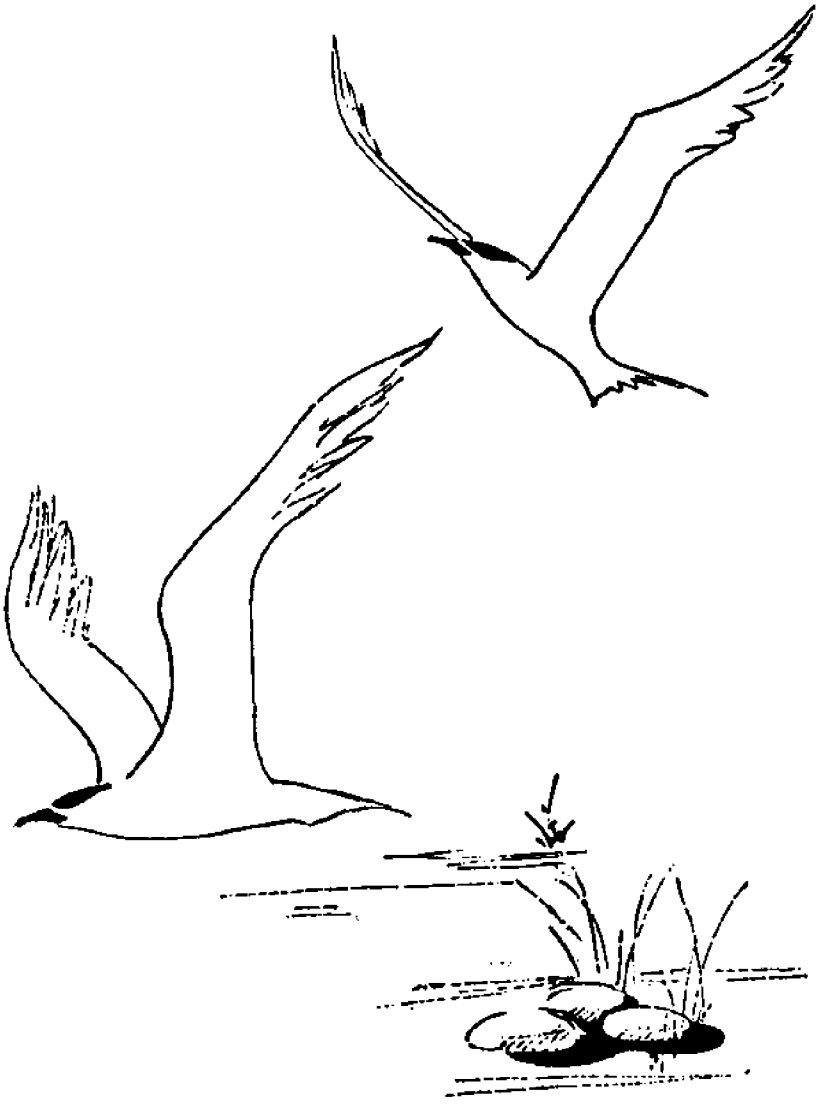

GUIDELINES

FOR LONG ISLAND COASTAL MANAGEMENT

THE REGIONAL
MARINE RESOURCES COUNCIL

A COMMITTEE OF THE

NASSAU-SUFFOLK REGIONAL PLANNING BOARD

1973

Regional Marine Resources Council

A Committee of the Nassau-Suffolk Regional Planning Board

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September 1, 1973

Honorable Leonard W. Hall, Chairman
Nassau-Suffolk Regional Planning Board
Hauppauge, New York 11787

Dear Mr. Hall:

The Nassau-Suffolk Regional Marine Resources Council (Council) in compliance with guidance received from the Nassau-Suffolk Regional Planning Board (Board), transmits herewith a report entitled, Guidelines for Long Island Coastal Management, which is relevant to improved management of the Nassau-Suffolk marine environment. This report treats four areas: 1. Coast Stabilization and Protection; 2. Dredging and Dredge Spoil Disposal; 3. Wetlands Management; and 4. Integrated Water Supply and Wastewater Disposal, which the Council considers to be the top priority marine environmental problem areas in the Nassau-Suffolk Region.

The subject report is a part of the Council's continuing effort to implement the Oceanographic Committee's recommendations contained in The Status and Potential of the Marine Environment. This report is, to a large extent, based on a research program funded by Nassau and Suffolk and by the National Sea Grant Program, and its content is abstracted from a draft report submitted to the Board on 8 March 1973.

The report contains guidelines for public policy, planning, decision and action by elected and appointed officials and the general public. In addition, the report assesses the science and technology on which the gudelines are based, and lists the priority research requirements needed to improve the knowledge base.

I would like to express the appeciation of the entire Council for the continued encouragement and support received from the Board and the Nassau and Suffolk County Executives.

Very truly yours,

E. C. Stephan, RAdm. USN (ret)
Chairman, Regional Marine Resources Council

ECS:er
Enc.

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INTRODUCTION

During the process of formulating a comprehensive development plan for Long Island, the Nassau-Suffolk Regional Planning Board (the Board) recognized that existing knowledge was insufficient to deal effectively with problems related to multi-purpose use of the marine environment. The Board lacked the planning tools necessary to determine how the coastal zone could be compatibly or exclusively used by such competing interests as residential housing, commercial and public recreation facilities, commercial fisheries, marinas, power plants, sewage treatment facilities and petroleum suppliers. The available knowledge, even when translated into a form useful to local government officials, planning boards and the general public, was all too often exploited by special interest groups or its meaning obscured due to a lack of information concerning the structure of government operations in respect to the marine environment. The Board was advised by its Oceanographic Committee in 1966 that if Long Island was to maintain its desirability and attractiveness as a place in which to work and live, the trend of estuarine and shoreline deterioration had to be reversed. To help bridge the information gap and to provide a rational basis for solution of marine environmental problems, the Board established the Regional Marine Resources Council (the Council) in 1967.

The Council was charged with the responsibility of advising the Board on matters of marine concern and designing a research program aimed at organizing knowledge and data into a planning framework that would permit both rational and efficient decision making. The ultimate objective of the Council research program has been, and continues to be, the optimal utilization of the natural resources found in Long Island's

coastal zone. (See Appendix A for a statement of objectives and public relations policy of the Council.) The research program has been conducted over a period of five years with financial support from the Board and the National Sea Grant Program of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. Consultant reports, seminars, briefings, as well as input from the voting members representing environmental groups, academic institutions, and marine industry and the responses of advisory members appointed from various Federal, State and local agencies, have contributed to the information base of the research project (See Appendix B for a list of Council Members).

The results of the project are being transmitted to the public in the form of suggested guidelines or generalized procedures to be followed in the process of policy planning, decision and action at the local level. The guidelines themselves represent the integration of scientific information and local political, economic and social realities in order to provide a means of managing the future use of the marine resource base from a posture which stresses environmental considerations, yet is realistic in terms of past and future pressures exerted by a growing metropolitan region.

In keeping with its role as a sounding board for discussion of local marine oriented research, the Council has evaluated the existing knowledge base in terms of its adequacy for the solution of environmental problems in four major areas of concern - *coast stabilization and protection; dredging and dredging spoil disposal; integrated water supply and wastewater disposal; and wetlands management.* This assessment of the state of the art in the four major areas was used to outline research requirements designed to serve as a guide for directing research efforts

to fill identified knowledge gaps. Because research activity is often regional or national in both need and scope, the assessment of the knowledge base and the outlined research requirements are not stressed in the body of this report, and can be found in Appendix C.

Planning guidelines have been developed in the four subject areas. The guidelines are flexible and not static. They not only suggest public policy, but also make specific recommendations by which individual courses of action can be weighed and decided upon. The resources of the Council will be used in the future to update the guidelines from time to time, as necessitated by changes in technology and in development patterns. However, the Council believes that on the basis of current knowledge, the guidelines are adequate for the process of controlling and directing development.

