SECTION V

FLOODING AND EROSION POLICIES #11-17

A. INTRODUCTION

1. Flooding and Erosion Issues and their Evolution in East Hampton

As an island promontory surrounded by water, East Hampton is singularly exposed to forces of the sea and weather. The Town's 110 miles of shoreline are protected by fragile beaches, dunes and bluffs, and while these are the same scenic and recreational attributes that lure tourists and second homeowners to a resort community, they are also vulnerable to winter nor'easters and catastrophic hurricanes. The awesome natural forces of storm events can quickly transform scenic views and real estate assets into disaster areas and insurance liabilities.

Coastal flooding and erosion planning and policy in East Hampton have largely evolved in response to storms and other impacts of natural forces on development. Historically there has been less concern about episodic flooding and erosion in undeveloped areas where private property or public infrastructure were not at risk. This emphasis on protecting developed areas has masked the importance of maintaining unspoiled natural coastal features, both to sustain the Town's resort economy and because of their vital protective role in buffering the coast from flooding and erosion.

A consideration of flooding and erosion and the coastal processes that determine them depends, as does any problem, on the point of view from which it is seen. In *The Beaches are Moving*, a popular classic of coastal management, authors Wallace Kaufman and Orrin Pilkey portray the conceptual dilemma thus: "The nature of sand is to move. That is how it came to the beaches, how it blows from the beaches into the dunes, and how it washes from the dunes into the bays to form new salt marsh and forest. ...Those who live near the shore choose to say that a shoreline moving with the water toward their house is 'eroding.' ... Most geologists speak of beaches *retreating*. Barrier islands are said to *migrate*. Beach erosion, geologically speaking, is not usually a permanent loss, but a strategic retreat. ... The barrier islands which protect most of the Gulf and East coasts have existed continuously for thousands of years, but they have retreated many miles. ... Beaches are not stable, but they are in *dynamic equilibrium*. ...Dynamic equilibrium is not stability ... but a net balance among many changes." (Kaufman and Pilkey, 1979)

Anne Simon, author of *The Thin Edge, Coast and Man in Crisis*, published in 1978, puts it more poetically, "Sand meets water's force with its natural tendency to move; its soft answer turns away the sea's wrath. Waves energized by the sun, moon and wind crash on the wide expanse as they have done every day and night since the island was formed. The use of sand to receive and repel this merciless attack is a triumph of natural engineering. The smallest grain of sand is almost indestructible, especially when wet, keeping a film of water about itself by capillary action. Because of this liquid cushion, there is little further attrition. Even a heavy surf cannot cause one sand grain to rub against another."

"... For us, shifting sands is a convenient cliché but an inconvenient reality. We do not accept it. We call it erosion and engage the United States Army Corps of Engineers to fight it." (Simon, 1978)

The view of flooding and erosion as part of natural processes of dune, beach and bluff formation, as phenomena which should be adapted to, rather than fought against, arises from a long-term perspective of coastal processes. Again, Pilkey and Kaufman, "There are no catastrophes or disasters in nature. The powerful events that seem so unusual to us are disasters only because our lives are

short and our bodies fragile. ...Great storms, floods, landslides, and quakes are, in the grand scale of time, normal events recurring again and again, more or less regularly. ...'Disasters' are part of the dynamic equilibrium of the beaches."

"Storms, landslides, and tsunamis, despite their destruction, offer a valuable frame for human activity on the beaches. First, they provide a measure of the ultimate forces we will encounter. Second, because they can move the beaches in a matter of hours, they often tell us just how transient that landscape is. Like a painting in a good frame, human activity in the context of natural disasters appears with new clarity." (Kaufman and Pilkey, 1979)

In early times, neither the colonial settlers nor the native Montauketts built permanent habitations along the shore. Only within recent decades has land use changed to produce intense development pressure on the immediate coast, from a combination of a booming resort economy, population growth, modern construction techniques, and improved regional transportation and communication.

Siting of contemporary development has often failed to take into account coastal storms and the potential for damage from flooding and erosion. Following major storms, homeowners recognizing their precarious predicament have built structures designed to protect their property. However, attempts at erosion protection using groins, bulkheads and other hard structures have had detrimental effects on neighboring beaches or property and have often aggravated the erosion problems they were designed to prevent. Their legacy is seen in the disappearance of the sandy beaches adjoining erosion protection structures, a poignant loss for East Hampton, whose way of life and fishing and resort activities have always depended on unrestricted access to unspoiled beaches.

East Hampton has a rich tradition dating back to its origins as a colonial entity of maintaining coastal resources for all its citizens. The beaches in East Hampton are for the most part publicly owned and remain in fee title of the Town Trustees under the colonial Dongan Patent for the "Freeholders and Commonalty" of the Town.

East Hampton's north and south shores have greatly differing geography and geology with different weather exposures. Ocean swells breaking on the south ocean shore may travel from West Africa or Iceland, whereas the northern bay shores are primarily exposed to nor'easters with a more limited fetch. The Town's south shore ocean beaches are generally more dynamic because of the higher wave energies and greater quantities of sediment being transported. According to a 1988 study by the Marine Science Research Center of SUNY Stony Brook concluding ten years of ocean beach monitoring in East Hampton Village, beach width there can vary as much as 270 feet in a given year. (MSRC, 1988)

The Town's bay beaches, while more protected, are narrower and more fragile and may take longer to recover from storms. They are mostly fed by sediment from bluffs and headlands. In areas where residents have attempted to stabilize bluffs with hard structures, these sand sources have been restricted, and the resulting deficit in the local sediment budget has lead to further narrowing or elimination of the beaches.

Flooding and erosion in East Hampton's coastal zone are caused primarily by storms, and secondarily by other meteorological and coastal processes including wind and rain, tidal, littoral, and other hydrographic forces, sea-level rise, and the interactions of coastal geomorphology with development. Other causes of flooding and erosion include effects of development, and other human activities that interfere with coastal processes and sediment transport, such as inlet stabilization, and construction of erosion protection structures, particularly those perpendicular to the shore such as groins and jetties.

Flooding and erosion policy issues that have arisen in the LWRP process generally can be reduced to either 1) use conflicts, such as protection of private property versus preservation of public beaches and coastal resources; or 2) policy responses to natural forces, coastal and littoral processes, and effects of storm events and rising sea level.

Recognition of the realities of long-term coastal processes has come slowly to communities like East Hampton, along with a gradual conceptual shift toward adapting coastal planning to the inexorable forces of nature rather than, like King Canute, attempting to oppose them. Zoning, a primary tool for regulating land use in the coastal zone, was introduced in East Hampton in 1957, and was followed in the 1960's by local adoption of National Flood Insurance Program standards (as the Flood Hazard Overlay District), and coastal and wetland setback requirements. Some development that occurred before the advent of zoning and setbacks was, in hindsight, poorly conceived and hazardously sited. Pre-zoning setbacks were more often dictated by the excellence of a water view than potential flooding or erosion, and setbacks themselves were only gradually implemented and increased through progressive revisions of the zoning code. Under earlier laissez faire policy, coastal owners were allowed a free hand in protecting upland property, often at the expense of neighbors and of public recreational resources. To protect these resources the Town in 1984 instituted a system of Natural Resource Special Permits for coastal construction. Formulating coastal policy for the Town remains an ongoing process, of which this Local Waterfront Revitalization Program (LWRP) is the most recent addition.

On a national level perceptions and policies relating to flooding and erosion have also evolved, as noted in this excerpt from the *NYS Coastal Erosion Task Force Report*:

> **[Federal] Policy trends**
> "Prior to this century, there were no pertinent federal programs, which meant individuals occupied coastal locations at their own risk. After a series of severe storms in the first half of this century, hard shoreline protections projects by the Corps of Engineers became the general response to erosion. Increasing cost of construction, a poor success rate for hard structures, and a burgeoning shoreline population during the 50's and 60's began shifting the policy from coastal "hardening" to "soft" solutions to coastal hazards such as beach nourishment. This shift was facilitated by a growing body of scientific information on coastal processes and the response of coastal morphology. As scientific evidence of how man had altered natural processes along the coast grew, environmental groups began to push for legislative changes to protect the shoreline. This trend continued, as evidenced by implementation of the NFIP and CBRA. Recent proposed amendments to the NFIP suggest

that this policy approach of non-structural solutions will continue. Only recently has the federal government recognized erosion as a hazard in its own right. Erosion is no longer viewed as a short-term hazard resulting from storms but a chronic problem. This recognition has drawn attention away from trying to control erosion and focused it on altering design and location of coastal development to accommodate erosion. The advantage of this focus is that over the long run it will result in a cost savings to governments and taxpayers." (NYS DOS, 1994, Vol. II, p. 63)

2. Policy Goals

Overall policy goals for these **Flooding and Erosion Policies** are to maintain the public interest in coastal resources and protect the health and safety of Town residents. The Town's primary policy objective is to maintain or enhance the protective capacity of its natural coastal features, with due regard for the needs of individual property owners. The overriding concern is to preserve and protect this unique and unusually exposed bit of earth's surface at its critical interface of land and sea.

In producing this report, the Town of East Hampton has attempted to learn from mistakes of the past, assess current mainstream thinking on flooding and erosion solutions, and consider a planning horizon of several decades to preserve coastal resources. The wisdom of the policies will ultimately be judged by the hindsight of posterity. Great care and effort have been taken to analyze and understand the dynamics of the Town's coast with the resources presently available.

In the face of recurrent storm damage and shoreline recession, when future sea-level rise may accelerate due to global warming, a priority goal is to maintain the dynamic equilibrium of natural protective features, beaches, bluffs, dunes, wetlands and native vegetation. In practice, this approach to flooding and erosion problems leads to an emphasis on non-structural and soft solutions which will not disrupt coastal processes or damage natural protective features. In some instances, in order to both maintain natural features and protect homes and other shorefront development, a strategic retreat of development from receding shorelines is the preferred approach for flooding and erosion protection.

This is the policy thrust of the New York State Coastal Program and of the *NYS Coastal Erosion Task Force Report* (NYS DOS, 1994), and increasingly of national and local policy in other coastal areas. The *NYS Coastal Erosion Task Force Report* summarizes the State policy evolution:

"The most significant trend in New York's coastal hazard programs has been the shift from reliance on purely technical and engineering solutions to accommodation of natural processes. ...there is growing recognition that resource protection policy should be moving in the direction of doing no damage to coastal processes, which means mitigating downdrift effects of engineered modifications of the shoreline. The net result of this trend would be to return coastal processes to a more natural state.

... As a result of these trends, an informal policy of moving back from the coastline in some areas and protecting other areas where the cost of protection is justified by the public benefits preserved has emerged. This approach does not accommodate the extreme options of

> wholesale retreat and abandonment of hazard areas on the one hand, nor total shoreline fortification on the other. Given limited state and local budgets, it uses cost/benefit decisions to create a balanced response to coastal erosion." (NYS DOS, 1994, Vol. II, pp. 75-76)

The Inventory and Analysis section of this report is designed to provide a picture of existing flooding and erosion conditions in the Town, to highlight vulnerable areas and develop an information base for the Policies, to recommend ways to minimize future damage from flooding and erosion and to protect the natural features that are the primary defense against these forces. Future changes in storm activity, rising sea level, and patterns of development may require great flexibility on the part of residents and government alike. Saltmarsh areas where sea level rises faster than sediment can be deposited, and low lying areas around the bay will likely be the most vulnerable to submergence and flooding.

Planning and decision making for flooding and erosion in the Town's coastal zone necessarily has both short and long-term components, short-term in response to storms and long-term for littoral and geologic coastal processes. A 30-year planning horizon is useful for most structures and storm events, and is employed by the New York State Coastal Management Program. It is also important to gain a longer term perspective through practices such as historical shoreline change analysis to discern localized erosion trends, and to establish baselines for monitoring future erosion, sea level rise and effects of storms. The Town is beginning to perform this type of work (see Erosion Monitoring in **Projects**) but little information is available as yet, and remains beyond the present scope of this report.

Such studies should be utilized as they become available to amplify this inventory, revise the analysis and redefine policy on a periodic basis. As coastal systems are constantly in transformation, the LWRP should also be adaptable to dynamic conditions of the shore, and be revised as understanding of coastal processes improves. Until such data are available, East Hampton should take a conservative approach to protecting the coastal resources that are vital to the Town's economic and physical well-being.

A number of issues and resulting recommendations identified in the Inventory and Analysis are not directly addressed by policies of the LWRP. Examples include reconstruction and redevelopment in the wake of a catastrophic storm event; remediation for deteriorated natural protective features such as eroded beaches, dunes and road ends; long-term ramifications of rising sea level and consequent implications for setback requirements and habitat protection; and coastal zone insurance problems related to storm damage and flooding and erosion concerns. A number of these problems will be addressed by LWRP **Project** initiatives and several are being covered by Town projects currently underway or included in recent grants to the Town. (See **Projects**.)

3. Methodology

The Inventory examined conditions for flooding and erosion in the Town reach by reach. A matrix to identify significant flooding and erosion related features was formulated and completed for each reach. The reach boundaries are consistent with the other sections of the LWRP, which divide the Town into geographically associated areas. They are not specific to coastal processes that cause

flooding and erosion, or to a division of the coastline into littoral cells or geomorphic units. Further delineation of the coast by shoreline type, wave energy, sand transport patterns or other coastal processes that define coastal geomorphology is described within the reach narrative, but may overlap from reach to reach.

Resources used in the Inventory include 1:200 color aerial photographs, National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM's), maps for the Coastal Barrier Island Resource Areas (CBRA zones), NYS Coastal Erosion Hazard Area Photo Maps, US Army Corps of Engineers (ACOE) Sea Lake and Overland Surge from Hurricanes (SLOSH) Maps, 1974 Suffolk County Five Eastern Towns Topographic Maps, and other references and anecdotal information provided by Town Planning and Natural Resource Department staff. Actual conditions in most areas were verified by field inspections. On October 17, 1994, an aerial video inventory of the Town's coastline was undertaken by helicopter in cooperation with the Air National Guard, the Peconic Estuary Program, The Nature Conservancy, and the Group for the South Fork with a grant from the Nathan Cummings Foundation.

The inventory was undertaken using available resources with the recognition that more detailed information would be helpful. Data on historical shoreline change, through photogrammetric analysis and surveying, and sediment budgets, including transport paths, is needed to help define erosion hazard zones. The Town is working to acquire this information in the Erosion Monitoring Project (see **Projects**).

Recommendations in the analysis were designed to err on the side of caution in protecting coastal resources, and to balance the public interest of access to resources with the right to protect private property. Specific recommendations are found in several sections including: Reach Analyses; Townwide Issues and Recommendations; Vulnerable Areas, Issues and Recommendations; and Policies.

To help visualize recommendations for treatment of erosion protection structures, they are represented graphically on Map V-2, Flooding and Erosion Protection. The recommendations are designed to both preserve or enhance coastal resources and natural protective features and to protect upland property. The map is based on the detailed discussions and recommendations in the Analysis sections and on general observations on the interaction of structures and coastal processes. As depicted on the map, areas of the Town's coastline were designated with one of three categories reflecting coastal conditions and resultant policy recommendations:

Condition 1: Area predominantly contains no shore-parallel hard structures.

Recommendation 1: Do not allow new hard structures. Existing shore parallel structures are to be replaced only under conditions of exceptional hardship. Do not replace groins and other perpendicular structures, except where used to protect navigational channels.

Condition 2: Area with existing hard structures which are isolated or discontinuous and where natural protective features could furnish erosion protection, or the structure is interfering with access to public beaches, or unduly interrupting coastal processes.

Recommendation 2: Do not issue permits automatically for rebuilding or emergency replacement of structures. Analyze erosion protection function of structure versus natural or non-structural protection. Some shore-parallel structures should not be replaced. Do not replace groins and other perpendicular structures, except where used to protect navigational channels.

Condition 3: Area with existing hard structures and minimal natural protection where structures provide the only remaining protection against flooding or erosion, provide public access, or preserve a public water dependent use.

Recommendation 3: Structures may be rebuilt in-place in-kind under an emergency permit, or modified with full NRSP permit review, in order to mitigate adverse effects on neighboring property or resources. Do not permit expansion of structures into larger or more permanent types, e.g. from bulkheads to rock revetments; however, soft or non-structural solutions may be used to enhance protection or restore resources. Do not replace or permit groins and other perpendicular structures, except where used to protect navigational channels.

The analysis and recommendations apply to existing conditions, and for storm events within the 30-year storm parameters that conform with State policy requirements. If a larger storm or catastrophic storm event occurs, post-storm redevelopment should be evaluated in the context of a Town *Hurricane Damage Mitigation Plan* or *Hazard Mitigation Plan* (see **Projects**).

4. Historical Storm Record

Hurricanes and severe winter storms have been recorded in the area since the earliest colonial records, with relative lulls of years or decades punctuated by periods of intense storm activity. Before East Hampton's settlement, a 1635 account by Governor William Bradford of Plymouth Colony in Massachusetts records "a mighty storme of wind & raine, as none living in these parts, either English or Indeans, ever saw". It was accompanied by a 20-foot storm surge and winds that "blew downe many hundred thouwsands of trees" (Pennybacker Collection, 1939) Although colonial records are understandably spotty, anecdotal accounts by the settlers on Long Island record storms throughout the 1700's and 1800's, including a "tremendous gale" in 1723, a hurricane in September 1782, the Christmas Storm of 1811, the Great September Gale of 1815 which was characterized as the "worst and most destructive hurricane ever known in these parts" (Pennypacker Collection, 1939), and the Great Blizzard of 1888, among others.

Hurricanes and severe storms are by no means infrequent visitors to Long Island. The National Hurricane Center (telephone conversation 5/93) records twenty-six tropical cyclones or hurricanes hitting Long Island since 1886. Fred Anders, Coastal Hazards Specialist for the NYS DOS notes that winter nor'easters have numbered at least sixty-five in the last century, with nine classed as severe and one extremely severe (3/62) (Hurricane Conference 11/92). Recent severe nor'easters include the Halloween Storm of October 1991, and the winter nor'easters of December 1992, March 1993 and December 1994. A recent article by Dolan and Davis (1994) notes that the past decade has been characterized by frequent major northeasters, and that the trend appears to be continuing.

Twentieth century records are marked by the hurricane of September 21, 1938, "The Atlantic Express", which made landfall at Westhampton and killed more than 700 people along the east coast, devastating beaches and property. East Hampton has been hit by numerous other hurricanes and storms since (an unnamed hurricane in 1944, Carol and Hazel in '54, Donna & Edna in the early '60's), but none packing nearly the force and untoward loss of life and property as the '38 Hurricane.

While understanding of hurricane dynamics and satellite tracking and warning systems have improved dramatically in recent decades, it should be noted that East Hampton has been spared storms of catastrophic magnitude since '38. Moreover, on the present Saffir/Simpson scale (see next page) the '38 Hurricane would have been a Category 2, or possibly 3, with winds of 95 m.p.h. By comparison, Hurricane Hugo, which struck the Carolinas in 1989, was a Category 4 storm, packing winds up to 135 m.p.h. The storm surge elevations recorded in '38 (excluding the wind-driven waves on top) were 11.9 feet and 14.7 feet at Westhampton Beach and Montauk respectively, whereas the ACOE SLOSH (Sea Lake and Overland Surge from Hurricanes) Model indicates that a Category 4 hurricane would, on it's eastern side, carry a surge in excess of 20 feet. While Category 4 and 5 hurricanes are relatively unlikely in the cooler waters of the north Atlantic, a fast moving Category 3 storm can produce similar effects (Coch, 1994). Given the sixty years since the '38 hurricane, the level of complacency about hurricane hazards in East Hampton is alarming. Homeowners along the low sandy beaches of East Hampton may be unaware that these areas were completely overwashed in the '38 hurricane.

Though major storm events that caused erosion, property damage and power outages, recent hurricanes have had relatively less impact on East Hampton's coastal zone. Both Hurricane Belle (1976), and Gloria (1985), with maximum winds up to 150 m.p.h., lost energy before landfall and hit at low tide, which lessened their impact. Hurricane Bob (1991), whose eye passed just east of Montauk, also arrived near low tide, and its eastward curving track spared East Hampton its full effect.

Long Island's geography and East Hampton's particular location increase vulnerability to hurricanes. Because of the Island's east-west projection into the Atlantic, hurricanes following the warm waters of the Gulf Stream north tend to meet the coastline at right angles, in a coast-normal path, rather than the glancing impact common to the north-south coasts of the Carolinas. Since a hurricane's cyclonic motion is counter-clockwise, the storm's forward motion and cyclonic wind velocity are theoretically additive on the right side, increasing storm surge and wind speed to the east, though precisely to what extent is unknown. For example, the '38 “Atlantic Express” Hurricane had wind speeds of 95 m.p.h.,

coupled with unusually high forward velocity of 60 m.p.h., theoretically adding up to a wind velocity on the East Hampton side of 155 m.p.h. and increasing the storm surge at Montauk to almost 15 feet. Dr. Nicholas Coch, a coastal geologist at Queens College, as reported in a New York Times article 8/23/94, and in the Journal of Coastal Research (1994), discusses the meteorological conditions that contribute to such high velocity storms. He also notes that because of the right angle formation of the New York Bight, wind-driven waters from a hurricane will tend to pile up here, again increasing the storm surge. "Higher damage potential exists because hurricanes at high latitudes typically move faster and they have historically approached the coast of the northeastern U.S. at a high angle; this trajectory results in maximum damage that extends far inland. In addition, the northeastern U.S. has a highly populated and developed coastline where few people are aware of the catastrophic regional damage that resulted 55 years ago from the last great storm, the 1938 Long Island-New England Hurricane." (Stevens, 1994)

Table V-1: SAFFIR/SIMPSON HURRICANE SCALE

Category	Central Pressure	Winds	Surge	Frequency	Damage
1	> 28.94 In	74-95 MPH	4-5 Ft	19 Yrs	Minimal
2	28.50-28.91 In	96-110 MPH	6-8 Ft	44 Yrs	Moderate
3	27.91-28.47 In	111-130 MPH	9-12 Ft	79 Yrs	Extensive
4	27.17-27.88 In	131-155 MPH	13-18 Ft	180 Yrs	Extreme
5	< 27.17 In	> 155 MPH	>18 Ft	480 Yrs	Catastrophic

Category 1. Winds of 74 to 95 miles per hour. Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real wind damage to other structures. Some damage to poorly constructed signs. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.

Category 2. Winds of 96 to 110 miles per hour. Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings; some window and door damage. No major wind damage to buildings. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.

Category 3. Winds of 111 to 130 miles per hour. Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes destroyed. Serious flooding at coast and many smaller structures near coast destroyed; larger structures near coast damaged by battering waves and floating debris.

Category 4. Winds of 131 to 155 miles per hour. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows, and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Major erosion of beaches.

Category 5. Winds greater than 155 miles per hour. Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Very severe and extensive damage to windows and doors. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings overturned or blown away. Complete destruction of mobile homes.

(Sources: National Hurricane Center, New York State Hurricane Evacuation Study, 1993)

The relative lull in recent years of severe hurricane activity and accompanying flooding and erosion may not be indicative of future trends. The U.S. Weather Service predicts that during the 1990's the frequency and intensity of Atlantic hurricanes will increase. In the New York Times article above, Brian Jarvinen, a research meteorologist at the National Hurricane Center, estimates that "based on climatology you'd expect to see a hurricane in the region every 12 years" on average. Based on the Long Island Regional Planning Board's Hurricane Damage Mitigation Plan (1984), there is a 96% chance of a major tropical storm on the east end in any given ten-year period.

Severe erosion, particularly on the Town's northern bay reaches, has resulted from recent winter storms, particularly the Halloween Storm of October, 1991, and the December 11, 1992, March 1993 and December 1994 nor'easters. Damage was extended as these storms lingered for days, pushing wind-driven water into the bays without respite on successive high tides. While wind velocities are less in nor'easters than hurricanes, they are generally larger weather systems, and the extended duration of wave action increases the potential for damage. Nor'easters also occur more frequently than hurricanes, and the combined effect of two or more storms in succession on beaches that have not had time to rebuild can be as devastating or more so than a hurricane.

The *NYS Coastal Erosion Task Force Report* described the December 11, 1992 nor'easter:

> "... Along the portions of the south shore of Long Island, the nor'easter generated wind velocities that exceeded Category 1 hurricane force (74 miles per hour). Wind speeds at Montauk Point, Tobay Beach, Orient Point and Ambrose Light were over 80 miles per hour. Strong northeasterly winds pushed ocean waters toward the State's Atlantic coasts and into Long Island Sound through 4 tide cycles. The sustained storm surge reached impressive peaks during high tides. The National Weather Service estimated 15 to 25 ft. seas on the ocean and 10 to 15 ft. seas on Long Island Sound. At Willets Point, on Long Island Sound, Queens, the tide gauge recorded a maximum water level of 11.2 ft. NGVD, a reading exceeded only by those of the 1938 Hurricane and Hurricane Carol. The tide gauge at the Battery on the southern tip of Manhattan recorded a maximum water level of 8.0 ft. NGVD, its fifth highest recording. Elevated water levels continued throughout the region for several

days following the storm. The tidal surges combined with high winds and heavy rain inflicted widespread damage." (NYS DOS, 1994, Vol. II, p. 42)

Planning for potentially increasing frequency and severity of catastrophic storms should be reexamined and consolidated in a Town *Hurricane Damage Mitigation Plan* or *Hazard Mitigation Plan* (see **Projects**). Such plans will focus not only on deployment of emergency resources and post-storm recovery, but also designate critical infrastructure, examine stormproofing in building codes, look at vulnerable areas where post-storm reconstruction may be undesirable, provide incentives for relocation, etc.

5. Storm Related Insurance Concerns

In the wake of losses estimated at $16.5 billion from Hurricane Andrew in Florida in August, 1992, insurance companies are reassessing risk exposure to severe storms and hurricanes along the rest of the east coast, with particular implications for Eastern Long Island. As a majority of losses from Andrew were wind rather than flood related, and covered by private homeowners' policies rather than Federal Flood Insurance, companies are taking a new look at potential losses from "windstorm" damage and taking a variety of steps to reduce exposure on Long Island, including ceasing to issue new policies in the coastal zone, a practice known as "shorelining".

Results of a "*Long Island Homeowners Windstorm Underwriting Survey*" by the Independent Insurance Agents Association of Suffolk County, updated as of September 19, 1994, that lists companies controlling over 90% of the Long Island insurance market, are summarized as follows:

"1) Companies that control 45% percent of the market (of the total market survey) are not providing a viable market for new homeowners policies on Long Island.
2) Companies that control 62 percent of the market (of the total market survey) are not providing a viable market for new homeowners within one mile of the water.
3) There is no viable market (except for Chubb on occasion), for risks less than 1000 feet from tidal water.
4) Between Allstate, Travelers, Continental, Excelsior, and USF&G there is a desire to terminate 8.4% of the total market, which will affect the owners of 78,000 one and two family homes." (IIAASC, 1994)

Lack, or unavailability, of homeowner coverage could severely inhibit the Town's ability to recover in the aftermath of a catastrophic storm, if home and business owners do not have resources to rebuild. A worst-case scenario is that damage from winter storms, as experienced in '92-94, would cause already skittish insurers to withdraw from the local market leaving many homeowners uncovered, and exposed to a hit by a major hurricane or winter nor'easter. This potential insurance shortfall should be examined further in the *Hurricane Damage Mitigation Plan* (see **Projects**).

While insurance unavailability is generally a problem now only when properties change ownership, the situation could rapidly become epidemic if a big storm causes widespread losses to insurance companies with extensive exposure on Long Island. It should be emphasized that this problem affects not only waterfront homes, but those within 1000 feet, and in some cases a mile, of the water,

which includes most if not all development in the Town's coastal zone. These deficiencies also have the potential to restrain real estate transactions, since most mortgages are contingent on issuance of homeowners insurance. The potential impact on the real estate industry in East Hampton, a major segment of the local economy, could be substantial.

Present state insurance regulations do not permit underwriters to discriminate through premium differentials for higher risks such as coastal properties. This policy may require reexamination if homeowners insurance becomes widely unavailable in the coastal zone. While there is some attraction to allowing market forces to underscore the risks of building on the immediate coast, government continues to have an obligation to protect the safety and well being of citizens and their property. In most disasters the taxpayers become the insurers of last resort, so from the standpoint of fiscal responsibility it also behooves government to make sure that private insurance remains available.

