measures taken on alleged violations.

The Coastwatch Program organized by the American Littoral Society is a step in the right direction, but the base of "coastwatchers" should be broader than committed conservationists. Law enforcement officials should be made aware of the kinds of activities that require permit approvals, and of what State and Federal offices should be apprised of activities such as filling or new construction in regulated environments, so that followup inspections can be made by the appropriate agency personnel. The publication of portable maps (e.g., 1:250,000 scale) showing wetlands and other sensitive features subject to regulation should be a priority undertaking. The environmental reasons why protective legislation should be enforced should be the subject of frequent reminders to the public. Educational materials concerning why coastal resources are important and are regulated should be developed by DEP and distributed through the public schools, institutions of higher learning, natural history and science museums, and conservation groups.

Particular attention should be given to educating local zoning board and environmental commission personnel in the nature and extent of regulatory controls at higher governmental levels, and local agencies should be encouraged to coordinate with other levels of government at the earliest practicable stage in project review.

D-2. DEP-OCZM should act as an intermediary between educators and surveillance and enforcement units in DEP to continue to encourage internship and work-study programs whereby students can assist in surveillance activities.

There is a growing commitment to environmental studies programs in the high school and college curricula. Students are eager to participate in activities that give them first-hand exposure to coastal resources and ways to protect those resources. By enlisting student aides and interns during summer and even during the school year, DEP can enhance State surveillance capabilities manifold for at least some categories of resources at the minimum expenditure of funds. The Rutgers University (Cook College)-DEP cooperative program now is in its fourth year and should continue to receive DEP support.

Many of the recommendations in this report address ways to enhance interagency coordination. Projects in the coastal zone that need one approval are likely to need others, because resources are densely "packed" in this region.

D-3. DEP should continue its efforts to secure interagency reviews of coastal permits, and should enhance the review process by insuring feedback to reviewers.

Particular attention should be focused on State-Federal coordination to secure enhanced enforcement of Federal laws such as Section 10 of the River and Harbor Act and Section 404 of the Clean Water Act. In the experience of the consultant, priority attention should be given to enhanced Federal enforcement in the Hackensack Meadowland District and the rest of the northern waterfront section of the coastal zone.

D-4. DEP should request the New York District of the Army Corps of Engineers to increase its surveillance of filling operations in the Hackensack River basin, and to require full compliance with Section 404 of the Clean Water Act within the jurisdiction of the New York District in New Jersey.

D-5. DEP should insure that there are sufficient personnel for surveillance that each inspector knows his geographical region of responsibility intimately.

DEP should publicize the fact that its surveillance personnel will inspect all land areas in the coastal zone on foot, by automobile, or by boat at least twice annually on a routine basis. The availability of airplanes, helicopters, and aerial photographs to assist in the ground surveillance also should be made known. Public awareness that surveillance is ongoing will encourage voluntary compliance with coastal regulatory programs.

E. Further Study Needs

Several data gaps have become apparent during the preparation of this report. DEP can assist in filling these gaps for the coastal zone.

E-1. The resources of the coastal zone should be identified on a map series of uniform scale (such as 1:24,000), and the inventoried data should form a basic underpinning of the coastal permit review process.

At the outset of the present investigation, it was anticipated that inventory maps would be available during the course of the work. Coastal resources have not yet been inventoried, however, at a uniform, regional scale. A selection of existing data was presented by DEP-OCZM in its 1975 Inventory of the New Jersey Coastal Area, and pilot comprehensive mapping has been accomplished in Cape May County. The inventory should be completed throughout the coastal zone.

E-2. DEP should encourage the collection of original resource data in the coastal zone so that additional currently unprotected resources are identified, and should publicize the availability of Federal assistance for such inventories.

It is not possible to protect unrecognized resources when reviewing projects for their direct and their cumulative impacts on the coastal zone. At present, DEP is administering a contract to map submerged estuarine vegetation using NOAA funds. Other comparable activities could include surveys to identify maritime heritage resources (matching funds are available through the Heritage Conservation and Recreation Service), historic and archaeolgic resources, critical habitat for imperiled species, scientific sites, and shoreland wetlands in the coastal zone. The National Trust for Historic Preservation funds grant programs to assist in the restoration and conservation of maritime and other resources that qualify for listing on the National Register of Historic Places. Federal funds can be secured for the public acquisition of islands pursuant to the Coastal Zone Management Act, and DEP should seek out candidate islands in the coastal zone. The extent of regulated coastal wetlands should be determined, by type, by county, and by watershed, to make possible the estimation of significance when coastal wetlands are proposed for alteration, and the same data should be prepared if shoreland wetlands are delineated. Fish spawning, grounds and other critical wildlife habitats; communities with specially distinctive ethnic or architectural attributes; wild, scenic, and recreational rivers; areas that potentially may qualify as National Natural Landmarks; and natural areas that qualify for designation under NJSA 13:1B-15.12a et.seq.; all should be inventoried. Several areas within State lands now are included in the New Jersey National Areas System, but no private lands have been designated in the coastal zone or elsewhere in the state.

E-3. DEP should foster and encourage the development of a formal, coordinated natural resources inventory and research effort in the New Jersey coastal zone.

Such an effort could be set up as a new and distinct bureau or division within the DEP, or DEP could coordinate such an effort by designating a major university as the program manager. Consistent, up-to-date, and well-managed data on the present location, abundance, condition, and function of natural resources are needed in New Jersey. To fill this need a study group could be created whose express purpose would be to study in a coordinated fashion the natural resources of the State. Such a group might be designated the New Jersey Natural History Survey. Such a group might be structured according to disciplines (i.e., terrestrial ecology, marine ecology, etc.) or according to specific study goals (i.e., "survey and evaluate migratory pathways and prime spawning areas"). The basic approach would be to study the natural resources of New Jersey by hiring competent scientists and specifically directing them to devote their full-time energies to meeting designated resource inventory goals. As the location and abundance of a specific natural resources becomes better known, a coordinated effort to establish quantitative thresholds for the environmental parameters of concern listed in Tables 9 through 26 could be undertaken. The fragmented natural resource data of varying quality which are available today are testimony to the inadequacies of the present system. New Jersey should boldly undertake to initiate a new coordinated system which will produce high quality data on which to base future coastal resource decisions.

The functions of the proposed Natural History Survey could include:

- Coordination and conduct of original research on the functioning of ocean, estuarine, and fresh water ecosystems of the State and on ways to mitigate adverse impacts from future development.

- Development and maintenance of a continuing inventory of coastal resources.

- Development of public education concerning techniques to accomplish development in the coastal zone that is compatible with the resources of the region.

- Technical assistance to regulatory agencies that must make planning and permit decisions in the coastal zone.

- Liaison with scientific counterpart personnel in surrounding states.

E-4. DEP should assist the Hackensack Meadowlands Development Commission to designate valuable public and private wetlands in the District as part of the State Natural Areas System.

A number of areas are slated for preservation by the HMDC Master Plan. Some or all of these areas should be designated as parts of the State Natural Areas System to give recognition to their biological importance. Any proposals to alter such areas consequently would be more likely to receive detailed scrutiny by regulatory reviewers.

E-5. DEP should assist the Division of Fish, Game and Shell Fisheries to identify public and private wetlands elsewhere in the coastal zone that merit listing as parts of the State Natural Areas System and should expedite their designation.

For example, the outstanding freshwater tidal marsh at Fish House Cove on the Delaware River (Pennsauken, Camden County) currently is not protected by the Wetlands Act from proposed filling because of a combination of unpromulgated maps and incomplete mapping. During 1979 the Camden County Environmental Agency succeeded in bringing the area to the attention of the US Fish and Wildlife Service and the Army Corps of Engineers, and it may be accorded protection under Section 404 of the Clean Water Act. How may more such cases are extant in the coastal zone is a matter of conjecture.

E-6. DEP should identify and publicize known and potential polluted areas and sources of pollution that affect the coastal zone in order to focus public and regulatory attention on such problems.

Polluted estuaries and the watersheds which contribute polluting substances to them should be mapped and included in DEP environmental impact statements. Streams should be classified into categories such as those that (1) always meet or exceed established standards, (2) generally meet standards, and (3) always fail to meet standards, on the basis of existing information from the plans developed by or for the DEP Division of Water Resources under Sections 208 and 305 of the Clean Water Act. Landfills should be shown on a map, with differentation of categories by potential for adverse impact. Facilities subject to oil spills and facilities where explosives, toxic substances, or hazardous wastes are stored also should be mapped. Known areas with polluted sediments should be flagged. Particular attention should be given to those sites where accidents or floods could release toxic or deleterious substances to the waterways. Sites with a past history of clandestine dumping also should be noted and their characteristics described, so that surveillance in future can be intensified.

E-7. The boundary of the coastal zone should be expanded to include those watersheds from which runoff is found to cause direct and significant adverse impacts on the estuarine environment.

In the developed sections of the coastal zone, water pollution control is a major and continuing responsibility of the DEP Division of Water Resources and other agencies. DEP should assist in these efforts by

including watersheds known to have significant contributions of pollutants from urban/industrial or other activities within the coastal zone boundaries. Candidate areas are to be found along the northern waterfront, where old, mixed residential/industrial land uses still send urban stormwater, sanitary effluent, and industrial discharges directly into the waterways (for example, the Cromakill Creek basin in Hudson County). Similar water quality problems are extant along the developed Delaware River waterfront. The watersheds that should be included, at a minimum, are those urbanized lands that drain to tidal waterways directly, and are not otherwise included in the coastal zone.