The guidelines are designed for use at the county, township and village levels. They provide a perspective useful in formulation of public policy and decision-making. Thus, the guidelines should be helpful to planning commissions in their review of subdivision design and in municipal planning, to zoning boards in their formulation and amendment of zoning ordinances and building codes, and to conservation advisory councils in their review of both public and private development projects to assure the maintenance of an aesthetic balance between man and the natural environment. Government agencies in charge of projects which can have significant effects on coastal resources should use the guidelines during the design phase of such activities to lessen possible adverse environmental impacts. The Nassau-Suffolk Regional Planning Board will use the guidelines as a basis for integrating marine environmental considerations into the comprehensive planning process, and for creating a coastal zone management scheme

for Long Island. The general public can also benefit from the guidelines, by using them to help evaluate proposed bond issues, and to monitor the performance of public officials charged with the allocation of coastal resources.

The future work of the Council will be aimed at implementation and interpretation of the guidelines, as well as the formulation of guidelines in other areas, e.g., management of the shellfish industry, and the prevention and clean-up of oil spills. The guidelines will be forwarded to the Nassau and Suffolk County Executives and the appropriate legislative bodies at the county level for consideration. An effort will be launched to convince the 107 cities, towns and villages of the Nassau-Suffolk region, which retain basic land use powers to endorse and use the guidelines as a basis for decision-making.

COAST STABILIZATION AND PROTECTION

Various shoreline management problems have resulted from man's use of the shoreline and adjacent land. The natural erosion of the shore has become a problem where permanent structures, buildings or roads are threatened with destruction, either because of long-term shoreline changes, or the short-term effects of hurricanes and "northeasters". Sand mining channel dredging, stabilized inlets, and shore protection structures have created situations where the natural rate of erosion effecting both beaches and marshes has been increased.

Peoples' memories are also short. They fail to remember, take into consideration, or perhaps are not informed of the devastating shoreline destruction - beaches were literally swept clean of all human development - caused by the 21 September 1938 and 31 August 1954 hurricanes. Loss of

life is also a potential hazard; 45 people were killed or listed as missing on the south shore of Long Island as a result of the 1938 hurricane. Extensive development of Long Island's shorelines has occurred without due consideration for the dynamics of shoreline topography. The result of this disregard of natural process has been increased shoreline damage on an annual basis. The recurrence of the record storm tidal flood in our area would cause 170 million dollars (1970 dollars) in damages on the south shores of Nassau and Suffolk Counties, and 2 million dollars in damages on the Long Island north shore and the eastern forks.

Shoreline damage caused by wave and tidal action has resulted in the construction of shore protection devices and beach fill. Such projects have been financed by private individuals, beach associations, local municipalities, the State of New York and the Federal government, and have often been constructed on a piecemeal basis without a comprehensive evaluation of their potential effects on large segments of the shore. The practice of constructing groins, seawalls, and bulkheads, as well as the re-building of beaches by filling with dredged materials is extremely expensive. The U. S. Army Corps of Engineers estimates that the initial cost for beach restoration by sandfill is roughly 157 million dollars for the south shores of Nassau and Suffolk Counties, and 59 million dollars for the shore between Orient and Montauk Points, and about 103 million dollars along Long Island's north shore. Unless care is taken during the design of shore protection devices, they could interfere with the natural equilibrium of coastal processes, and hence may adversely affect nearby shore areas by diminishing their supply of sands; they are also inherently dependent on the dynamics of the littoral zone, and may not perform their intended function.

Future development of Long Island's shorelands should be controlled to lessen the need for coast stabilization measures. Land use planning should be based on an understanding of the processes affecting the configuration of the shoreline, as well as the factors which cause the need for shore protection. Even though the findings of research conducted by the New York State Sea Grant Program on the shorelines of Peconic and Gardiners Bays are not yet available, the guidelines developed here should be applied to the appropriate segments of these shores on a site-by-site basis.

Planning Guidelines

1. Control development on those lands contained in the *Intermediate Regional Tidal Flood Plain** by use of *flood plain zoning*, land use management concepts and other regulatory tools. Uses other than those requiring shorefront locations and those related to recreation should be discouraged. *Non-conforming use* status should be applied to existing development.

2. Locate all future construction on the flood plain in accordance with the establishment of sufficient *set-back lines*, so as to avoid damage from short-term shoreline changes. Prohibit expansion of existing uses within the *Intermediate Regional Tidal Flood Plain*.

3. Prohibit construction on *primary dune* lines.

4. Adopt *bluff hazard zoning* in those shoreline areas, especially along the north shore of Long Island, which are backed by eroding bluffs. Prohibit construction of dwellings in the zone 100 feet landward from the top seaward edge of the bluff defined by an abrupt increase in slope.

5. As a general rule, discourage expenditure of public monies for the design and construction of shore protection work and beach nourishment on private lands unless public access to those lands is provided.

6. Accept the natural, long-term shoreline regression that is occurring along Long Island's north shore as a phenomenon that is beyond man's present capability for practical, effective control. Maintain heavily used beaches and recreation areas; and, when the need exists, establish new beach areas by means of sand nourishment techniques in locations where historical records indicate either an accretion or low to moderate erosion of the shore. Maintain existing navigation channels connecting major embayments with the Long Island Sound.

*See Appendix D for definitions of italicized terms.

7. Emphasize dune stabilization and beach nourishment techniques, compatible with natural processes, as the primary means of minimizing storm breaching of the south shore barrier islands, and thus protect the environments of the south shore bays from sudden short-term changes.

8. Do not undertake dredging of sand for beach nourishment from areas shoreward of the position of the outer *winter bar*.

9. Stabilize existing south shore inlets (East Rockaway, Jones, Fire Island, Moriches and Shinnecock) at approximately their current dimensions and locations. Permit drastic changes in the inlet characteristics only when explicitly justified by analysis of consequent changes such modifications will produce in the bays.

10. Foster implementation of Federal projects for *sand bypassing systems* at Shinnecock, Moriches and Fire Island Inlets.

11. Prohibit the construction of *groins* and other shore protection devices either by government or private persons unless it can be demonstrated that such structures will not adversely affect adjacent property.

DREDGING AND DREDGE SPOIL DISPOSAL

Growth in the region's population and economy has generated pressures for development of marine resources in differing ways, such as waterfront housing, marinas, channel dredging and recreation facilities. Some types of development have required the dredging of bay bottoms and shorelands, and the subsequent disposal of the dredged materials, either as fill, as the creation of spoil banks and artificial islands, or as beach nourishment. Alteration and destruction of the valuable natural habitats found along the shores and bay bottoms of the Nassau-Suffolk region have occurred in the past without due regard for the functions these habitats play in the maintenance of environmental quality, lifestyles and diverse recreational opportunities. Today we are aware that even small scale alterations over widespread areas may have a cumulative effect on the region's ecology, and thus should be regarded with as much scrutiny as a major project alteration in a localized area. Thus,

the issue of dredging can be stated in two parts: 1. determination of which dredging projects are essential, and are in the best interests of the public, and 2. how to design and implement such projects in a manner which is not environmentally counter-productive.

Dredging activity is executed for various reasons - channel and inlet maintenance, removal of polluted sediments, beach nourishment, pier and bulkhead construction, new channels, marinas, sand and gravel mining, and development projects (such as parking lots and housing sites). In terms of the volume of sediments removed, government agencies dominate dredging activity in the Long Island region. The State of New York accounted for 46.4 percent of the total volume of 7,184,234 cubic yards of material removed from Long Island waters during the period 1970-72, while Suffolk County activity amounted to 26.9 percent. Private interests removed 3.5 percent. Dredged materials were disposed in upland sites (64.6 percent), as beach nourishment (20.1 percent) or in government dumping grounds and offshore ocean areas (15.3 percent).