A 12/28/93 front page New York Times article notes, "...insurance companies are paying for a five-year program to evaluate local building codes across the country and the extent to which the codes are enforced." The NYS Coastal Erosion Task Force recommended developing coastal storm related improvements to the state building codes. The Town should monitor and evaluate recommendations in this area, for instance requiring hurricane straps for roof rafters, and ensure that local building codes remain in compliance with industry standards to minimize insurance costs for residents. Specific standards might appropriately be addressed in the *Hurricane Damage Mitigation Plan* (see **Projects**).

6. Climate Change and Sea Level Rise

Temperature, wind and weather, the set of climatic assumptions on which we base our present understanding of flooding and erosion phenomena, may be changing on a global scale which will ultimately have effects locally. A recent article in Science News opens with the following: "The fever is back. Two years after Mt. Pinatubo's 1991 eruption cooled it down, Earth's temperature has once again soared. According to the British Meteorological Office, which tracks land and sea surface conditions, Earth's average temperature in 1994 climbed 0.31°C above the mean for 1951 to 1980. That makes last year the third warmest since the late 1800's, as far back as global records reach. First and second place belong to 1990 and 1991, which followed on the heels of a marked rise that began in the mid-1970's. Global warming has officially returned."(Monastersky, 3/11/95)

The changing climate factors may exert an increasing influence on future flooding and erosion in East Hampton. Changes in levels of atmospheric carbon dioxide, methane, chlorofluorocarbons, and other gases released by human activities are expected to raise the earth's average surface temperature through a mechanism commonly called the greenhouse effect. Resulting thermal expansion of the oceans and melting of glaciers and polar ice sheets is expected to accelerate global sea level rise, with locally varying impacts.

The effect of sea level rise on coastal flooding and erosion depends on both the present rate of relative sea level rise and possible future rates. Assessment of sea level trends and their effect is dependent on the time span observed. For instance, research on the South Carolina coast by

Colquhoun and Brooks (1986) shows at least six major fluctuations in sea level over the past 20 million year span. The *NYS Coastal Erosion Task Force Report* states that, "Based on continued refinement of available data, the most recent estimates of relative rise (Emery and Aubrey, 1991) for this region show rates of approximately 0.14 inches/yr in New York Harbor and 0.07 inches/yr at Montauk Point." (NYS DOS, 1994) These annual increments may be evidenced in a gradual but inexorable loss of shoreline over decades. Within a 30-year planning horizon this may amount to significant shoreline retreat. By some calculations (e.g. Coch, 1990) a 3-6 inch rise in sea level could cause 25-50 feet of shoreline recession.

Kaufmann and Pilkey note that, "As sea level rises, islands and beaches do not stand still and allow water to pass over them. Like a well disciplined retreating army, they move back through a series of complex maneuvers. These include inlet formation during storms, inlet tidal deltas, inlet migration, overwash, and dune formation. Engineers who know geology estimate that for every one foot rise in sea level the beach retreats anywhere from a hundred to a thousand feet." (Kaufman, Pilkey, 1979)

The rate of global warming, the amount of future sea level rise and the degree to which they may be accelerating are the subject of extensive debate in scientific, popular press and policy arenas. A December 25, 1989 issue of Forbes Magazine pointed to deficiencies in current climate modeling, "The major weakness of the models is their assumption that the CO_2 buildup is the significant climate variable ... cloud cover is at least 100 times more powerful in affecting temperatures than greenhouse gases and is infinitely variable." (Brooks, 1989)

Emery and Aubrey (1991) note the difficulties in extracting reliable trends from existing data: "Both worldwide and regional examinations showed the trends of change in mean annual levels to be too variable for those trends to represent a simple eustatic rise of sea level caused by return of glacial meltwater or by heating of ocean water through climatic warming during post-glacial or even during the span of the industrial revolution (the greenhouse effect).

[Summary:] Our analysis shows that the signal of a possible eustatic rise of sea level is obscured by "noise" caused mainly by movement of the land beneath tide gauges; thus, study of the "noise" is a potential source of information about modern movements of the Earth's crust - especially of plate tectonics. ...At present, we cannot discover a statistically reliable rate for eustatic rise of sea level alone, but it may not matter to the sea-front property owner whether his house becomes flooded because of a rising sea or a sinking coast.

The present rate of relative sinking of land levels along coasts is less than a tenth of that during the time of fastest melt and retreat of late Pleistocene ice sheets, and more than 10 times the average for the past 50 m.y., during most of which the effects of glaciation were absent and geological agents alone were effective. In addition, many present coastal changes (erosion of beaches, collapse of sea cliffs, disappearance of salt marshes, sinking of some coastal cities, siltation of harbors, and others) are caused more by indirect and unexpected results of human activities than to changes of sea level or land level. Most coastal instability can be attributed to tectonism and documented human activities

without invoking the specter of greenhouse-warming climate or collapse of continental ice sheets." (Emery, Aubrey, 1991)

Dr. Rhodes Fairbridge, former chairman of the Geology Department of Columbia University, a local resident and long-time observer of the coastline, comments that he has discovered no discernible rise in local sea level based on Montauk tide gauge records (personal communications 5/22 and 6/14/95, public comments 6/23/95). He believes fluctuations in mean sea level (MSL) are tied to existing climate, astronomical and geological cycles such as the El Niño current, sunspot and lunar cycles and tectonic phenomena, and that although global warming is a reality, it's effects on MSL are not yet apparent and cannot be anticipated with precision. He believes they should be considered as minimal for planning purposes.

Many scientists believe climate change and sea level rise will accelerate over the next century, but disagree on the timing and magnitude of such change. Early 1980's estimates of a 2-7 foot rise in sea level over the next 50-100 years have been pared to a more conservative 1-3 foot figure as climate models have become more sophisticated. A United Nations Intergovernmental Panel on Climate Change report, written by more than 140 prominent scientists and reviewed by an additional 230, currently projects sea level rise over the next century of less than 2 feet (NYS DOS, 1994). Dr. Fairbridge believes even 0.5 m (1.5 ft) is high, and that the actual amount of sea level rise may be closer to 10 cm (4 in).

"These are substantial reductions, but the projected changes in global-mean temperature and sea level are still very large. For comparison, the warming corresponds to a rate roughly five times that observed over the past century, and the sea level rise is at a rate roughly four times that estimated for the past century." (Wigley and Raper, 1992)

Interestingly, recent data from Greenland ice cores, said to reflect the climate record for the previous inter-glacial subdivision, which began around 130,000 years ago and lasted about 10,000 years, point to larger and more rapid climatic fluctuations than at present, an indication that the more or less steady state of the earth's climate in the last 300 years since the "Little Ice Age" may be the exception rather than the rule. "At one point between the last two glacial epochs, the climate melted enough polar ice to raise sea levels some 30 feet. As noted by a member of the drilling team, Dr. David A. Peel of the British Antarctic Survey, it was so warm in England that hippopotamuses wallowed in the Thames and lions roamed its banks." (New York Times, 7/15/93). Subsequent analyses of the same Greenland ice cores have contradicted this hypothesis, however, other indicators for the previous interglacial, such as pollen in lake sediments or minerals in deep-sea sediments, provide support for violent fluctuations in the climate. This work opens the possibility that global warming due to pollutants could trigger inherent instabilities in the system with uncertain consequences (New York Times 11/1/94, Science News 7/30/94 and 10/29/94).

There remain inherent uncertainties and distortions in present climate models. Even with supercomputers, attempting to replicate complex and chaotic atmospheric, terrestrial and oceanic systems of immense variability is difficult. Despite the uncertainties, it seems clear that the primary greenhouse gas, CO_2, will double in concentration sometime in the next century, and that without

limits on carbon emissions, the consensus is that climate will warm by roughly 1°C by 2025, and 3°C by the year 2100 (NY Times 11/1/94 and Science News 9/24/94). Even within the range of uncertainties of the models, these forecasts and their consequent implications for sea level rise represent significant long-term impacts on our coastal systems, which should be considered in public policy.

For planning purposes these uncertainties are best addressed by a periodic reexamination of data and planning options, and by pursuing policies that maintain maximum ability to adapt to potential increases in sea level within a reasonable cost framework. Evaluation of development or public works in the coastal zone should consider potential effects of sea level rise and include response options such as relocation of structures, allowing for migration of wetlands, saltwater infiltration of aquifers, etc.

In the abstract for a 1991 paper entitled "*Global coastal hazards from future sea level rise*", Vivien Gornitz of the NASA Goddard Space Flight Center Institute for Space Studies and Columbia University evaluates some of the possible (though not necessarily probable) effects of sea level rise:

> *Coastal inundation*
> "A rise of sea level between 0.3 and 0.9 meters (1-3 feet) by the end of the next century, caused by predicted greenhouse climate warming, would endanger human populations, cities, ports, and wetlands in low-lying coastal areas, through inundation, erosion and salinization. The consequences of a global sea level rise would be spatially non-uniform because of local or regional vertical crustal movements, differential resistance to erosion, varying wave climates, and changeable longshore currents. ... Sea level rise may accelerate 3-8 times over present rates, within the next century.
>
> The permanently inundated coastal zone would extend to a depth equivalent to the vertical rise in sea level. Major river deltas, coastal wetlands and coral islands would be most affected. Episodic flooding by storm waves and surges would penetrate even farther inland. Beach and cliff erosion will be accentuated. Saltwater penetration into coastal aquifers and estuaries could contaminate urban water supplies and affect agricultural production."
>
> *Wetlands migration*
> The paper goes on to note that, "Coastal wetlands will be among the most severely affected ecosystems, since these form largely in the intertidal zone. The response of salt marsh to rising sea level depends on the relative rates of submergence vs. vertical accretion or sedimentation. A marsh may maintain its areal extent or even grow in the face of sea level rise, if sedimentation rates at least match submergence rates.
>
> ... Under extremely high rates of sea level rise (2.2 meters by the year 2100), 73% of all U.S. wetlands existing in 1975 would be inundated, based on a sample of 57 coastal sites ... This loss could be reduced to 56%, by the formation of new wetlands further inland. Under a

lower sea level rise scenario (1.4 meters), a 40% inundation could be reduced to 22%, by inland migration of wetlands.[1]

Storm frequency
... A rise in mean sea level will result in a greater frequency of occurrence of a storm surge at a given height. For example, a 4 meter surge is calculated to occur at Hoek van Holland, on average once in around 250 years. If sea level were to rise by 1 meter, a surge of only 3 meters would be needed to reach the 4 meter level. The 3 meter surge has a frequency of occurrence of approximately once in 50 years. Possible changes in tidal range, storm frequency and storm tracks may require revision of present surge recurrence curves.

Erosion rates
... The rate and extent of coastal erosion is expected to intensify as a result of increased sea level rise.

... In some cases, projection of historical shoreline erosion with respect to local sea level changes may be the most feasible approach to predicting future trends. ... this method accounts for the inherent variability of shoreline response, based on varying coastal geomorphology, beach composition and exposure to waves and tides.

Saltwater intrusion
... Sea level rise will also promote saltwater intrusion into coastal aquifers. Along barrier coasts... a freshwater lens overlies saltwater. According to the Ghyben-Herzberg-Dupuit model, the freshwater lens is forty times thicker than the elevation of the water table above mean sea level. Thus, each increment of sea level rise will reduce the freshwater capacity by 40 times. ... Any coastal erosion would further reduce the freshwater storage, with serious consequences for the water supplies of small islands and coastal dune areas.

Affected zone
... While the elevation zone within 1 meter faces the highest probability of permanent inundation, the coastal strip within 5 meters of present sea level is also at high risk to above normal tides from severe storm surges." (Gornitz, 1991)

Based on an analysis by Gornitz, parts of Long Island are in the highest (4%) risk category for sea level rise impacts.

In a paper, "*Probable Effects of a Storm Like Hurricane Hugo on Long Island, New York*", Coch and Wolff discuss potential effects of climate change on Long Island:

[1]This assumes that wetlands are free to migrate inland, which is not the case if bulkheads block their path.

> "If global warming does occur, it has two important consequences for coastal areas (Titus, 1986). The immediate consequence is that the greater concentration of heat in the mid-latitudes will create warmer ocean surfaces. This provides a greater heat exchange with the atmosphere -- causing a potential increase in the frequency and intensity of hurricanes. The consequences for Long Island are that stronger, and more frequent hurricanes will affect this area in the future. The long-term result of global warming is that sea level will rise as a result of increased melting of polar ice as well as the expansion of ocean water itself as it is heated. The rate of sea level rise ... is now predicted to increase to 1-4 feet during the next 100 years. Few scientists doubt that sea level will rise in the future. However, the rate of sea level rise, as well as the rate of global warming, is still a matter of dispute at present. ... While a rate of sea level rise of one foot per century may seem inconsequential to some, the geometric realities are not. A one foot rise in sea level along a very gently sloping coast such as Long Island's will result in a 100-foot landward displacement of the shoreline!" (Coch and Wolff, 1990)

While planning inherently deals with an uncertain future, overall these climate factors point to an increasing risk of flooding and erosion in coming years, and a need for planning procedures better adapted to receding shorelines and more frequent catastrophic storms. However, whatever risks future climate change and consequent sea level rise ***may*** pose, ***present*** storm activity and existing sea level rise already constitute great risks and problems for development in the coastal zone, and should be given more consideration in management decisions. Wherever possible, decision makers should embrace options that are adaptable to future sea level rise.

It is arguably easier to incorporate such measures into Town comprehensive planning before sea level rises to threaten existing resources and property. As James Titus, director of the Environmental Protection Agency's Sea Level Rise project, notes, "Political feasibility may be enhanced because it is easier to reach a consensus when no one is immediately threatened. Moreover, such planning reduces risk to investors: although they still face uncertainty regarding climate change and sea level rise, planning can prevent that uncertainty from being compounded by uncertainty regarding how the government will respond." (Titus, 1990)

As data accumulates and the uncertainties of climate models are reduced, the Town should reexamine flooding and erosion related planning and zoning measures, such as waterfront and wetland setbacks and larger lots to permit relocation, at regular intervals of a decade or less. Planning measures should be considered now to preserve future options for wetland and species migration, and protection of critical features such as beaches, and drinking water aquifers and major infrastructure such as transportation arteries. While it is difficult to predict how complex and poorly understood natural systems such as wetlands will react to rapid rise in sea level, the high value of these ecosystems to fisheries, habitats and the local recreational economy compel a major effort to monitor and understand them and to provide adequate natural buffers. Unfortunately our bay shorelines are often bulkheaded, preventing inland migration of beaches and wetlands.

Although research on large scale phenomena such as climate change and regional coastal processes is better done at the State and Federal level, future projects of the LWRP such as the *Town Coastal*

Erosion Monitoring Program and a *Hurricane Damage Mitigation Plan* (see **Projects**) will improve planning procedures to better address local flooding and erosion concerns on a long-term basis.

7. Coastal Topography and Geomorphology

As part of the South Fork of Long Island, East Hampton Town consists geologically of a bedrock base with layers of sediment from the Cretaceous Period and Pleistocene Epoch, the latter known as the Ice Age. Deposits from several glacial advances and retreats formed the South Fork, the last one, the Wisconsin glaciation, ending about 10,000 years ago.

At its climax, the Wisconsin glacier terminated in the Ronkonkoma moraine, reaching its southernmost limit and forming the South Fork. Later, in another advance of the Wisconsin glacier, the Harbor Hill moraine formed the North Fork. There is evidence that there may have been another incomplete glacial advance between the Harbor Hill and the Ronkonkoma advances that created the islands situated in the Peconic Bay, including Gardiner's Island.

Montauk Point represents the easternmost advance of the Ronkonkoma moraine on Long Island. As the moraine moved over an uneven base, it left deposits at various elevations, some below the present sea level. After the last Wisconsin advance and subsequent sea level rise, Long Island's easternmost tip was at Bluff Road in Amagansett. This "fossil bluff" continues along Bendigo Road in Amagansett on the bay side. Between Amagansett and Hither Hills the moraine was separated from the mainland, and Montauk and probably Promised Land existed as separate islands.

East of Stony Hill, the moraine dips below the isthmus of Napeague and reappears as the Hither Hills. Westward it slopes into the Three Mile Harbor basin and re-emerges as the high area in the western central portion of the Town before continuing into Southampton. (Town of East Hampton, 1985).

As the Ronkonkoma moraine began to recede, meltwater streams carried sand and gravel deposits in coalescing alluvial fans, forming outwash plains. Later as the Harbor Hill moraine on the North Fork began to recede, meltwater streams carried outwash that occasionally breached the Ronkonkoma moraine. The outwash deposits of these two terminal moraines are superficially indistinguishable. (Town of East Hampton, 1986)

The greater part of the moraine is made up of compound ridges that are a result of slight fluctuations in the edge of the ice margin. Slight advances and recessions in the glacial margin resulted in abnormal forms of relief. Ice blocks became detached and buried, boulders were scattered and substantial pockets of glacial till were deposited. Thus kettles, irregular basins, knobs, ridges, and kame deposits of poorly stratified sand and gravel were formed resulting in a complex topography typical of glacially produced landscapes. Large boulders known as erratics were broken off rock formations in New England and rounded as they were carried great distances by the glacier. Altitudes range from sea level to approximately 200 feet above sea level at several isolated high points.

The moraine is composed largely of glacial drift, consisting of both unstratified sediments deposited directly in place by melting ice, and stratified meltwater stream or lake deposits. Such unsorted, unstratified drift, varying in character and composition from boulders to finely ground rock material, silts and clays, is known as till. The backbone of the Ronkonkoma moraine is composed of till. It's varied composition becomes evident as eroding headlands or bluffs along the shore are exposed and the contents sorted by littoral processes.

In contrast, the outwash plains are relatively flat lands consisting of sandier more stratified material deposited by meltwater streams. The finest materials, which provide the basis for the best soils, tended to be carried and deposited the farthest from the moraine, the remnants of which are now the fertile lands along the Town's southern reaches.

In the most recent Holocene epoch, two other geological processes have transformed East Hampton's coastal landscape since the glaciers. Beaches, dunes and spits have formed from the erosion of headlands, littoral drift and aeolian, or wind borne deposition. The Montauk peninsula, for example, has been altered significantly in relatively recent geologic times by these dynamic and relentless coastal processes. The Napeague isthmus formed from littoral deposition in a series of sandy spits called a tombolo complex, reconnecting the island of Montauk to the mainland. Montauk Point itself has been subject to severe headland erosion. Within the 200-year period since George Washington commissioned the Montauk lighthouse in 1796, a mere flicker in geologic time, this headland has eroded more than 300 feet.

The south shore from the Montauk hamlet to Georgica Pond is nearly a straight line due to erosion and downdrift deposition of sediments from the Montauk headlands and possibly from offshore. With no sheltering barrier beaches located offshore as along Dune Road and on Fire Island the East Hampton coast receives the full impact of ocean surf and weather. Wave force is determined by winds and storms, by the bottom configuration it travels over, and by fetch, the distance traveled. Long period swells striking the Town's south ocean shores from the southwest in the prevailing summer pattern may have a fetch of 5000 miles traveling from West Africa, or some 2000 miles from Iceland in winter nor'easters. Depending on weather and direction these ocean waves may have tremendous force and can transport great quantities of sand onshore and offshore, a lesser amount of which also moves along the shore. The net longshore movement is known as littoral drift.

While the net littoral drift along the south shore is generally east to west and carries sand to form beaches westward, there are frequently local reversals in direction over periods of time, which can result in some areas acting as microsystems or compartments of the larger littoral system. The contribution of sediments from offshore is unknown within the system, and sediment budgets overall show a net loss from East Hampton shorelines (Kana, 1995).

Waves impacting the northern bay shores, in contrast, have a fetch of, at most, a hundred miles, with consequently less size and force. The bay reaches of the Town are, in general, lower-energy tide-dominated environments not exposed to the direct forces of the ocean. However, winter nor'easters can severely affect these northerly shores because the sediments are often of coarser less sorted materials, and they have not built up the protective dune systems as on the south shore. High-angled

bluffs and narrower beaches on these normally stable shores make them more vulnerable to storm erosion.

Beaches and dunes are also subject to seasonal changes and wind patterns. Generally, beach buildup occurs during the summer when prevailing onshore winds cause accretion. Winter storms result in narrower beaches as sand is washed out to sea or to nearshore bars by strong wave action. (McCormick, et al, 1984).

A second ongoing geological process is the formation of marshes. This occurs as sediment and organic materials are entrapped in tidal waters by grasses and marsh vegetation along the fringes of tidal creeks and embayments. Extensive tidal marshes, wetlands and tidal flats have formed in the Town's enclosed harbors, and are valuable buffers and catchment areas to absorb and dissipate floodwaters, as well as providing critical habitat and nurseries for finfish and other marine life. The enclosed harbors are generally protected from the higher energy environments of Gardiners Bay or Block Island Sound by baymouth spits. The sites where these spits are formed are generally more energetic, and if the spit is lost to erosion or sea level rise the protected marsh areas could be adversely affected.

Many of these low-lying marsh areas formed by tidal processes are now designated flood zones, and have been encroached on by development that could be extensively damaged in a hurricane or catastrophic storm. Beach, dune and bluff areas along both the north and south shores also are areas with high flooding and erosion potential that, because of development, represent potentially large liabilities for storm damage.

The surface geology of East Hampton is a direct function of Pleistocene glacial processes and deposits and recent Holocene beach, dune and marsh building processes. The sweeping climatic changes that produced our present coastal landscape since the retreat of the glaciers 10,000 years ago are still in motion. Indeed, if human alteration of the biosphere is accelerating change in earth's climate as described above, the Town's coastal landscape may once again undergo a period of rapid transformation.

8. Existing Programs for Flooding and Erosion Control

(a) National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes flood insurance available to property owners in flood prone areas of communities that participate in floodplain management. NFIP was initiated by Congress and is administered by the Federal Insurance Administration (FIA) of the Federal Emergency Management Agency (FEMA). NFIP identifies areas at risk for coastal flooding on Flood Insurance Rate Maps (FIRM's) and is the primary vehicle for Federal flood hazard management.

NFIP is enabled locally through the Town's Zoning Code in **Sections 153-3-40** through **-45, Flood Hazard Overlay District** and implemented by Planning and Building Departments and Zoning

Board of Appeals. Changes in the NFIP were enacted in the National Flood Insurance Reform Act of 1994 and were recently incorporated in revisions to the Town Code.

To date, the NFIP program has achieved somewhat the reverse of its stated objective of guiding development away from flood prone coastal areas, often encouraging development by having the government assume risks that would not be carried by private insurers. NFIP does not specifically insure against coastal erosion hazards; however, the recent reform requires FEMA to evaluate erosion hazards and to list communities with likely erosion hazard areas. NFIP in the past has assumed flooding risks will on average stay the same, which as noted in the paragraphs above on Climate Change and Sea Level Rise, may not be the case. New requirements for periodic update of the FIRM's at least every five years may improve their correspondence to actual conditions.

Provisions of the 1994 NFIP Reform Act include modest funding for relocation or removal of flood damaged properties and for development of hazard mitigation plans, and for erosion mitigation measures on both state and local levels.

There are both conceptual and procedural problems with the NFIP as presently devised, particularly as it treats erosion, some of which were outlined in the *NYS Coastal Erosion Task Force Report*:

> "The NFIP treats erosion as a subset of flooding. Critics charge damages for erosion are paid to participants, but the premiums charged for a policy do not reflect actuarial rates for erosion. Estimates for the increased cost of covering erosion damage range up to 7 times present premiums. It is argued that the NFIP should specifically address erosion either through establishment of building setbacks, increase premiums to reflect actuarial rates, mandatory relocation from erosion hazard areas, or similar methods.
>
> ... Related to the problem of erosion damages in V zones is the contention that elevation practices promoted by the NFIP simply delay the inevitable destruction of a structure to some time in the future, and thus do not adequately address the problem. ...Critics suggest an amendment to the NFIP to either actively promote relocation/demolition, or remove the elevation requirement from V zone structures and replace it with requirements that would limit structure size and location to minimize financial loss when the structure is damaged.
>
> A third issue regarding the NFIP is a perceived failure to redirect development away from hazard areas, and thus provide adequate public protection. ...A Government Services Administration report even suggested that the NFIP was a slight stimulation to increased hazard area development. Critics contend that buy-out programs and relocation/demolition programs have very low budgets and have been used reluctantly by administrators. While these programs are voluntary, little effort has been made to seek participants." (NYS DOS, 1994, Vol. II, p. 108)

Under the present program, subscription of Federal Flood Insurance is not mandatory for property owners within designated flood hazard zones, resulting in large numbers of uncovered properties that in the event of catastrophic storms, receive taxpayer funds through FEMA relief anyway. Provisions

of the Reform Act are intended to expand participation in the program, by including Flood Insurance with mortgage payments and requiring notification of the need for Flood Insurance in property transfers within flood zones.

NFIP represents a potentially substantial taxpayer liability, with roughly $210 billion worth of insurance in force, composed of about 2.5 million individual policies. FEMA some years ago estimated the probable program cost for a bad storm year at anywhere from $3.5 to $4 billion in claims. From 1978 to 1986 the program operated at a $652 million deficit, made up by federal taxpayers.

Guidelines and regulations for floodplain construction along the coast are formulated by State and Federal agencies. The U.S. Department of Housing and Urban Development, in conjunction with the ACOE, studied the history of major storms and estimated the flood stages related to the one-hundred year floodplain. The one-hundred year floodplain is described as land inundated by a flood that has a 1% chance of being equaled or exceeded during any given year (FEMA, 1987).

As part of this process, official Flood Insurance Rate Maps (FIRM's) are prepared by FEMA. Flood hazard areas are designated on the FIRMs to identify coastal areas subject to storm flooding.

The hundred year coastal floodplain is divided into three adjacent zones that define different types of flood hazard, and therefore require different floodplain management techniques:

- Areas of special flood hazard or A-zones are "those areas of land within the one-hundred year floodplain (subject to a one-percent or greater chance of flooding in any given year)."
- Coastal high hazard areas or V (Velocity)-Zones are that portion of the coastal hundred year floodplain that would be subject to flooding and "high-velocity waters (wave action), including but not limited to hurricane wave wash."
- Areas of shallow flooding (1-3') "within or adjacent to the one-hundred year floodplain ... where the path of flooding is unpredictable and indeterminate and where velocity flow may occur. These areas are designated on a FIRM as Zones AH, AO and B." (East Hampton Town Code **§153-3-42**)

(b) Flood Hazard Overlay District

The East Hampton Town Code codifies the rules and regulations governing construction activities in Flood Hazard (A-Zones) and Coastal High Hazard Areas (V-Zones) designated on the FEMA Flood Insurance Rate Maps (FIRM's). These are contained in **Flood Hazard Overlay District § 153-4-40 to -45**, as revised in 1998. Town standards conform to the National Flood Insurance Program regulations and include standards for construction, elevation, and placement of utilities. They also prohibit alteration of sand dunes. New construction or substantial improvements within NFIP Flood Hazard Zones must conform to the regulations for the district. **Regulations for Flood Hazard Overlay District §153-3-45** are excerpted in **Flooding and Erosion Policy #11**.

(c) Coastal Barrier Resources Act

NFIP Flood Insurance Rate Maps also identify undeveloped coastal barriers known as CBRA zones, of which there are eleven within the Town. These zones were designated as part of the Federal Coastal Barrier Resources Act enacted in October, 1982 and revised in the Coastal Barrier Improvement Act (CBIA) signed into law on November 16, 1990. CBRA was enacted in response to concerns for the fragile ecology of undeveloped barrier lands along the coast, the result of a Department of Interior task force in 1977. Its stated purpose is:

> "To minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources ... by restricting future Federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers ...."

The law is administered by the U.S. Fish and Wildlife Service.

CBRA generally prohibits new federal financial assistance for development or infrastructure on these coastal barriers, including (effective 10/1/83) Federal Flood Insurance. Exceptions include maintenance of inlets and related structures, environmental research and wildlife management, and nonstructural shoreline stabilization projects. It's effect on development in the Town of East Hampton is difficult to assess, particularly since federally insured financial institutions are still permitted to make loans in CBRA zones.

CBRA zones are present in Reach 1, including Cedar Point, Northwest Harbor and Northwest Creek; in Reach 2, at Three Mile Harbor including Sammy's Beach and Maidstone Park, and at the mouth of Hog Creek; in Reach 3, at Accabonac Harbor including parts of Gerard Park and Louse Point; in Reaches 4 and 10, extending from the mouth of Napeague Harbor to the ocean; in Reach 6, Big Reed Pond; in Reach 8, Oyster Pond and the north side of Montauk Point; Reach 10, in Amagansett through the Double Dunes from near Atlantic Avenue to west of Indian Wells Highway; in Reach 11 Georgica and Wainscott Ponds extending to the ocean; and Reach 12, the spits and coastal ponds of Gardiner's Island.The CBRA zones are depicted on Flooding and Erosion Hazard Map V-1**.**

(d) Other Federal Programs

Other Federal programs affecting flooding and erosion conditions or policy include:

(i) Army Corps of Engineers (ACOE)

ACOE maintains the Federal channel at the inlet to Lake Montauk. The inlet jetties have affected flooding and erosion of downdrift areas. ACOE has also participated in construction of erosion protection structures at the Montauk Lighthouse, and of the groins on the ocean beach in East Hampton Village which have affected beaches to the west in Reach 11.