ACKNOWLEDGMENTS AND AUTHORSHIP

The consultant thanks Assistant Commissioner Donald Graham and the many members of his staff in the Division of Coastal Resources, other agency personnel in the Department of Environmental Protection, and the staff of other State, interstate, and Federal agencies for assistance and numerous courtesies during the preparation of this report. Particularly helpful comments were provided on an earlier version of this report by T. Hampton, R. Kantor, D. Kinsey, S. McKenzie, and S. Weiner. Remaining errors of fact or interpretation are those of the consultant. Mr. Richard Kantor was project manager for the Bureau of Coastal Planning and Development, and Mr. Raymond Bogardus was project manager for WAPORA.

The impact analysis section of this report was written by Raymond Bogardus, Joe Andrea, Michael Black, and the late Dr. Jack McCormick. Technical assistance for this section was provided by C. Rhodehamel, J. Urban, A. Hirsch, J. Munro, M. Black, and R. Cutler. Matrices were prepared by J. Andrea with the assistance of R. Bogardus, M. Black, J. Urban, and C. Rhodehamel, with helpful guidance and review by S. McKenzie, R. Kantor, and J. Perykasz of the Bureau of Coastal Planning and Development, NJDEP.

The management section of this report was written and edited by Dr. James A. Schmid with the assistance, for legal matters, of Ms. Mary Ann Thompson. Insightful comments were provided on an earlier draft of this section by the late Dr. Jack McCormick. Technical assistance was provided by J. Munro, C. Rhodehamel, M. Hannemann, V. Jurka, and J. Andrea.

The photographs in Volumes Two and Three were taken by J. Munro.

Graphics for this report were produced by J. Gold, S. Kullen, and J. Wrend under the supervision of W. Bale. Typing was by P. Awner, S. Baldwin, E. Ennis and N. Daoud.

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Appendix 1. Example of a resource-based permitting strategy developed for the Army Corps of Engineers.

The following pages are excerpted from a report on the Kenai River Basin, a region of about 3,000 square miles in southcentral coastal Alaska. The report was prepared by the consultant and published by the Anchorage District of the Army Corps of Engineers (ACE 1978). The Kenai Basin is renowned for its salmon fishery and other wildlife.

The summary tables of "permit activities classifications" prepared for the Kenai Basin resemble the "acceptability tables" prepared by DEP-OCZM for the New Jersey coastal zone (for example, NJDEP 1979: Appendix H, p. 193, 240-242). In case of the Kenai Basin, however, the tables were prepared following completion of a comprehensive inventory and a precise review of the extent of Corps regulatory jurisdictions. They were made specific to five geographical subregions (each about 40 square miles of the Basin, except for the National Moose Range where few permit applications are expected). Except for parts of Cape May County, no comprehensive inventory has yet been undertaken by DEP-BCPD for the New Jersey coastal zone , and no similarly detailed permit activities classification has been attempted.

AREA CLASSIFICATION AND ACTIVITY RATING SYSTEM

Several factors affect the administration of Corps of Engineers (COE) permit authority. To effectively convey the results of this Review, the following area classification and activity rating systems were developed.

Area Classification System

The Study Area has been divided into two units: The primary area comprises lands and waters directly under the jurisdiction of the Corps. Secondary areas are lands and waters outside the jurisdiction of the Corps. Because activities in secondary areas may affect areas under Corps jurisdiction, and, conversely, the Corps' permit authority may affect secondary areas, secondary areas are included in this Review.

Areas of Jurisdiction of the Corps of Engineers

Within the Review Corridor, shown in Figures 6, 7, 8, and 9 on pages 27, 31, 35, and 39, respectively, numerous requests for permits are anticipated although few permit applications are expected from the rest of the Review Area. The greatest part of the Corps responsibility to administer the permit program is based on Section 10 of the River and harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977 which may be found in the Regulatory Program of the U.S. Army Corps of Engineers of 19 July 1977 (43 FR 138; Chapter II, 33 CFR, Part 320-329). A copy of these regulations may be found in Appendix B and is the document cited in the following discussions concerning areas of jurisdiction within the Review Area.

Section 10 prohibits the construction of any structure or performance of any work in or over any navigable water of the United States that could obstruct or alter such waters in any way unless the structure or work has been authorized by the District Engineer (33 CFR 320.2(b)0.

Section 404 prohibits the discharge of dredged or fill material into most waters of the United States unless authorized by the District Engineer (33 CFR 320.2 (g)).

The Corps' jurisdictional boundaries for Section 10 purposes extend shoreward to the mean higher high water line in tidally influenced waters and to the ordinary high water line in non-tidal waters. For Section 404 purposes, the Corps' jurisdiction extends to the high tide line in tidally influenced waters and to the ordinary high water line in non-tidal waters. Section 404 jurisdiction is also extended to all wetlands affecting these waters (33 CFR 322.2 and 33 CFR 323.2).

All waters of the Kenai River, including Skilak Lake and up to and including Kenai Lake have been determined "navigable" on the basis that they are now used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. The Corps jurisdiction in tidal and non-tidal portions of these waters is under both Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977.

All wetlands adjacent to the entire Kenai River, including Kenai Lake, Skilak Lake, and tributaries, are regulated under Section 404 of the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977. Should any of the wetlands be located below the mean higher water mark in tidally influenced water or below the ordinary high water mark in non-tidal water, they will also be regulated under Section 10 of the River and Harbor Act of 1899.

All other waters of the United States in the Kenai River watershed including isolated wetlands, isolated lakes, and intermittent streams, and potholes, the degradation or destruction of which could affect interstate commerce are regulated under Section 404 of the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977 which applies to the discharge of dredged or fill material (33 CFR 323.2 (a)(5)).

Other critical environmental areas of special concern in evaluations of applications for permits include:

Properties listed, or eligible for listing, in the National Register of Historic Places (33 CFR 320.3 (j)).

Critical areas for species designated by the Secretary of the Interior as endangered or threatened (33 CFR 320.3 (j)).

Properties acquired or developed with assistance from the Land and Water Conservation Fund (33 CFR 320.3 (m)).

Flood plains of the Kenai River and its system or tributaries (33 CFR 320.4 (l)).

Important habitats for fish and wildlife, including such features as nesting areas of migratory birds (33 CFR 320.3 (c)).

The subarea maps of the Review Corridor are color coded to reflect the areas of Corps jurisdiction. Wetlands are green, water bodies and tributaries are blue. Although the Corps jurisdiction does not include the entire flood plain when no wetlands are adjacent, it is indicated on the maps to enable the applicant to wisely plan for activities.

ACTIVITY EVALUATION

The evaluation method for proposed activities within the Subareas is designed to provide interested parties with a system that is easily understood. Activities requiring Department of Army permits are reviewed as they relate to a subarea, based on information found in the Profiles. Each activity is evaluated within its subarea and designated as an activity that will be conditioned (C), ordinarily denied (OD), or not applicable (N/A). Activities in wetlands will have an additional activity evaluation unit (W) for evaluating permit requests for specific types. This unit alerts interested parties to the fact that permits are required for the discharge of dredged or fill material in wetlands.

These activity evaluations are offered as guides for the permit applicant, commenting agencies and individuals, As guides, the evaluations do not carry the force of law nor are they prejudgements of the

ultimate action to be taken on a specific permit application. Every permit application received by the Alaska District will continue to be processed and subsequent determinations made on a case-by-case basis.

The decision to condition or deny a specific permit is made by the Alaska District Engineer following a public interest review. The importance of the public interest review cannot be overemphasized. If through the public interest review it is determined that the granting of a specific permit with conditions will be in the public interest, the permit will be issued with said conditions. (No permits, unless under emergency situations, are granted without a public interest review.) Likewise, if during the public interest review it is determined that the granting of a specific permit is not in the public interest, the permit will be denied.

In making the decision to issue or deny a specific permit the Alaska District Engineer must follow general policies which govern permits. Discussions of the general policies, areas where permits are conditioned, areas where permits are ordinarily denied, and wetlands permitting policies follow.

General Policies Governing Permits

All applications for Department of Army permits for actions affecting the Kenai River, its tributaries, and wetlands undergo a public interest review following the publication of their respective public notices. These policies are derived from 33 CFR 320-329, other Federal regulations, and the profile information and findings of this review.

A permit will be granted only if its issuance is found to be in the public interest. Questions which must be answered during the public review are as follows:

1. Will the activity have adverse effects on the enhancement, preservation, or development of historic, scenic, wildlife, recreation, economic, and similar values?

2. Have applicable State or Federal water quality statutes, rules, and standards been met for the activity?

3. Will fish and wildlife resources be protected adequately or can they be protected by special conditions attached to the permit for the activity?

4. Has required local, State, or other Federal authorization been granted or denied for the activity?

5. Does the proposed activity conform to State, regional, and local land use goals, policies, plans and ordinances that apply to the land and water areas under review?

6. Does the activity tend to preserve and maintain agricultural land?

7. Will the activity increase flood hazard potential or will it locate a permanent structure in a hazardous area? If so, has the applicant demonstrated that there is an overriding necessity for the proposed activity?

8. Will the activity protect or increase erosion of stream bank or tidal flat that may be caused by wind or currents?

9. Does the activity improve public access to and public recreational use of the resources of the area? If so, will the resources of the area support such access and use?

10. Does the activity help to maintain or enhance the local and regional economy? If so, does it conflict with overriding State or national interest?