Dredging activity can produce damage to marine resources by: 1. removing beneficial *substrates* and destroying aquatic life; 2. increasing turbidity and sedimentation which can be deleterious to water quality and marine life, depending on the type and life stage of the species involved; 3. changing the topographic conditions of the sea floor which can lead to alteration of circulation patterns, shoaling and subsequent changes in water quality; and 4. destroying wetlands and wildlife habitat. The complex relationships of marine ecosystems often make it difficult to predict the consequences of a specific dredging project. However, recent research in Moriches Bay has shown that bottom dwelling organisms are less abundant in dredged channels than in other bottom

types with different characteristics. It has been suggested that dredging and shoreline development associated with small bays be subject to a moratorium until long-term effects can be assessed. However, there appears to be little, if any damage associated with the maintenance dredging of existing projects, providing the spoil from such projects is disposed of in an acceptable way.

Dredging and dredge spoil disposal is unique among the four high priority problem areas discussed in this report in that these activities are subject to certain permit procedures, approvals and reviews. These involve some or all of the following:

a. Local governments with rights over certain wetlands and bay bottoms have dredging and/or grading ordinances which require review of proposed dredging projects by local conservation advisory councils or commissions before permits for such work are issued. In Suffolk County, the Council on Environmental Quality reviews dredging projects involving the expenditure of Suffolk County funds.

b. Before a dredging project can commence, the New York State Department of Environmental Conservation must certify that work on the project will not cause violation of water quality standards. The department also must approve the installation of piers and floats, with the exception of work performed by municipalities exempted by law.

c. The Department of the Army, Corps of Engineers, is the Federal government permit granting agency for dredging, filling and installation of structures in navigable waters; other Federal agencies such as the U. S. Department of the Interior and the Environmental Protection Agency as well as the general public,

are given the opportunity to review and comment on permit applications.

Planning Guidelines

1. Consider each dredging proposal on the basis of its merits by evaluating need, environmental effect, socio-economic advantage, monetary cost, and cost in committing, consuming, or otherwise destroying natural resources.

2. Evaluate environmental costs and benefits and the impact on natural resources by considering:

   a. the effects of the removal of bottom material in the area to be dredged;
   b. the dredging operations's effects on turbidity and sedimentation in adjacent waters;
   c. the modifications of flushing rates, salinity and oxygen levels caused by channelization;
   d. the location where dredged material is to be placed as either fill or *spoil* and its effect on the environment; and
   e. the degree of temporary and permanent effects.

3. When temporary incursion of wetland areas is deemed essential for construction of sewer pipeline, provide for restoration of disturbed areas in accordance with permit procedures described in Wetlands Guidelines.

4. Avoid dredging that in any way cuts into or otherwise effects the fresh water *aquifers*.

5. The following areas are particularly sensitive to the effects of dredging and /or deposition and should receive special evaluation:

   a. inlets;
   b. channels that can affect back bay current patterns;
   c. important shellfish areas;
   d. locations where induced sedimentation and turbidity can be widespread, causing shoaling and/or deterioration in water quality, as in the removal of duck farm sludge or other wastes, and in long-term sand and gravel mining projects;
   e. areas where dredge spoil is polluted to the extent that it exceeds Federal criteria for open water disposal; and
   f. areas not previously subject to dredging.

6. Determine the motivation and need for the project. Project motivations can be grouped under the general categories of:

   a. navigation improvements;
   b. shoreline construction and landfill;
   c. substrate removal; and
   d. miscellaneous, such as the development of new wetlands.

7. Consider the following specifics when determining whether a project is in the best interest of the public.

   a. preservation of resources;
   b. project economics;
   c. project aesthetics;
   d. historic values;
   e. fish and wildlife values;
   f. tidal flood damage;
   g. land uses;
   h. navigation;
   i. recreation;
   j. loss of water supply;
   k. bay water quality;
   l. aquaculture;
   m. shoreline erosion; and
   n. the desirability of alternative locations and methods.

8. Provide for a public notice and a hearing to determine whether there is any public reaction to a proposal. This may be accomplished by processing the application as follows:

   a. Local government level (i.e., county, town and village)
      i. Develop local law covering dredging and construction in or bordering on waterways and provide an appropriate permit application form.
      ii. Designate the person, department or agency to process applications.
      iii. Provide for a public notice, and if objections are raised, a public hearing on the project.
      iv. The application is approved or disapproved at the local level. If approval is given, application is converted to a permit issued by the local level within 30 days from issuance of permit by Department of the Army.
   b. New York State Department of Environmental Conservation
      i. Applicant must apply for certification of assurance that work will not violate water quality standards. Such certification should be forwarded to applicant and Department of the Army within 60 days from receipt of all required information.
   c. U.S. Army Corps of Engineers
      i. Upon receipt of permit application and water quality certification, the U. S. Army Corps of Engineers publishes a public notice describing the application.
      ii. The Environmental Protection Agency, the Department of the Interior, and the New York State Department of Environmental Conservation may comment favorably or unfavorably on the public notice. In the event of public objection to the project, the U. S. Army Corps of Engineers should hold a public hearing on the application. If, after the public hearing, the Corps of Engineers District Office cannot reach a decision, the case may be referred to the Secretary of the Army for final action.

9. Provide adequate inspection of all projects to insure compliance

with the terms of permits. The local and/or Federal permit issuing agency should administer the inspection process.

INTEGRATED WATER SUPPLY AND WASTEWATER DISPOSAL

The present population of the Bi-County region - 2.66 million people - is larger than that found in 26 of our states. Population projections indicate that an additional 1.4 million people (the population of the City of Detroit) will be living in the Nassau-Suffolk area by the year 2000. Concomitant with this population growth is the transformation of vacant land to built up uses. In 1966 only 17, 000 acres of land remained vacant or in agricultural use in Nassau County, while 336,000 acres of such land existed in Suffolk County.

Urbanization and its by-products - sewage treatment plant effluent, leachates from septic tanks and cesspools, and storm water runoff - have caused both surface water and groundwater quality deterioration. At present, 17 percent, or roughly 205,000 acres of New York Marine District waters are closed to the taking of shellfish for culinary purposes. In 1904, production of oyster meats in New York marine waters peaked at over 20 million pounds; in 1971, production was only 778,000 pounds. Yet, Long Island's estuarine waters remain highly productive for other species. In 1971, commercial shellfishermen in Suffolk County produced 8.1 million pounds of hard clam meats, or 47 percent of the total hard clam production in the United States. Compatible, multi-purpose use of Long Island's marine environment in the future will depend heavily on the strategies employed for water supply and the treatment and disposal of domestic and industrial wastewaters and street runoffs.

Consumptive water usage in Nassau County will amount to 328 MGD (million gallons per day) by the year 2020; *permissive sustained yield* of the

aquifers in Nassau County is only 151 MGD. Thus, Nassau County will have a future water supply deficit of 177 MGD. Suffolk County, however, has a permissive sustained yield of 466 MGD, and a projected consumptive water use of 381 MGD for the year 2020. Thus, Suffolk will have a water supply surplus of 85 MGD at this future date.

Permissive sustained yield estimates are based only on factors which would adversely affect the public water supply, such as *salt water intrusion*. They do not include ecological, aesthetic or recreational constraints. Utilization of the permissive sustained yield would permit groundwater levels to eventually be reduced as much as 75 percent below present levels within the interior of the *water budget area*. The development of the permissive sustained yield is also predicated on the assumption that groundwater will not be contaminated by cesspool wastes and other pollutants to the extent that it cannot be used for human consumption.