ACOE is engaged in a $16 million study of erosion problems and solutions for the South Shore, the Fire Island to Montauk Point Storm Damage Reformulation Study, to be completed in 2002, which will have significant implications for flooding and erosion policy on Long Island.

(ii) Federal Emergency Management Agency (FEMA)

Besides the NFIP, if hurricanes or other catastrophic storms lead to declaration of a "major disaster", Federal Disaster Assistance would be administered by FEMA under the Stafford Disaster Relief and Emergency Assistance Act. The Stafford Act also provides for hazard mitigation including federal assistance in property acquisition and relocation.

Changes in these and other Federal programs can affect the Town's ability to respond to flooding and erosion and storm events, and the Town should keep informed through its representatives and official contacts. For instance, a recent FEMA directive states that FEMA will consider disaster assistance for beach nourishment only for "improved" beaches, i.e. "one that (i) was constructed by the placement of sand (of proper grain size) to a designed elevation, width, and slope; and, (ii) has been maintained in accordance with a maintenance program which includes the periodic renourishment of sand. ...Beaches that do not meet these conditions are ineligible for federal disaster assistance under current regulations." (FEMA, 1994) Few, if any, beaches in East Hampton meet these criteria.

(iii) National Weather Service (NWS)

The NWS provides storm and flood warnings from a regional office which recently moved to new quarters at Brookhaven National Laboratory. The Town is exploring installation of a weather monitoring and tidal gauge network that would allow direct data exchange with NWS. This will assist the Town in emergency response planning for major storms, and help to compile a database for flooding and erosion monitoring (see *Storm and Flood Monitoring Cooperative with National Weather Service* in **Projects**).

(iv) Federal lands and installations within the Town

U.S. Fish and Wildlife Service retains title to the former Coast Guard reservation in the Double Dunes between Atlantic Avenue and Indian Wells Highway in Amagansett. The area is presently managed under a cooperative agreement by The Nature Conservancy. The active Coast Guard station at Star Island in Lake Montauk is within flood hazard zones and could be inundated according to the SLOSH model in a Category 1 hurricane. Montauk Lighthouse, formerly a Coast Guard station, now contains an automated light package, and is managed by the Montauk Historical Society.

(e) New York State Coastal Erosion Hazard Act (CEHA)

The Coastal Erosion Hazard Act (CEHA) forms article 34 of the NYS Environmental Conservation Law, and is a regulatory program to identify and manage coastal erosion hazards. It may be administered either by the State or through an approved local program. The program is designed to discourage placement of structures within defined Coastal Erosion Hazard Areas.

The Coastal Erosion Hazard Areas are identified on the NYS DEC Coastal Erosion Hazard Photo Maps for the Town and are seaward of an Erosion Hazard Line drawn on the maps. They are described in this section in the inventory for each reach. Siting and construction of new structures or replacement of existing structures within these CEHA zones is governed by the Coastal Erosion

Management Regulations (6 NYCRR Part 505, as amended March, 1988) and requires a CEHA permit issued by the NYS DEC. CEHA Regulations are excerpted in **Appendix E.**

The Town of East Hampton has not yet adopted a local law for CEHA, and CEHA permits remain under NYS DEC administration. Adoption of a local Coastal Erosion Hazard law and local administration of the CEHA regulations is a recommendation of the LWRP. See **Local Implementation Section XV.A.** CEHA permitting covers most types of coastal structures in CEHA zones, including erosion protection structures, and incorporates a number of features that would further the goals of the LWRP. These include maintenance provisions and requirements to minimize or mitigate adverse effects on neighboring property and natural features. Town permitting would also facilitate procedures for local residents, and emphasize lead agency status for the Town's waterfront policies and regulations.

(f) Sea Lake and Overland Surges from Hurricanes (SLOSH) Model

The SLOSH Model commissioned by the ACOE is "the latest and most sophisticated mathematical model yet developed by the National Weather Service to calculate potential surge heights from hurricanes." (SEMO, 1993) It models storm surge elevations above MSL on both open coasts and within tidal basins, given barometric pressure, storm movement and size, and generates maps showing surge elevations and boundaries of maximum inland flooding for hurricane categories 1-4 on the Saffir/Simpson Scale.

The zones indicated on the SLOSH maps are the worst case scenario for a hurricane of given strength, that is, if the hurricane makes a direct hit at a particular location. "The end result is a line that represents the maximum inundation that could be expected from any category storm, but is not an accurate representation of hurricane flooding potential unless the storm matches the worst case conditions, and then only for the shoreline immediately adjacent to where it makes landfall. The probability for that occurrence has not been determined, and could be quite large. SLOSH cannot be directly related to the FEMA 100 year flood plain." (Fred Anders, personal communication, July 1995)

SLOSH does not adjust for tidal levels at the time of impact but is based on the datum for MSL (NGVD 1929). "Other factors that contribute to the total water height are the initial water level within the basin at the time the hurricane strikes and wave effects. Storm surge is defined as the difference between the observed water level and the normal astronomical tide. Any astronomical tide level above the mean is additive to the storm surge. The timing of the arrival of storm surge is important in that the difference in total flood elevation can be as much as 7 feet in the study area, which can easily be the difference between a catastrophe and a non-event. **... If astronomical high tide occurs coincidentally with the peak storm surge, the combination could be considerably higher than the SLOSH surge values shown on the inundation maps....**" (SEMO, 1993)

Although designed primarily to identify areas for evacuation, the SLOSH model provides a useful indication of the potential extent of flooding and erosion, particularly for more frequently occurring Category 1 or 2 storms, as well as vulnerability of evacuation routes, designated shelters, and other infrastructure, which can be incorporated in local Civil Defense planning. Anecdotal reports from

coastal experts indicates the SLOSH model has been fairly accurate in predicting flooding for recent hurricanes.

B. REACH INVENTORY & ANALYSIS

1. Reach 1 -- Northwest Harbor

(a) Description

Sag Harbor Bay, Northwest Harbor and Shelter Island Sound form a sheltered embayment with limited wave energy, opening to the more exposed coast of Gardiner's Bay at Cedar Point. Large tracts of parkland and preserved open space including Barcelona Neck, the Grace Estate, Cedar Point County Park, and Mashomack Preserve on Shelter Island, make this reach one of the premier natural areas of the Town, and have kept the shorelines in a largely natural state.

Historic uses of Northwest Harbor have altered Reach 1's littoral processes in ways that affect flooding and erosion but are difficult to quantify. Sag Harbor was a major east coast port during the heyday of whaling in the mid-1800's. A stone breakwater shelters the anchorage, altering circulation and littoral drift. Cedar Point Lighthouse, constructed in 1868, was not originally connected to the mainland, but the spit has since filled in with reentrant material from Hedges Bank and the eroding bluffs to the west.

Present development consists of sparse residential construction in the subdivisions of Settlement at Northwest and Grace Estate, a small concentration of residential housing at Northwest Landing, the unirrigated golf course at Barcelona, the County dock at Northwest Creek, and the infrastructure of Cedar Point County Park.

Geologically, Reach 1 is a composite of undifferentiated morainal till and glacial outwash deposits. Knobs and kettleholes with slopes of 20% and greater, and drainage swales are found throughout the reach. Barcelona Neck abutting Northwest Harbor has elevations approaching 100', which slope down to 50' at Barcelona Point to form steep cliffs. Sediment size, composition and sorting, all of which determine erosion potential, vary widely through the reach, with unsorted till washing out of the morainal bluffs and mixing with reentrant material of previous glacial outwash and nearshore sands.

(b) Natural Protective Features

Reach 1's curvilinear shores with their bluffs, dunes and beaches bordering Sag Harbor Bay and Northwest Harbor are dynamic erosion areas relative to the low energy context of the north shore. Beach profiles vary from flat with sandy tidal flats along Cedar Point, to steeper rocky beaches backed by eroding bluffs. There is a low dune complex, partly spoil and fairly well-vegetated, on the barrier spit of Northwest Creek, another at the base of Cedar Point, and at the west end of Barcelona.

The bluffs on the west side of Cedar Point Park are exposed to the fetch from the northwest across Shelter Island Sound, causing rapid erosion that deposits sediment at the base of Cedar Point. The

longest fetch and highest wave energies in the reach impact the bluffs of Hedges Bank facing Gardiner's Bay. The low bluffs of the Grace Estate and the higher bluffs on the Barcelona Neck also receive intense wave energy in nor'easters, evidenced by storm-cut terraces and stony beaches. There is a strong littoral movement to the south along the west side of Barcelona, contributing to a large infill area at the base of the peninsula. Longshore currents in this area are affected by the parallel breakwater at Sag Harbor.

Two major spits have formed as a result of wave action on headlands. The first composes Cedar Point and the second is at the entrance to Northwest Creek. Northwest Harbor, located between these two spits, is somewhat protected from wave action, and wave heights exceed about two feet only in extreme storm conditions. The harbor is shallow with sand deposits from the eddying circular currents. A smaller spit forms the entrance to Alewife Brook. Much of the low lying area around Northwest Creek and Cedar Point and the harbor in between is within CBRA zone # NY-51P.

The inlets of Northwest Creek and Alewife Brook trap some sediment from the littoral drift, which has a net movement to the north because of prevailing southwesterlies. Some of the remaining sediment is swept offshore in the deep channel of Shelter Island Sound off Cedar Point. Shoals form regularly at the Northwest Creek inlet, which has often been only marginally navigable, providing minimal tidal flushing of the Creek. The inlet was moved from the eastern side of the barrier spit in 1962, which may have contributed to the navigation and flushing problems. The inlet channel was dredged in May 1995 to improve the navigation and flushing. Spoil from this and other maintenance dredging of the channel has been used to build the low dune complex that forms the barrier spit.

Reach 1 contains a number of small coastal ponds, one in the infill area at the base of Barcelona Neck; Cedar Pond; Alewife Pond; Scoy Pond; Little Scoy Pond; Cow Pond and Fresh Pond in the Grace Estate; and Larkin's and Staudinger's Ponds at the head of Northwest Creek. These ponds act as receiving areas for floodwaters, with Alewife and Cedar Ponds having the greatest potential capacity.

Creeks include Little Northwest Creek, Rattlesnake Creek and Red Creek at the ends of Northwest Creek, Alewife Brook and Scoy's Run. There is also an intermittent creek opening into the pond on the west side of Barcelona, and one into the saltmarsh on the east side of the Northwest Creek spit, and a seep on the east side of Northwest Creek itself. The creeks are primary floodwater corridors in storms and hurricanes.

Tidal marshes border the low area on the west side of Barcelona, Little Northwest Creek, the mouth of Alewife Brook, all of Northwest Creek except around the County dock, and around the old inlet east of the present entrance. Drainage ditches installed by Suffolk County Vector Control have altered the marsh characteristics of Northwest Creek, accelerating distribution and inland penetration of floodwaters and probably increasing the storage capacity of the marsh.

Extensive surrounding wetlands are a factor in the designation of Alewife and Scoy Ponds, the Cedar Point peninsula, Northwest Creek, and Sag Harbor-Northwest Harbor as NYS Critical Habitats (see

Significant Habitats Policy #7, and Water/Air Resources Policies #30-44). These wetlands serve an important buffer function by storing floodwaters and retarding the wave energy of a storm surge.

(c) Coastal Structures

Coastal hard structures are few in Reach 1, the largest being the County dock at Northwest Creek, actually a filled bulkhead as noted above, and the Cedar Point Lighthouse with the approximately 100 yards of rock revetment that protects it at the tip of Cedar Point. A smaller light, known as Gin Lighthouse, is on a rock bordering the channel into Sag Harbor. About 50' of riprap is up in the beach grass east of the launch ramp at the County dock, which may have been used to stabilize the shoreline when the inlet was moved. There are also low jetties partially overgrown with wetland vegetation and some associated bulkheading at the inlet to a former marina site east of Northwest Landing, and the remains of a private dock and shoreline riprap near Settlement at Northwest.

The remaining shoreline is essentially undisturbed by coastal structures.

(d) Flooding and Erosion Zones

Potential flooding in storm events is represented on the FIRMs issued by FEMA for the Town, as revised 5/18/92 (see FIRM #'s 360794 -0024D, -0027C, -0028C, -0029C, and -0031C). Velocity (V) Zones, highest flood hazard areas subject to wave velocity in major storms, are indicated for all the waters and surrounding shorelines of Sag Harbor Bay, Northwest Harbor, Gardiner's Bay, and adjacent creek mouths. A-Zones, also subject to high flood hazard but not to wave action, surround Little Northwest Creek, Barcelona Neck, Northwest Creek, and back the V-Zones along the coast of the Grace Estate and Cedar Point, extending inland around Alewife Brook and Alewife Pond, Scoy Pond and Cedar Pond. As noted, a CBRA zone covers the spit of Northwest Creek, and Northwest Harbor across the spit of Cedar Point.

In addition, the State of New York Hurricane Inundation Map (Greenport Quadrangle #O2 and Gardiner's Island West Quadrangle #P2) utilizing the FEMA developed SLOSH model shows that much of Barcelona Neck and the shores of Northwest and Little Northwest Creeks, as well as the east shore of Northwest Harbor, and area surrounding Alewife Brook and Alewife Pond, could be subject to substantial inundation in a Category 2, 3, or 4 hurricane.

NYS DEC CEHA photos issued 6/7/88 (#23-730-83 Sheet 41-N, #23-727-83 Sheet 42-N, #23-723-83 Sheet 43-N, #24-1145-83, Sheet 44-N) show Erosion Hazard Areas extending along all of the Gardiner's Bay shore to Hedges Bank. The CEHA line does not extend west of Cedar Point, presumably because this is not classified as an exposed shoreline, the program does not map small harbors, and the assumption is there will be no erosion.

(e) Analysis

Flooding and erosion have relatively minor consequences for development in Reach 1 because of the amount of parkland and open space, undisturbed shoreline, and relatively low wave energies. In general, the wide variety of coastal geomorphology, topography and natural protective features provide natural flood control mechanisms, and any structures that interfere with them should be avoided. Following the NYS DEC logic for not including the Northwest Harbor area within the

CEHA because it is not an erosion hazard area, no additional hard structures are needed to control erosion, and none should be permitted. The exception is the revetment preserving the historic Cedar Point Lighthouse in the County Park, which should be maintained. Most existing development in Reach 1 is set back sufficiently that shoreline recession from erosion should not threaten residences in the immediate future, although hurricane flooding could do so.

Remains of existing structures at the former private marina inshore near Northwest Landing, and the dilapidated dock and revetment at Settlement at Northwest are no longer functional, and they should not be repaired or replaced as they deteriorate.

The existing County dock/bulkhead in Northwest Creek should be evaluated regarding its utility for fishing and boating versus its impact on the wetland systems. It should probably be reconfigured when it deteriorates, removing the bulkhead and regrading to a pre-construction level, leaving a simple launch ramp facility. The dock may originally have been part of a Suffolk County Parks Department scheme for an extensive public marina/mooring area, but it currently receives minimal use except for some offloading from small craft by commercial fishermen and does not function in a flooding or erosion prevention capacity.

Use of the artificially relocated channel to Northwest Creek should be reconsidered because of its need for frequent maintenance dredging and poor tidal circulation. Because of rapid shoaling in the channel, flushing within Northwest Creek is sometimes inadequate and navigation in and out becomes difficult. The Creek has become anoxic in some parts in recent years and is presently closed to shell fishing year round by NYS DEC, except for conditional openings in the winter months. Consideration should be given to eventually re-opening the original channel at the east end of the barrier spit, either keeping or closing the existing channel. The spit is of sufficient elevation as not to require additional dredge spoil. Spoil from dredging of the Northwest Creek channel could be used to nourish beaches on the north and west sides of the neighboring State property at Barcelona Neck, or along the bluff toe of the west shore of Cedar Point County Park, although that distance may be impractical for hydraulic pumping.

Retaining the quality of the significant habitats in the reach requires they be kept in a natural state, and no coastal structures, bulkheading, etc. should be permitted to disrupt littoral processes which affect nesting areas or other elements of the habitat.

Additional development in Reach 1 should be discouraged in the 100-year FIRM flood zones, erosion hazard areas on CEHA maps, areas subject to a Category 1, 2, or 3 hurricane surge overwash on the SLOSH maps, or adjacent to fresh or tidal wetlands (NYS DEC Freshwater Wetland Maps), or near the various creeks. As is evident in other reaches of the Town, development in these areas leads to increased disruption of coastal processes, property loss, pollution of surface waters and habitat degradation. Development controls in these areas include updated (1999) FEMA flood regulations in **§153-3-40 to -45**, Town Natural Resource Special Permit requirements, and CEHA regulations proposed for local adoption (see **Section XV, Local Implementation**).

The residences at the end of Northwest Landing Road, particularly those close to or impinging on the wetlands surrounding Northwest Creek, are at high risk of flooding during storm events, and should be further analyzed in the *Hurricane Damage Mitigation Plan* (see **Projects**). Any additions to the homes in the area, as well as secondary structures, should be kept modest and on the landward side, and should be accompanied by required improvements in flood-proofing.

Consideration should also be given to restoring the Northwest Creek saltmarsh to more natural flooding and drainage patterns by closing the ditches cut for mosquito control, and replacing them with an Open Marsh Water Management (OMWM) system. This will aid in protecting the wetlands, reducing flood hazards by increasing the absorption capacity, and enhancing water quality (see **Water Resources Policies #30-40 & 44**). Increased flushing from recent dredging of the channel should also improve water quality.

The bluff areas at Cedar Point Park, both on the Northwest Harbor side and on the Gardiner's Bay side, are subject to vigorous erosionary forces, but if maintained in a natural state, the dynamic equilibrium of the beach/bluff system will be maintained and bluff recession will be more uniform. Hard structures are unnecessary here and should not be permitted. Beach nourishment, possibly utilizing spoil from future maintenance dredging of the Northwest Creek channel, should be considered if bluff erosion threatens park facilities. Historical erosion rate data could provide an estimate for whether this might occur (see Erosion Monitoring in **Projects**).

Beach vehicle access on the Cedar Point spit contributes to destruction of beach vegetation that inhibits erosion and effects of flooding. Beach vehicle use on the spit appears to be excessive and should be reduced. **Public Access and Recreation Policies #9 & #19-22** also recommend closure of this point to vehicles from April 1st - August 15th to protect nesting terns and piping plovers.

Reach 1 is one of the most unspoiled areas of the Town, and as immense effort and public resources have been expended to preserve the land, the coastal resources must likewise be maintained in a pristine state to the greatest degree possible.

2. Reach 2 -- Three Mile Harbor/Hog Creek

(a) Description

Except for the sheltered waters of Three Mile Harbor and Hog Creek, the Reach 2 coast is exposed to Gardiner's Bay, with Hedges Bank receiving the full intensity of northeast storms because of its NW/SE orientation. The wave-dominated shoreline of Hedges Bank forms storm-cut terraces, and some of the material from the high bluffs is carried in the littoral drift to feed Sammy's Beach, and some also to the northwest to Cedar Point. Unusual aeolian dunes perched along the bluff-top at Hedges Bank testify to winds powerful enough to force upward migration of bluff sediments. There are no shoreline hardening structures in the immediate Hedges Bank area, and it remains a fine example of a natural weather shore in the bay environment.

Steep bluffs with elevations of 25'- 40' comprise the coastline from Hedges Bank to Lafarge's Landing at the end of Old House Landing Rd., dipping to near sea level at Sammy's Beach and

Maidstone, before ascending to bluffs of almost 60' east of Maidstone Park Beach between Flaggy Hole Road and Runnymede Drive. The rocky beaches beneath the bluffs widen to sandy beaches at Sammy's Beach and Maidstone Park which have been enhanced by periodic dredge spoil from the Three Mile Harbor channel. Littoral drift along this shore appears to be predominantly west to east from Hedges Bank to Sammy's Beach, and east to west toward Maidstone from Hog Creek Point, resulting in sand buildup on either side of the Three Mile Harbor jetties.

Narrower beaches form an intermittent fringe along the shores of Three Mile Harbor. Windborne and other reentrant material inside the harbor in the Folkstone area is forming a low dune system within the harbor, partially burying the marsh. Both Hog Creek and Three Mile Harbor were originally closed intermittently to navigation by littoral drift, but were later opened and stabilized for boating use. Both harbor entrances are regularly dredged and maintained. The inlet to Three Mile Harbor is stabilized by a 650' steel-sheet pile jetty to the west and a 600' stone jetty to the east. Both were installed in the 1930's to prevent rapid shoaling of the channel.

Sediment transport around the Three Mile Harbor inlet is interrupted by the jetties, but the stabilized inlet may now constitute an effective null point in the littoral system where sediment from the headlands to both east and west accumulates and the longshore currents effectively cancel each other out.

The south end of Three Mile Harbor was not originally navigable south of Marina Lane, but has been dredged and a navigation channel extended to the marinas at the head of the harbor. Spoil from the channel has been deposited at the Marina Lane site which was originally wetlands.

Topography in Reach 2 continues the knob and kettle formations typical of outwash deposits from the Ronkonkoma moraine, which can be seen in cross-section in the escarpments of Hedges Bank and to the east of Maidstone. Three Mile Harbor itself is a drowned meltwater drainage basin, with two creeks still draining into it, Soak Hide Dreen at the south end, and Hands Creek to the west. Because of these formative influences, the harbor has steep slopes along its perimeter in several locations, which would be prone to erosion were it not for the reduced wave energy in the sheltered harbor. Marsh deposits have gradually built up around the perimeter of the creeks and harbor, notably on the harbor's north side where the marsh meets beach in a tidal flat. These areas, which form the fourth largest tidal wetland in the Town, also act to buffer and absorb floodwaters.

Land use in Reach 2 is primarily residential, densely built around the harbor and Hog Creek, with marinas and related restaurants and services along the east side of Three Mile Harbor. Three Mile Harbor is the second most active of the Town's harbors, and supports nine private and commercial marinas, plus two homeowners' association marinas and approximately fifty individual private docks. Town parkland preserves open space at the mouth of Three Mile Harbor at Sammy's Beach and Maidstone Park. Both of these areas are particularly prone to flooding. The largest tract in the reach, 170 acres of undeveloped land belonging to Camp Blue Bay Girl Scout Camp, also retains the only remaining long stretch of unbulkheaded bluff east of Maidstone.

Hog Creek was the center of another gently sloping glacial drainage channel west of Hog Creek Point. Hog Creek is now a narrow shallow estuary fringed with saltmarsh that was artificially opened to Gardiner's Bay and dredged and widened for development in the 1950's. Alteration and destruction of the original Hog Creek shoreline through installation of lawns, filling of wetlands, and construction of bulkheads, docks and piers have all contributed to erosion and instability of the present shoreline. As a result some residences are prone to flooding in time of major storm or hurricane. Hog Creek is one of the fastest shoaling inlets in the Town, having been dredged four times within the past fifteen years, approximately the same frequency as Accabonac Harbor. The inlet is bulkheaded with steel sheathing, and the immediate interior with CCA timber. The Creek shoals up abruptly immediately past the marinas, forming a bar that remains nearly impassable even at high tide.

The Lions Head and Clearwater Beach property owners' marinas just inside the mouth of Hog Creek contain approximately 150 slips for recreational boats, which could be vulnerable to storm surge (see SLOSH model). The south end of the Creek is shallow and marshy, and severe flooding in this area could interdict Hog Creek Road, isolating the Fireplace and Clearwater sections of Springs (see SLOSH, FIRM's). To the west of the creek mouth three small coastal ponds have formed in the infill area from the bluffs to the south. Home sites around these ponds were in some cases created by filling wetlands, leaving them particularly exposed to flooding and storm surge.

(b) Natural Protective Features

In Three Mile Harbor, Dayton and Penny Sedge Islands are both located near the north end. Penny Sedge Island has been artificially built up with dredge spoil (Geological Water Survey Paper 2073, 1982, Plate 1) but may have originated through natural deposition as part of an internal delta. Penny Sedge Island shelters Harbor Marina, and Dayton Island protects the backshore marsh of Sammy's Beach.

Sammy's Beach forms the barrier spit at the mouth of Three Mile Harbor, and it and the harbor, including the islands above and surrounding undeveloped lands, including part of Maidstone Park, form a designated CBRA zone under the Federal Coastal Barrier Resources Act. The mouth and immediate environs of Hog Creek are also in a CBRA zone.

Most of Three Mile Harbor is a State designated Significant Coastal Fish and Wildlife Habitat (SCFWH), with the remaining area (Soak Hide Dreen and the south end) a Locally designated SCFWH (see **Significant Habitats Policy #7**). The harbor contains extensive tidal wetlands around Folkstone, south of Gann Road, from Squaw Road to Duck Creek, and in the south end from Marina Lane on the east side of the harbor; also extensive wetlands all the way from Oyster Shores to Hands Creek and north to Sammy's Beach on the west side. Some of the tidal wetlands at Hands Creek have been ditched by County Vector Control and would become enhanced flood corridors, especially at the northwest end of the Creek, where hurricane flooding could make the end of Hands Creek Road impassable.

Tidal flats extend from Dominy Point to Sammy's Beach on the west side of Three Mile Harbor, and less extensive flats on the east side along Squaw Road. The tidal flats also dissipate wave energy in storms.

East of Three Mile Harbor high bluffs rise from the end of Flaggy Hole Road to a height of about sixty feet, at a natural angle of repose in front of the Blue Bay Girl Scout Camp, then are bulkheaded along the toe until they descend to the infill ponds west of Hog Creek. This provides a contrast between the naturally receding bluff and the adjacent attempts at stabilization through use of hard structures. The wide terraced beach of cobble and sand in front of the unarmored bluff at Camp Blue Bay is reduced in front of the bulkheads to a narrow strand submerged at high tide. Where bulkheads have begun to fail from storm damage the process of natural slumping and recession resumes immediately. As shoreline recession and storms expose the bulkheads increasingly to wave action, the fronting beach is rapidly scoured out by reflected wave energy, and the structures face increasing risk of failure.

East of Hog Creek inlet to Hog Creek Point the bluffs again rise gradually, though only to a 15-20' height, much of it secured by bulkheads and hard structures, fronted only by a rough cobble beach, all that remains of a beach derived from an exposed headland with its upland sediment supply confined by bulkheading.

(c) Coastal Structures

Numerous coastal structures erected in Reach 2 affect flooding and erosion, and circulation in the enclosed water bodies. Walkways over the bluffs at Hedges Bank have contributed to erosion, and at two sites swimming pools that were drained over the bluff caused substantial slumping from the bluff top. As noted above, there are otherwise no other hard coastal structures in the Hedges Bank area. Several homeowners have attempted to anchor the bluff toe using soft solutions such as re-vegetation and materials such as filter cloth to retard erosion, and have planted the bluff face to inhibit slumping.

The jetties at the entrances to Three Mile Harbor and Hog Creek obviously interrupt the littoral drift, although the Three Mile Harbor entrance, as mentioned above, is at this point fairly stable, with sediment accretion outside both jetties. The Hog Creek jetty causes accretion to the east and some starvation of the beach to the west. Shorefront homeowners on the headland near Hog Creek Point have attempted to forestall erosion by installing a variety of structures ranging from homemade bulkheads or seawalls of beach cobble, to a full fledged rock revetment, groins and bulkheads, which have probably contributed to flanking erosion of unarmored properties on either side.

A solid timber dock at Camp Blue Bay is acting as a groin, presently half buried in sand, accumulating to the east (littoral drift is east to west). It should not be reconstructed or repaired, but reduced in size, or reconstructed on pilings to bypass sand. The wide terraced beach of cobble and sand in front of the unarmored bluff at Camp Blue Bay terminates almost entirely at the first lot with a bulkhead to the east. The house above it is located close to the bluff edge, and the bulkhead has been recently reconstructed and backfilled. The house appears to have room on the lot to be moved back, possibly within standard bluff and frontyard setbacks.