11. If the activity is to provide or improve major transportation facilities, will the social, economic, and environmental effects of the facility be acceptable?

12. Does the activity interfere unnecessarily with natural erosion and accretion processes?

13. Will the activity minimize the disturbance of adjacent vegetation?

The responses to this review must indicate clearly the proposed activity is in the public interest and will minimize adverse effects on the environment before a permit will be issued.

Areas Where Permits Are Conditioned

All permits issued for activities in the Kenai River, Kenai Lake, Skilak Lake, tributaries, and wetlands shall contain standard permit conditions, however, certain activities will require special conditions. These special conditions are designed to ensure that the proposed activities are carried out in a manner that will minimize their effect on navigation, fish and wildlife, water quality, and other considerations. For example, a permit for the construction of a floating dock on the Kenai River may be authorized provided the applicant agrees to conditions such as:

1. The dock is constructed of environmentally compatible and aesthetically pleasing materials.

2. The dock or dock platform is portable to facilitate removal and thereby minimize susceptibility of damage to the structure and damage caused by the structure from washouts during flooding.

3. The dock is no larger than the minimum size required to accomplish the desired purpose. Where a single boat will be docked, the facility should be no larger than the maximum length of one boat parallel and perpendicular to shore.

It must be emphasized that while the applicant must agree prior to permit issuance to meet the conditions for specific activities as described in the section of this review entitled "Permit Conditions and Recommended Management Practices", additional conditions may be placed on the permit as a result of the public interest review. Likewise, there may be instances where permits are issued with fewer special conditions. In any event, all applicants should be aware that no permits will be granted without conditions. The extent of the special conditions placed on a permit will come as a direct result of case-by-case examinations of individual permit applications and the public interest review procedure.

Areas Where Permits Are Ordinarily Denied

Any individual may apply for a Department of the Army permit for any activity proposed in areas within Corps of Engineers' jurisdiction, and the application will be processed on a case-by-case basis; however, several types of activities (work) in specific areas of the Kenai River and tributaries have been determined to be detrimental to the overall integrity of the system. An example of these activities would be groins, revetments, dams, gravel removal, canals, and navigation channels. In the Kenai River or tributaries the use of fill to construct a fill embankment, groin, levee, or dam will ordinarily be denied. Interested parties should consult the individual subarea matrices to determine those specific activities which would ordinarily be denied.

Wetland Permitting Policies

Wetlands have been documented to exist within the Study Corridor. The methodology used to classify these areas as wetlands are explained in the following Profiles. Under current Section 404 regulations, the U.S. Army, Corps of Engineers exercises jurisdiction in these areas. Wetlands are one of the most important natural resources addressed by Corps of Engineers permit regulations. Wetlands are defined as:

> "... Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." 33 CFR 323.2 (c).

In reviewing permit applications, the Alaska District Engineer is required to take into account the interrelated nature of wetlands resources and to account for the cummulative effects of many piecemeal changes that may result in impairment of wetlands.

"No permit will be granted to work in wetlands identified as important. . . unless the District Engineer concludes, on the basis of the analysis required. . . that the benefits of the proposed alterations outweigh the damage to the wetlands resource and the proposed alteration is necessary to realize those benefits." (33 CFR 320.4 (b)(4)).

Wetlands that are considered to perform functions important to the public interest are described in the Corps regulations 33 CFR 320.4 (b)(2). They are as follows:

1. Wetlands which serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing, and resting sites for aquatic or land species.

2. Wetlands set aside for study of the aquatic environment or as sanctuaries or refuges.

3. Wetlands the destruction or alteration of which would affect detrimentally natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, current patterns, or other environmental characteristics.

4. Wetlands which are significant in shielding other areas from wave action, erosion, or storm damage. Such wetlands often are associated with barrier beaches, islands, reefs and bars.

5. Wetlands which serve as valuable storage areas for storm and flood waters.

6. Wetlands which are prime natural recharge areas. Prime recharge areas are locations where surface and ground water are directly interconnected.

7. Wetlands that through natural water filtration processes serve to purify water.

To date, no quantitative data are known which document the importance of individual wetlands within the Study Corridor. In the absence of such data, the Alaska District will, upon request or upon receipt of a permit application, conduct on-site investigations to document whether or not a particular site is a wetland. (It should be emphasized that areas depicted as wetlands on the subarea maps were so designated merely as a guide for individual permit applicants and other interested parties. It is possible that physical and/or biological phenomena may have altered the extent of these wetland areas since publication of data used in their classification. At this time it is not known if a change has occurred, nor is it known that if in fact a change has occurred, the wetland areas have increased or decreased.)

The investigations will be done in areas designated as wetlands in this report or any other areas in question. All permit applications for work involving the discharge of dredged or fill material in wetlands will be processed on a case-by-case basis; however, permits will ordinarily be denied for activities in wetland areas identified during the public interest review to be wetlands performing functions important to the public interest and considered vital areas constituting a productive and valuable resource (see items 1-7 mentioned previously).

PERMIT CRITERIA BY SUBAREA

To facilitate the use of this Environmental Review, the Study Area has been divided into five subareas. The boundaries of these subareas are shown in Figure 5. The next five sections include a narrative summary of background profile information for each subarea. A map and table show for each of Subareas I through IV the classification given various permit activities.

No map of Subarea V is included because very little, if any, permit activity is anticipated in this section of the Study Area. Limited permit activity for public access facilities may be received, however, no additional private permit requests are expected since the majority of land in the area is controlled by the Federal Government.

The following procedure is suggested for utilization of Subarea maps and tables:

1. Locate the Subarea where the permit activity is anticipated on one of the following maps.

   A. Subarea I: Kenai River - Cook Inlet Confluence to Limit of Tide (River Mile 12, Page 25).

   B. Subarea II: Limit of Tide to Kenai National Moose Range Boundary (River Mile 12 to River Mile 25, Page 29).

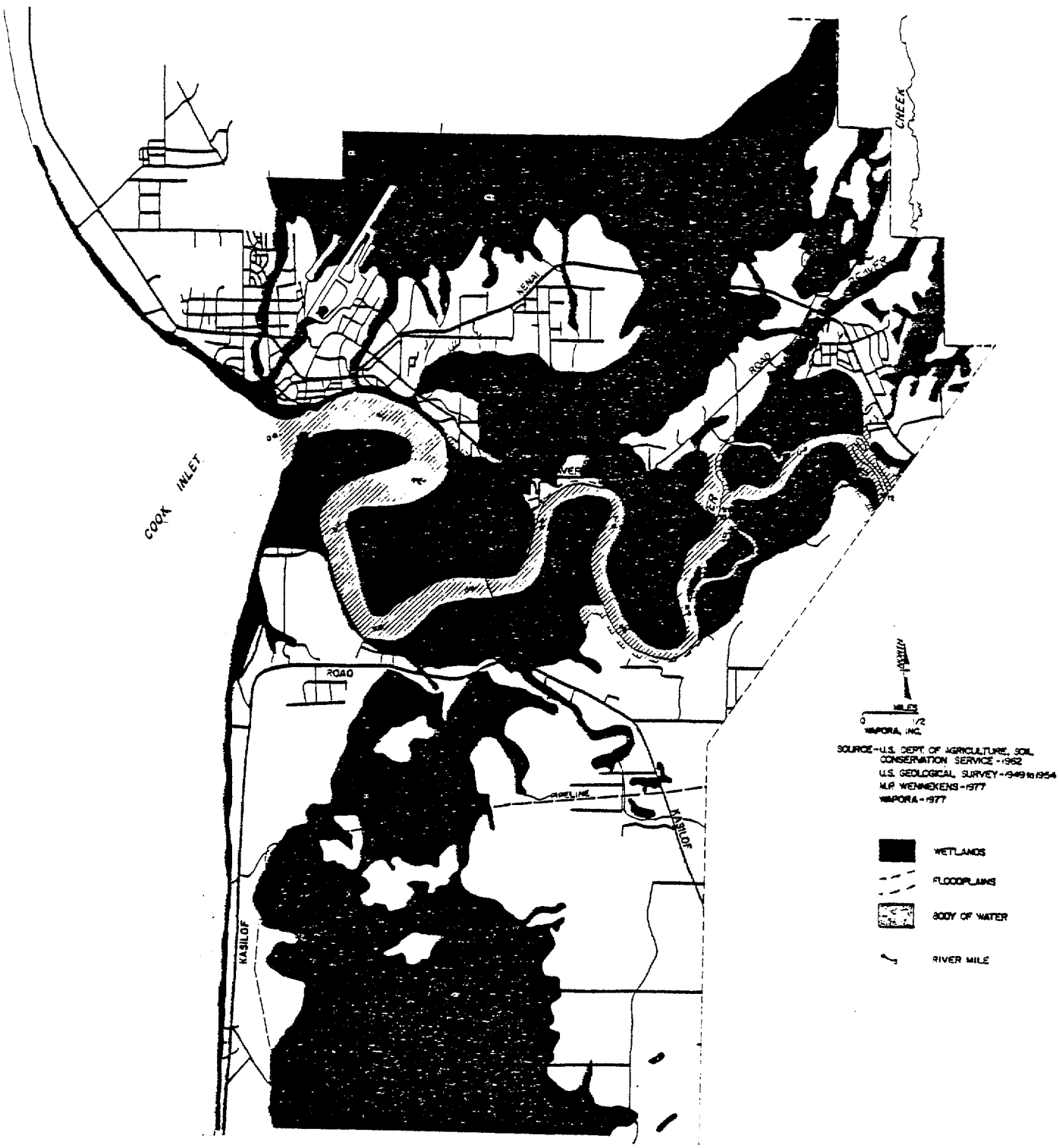
   C. Subarea III: Kenai National Moose Range Boundary to Moose River (River Mile 28 to River Mile 36, Page 33)

   D. Subarea IV: Kenai River area to Kenai National Moose Range Boundary (River Mile 36 to River Mile 45, Page 37).

2. Locate the specific site where a permit activity is anticipated.

3. Match the activity (dock, slip, etc.) with the area in which the activity is anticipated (Kenai River, Tributary or Wetland).