Nassau and Suffolk Counties must solve the problem of how to meet the requirements for water supply and wastewater disposal in an economically, sociologically and environmentally acceptable way. Current decisions involving various management schemes have to be made with cognizance of future population and land use projections, as well as changes in technology. An integrated system of water supply and wastewater disposal consists of the following components: acquisition, transmission, treatment, distribution, and use of fresh water; and collection, treatment and disposal of wastewaters. The selection of the system servicing a particular area depends on economic and political considerations, the results of future research, and value judgements in terms of potential effects on surface water resources and the quality of marine waters. Implementation of mixed strategies involving: 1. importing water from

New York City; 2. installation of both sanitary and storm water sewers; 3. continued use of *secondary treatment* and the disposal of effluents via ocean outfall; 4. *groundwater recharge* with effluent subject to *advanced wastewater treatment*; 5. *injection barriers* to limit salt water intrusion; and 6. cesspools or individual waste treatment systems, will no doubt be executed in the Bi-County region because of different patterns of land use, population, and variation of hydrologic conditions.

Planning Guidelines

1. Continue the present program of installing sewage collection treatment and disposal systems in densely populated areas for handling domestic and industrial wastewater until better water supply and wastewater disposal schemes are developed.

2. Permit access over wetland areas where necessary for the efficient and economic installation of important equipment. Take measures to insure minimum ecological disruption during installation.

3. Require adequate treatment for all sewage plant effluents discharged to estuarine or any other confined waters, in order to maintain acceptable marine water quality.

4. Continue ocean disposal of wastewaters subject to treatment producing an effluent with acceptable quality for ocean discharge. However, it must be recognized that this system lowers groundwater levels.

5. Design storm water systems so as to reduce contaminant flows into the marine environment.

6. Evaluate new sources of water, such as connection with mainland surface water supplies and desalinization, for the purpose of improving existing water supply systems.

7. Consider advances in wastewater treatment technology such as renovation of wastewater through land disposal by spray irrigation, and the merits of different water management schemes, such as a *dual water supply system, a non-aqueous waste disposal system* and *treatment of water supply at the well-head,* in the design of new water supply systems.

8. Require installation of sewers and wastewater treatment facilities as a condition for approval of development plans in areas designated as intermediate or higher in population density (greater than five people per acre) in the Nassau-Suffolk Comprehensive Plan.

WETLANDS MANAGEMENT

Marine wetlands can be considered as either valuable, productive natural habitats, or as worthless swamps offering opportunity for creating buildable land for various types of development. The difference in these two perceptions of the role wetlands play in Long Island's coastal zone has created conflicts between developers and preservationists. Public outcry for wetlands protection has increased in recent years due to more awareness of the natural functions of wetlands and the amenities they provide, as well as the fact that wetlands have become a diminishing resource in the Long Island area.

Several functions are performed by marine wetlands in their natural state. Such natural functions include: 1. protecting adjacent mainland areas by acting as natural breakwaters which buffer the impact of storm waves; 2. providing essential habitat for many species of fish and wildlife; 3. producing food and nutrient materials for use in the wetland environment and coastal estuarine waters; 4. acting as a sediment trap for the removal of silts, organic matter and pollutants from both tidal waters and upland runoffs; 5. transforming waste products into useful nutrient materials by both chemical and biological processes; and 6. serving as a storage area for storm tidal waters and upland runoff. Man has used wetlands in a number of different ways, e.g., recreational pursuits, such as bird watching, hiking, hunting and fishing; aesthetically pleasing open spaces; and various educational and research activities. However, other uses by man have either destroyed or altered wetlands by filling, channel dredging, bulkheading, and by pollution and insecticide loading.

Wetlands management involves the problem of how to recognize, pre-

serve and enhance the usefulness of wetlands for ecological and human purposes. Drastic reductions in Long Island's wetlands inventory have occurred in recent years. In 1954, there were 14,130 acres of wetlands in Nassau County; by 1971, 9,538 acres remained - a 32 percent loss of the existing 1954 acreage. In Suffolk County, 1954 wetlands totalled 20,590 acres, and by 1971, 12,725 acres remained - a 38 percent loss. Thus, for the Bi-County region as a whole, 12,457 acres of wetlands were destroyed during the 17 year period, 1954 through 1971. The effects of this destruction are obvious in terms of loss of open space, but they are not so apparent when dealing with ramifications for estuarine and oceanic ecology. However, it is known that 90 percent of the species comprising the marine fishery sport catch of the Atlantic coast are estuarine dependent during some portions of their life histories, and that 63 percent of the species comprising the Atlantic coast commercial fish catch are considered to be estuarine dependent.

Control of the remaining Nassau County wetlands is virtually assured in that 96 percent of these wetlands are owned by some level of government. The situation is potentially much more serious in Suffolk County, because between 34 and 47 percent of Suffolk's wetlands are in private ownership, and hence, may be optioned for future development. The recently enacted New York State Tidal Wetlands Act authorizes a moratorium on the alteration of tidal wetlands until a program with land use regulations governing wetlands is established. During the moratorium, the Commissioner of the New York State Department of Environmental Conservation may issue permits for wetlands alteration in certain hardship cases. This new law, however, is not applicable to any lands appropriated now or in the future by New York State or any of its departments under the power of eminent domain.

Planning Guidelines

1. Consider all remaining wetlands in the Nassau-Suffolk area worthy of preservation; any proposed use of such lands must be seriously weighed against its predictable deleterious effect.

2. Encourage the establishment of a two-year state imposed moratorium on any wetlands encroachment.

3. Encourage New York State, pertinent local governments and private agencies to acquire at the earliest practical date a *fee simple* or lesser property interest in as much of the remaining privately held wetlands, with a view toward preserving them in perpetuity. Grant tax and other incentives to individual wetlands owners who assure preservation and enhancement of their properties.

4. Establish institutional mechanisms for wetlands regulation within the two counties and each town, city and village having such lands within their respective jurisdictions.

5. Establish uniform regulations governing wetlands use, yet recognize the fact that individual tracts of wetlands vary widely from each other in the degree of encroachment that they can absorb without substantial damage. Include in such a code, applicable to both public and private owners alike, a permits system (analogous to building permits) which requires that an authoritative environmental impact statement accompany each permit application. The evolved regulations should be consistent with guideline one above.

6. Establish the Regional Marine Resources Council as the body with responsibility for wetlands advisory planning activity in the Nassau-Suffolk region. In conjunction with this role, the Council should:

    a. initiate efforts to secure technical and financial assistance from appropriate state and Federal agencies for the design of a preliminary wetlands management plan ready for implementation within two years;
    b. provide a coordinating function, sponsor meetings, hearings, and specific objectives of wetlands management; and
    c. act as a land-use advisory body to assist local governments in solving planning and management problems related to marine wetlands, as well as advising on any research needs related to such problems.

SOURCES OF ASSISTANCE

Various public agencies, academic institutions and private groups with expertise and in some instances, mandated responsibilities in environmental matters, will assist local municipalities, planning groups and the general public with problems involving marine resource use. Examples of such assistance include the following:

1. The Soil Conservation Service of the U. S. Department of Agriculture will provide municipalities and individuals with assistance in such areas as erosion control (including stabilization of eroding bluffs), vegetation and re-vegetation, drainage, water management and soils interpretation.
2. The U. S. Geological Survey of the U. S. Department of the Interior provides local groups with basic hydrologic data and interpretation of such data, concerning surface water and groundwater quality.
3. The Department of the Army, Corps of Engineers, upon the request of municipalities will undertake studies concerning navigation improvements, hurricane protection measures and beach erosion control. Corps recommendations can be implemented, provided they are authorized and funded by the Federal government, and assurances of local cooperation are provided. A total of 24 navigation projects, two combined beach erosion and hurricane protection projects and one combined beach erosion and navigation project, involving the Nassau-Suffolk region have been authorized by Congress.
4. The New York State Department of Environmental Conservation, Division of Resource Management Services, Bureau of Water Management, is the state coordinating agency designated to assist communities in qualifying for subsidized flood insurance authorized by the Federal

Insurance Administrator in the U. S. Department of Housing and Urban Development. The Towns of Brookhaven and Islip, the City of Long Beach and the Villages of Asharoken, Ocean Beach, Saltaire and Westhampton Beach have adopted land use and control measures designated to reduce future flood damages within their jurisdictions, and have thus qualified for subsidized flood insurance.