The series of groins and bulkheads along Runnymede Drive in Lion's Head is depriving the longshore sediment budget to the west in a process that has lead to armoring of this whole length of bluff and a resulting loss of the beach fronting the structures. There are seven timber groins in the area, the westerly three of which are excessively long (30-40'), the easterly four about half that length. All are interrupting the east to west littoral drift, and should not be rebuilt. The increasingly exposed structures may become prone to failure in a storm event, lacking a beach to dissipate wave energy. The third or fourth bulkhead east of Flaggy Hole Road is presently failing and some slumping of the bluff has resulted. Beach loss is particularly severe along Kings Point Road, from #322 south along the bulkhead, where the beach has become very narrow.

Near the high point of the bulkheaded bluff (50-60') several houses have pools and lawns almost on the edge of the bluff. If these pools are lost to storm-induced bluff slumping or to shoreline recession, the homes will probably still survive and will have some land remaining on which to be moved back. Lot depths decrease approaching the east end of Runnymede Drive as the bluff descends near the infill ponds. There is still room to move houses back but they would probably require front yard variances.

The infill area at the false point near the ponds appears to be an accreting headland. The sediment supply may come from Hog Creek Point or from offshore currents carried from Hedges Bank or Gardiner's Island. The beach from the inlet to Hog Creek Point is cobble, gravel and boulders, with little sand. On this exposed headland the high rate of shoreline recession coupled with insufficient setbacks has motivated one homeowner after another to build hard erosion protection structures, with varying success in stemming flooding and erosion. Additional hard structures in the areas where bluffs are low would probably have minimal success in inhibiting flooding.

The interior of Three Mile Harbor contains numerous residential bulkheads and docks, as well as the commercial marinas on the east side. Bulkheading has in some cases been used to anchor steep banks, but has often resulted in loss of tidal wetlands, and even within the tidal-dominated environment of the harbor has diminished fragile strands of fronting beach. Erosion control structures, such as the several groins placed north of the mouth of Hands Creek, are generally ineffective in this low energy situation.

As noted above, bulkheading within Hog Creek has also contributed to loss of tidal wetlands, and instability of the shoreline, reducing flood retention capacity and increasing flooding and erosion in time of storms.

(d) Flooding and Erosion Zones

Potential storm flooding as indicated on FIRM's (#'s 360794 -0021D, -0022D, -0024D, -0025C) shows Velocity (V-7) Zones along the entire Reach 2 shore of Gardiner's Bay, plus much of Three Mile Harbor. Sammy's Beach is in A-8 Zone, and Hog Creek and Hands Creek as expected flood corridors are also in A-Zone, along with most of the remaining shore of Three Mile Harbor. As noted above Three Mile Harbor and its undeveloped shoreline and the mouth of Hog Creek are within the CBRA zones. These areas are subject to overwash. B- Zones back the harbor and creek areas, including arterial roads in some low areas.

The SLOSH Model (Gardiner's Island West Quadrangle #P2, East Hampton Quadrangle #P3) is also pertinent. It shows a Category 2 hurricane possibly inundating much of Sammy's Beach and Maidstone Park, and additionally cutting Springy Banks Road at the south end of the harbor from Soak Hide Dreen.

A SLOSH worst case Category 4 hurricane could overwash all of Sammy's Beach, Maidstone Park and the low parts of the east side of the harbor, including the marinas, interdicting 3 Mile Harbor Road. To the east, waters from the Hog Creek flood corridor cut off Fireplace along Fort Pond Boulevard, and Clearwater Beach along 3 Mile Harbor Road and Hog Creek Road. The Clearwater subdivision could be inundated, as that of Lions Head, up to about two blocks inland from the shoreline.

Coastal Erosion Hazard Areas (CEHA photos #23-723-83 sheet 43-N, #23-727-83 sheet 42-N, #23-730-83 sheet 41-N, #21-1139-83 sheet 40-N, #20-1135-83 sheet 39-N) include the bluffs of Hedges Bank and the bay shore of Sammy's Beach, covering the residences from east of Sammy's Beach Road to the beach access point at the road end. Maidstone Park is in a CEHA Area, including the municipal beach area, as are some houses on Runnymede Dr. west of Lions Head, and one residence on Bay Inlet Rd. Houses in Clearwater Beach on Kings Point Road between Hog Creek Point and Hog Creek inlet are also in CEHA Areas.

(e) Analysis

Reach 2's eroding bluffs at Hedges Banks and Flaggy Hole east to Hog Creek Point characterize the difference between natural and armored shorelines on the Town's coast.

The bluff at Hedges Bank, because of its direct exposure to northeast storms, would be expected to have a high rate of recession. The shoreline remains as yet largely undisturbed by coastal structures, and should be kept this way, since the natural slumping of the bluff and the consequent rocky beach profile provides an effective natural buffer to the high wave energy of Gardiner's Bay and ensures long-term maintenance of the beach. These bluffs also feed Sammy's Beach directly to the east, and any interruption of the littoral process would starve the beach there. Because of the exposure and the integrity of the natural system, Hedges Bank is an appropriate site for the proposed *Town Erosion Monitoring Program* (see **Projects**) and this data will help to determine erosion rates.

Sammy's Beach is one of the most vulnerable areas to flooding and erosion in the Town, with a number of dwellings within the CEHA. Because parts of it are also in a CBRA Zone, and a State designated SCFWH, with high quality marsh and tidal flats on the south side, it should receive special planning consideration in the *Hurricane Damage Mitigation Plan* (see **Projects**). Because of the habitat values, the present unarmored shore, and the sediment supply both from the bluffs to the west and the dredge spoil from Three Mile Harbor, no hard erosion control structures should be permitted in the Sammy's Beach area. These and other recommendations for flooding and erosion protection in Reach 2 are outlined on Flooding and Erosion Protection Map V-2.

Because the area is vulnerable to flooding and erosion, expansion of existing homes should be limited, including secondary structures such as pools. Homeowners should not receive automatic

relief for expansions or additions under the relief provisions of the Town Zoning Code **§153-4-37**, which also states that where minimum setbacks cannot be met they should be as great as possible. This provision should not be construed to allow additions or expansions of existing residences in sensitive areas. Additions to existing residences should not be granted relief from setbacks without meeting the standards for variances set forth in Town Zoning Code **§153-8-50 (D)** and **§153-8-50 (E)**. From the end of Old House Landing Road east to the end of Sammy's Beach Road, any additions to existing structures should also require retrofitting of the existing structure to FEMA floodproofing standards under the provisions of the Flood Hazard Overlay District. Vacant parcels in the Sammy's Beach area should be acquired by the Town wherever possible, and options for acquisition or relocation should be further examined in the *Hurricane Damage Mitigation Plan*, particularly where setbacks cannot be met.

Hands Creek is also a flood-prone area. Although the saltmarsh naturally absorbs floodwaters, Hands Creek Road at the northwest end of the Creek could be obstructed by flooding in a major storm. On the harbor side, the several groins just north of the Hands Creek inlet are ineffectual in the low energy environment of the harbor, and should not be rebuilt or maintained. This protected western shore of Three Mile Harbor has a minimal erosion component and hard structures are of low utility. Map V-2, Flooding and Erosion Protection, designates all of the western shore of Three Mile Harbor as Condition 1, where hard structures should not be permitted, except for some isolated areas with preexisting structures which should be carefully evaluated if they require reconstruction (Condition 2), or not be reconstructed.

On the east side of the harbor, coastal structures at commercial marinas are eligible for emergency permits for in-place in-kind reconstruction when damaged, since they constitute an important water-dependent use and supply some public access (Condition 3 on map).

The inlet jetties at Three Mile Harbor must be maintained because of its importance to the harbor, but if at some point in the future it becomes clear that the inlet does not, as hypothesized here, constitute a null point in the littoral system, some mechanism for sand bypassing may become desirable. This could be as rudimentary as studying more carefully the apportionment of dredge spoil from the channel from maintenance dredging.

As noted above, the bluffs rising east of Flaggy Hole Road then descending to the infill area west of Hog Creek have already been armored extensively, with consequent loss of fronting beaches, except for the shore of the Blue Bay Girl Scout Camp. The remaining unbulkheaded bluff and beach in front of the Camp should be maintained in their natural state, and elsewhere shore parallel structures should only be replaced under conditions of exceptional hardship, and new structures should not be permitted (Condition 1 on map).

Along Runnymede Drive where structures provide the only remaining protection against erosion, from lot #24-4-13 to #23-4-2, the last house at the intersection with Pond Lane, existing bulkheads should be allowed to be replaced in-place in-kind for normal maintenance and for storm emergencies up to the 30-year storm standard (Condition 3 on map). The owners should also be required to maintain the public access and right of way along the shore, if necessary by sand placement and

replacement as needed. See **Policy #13/13A**. The timber groins which are interrupting littoral drift should not be replaced or reconstructed. Dredge spoil from the Hog Creek inlet could appropriately be used to nourish the beach along Runnymede Drive.

Should a catastrophic storm or hurricane beyond the 30-year storm cause these bulkheads and groins to fail triggering a massive bluff slump, the Town in the *Hurricane Damage Mitigation Plan* should consider requiring houses to be moved landward when lots have sufficient depth, reconfiguring the bluff to an angle of repose, and restoring the dynamic equilibrium of natural shoreline processes. Several homes have swimming pools within a few feet of the top of the bluff which are non-conforming, and should not be replaced if severely compromised in a storm event. See **Projects**.

From the east end of Runnymede Drive to the Hog Creek inlet no new erosion protection structures should be permitted, as this infill area is largely protected by the fronting beach and ponds (Condition 1). The Hog Creek inlet jetties and associated bulkheading should be permitted maintenance and in-place in-kind replacement within the 30-year standard. The property association marinas on either side of the mouth of the Creek should also be permitted to make necessary repairs or in-place in-kind replacements (Condition 3). In the low-energy interior of Hog Creek no new residential docks or hard structures should be permitted along the shore, nor should existing structures be replaced when damaged or deteriorated, except under conditions of exceptional hardship (Condition 1).

From Hog Creek inlet east to Hog Creek Point on the bay soft structures and beach nourishment should be used to maintain the existing beach (Condition 1). Tapering in of the structure at the first bulkheaded lot east of the inlet, tax map lot #024-1-4, will reduce scouring from the structures to the east. From that lot extending east around Hog Creek Point to the northerly boundary of lot #41-2-22, because of the number of already existing structures on this eroding headland, property owners should be allowed emergency permits for in-place in-kind reconstruction in case of storm damage, to the 30-year standard (Condition 3).

The SLOSH Model indicates the potential for extensive flooding around Three Mile Harbor and the creeks from the direct impact of a hurricane. In the improbable event of a Category 4 hurricane, the merging of floodwaters from Hog Creek and Accabonac Harbor along Fort Pond Boulevard could isolate the Lions Head-Kings Point-Clearwater Beach-Fireplace sections of Springs. In lesser category storms low-lying and bayfront areas could be subject to flooding and wave action, blocking arterial roads such as Fireplace Road and making evacuation problematic. Three Mile Harbor Road could be cut at a number of points, including at Soak Hides/ Springy Banks and at Duck Creek, further isolating the Springs.

If overwashed by storm surge damage to life and property in flood zones and vulnerable areas might be substantially worse than expected, since no major hurricane has struck the area since 1938, and a large proportion of the waterfront residences in the reach were not then built. Sammy's Beach, Hands Creek, the east side marinas, low-lying residential areas at the south end of Three Mile Harbor, and the area surrounding Hog Creek and Hog Creek Point could be at risk. Salt contamination of shallow surface wells in overwash areas could also prove a problem in the

aftermath of a major hurricane. Given the high concentration of residential development in Reach 2, planning for hurricanes and catastrophic storms using available tools such as SLOSH should continue to be reviewed and upgraded.

3. Reach 3 -- Accabonac

(a) Description

Accabonac Harbor is a broad shallow estuary on a flat coastal plain, and the most significant feature of Reach 3. Two barrier spits on either side of the inlet to Accabonac Harbor, Gerard Park on the north and Louse Point on the south, separate Accabonac Harbor from Gardiners Bay.

In 1959, Suffolk County relocated the harbor inlet a quarter mile north of the then existing channel and used the dredge spoil to extend the Louse Point sandspit northward. The relocation probably altered the littoral system, as demonstrated by the channel's frequent requirement for maintenance dredging (four times in the last nine years) to keep it open for navigation. Also the Louse Point spit has accreted substantially, and a substantial sand flat has built up offshore of the old inlet since the channel shift. Flushing within the harbor also seems reduced. A former sluice between the north end of Accabonac Harbor and the bay along the southerly causeway to Gerard Park was filled and paved over, also reducing flushing in the harbor. The Town Trustees advocate restoring the channel to its original location and reopening the sluice along the causeway to Gerard Park to increase flushing and improve water quality.

From Accabonac Harbor, the coastline climbs sharply to Accabonac Cliff, morainal bluffs peaking at 100' high that have historically fed the beaches from Louse Point to Devon, but are now stabilized by bulkheads and revetments which have effectively eliminated the beach from the bluff toe and have starved sediment from the beach to the south. The groins have apparently diverted sediment transport offshore, contributing to a sand flat to the south. Littoral drift is generally north-south from Hog Creek Point to Gerard Point at Accabonac, and from Accabonac Cliff south to Devon.

From Accabonac Cliff the terrain descends to Barnes Landing, a municipal beach unintentionally stabilized by the Bell Estate dock, a sheet-steel structure built in the 1920's that now acts as a large groin. Lower bluffs ascend from Barnes Landing through the Bell Estate, descending again to Alberts Landing and Fresh Pond at the southerly end of the reach.

At a point near the north end of Waters Edge Road the Accabonac Cliff acts as a headland, with material also passing to the north into the extensive shoal on the south side of the Accabonac channel and the infill area at Louse Point. Littoral drift appears to reverse periodically here depending on storm conditions, etc. The longshore current runs nearly parallel to the shore in the stretch along Accabonac Cliff, where it has considerable velocity.

Land use in Reach 3 is almost entirely residential, with pockets of higher density along Gerard Drive, at Louse Point, in the Barnes Landing subdivision, and along Devon Landing Road south of Fresh Pond. Many of the residences in these areas are smaller summer cottages. Commercial development

is minimal within the coastal zone, the only instance being Springs General Store. Accabonac Harbor is an important anchorage for recreational and small fishing boats.

(b) Natural Protective Features

Much of the Reach 3 coastline is exposed to the force of nor'easters, though Gardiner's Island and Cartwright Shoal shelter this part of Gardiners Bay. The shoal is recorded as Cartwright Island on many maps and charts, was used as a bombing target during WWII, and was an island sand spit and rookery a few feet above MSL as recently as the 1960's. It is now almost entirely submerged. When Cartwright Shoal is overtopped by storm surge, waves traveling the full fetch of Block Island Sound bear down on Accabonac Cliff, and the wave energy is substantial. Storm winds from the north can also bear directly on this shoreline. Both conditions generate wave energies than can cause extensive erosion of this exposed and precipitous shore. Recent nor'east storms and hurricanes have repeatedly flooded the relatively narrow bay beaches and overtopped even the more massive of the stone revetments along the coast of Reach 3, causing erosion of the backshore and bluffs.

The bay beaches that are the first line of natural defense against flooding and erosion have been altered in many areas of Reach 3 by shoreline stabilization attempts, bulkheading or armoring by homeowners and, in a few cases, by the municipality. Eliminating the bluffs from the longshore sediment budget has starved these bay beaches, eliminating or degrading an important protective feature and an invaluable recreational resource and habitat. An approximately 200' wide beach between Barnes Landing and Louse Point at the base of the Accabonac Cliff has disappeared altogether in a 30-year period. The artificially stabilized bluffs are at a steeper angle than the natural angle of repose, and should significant toe erosion occur due to storm surge overwash, it could result in accelerated bluff slumping and recession.

Continued beach vehicle activity after significant storm events, often within a few feet of the beach grass line, has prevented regrowth and reestablishment of the natural shore vegetation community that helps to stabilize these fragile bay beaches and build dunes. The Town Trustees wish to see reasonable measures taken to encourage the regrowth and restoration of natural shore vegetation while at the same time protecting the public's right to use and enjoy our beaches. Some beach accretion occurs when less frequent storms from the southeast transport sand in from offshore flats to the beach. Dune building also occurs from aeolian deposition, especially in winter when northerly winds move sand onto the upper beach.

The beaches at the south end of Gerard Park and at Louse Point are the widest in the Reach, probably because this area is an infill area both from Hog Creek Point and the Accabonac Cliff, and where natural shore straightening is taking place. Both areas have also been dredge spoil sites for periodic maintenance dredging of the Accabonac channel.

The beach at Gerard from the first causeway south is composed of sand and cobble, and its profile is probably the steepest in the reach, indicative of intensive wave energy and rapid longshore currents. Both the Gerard and Louse Point barrier spits are low-lying and subject to overwash in storms, but in general protect the harbor. The entire shoreline of Accabonac Harbor is a designated CBRA Zone, including Louse and Gerard Points and also incorporating Wood Tick Island, but with

the exception of the developed parts of Gerard Park. The sand flat off Louse Point dissipates some wave energy, and because of the amount of offshore sand there, it is unsurprising that the channel requires frequent dredging.

The extensive salt marshes bordering Accabonac Harbor act to buffer and absorb floodwaters, although a network of County Vector Control ditches and some boat slips dug into the wetlands act as flood corridors that increase flood penetration and drainage. Recent efforts by the Town Natural Resources Department to manage the marshes with OMWM techniques should improve the floodwater retention of the marshes and restore them to a more natural state. In addition Chatfield's Creek and James Springs drain into East Harbor of Accabonac, and also act as channels for floodwaters.

Fresh Pond also has some associated tidal marsh but is more brackish. The Vector Control ditches which connect to it from Chapel Lane in Barnes Landing drain a large freshwater wetland system which would be a primary flood corridor in a major storm (see SLOSH). Accabonac Harbor is a State designated Significant Coastal Fish and Wildlife Habitat, and Fresh Pond is a locally designated Significant Coastal fish and Wildlife Habitat, so it is important to maintain their wetland systems and contributing watersheds for habitat reasons in addition to flood control.

(c) Coastal Structures

There are numerous erosion control and shore stabilization structures in Reach 3. From Clearwater Beach south to Gerard Park there are 15-20 groins and approximately 4000' of bulkheading; 10 groins and several new rock revetments south of the first Gerard causeway; a stone jetty at the end of Gerard on the Accabonac inlet; 15 groins and 3000' feet of bulkheading with 1500' of rock revetment along Accabonac Cliff to Barnes Landing; and 12 groins from Bell's dock to Abraham's Landing, not including the dock and a stone jetty constructed to stabilize the inlet to Fresh Pond.

The rocky beach from Hog Creek Point to the Fireplace Road end contains a variety of structures, including a sta-pod groin, one sizable rock revetment, and another homemade from beach stones. Most lots have bulkheads, some of which along the bluff area appear to have 8-10' of sheathing exposed, supporting green lawns up to the bluff edge. This indicates a high amount of reflected wave energy, and the possibility of bulkhead failure. Two or three older groins have been fashioned using natural beach boulders, and there are also some older style hollow timber groins, none of which appear to be accumulating sediment. Onshore sand is minimal and the beach is mostly stones and cobble sorted into terraces; the beach profile appears steep for a bay beach, all of which reflects the exposed nature of this shoreline, a direct hit for nor'easters.

The bluff rises to about 15' along Hog Creek Point then descends to Fireplace. These bluffs have some clay content, supporting sharp cliffs instead of sandy slopes, and are receding and eroding significantly where unprotected. A low tapered bulkhead and kneewall at the first lot north of the Fireplace Road end is an example of bluff stabilization where the structure is further from the active tidal and flood zone.

From Fireplace Road end south along Gerard Drive to the second causeway the area is extensively armored, including some unusual structures not found elsewhere in Town. Three large concrete and steel groins approximately 100' in length interrupt littoral drift just south of Fireplace Road, capturing sand and effectively causing downdrift scouring to the south. They are substantial, shielded by additional stone, and could be removed or reduced in size to restore sand movement. South of these groins the exposed beach is minimal or nonexistent.

The entire shoreline from Fireplace Road end to the first causeway on Gerard Drive is bulkheaded, mostly with heavy CCA pine. Doubled bulkheads on several properties indicate past failures of the devices. Some bulkheads have been doubled up, the replacement structure placed seaward of the original, with concrete apparently poured in between. At some points, notably Salter's cottages, new bulkhead was constructed well seaward (ca 15') of the old one and backfilled. Though bulkheads are high, 8-10' above MLW, and show signs of storm overwash with seaweed deposited on top and retardation of beach grass and lawns near the bulkhead. The landward margin upland along Gerard Drive to the second causeway appears insufficient to move houses back very much.

The Town-built rock revetment along the north causeway is poorly constructed and unlikely to remain in place in heavy storm overwash. It appears to have been simply dumped and heaped up as a stopgap. The causeway roadbeds wash out frequently in storms and often require repaving.

Between the first and second causeway are some bulkheaded properties, and several new rock revetments, as well as three or four timber groins approximately 40-50' in length. The groins are inappropriately long, capturing sand at the expense of the downdrift areas. As in the area further north, beaches have disappeared beneath bulkheads except where sand has been captured by groins. The area between the causeways is low lying, and as is demonstrated by the former bog mat present on the bay side beach, this barrier spit has been migrating steadily landward. The bulkheads and revetments may deter this natural movement for the short-term, but clearly do not forestall overwash in hurricanes and major storms, when larger amounts of material may be transported. Many of the homes from the causeway south along Gerard have been floodproofed by elevating them on piles, which is probably the most effective protective measure that can be taken.

Along the south side of the second causeway are the remains of a structure said to be a former tidal sluice to the north end of Accabonac Harbor, dating from the 1930's. Over the years, numerous discussions have occurred concerning the viability of a cut to improve flushing for the north harbor, and this is probably a logical spot for it to be reopened or restored.

The Reach 3 littoral system, shoreline dynamics and sediment budgets have been extensively disrupted by human interference. It is left to anecdotal recollection and conjecture as to what the natural coastline looked like, but it can be stated with certainty that coastal structures have accelerated and exacerbated erosion rates in this reach, especially during a relatively quiescent period of few hurricanes. Photographs from eighty years ago show the bluffs at a natural angle of repose, with wide beaches and extensive vegetation on the bluffs and upper beach. In contrast, residences that seemed well buffered by beaches and bluffs when built in the late 50's or early 60's now sit atop

steeply angled bluffs and are threatened by erosion and storm flooding to an extent that homeowners feel compelled to further armor the shoreline to protect their property.

The loss of beach resources in this area exhibits a pattern occurs in other areas in the Town. Residences were built on the bluff along Waters Edge Road in the Barnes Landing subdivision in the early 60's, predating zoning and current setbacks. As erosion of this naturally receding headland began to encroach on blufftop lawns and decks, homeowners constructed bulkheads and groins to secure the bluff toe. Construction of erosion protection devices was poorly conceived and engineered, and often did more damage than good.

Bulkheads were constructed at insufficient distance from the water, and when they were subjected to storm events, wave energy reflected from the vertical bulkhead surface caused rapid erosion of the beach. A first timber groin constructed in the 60's was overly long for the task and caused downdrift scouring, further diminishing the beach. Affected neighbors began constructing their own bulkheads and groins. By the mid-70's much of the beach had disappeared, the bulkheads were beginning to fail, and in the early 80's massive shore-parallel rock revetments were installed, with structures ultimately armoring virtually the entire length of the bluff. Little or no beach now remains along most of Accabonac Cliff. Unfortunately, the response to the accelerated erosion caused by the structures has been to build more, and more massive, structures.

North of the Bell Estate dock the beach has been held in place because the steel sheet pier, originally reached by a catwalk over water, began to act as a groin and filled in the beach behind it. There are buried bulkheads at the toe of the Bell Estate bluffs with several rock-filled timber groins south of the dock that were constructed to stabilize the bluff in the 1920-1940 era. A small section of seawall lies just south of Fresh Pond Road, and a hodgepodge of other bulkheading and small groins line the shore between Fresh Pond and Devon Yacht Club. With littoral drift from north to south in this part of the reach the structures have apparently contributed to progressive loss of beach to the south, most acutely along Cross Highway between Fresh Pond and Devon. The inlet to the marina at the Devon Yacht Club silts up rapidly and has to be dredged annually.

The stone jetties constructed by the Town to stabilize the opening to Fresh Pond are an example of intentions gone awry. In spite of the jetties, downdrift scouring and the vagaries of natural sedimentation have caused the inlet creek to shift and silt up, constricting flushing of the pond. The original channel from the 20's was 200' to the north.

Soft solutions have been utilized occasionally in Reach 3, notably terracing and planting of toe-armored bluff faces, and a low bluff restoration at the south end of Waters Edge, on properties with Suffolk County Tax Map (SCTM) #103-5-34 & -35, where sand was brought in and vegetation used to stabilize it. These measures have bought time and mitigated erosion in recent nor'easters, but have to be seen as requiring ongoing maintenance and periodic restoration.

The Town Natural Resources Department, assisted by the Accabonac Protection Committee, Group for the South Fork and local Girl Scouts, has planted beach grass along the Gerard causeway and restored vegetation at the Gerard and Louse Points road-ends. Dredge spoil from the Accabonac

channel has also been deposited at Gerard and Louse Points, helping to build up these areas and reduce overwash potential.

Within Accabonac Harbor there are no coastal structures other than small residential docks, and several public launch ramps (see **Public Access and Recreation Policies #9 & 19-22**).

(d) Flooding and Erosion Zones

FIRM's (#360794-0018C, -0019D, -0020D, and -0022D, dated 5/18/92) indicate V-7 zones for the entire Gardiners Bay shoreline of Reach 3. All of Accabonac Harbor is in the A-zone including Gerard Park and Louse Point, and the A-zone cuts Fireplace Road near Gerard and at the Springs Church, and Old Stone Highway at Landing Lane, where it also extends inland to Pussy's Pond. A-zones also cover Fresh Pond and extend through the wetland system to Barnes Hole Road. Albert's Landing, Fresh Pond landing, and Cross Highway between Fresh Pond and Devon are also in the A-zone. Accabonac Harbor and its surrounding shoreline and wetlands, with the exception of some residential areas of Gerard Drive and Louse Point, is included within a CBRA zone, an indication of overwash potential.

According to the SLOSH model (Gardiner's Island West Quadrant #P2, Gardiner's Island East Quadrant #Q2, East Hampton # P3, and Napeague Beach #Q3) a category 1 hurricane would overwash Gerard and Louse Points. A category 2 storm could cut off Fireplace Road at several places, and flood Old Stone Highway in the Barnes Hole area. A category 3 or 4 hurricane could additionally inundate the evacuation shelter at Springs School, much of Fort Pond Boulevard, and merge Accabonac Harbor with Hog Creek along Hog Creek Road and Accabonac and Fresh Pond through the wetland system at Barnes Hole Road. Such a storm would sever all the main arterial roads in Springs, making evacuation from low lying areas problematic and threatening a shelter site as well.

Coastal Erosion Hazard Areas (photos #17-748-83 sheet 33-N, #18-742-83 sheet 34-N, #18-739-83 sheet 35-N, #18-736-83 sheet 36-N, #18-733-83 sheet 37-N, and #20-1133-83 sheet 38-N) in Reach 3 include the entire Gardiners Bay shoreline, encompassing houses on Kings Point Road just east of Hog Creek Point, some bay shore dwellings on Gerard Park and the causeway, all of Louse Point to the curve in the road, Accabonac Cliff to Barnes Landing including several homes at the south end of Waters Edge, and the Bell Estate bluff, possibly including some houses constructed since the photo maps were finalized. All of the bay shore houses on Cross Highway between Fresh Pond Landing and Abrahams Landing are also in the CEHA.

(e) Analysis

Reach 3 includes some of the Town's areas most vulnerable to flooding and erosion, especially Gerard Park and Louse Point. On the positive side, repeated overwash of these areas has resulted in some dwellings being floodproofed to NFIP standards. As with other reaches, much of the construction in these areas has occurred in a period that should properly be regarded as a lull in storm activity. Homeowners should be discouraged from expanding or enlarging residences in flooding or erosion hazard zones. Any permits granted for remodeling or expansion of residences in CEHA, CBRA, V- or A-zones should require floodproofing to NFIP standards. Floodproofing should not,

however, be construed to effectively allow three story houses in violation of the Town's multi-story zoning ordinances.

Hurricane evacuation planning should be reviewed by the Town in light of the SLOSH model, which indicates that severe flooding could occur in the areas surrounding Accabonac Harbor, the wetland system from Fresh Pond to Barnes Landing, in the Kings Point area, and at the Springs School shelter. Flood victims could be difficult or impossible to reach in a Category 3 or 4 hurricane. Kings Point, Gerard, Louse Point, Pussy's Pond, Accabonac Cliff and Cross Highway near Fresh Pond are all areas which should be examined for planning modifications in the *Hurricane Damage Mitigation Plan* (see **Projects**).