4. Determine the permit classification



SUBAREA I – FIGURE 6.

Table 1. Subarea I: Permit Activities Classification

ACTIVITY	KENAI RIVER	TRIBUTARIES	WETLANDS
STRUCTURES (no filling):			
DOCKS			
Floating	C	N/A	N/A
Piled	C	N/A	N/A
Crib (open)	C	N/A	N/A
Cantilevered	C	N/A	N/A
DOLPHINS	C	N/A	N/A
RAMPS	C	N/A	N/A
Small Private	C	N/A	N/A
Large Community	C	N/A	N/A
GROINS	O/D	N/A	N/A
REVETMENTS	C	N/A	N/A
DAMS	O/D	N/A	N/A
DISCHARGE LINES	C	N/A	N/A
SUBSURFACE UTILITIES	C	N/A	N/A
OVERHEAD UTILITIES	C	N/A	N/A
MOORING BUOYS	C	N/A	N/A
DREDGING:			
GRAVEL REMOVAL	O/D	N/A	N/A
CANALS*	O/D	N/A	N/A
NAVIGATION CHANNEL*	O/D	N/A	N/A
SLIPS*			
Shoreline Notch	C	N/A	N/A
Community Facility (Large)	C	N/A	N/A
FILLING:			
FILL EMBANKMENT**	O/D	O/D	W
RAMPS			
Small Private	O/D	O/D	W
Large Community	C	O/D	
GROINS	O/D	O/D	W
REVETMENTS	C	C	W
LEVEES	O/D	O/D	W
DAMS	O/D	O/D	W
CULVERTS & BRIDGE APPROACHES	C	C	W
SUBSURFACE UTILITIES	C	C	W
OVERHEAD UTILITIES	C	C	W
DISCHARGE OF FILL OR DREDGED MATERIAL	O/D	O/D	W

Legend: C - Permits ordinarily conditioned. (see page 18)
O/D - Permits ordinarily denied. (see page 19)
W - Permit required for the discharge of dredged or fill material (see page 19)
N/A - Not applicable (No Department of the Army Jurisdiction).
* - Maintenance Dredging (Activities authorized by a Department of the Army permit or existing facilities which were constructed prior to 18 December 1968 are subject to a permit condition that requires the structure or work to be maintained in good usable condition.)
** - Examples: House pad, access road, etc.

Subarea V. Kenai National Moose Range Boundary to Outlet of Kenai Lake

Subarea V begins at River Mile 45 and continues upstream to River Mile 83. Kenai River mainstem spawning is documented throughout the subarea. All major tributaries entering the River in this subarea except Cooper Creek are known to provide nursery habitat and may provide spawning habitat. Previous studies by the Alaska Department of Fish and Game have shown that sockeye salmon rearing occurs in Skilak Lake.

There has been little residential or commercial development in Subarea V, as the majority of land is controlled by the federal government. The major exception to this pattern is the settlement of Cooper Landing near the outlet of Kenai Lake, which is held by various private interests.

The topography of the area is flat west of Skilak Lake and mountainous to the east of the Lake. This subarea is considered the most aesthetically pleasing of the Study Area.

Future permit requests are anticipated from residents of the Cooper Landing area. As the settlement of Cooper Landing grows, future studies may be required to determine the suitability of proposed permit actions. Permit requests may arise also for additional public access facilities associated with the Kenai National Moose Range.

PERMIT CONDITIONS AND RECOMMENDED MANAGEMENT PRACTICES

In addition to standard conditions found on all permits, many activities in the Kenai River, Skilak Lake, Kenai Lake, their tributaries, and wetlands must meet specific conditions before a permit may be issued. These special conditions as they apply to the described activities requiring permits are included in the section along with recommended management practices which should be followed to the maximum extent possible to minimize potential adverse effects on the environment. (Although recommended management practices are not enforceable by the Corps of Engineers, the extent to which applicants agree to their adherence will be considered in the determination to issue or deny a permit.)

The conditions and management practices outlined in this section have been developed from the summary findings of the environmental profiles and have not been developed for those activities for which permits would ordinarily be denied. These profile conclusions are listed in parentheses behind each condition and can be found in their entirety on the following pages.

Docks

A dock is defined as a place (such as a wharf or platform) for loading or unloading goods or people. Floating, piled, and cribbed docks have been constructed on the Kenai River and serve as river access structures for boats or planes.

Although isolated, individual boat docks may not create significant impacts, the cumulative impact of several docks may be adverse. A proliferation of boat docks will reduce aquatic habitat, limit near-shore fishing, accelerate erosion, create additional flood hazard (debris), and diminish the aesthetic appeal of an area.

Community or shared facilities minimize the impacts caused by excessive numbers of smaller boat docks. Depending on the availability of community facilities, individual boat docks may not be needed. Permit applications for community or shared boat docks will be encouraged in place of individual facilities. Although permit requests for numerous types of boat docks are anticipated, cantilivered or floating structures will be encouraged over pile structures.

Special Conditions

a. Docks shall be constructed of environmentally compatible and aesthetically pleasing materials. (For example, railroad ties or creosote-treated wood would not be acceptable in that they may impart the preservative to the water and degrade water quality. Automobile bodies or discarded freezers may provide suitable foundations for docks but obviously would be environmentally unacceptable and aesthetically displeasing.) (Physical 9; Biological 3; Aesthetic 1,2, and 3; and Land and Water Use 2)

b. Docks or dock platforms shall be portable to facilitate removal and thereby minimize susceptibility of damage to the structure, and damage caused by the structure from washouts during flooding. (Physical 5; and Land and Water Use 1)

c. Docks shall be no larger than the minimum size required to accomplish the desired purpose (usually the maximum length of one boat parallel and perpendicular to shore for individual facilities). (Physical 2; and Aesthetic 2)

Recommended Management Practices

The following management practices should be followed to the maximum extent possible:

a. The dock should not be constructed in a manner that will adversely affect a wetland. (Physical 8; Biological 1; and Socio-economic 1)

b. The dock should not be constructed directly on a cut (high-energy) bank. (Physical 3)

c. Construction of roadways or access to the dock should be such that a minimum of vegetation is removed and that erosion is minimized. (Physical 1 and 4; and Biological 3)

Slips

A slip is defined as a sloping ramp extending to the water's edge to serve as a facility for landing or repairing ships (boats). Small and large slips have been constructed on the Kenai River

primarily as access sites. Small, isolated, individual slips may not produce significant impacts. Although small slips provide some benefit as nursery sites for salmon, the cumulative impact of slip proliferation may be adverse.

A proliferation of slips would cause removal of unacceptable amounts of shoreline vegetation, increase erosion potential, and diminish the aesthetic appeal of the area. Permit applications for community or shared slips will be encouraged over individual slips.

Special Conditions

a. Slips shall be constructed only during periods of low water and in areas where in riverbed excavation work is not necessary. (Biological 2 and 3; and Socioeconomic 3)

b. Excavated material shall be placed inland a sufficient distance to insure that it does not re-enter the river through erosion. (Physical 1; Biological 2 and 3; Land and Water Use 2; and Socioeconomic 3)

c. Slips shall not be constructed in a manner that would cause drainage of an adjacent wetland. (Physical 8; Biological 1; and Socioeconomic 1)

d. Riprap shall be placed on the sides and bottom of the slip to prevent erosion. The material should be of sufficient size to preclude washouts or erosion. Side and back slopes of the slip should be replanted with vegetation suitable to stabilize the slope and add aesthetic appeal. (Physical 1,4,7, and 9; Biological 2 and 3; Socioeconomic 3; and Aesthetic 1, 2, and 3)

e. Excavation for slips shall not extend below the ordinary low water mark. (Biological 2 and 3; and Socioeconomic 3)

Recommended Management Practices

a. Roadways or other access to the slip should be constructed in such a manner that minimizes vegetation removal or destruction. (Physical 1, 4, and 8; Biological 2 and 3; Socioeconomic 3; and Aesthetic 1)

b. Slips should not be constructed directly on a cut (high energy) bank. (Physical 3)

Ramps

A ramp is defined as a slope for launching boats. Ramps have been constructed along the Kenai River for that purpose. The slopes of some ramps on the river have been paved. Other slope stabilization materials such as metal landing mats have been used. In general, slope stabilization does not produce significant impacts. Ramps without stabilization materials, however, are subject to erosion. Ramp proliferation reduces the aesthetic quality of an area.

Community (or shared) ramps will be encouraged over private facilities. Such ramps, depending on location, would eliminate the need for individual facilities.