5. The Suffolk County Council on Environmental Quality serves as an advisory body to County government, including review of capital program requests and environmental impact statements prepared by County agencies, and also acts as a referral service to the public-at-large regarding environmental questions such as gypsy moth control, detergent regulations, etc.

The agencies and individuals listed in Appendix B provide an initial source of assistance to those with problems and questions.

Appendix D contains an annotated bibliography of MRC research reports that provided background for the development of the planning guidelines and research requirements contained in this report. Also listed are selected references pertaining to the priority problem areas of coast stabilization and protection, dredging and dredge spoil disposal, integrated water supply and wastewater disposal and wetlands management.

APPENDIX A

Objectives and Public Relations Policy of the Regional Marine Resources Council

The objectives of the Marine Resources Council, under the general direction of the Nassau-Suffolk Regional Planning Board, are as follows:

1. To develop as a long-range goal, a planning model for the optimal utilization of Long Island's marine resources;

2. To duly consider and advise on problems referred to the Council by the Board;

3. To duly consider other problems referred to the Council and deemed to be of sufficient importance for Council consideration;

4. To conduct briefings for the purpose of increasing the Council's understanding of marine environment problems and their alternative solutions;

5. To conduct a research program to develop means of improving the quality of environmental management through guidance of public policy, planning, decision and action; and

6. To establish and maintain communication with public or private interests with marine environmental concerns.

The public relations policy of the Marine Resources Council, subject to the general direction of the Nassau-Suffolk Regional Planning Board is as follows:

1. Meeting Status

   Meetings will generally be closed and in executive session. Open meetings will be held and press and public invited when deemed desirable by the Council.

2. Availability of Minutes

   Minutes of all meetings are available to the public at the Council offices.

3. Press Statements

   Press statements will be made by the Chairman or his designated representative when considered appropriate by the Chairman.

4. Relations with Public Agenices and Private Organizations with Marine Environmental Concerns

   a. Advisory members of the Council include representatives of Federal, State and local agencies with marine environmental interests.

   b. Advisory members of the Council may include invited representatives of major environmental organizations.

   c. The Council will endeavor to keep local environmental organizations informed of Council activities.

   d. The Council will endeavor to keep itself informed of local environmental agency and organization activities.

APPENDIX B

Regional Marine Resources Council Membership

CHAIRMAN

RAdm. Edward C. Stephan, USN (ret) Term ending: 12/73	5304 Elliott Rd., Washington, D.C. 20016 Area 301 229 2877

STAFF

Dr. Clarke Williams Research Administrator	Regional Marine Resources Council Veterans Memorial Highway Hauppauge, New York 11787 979 2935
Dr. Lee E. Koppelman Executive Director, Nassau-Suffolk Regional Planning Board	Nassau-Suffolk Regional Planning Board Veterans Memorial Highway Hauppauge, New York 11787 979 2922
Mr. DeWitt Davies Marine Environmental Planner	Regional Marine Resources Council Veterans Memorial Highway Hauppauge, New York 11787 979 2935
H. Crane Miller, Esq. Legal Consultant	Alvord & Alvord 918 16th Street, N.W. Washington, D.C. 20006 Area 202 393 2266

TERM MEMBERS

Nassau County

Dr. John C. Baiardi Term ending: 12/74	President New York Ocean Science Laboratory P.O. Box 867 Montauk, New York 11954 668 5800
Dr. A. Harry Brenowitz Term ending: 12/73	Adelphi University Institute of Marine Science Idle Hour Boulevard Oakdale, New York 11769
Hon. John J. Burns Term ending: 12/73	166 DuBois Avenue Seacliff, New York 11579 671 2282 (former Commissioner, NYS Office for Local Government)
Mr. Leo Geyer	Advanced Aircraft Systems, Plant 5 Grumman Aerospace Corp. Bethpage, New York 11714 575 3923

Mr. Edward Patterson Term ending: 12/76	Asst. Director, Planning Nassau County Museum Sands Point Park & Preserve Middle Neck Road Port Washington, New York 11050 883 1610
Mr. Joseph Shapiro Term ending: 12/74	Commander Oil Co. South Street Oyster Bay, New York 11711 922 7000
Mr. Harold Udell Term ending: 12/76	Director Dept. of Conservation and Waterways Town of Hempstead One Parkside Drive Point Lookout, New York 11569 431 9200
Vacancy	

Suffolk County

Dr. Edward Baylor Term ending: 12/74	Marine Sciences Research Center Surge J SUNY Stony Brook, New York 11790 246 7710
Mrs. Ann Carl Term ending: 12/75	Lloyd Lane Huntington, New York 11743 271 5769 (Lloyd Harbor Study Group)
Mr. Matthew Klein Term ending: 12/76	Box 126 Hauppauge, New York 11787 265 3653 (Director of Marine Sales, General Motors Marine Diesel Engines)
Mr. Dennis Puleston Term ending: 12/74	Chairman Environmental Defense Fund 162 Old Town Road Setauket, New York 11733 751 5191
Prof. Walter L. Smith Term ending: 12/73	Chairman, Biology Department Suffolk County Community College 533 College Road Selden, New York 11784 732 1600 Ext. 243
Mr. John Suydam Term ending: 12/75	910 South 7th Street Lindenhurst, New York 11757 226 5395 (President, National Party Boat Owners Alliance, Inc.)

Mr. Nathaniel Talmage, Vice Chmn. **Term ending: 12/73**	36 Sound Avenue Riverhead, New York 11901 727 2326 (Agriculturist)
Mr. George Vanderborgh, Jr. **Term ending: 12/76**	Vice President Long Island Oyster Farms, Inc. Box 94 West Sayville, New York 11796 757 1600

ADVISORY MEMBERS

County

Mr. Carl Eisenschmeid, P. E.	Principal Civil Engineer Suffolk County Dept. of Public Works Yaphank Avenue Yaphank, New York 11980 924 3451
Mr. John M. Flynn, P. E.	Commissioner Suffolk County Dept. of Environmental Control 1324 Motor Parkway Hauppauge, New York 11787 234 2622
Mr. Stanley Juczak	Nassau County Dept. of Health Nassau County Office Building Old Country Road Mineola, New York 11501 535 2404
Mrs. Carlyn S. Larson	Secretary to the Council on Environmental Quality County Center Hauppauge, New York 11787 979 2798
Dr. Edith Tanenbaum	Nassau County Planning Commission 240 Old Country Road Mineola, New York 11501 535 5220

New York State

Mr. Edward Bevelander	Supervisor, Boating Safety Development New York State Parks & Recreation Bureau of Marine & Recreational Vehicles 150 Broad Hollow Road - Suite 209 Melville, New York 11746 271 9818

Mr. Albert Jensen	Regional Supervisor of Marine & Coastal Resources New York State Dept. of Environmental Conservation Bldg. 40, SUNY at Stony Brook Stony Brook, New York 11790 751 7900
Mr. Albert Machlin	Regional Engineer for Environmental Quality New York State Dept. of Environmental Conservation Bldg. 40, SUNY at Stony Brook Stony Brook, New York 11790 751 7900
Mr. Howard Quinn	District Director, New York State Office of Planning Services 45th Floor, 2 World Trade Center New York, New York 10047 Area 212 488 4818 - 4589
Mr. Randolph Stelle	New York State Dept. of Environmental Conservation Water Management Planning Bldg. 40, SUNY at Stony Brook Stony Brook, New York 11790 751 7900