With respect to Gerard Park, proposals for re-opening the north-end sluice or opening a second inlet along the causeway to improve the flushing have circulated for years, and a solution could be combined with redesign of the causeway to ameliorate the nearly annual washouts of the roadbed there. The idea has merit but needs study to evaluate effects on the valuable shellfishery and bird habitat, on tidal range and circulation, as well as flooding and sedimentation within the harbor. Accabonac Harbor remains largely free of coastal structures, and erosion protection structures are of little utility in the low energy saltmarsh environment of this shallow harbor. No additional structures should be permitted on the interior shore of Accabonac Harbor.

Use of erosion protection structures has altered much of the immediate shoreline in Reach 3, particularly from Hog Creek Point to Gerard Park, along Accabonac Cliff south to Barnes Landing, and from the Bell Estate dock to the Devon Yacht Club inlet in Reach 4. Shoreline erosion protection structures have had limited effectiveness in controlling upland erosion in Reach 3, and while they may have retarded shoreline recession to some extent, they have typically done so at the expense of neighboring property or fronting beaches. Downdrift areas have been affected by scouring, and fronting beaches by erosion, accelerated by wave energy reflected from vertical surfaces such as bulkheads.

This has affected public access and the ability to traverse public trust lands and beaches, in some cases culminating in complete loss of the fronting beach. In these areas the sacrifice of recreational resources and public trust lands in order to protect private property seems an unacceptable cost. It is the Town's municipal responsibility to reverse or prevent these negative impacts on public resources wherever possible, and Town policy should make this its foremost priority.

The marked scouring of downdrift beaches evident in Reach 3 near or adjacent to perpendicular erosion protection structures has led to a chain reaction of shore armoring as downdrift areas are continuously affected by updrift structures. Throughout the reach, perpendicular structures have caused unconsidered negative effects downdrift, are too large for the designed erosion protection function, or are simply unnecessary. Perpendicular structures such as groins which interfere with littoral drift and sediment transport should therefore not be replaced or restored, except where used to protect navigational channels, as at Gerard Point, and no new perpendicular structures should be permitted.

In areas of Reach 3 with existing hard structures and minimal natural protection where structures provide the only remaining protection against flooding or erosion (Condition 3 on map), the shore-parallel structures should be permitted to be maintained to protect homes and property. However, expansion of structures into larger or more permanent types, e.g. from bulkheads to rock revetments, should not be permitted, as this may exacerbate loss of public resources or neighboring property, or foreclose other soft erosion protection solutions. Soft or non-structural solutions can be used to enhance protection or restore resources. Replacement structures should not extend seaward of the existing structure, e.g. a bulkhead replacement should be behind rather than in front of the existing bulkhead. Permitting of such structures should include provisions for maintenance of fronting beaches (see **Policy #13/13A**).

As an example, where existing erosion control structures on the bay side of Gerard Park are more or less continuous north of SCTM #41-2-22, property owners should be permitted in-place in-kind replacement of shore-parallel structures, with emergency permitting in case of storm damage.

Also, between Fresh Pond, starting at the northerly boundary of tax map #127-3-3, and Abraham's Landing, ending at the northeast corner of tax map #127-2-15 in Reach 4, the extensive existing sea walls and revetments should be permitted in-place in-kind replacement or maintained with emergency permits following storms (Condition 3).

Where the extensive bulkheading, groins and revetments under Accabonac Cliff have caused erosion of the fronting beach, restoration of lost beaches and public access should be explored, with sand recovery from offshore shoals or dredge spoil from the channel, and creation of an erosion control district as a possible means to finance initial project cost and annual maintenance (see *Hurricane Damage Mitigation Plan* in **Projects, Section XIV**). Existing bulkheads should be permitted to be replaced in-place in-kind (Condition 3), but no new groins or revetments permitted. Only beach nourishment or other soft solutions should be permitted at the north and south ends of the cliff outside of this area. (See also **Section XV**).

In order to restore the eroded beach in this area permit procedures should be revised to incorporate both downdrift mitigation and beach maintenance requirements, with financial surety to insure continuity, and sunset provisions to phase out structures if necessary to accommodate rising sea level or increased shoreline recession.

If an entire area, such as Gerard Park or Accabonac Cliff, is destabilized in a catastrophic (greater than the 30-year) storm event or by increased erosion rates, existing erosion protection structures should not be replaced if they no longer function as designed or if the shoreline position has been substantially altered. Mechanisms should be developed to relocate structures landward, or assist with buyouts as necessary. Such area mechanisms including possible erosion protection districts, and other parcel specific solutions should be put in place as part of a *Hurricane Damage Mitigation Plan* (see **Projects**).

In those areas of Reach 3 designated as Condition 2 on Flooding and Erosion Protection Map V-2, with isolated or discontinuous hard structures, or where natural features could furnish erosion

protection, permits for rebuilding or emergency replacement of structures should not be issued automatically. Structures should be analyzed on a case by case basis versus natural or non-structural protection. Under present conditions some shore-parallel structures should not be replaced. Groins and other perpendicular structures should not be replaced. As an example, the area from the Bell Estate dock (SCTM #104-2-11) past Fresh Pond to the northerly boundary of SCTM #127-3-3 has a number of pre-existing structures that are adversely affecting the beach.

In areas of the reach depicted as Condition 1 on Map V-2, predominantly without hard structures, new hard structures should not be permitted in order to preserve coastal resources and natural protective features. Existing structures should be replaced only under conditions of exceptional hardship. Groins and other perpendicular structures should not be replaced or restored unless protecting navigational inlets. As an example, on Gerard Drive south of lot #041-2-22 to Gerard Point, new structures should not be permitted. Existing shore-parallel structures should only be repaired or replaced only under conditions of exceptional hardship. Within the CBRA zone on Gerard Park armoring of the shoreline with erosion control structures should not be permitted.

Condition 1 also applies south of Louse Point at the bluff leading up to Accabonac Cliff. Spoil from the dredging of the Accabonac Harbor channel should be used there for beach nourishment, and soft solutions used for bluff stabilization in preference over structural ones. The Condition 1 recommendation also applies to the area south of Accabonac Cliff, past Barnes Landing to the Bell Estate dock, where soft erosion protection solutions should be used. The Town Trustees own, and have sole authority over, sale or gift of dredge spoil which has come from bottomlands within their ownership and/or control.

At Fresh Pond, where the inlet has filled in and shifted despite the presence of the Town jetties, removal of these jetties is recommended to restore natural movement of the creek channel. This would also decrease scouring of the downdrift area to the south. Widening of the channel to the pond would also increase flushing and improve water quality, and would stabilize the south side of the inlet where it has been eroding the Town park over the last decade. To help control flooding as well as improve water quality, stormwater catchment from the Bell Estate road system should be improved, and additional OMWM undertaken for the wetland system at the headwaters of Fresh Pond (see **Projects**).

Spoil from the dredging of the Devon Yacht Club marina could appropriately be used to nourish the beaches to the north between the Yacht Club and Fresh Pond. This is an area of strong tidal flow where the ebb tide pulls sediment south toward the Devon channel.

4. Reach 4 -- Napeague North

(a) Description

Reach 4 is dominated by a low sandy area between Devon and Hither Woods that follows the easterly curve of Gardiners Bay to Napeague Bay. The major coastal feature of this reach is Napeague Harbor.

Fossil bluffs along Bendigo Road mark what was once the post-glacial shoreline at a time when Montauk was an island. All of Napeague was submerged then except for another small island at Promised Land, and the moraine reemerged above sea-level at Hither Woods.

Wave-deposited sand gradually filled in the Napeague isthmus, also forming the spits of Goff Point and Hicks Island that enclose Napeague Harbor. From Napeague Harbor the terrain ascends through the 30-45' Walking Dunes to rejoin the moraine at Nominicks in Hither Woods at an altitude of 86'.

The coastal environment varies from the wave-dominated sections of Gardiner's and Napeague Bays, to the low-energy tidal conditions in Napeague Harbor. The highest wave energies occur along Water Fence where Napeague Bay is no longer sheltered by Gardiner's Island and waves with the long fetch from Block Island Sound break unimpeded on this shore in nor'easters and winter storms.

Littoral drift carries sediment southwesterly along the Gardiner's Bay shore, then eastward from Cherry Point which acts as the defining headland in this coastal compartment. From Abraham's Landing to Promised Land is mostly a lee shore in prevailing winds, and except in storm surge conditions is not subject to high erosion rates.

Land use in Reach 4 is primarily sparse residential; except for the Devon Yacht Club and its associated marina; the Multi-Aquaculture facility adjacent to the site of the old fish factory on Promised Land in Napeague State Park; the "Art Barge" on Napeague Harbor; and several restaurant operations and a tennis club along the north side of Montauk Highway. A more concentrated residential section at Lazy Point borders the west side of Napeague Harbor, including a small trailer park and numerous small cottages, originally summer “camps” on Town Trustee land along Shore Road, with a second trailer park and residential cluster at Crassen Boulevard. The extensive preserved open space in Reach 4 includes the 1253 acres of Napeague State Park and an adjoining 1441 acres in Hither Hills State Park, as well as Trustee lands on the west side of Napeague Harbor.

(b) Natural Protective Features

Much of the Reach 4 shoreline remains relatively undisturbed, leaving intact the wide variety of natural protective systems. The sandy beach from Devon to Promised Land is in a natural condition, with a gradual profile that buffers wave action, turning progressively steeper and rockier east of Napeague Harbor in a transition to the bluffs and wave-dominated shore at Water Fence in Hither Woods. A low dune affords limited protection to the houses along the shore on Cranberry Hole Road. However, the entire area is low-lying and would be subject to flooding and erosion in a major storm event. The low dunes extend east of Cherry Point through Promised Land to the Lazy Point area, with a dune complex extending inland until it meets the interior saltmarshes and brackish marshes of Napeague Meadow.

The beach at Cherry Point is a good example of natural terracing from storms, with discrete levels of storm cast cobble, and sandy areas with reasserting vegetation. The upland furthest from the water shows a combination of low dune migrating landward and encroaching on a wetland area behind it, vegetated with beach grass, shad, and blueberry. Seaward of the dune a low berm of sand and cobble is covered with poison ivy and beach grass, then a cobbly/sandy strip of beach, a runnel,

then another shallow cobble terrace, sandy beach, and rock cobble just offshore. Further east near Bayview Avenue submerged bog mat is visible just offshore, another indicator of the landward migration in the area.

Beamon's Creek at the southwest bend of Napeague Harbor and the small creeks and extensions of Napeague Pond broaden into a marsh system that projects west of Napeague Meadow Road for a considerable distance paralleling the Old Montauk Highway sand road, the wagon route to Montauk that predated NY Route 27. There is also a small tidal creek on the southeast corner of Napeague Harbor that connects to more marsh along the LIRR right-of-way.

On the harbor's east side extensive salt and brackish marshes border the Walking Dunes, behind a low dune system cut by ORV traffic in several locations. These breaks in the dune have increased flooding of the wetlands behind the dune as well as traffic damage to sensitive vegetation, and could cause potentially damaging blowouts. In season the harbor is favored by windsurfers, some of whom apparently prefer driving in to Goff Point on the fragile beach along the east side of the harbor.

Another extensive wetland system near the intersection of Bendigo and Cranberry Hole Roads on both sides of the road also has considerable floodwater retention capacity. Vector Control ditching in that system and throughout the extensive marshes fringing Napeague Harbor probably increases the retention capacity and velocity of floodwaters and the extent of their inland penetration. A channeled stream draining the Bendigo wetland terminates in the Devon Yacht basin.

Several coastal ponds also act as floodwater reservoirs, including Napeague Pond, Skunk's Hole on the east side of Napeague Harbor, and Fresh Pond in Hither Hills State Park. Fresh Pond, one of the larger purely fresh water ponds in the Town, covers approximately 34.2 acres, with 1.1 miles of shoreline.

A barrier island, Hicks Island, which has been used as a spoil site when the west channel to Napeague Harbor is periodically dredged, protects the mouth of Napeague Harbor, and is an important colonial waterbird nesting site. Just east of Hicks a barrier spit, Goff Point, shelters the east side channel to the harbor. Goff Point is subject to frequent overwash in storms. Hurricane Bob in 1991 breached the spit, creating another island in the mouth of the harbor that remained separate for six months before littoral drift sediments closed it again.

The bluffs rising along the Hither Woods shore of Napeague Bay are by and large in a natural state, except for a few areas where pedestrian trails and incursions by illegal ORV users have prevented the natural vegetation from establishing itself. These bluffs are a good example of natural recession in a high wave-energy environment where material constantly washes out of the slumping morainal bluff to feed a rocky but constantly replenished beach. It would provide a good natural control area for the Erosion Hazard Monitoring Program (see **Projects**).

(c) Coastal Structures

At the west end of Reach 4, Devon Yacht Club has a small marina basin excavated into the shore and stabilized with bulkheading around its perimeter with a 200' jetty to the north and 75' on the

south to stabilize the entrance. The inlet nevertheless requires frequent maintenance dredging. Dredge spoil which in the past has been transported offsite, might be better used to nourish neighboring beaches to the north diminished by numerous erosion control structures. A 350' pile pier is also part of the Yacht Club but is of sufficiently open construction to have a negligible effect on the littoral system.

A second disused marina lies at the site of the old fish factory at Promised Land. This was at one time a large industrial operation for reducing bunker fish (Menhaden) to fish meal and fertilizer, but ceased operations in the early 1960's, and the site is now New York State parkland. Deteriorating bulkheads and docks, as well as concrete and brick structures remain on the site, and some infilling of the old navigation channels is evident. A buried groin, which may actually be the remains of one of the bunker boat hulls, lies to the east of the old fish factory basin, and acts to deflect the littoral drift slightly. As mentioned above this coastal exposure, particularly this west side of Cherry Point, is relatively sheltered and the littoral disruption by these structures is probably minimal. See **Development Policy #1** and **Projects** regarding reuse and revitalization of this site.

As a result of erosion on the more exposed east side of Cherry Point two summer cottages at the end of Mulford Lane are for all practical purposes out on the beach, with their septic systems leaching into the bay and their foundations awash in any high tide. The structures seem unlikely to survive many significant storm events. They should not be rebuilt, and preparation should be made to reclaim ownership of the land by the State or the Town Trustees.

East of Mulford Lane and along Shore Road a series of groins and other erosion protection structures is affecting the beach. A single large rock groin near the west end of Shore Road is excessive in size and should be dismantled or shortened and reduced in profile to mitigate scouring to the east. There is one filled bulkhead, also near the west end of Shore Road which aggravates flanking erosion and interrupts the continuity of the beach profile. Another 5-6 groins to the east are minimal in profile, and have a commensurately low impact on the beach. The severity of erosion is greater, with less of an upland buffer around the eroding Cherry Point headland, and less approaching the entrance to Napeague Harbor at the east end of Shore Road, where a wider beach and established dune vegetation protect the upland.

At the end of the Shore Road loop on Napeague Harbor riprap has been placed by the Town to forestall erosion around the newly reconstructed Town launching ramp. Within Napeague Harbor are remnants of an old fishing station, Merrill's Irish Mist, on Fiore's Pond at the southwest side. Some bulkheading and a culvert between it and Napeague Pond remains which acts to increase flushing of the pond, and flooding in the marshes to the west. Bulkheads also protect the Art Barge and a neighboring home at the south end of the harbor, and there is a series of small groins and bulkheads fronting residences along the southeast harbor shore. No other coastal structures are present in Reach 4 east of Napeague Harbor.

(d) Flooding and Erosion Zones

FIRM's (#360794-0020D, -0017D, -0013D, and -0009D, dated 5/18/92) indicate flood Velocity (V-) zones along the shoreline of Gardiners and Napeague Bays throughout the reach, and covering the

shores of Napeague Harbor. Cranberry Hole Road, Napeague Meadow Road, Lazy Point and Goff Point are also within V-zones. A-zones include much of the Lazy Point area, plus the harbor borders backing the V-zones as far south as Montauk Highway. In summary, most of the low-lying areas of Napeague in Reach 4 are in the NFIP 100-year floodplain.

Most of Napeague Harbor is also in a Federal CBRA zone extending through to the ocean in Reach 10, a further indication of the overwash potential for the entire area.

The SLOSH model (Gardiner's Island East Quadrangle #Q2 and Napeague Beach Quadrangle #Q3) shows that a Category 2 hurricane could inundate the Devon area and much of the shoreline of Gardiners and Napeague Bays to Napeague Harbor, which could flood to sever Montauk Highway. A Category 2 storm could also break through on the east side of the Walking Dunes into Fresh Pond, as well as flood all of Lazy Point, Goff Point and much of Promised Land.

A Category 3 hurricane could additionally link the ocean and bay at Cranberry Hole and White Sands on the Napeague stretch. A Category 4 hurricane could submerge the Napeague area from the Bendigo bluff to the Walking Dunes, with Napeague Bay and the Atlantic merging to overwash the entire area. All structures in this part of the reach would be at risk in such a storm.

CEHA photo maps (#15-766-83 sheet 28-N, #15-762-83 sheet 29-N, #16-1205-83 sheet 30-N, #17-755-83 sheet 31-N, #17-751-83 sheet 32-N, #17-748-83 sheet 33-N and #18-742-83 sheet 34-N) show erosion hazard areas along all of the shoreline of Gardiner's and Napeague Bays and into Block Island Sound, including the structures of Devon Yacht Club, several homes along the bay shore on Cranberry Hole Road, the Multi-Aquaculture facilities, waterfront homes at the end of Mulford Lane, and all of the residences situated on the water side of Shore Road at Lazy Point. Lazy Point, Hicks Island and Goff Point are also within the CEHA but have no structures at risk.

Napeague was also chosen as a study area for the *Hurricane Damage Mitigation Plan for the South Shore of Nassau and Suffolk* (LIRPB, 1984). Some of the strategies in this study recommended:

- Accept the natural shoreline regression along the headlands portion of the reach as beyond practical control.
- Expand public open space in areas vulnerable to overwash and flood damage.
- Seek to expand undeveloped coastal barrier designations under the Coastal Barrier Resources Act on storm-damaged portions of the island.
- Develop plans for emergency response procedures in the event of a breach at Napeague.

The study goes on to note: "...Evacuation of the eastern end of the south fork is a particular concern because of the limited carrying capacity of Montauk Highway -- the reach's only major east-west transportation corridor -- and the potential for an overwash of the highway at Napeague, which would effectively cut off all land-based evacuation routes for the Montauk peninsula. The potential for flooding is particularly high at Napeague because the area is low-lying, narrow, and fronted by small irregular dunes." (LIRPB, 1984)

(e) Analysis

Reach 4 features some of the finest undisturbed stretches of coastline in the Town, largely due to the amount of parkland and open space. Insofar as structural and residential consequences of flooding and erosion are insignificant in the undeveloped parts of the reach, those sections of coast should remain in their natural state.

Further recommendations for Reach 4 are represented graphically on Map V-2. With a few exceptions for existing erosion protection structures within the reach, most of the Reach 4 shoreline is designated on the map as Condition 1: predominantly without shore-parallel hard structures, where no new hard structures should be permitted, and where existing structures should be replaced only under conditions of exceptional hardship, and perpendicular structures such as groins should not be replaced, except where used to protect navigational channels. This designation is intended to preserve the exceptional coastal resources and natural protective features of this reach.

Former dock and marina structures at the old fish factory site within Napeague State Park are designated as Condition 2 on the map, as isolated existing structures. They are in disuse and probably should not be replaced or improved, except insofar as they are used to enhance public access, including possible reuse as a fishing pier. If at some point the park facility is upgraded to enhance access, demolition and removal of the existing dilapidated structures should be considered (see **Development Policy #1, Public Access and Recreation Policies #9 & 19-22**).

Within Napeague Harbor there are two sites designated as Condition 2. The first includes the Art Barge, and a neighboring private home (SCTM's #109-1-20 & -21), both of which are presently bulkheaded and within both the V- flood zones and the CBRA zone. These properties are sufficiently low-lying that they would probably not survive without protection. The presence of the bulkheads does not appear to have a significant erosion impact on the adjacent parts of this otherwise unpopulated and well vegetated section of the harbor shoreline. This is generally a low energy tidal environment, and the buildings are occupied only in the summer. In this case, where flooding from winter nor'easters is the problem rather than erosion, the bulkheading should be permitted to be maintained within the 30-year storm standard, however, only by following the full permit procedure, and considering other floodproofing options such as elevating the structure.

The second Condition 2 area within Napeague Harbor is a group of residences along the southeastern shore of the harbor, from SCTM #109-1-13.1 to #110-2-3. The homes have some shore-parallel armoring (bulkheading), and also a series of small groins, which are essentially non-functional in the harbor environment. The residences are also on higher ground where flooding is somewhat less of a hazard. As noted in the general recommendations for Condition 2, there should be no reconstruction or replacement of the existing coastal erosion structures without full permitting procedures in which non-structural alternatives are also analyzed, and no additional structures should be constructed. The perpendicular groins should not be replaced or restored, as they serve little for erosion protection and otherwise disrupt littoral or tidal processes within the harbor.

As indicated by the flooding and erosion zones from the FIRM's, CBRA, SLOSH, and CEHA, Napeague is particularly susceptible to flooding and erosion in storms. It is also vulnerable to

shoreline recession from sea-level rise because of its flat sandy shoreline, wetlands and low lying terrain.

The low dune system and gradual profile of the beach along the residential area of Cranberry Hole Road provide as good a natural buffer as is likely to occur in such a low-lying area and should not be disrupted with coastal structures. Any post-storm reconstruction or routine building permits for improvements in this and the Lazy Point/ Crassen Blvd. area around Napeague Harbor should incorporate residential flood-proofing.

In a severe hurricane or nor'easter all of the homes in this Lazy Point area are potentially in harms way of floodwaters. Many of the waterfront homes at the west end of Shore Road and near the road ends of Mulford Lane and Bay View Avenue are also at risk from normal erosion of the Cherry Point headland.

The *Hurricane Damage Mitigation Plan for the South Shore of Nassau and Suffolk Counties*, under Napeague Strategies recommends, "The structures located on Napeague Bay between Cherry Point and Lazy Point are highly vulnerable to flooding. Many of these houses are on land owned by the Trustees of the Town of East Hampton, which is leased to individual homeowners. Approximately one-half of the houses in this area appear to be year-round residences. All of the structures along the shoreline are within the 100-year floodplain. It should be public policy to severely limit any additional development in this area, and to phase out housing on the Town Trustee owned land. This land could then be retained for public access and recreational use." (LIRPB, 1984, p. 156).

The *South Shore Plan* continues with more detailed comments, excerpted here: "It is recommended that the Town Trustees immediately formulate a plan to phase out the leases and remove the structures at Lazy Point. The Trustees should investigate the option of extending the leases to allow present leaseholders a chance to amortize their structural investment over a 10 year period, in exchange for leaseholder agreement that structures will not be rebuilt after sustaining damage from storm-related flooding and/or erosion equal to or exceeding 50% of structural value." (LIRPB, 1984, p. 163). This recommendation is also consistent with NYS DEC Regulations for structures within CEHA zones. Note: The Trustees disagree with the above recommendations.

The two dwellings on the beach at the end of Mulford Lane should be condemned and removed by the County Health Department and NYS DEC, and the underlying State and/or Trustee lands should be reclaimed. Other policies and mechanisms to address long-term flooding and erosion hazards at Napeague should be further resolved in a local *Hurricane Damage Mitigation Plan* or *Hazard Mitigation Plan* (see **Projects**). The Town Trustees should formulate such policies as they see fit for Trustee lands to which they hold title.

A Town *Hurricane Damage Mitigation Plan* or *Hazard Mitigation Plan* should address eventual removal of the perpendicular erosion control structures along the bay shore of Shore Road on Lazy Point (Condition 1), which are disrupting sediment transfer. While some structures are of short stature others are excessively large and interfere with coastal processes. The stone groin furthest to the west appears to be accumulating sand on the Lazy Point side, contributing to the scouring at the

end of Mulford Lane above. At minimum, no new erosion protection structures should be permitted on Lazy Point, and existing structures, especially perpendicular structures such as groins, should be phased out and not repaired or replaced as they deteriorate. If through eventual extinction of the Trustee leases at Lazy Point the area were to revert to public open space, it would be even more desirable to restore the natural shoreline dynamics.

On the east side of Napeague Harbor the primary erosion concern is damage to the narrow east harbor beach, back-dune wetlands, and dune areas from ORV use. For detailed recommendations regarding signage, recommended ORV restrictions and enforcement, and revegetation of dune cuts, see Townwide Recommendations in **Public Access and Recreation Policies #9 & 19-22**.

5. Reach 5 -- Hither Woods/Fort Pond Bay

(a) Description

All of the Hither Woods section of Reach 5 to Rocky Point on Fort Pond Bay is preserved open space, where natural coastal processes prevail. Flooding and erosion are inconsequential to development in this area, but it is an excellent example of a naturally receding bluff line, with elevations to 60' overlooking boulder strewn beaches. The bluffs descend to near sea level at the eroding Rocky Point headland.

East of Rocky Point two of the highest points in Montauk, "Montauk Mountain" on the west and Fort Hill on the east, frame Fort Pond Bay and overlook Fort Pond. The morainal bluffs rise from Rocky Point to 60-80' before descending to the southerly shore of Fort Pond Bay where a low marshy infill area divides the Bay from Fort Pond, formed when glacial meltwater filled a kettle. Along Fort Pond Bay's eastern shore, approaching Culloden Point, the coastal terrain again rises gradually to 30-50' bluffs.

Fort Pond Bay is a natural deep water anchorage, the deepest (47') harbor of the Town, and the site of the original Montauk fishing village prior to the 1938 hurricane. While it was an advantageous anchorage in the days before Lake Montauk (Great Pond) was opened and stabilized for navigation, it is exposed to the north, and the '38 hurricane effectively wiped the fishing village from its shore. Nor'easters pound unimpeded into this harbor from Block Island Sound, especially onto its western shore.

A former sand mine on Fort Pond Bay's western shore is now a proposed residential subdivision. An existing condominium project, and a Town affordable apartment complex, the Town Shellfish Hatchery, a motel, the Montauk Railroad Station, a lobster packing operation, and a variety of small businesses and a residential enclave now occupy the site of the old fishing village. They are similarly vulnerable to storm surge in a hurricane, although the condominiums at Rough Riders Landing are of relatively recent construction and are floodproofed to NFIP standards.

Fort Pond itself is bordered by considerable residential and commercial resort construction including houses, restaurants, motels, a day camp, movie theater, etc. There are a number of small residential docks as well as two commercial docks at the south end, including one for a sailboat rental business.

Town and State parkland rims the immediate shore at the south end of the pond, and there is a NYS DEC launch ramp.

Eastward along the shore of Fort Pond Bay up to the Culloden tract are residential areas interspersed with several guest houses and the Hotel Montauket with its bar and restaurant. Several stairways pass down the bluff to the rocky boulder-strewn beach, which has a steady northwest exposure.

The littoral drift in Block Island Sound appears to be southwesterly west of Rocky Point and southeasterly in Fort Pond Bay, east of the Point. The remainder of the reach to the east has the prevailing southwesterly longshore current.

(b) Protective Natural Features

Bluffs and coastal ponds are the two distinctive natural features of Reach 5. For all of the reach shore, except along the southern edge of Fort Pond Bay, bluffs back rock strewn gravelly beaches which effectively dissipate much of the wave energy. The 20-60' bluffs along Culloden are fairly stable and well vegetated, and because of their clay-based deposits support unusual and rare plant communities.

The coastal ponds, Fort Pond, Tuthill Pond and half a dozen small coastal ponds fringed by wetlands in the Culloden tract can receive and hold floodwaters, and Fort Pond and Tuthill Pond also act as flood corridors inshore. By the SLOSH model, Fort Pond in a Category 2 hurricane could be an avenue for the waters of Fort Pond Bay to enter the central business area of the Montauk hamlet. In a Category 3 or greater hurricane the ocean and bay could merge through this area, overwashing most of the downtown business area and the dunes along the ocean.

Wetlands in the low area between Fort Pond and Fort Pond Bay also have some flood absorbing capacity, albeit minor. Steep banks along the east shore of the Pond may be undergoing some erosion.

(c) Coastal Structures

No coastal structures are present along the Hither Woods coastline from Quincetree Landing to Rocky Point.