Special Conditions

a. Ramps shall be constructed only during periods of low water to minimize the discharge of excavated materials into the stream. (Physical 1, 7, and 8; Biological 2 and 3; and Socio-economic 3)

b. The slope of the ramp shall not exceed a grade of six to one (6 feet horizontal to 1 foot vertical). (Physical 1)

c. Ramps shall be designed and constructed in a manner that will avoid the alteration of the drainage patterns of adjacent wetlands. (Physical 8; Biological 1; and Socioeconomic 1)

d. Excavated material shall not be discharged into the stream but will be deposited at a distance from the ramp sufficient to prevent introducing the material into the waterway. (Physical 1; Biological 2 and 3; Land and Water Use 2; and Socioeconomic 3)

e. Ramps shall not extend below the ordinary lower water line. (Biological 2 and 3; and Socioeconomic 3)

f. The bottom surface of the ramp shall be stabilized to reduce erosion. (Physical 1 and 7; Biological 2 and 3; and Socio-economic 3)

g. Riprap of sufficient size to prevent washout shall be placed on the side slopes of the ramp. (Physical 7)

Recommended Management Practices

a. Ramps should not be constructed directly on a cut (high-energy) bank. (Physical 3)

b. Areas above the high water line should be revegetated where possible. (Physical 4; and Aesthetic 1)

c. Construction of roadways or access to the ramp should be such that a minimum amount of vegetation is removed and erosion is minimized. (Physical 1, 4, and 8; Biological 2 and 3; Socio-economic 3; and Aesthetic 1, 2, and 3)

Culverts

A culvert is a conduit (pipe, tile, or tube) over a transverse drain. Culverts are designed to carry water under a roadway, but often they cause barriers to fish passage by constricting flow, increasing current velocities, and creating waterfalls.

Special Conditions

a. The culvert shall not restrict normal water flow in a manner

which would increase current velocity. (The shape and dimensions of the culvert must be similar to the shape and dimensions of the stream bed.) (Physical 9; and Biological 3)

b. Culverts shall be placed at a depth sufficient to insure that artificial impoundments are not created upstream. (Biological 3)

c. Riprap or other stable fill material shall be placed at the outlet of the culvert to insure protection against erosion at the outlet. (Erosion at the outlet could create a waterfall that would become a barrier to fish passage.) (Physical 1 and 7; Biological 2 and 3; and Socioeconomic 3)

d. Culverts shall be constructed during the period between fry emergence and adult spawning. (Physical 1; Biological 2 and 3; and Socioeconomic 3)

e. In all cases, prevention of discharge into the stream of excavated material shall be ensured. (Physical 7; Biological 2 and 3; and Socioeconomic 3)

Recommended Management Practices

a. In general, culvert location should consider the natural terrain in such a manner that placement will require a minimum of backfill. (Physical 9; and Aesthetic 1 and 3)

b. Culverts should be constructed of materials (preformed cement or corrugated steel) that will be aesthetically acceptable. (Aesthetic 2 and 3)

c. Vegetation disrupted or destroyed during construction should be restored or replaced with those types of vegetation appropriate for disrupted areas. (Physical 4; and Aesthetic 1)

d. In known fish spawning or important nursery areas, a bridge structure should be considered over a culvert installation. (Biological 3; Socioeconomic 3)

Revetments

A revetment is defined as a facing (as of stone or concrete) to sustain an embankment. On the Kenai River, revetments have been constructed for bank erosion protection and bank stabilization.

The Kenai River is a swift flowing, meandering stream. As a result, natural erosion along the streambank is a constant problem for riparian landowners. The cumulative effect of the continuous restoration of eroded banks is potentially altered stream flow, reduced aquatic habitat, and diminished aesthetic quality. In some streams of the lower 48 states, bank protection measures have reduced streams to sterile, concrete channels. The question then arises, who is allowed to revet and who is not? Although it is beyond the scope of this review to make such decisions, it is hoped that local, state, and federal officials will formulate a management plan that

will offer solutions to the problem. In the absence of such a plan, the following guidelines are offered for various revetments that may be used on the Kenai River:

Natural vegetation is the first preference for revetment. Vegetation stabilizes banks, contributes detrital material for use by aquatic organisms, provides habitat for fish and wildlife, and provides a shoreline more aesthetically pleasing than one denuded. In many areas, however, vegetation alone will not reduce erosion. Cut (high-energy) banks are an example of such areas.

Where vegetation alone is not sufficient to control erosion, riprap in combination with vegetation is preferred. Riprap is acceptable if the material to be used is of sufficient size to resist erosion.

The grade of the newly riprapped or reveted bank is critical to its functional success. The U.S. Fish and Wildlife Service has suggested experimenting with bank slopes of four to one, or eight to one (horizontal to vertical) to provide more stable areas resistant to erosion and wave actions, and to permit the growth of selected vegetation. Various vertical-to-horizontal diagrams are shown in Figure 10.

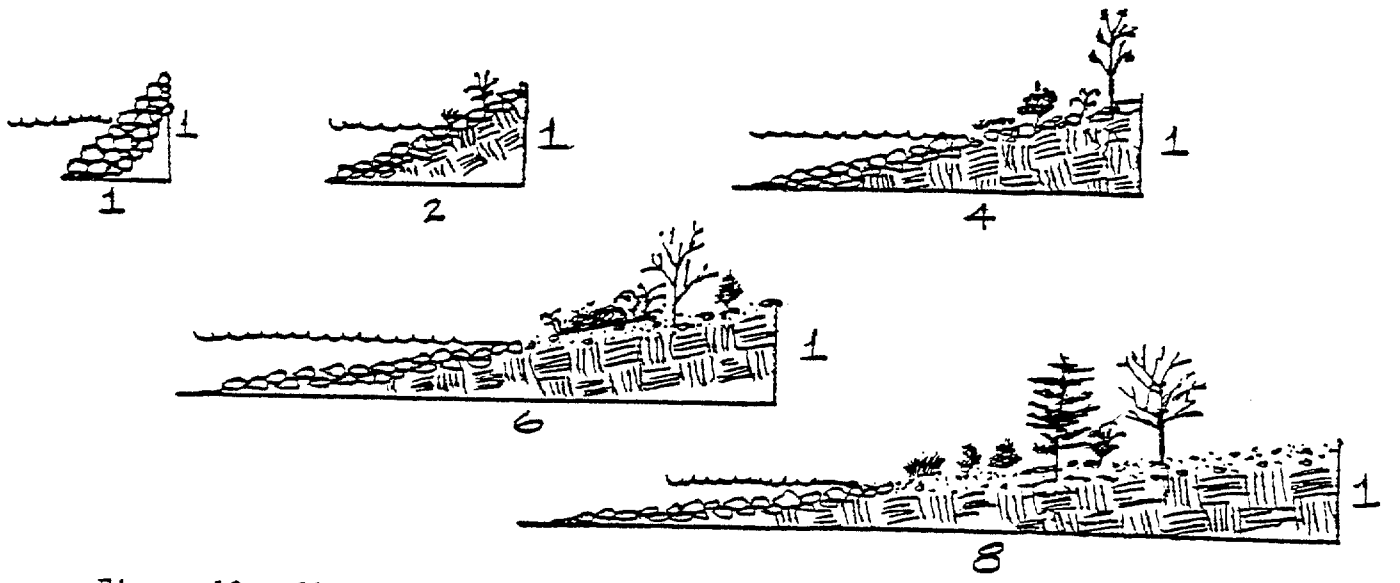
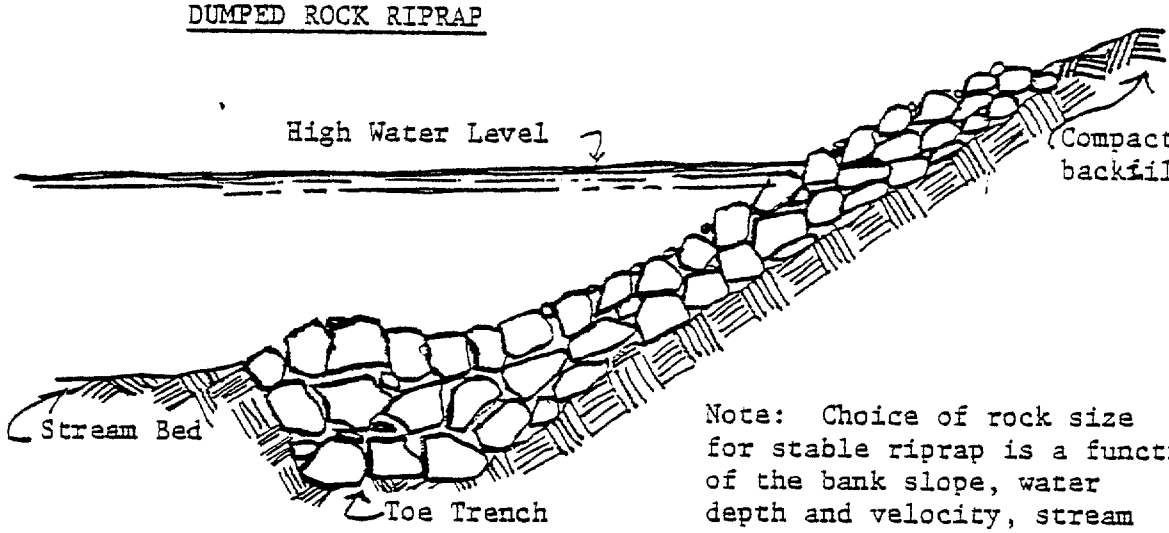


Figure 10. Slope Grade Diagrams (after Nehalem Wetlands Review, 1976).