Federal

Mr. Charles Barnett	District Conservationist U. S. Dept. of Agriculture Soil Conservation Service 127 East Main Street Riverhead, New York 11901 727 2315
Mr. Morris Colen	Plan Formulation Branch North Atlantic Div.- COE 90 Church Street New York, New York 10007 Area 212 264 7088
Mr. Charles Durfor	Acting Chief, Water Programs Grants Environmental Protection Agency 26 Federal Plaza New York, New York 10007 Area 212 264 1833
Mr. James W. Godbolt	Superintendent Fire Island National Seashore National Park Service U. S. Department of the Interior Box 229 Patchogue, New York 11772 289 4810

Mr. John Zammit	Operations Division U. S. Army Engineer Dist., New York 26 Federal Plaza New York, New York 10007 Area 212 264 0182
Mr. Ron Sake	Acting Supervisor, Long Island Area Office Division of River Basin Studies U. S. Fish and Wildlife Service U. S. Department of the Interior 50 Maple Avenue Patchogue, New York 19772 475 3434
Cmdr. James Waskiewicz	c/o Commander (ecv) Third Coast Guard District Building 107, Rm 107 Governors Island New York, New York 10004 Area 212 264 4962
Dr. John Winslow	Hydrologist in Charge, U. S. Geological Survey 1505 Kellum Place Mineola, New York 11501 746 3750

CITIZEN ADVISORY GROUPS

Mrs. Claire Stern	Executive Director Long Island Environmental Council 95 Middle Neck Road Port Washington, New York 11050 883 4725

APPENDIX C

Knowledge Base and Research Requirements

Coast Stabilization and Protection

A. Knowledge Base

1. Good in design of beach protection structures.
2. Fair in development of offshore sand mining.
3. Fair in understanding the movement of littoral materials.

B. Research Requirements

1. Recognizing the fact that sand has become a scarce resource in nearshore areas because of ecological restraints in shallow water dredging, as well as man's interference with natural shoreline equilibrium, efforts are needed to develop the required technology for economical transfer of sand from deep water to the shore.

2. Continue research on the innovative design of traditional, fixed shore structures. The use of artificial seaweed, flexible groins and floating breakwaters and planting to stabilize spoil areas requires further investigation.

3. Model study inlets and harbor entrances, and design better sand transfer systems for utilization at these littoral barriers.

4. Examine the use of wetland fringes for stabilization of the landward edge of barrier islands and baymouth bars. Such research could be coupled with efforts to create new wetlands.

5. Continue research on the dynamics of natural barrier beaches recently started by the U. S. Department of Interior in North Carolina, and couple the results of such research with land management techniques for use in areas with similar environmental characteristics.

6. Analyze littoral transport along the shores of Long Island to determine volumes, sources of the sand, and net flow directions.

7. Even though studies have shown the existence of vast sand and gravel resources on the continental shelf to the south of Long Island, inventories on a more local basis are needed to assess the physical, ecological and economic feasibility of using offshore sand to maintain major Long Island beaches.

8. In the event that offshore sand deposits are mined for the purposes of beach nourishment, studies should be undertaken so as to indicate whether or not such removal will promote erosion of adjacent beaches.

9. Analyze the feasibility of creatively employing inlet development and stabilization techniques to enhance the environment of the south shore bay system. Develop models to determine the relationship between the size and location of inlets and selected physical/chemical characteristics of the interior bays.

10. Define and map the Intermediate Regional Tidal Flood Plain for the shores of Suffolk County. (A flood plain mapping project for the shores of Nassau County has been completed by the U. S. Army Corps of Engineers).

11. Create a research team to study the legal, economic and political aspects of an overall erosion control program that is designed to limit barriers hindering effective action.

12. Because Long Island experiences a catastrophic storm which occurs on the average, once in every 30 to 40 years, the planning departments of both counties should develop a contingency plan for such a disaster. Such a plan would: a. outline emergency procedures for the protection of life and property; and b. recommend public condemnation and purchase of certain properties for future public use and for conservation.

Dredging and Dredge Spoil Disposal

A. Knowledge Base

1. Good in shallow water dredging for navigation channel maintenance.
2. Fair in deep water sand dredging for various purposes.
3. Poor in environmental and ecological effects of dredging and dredge spoil disposal.
4. Poor in dredging to maintain desired circulation, flushing, and salinity in bays and harbors.

B. Research Requirements

1. Develop predictive models to determine the effect of new or modified inlets and/or channels on the physical and chemical characteristics of estuarine areas, particularly for the south shore bays of Long Island. Such models predicting changes in current patterns, flushing rates, salinity and temperature, and the effects of contaminants introduced through stream flow, runoff, and waste disposal would enable more rational decision making regarding the desirability of dredging operations.

2. Continue research to determine the effects on marine life and productivity caused by physical and chemical alterations of the bays.

3. Develop a management scheme to facilitate decisions on specific dredging operations using proposed criteria to evaluate the magnitude of the potential impact, and to determine the extent of permit application evaluation.

4. Develop and evaluate methods of offshore dredging for use in beach nourishment and sand mining.

Integrated Water Supply and Wastewater Disposal

A. Knowledge Base

1. Good in quantitative understanding of groundwater resources and surface water resources.
2. Good in the technology for desalinating sea water.
3. Good in wastewater treatment, and rapidly improving as a result of ongoing research and development.
4. Poor in wastewater disposal, primarily because of lack of knowledge as to what receiving waters can assimilate without damage to the marine environment.
5. Fair in understanding of process for recycling of water into the ground by injection, collection basin or infiltration.

B. Research Requirements

1. Determine the physcial, chemical and biological characteristics of wastewater to be discharged into: a. ocean waters, estuaries and their tributaries; and b. the ground by agricultural irrigation, for augmentation of the groundwater supply and as barriers to salt water intrusion.

2. Evaluate and standardize effective water quality indicators.

3. Investigate the movement of contaminants into and out of Long Island's estuaries, including contaminants from sources adjacent to the area, as well as the flushing requirements necessary to maintain acceptable water quality.

4. Investigate the movement of contaminants in groundwater with regard to the requirements of maintaining an acceptable quality as it influences marine resources.

5. Ascertain the optimum salinities for shellfish, and determine the flushing requirements needed for the maintenance of such salinities.

6. Evaluate the adequacy of existing beach closure standards, and improve them if necessary.

7. Improve knowledge of the cumulative effects of toxic material in food chains, and if necessary, modify waste disposal policies.

8. Establish suitable restrictions on the use of cesspools and septic tanks adjacent to ocean waters, estuaries and their tributaries.

9. Continue research on the following aspects of water resources which bear directly or indirectly on coastal zone management because of the interaction of ground and surface waters with the marine environ-

ment: a. water usage; b. onshore and offshore geology; c. groundwater levels; d. groundwater contaminants; e. industrial water supply and discharge; f. infiltration processes; g. groundwater outflow into the marine environment; h. methods of groundwater recharge using wastewater subject to various degrees of treatment; i. advanced wastewater treatment; j. area or individual unit wastewater treatment equipment; k. use of treated wastewater for water supply; l. the necessity and feasibility of a dual water supply for potable and general purpose use; and m. contaminants contained in agricultural and urban runoffs, particularly asphaltic and other hard surface runoffs.

Wetlands Management

A. Knowledge Base

1. Poor in amount and quality of wetlands required to meet various functions of wetlands, such as ecological support for shellfish, coastal finfish, deep water finfish, and for storm protection, recreation, and aesthetic values.
2. Poor in understanding means by which wetlands could be created, restored, or enhanced.
3. Fair for both qualitative and quantitative inventories of the remaining marine wetlands in the Nassau-Suffolk area. For wetland inventory information, the Regional Marine Resources Council has adopted the report entitled, The Marine Wetlands of Nassau and Suffolk Counties. . . New York 1972, as amended, compiled and published by the Marine Sciences Research Center of the State University of New York at Stony Brook.