Within Fort Pond Bay there are several large timber docks on pilings, a 600' pier at the sand mine site at Benson Point, a 450' pier with a 270' "L" at Rough Riders Landing, and a 260' pier at Duryea's along Tuthill Road. All are of sufficiently open construction not to interfere with littoral drift. Several sustained damage in Hurricane Bob in August '91 and winter storms in '92-93. In a major hurricane waterborne debris from these heavy timber structures could damage other nearby structures or property.

Remains of part of the concrete World War II sea-plane pad and launching ramp at Benson Point have caused some visible scouring downdrift. Three groins installed by homeowners along Navy Road also produce scouring. The groins are stone, fairly low in profile but substantially built. In addition to the groins two of the residences have backing bulkheads supporting the bluff toe and one

has a shore parallel revetment partially buried by the bluff. The residence furthest to the northwest also has a long stairway down the 60-80' bluff, which was damaged in the 1992-3 winter storms.

A smaller groin protects the seawater intake to the Town Shellfish Hatchery, and two groins are at Rough Riders Landing just west of the L-shaped dock. The latter three do not appear to be having a noticeable effect on littoral drift. The former Navy dock at Rough Riders Landing has a NOAA tide gauge, which was installed in the 1940's and has accumulated data over a period of fifty years, which is useful in analyzing past coastal flooding patterns for this area.

Riprap has been used to armor the shoreline near Duryea's lobster dock along Tuthill Road, probably to mitigate the frequent overwash from Fort Pond Bay into Tuthill Pond, which has flooded Tuthill Road several times in recent winter storms. There is also some riprap in front of the Town Hatchery, and by the Montauket Hotel further east of Duryea's.

A LIPA emergency substation for Montauk is located in the A-flood zone on wetlands along the northern shore of Fort Pond. This installation has been built up with fill to the extent that it properly constitutes a coastal structure. A number of private docks and commercial enterprises with structures are located on Fort Pond's shore.

(d) Flooding and Erosion Zones

FIRM's (#360794-0008C & -0007C dtd 2/19/87 & #360794-0006B dtd 3/16/83) indicate a V-7 zone along the shores of Hither Woods on Block Island Sound and of Fort Pond Bay. A-zones cover the old sand mine site at Benson Point, and the backshore of Fort Pond Bay through Fort Pond to South Emerson Street in the Montauk business district. The old fishing village site, the railroad station, and a LIPA sub-station on Fort Pond are in the A-zone, and the wetland areas of Culloden. All are backed by B-zones.

The SLOSH model for Reach 5 (Gardiner's Island East Quadrangle #Q2 and Montauk Point Quadrangle #R2) shows a worst case Category 1 overwash along Industrial Road and the Fort Pond shoreline. A Category 2 storm could additionally inundate Quincetree Landing in Hither Woods, and expand the overwash at Fort Pond from Second House Road to Tuthill Road, including the railroad station, firehouse area, and Rough Riders Landing, to the Montauk business district. In a Category 3 hurricane the ocean could break through at the business area to merge with Fort Pond and Fort Pond Bay, and a Category 4 storm could completely overwash the business area as well as low parts of Culloden within the reach.

CEHA areas (Photos #12-1110-83 sheet 23-N, #12-1111-83 sheet 24-N, 13-1115-83 sheet 25-N, #14-1120-83 sheet 26-N, #15-769-83 sheet 27-N, and 15-776-83 sheet 28-N) cover the dock at Benson Point, the Port Royal Motel on Fort Pond Bay, and the condominiums at Rough Riders Landing. Duryea's lobster business, the Hotel Montauket and the solitary Sexauer residence near a wetland in Culloden are also in CEHA erosion hazard zones along the shore west of Culloden Point.

(e) Analysis

Flooding and erosion along the undisturbed shoreline of Hither Woods and the uninhabited part of Culloden have little if any impact on human life or property. However, some endangered plant species, such as Scotch lovage (*Ligusticum scothicum*), are vulnerable to flooding and natural erosion of the bluff toe along Culloden, and their preservation should be considered. These shores provide the best erosion buffer to storms and should be kept in a natural state to the greatest extent possible.

Shore hardening structures along the southwest shore of Fort Pond Bay are causing evident downdrift scouring. Shore-parallel erosion protection structures along all of the shore of Fort Pond Bay are designated Condition 2 on Flooding and Erosion Protection Map V-2, for a variety of reasons, including that the structure is interrupting coastal processes, obstructing public access, or because erosion protection could be furnished by natural protective features.

The most vulnerable areas in Reach 5 are the low-lying southern shore of Fort Pond Bay, Tuthill Pond and Fort Pond itself which could form a major flood corridor extending to the Montauk business district in a hurricane or catastrophic storm. Present infrastructure and residential and commercial construction in this area are at high risk and should be closely examined in the *Hurricane Damage Mitigation Plan* (see **Projects**). Commercial sites on Industrial Road should be checked for toxic materials and potentially hazardous debris that could become water borne in an overwash from a catastrophic storm. Alternative siting should be considered for these facilities out of the 100-year floodplain. No new facilities with similar hazards should be sited here, and the present ones should not be permitted to expand.

The LIPA substation situated in the wetland on Fort Pond is a concern during flood conditions and hurricane overwash. The siting of this installation, theoretically designed to provide emergency power to Montauk in hurricanes and other catastrophic events when power lines to the west are likely to be interrupted, is inconsistent with floodplain management. If not for its elevation on fill the substation would be submerged in any heavy rains. It is located in the A- flood zone, and the SLOSH model indicates the site could be overwashed in any category hurricane. Fuel for the generators is also stored onsite, and serious environmental consequences could result if a hurricane propelling timber debris from Fort Pond Bay docks impacts this facility, or if the tanks were to break loose causing a substantial fuel spill. The facility should be relocated. One possible alternative site is the former Town landfill, now a transfer facility, in Hither Woods; others should be examined.

6. Reach 6 -- Montauk North side -- Culloden Point to Shagwong

(a) Description

Lake Montauk, known to the colonials as Great Pond and to the native Montauketts as Wyandanee Lake, is the dominant feature of the reach and the Town's largest harbor, covering 1037 acres. Formed as an elongated glacial kettle and closed by littoral drift sediments from the eastern headlands, it was fresh water until the Benson purchase of much of Montauk in 1879. It was privately dredged and stabilized in 1926 with two stone jetties installed to form a 500' wide inlet,

which later became the Federal channel. Dredge spoil from the inlet was used to raise and enlarge Star Island and to connect it to the mainland with a causeway.

The open coast between the two points defining this reach is wave-dominated, except for the tidal-dominated system of Lake Montauk. From the bluffs at Culloden Point a series of intermittent dunes and beaches travels along the shore of Block Island Sound. Some of these have migrated inland to form the northern shores of the harbor, extending on the east side to Big Reed Pond and its adjacent wetlands.

The uplands are typical moraine, with rolling knob and kettle topography and elevations exceeding 100'. East of Lake Montauk, Prospect Hill with an elevation of 142' is part of the backbone of the moraine. Banks on the west side of Lake Montauk slope more gradually than those on the east side, and are more flood prone. While marshes developed along the western side, the erosive forces of chronic wave action have eroded the shoreline creating shallows and narrow beaches along the receding eastern bank.

Lake Montauk, especially in the Coonsfoot Cove area, has the highest concentration of private and commercial marinas, waterfront restaurants, fish-packing and other water-dependent businesses in the Town. On the northwest side of the Lake is a concentration of residences and motels. South of Star Island, Lake Montauk is primarily single-family residences, with some condominium development, restaurants and a pre-existing non-conforming marina.

On Block Island Sound along Sound View Drive and Captain Kidd's Path, waterfront homes have been armored with bulkheading and/or rock rip-rap, and beach loss has been dramatic. The area is downdrift of the massive inlet jetties, which interrupt sediment transport to the west. Erosion problems have also resulted from insufficient setbacks, aggravated by the effects of erosion protection structures, construction of which has progressed westward in a typical chain reaction of downdrift beach loss and attempts at structural response. The shore armoring has accelerated erosion of the fronting beach by reflecting wave energy and restricting the upland sediment supply. Spoil from recent maintenance dredging of the Federal channel for the inlet has been deposited on the west side but has been insufficient to alleviate the erosion problem.

(b) Natural Protective Features

The natural protection afforded by the dune system from the Lake Montauk jetties west to Culloden Point has been compromised by the downdrift scouring from the jetties, residential and motel construction on or in close proximity to the dunes, and attempts by property owners to preserve the upland with shore-hardening devices that have accelerated beach erosion. This shoreline is exposed to the full fetch of Block Island Sound in nor'easters and would be vulnerable to erosion in any case. The erosion control structures, by reflecting wave energy, have unfortunately hastened erosion of the natural beach which would otherwise dissipates the wave energy. The difference is striking where bulkheads have been installed and beaches have disappeared nearly completely, versus unarmored sections of the same shoreline where the beach has maintained a relatively gradual profile.

The bulkheads and revetments in front of houses and motels along Sound View Drive west of the Montauk jetties accumulated a sand beach during the '93-94 winter, after several years of erosion, demonstrating the variability of conditions there. In fall of '93 there was deep water in front of the property owners' bulkhead of the Sound View Drive Association. In spring/summer '94 there was a slender beach in front of the bulkhead, which was once again removed by the Christmas nor'easter of 1994. Dredge spoil from maintenance of the channel was again deposited west of the jetties in spring of 1995, but considerable sediment was lost to the surf conditions engendered in August 1995 by Hurricane Felix before it drifted out to sea. Dredge spoil was again deposited in 1996, but by 1997-98 the beach had again disappeared.

The scouring effect of the west jetty remains a concern, with pronounced buildup on the updrift side of the east jetty. Some form of sand bypassing around the Federal channel to Lake Montauk remains desirable. Bulkheads and revetments continue to cause rapid loss of fronting beaches in the area when exposed to surf conditions. The present channel location appears to occupy the inner curve of a cove between two headlands, along with mobile dunefields on what was the barrier spit across the mouth of Great Pond (now Lake Montauk).

In sharp contrast the beaches and dunes east of the jetty in Montauk County Park remain wide and well supplied because of accumulation by the upstream jetty and past deposition of dredge spoil. There is, however, a substantial cut in the dune east of the jetty used for ORV access. ORV camping and fishing use in the park is heavy, particularly on summer holidays, when camper vehicles literally line the beach, contributing to erosion and retarding growth of protective beach and dune vegetation. The access cut in the dune would likely be exacerbated by storm flooding, and could lead to a further blowout in the dune system and accelerated flooding of the interior dune system, Big and Little Reed Ponds, and possibly East Lake Drive (see **Public Access and Recreation Policies #9 & 19-22**).

The dune at the east end of the runway at Montauk Airport is in good condition and well vegetated, particularly on the landward side, rising to a height of about 30'. An old blowout seems to have been halted with snow fencing, and vegetation as appears on aerial photos has increased over the last decade. With present dune height, observations indicate a low probability of a breach by storm surge at this point.

Several coastal ponds and their neighboring marshes in the reach act to absorb floodwaters, including Big and Little Reed Pond on the east side of the Lake, Stepping Stones Pond to its southwest, and the ponds in Culloden. Big Reed Pond has been ditched for drainage to some extent by County Vector Control, particularly on the north side nearest the Montauk airstrip, which reduces its flood retention ability somewhat. Big and Little Reed Pond and Culloden should continue to be maintained in their natural state for flood control and as part of the State designated SCFWH.

Creeks and streams entering the Lake could become flood corridors in extreme flood conditions, including Peter's Run on the west side, Little Reed on the east, and Rock Run, and Clear Creek from the Ditch Plains area. A current Town drainage project at the south end, known as the *Oceanside Drain Project* will act to further impound floodwaters in wetland areas and should increase

floodwater retention as well as reduce non-point source pollutants (see **Water Resources Policies #30-40 & 44** and **Projects**).

(c) Coastal Structures

Besides the inlet jetties and the shore-hardening structures alluded to along Sound View Drive on Block Island Sound, there is extensive timber bulkheading and dock construction in the northern portion of Lake Montauk, particularly in the Coonsfoot Cove area, the area surrounding the Town's commercial dock and the Coast Guard Station, and the marina and fishpacking operations along the north end of East Lake Drive. The causeway to Star Island was originally culverted, but the culverts have closed up over the years from lack of maintenance and/or sedimentation, leaving Coonsfoot Cove with poor flushing.

The south end of the Lake has relatively few coastal structures: some 12-20 small groins, which have little scouring effect because of the limited circulation, bulkheads and a seawall, half a dozen residential docks, and a non-conforming 87-slip commercial marina, Captains Marina (Montauk Lake Club) on East Lake Drive. Because of the low energy tidal environment of the Lake these structures are of minimal utility for flooding and erosion control.

From the inlet jetties east to Shagwong Point there are no coastal structures.

(d) Flooding and Erosion Zones

On the FIRM's (#360794 -0002C, -0004C, -0005D dated 5/18/92, and #360794-0006B dated 3/16/83) V-zones encompass all of the shore of Block Island Sound and the water area of Lake Montauk. A-zones backed by B-zones cover West Lake Drive's northern end as well as the Sound View Drive and Capt. Kidd's Path areas west of the inlet, and all of the shoreline of the Lake including Star Island and the marina area in Coonsfoot Cove, and inland on the east side at the airstrip to Big Reed Pond. Big Reed Pond and the surrounding area are also a designated CBRA zone, another indication of overwash potential.

Worst case hurricane overwash zones demonstrated by the SLOSH model (Montauk Point Quadrangle, Drawing #R1) show possible inundation of Star Island and the wetlands surrounding Big Reed Pond in a Category 1 storm. A Category 2 hurricane could also overwash much of the Sound View Drive and Coonsfoot Cove areas, as well as along West Lake Drive and the south shore of the Lake. Block Island Sound could break through the dunes to Big Reed Pond, and Stepping Stones Pond could flood to merge with Lake Montauk, as it does regularly in nor'easters.

In a Category 3 hurricane, the remainder of Sound View Drive could be inundated and an area from the east jetty to south of Big Reed Pond on East Lake Drive could be be overwashed. A Category 4 storm could overwash all of the jetty area, all of West Lake Drive and the western shore of the Lake in the Stepping Stones area, and the Atlantic Ocean could overwash the Ditch Plains area to merge with the Lake, forming continuous open water from the ocean to Block Island Sound.

While damage from wind and storm surge overwash in a Category 4 hurricane is difficult even to contemplate, we can hope such events remain sufficiently infrequent so as not to threaten the Town.

However, smaller category hurricanes are by no means unknown in East Hampton, and concerns for life and property in potentially affected areas should not be underestimated. Although designed for evacuation planning, SLOSH is a useful tool for indicating areas of potential overwash which development should be directed away from, and which should be examined in more detail in the *Hurricane Damage Mitigation Plan* (see **Projects**).

State Coastal Erosion Hazard Areas as delineated on CEHA photo maps #11-782-83 sheet 20-N, 11-780-83 sheet 21-N, 11-776-83 sheet 22-N and 12-1110-83 sheet 23-N, include within the hazard zone the houses along Captain Kidd's Path and Sound View Drive, and all shores of Block Island Sound, including the County Park. Town-owned land adjacent to the jetties, and the end of the Airport runway near the dunes are also within the CEHA hazard zone.

(e) Analysis

The Sound View Drive area is one of the most vulnerable in the Town to storm-induced erosion and flooding because of downdrift scouring from the inlet jetties and the cumulative effects of erosion control structures in this exposed high-energy location. Two houses have been lost in the last decade to storm and wave action. Sand deposited from the periodic maintenance dredging of the inlet is insufficient to compensate for the combined sediment deficit and storm erosion, so the problem will likely recur. Spoil from the channel dredging should no longer be deposited on the east side of the inlet where beaches have in general been accreting but should be deposited exclusively on the west side.

Hard structures are the only remaining erosion protection along parts of Sound View Drive, and emergency maintenance and reconstruction of erosion protection structures and filling in of gaps should therefore be permitted within 30-year storm parameters. The area is designated Condition 3 on Flooding and Erosion Protection Map V-2. The numerous erosion protection structures that have been erected in this area have not alleviated beach loss, but to the contrary have accelerated it. Inevitably the need for erosion protection has lead to demands for government intervention to solve the problem with coastal engineering solutions. This is one of the few areas in the Town where there is some Federal responsibility, because of the ACOE role in maintaining the inlet channel and the jetties, which probably cause some downdrift scouring. The Federal government should fund mitigation measures such as an effective sand-bypassing plan as part of the regular maintenance of the Federal channel by the ACOE.

Coonsfoot Cove and the other extensive water-dependent and marine oriented businesses at the north end of Lake Montauk are also vulnerable to storm flooding, especially in a Category 2 or greater hurricane. Little can be done to reduce the exposure of these docks and other water-dependent enterprises. The structures of these water-dependent businesses provide needed public access to the Montauk waterfront, and should be permitted in-place in-kind replacement or reconstruction. They are so designated as Condition 3. Non-commercial areas in the north end of the Lake now predominantly without coastal structures should remain so (Condition 1), and some existing structures should be reevaluated versus non-structural alternatives before replacement or reconstruction (Condition 2). See Map V-2.

The remaining shore of Lake Montauk is also vulnerable to storm flooding. Because of the amount of residential development surrounding the Lake, it is important to maintain natural protective features such as wetlands, ponds, and streams with flood absorption and retention capacity. In the low energy tidal environment of the southern portion of the Lake hard erosion protection structures are relatively few and have little utility in retarding erosion. Therefore, as indicated on the map, new structures should be prohibited and existing hard structures should not be replaced except under conditions of exceptional hardship (Condition 1).

According to the SLOSH model and the FIRM's, a hurricane of Category 2 magnitude or greater could overwash much of the Sound View Drive, Coonsfoot Cove, and Star Island areas, as well as the Montauk airstrip, and much of the remaining shore of Lake Montauk. A direct hit by a Category 3 or greater hurricane could allow Block Island Sound to breach the dunes at the airstrip and the Atlantic to break through to the Lake at Ditch Plains, connecting the ocean with Block Island Sound and wreaking significant damage over the low-lying residential areas of East and West Lake Drives, as well as the marina complexes at the north end.

Planning mechanisms should be instituted through the *Hurricane Damage Mitigation Plan* (see **Projects**) to limit damage and plan for both the emergency response and for the aftermath of a catastrophic storm. Should a storm cause wholesale destruction of structures and facilities, their reconstruction should be used as an opportunity to modernize facilities, improve floodproofing and enhance public access, for example, the linked public walkway for the Coonsfoot Cove waterfront proposed in the **Public Access and Recreation Policies #9 & 19-22** and **Projects**. It should also include desirable improvements for hazard mitigation and remediation including relocating structures, upgrade of aging septic and drainage systems (see **Water Resources Policies #30-40 & 44**), and restoration of vegetative buffers and natural shorelines, etc.

7. Reach 7 -- Oyster Pond/North Montauk Point

(a) Description

Montauk Point and Oyster Pond are the principal features in Reach 7. Montauk Lighthouse is a prime landmark, scenic and historic site for the Town and the State, and its preservation is a priority. The armoring at the Lighthouse constitutes the largest coastal structure in the Town.

All the land in this reach is government owned, and the only structures and facilities present are those relating either to the lighthouse or Montauk State Park. Flooding is not a significant consideration for structures in Reach 7 except as it affects these facilities and their accompanying infrastructure.

The reach terrain consists of morainal outwash deposits gradually sloping northward to low wave-cut cliffs. The cliffs are bordered by sandy beaches from Shagwong Point to around False Point, then changing to cobble as they approach Montauk Point. Eroded Montauk Point forms a truncated 65' hill with the Montauk Lighthouse at its top, a precipitous bluff to seaward and a steep swale behind.

Oyster Pond, a mile east of Montauk Harbor, is known for its abundance of oysters and historic use by the Montauk Indians. Oyster Pond gut opens naturally to Block Island Sound 2-3 times per year, depending on tidal or storm events. The Pond and its intervening bar are a designated CBRA zone. On 1800's maps it appears to have been more landlocked with a substantial landmass between the pond and the sound. Three north-flowing streams feed Oyster Pond, Rely's Run, Hatty's Run, and Ogden Brook. A number of smaller coastal ponds including Rush, Reed, and Money Ponds are also located in the reach.

Erosion is especially critical in the vicinity of the Lighthouse. Geologically Montauk Point is the most prominent eroding headland of the South Fork, and its sediments have fed beaches to the west since the retreat of the glaciers. The Montauk Lighthouse was commissioned by George Washington in 1796 on the Montauk Point headland with a projected 200-year lifetime. It was originally set back some 300' from the ocean but now withstands the forces of nature only with the aid of massive rock revetments. Numerous attempts at stemming erosion over the last fifty years have utilized both hard and soft solutions, including extensive planting of the bluff face using the reed-trenching method pioneered by Georgina Reid, a dedicated volunteer who single-handedly guided stabilization of the upper bluff at the Lighthouse. The most recent erosion control project has been completed using a combination of Federal, State and local resources to reconstruct and extend the existing revetment and revegetate the bluff.

Depending on the rapidity and magnitude of sea level rise and recurring storm events, alternatives such as moving the lighthouse back from the bluff may ultimately have to be reexamined, as has occurred at other historic lighthouses on Block Island and at Cape Hatteras.

(b) Natural Protective Features

Natural erosion protection in Reach 7 comes from beaches and bluffs, whose cobbled and sandy shores dissipate wave energy except where the erosion control structures have essentially formed a vertical seawall backed by steep cliffs at the Point. Montauk Point receives the largest amount of wave energy of any landmass in Town for the simple reason that it is the farthest point east on Long Island, and also that ocean waves refract around the headlands to focus energy in eroding more resistant areas. Overall littoral drift appears to follow the coast east-west and southeast-northwest.

The coastal ponds act as receiving and retention areas for storm floodwaters, and there is a low swale/runnel area just west of the Point that also acts as a flood retention area. The marshes rimming Oyster Pond act similarly. Just offshore of the State Park concession stand are the remains of stumps from a drowned forest, indicative of the magnitude of shoreline recession that has occurred here over time.

The barrier spit at Oyster Pond intermittently opens and closes the pond, depending on overwash and the severity of storm events. Conceivably in a catastrophic storm or due to sea level rise, a breach could remain open indefinitely and become a permanent inlet. As Oyster Pond is a State designated SCFWH, this possibility and potential strategies for mitigation should be examined (see **Projects**).

(c) Coastal Structures

Montauk Lighthouse and its approximately 800' of massive rock revetments armoring the Point are together the largest coastal structure in East Hampton. The recent work builds on earlier efforts by the Coast Guard and ACOE. The new revetment uses larger rocks, a more extensive structure, and improved stone setting to increase the level of protection. Earlier work ca. World War II by the ACOE included toe protection with a less massive and well-placed rock revetment, which is now seaward and forms a foundation for the current rock revetment. Later the Coast Guard installed rock-filled gabions, and reed-trenching and terracing with beach grass planting of the bluff was initiated and carried out for many years by Georgina Reid. More recently, local landscaper Greg Donohue has worked to further revegetate the bluff in conjunction with the present revetment work. The completed project wraps the revetment around the bluff to the south where it descends to Turtle Cove. No additional coastal structures are present in Reach 7.

(d) Flooding and Erosion Zones

FIRM's #360794-0001D, -0002C, and 0003D, dated 5/18/92 show V-zones along the entire shore of Block Island Sound to Montauk Point, with A-zones covering Oyster Pond and its shore areas, as well as the wetlands west of the Point. Both Oyster Pond and its fronting bar, and the area from west of False Point to Montauk Point are designated CBRA zones, indicating the potential for overwash and erosion.

The SLOSH model (Montauk Point Quadrangle #R2) also shows Oyster Pond as a primary flood corridor in Reach 7, which could extend inland to overwash Montauk State Parkway in a Category 4 hurricane. The wetlands and ponds west of the Point are also overwash areas.

CEHA areas in Reach 7 (CEHA map-photos #9-792-083, #9-789-83, and #11-782-83) cover all the undisturbed shores of Block Island Sound to the Point, including the Oyster Pond barrier spit and the coastal ponds along the north side of the point.

(e) Analysis

Montauk Lighthouse is one of the most vulnerable sites to erosion on the entire east coast. Because it is one of the State's and the Town's premier historic and tourist spots there is strong support for its preservation, and for the heroic and expensive erosion control measures required to prevent its demise. George Washington's colonial survey that sited the structure for a 200-year lifespan from the eroding bluff turned out to be remarkably accurate, as the bluff has since receded almost to the Lighthouse.

The question of how to preserve the Montauk Lighthouse remains. The history of attempts has been one of trial and error. To date, structural erosion protection remedies have dominated, and the prospect of moving the massive stone Lighthouse back from the cliff is sufficiently daunting that it has not yet been seriously considered. The recent relocation of the lighthouse from the south bluff of Block Island is a possible paradigm. However, the Montauk site is complicated by its hilltop location and concerns over preserving its historical/archaeological integrity. In any case, the ability of the present fortifications to withstand the hydrodynamic and meteorological force of Atlantic storms will eventually become apparent. Should sea level rise indeed prove to be accelerating, and

hurricanes become more frequent and severe, costs of further armoring may escalate and alternatives have to be reevaluated.

The armoring of the Montauk Point headland and its removal from the littoral sediment budget may be having untoward consequences on other coastal areas in this reach and along the Atlantic Ocean shore. Wave energy, reflection and refraction at the Point have already been altered by replacement of the graduated profile of slumping bluff, natural shore and nearshore by a rock seawall. The effects on shoreline dynamics will likely manifest both at the Point and reverberate locally in offshore and longshore patterns, in ways as yet undetermined. These phenomena and alternative solutions should be investigated and analyzed further through monitoring and any future impact studies for the Point. Given the degree of public ownership and natural coastline in Reach 7, no additional erosion protection structures other than the revetment at the Lighthouse should be contemplated or permitted (Condition 1).

Changes in littoral patterns, sediment movement or storm incidence could also affect the barrier spit at Oyster Pond. If the spit were permanently breached by storm events or rising sea level, the pond could conceivably become an inlet, altering the brackish pond habitat in unforeseen ways. The Town and State should monitor breaches after storms and develop contingency plans for possibly closing breaches to preserve the high habitat values and numbers of threatened or endangered species around Oyster Pond (see **Significant Habitats Policy #7**).

Beach vehicle traffic by recreational fishermen on the State parklands is seasonally heavy and may contribute to erosion by limiting establishment of natural vegetation, forming nearshore runnels from ruts, or disturbing beach sediments. However, this is generally a cobble beach, and LI State Parks personnel monitor beach traffic, controlling the situation carefully. (Larsen, PC, 1995)

8. Reach 8 -- Montauk Bluffs

(a) Description

Dramatic clay bluffs known as hoodoos line much of the Reach 8 shoreline, a scenic marvel of natural erosion forces without parallel on the east coast. Land use in Reach 8 consists largely of undeveloped parkland with isolated residences dispersed in the moorlands along the ocean bluffs, a Town affordable housing project in the Camp Hero, and the Montauk Shores condominium trailer park along the ocean at the western end of the reach. The rocky shore west of Montauk Point was the site of numerous shipwrecks in the nineteenth century, and the Montauk Lighthouse serves as an important navigation beacon to keep boats clear of its hazards.

A few of the prestigious resort homes are close to the bluff edge. From Montauk Point to the western edge of the reach the shoreline coincides with the terminal moraine. The wave-cut bluffs are 30'-80' high, generally bordered by narrow boulder strewn beaches. The rapid erosion of the Montauk Point bluffs has generated some of the sediments that have maintained beaches to the west, carried by the littoral drift which is predominantly east to west.

A 10' to 80' thick deposit of Montauk till underlies the morainal and outwash deposits in Montauk. As pockets of the Montauk till are exposed along the bluffs, channels erode from wind, seeps, and rain runoff, and landslides drop boulders that collect in the gullies. The intermittent flow of water out of the bluff faces also exerts a recurring erosion force on the bluff. This process is apparent in the dramatic bluffs that begin at Driftwood Cove two miles west of the Lighthouse. These hoodoo bluffs contain large vertical fluted sections of hardpan clay and stone that rise from 7' above MSL to approximately 70' above MSL.

Where the glacial erratics accumulate below they offer protection to the bluffs behind. Depending on the clay content and distribution of boulders in the bluffs, and offshore underwater boulders and sandbars, the bluff line tends to retreat at an irregular pace. As the bluff erodes, the boulders are exposed and eventually settle into the sea and along the shore to form natural barriers. A series of scalloped coves are sheltered by natural promontories and defended by boulder strewn beaches. The offshore boulders also play an important role as a barrier or reef in absorbing wave energy.