Studies in Puget Sound[17] indicate that concrete stairsteps and rock riprap facings of moderate slope (one-horizontal-to-one-vertical or less steep slope) are least detrimental to survival of chum and pink salmon fry. Various revetment structures are shown in Figures 11 and 12.

Upon completion of rock placement, or during the placement of the top layers, material relatively higher in soil content can be added to provide a seed bed for vegetation. Revegetation could be accomplished by planting black cottonwood, Labrador tea, willows, and various grasses and sedges. Applicants should contact local

DUMPED ROCK RIPRAP



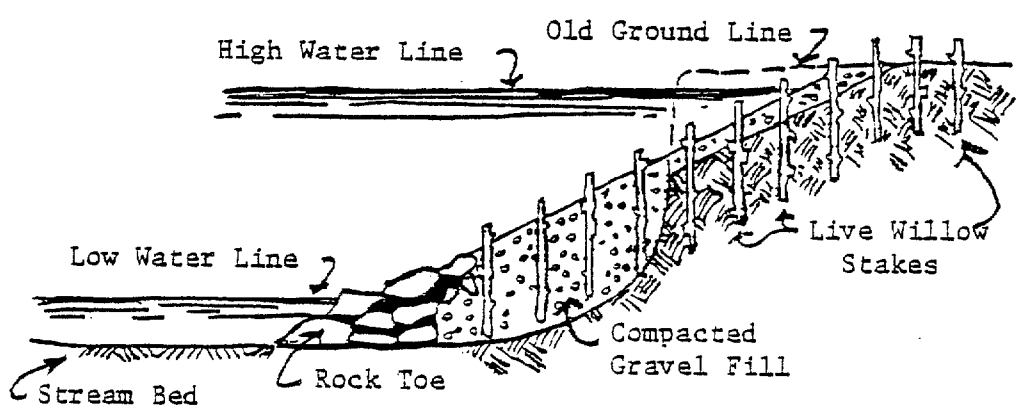
Cross Section of Channel

Note: Choice of rock size for stable riprap is a function of the bank slope, water depth and velocity, stream curvature, and specific gravity (density) of the rock.

WILLOW-GRAVEL BANK PROTECTION

Filled Slope

Note: All gravel fill is susceptible to erosion in high velocity streams.



Cross Section of Channel

Figure 11. Revetment Structures (after Nehalem Wetlands Review, 1976).

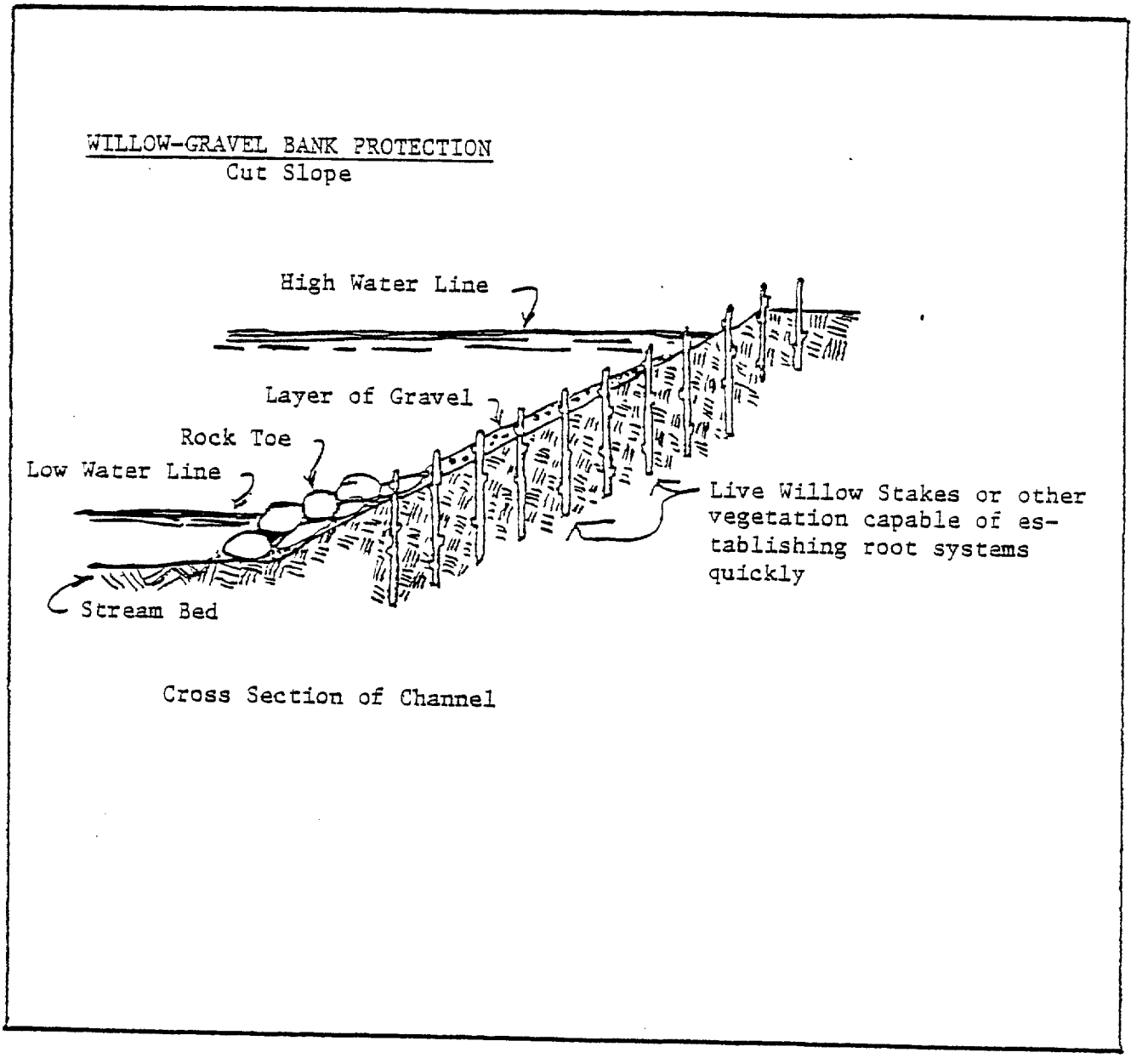


Figure 12. Revetment Structure (after Nehalem Wetlands Review, 1976).

Soil Conservation Service personnel for advice and suggestions on plantings.

Bulkheads (vertical or near-vertical structures parallel to the shoreline) provide efficient erosion control, but cause loss of aquatic habitat and degrade the aesthetic value of an area. Aquatic habitat is lost primarily through the destruction of niches that are normally available on the uneven surfaces of the stream slopes. These surfaces, usually gravel, may be used as salmon spawning sites and would provide habitat for macroinvertebrate populations. Installation of bulkheads, therefore, is strongly discouraged.

Special Conditions

a. Riprap material shall be of sufficient size and bulk to prevent the material from being washed away. (Physical 7)

b. Revetments shall be constructed only during periods of low water so that discharge of construction-disrupted material into the waterway will be minimized. (Physical 1 and 7; Biological 2 and 3; and Socioeconomic 2)

c. Permits will not be granted for revetments until the applicant demonstrates that the planned activity will produce the least adverse impact on spawning or nursery sites. (The applicant should be aware of the location and relative importance of spawning and nursery sites downstream from the activity site, importance of spawning and nursery sites at the proposed activity site, and should demonstrate ability to protect those critical habitats.) (Biological 2 and 3; and Socioeconomic 3)

d. Revetments shall be constructed in a manner that would not alter the flow or integrity of wetlands. (Physical 8; Biological 1; Land and Water Use 2; and Socioeconomic 1)

Recommended Management Practices

a. Natural vegetation is the preferred revetment and should be used whenever possible. (Physical 4)

b. Riprap revetments should be revegetated above the ordinary high water mark with appropriate ground-holding vegetation. (Physical 4)

Dredging

Dredging is defined as digging, gathering, or pulling material (in this case, from a navigable water) with some type of device. Dredging disturbs the stream substrate, may alter stream flow and current patterns, and may increase turbidity and the amount of sediment in the stream. Dredging is usually conducted to maintain the navigability of canal systems, to improve river access to facilities, or for the removal of gravel for construction purposes.

Special Conditions

a. Dredging shall occur only during those periods between fry emergence and adult spawning. (Physical 1 and 9; Biological 2 and 3; Land and Water Use 2; and Socioeconomic 3)

b. Dredging shall not occur in areas of known or suspected spawning or nursery activity. (Biological 2 and 3; and Socioeconomic 3)

c. The applicant shall demonstrate that dredging will be done in a manner that will minimize in-stream resuspension of materials. (Physical 1 and 9; Biological 2 and 3; Land and Water Use 2; and Socioeconomic 3)

d. In-stream disposal of dredged materials is prohibited. (Physical 1 and 9; Biolgical 2 and 3; Land and Water Use 2; and Socioeconomic 3)

e. The disposal of dredged material shall be at a distance inland sufficient to prevent reintroduction of the material to the waterway, and should not be in a wetland. (Physical 1 and 9; Biological 2 and 3; Land and Water Use 2; and Socioeconomic 3)

Bridges and Bridge Approaches

A bridge is defined as a structure carrying a pathway or roadway over a depression. Bridge approaches are defined as pathways or roadways which connect to bridges. While the Corps of Engineers does not regulate bridges generally, they do comment on permits issued by the U.S. Coast Guard for such structures. The Corps, however, does regulate bridge approach fills. Four bridges having approaches cross the mainstem of the Kenai River. Several smaller bridges with approaches span Kenai River tributaries.