B. Research Requirements

1. Design and develop a management-oriented wetlands classification system.

2. Expand the inventories of each wetland unit in both counties on the basis of the characteristics established in the above classification scheme.

3. Establish the value (quality) of each major wetlands complex according to the degree with which it fulfills a set of delineated natural functions and human uses. Determine the acreage necessary to support such functions and uses.

4. Identify and evaluate physical and nonphysical wetlands management techniques.

5. Develop a comprehensive wetlands management plan that integrates the inventory data on wetland characteristics, the quality evaluation, and the management techniques into a coherent plan for the Island's wetland system as a whole, and for its individual wetlands complexes.

6. Develop a uniform code and a model environmental impact statement for marine wetlands. The degree of competency required to author such impact statements should be assessed.

7. Research and field test means of wetlands restoration, creation and enhancement.

APPENDIX D

Glossary of Italicized Terms

I. Coast Stabilization and Protection

Intermediate Regional Tidal Flood Plain - those lands covered by a tide having an average frequency of occurrence in the order of once in 100 years, although the tide may occur in any year.

flood plain zoning - regulations designed to limit or reduce damage from flooding; such zoning regulations could establish:

a. stringent use restrictions for high hazard areas subject to wave or erosion action or without access during times of flood;
b. use restrictions for other areas to allocate lands to uses with low flood damage potential;
c. elevation requirements;
d. beach setbacks; and
e. special provisions for dune or beach protection.

non-conforming use - pre-existing land use that does not conform with present zoning regulations; present zoning regulations take effect upon termination of the non-conforming use.

set-back lines - required horizontal distance between a building, road or other form of construction and a beach, dune, shoreline or similar flood prone area, designed to establish a buffer to limit flood or erosion damage.

primary dune - the ridge or mound of loose, wind-blown material, usually sand, located immediately landward of the beach berm.

bluff hazard zoning - the use of zoning ordinances to control land uses adjacent to eroding bluffs for the purposes of:

a. minimizing community expense for construction of shore protection structures;
b. preventing erosion-related damage;
c. preventing the acceleration of bluff erosion; and
d. preventing the victimization of unwary purchasers of property fronted by eroding bluffs.

winter bar - an offshore ridge or mound of sand, gravel, or other unconsolidated material lying a short distance from and usually parallel to the beach; it results from the removal of sediments from the beach because of winter storm turbulence.

sand bypassing systems - technique utilizing land-based dredge plants, floating dredges and/or mobile land-based vehicles for the purpose of artificially nourishing the shore downdrift from inlets to improve its stability; nourishment is accomplished by using the available littoral supply from updrift sources.

groins - shore-protective structures designed to maintain or build a protective beach by trapping littoral drift. Groins are usually constructed perpendicular to the shore and extend from a point landward of possible shoreline recession into the water a sufficient distance to stabilize the shoreline.

II. Dredging and Dredge Spoil Disposal

substrates - the sea or bay bottom and its characteristics which are dependent on grain size distribution.

spoil - waste materials resulting from the dredging process.

aquifers - bodies of earth material that readily yield economically significant amounts of groundwater to wells.

III. Integrated Water Supply and Wastewater Disposal

consumptive water usage - uses of water which ultimately result in a net loss of water in available supplies, e.g., evapotranspiration of irrigation water and discharge of treated sewage to the sea.

permissive sustained yield - the "safe yield", or rate at which water can be withdrawn from an aquifer without producing an undesired result.

water budget area - that area which covers about 760 square miles, bounded on the west by the Nassau-Queens border, on the east by an imaginary north-south line that separates the eastern forks from the main part of Long Island; the northern boundary follows roughly, but with local departures, the northern shoreline and the southern boundary is a curved line that joins the streamflow measuring stations on the major streams that drain into the bays along the south shore.

salt water intrusion - the movement of salty groundwater into areas previously occupied by fresh groundwater.

secondary treatment - a combination of processes, including screening, gravity separation, biological flocculation and precipitation capable of producing an 80-95% reduction in BOD, 85-90% reduction in suspended solids and 95-98% reduction in bacteria.

groundwater recharge - the addition of water to the groundwater reservoir via injection or infiltration.

advanced wastewater treatment - a term employed to describe a variety of techniques which may be applicable to improve performance in conventional waste treatment in order to produce an effluent of very high quality by substantially removing refractory organics, dissolved inorganics, and phosphorus and nitrogen compounds from wastewater.

injection barriers - the creation of an artesian pressure ridge parallel to a shore by means of recharging renovated wastewater in a line of injection wells, for the purpose of limiting salt water intrusion.

dual water supply system - a water supply system with two components; one component supplies water of high quality for culinary purposes, while the other supplies water of lesser quality for such purposes as domestic waste disposal.

non-aqueous waste disposal system - system which utilizes substances other than water for the handling and conveyance of domestic wastes.

treatment of water supply at the well-head - concept of treating water at its source before it is used, rather than before its disposal; requires the continued use of cesspools as a means of waste disposal.

IV. Wetlands Management

marine wetlands - those lands inundated and re-exposed by mean high and mean low spring tides, respectively, at least monthly and characterized by predominant growth of either cordgrass (Spartina alterniflora) or salt meadow hay (Spartina patens) or both, but including a protective fringe of uplands above mean high spring tide level, and any adjacent mudflats. The upland fringe will vary among separate tracts of marine wetlands, but will usually be characterized

by growths of Black Rush (Juncus Gerardi), Sea Myrtle (Baccharis halimifolia), Seaside Goldenrod (Solidago sempervirens), Bullrush (Scirpus), Marsh Elder (Iva frutescens), Cattails (Typha), and Reed (Phragmites communis).

fee simple - a fee without limitation or restrictions on transfer of ownership; the maximum possible ownership in real estate.

APPENDIX E

Annotated Bibliography of Regional Marine Resources Council Publications

Oceanographic Committee of the Nassau-Suffolk Regional Planning Board. The Status and Potential of the Marine Environment. Hauppauge, New York: Nassau-Suffolk Regional Planning Board, December 1966.

Report on the findings of the Committee on the marine resources of Long Island and their relations to industry, conservation, research and education; its recommendations on the formation of a Regional Marine Resources Council, with notes on sources of information on problems. Bibliography 100 items (91 pp).

Regional Marine Resources Council. Proceedings of the Conference on Shellfish Culture. Hauppauge, New York: Regional Marine Resources Council, 1971.

Papers on state of the art of shellfish culture, i.e., algae culture, mulluscan embryology and physiology, culture methods - present and future, and techniques and problems in commercial shellfish farming. (106 pp).

Regional Marine Resources Council. Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal. Hauppauge, New York: Regional Marine Resources Council in cooperation with U. S. Environmental Protection Agency and U. S. Geological Survey.

Papers on state of the art in wastewater treatment, groundwater management experiences and new projects for treatment and recharge. (167 pp).

Regional Marine Resources Council. Proceedings of the Wetlands Management Seminar. Hauppauge, New York: Regional Marine Resources Council in cooperation with the National Oceanic and Atmospheric Administration (in press)

Papers on the values of wetlands, both natural and managed, the states of the art for wetland management, present guidelines for wetland management - federal, state, and local levels, and research needs for wetlands management (approx. 130 pp).

Regional Marine Resources Council. Proceedings of the Seminar on Dredging/Dredge Spoil Disposal and Coast Stabilization/Protection. Hauppauge, New York: Regional Marine Resources Council in cooperation with U. S. Army Corps of Engineers (in press).

Papers on dredging technology, regulatory procedures, dredging and spoil disposal activities on L. I., research activities, state of the art on beach erosion and stabilization, notes on the National Shoreline

Study, and Federal beach erosion activities on L. I. (approx. 125 pp).

Regional Marine Resources Council. Guidelines for Long Island Coastal Management. Hauppauge, New York: Regional Marine Resources Council, a Committee of the Nassau-Suffolk Regional Planning Board (in press).