The resulting irregular coastline is distinct from the more usual process of shoreline straightening through erosion and littoral drift. The shore straightening process is still active, but local geology plays a major role in shoreline configuration. Some areas, such as Driftwood Cove, exhibit a certain amount of natural stability. Surfers and recreational fishermen are attracted by the rocky shores and small coves, and the hoodoo bluffs attract hikers and beachcombers.

Flooding and erosion are not a hazard to structures in the parklands but may threaten some residences, particularly those built near the receding bluffs, and the Montauk Shores condominium trailer park at the west end of the reach. In some areas of the clay bluffs perched ponds and freshwater wetlands support an unusual community of rare and endangered plants. These habitats may be threatened when the receding bluff edge causes the ponds to drain out over the bluff, sometimes also washing out sections of the bluff.

(b) Natural Protective Features

The bluffs and rocky cobble beaches of Reach 8, dotted with glacial erratics and interspersed with sandy coves, are the primary protection from the high wave energies of the Atlantic. The clay and stone content of the bluffs causes them to erode more slowly and irregularly than the sandy bluffs in other reaches of the Town. The weather sculpted hoodoo formations are a bizarre native land form and scenic attraction unique along the east coast that are worthy of protection in their own right.

Because of the seeps, wetlands and the general impermeability of the clay soils, drainage over the bluff face is an important erosion factor in Reach 8. While secondary to the unchecked wave energy of the Atlantic Ocean, surface runoff over the bluffs is a significant factor in consideration of erosion problems and solutions in this reach.

At several points the bluffs descend to coastal ponds, including Lily [Church's] Pond just west of the former Warhol estate, which acts to receive floodwaters. Under storm conditions these ponds occasionally breach, opening them to tidal flow and/or wave action. West of Montauk Point a stream

empties onto the beach, although it has minimal flow and probably does not contribute greatly to erosion.

Where the bluffs descend at the Montauk Shores condominium trailer park, flooding and erosion are a significant problem. Mobile homes within this low lying development lack the protection of the higher bluffs and the ones nearest the water suffer from inadequate setbacks.

(c) Coastal Structures

Over the years several attempts at bluff restoration and erosion control have been made along this rocky coast. Gabions, bluff-toe armoring, filter boxes, drainage pipes and terraced plantings have been installed with varying results.

Driftwood Cove, west of Camp Hero in the hoodoo bluff area of Old Montauk Highway, includes erosion control structural attempts at Stone House and at the Richard Avedon and Peter Beard properties. Stone House is the site of an extensive private bluff stabilization and erosion control project designed to protect the bluff toe, channel drainage off the 60-80' bluff face, and establish vegetated terraces with filter boxes at the bottom. The project, an attempt to preserve an historic home in danger of being destroyed which was situated 10' from the edge of the bluff, was never satisfactorily completed. It's success has been limited by inadequate size and placement of the toe armoring rock and by the steep angle of the cliff. However, due to the sheltered character of Driftwood Cove, with bouldered promontories to both east and west, the bluff is stable to the extent that flanking erosion of the bluff to the west of Stone House is not dramatically different from the armored area.

East of Stone House various efforts at revetments and drainage diversions on the Avedon and Beard properties have attempted to stabilize the bluff, with no greater success. In landscaping the bluff these projects have eliminated the dramatic hoodoo formations unique to the area. These formations are an unusual artifact of erosion forces on the clay bluffs, so their preservation as a scenic native land form conflicts with erosion control efforts that involve regrading, terracing or revegetating the bluff face. From time to time similar proposals are considered by the Zoning Board of Appeals for adjacent sites.

Concrete rubble and other remnants of World War II military installations at Camp Hero are occasionally dumped out on the beach by storms and the natural recession of the shoreline.

At the Montauk Shores condominium trailer park just east of Ditch Plains the beach begins to narrow starting from the Otis Avenue groin toward the eroding headland at the east end of the trailer park. In the same distance the bluff ascends from 2' to about 10' at the headland, which marks the beginning of another cove cell with bluffs rising 20-30'. Rock and concrete rubble have been placed on the beach as riprap at the eroding east end of Montauk Shores, and the cobbled beach though steep, affords some dissipation of wave energy. There are three wooden stairway access structures at intervals over the length of Montauk Shores. Water seeps out of the bluff at several locations. What appear to be cesspools and remains of concrete drainage rings are out on the beach at several

locations. Montauk Shores condominium applied to construct an additional revetment following erosion from the 1992-93 winter nor'easters but no action has yet been taken.

No other coastal structures of significance are present along the Atlantic shore of Reach 8.

(d) Flooding and Erosion Zones

FIRM's #360794 -0001D, -0003D, and -0005D, dated 5/18/92 show V-zones along the entire Atlantic Ocean shoreline of Reach 8, extending inland somewhat at the lower elevation of the Montauk Shores condominium. A-zones surrounded by B-zones encompass the low area of wetlands extending toward the ocean south of Deep Hollow Ranch into the Warhol Estate.

The SLOSH model (Montauk Point Quadrangle, drawing #R2) indicates a that a flood corridor could form through Montauk Shores condominium in a Category 2 hurricane, with additional inundation of the Warhol Estate wetlands and complete isolation of Montauk Shores condominium in a Category 4 storm.

CEHA areas (Photo map #7-455-83, sheet 15; #7-459-83, sheet 16; #8-1200-83, sheet 17; and #9-172-83, sheet 18) include all of the shore and bluffs of Reach 8 along the south shore, including the Stone House, several of the perched ponds on the bluffs, and the southern edge of the Montauk Shores condominium.

(e) Analysis

The spectacular hoodoo bluffs and cobbled beaches of this reach, though isolated, have unique scenic and geologic value to the community and for the entire east coast. The storm-driven waves of the Atlantic and the geologic, hydrodynamic and erosionary forces that produced these formations dwarf man's efforts to control them, and except where historic or biologically unique resources are at risk the natural systems should be left intact.

The Montauk moorlands ecosystem in the upland portion of the reach supports many rare indigenous and endangered plants (see **Significant Habitats Policy #7**), and the perched ponds and wetland systems periodically flood and drain naturally. Where minimal interventions, such as enhanced drainage via a simple pipe, can prevent loss of these significant habitats, such measures would be consistent with the goals of this plan.

The high proportion of public ownership permits a generally laissez-faire policy for much of this reach. Where larger tracts of undeveloped land remain in private hands, extended coastal setbacks and low density development should be required in order to preserve these unique features and natural coastal processes. Where possible, public acquisition of remaining undeveloped lands should be pursued (see **Development Policies #1-6** and **Appendix B**). Problem areas remain where residences have been constructed overly close to the striking ocean vistas of the bluffs. Because of the sparse distribution and large lots, homes can generally be moved back from the receding bluff rather than permit erosion protection structures to interrupt natural littoral systems and storm-generated transformations.

At the Montauk Shores condominiums, approximately 200 mobile homes and cottages front on 920' of the ocean. Recent winter storms exposed septic systems and encroached on residential lots. Some of these homes are classified within the CEHA hazard zone and most are also within the V-zone for NFIP. The NFIP flood hazard designation requires hurricane straps for mobile homes. However, none of the mobile homes observed have complied with this safety requirement. The development was recently converted to condominium ownership. As the only waterfront high density residential area in Reach 8, other than the affordable housing project in Camp Hero, hurricane evacuation from Montauk Shores is a necessary concern. Particularly with respect to residences within the CEHA zone, this area deserves further examination in the *Hurricane Damage Mitigation Plan* (see **Projects**).

A rock revetment has been proposed to armor the bluff toe at the east end of Montauk Shores. The relatively low height of the bluff (ca 10'), the high energy wave environment, the narrow beach, and the proximity of the first row of trailer homes to the bluff edge all indicate that the project would have limited effectiveness over any but the very short-term. A revetment here would not be really effective without being high enough to obscure the ocean view. Where the bluff descends toward Ditch Plains at the western end of Montauk Shores, there is a wider beach affording some natural protection, the result of updrift accretion from the Otis Avenue groin (see Reach 9).

9. Reach 9 -- Hamlet of Montauk/Hither Hills

(a) Description

Reach 9 varies from knob and kettle and outwash terrain of the moraine in its eastern and western extremities, to a sandy floodplain deposited by littoral drift in the Montauk hamlet area. At the eastern extremity of the reach, Ditch Plains is a low wetland area that was ditched and drained in the 1950's for housing development. This artificial drainage system is unusual in that water flows north into Lake Montauk through several surface and subsurface watercourses instead of south into the ocean. Because of the high groundwater condition, septic infiltration has been an ongoing source of pollutants into the south end of the Lake, especially in heavy rain or flood conditions. Several attempts at drainage diversion by the Town and NYS DOT have not improved the situation. The Town Natural Resources Department and Concerned Citizens of Montauk are in the design phase for construction of a series of marsh ponds to impound and filter runoff and pollutants from the area (see **Water & Air Resource Policies #30-44**, especially **Non-Point Discharges #37**).

The Town bathing beach at Ditch Plains is an important tourist and recreational facility, both for swimming and as a mecca for surfers. 30-50' bluffs in the section west of Ditch Plains continue the hoodoo formations of fluted clay formed by the erosive forces of waves, wind, rain, surface seepage, and freezing and thawing. The fronting beaches are relatively narrow and boulder strewn, and there are numerous trails atop the bluffs and upland through the undeveloped Montauk moorlands tract, known as Shadmoor. In some cases, particularly where ORV's have driven along the bluff top, overuse of the trails has accelerated destabilization and consequent erosion of the bluff.

The Montauk hamlet to the west is the center of business and resort activity for the area, with numerous motels along the oceanfront, many of them built into the dunes themselves, and a busy

downtown area extending to the traffic circle presided over by East Hampton's sole six-story "skyscraper". The Town's Kirk Park is located along the beach with a large paved parking lot just behind the primary dune. Virtually all of the business area is within the hundred-year floodplain. However, since most construction predates the NFIP, little of it adheres to NFIP floodproofing standards.

West of the business area the terrain again ascends to 50' morainal bluffs, with generally more outwash than the eastern sector between the moraine and the beach. The beach throughout this area is also wider and sandier due to deposition from littoral drift, and the bluffs are generally less steep, better vegetated and more stable than those to the east. West of the business area a substantial portion of the brushy upland between Old Montauk Highway and the bluff edge is in the Benson Reservation, an undeveloped buffer which provides access and uninterrupted vistas to the Atlantic, as well as containing a dune/bluff ecosystem. Further west buildings are again present on the south side of Old Montauk Highway including residences and several resort hotels, with Gurney's, Panoramic View and Wavecrest built into the actual slopes of the bluff. In the last fifty years these bluffs have not retreated extensively due to the infrequency of severe hurricanes hitting on high tides and the tendency of this beach to accrete from littoral drift. However, winter storms of the '93-94 season severely narrowed the beach and eroded the bluff toe, to an extent that drainage and other structures were exposed or washed out onto the beach.

(b) Natural Protective Features

Natural protective features in Reach 9 can generally be characterized by the four primary types of terrain: the wetlands, dune and beach system at Ditch Plains; the hoodoo bluffs to the west; the beach and dune system bordering the Montauk business area; and the sandy beaches and sloping bluffs of the Hither Woods moraine.

The fronting beach and dune system at Ditch Plains is both an important recreational facility and protects the upland areas by dissipating wave energy. Both the sandy beach and the low dune backing were subject to extensive erosion and loss of sand in the 18 winter storms of '93-94, which made up in frequency what they lacked in severity, and left the beach with an exposed cobble base that was uncomfortable for bathers. The Town, concerned about the condition of the beach for summer use, and having just completed a new comfort station and paved parking area, in June '94 decided to place sand on the beach to make it usable for the summer. The subsequent '94-95 winter storm season was less severe, and although there was some continued erosion at the toe of the dune and the beach remained narrow, by summer most of the cobble remained covered by sand. In mid-August 1995, heavy surf from Hurricane Felix, which hovered well offshore for several days before drifting out to sea, again reduced the beach to cobble and caused additional toe erosion. The Town again placed sand from dredge spoil on the beach in 1997. Aside from reducing use of the bathing beach, there is concern that alteration in the dune profile may increase the potential for overwash into the residential area in storm conditions.

In terms of coastal dynamics Ditch Plains functions as a somewhat distinctive cell of the scalloped cove coastline extending through the bluff section of Montauk. The Otis Avenue groin, constructed in the late 50's- early 60's, while somewhat porous and deteriorating, contributes to scouring at Ditch

Plains beach. According to coastal geomorphologist Jay Tanski (site visit 5/19/94), it is less of an erosion factor than the onshore wave action in storms. Fred Anders, Coastal Hazards Specialist, NYS DOS, believes the Otis Avenue groin is a significant contributor to the erosion at Ditch Plains (site visits 3/28/95, 5/6/98). Aerial photographs tend to bear out this hypothesis, which suggests shortening or removal of the groin as one possible remedy. The Town Board has authorized an intensive study of these erosion factors and possible solutions, and as of December, 1997 had obtained a matching grant to determine causes and solutions for the erosion problems at Ditch Plains (see **Projects**).

Just west of Ditch Plains, there appears to be a large cache of sand offshore of Rheinstein Park, which when wave direction changes, may constitute a natural sand reservoir to replenish the Ditch Plains beach. Prevailing southwesterlies may bring sand back in to the beach from these offshore bars. The Town Natural Resources Department has periodically installed snow fence along the dune toe to capture wind blown sand and allow dune vegetation to reestablish itself. Long-term monitoring of beach profiles has also been begun as part of the *Town's Beach Monitoring Pilot Project* (see **Projects**).

The situation at Ditch Plains is an example of the powerful erosionary forces at work along the ocean shore in Reach 9 and the effects of an erosion protection structure in a high-energy ocean environment. The great variability in the onshore sediment budget and consequent beach width, and shoreline recession may begin to threaten upland development in the Ditch Plains subdivision.

The hoodoo bluffs fronting the Shadmoor tract have similar characteristics to those in Reach 8, with similar concerns about their preservation as an intact natural system. This unique coastal morphology and the related upland should be a primary focus for preservation efforts at all levels of government.

The dune system that protects the Montauk business area is in a dangerously depleted condition, both from unregulated pre-zoning construction with inadequate setbacks, and storm events that have cut back the existing beach and dunes. A large unvegetated indentation seaward of the wooden catwalk from the parking lot near the Montauk IGA supermarket at Kirk Park is evidence of the heavy pedestrian traffic on the dunes. Behind the dune the cleared parking lot for the park and for the supermarket continue the unvegetated area. This is also the closest point in the business area to the southern end of Fort Pond, so the potential for a storm surge to breach the dune and open a flood corridor from the Atlantic to Fort Pond Bay or vice versa at this point is significant (see SLOSH).

The Town owned beach all along South Emerson Drive in the Montauk business area has suffered from cutbacks in the dune from winter storms. There are access points to this beach via road ends at South Embassy Street, Emery Street, and South Eton Street and also via the wooden catwalk, as well as several sand paths crossing the dune. The latter two road ends ascend 8-10' to cross the dune and their use by beach vehicles with consequent ruts and impact on vegetation increases their tendency to blow out from winter winds.

As noted, the bluff and beach profiles along Old Montauk Highway west of the Montauk business area are relatively stable. However, winter storms of the '92-93 season made inroads into the toe of the bluff and greatly narrowed the beach before onshore winds began to bring sand inshore for the summer. Beaches remained unusually narrow following the '93-94 winter storm season, and the normal seasonal accretion of the '94 summer.

A catastrophic storm could radically alter the dynamic equilibrium of bluff and beach in this area. At the time of the last revision of the Town Code property owners maintained that the bluff in this area was stable and well vegetated and convinced the Town to measure bluff setbacks from the bluff toe rather than the top of the bluff, effectively reducing setbacks. In light of beach and bluff erosion from the recent storm activity this policy bears reexamination.

(c) Coastal Structures

A single 150' stone groin at Otis Avenue, installed some 30-35 years ago, constitutes the only sizable hard erosion control structure in the reach. It has caused evident scouring to the west at the Ditch Plains bathing beach.

Riprap and rubble placed along the beach to protect the Montauk Shores trailer park condominium just to the east in Reach 8 may also influence erosion at Ditch Plains. Proposed revetments to protect Montauk Shores could further aggravate this situation.

Numerous (30-50) stairways, paths and walkways for private and common use traverse the bluffs and dunes extending west to Hither Hills Park, in some cases damaging or interrupting natural vegetation. Any opportunity to reduce or consolidate the number of accesses should be taken advantage of here to help reduce the harmful impacts.

Several of the Old Montauk Highway resorts, including Gurney's and Wavecrest, have some structures and drainage installations that are situated, for all practical purposes, on the beach itself. While not erosion control structures, in overwash or catastrophic storm conditions some of this construction will be in the surf zone and will interfere with natural overwash, probably increasing localized erosion.

(d) Flooding and Erosion Zones

The FIRM's (#306794 -0005D dated 5/18/92, and -0007C, -0008C, and -0009C, dated 2/19/87) indicate V-zones along the entire Atlantic shoreline of Reach 9. The V-zone extends inland at Ditch Plains, and again at the Montauk business area to include the motels along South Emerson Street. A-zones cover the remaining area between Ditch Plains north to Lake Montauk, except for an area of B-zone; and from the south end of Fort Pond to the V-zone along the Ocean. The high density of residential, commercial and resort development in these areas constitutes the most concentrated liability for storm-driven flood damage in the Town.

The SLOSH model (Montauk Point Quadrangle #R2 and Gardiner's Island East Quadrangle #Q2) shows that in a Category 2 hurricane much of the Ditch Plains area could be overwashed, possibly with a breach through to Lake Montauk. This becomes a greater probability in a Category 3 or 4

storm, which could also breach the ocean dune just west of the hamlet, connecting the Atlantic and Fort Pond Bay and causing an extensive overwash of the business area, with consequently increased destruction of property and significant erosion of the ocean bluffs to the east and west.

CEHA photo maps (#7-443-83 sheet 10, 7-447-83 sheet 11, 7-451-83 sheet 12, 7-455-83 sheet 13, 7-459-83 sheet 14 and 7-455-83 sheet 15) show part of the East Deck Motel within the hazard zone, a residence just east of Rheinstein Park at Ditch Plains, and the ocean bluffs along the Shadmoor parcel within the CEHA zone. The dunes and the beachfront motels on the south side of South Emerson Avenue in the Montauk business area are also in the CEHA, as are the dunes and bluffs extending west in the Benson Reservation, some of the southerly units of Gurney's resort complex, a corner of the Panoramic View hotel, and some units of the Wavecrest. Immediate dune and bluff areas and associated structures along the entire reach are generally contained within the CEHA zone.

(e) Analysis

The intense wave energies of storms focused on the Atlantic Ocean shore dictates prudence in attempting to divert or disrupt these awesome forces with engineered structures. Use of structural erosion solutions in other locations on the south shore has had predictably negative consequences on downdrift and neighboring areas, which have occasionally been catastrophic, as at Westhampton Beach, or progressively harmful as with the effects of the Federal groins in East Hampton Village on the beach at Wainscott. The single hard erosion control structure in Reach 9, the Otis Avenue groin, produces scouring on the public beach at Ditch Plains immediately to the west. An opportunity still exists to preserve the natural coastal processes for the remainder of this reach, and the Town should prohibit any further installations of hard erosion protection structures along this highly dynamic shore. The entire shoreline of the reach is designated Condition 1 on Flooding and Erosion Protection Map V-2.

Ditch Plains is especially vulnerable as a low-lying floodplain with relatively little distance between the Atlantic Ocean and Lake Montauk, and because of the potential for storm surge overwash in a Category 2 or greater hurricane. The Ditch Plains wetland system has great floodwater retention capacity. However, it channels water back into Lake Montauk because of artificial drainage projects dating to the 1950's. Floodwaters accumulate rapidly in the system, and in case of a catastrophic storm or overwash from a hurricane surge (see SLOSH), it would become a major flood corridor between the Lake and the Ocean. If the Atlantic Ocean and Lake Montauk were to merge at Ditch Plains, the destruction of homes and property would be substantial. Again, this area should be included in a Town *Hurricane Damage Mitigation Plan* to encourage flood-proofing and other mitigation measures in the wake of a storm. In addition, because of the beach's recreational importance the Town may need to consider ongoing beach nourishment, dune enhancement or other conservation measures to provide flooding and erosion protection and maintain the beach.

The best protection from storm related flooding and erosion remains the natural bluff and dune systems, and beaches replenished by littoral processes. Planting additional beach grass, revegetating dunes with native species or encouraging dune formation by trapping sand with snowfencing are well-proven ways to enhance these resources. The Town is exploring using non-structural or soft

solutions to the erosion at Ditch Plains, and is studying the causes and possible mitigation with the aid of a consultant (see **Projects**).

At Kirk Park, heavy pedestrian traffic has caused significant beach grass loss at the boardwalk over the dune. Snow fencing and beach grass planting can be used to revegetate the area and to make it continuous with the rest of the dune line. Artificial reconstruction of the dune here may also be desirable. This location is of particular concern because of the potential for a hurricane storm-surge overwash, which could conceivably connect Fort Pond Bay to the Atlantic through Fort Pond, wreaking havoc in the low-lying Montauk business area just behind the dune. Not only the storm surge itself, but the "ebb surge" of escaping floodwaters trapped behind the dune, and wind and wave-driven debris would cause additional damage.

The Montauk business area should be evaluated in the proposed *Hurricane Damage Mitigation Plan* and *Revitalize Hamlet of Montauk* (see **Projects**), including restoring and rebuilding the natural protective features, floodproofing structures and other mitigation measures in the wake of a catastrophic storm. Structures within the CEHA zone should be given particularly careful consideration. If recurrent storms or rising sea-level cause further deterioration of the dune system protecting the Montauk business area, more comprehensive management measures such as an erosion control district may also need to be considered. Shoreline recession rates should be established by beach profile monitoring and historical shoreline analysis (see also *Erosion Monitoring* in **Projects**).

Along the bluffs of Old Montauk Highway, where resort structures are in the CEHA zone, the Town established reduced bluff setbacks, measured from the toe rather than the edge of the bluff, originally on the assumption that this is an accreting and stable, rather than retreating shoreline. Judging from the effects of storm activity in 1993-94 this is probably not the case. The Town should eliminate the reduced bluff setbacks, and bring them into line with the rest of the Town. Historical shoreline change analysis should be used to confirm erosion rates in the area, and monitoring should be instituted on an ongoing basis (see **Projects**). If a catastrophic storm substantially damages or destroys these structures, particularly those within CEHA zones, they should not be rebuilt, and native plantings should be used to stabilize the bluff.

At Gurney's Resort on Old Montauk Highway, part of the dune area has been used for a refreshment and towel stand on the beach and for additional guest cottages which are almost on a level with the beach. These lower structures of the resort complex are vulnerable to hurricane flooding and erosion, a risk increased by the lack of a protective dune or a vegetative buffer. The upper beach should be revegetated and these structures should not be rebuilt if substantially damaged or destroyed.

Neighboring Panoramic View resort, to the immediate west, has done a better job of preserving their dune system and utilizes a minimal pedestrian path for access to the beach that has maintained vegetative cover. The bluff in the immediate area is well vegetated, gently sloping and appears fairly stable. However, several private residences, including some of recent construction, have been built

near the toe of the bluff close to the beach, and these dwellings would be at risk in storm surge conditions. The homes built higher on the bluff are at less risk of tidal and storm flooding.

Effects of recurring storms and sea-level rise on the resorts along this section of Old Montauk Highway may eventually precipitate reexamination of land use patterns and zoning. For instance, in the eastern section of Old Montauk Highway approaching the business area, the Benson Reservation provides an extensive well-vegetated buffer zone which protects homes on the north side from flooding and erosion, as well as preserving the scenic water views from the Old Montauk Highway. This buffer is absent from Davis Drive west to the reach boundary at Hither Hills State Park. The Town may wish to institute a similar buffer for this western stretch. This analysis should be performed as part of the *Hurricane Damage Mitigation Plan* (see **Projects**).

The capital investment in resort facilities built on and into the bluffs will surely generate emergency requests for reconstruction in the wake of a storm, and therefore the Town should plan before the event and establish priorities and procedures while cooler heads prevail. Because of the resort businesses, calls for protective hard structures may also be anticipated. Use of shore hardening structures in CEHA zones is discouraged by the CEHA law and should not outweigh potential damage to public resources. As noted at the beginning of this reach analysis, it is recommended that hard erosion protection structures not be permitted on the Town's south shore Atlantic Ocean reaches.

10. Reach 10 -- Napeague South/Amagansett

(a) Description

The area of Reach 10 extending from Hither Hills west to Amagansett is characterized by beaches and dunes associated with the tombolo complex of spits which formed Napeague. Sediment deposition from the Montauk headlands carried by littoral drift continues to build this area, and it is one of the few reaches where beaches are generally accreting rather than receding.

Because of its composition, much of Reach 10 exhibits characteristics of a barrier beach rather than the outwash plain or morainal structure common to other reaches in the Town. These include the broad sandy beach and dune system, backed by low backshore areas such as the wetlands of Napeague Harbor. Barrier beaches and dune systems tend to be highly mobile land forms, which may present future problems for development in this area.

A large section of the Napeague beach, mostly within Napeague State Park, is a designated CBRA zone in the Federal Coastal Barrier Resources System. The CBRA zone does not include the residential development within the Montauk-By-The-Sea subdivision and also excludes other residential areas. It extends from the bay in Reach 4 through Napeague Harbor to the ocean in Reach 10, an indication of the potential for storm surge overwash and possible breach in this area. Much of this CBRA zone is also a State designated SCFWH. The 490-acre tract of undeveloped parkland consists of sandy beaches and primary dunes with elevations to 20'-30' above MSL, some of which are well vegetated.

A second Reach 10 CBRA zone is located in Amagansett extending through the National Wildlife Refuge and The Nature Conservancy land in the double dunes system from Atlantic Avenue to west of Indian Wells Highway.

The majority of development along this Napeague stretch, consisting of multifamily condominiums, single family residences and several restaurants, is contained within the NFIP Velocity (V-) Zone. Elevations range from 24' along the dune ridge to approximately 3' above MSL at roadside. The inland area contains numerous freshwater wetlands and is primarily within the A8 Flood Hazard Zone. This low area periodically experiences flooding problems from heavy rains and/or coastal storm overwash.

Bluff Road to the west represents an ancient shoreline cliff, or fossil bluff, cut into the Ronkonkoma outwash plain by wave action. A complex system of dunes known as the Atlantic Double Dunes evolved between this ancient shoreline and the present shore, now separated from the fossil bluff by distances up to about 1/4 mile in the area south of Bluff Road between Atlantic Avenue and Indian Wells Highway. Formed by littoral drift and wind and water erosion, the topographic features of the double dune system include a wide sandy beach, a primary dune, inter-dune area and secondary dune. The system is further characterized by interdunal swales, frequent ponds and numerous boggy areas, with unusual and fragile plant communities including lichens and a forest of native shadbush. This dune system has one of the largest remaining areas of undeveloped barrier beach with an accompanying back dune ecosystem on Long Island.

The Atlantic Double Dunes system extends from Napeague Beach west to the Town's boundary with the Village, interrupted by access roads to public beaches and areas of development. (Nature Conservancy, 1978). Some 200+ acres along 3.2 miles of shoreline have been acquired for conservation purposes. The remaining land is mostly privately owned and some areas, such as Beachampton, have intensive development of resort homes on small lots. Additional subdivisions extending to the western border of the Napeague Beach State Park were approved by Town governments of the 1970's in sensitive areas of the Double Dunes, which could be subject to overwash in a Category 2 or greater hurricane. Most of the residential construction has occurred since the last major hurricane in 1938, when a massive overwash of the Napeague isthmus occurred. Montauk was cut off by flooding in Napeague for nearly a week, and some structures in the dunes in Amagansett were destroyed. Many residences and structures in Reach 10 would be at risk from flooding and erosion in a similar event today, and from any storm that breaches the primary dune.

(b) Natural Protective Features

In common with Reaches 9 and 11, Reach 10's primary protective features are its beaches and dune system. Because of the Napeague State Park and Amagansett Double Dunes preserves, significant acreage is held in relatively undisturbed natural areas. Unfortunately the isolated character and remote location of many of these areas make them attractive for users of ORV's, and in some locations ORV's have damaged features or prevented regrowth of the fragile vegetation which stabilizes the dynamic dune system. The Town Trustees believe that damage caused by irresponsible ORV use can be minimized, or eliminated, by increased enforcement of existing laws which are

specifically designed to prevent such damage, while at the same time permitting responsible ORV use.