Special Conditions

a. Backfilling, where necessary, shall be of clean material free from pollutants.. (Physical 9; Biological 2 and 3; Land and Water Use 2; and Socioeconomic 3)

b. Bridge approaches shall be constructed only at periods of low water. (Physical 1 and 9; Biological 2 and 3; and Socioeconomic 3)

c. Bridges shall be of sufficient height to permit navigation.

Recommended Management Practices

a. In wetlands, piled bridges would be preferred to bridges built on fill. (Physical 8; and Biological 1)

b. Bridge pilings in tributary or mainstem channels should

be discouraged (long-span bridges would be preferred). (Physical 5)

Subsurface Utilities

Subsurface utilities are underground facilities (such as pipelines or cables) used to transport liquids or gases, transmit electric power, or transmit communication signals.

Special Conditions

a. Construction shall be done only in early summer, following fry emergence but prior to the onset of major sport fishing activity. (Physical 1 and 9; Biological 2 and 3; and Socioeconomic 3)

b. Vegetation within Corps jurisdictional boundaries removed adjacent to waterways shall be replaced using suitable practices. (Physical 1 and 4; Biological 2 and 3; Socioeconomic 1 and 3; and Aesthetic 1)

Recommended Management Practices

a. The applicant should demonstrate that construction methods will be designed to minimize adverse impacts.

b. Points of entrance to the waterways should not be in wetlands. (Physical 8; Biological 1; Socioeconomic 1)

Overhead Utilities

Overhead utilities include telephone, power transmission lines, and pipelines. Their effect on navigation, aviation, avifauna, and aesthetics are matters of public interest. Several overhead power transmission lines span the Kenai River and tributaries.

The minimum clearances shown in Table 5 are required for aerial electric power transmission lines crossing navigable waters of the United States. These clearances are related to the clearances over the navigable channel provided by existing fixed bridges, or to the clearances that would be required by the U.S. Coast Guard for new fixed bridges in the proposed power line crossing. The clearances are based on the low point of the line under conditions that produce the greatest sag, taking into consideration temperature, load, wind, length of span, and type of supports as outlined in the National Electric Safety Code.

Table 5. Minimum Clearances: Aerial Electric Power Transmission Lines Crossing Navigable Waters of the United States

Nominal System Voltage, kV	Minimum Additional Clearance (ft) Above Clearance Required for Bridges
115 and below	20
138	22
161	24
230	26
350	30
500	35
700	42
750-765	45

Special Conditions

a. No supporting structures shall be constructed within the mainstem of the Kenai River. (Physical 1, 2, and 8; Biological 1,

Recommended Management Practices

a. The applicant demonstrates that no other feasible means, such as subsurface routes or bridge attachment, are available.

b. Overhead utilities should cross navigable waters in areas not having intense waterfowl activity unless no alternatives are available.

Discharge Lines

A discharge line is defined as a pipe or system of pipes which release materials and/or effluents. Few discharge lines are known to exist on the Kenai River.

Special Conditions

Same as conditions for "Subsurface Utilities".

Appendix 2. Principal State Regulatory Authorities in New Jersey.

Act	Date	Reference	Geographical Jurisdiction	Nature of Authority and Administrative Agency
Riparian Lands Statutes	(1776) 1869-	NJSA 12:3 et seq.	All lands now or formerly below mean high tide, unless conveyed to others; ownership currently extends offshore to 3-mile limit (Peace Treaty of 1783 allotted the States ownership offshore 20 marine leagues, about 60 statute miles).	The State of New Jersey exercises sole ownership of tidally flowed lands in public trust. Special procedures for sale of grants, leases, licenses, (ordinarily landward of pierhead lines) by Natural Resource Council with approval of Commissioner of NJ-DEP, Attorney General, and Governor. The owner of the adjoining upland (ripa) must be given the opportunity to secure riparian title, before it can be conveyed to other private owners by the State.
Water-front and Harbor Facilities Statutes	1914	NJSA 12:5-3	Waterfront on or bordering any navigable water on stream within pierhead lines.	Pre-construction review of plans required for waterfront construction plans. Applicants must have obtained riparian grant, lease, or license before waterfront development permit can be approved. Approval by Director, Division of Coastal Resources, NJ-DEP; processing by Bureau of Tidelands.
Wetlands Act	1970	NJSA 13:9A-1 et seq.	Tidal wetlands as delineated on promulgated NJ-DEP maps (scale 1:2,400) currently from Raritan Bay to Atlantic coast to Delaware Bay and River.	Permits required for use of mapped wetlands, except continuing harvest of salt hay or other agricultural products and lawful mosquito control activities. Bureau of Coastal Project Review, NJ-DEP, processes Type A (minor) permit and Type B (major, with environmental impact statement) permit applications; approval by Director, Division of Coastal Resources.
Coastal Area Facility Review Act	1973	NJSA 13:19-1 et seq.	CAFRA area as defined by Act: selected zones along Atlantic coast and lower Delaware Bay, exclusive of lands regulated by Wetlands Act.	Permit with environmental impact statement required for commercial developments and for residential developments above minimum threshold (24 dwelling units). Application to Bureau of Coastal Permit Review; approval by Director, Division of Coastal Resources, NJ-DEP.
State Water Policy Commission Statutes	1929	NJSA 58:1-26 et seq.	Lands within natural and ordinary high water mark of any stream; from 1950-1972 jurisdiction was exercised over the 15-year floodplain; since 1972, over the 100-year floodplain.	Pre-construction review of plans for construction or repair of structures (including fill) and other alterations in streams by the Bureau of Flood Plain Management and approval by the Water Policy and Supply Council in the Division of Water Resources, NJ-DEP, is necessary to protect the public (stream encroachment permit).

Appendix 2. Principal State Regulatory Authorities in New Jersey (continued).

Act	Date	Reference	Geographical Jurisdiction	Nature of Authority and Administrative Agency
Flood Hazard Areas Statute	(1962) 1972	NJSA 58:16A-50 et seq.	Floodplains of the state(except lands designated tidal wetlands under NJSA 18:9A-1 et seq.), when they have been delineated officially by NJ-DEP after engineering survey.	Division of Water Resources, NJ-DEP, must study the nature and extent of floodplains. The Water Policy and Supply Council may regulate and prohibit land uses in floodways to preserve the flood carrying capacity of the streams. The Bureau of Flood Plain Management may set minimum standards for land use in flood fringe areas and enforce the standards if municipalities do not.
Hackensack Meadowlands Reclamation and Development Act	1929	NJSA 13:17 et seq.	Hackensack Meadowland District as defined by Act in Hudson and Bergen Counties (parts of 14 municipalities).	Zoning, planning, subdivision, and environmental performance standards authority vested in independent agency in Department of Community Affairs, with intermunicipal tax sharing pool. Commissioners appointed by Governor with consent of Senate.
Delaware and Raritan Canal State Park Act	1974	NJSA 13:13A-14	Review zone including D&R canal and adjacent lands in 17 municipalities.	Independent commission in NJ-DEP may review and modify or prohibit State actions that would affect the park adversely. Actions by others approved by municipalities also may be modified or prohibited.
Pinelands Protection Act	1979		Defined region in Atlantic, Camden, Cape May, Gloucester, Ocean, and Salem Counties.	Independent commission in NJ-DEP is to prepare studies, formulate a comprehensive plan, and develop an implementation mechanism to protect environmental values in the region. The Commission may grant hardship exemptions from the construction moratorium imposed by the Act. Commissioners appointed by Governor (7), county freeholders of each county (7), and Secretary of the Interior (1).
Fish Statutes	1937	NJSA 23:5-28	Statewide	No person is allowed to release any substance into the waters of the State which would destroy or disturb the habits of the fish inhabiting those waters. The Division of Fish, Game, and Shell Fisheries in DEP is to enforce this statute.
Noise Control Act	1971	NJSA 13:1G-1 et seq.	Statewide	NJ-DEP can set noise control standards, impose noise zoning, set noise standards for motor vehicles, and require permits from operations likely to produce noise.
Soil Erosion and Sediment Control Act	1975	NJSA 4:24-1 et seq.	Statewide	Municipalities must condition their approvals on soil conservation district approval of erosion control plans for all new construction projects (except a single family house) that will disturb more than 5,000 square feet of land and for which the State Uniform Construction Code requires a permit.

Appendix 2. Principal State Regulatory Authorities in New Jersey (continued).