Suggested management guidelines or generalized procedures to be followed in process of policy planning, decision and action at the local level, representing the integration of scientific information and local political, social, and economic realities in the four areas of coast stabilization and protection, dredging and dredge spoil disposal, integrated water supply and wastewater disposal, and wetlands management. Bibliography 30 items (approx. 40 pp).

Regional Marine Resources Council Research Reports Funded by the Nassau-Suffolk Regional Planning Board

Hardy, Charles D. Hydrographic Data Report: Long Island Sound - 1970 Part II. Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series No. 13, January 1972.

Data on single three day survey of L. I. Sound on salinity, temperature, dissolved oxygen and nutrients. Bibliography 4 items (20 pp).

Gross, M. Grant, et al. Characteristics and Environmental Quality of Six North Shore Bays, Nassau and Suffolk Counties, New York. Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series No. 14, January 1972.

Describes physical characteristics, results of surveys of water quality, sediments and waste deposits of six bays. Develops three environmental quality indicators (present, integrative and predictive), used to rate the six bays. Recommends further studies for better evaluation of bay environmental quality. Bibliography 109 items (98 pp).

Gross, M. Grant, et al. Survey of Water Quality and Sediments in Six North Shore Bays, Nassau and Suffolk Counties, Long Island, New York (Appendix to Technical Report No. 14). Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series No. 15, February 1972.

Describes sampling procedures, analytical techniques, data for water quality and sediment survey, with maps of the six bays showing location of sampling stations. Bibliography 6 items (29 pp).

O'Connor, Joel and Orville Terry. The Marine Wetlands of Nassau and Suffolk Counties, New York - 1972. Hauppauge, New York: Nassau-Suffolk Regional Planning Board, March 1972.

Inventories and classifies wetlands of Nassau-Suffolk Counties,

estimates changes in acreage since 1964. Identifies locations (by maps), area, and physical and ecological functions of wetlands necessary for planning and management decisions, such as governmental acquisition, definition of zoning regulations and recreational development. Bibliography 58 items (99 pp).

Cok, Anthony E. and Leslie A. Sirken. Investigation of Surface and Subsurface Sedimentary Deposits in Offshore Environments of Southern Long Island. Garden City, New York: Adelphi University Institute of Marine Science, 1973.

Describes methods used and results of research on geomorphology, sedimentology and stratigraphy in surface and subsurface sediments in the near and offshore regions of southern Long Island - the Ridge and Swale topography. Bibliography 6 items (18 pp).

Hair, Malcolm E. and Stuart Buckner. An Assessment of the Water Quality Characteristics of Great South Bay and Contiguous Streams. Garden City, New York: Adelphi University Institute of Marine Science, 1973.

Describes procedures and results of bi-weekly measurements of salinity, temperature, dissolved oxygen, dissolved phosphorus, particulate phosphorus, nitrate, nitrite, ammonia, and chlorophyl at 39 stations in Great South Bay over a seven month period. Comparison with previously available data with estimate of stability of various areas of the bay. Bibliography 33 items (59 pp) plus three appendices containing raw data.

Davies, D. S., W. Axelrod and J. O'Connor. Erosion of the North Shore, Long Island, New York. Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series No. 18, July 1973.

Description of beaches and bluffs of north shore of Long Island, inventory of natural characteristics and man made structures, character and effects of dynamic beach processes catalogued with recommendations as to steps to take to mininize damage to persons and property. Maps show station locations and erosion and accretion rates. Bibliography 99 items (101 pp).

O'Connor, Joel. Dredging and Spoil Activities in Nassau and Suffolk Counties, Long Island, New York. Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series (in press).

O'Connor, Joel and Paul Lin. Survey of Water Quality and Sediments in Six South Shore Bays of Long Island. Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series (in press).

O'Connor, Joel. Preliminary Considerations in Estuarine Monitoring Around

Long Island. Stony Brook, New York: Marine Sciences Research Center, State University of New York, Technical Report Series (in press).

Regional Marine Resources Council - Research Reports of Sea Grant Project, The Development of Methodologies for Planning for the Optimum Use of the Marine Resources of the Coastal Zone, by the Center for the Environment and Man, Inc., Hartford, Conn.

Ellis, Robert H., et al. Functional Step One, The Classification of Marine Resource Problems of Nassau and Suffolk Counties, April 1969.

Describes concept of Marine Resources Council Program, the definition and scope of marine resource problems, and method used for classifying problems identified in this first step, and provides an example of analysis and synthesis necessary in the next functional step of the program. Bibliography 21 items (65 pp).

Smith, Frank A., et al. Fourteen Selected Marine Resource Problems of Long Island, New York: Descriptive Evaluations. January 1970.

Identification and systematic description of 14 outstanding marine resource problems with indication of information needs. Bibliography 191 items (121 pp).

Cheney, Philip B. Functional Step Two, Knowledge Requirements. February 1970.

Categorization of knowledge requirements for development of marine resource planning into those pertaining to location and time specific information in the form of descriptive data, and those pertaining to the understanding of man environment (31 pp).

Ortolano, Leonard. Quality Standards for the Coastal Waters of Long Island, New York. April 1970.

Legal and other basis for water quality "standards", use in classifying L. I. waters, possibilities for refinement, recommendations for new sets of standards for marine resource management. Bibliography 15 items (26 pp).

Ortolano, Leonard and Philip S. Brown, Jr. The Movement and Quality of Coastal Waters: A Review of Models Relevant to Long Island, New York. July 1970.

Description of hydrodynamic, hydraulic and water quality models, state of the art of such models, and possible application to L. I. coastal waters. Bibliography 48 items (88 pp).

Cheney, Philip B. High Priority Research and Data Needs, Interim Functional

Step Four. November 1970.

Preliminary method of selection and list of high priority research and data collection programs considered vital to the solution of L. I. coastal problems and management of the coastal zone. Bibliography 8 items (14 pp).

McGuinness, W. V., Jr. and R. Pitchai. Integrated Water Supply and Wastewater Disposal on Long Island. February 1972.

Examination of natural hydrological systems, man's water supply and wastewater system and its effect on water quantity and quality, now and projected into the future. Development and analysis of alternative solutions regarding water supply/wastewater disposal problems. Bibliography 59 items (180 pp).

Bartholomew, F. L., and W. V. McGuinness, Jr. Coast Stabilization and Protection on Long Island. February 1972.

Description of shore topography and usage, erosion mechanisms, possible means of coast stabilization and management, solutions, need for further research, and suggested guidelines for controlling use. Bibliography 34 items (47 pp).

Dowd, Richard M. Dredging on Long Island. February 1972.

Dredging motivation, processes, environmental conditions changed and implications of the changes, suggested controls for managing dredging needs in acceptable manner. Bibliography 32 items (43 pp).

Green, Ralph F. Wetlands on Long Island. February 1972.

Wetlands characteristics, natural functions, uses by man, and natural and man-made changes, experience with various techniques for wetlands management and suggested guidelines for L. I.. Bibliography 54 items (80 pp).

McGuinness, W. V., Jr. State of the Art for Selected Marine Resources Problems on Long Island. February 1972.

Assessment of adequacy and availability of data and knowledge most relevant to planning and policy formations for four high priority marine resource problems: integrated water supply and wastewater treatment and disposal; coast stabilization/protection; dredging/dredge spoil disposal; and wetlands management. Bibliography 175 items (72 pp).

Pitchai, R. and W. V. McGuinness, Jr. A Proposed Problem-Oriented Marine Research Program for Long Island. February 1972.

Summaries of 77 research projects specifically relating to the solution of four high priority marine resource problems: integrated water supply and wastewater treatment and disposal; coast stabilization/protection; dredging/dredge spoil disposal; and wetlands management, with indicated costs and priorities. Bibliography 15 items (119 pp).

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