Act	Date	Reference	Geographical Jurisdiction	Nature of Authority and Administrative Agency
Solid Waste Management Act	(1970) 1975	NJSA 13:13-1 et seq.	Solid waste facilities, statewide.	Solid Waste Administration, NJ-DEP, must approve proposals for solid waste disposal facilities. Environmental impact statement is part of application, along with engineering plans.
Supplement to Solid Waste Management Act	1976	NJSA 13:1E-38 et seq.	Hazardous waste facilities, statewide.	Disposal of hazardous waste, chemical waste, bulk liquids, and pesticides are prohibited within 1,000 yards of defined riverine flood hazard areas beginning in 1977. Facilities for such wastes must monitor groundwater and must prevent pollution of the waters of the State.
Realty Improvement Sewerage and Facilities Act	(1954) 1971, 1972	NJSA 58:11-23 et seq.	Realty improvements with 50 or more aggregate dwelling units statewide.	Proposed realty improvements where approved water supply and sewerage are lacking must receive certification from the Division of Water Resources, prior to local subdivision approval, that applicable State standards are met considering soil conditions, groundwater levels, population densities, and growth trends.
Realty Improvement Sewerage and Facilities Act	1966	NJSA 58:11-44 et seq.	Realty improvements in defined Critical Areas [currently, in Central Pine Barrens, in Burlington County adjoining Mullica River and tributaries, and throughout Monmouth, Atlantic, and Cape May Counties where the surface elevation is less than 10 feet above mean sea level, 1929 datum.]	Building permit cannot be issued by local authority prior to Division of Water Resources, NJ-DEP, certification of sweage disposal plans, and sewage facilities cannot be constructed prior to State approval. Special, stringent water quality standards in Central Pine Barrens.
Air Pollution Control Act	1967	NJSA 26:2C-1 et seq.	Statewide for regulated facilities	Division of Environmental Quality, NJ-DEP, must approve permit to construct and certificate to operate regulated facilities that emit air contaminants. Boilers with heat input rate of 1 million BTU/hr or more using commercial fuel or smaller, and non-commercial-fuel equipment of any size, are regulated. Incinerators in one or two unit dwellings, and dwellings with six or fewer units if one is owner occupied, are excluded. Fuel service stations and facilities for volatile organic materials require a permit for their construction or alteration.

Appendix 2. Principal State Regulatory Authorities in New Jersey (continued).

Act	Date	Reference	Geographical Jurisdiction	Nature of Authority and Administrative Agency
Safe Drinking Water Act	1977	NJSA 58:12A-1 et seq.	Statewide	NJ-DEP has the power to regulate the quality of public water supplies, to set and enforce standards for drinking water, and to conduct monitoring, inspection, and systematic surveys of potable water supplies. Division of Water Resources processes permits to construct, modify, or operate a public water supply and to interconnect approved water supply systems with other systems.
Spill Compensation and Control Act	1976	NJSA 58:10-23.11	Statewide	DEP has the authority to regulate the transfer and storage of hazardous substances, to establish a spill compensation fund supported by a tax on petroleum, and can require information on hazardous substances. The Act also affirms the liability of the owners of hazardous substances for any spilled materials.
Water Supply Law	1958	NJSA 58:22-1 et seq.	Statewide	Vesting of responsibility to regulate water supplies in Division of Water Resources.
Delaware and Raritan Canal Statute	1934	NJSA 13:13-1 et seq.	D&R Canal	Delaware & Raritan Canal is State property and the State may sell water from the Canal.
Water Pollution Control Act	1977	NJSA 58:10A-1 et seq.	Statewide	Defined pollutants are not to be discharged unless a permit has been issued by NJ-DEP or US-EPA. Facilities for the collection, treatment, or discharge of pollutants cannot be built or operated without the approval of NJ-DEP. Treatment works approval, sewer system approvals, exemptions from sewer bans, and industrial pretreatment requirements are administered by the Division of Water Resources.
State Water Policy Commission Statutes	1929	NJSA 58:1-18 et seq.	Statewide	Proposed public or semi-public water supply (diversion) systems drawing on any source must be approved by the Division of Water Resources, NJ-DEP.
Subsurface and Percolating Waters Statutes	1947	NJSA 58:4A-2	Entire State is a delineated area	Proposed groundwater diversion wells and ponds of 100,000 gallons/day require permit approval from the Division of Water Resources, NJ-DEP.
State Water Policy	1963	NJSA 58:1-36	Entire State is a delineated area	Proposed diversions of surface water for consumptive use at rates greater than 70 gallons/minute require

Appendix 2. Principal State Regulatory Authorities in New Jersey (concluded).

Subsurface and Percolating Waters Status	(1974) 1971	NJSA 58:4A-14	Statewide	Permits from the Division of Water Resources, NJ-DEP, are required prior to drilling of wells. Samples of drilled material must be delivered to the State Geologist, and a well log must be filed with the Division after the well is completed. Abandoned wells or test holes must be sealed by their owners (NJSA 58:4A-4.1 et seq.).
Health Care Facilities Statutes	1971	NJSA 26:2H-7 et seq.	Statewide	New health care facilities require a certificate of need from the State Commissioner of Health prior to their funding or licensing by State or local agencies.
State Highway Statutes	1927	NJSA 27:7-1 et seq.	Statewide	A permit is required from the Department of Transportation for constructing various facilities in or that affect State highway rights-of-way.
State Highway Statutes	1971	NJSA 27:7A-11 et seq.	Statewide	A permit is required from the Department of Transportation for off-premise advertising signs along State highways.
Water Pollution Control Act	(1921) 1977	NJSA 58:10A-1 et seq.	Statewide	A permit is required to establish a factory for the manufacture of goods, but the permit may be waived by the Division of Water Resources, NJ-DEP, if wastes are discharged to a public treatment system.
Dam Construction Statute	1912	NJSA 54:1 et seq.	Statewide	Proposed dams that raise waters more than 5 feet where the drainage area is 0.5 square mile or more above the dam must secure prior approval from the Division of Water Resources, NJ-DEP.
Dams and Reservoir Statutes	1912	NJSA 58:4-9	Statewide (permanent reservoir drawdown)	The owner shall not destroy or abandon a reservoir 20 years old with settled shorelines without the consent of NJ-DEP.
Fish Statutes	1937	NJSA 23:5-29	Statewide (temporary reservoir drawdown)	No person shall shut off or draw off the waters of any pond, stream, or lake or place a screen in the waterway without permission from NJ-DEP, Division of Fish, Game, and Shell Fisheries.

Appendix 3. Federal Environmental Laws Most Frequently Encountered

Clean Air Act (42 USC 1857 et seq.)

Clean Water Act (PS 92-500, as amended; 33 USC 13 et seq.)

River and Harbor Act of 1899 (33 USC 401-413)

Mineral Leasing Act of 1920 (30 USC 191-192; 351-353)

Fish and Wildlife Coordination Act of 1934, as amended (16 USC 661 et seq.)

Atomic Energy Act of 1954, as amended (42 USC 2011 et seq.)

Wilderness Act of 1964, as amended (16 USC 1131 et seq.)

National Historic Preservation Act of 1966 (16 USC 470 et seq.)

Department of Transportation Act of 1966 [49 USC 1653 (f)]

National Flood Insurance Act of 1968, as amended (42 USC 4001 et seq.)

Wild and Scenic Rivers Act of 1969, as amended (PL 90-542)

Occupational Safety and Health Act of 1970, as amended (PL 91-596)

Coastal Zone Management Act of 1972 (PL 92-583; 16 USC 1451 et seq.)

Marine Protection, Research, and Sanctuaries Act of 1972 (PL 92-532; 33 USC 1401 et seq.; 16 USC 1431 et seq.)

Noise Control Act of 1972 (PL 92-574)

Ports and Waterways Safety Act of 1972 (PL 92-340; 33 USC 1221; 46 USC 391a)

Endangered Species Act of 1973 (16 USC 1531 et seq.)

Archaeological and Historic Preservation Act of 1974 (16 USC 469 et seq.)

Safe Drinking Water Act of 1974 (PL 93-523; 42 USC 300; 21 USC 349)

Federal Land Policy and Management Act of 1976 (PL 94-579; 43 USC 1701)

National Forest Management Act of 1976 (PL 94-588; 16 USC 1600)

Resource Conservation and Recovery Act of 1976 (42 USC 6901-6987)

Toxic Substances Control Act of 1976 (PL 94-469)

Surface Mining Control and Reclamation Act of 1977 (PL 95-87; 30 USC 1201)

Federal Insecticide, Fungicide, and Rodenticide Act of 1978 (PL 95-396; 7 USC 121 et seq.)

Appendix 4. Ranking of principal known chemical contaminants of the New York Bight, June 1977, in terms of research priority (O'Connor and Stanford 1979).

Category A. Major Perceived Threats That Require Continued Study

Chlorinated pesticides[1]	Polynuclear aromatic hydrocarbons (PNAHs)[2]
Lead	Polychlorinated biphenyls (PCBs)
Mercury	Plutonium

Category B. Potentially Significant Threats For Which Data Must Be Collected and Evaluated

Arsenic	Isophorone
Benzidenes	Low-molecular-weight, halogenated hydrocarbons (LMHHs)[3]
Cadmium	Petroleum hydrocarbons (PHCs, other than PNAHs)
Chlorobenzenes	Thallium
Chlorophenols	
Diphenylhydrazine	
Halogenated diphenyl ethers	

Category C. No Threat At Present, On The Basis of Existing Information

Chromium	Phenols
Haloalkyl ethers	Phthalates
Nitrobenzenes	Selenium
Nitrophenols	Silver

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[1]Aldrin/Dieldrin, Chlordane (technical mixture and metabolites), DDT and metabolites, Endosulfan and metabolites, Endrin and metabolites, Heptachlor and metabolites, Hexachlorocyclohexane (all isomers), and Toxaphene.

[2]Aromatic compounds with unsaturated ring structures: Benzene, Alkyl-substituted benzenes, and Polynuclear hydrocarbons with multiple alkyl substitutions.

[3]Carbon tetrachloride, Chloroform, Chlorinated ethanes (includes 1,2-dichloroethane, 1,1,1- trichloroethane, and hexachloroethane), 1,1- and 1,2- Dichloroethylene, Halomethanes (other than specified), Tetrachloroethylene, Tricholoroethylene, and Vinyl chloride.