As noted above, because of the depositional nature of much of the reach, it exhibits many characteristics of a barrier beach, including a highly dynamic and somewhat migratory coastline and normally wide sandy beaches with an offshore bar that builds and recedes seasonally. The dune system is also subject to fluctuation through normal processes of aeolian deposition and occasional blow-outs. The primary dune is the defensive barrier to storm events which may cause cycles of substantial erosion, later rebuilt by winds and seasonal fluctuations of the beach and the anchoring effects of opportunistic vegetation such as beach grass. Dune building can sometimes be aided by minimal human intervention.

At the Navahoe Road access point, a well designed dune restoration project using snow fencing has successfully trapped sand. The access path traverses a high dune which appears to have been in danger of blowing out. The access path is well defined and protected by the snow fencing to give the dune an opportunity to revegetate itself. Following the '93-94 winter storm season the beach was unusually narrow, and remained at a reduced width beginning through the '94-95 winter.

At the Dolphin Drive/Atlantic Drive access point, a storm-narrowed ocean beach left the area vulnerable after the '93-94 winter, and prevailing southwesterlies did not rebuild the beach to normal post-summer widths. Because of the narrow beach, ORV's are driving high up on the beach close to the beach grass line, preventing it from regenerating in some places, and restricting nesting area for colonial shorebirds.

In general where residential construction, ORV intrusions or road-ends make breaks in the primary dune, storms can open flood corridors that will impact the residences sheltered behind the dunes. This is evident in locations such as the east end of Marine Boulevard, where constant use by ORV's has decimated a dune and attendant vegetation, opening a new flood corridor during Hurricane Bob in 1991, which has since flooded repeatedly in winter storms. The Town Trustees wish to point out that the east end of Marine Boulevard has been used for access for many years, and wish to see the access maintained and improved so as to afford safe passage to vehicles traversing it.

Dune scarping occurs routinely from storm tidal surges, but generally repairs itself over time through normal littoral, aeolian and vegetative processes where structures, road-ends and other human activities do not interfere. As noted in the *NYS Coastal Erosion Task Force Report*, "Research suggests at least 100 ft of dry beach is needed in front of a dune to ensure natural maintenance." (NYS DOS, 1994) Much of Reach 10 normally enjoys beaches of this magnitude, though they were severely narrowed by the winter storms of 1992-93 and 1993-94, and have only partially recovered since.

The Double Dune system constitutes an additional buffer for coastal erosion and flooding and in areas where the interdune and secondary dune remain intact, forms a significant catchment basin for absorbing and dissipating floodwaters. In Double Dune areas such as Beachampton where the interdune has extensive residential construction, a hurricane tidal surge breaching the primary dune

would be partially impounded between the primary and secondary dunes and would likely cause considerable secondary property damage during the "ebb surge" as debris is circulated by receding floodwaters. This possibility should be further evaluated in the proposed *Hurricane Damage Mitigation Plan* (see **Projects**).

(c) Coastal Structures

Shore-hardening structures have generally not been permitted or constructed in Reach 10, except for one isolated shore-parallel rock revetment (known by the lawsuit it engendered, Pappas-Leeds) buried in the primary dune in front of a residence west of Napeague Lane. To date it has only been rarely exposed, and its impacts therefore not apparent. Other than soft erosion solutions such as snow-fencing and beach grass planting, and the disruptions caused by beach vehicles and heavy pedestrian use by summer bathers, coastal processes in the reach remain in a largely natural state. Paved road-ends with associated parking, ORV access points, and dune-transiting catwalks and stairways constitute the only prevalent breaks in the primary dune system.

Some residences on Marine Boulevard not constructed to NFIP or CEHA standards are built on top of or into the landward side of the primary dune. In severe storms or as the dunes continue to migrate landward, they may eventually act as waterfront structures that will chronically interact with storm tidal surge or floodwaters, with consequent scouring of adjacent beaches.

(d) Flooding and Erosion Zones

NFIP FIRM's (# 360794 -0009c dated 2/19/87, and # 360794 -0013E, -0017D, -0020D, and -0023D dated 5/18/92) show Reach 10 to be one of the most vulnerable to flooding in the Town, indicating V-zones along the entire Atlantic shoreline, extending inland, starting from the east to include the campground and the back dune wetlands in Hither Hills State Park, much of the dune and residential area to the south of Napeague Harbor, the dune areas along the ocean extending through Napeague State Park to the east end of Marine Boulevard in Amagansett, and much of the residential section of Beachampton closest to the ocean. A-zones back the V-zone throughout the reach, and include most of the back dune area from the intersection of Old Montauk Highway through the motel and residential areas of Napeague and Beachampton to the Village line.

The SLOSH model (maps from Gardiner's Island Quad #Q2, Napeague Beach Quad #Q3, and East Hampton Quad #P3) for Reach 10 also indicates extensive flooding potential from hurricanes. In a Category 2 storm SLOSH shows potential overwash of the dunes in Hither Hills, and Montauk Highway could be overwashed from Napeague Harbor and Napeague Bay in the areas immediately south of the harbor, and at Cranberry Hole. The Double Dune system could flood from Atlantic Avenue to a point south of the intersection of Skimhampton Road and Further Lane.

A Category 3 hurricane could cause near complete inundation of Napeague from both the harbor and the bay, with the ocean breaking through to join the bay. Most of Beachampton could be flooded.

In the more substantial overwash from a Category 4 storm, Napeague could be completely overwashed, as with the Double Dunes up to Bluff Road and along Further Lane, with a significant inland flood corridor opened up along Indian Wells Highway. Virtually all of the residential

construction in Napeague and south of Bluff Road, which constitutes most of the homes in Reach 10, could be at risk in such a storm.

Because of the relative lull in severe hurricanes since 1938, and because recent hurricanes, such as Gloria ('85) and Bob ('91), lost force or did not strike on high tide, present residents have never experienced the direct impact of a major hurricane. In contrast, the SLOSH model suggests that a direct hit by a Category 3 or 4 hurricane could damage or destroy most of the residential construction in Reach 10.

CEHA photo maps (#7-414-83 sheet 3, #7-418-83 sheet 4, #7-422-83 sheet 5, #7-426-83 sheet 6, #7-431-83 sheet 7, #7-435-83 sheet 8, #7-439-83 sheet 9, and #7-443-83 sheet 10) indicate erosion hazard zones covering all ocean beach areas and much of the dune lands in the reach. Considerable residential and resort construction is at risk in the hazard zone, including: seaward units of Driftwood, Sea Crest, Driftwood Shores, Ocean Colony and White Sands motel/condominiums in Napeague, plus a residence on the beach between Driftwood Shores and Ocean Colony, and a house south of Shore Road; the dune areas of Napeague State Park; houses at the end of Whalers Lane and Raymond Lane; houses on the south side of Marine Boulevard and at ocean road-ends in Beachampton; the sole beach house between Atlantic Avenue and Indian Wells Highway; and the unpopulated Double Dunes system south of Further Lane in Amagansett. Although CEHA in general regulates construction in secondary dune systems, in spite of the extensive secondary dunes in Reach 10, to date they have not been included by NYS DEC on the CEHA photo maps.

(e) Analysis

Proximity to the Atlantic and low-lying topography behind the dune system make Reach 10 one of the most vulnerable in the Town to flooding and erosion, with Velocity (V-) flood zones backed by A-zones along the entire shoreline, and numerous structures within the CEHA zones. Since the beaches and dune system provide the primary and best defense against storms and the elements, everything possible should be done to keep these natural features intact, and to discontinue practices that degrade them. Fortunately much of Reach 10 is in an area where littoral deposition has caused long-term accretion and widening of the beach. This does not forestall extensive erosion during storms, or the need for stringent conservation.

Town maintained road-ends provide public access, but also are significant potential flood corridors, and means of restoring dunes and revegetating these areas should be considered. The Town would do well to consider closing off and revegetating paved road-ends in a manner that would restore the primary dune while still providing parking, and visual, pedestrian and limited vehicular access. In Reach 10 these road-ends include Navajo Road, Dolphin Drive, Atlantic Drive, Napeague Lane, the east end of Marine Boulevard, Atlantic Avenue, and Indian Wells Highway. The Village-maintained beach at Two Mile Hollow is a possible prototype, where a low vegetated dune provides a view from the road end, but ORV and pedestrian access is provided through side corridors and a path to the beach (see **Projects**). While the Town Trustees believe that restoring the primary dune is a worthy objective, they do not wish to see further limitations on vehicular or pedestrian access to the beach, and believe all revegetation should be accompanied by alternate access at the revegetated site.

ORV use for fishing and recreation in Reach 10 is widespread and has caused significant damage at access points such as the east end of Marine Boulevard; to the dunes and back dune area in Napeague State Park; and to beaches, where beach grass regrowth is retarded, especially after major storms. Flooding and erosion in Reach 10 will continue to increase if beach vehicle traffic is not reduced, and restrictions are not strengthened to prohibit vehicles within a minimum of 20 feet from the beach grass line. This is the subsurface length of beach grass root runners, and the standard used in Fire Island National Seashore. In addition plant communities must be given time to naturally reestablish following major storm events. Post-storm moratoria on beach vehicle use should be routinely considered based on minimum beach width to allow beach grass to regenerate and the vegetation line to be redefined. Besides flooding and erosion considerations, Napeague Beach and the Atlantic Double Dune preserves are State designated SCFWH's, and ORV restrictions should be enforced to limit detrimental effects on nesting habitat of colonial shorebirds (see **Significant Habitats Policy #7**).

Note: The Town Trustees, unanimously (1999), do not support further restrictions on beach vehicle use. In many areas of the Town, beaches would be completely inaccessible to residents if they were not permitted to drive on the beach. Many waterfront, and near waterfront, owners seek to "privatize" the beaches in their neighborhood. For example, there are 'no parking' signs on virtually all roads, public and private, within walking distance of the ocean beach (except for a few road ends). Also, many areas, such as Beach Hampton, have private walkways over the dunes which are not open to the general public. On busy weekends, these walkways are policed by individuals who require proof that walkers are resident within adjacent subdivisions. As to damage at access points such as Marine Boulevard, as stated above, the record shows that the access is through an "existing natural gap in the dunes". Current restrictions prohibit travel within 50' of the beach grass line “where possible”. The Town Trustees would consider an amendment to the current regulations to prohibit parking within 20' of the beach grass line. No data is supplied to indicate how long it takes for beach grass to regenerate and the duration of any resulting moratorium. The Town Trustees have steadfastly monitored and protected the nesting habitats of colonial shorebirds, while at the same time protecting the public's right to use and enjoy the beach.

Additional conservation recommendations for the Double Dunes area include selective use of snowfencing to close blowouts in the dune and trap sand, beach grass planting, consolidation of access paths to the beach, and annual evaluations of erosion conditions each spring. (TNC, 1978)

Shore-hardening erosion control structures have not been utilized in Reach 10, with one exception, and the Town should continue this policy by prohibiting hard erosion protection measures in Reach 10 for the foreseeable future. The same conclusions regarding dynamic coastal conditions and potential problems of erosion protection structures along the ocean discussed in the Reach 9 analysis apply to Reach 10. All of Reach 10 is designated Condition 1 on Flooding and Erosion Protection Map V-2. Where property or residential structures become threatened by erosion or receding shorelines due to storms, sea level rise, or natural migration, the integrity of the primary dune system should be maintained by setbacks and soft solutions such as dune rebuilding and revegetation.

Although CEHA regulates construction and other activities on both primary and secondary dunes, the extensive secondary dunes in Reach 10 have not been included on current CEHA photo maps. Their inclusion is recommended in any future remapping by New York State, and/or adoption of local administration of CEHA. Local administration of CEHA would help to integrate State and local planning measures, and provide more rapid permitting responses to residents in the wake of a storm.

As the SLOSH model demonstrates, Reach 10 is potentially vulnerable to overwash from severe (Category 3 or 4) hurricanes. The reach contains dense concentrations of resort homes in Napeague and Beachampton, as well as some of the Town's most luxurious oceanfront homes along Further Lane in Amagansett. A large proportion of the Town's most valuable oceanfront property is at risk here.

Pre-storm planning initiatives to mitigate future flooding and erosion related damage in CEHA hazard zones, V-zones, etc. should be instituted through the *Hurricane Damage Mitigation Plan* (see **Projects**) or other planning mechanisms in cooperation with NYS and Federal NFIP authorities. The *NYS Coastal Erosion Task Force Report* should be further consulted for policy guidelines. Some of the *Task Force* recommendations can perhaps be implemented immediately, such as mandatory subscription to NFIP, which would help to mitigate some storm-related costs. The Town should also consult with private insurers and local agents as well as the NFIP to set up a framework for rapid assessment and repair of property damage in the aftermath of a storm.

Town efforts to provide responses to flooding and erosion problems in its coastal zone are interrupted by the municipal boundaries of East Hampton Village located between Reaches 10 and 11. To insure consistent coastal zone management the Village should be encouraged to undertake its own LWRP, and to provide consistency review with the relevant policies of the Town. This is especially true as regards hard erosion protection structures along the ocean beaches, where rock revetments are more the rule than the exception in the Village, and a series of stone groins is present on the ocean shore.

11. Reach 11 -- Wainscott

(a) Description

The terrain of Reach 11 is flat and sandy, consisting primarily of outwash plains, the ocean beach and dune system, and two coastal ponds, Georgica Pond and Wainscott Pond. The ponds were originally glacial drainage basins which were drowned by the rising sea level and subsequently closed by littoral drift.

The beach in Reach 11 acts as a simple barrier, lacking an interdunal buffer or back dune system as is present in the Double Dune system of Reach 10. The transition from the beach and primary dune directly to the outwash plain and coastal ponds leaves the backdune area more vulnerable to coastal flooding and to erosion and overwash from a storm surge.

Both of the ponds are locally designated SCFWH's (see **Significant Habitats Policy #7**), therefore particular consideration should be given to preventing habitat degradation in any applications for structures in their vicinity. Also, the wetlands bordering the ponds act to absorb and buffer floodwaters and any decrease in their capacity from bulkheading or filling will increase the sensitivity to flooding.

Georgica Pond is prone to substantial fluctuations in water level, resulting in periodic flooding of basements and septic systems on bordering properties even under relatively normal conditions. This has been a recurrent source of strife between homeowners and the Town Trustees, who traditionally open the Pond spring and fall to increase flushing and enhance fishery productivity by allowing migration of anadromous fish and crustaceans such as blue-claw crab. A storm drain that emanates from NYS Route 114 and empties into the Pond at Cove Hollow in the Village constitutes an additional and substantial input of stormwater runoff which increases flooding and pollution in Georgica Pond.

(b) Natural Protective Features

Georgica Pond is fronted on the ocean by a low barrier beach backed by sandy shoals within the pond, which are accumulating primarily from breaching and overwash and secondarily from windblown sand from the beach. In theory the shoals should be diminished by the outflow of the pond when it is opened at the gut, but the amount of accumulated sand appears to be too substantial to be greatly affected. The pond may also be breached by the ocean at the gut under storm conditions, or occasionally opens itself because of elevated water levels.

The primary dune rises to a maximum elevation of about 20 ft. in Reach 11, although erosion damage from the December 1992 and March 1993 winter storms have probably altered the dune/beach profile since the most recent FIRM dated 5/18/92.

Wainscott Pond also has a fronting beach with a dune, in contrast to Georgica, and has consequently not been open in recent times either naturally or artificially, probably since the 1938 hurricane. In the past, junked automobiles were apparently used to build some of the dune fronting Wainscott Pond after '38, and they are occasionally exposed by storms.

Flooding in Wainscott Pond is exacerbated by runoff from fields and roads to the northwest, a drainage corridor that culminates in the Pond through the culvert near the Wainscott School. As much of these floodwaters originate in the Town of Southampton, mitigation should be an inter-municipal effort (see **Projects**).

The ocean beaches in Reach 11, and more particularly the Village beaches to the east of Georgica gut, have been some of the best monitored and most intensely studied in the Town, because of concerns centered on the effects of a groin field in the Village consisting of two large Federally built groins and two smaller State built groins. Oceanfront property owners have funded research efforts by the Marine Sciences Research Center at SUNY Stony Brook and other coastal experts as well as a student monitoring project run by Tony Minardi, then a science teacher at East Hampton High School. A number of recent studies and articles have been reviewed for the LWRP, which examine

historical beach width, effects of the groins on the beach, and shoaling within Georgica Pond, among other parameters. Periodic reversals of the littoral drift, encompassing cycles of several years at a time, in the Wainscott-East Hampton Village area make it difficult to predict shoreline trends for Reach 11. However, the predominant littoral direction remains east to west, and long-term shoreline recession west of the groins is clear.

Dramatic interannual variation of the Reach 11 shoreline position occurs in response to storms, as exemplified in the '92-93 and '93-94 winter storm seasons. The long duration and easterly set of the December '92 and March '93 storms caused extensive loss of sand from the Wainscott beach, and the primary dune was compromised and several structures damaged. These nor'easters demonstrated the pronounced effect of storm events on short-term shoreline change. It can be difficult to identify long-term trends because of the magnitude of short-term events. At Wainscott following the summer of '94, the beach was the widest and had the flattest profile in recent memory, then narrowed dramatically following the Christmas nor'easter of December '94. It substantially rebuilt itself in '95-96, then during the '97-98 winter storm season was struck by a series of storms that dramatically decreased the beach elevation, leaving an 8-10' dropoff at the Beach Lane road-end, and revealing erosion protection structures on the beach that had been buried for 20 years or more. Anecdotal reports indicated one such structure, a row of sta-pods uncovered just east of Beach Lane, had supported the foundation of shorefront home that 20-30 years ago had a 200'lawn between it and the dune.

Long-term erosion along the ocean beach in Reach 11 has been increased by the massive Federal groins to the east, which according to one study (Leatherman, 1989) have a downdrift littoral shadow of at least 5000 feet where the sediment budget is decreased. A 1991 study by the Marine Sciences Research Center at Stony Brook notes that "If storm activity occurs during the time of a narrowed barrier (because of the westward shadow zone, especially evident in the winter months), then increased overwash activity can result." This was evident in the '92-93, '93-94, and '97-98 winter storms. Initiatives to shorten or remove these groins to restore natural littoral drift have to date met with little response from the relevant Federal, State or County agencies.

By historical shoreline analysis using aerial photogrammetric techniques, combined with beach profile surveys, the Town expects to determine long-term erosion rates for Reach 11 and other sensitive reaches (see *Erosion Monitoring Program* in **Projects**).

(c) Coastal Structures

The only coastal hard structures within Reach 11 are an unpermitted shore parallel revetment in front of the Kennedy home on the ocean just west of Georgica Pond, installed in April-May 1993, and remnants of sta-pod groins and revetments of unknown origin periodically uncovered on the beach by winter storms.

Soft solutions include sand fill, beach grass plantings and dune restoration projects done in summer/fall '93, covering about 1000' of Wainscott beach to mitigate damage from the '92-93 winter storms, with maintenance efforts over the same stretch in spring of '94, '95, and '98. The Town Trustees have favored soft solutions. In those cases where coastal hard structures were permitted in

the recent past, the Town Trustees required the upland owner to execute a covenant requiring the removal of the structure if it remains uncovered by at least 12" of sand for a period of 12 months or more.

The seasonally opened or storm-breached inlet at the Georgica Pond gut might also be construed as a structure in terms of coastal dynamics. The 1989 Leatherman study concludes however, that "the possible impacts associated with the opening of Georgica Pond should be minimal as long as the inlet channel is relatively small in size (cross-sectional area) and only allowed to stay open briefly (few days to a week)." (Leatherman, 1989) What the effect would be on shoreline dynamics if the inlet remained open for an extended time because of a catastrophic storm, rising sea-level, or natural shoreline migration, can only be speculated. At present it exhibits a tendency to close fairly rapidly from littoral drift or onshore sediment buildup.

As noted above the substantial Federal groins, and the lesser State groins, in the Village to the east, while not within Reach 11, have a pronounced impact on the Wainscott beach. Possible mitigation is discussed in the Analysis.

(d) Flooding and Erosion Zones

FIRM #360794-0033D dated 5/18/92 shows the V-zone covering all of the Atlantic shoreline in Reach 11, as well as most of Georgica Pond, the southern end of Wainscott Pond, including the residences along the dune from Georgica Pond to Town Line Road. A- and B-zones back the V-zone including the northern and western arms of Georgica Pond and its associated shores.

Both Georgica Pond and Wainscott Pond and their immediate shorelines are also designated federal CBRA zones, extending across the intervening dunes or spits to the ocean. This is also an indication of potential for flooding and overwash from storm surge.

The SLOSH model as shown in East Hampton Quadrangle #P3, shows the Georgica Pond gut can be breached by overwash in a Category 1 hurricane. A Category 2 hurricane surge could overwash the entire Georgica Pond area to Montauk Highway at Stephen Hands Path, cutting the Highway, with extensive flooding of the Pond shores. Wainscott Pond could be inundated up to the Wainscott cemetery.

In a severe Category 3 or greater hurricane the SLOSH model shows that Georgica and Wainscott Ponds could flood to merge across Beach Lane, and additional overwash of Montauk Highway could extend into Stephen Hands Path and west to the Airport Road, with Town Line Road and Beach Lane forming flood corridors extending inland 1/3 to ½ mile. This could inundate most of the residences within the reach, and extending beyond the coastal area.

CEHA zones, as delineated in Photo Map 7-402-83 Sheet #2 and 7-398-83 Sheet #1, extend along the ocean from the Town/Village line east of Georgica gut and include the Georgica Association cabanas and Kennedy residence, as well as houses at the south end of Wainscott Pond.

(e) Analysis

Because of its low primary dune system, the readily breached inlet to Georgica Pond, and the downdrift erosion shadow of the groins in the Village, much of Reach 11 is vulnerable to flooding and erosion in both hurricanes and severe winter storms. FIRM's indicate V- and A-zones along the entire shore, with several structures within CEHA zones, and potential hurricane overwash indicated by the SLOSH model. Measures to mitigate flooding and erosion in the reach should be addressed in the Town's existing emergency response plans and the proposed *Hurricane Damage Mitigation Plan* (see **Projects**).

As indicated on the FIRM's and more extensively by the SLOSH model, potential hurricane flooding is a concern in Reach 11 not only on the ocean beach but also along the Georgica and Wainscott Pond shores. The SLOSH model shows that much of the reach could be inundated in the direct impact of a Category 3 or greater hurricane, with possibly extensive damage to homes along the ocean and the ponds, and flooding of Montauk Highway, the primary artery for the Town and the Village, at the head of Georgica. As the SLOSH modeling indicates potentially more hurricane flooding than the FIRM's, the Town should examine hurricane emergency response planning in these areas in coordination with the Village of East Hampton. They should also be included in the study area for the *Hurricane Damage Mitigation Plan* (see **Projects**).

The 1989 study by Stephen Leatherman discusses the adverse impact of the Federal groins on the Wainscott beach and indicates the desirability of mitigating their downdrift effects. While shoreline position and beach width on the Village beach to the east appear to remain within seasonal and interannual variations, this is probably from the filling of the groin field, or from the periodic reversals of littoral drift in the area. There has been significant shoreline retreat in Reach 11, however, and Leatherman states "There is an obvious and unacceptable adverse impact of these groins on the Wainscott shoreline... resulting in the wave-eroded and storm-susceptible downdrift beaches...." (Leatherman, 1989) Similarly, a 1991 MSRC study notes "the shoreline change is approximately 15% to 20% greater for the existing, long Federal groins condition." (MSRC, 1991)

Potential remediation includes removal or shortening of the Federal groins to improve sand bypass and restore littoral drift. Leatherman suggests the two Federal groins be shortened by 205 feet to bring them in line with the State groins, which "would go a long way to correct the present shoreline problem." This action would require approvals from County, State and Federal agencies, particularly the ACOE. An August 1984 report (appended in Leatherman) commissioned by the ACOE on removal of the groins states "the short-term effects of removing the groins at the Easthampton (Georgica Pond) groin field and the Ocean Beach groin field should not be dramatic, since both of these fields are nearly filled and effectively by-passing." (Leatherman, 1989)

In the interest of improving the erosion situation on the Wainscott beach and forestalling further erosion and ensuing requests for hard structures, the Town should encourage initiatives for removal or remedial action on the Federal groins in the Village. In light of recent settlements regarding the Federal groin system in Westhampton, the Town should petition the Congress and/or the ACOE and other involved agencies to fund mitigation or removal of the groins as consistent with Town policy

against perpendicular hard structures, particularly on the south shore ocean reaches (see *Reduce Impacts of Federal Groins on Wainscott Beach* in **Projects**).

As in the other highly dynamic ocean reaches of the Town, hard structures constitute an undesirable interference with coastal processes, wave dynamics in storm conditions, potential storm surge from hurricanes, and natural dune building and migration. Perpendicular structures cause the most interference and as noted above, the most pronounced downdrift effects. Hard structures should not be permitted on the ocean beaches in Reach 11, and the Town should continue to pursue removal of the single anomalous and unpermitted shore-parallel revetment in the reach, particularly since the Kennedy residence in question is within the CEHA zone and has sufficient property to relocate further back from the dune. Relocation, dune rebuilding and enhancement through sand-trapping with snow-fencing and revegetation or beach grass planting, and other soft solutions should continue to be the methods of choice in responding to erosion under these high-energy ocean shore conditions.

In the confines of Georgica Pond bulkheading and revetments or other hard structures interfere with the flood absorbing capacity of the wetlands, and should not be permitted except under conditions of extreme hardship. Reach 11 is designated Condition 1 on Flooding and Erosion Protection Map V-2, reflecting the recommendation not to permit hard structures in the reach.

Periodic high water in Georgica Pond between openings can be partially attributed to the stormwater runoff from NYS Route 114 that empties into Georgica Cove and from NYS Route 27 (Montauk Highway). This problem can be mitigated by redirecting or otherwise impounding the stormwater runoff before it enters the pond. The Town should consult with residents and Village, Town Trustee and NYS DOT agencies to reduce this significant input into the Pond, both from the standpoint of flooding and pollutants. Recent improvements to Route 27 by NYS DOT included leaching basins and vegetative buffers to filter and impound stormwater. However, due to shallow depth to groundwater and the number and location of leaching basins installed, their ability to actually reduce flooding and remove pollutants is limited. Flooding at times of high water can cause coliform infiltration from home septic systems into the Pond, which could necessitate eventual closure of crabbing and shellfishing. Modifications to upgrade septic systems that consistently flood should be considered at Georgica Pond (see *Septic Waste Remediation* in **Projects**).

Because some flooding and erosion related problems in Reach 11 originate in East Hampton Village, for instance the Federal groins and the drainage inputs into Georgica Pond, the Town should encourage East Hampton Village to undertake its own LWRP to complement Town efforts (see *Drainage Mitigation, Georgica Cove* in **Projects**). Similarly, as some drainage and flooding problems affecting Wainscott Pond originate in Southampton Town, mitigation efforts should be undertaken in conjunction with Southampton and NYS DOT for this watershed (see *East Hampton/Southampton Cooperative Run-off Mitigation, Wainscott Pond* in **Projects**).

12. Reach 12 -- Gardiner's Island

(a) Description

Gardiner's Island is one of the largest privately held islands on the east coast, and represents an immensely important part of East Hampton's historical and natural heritage. It was purchased by Lion Gardiner in 1639 from the Montauk Indians, and received a patent from the King of England in 1640, establishing what is usually regarded as the first English settlement in New York State. It remained an independent manorial estate until after the American Revolution when it was annexed to Suffolk County and East Hampton Town. The Gardiner family trust remains the owner of the Island, and continues to maintain it for private use.

From an historic and archaeological standpoint Gardiner's Island contains the longest continuous intact record of colonial settlement in the Town and probably for much of New York State. Ecologically it provides exceptional habitat for many rare and endangered species, including the largest concentration of nesting osprey in New York State. The entire island is a State designated SCFWH. Federal CBRA designations cover zones at the northern and southern spits and surrounding the coastal ponds and associated shorelines.

Since Gardiner's Island is effectively a single residence, flooding and erosion are generally not significant threats to structures. Should future owners of the island elect to develop it further and intensify use, however, flooding and erosion would be significant planning considerations and should therefore be examined at least briefly in this plan.

From a coastal management standpoint, the island is an exceptional laboratory and historic record of coastal processes. Though much of the island was intensively farmed during its rich colonial history, the shoreline remains in an almost entirely unaltered natural state. Coastal topography varies widely, from coastal ponds and sheltered harbors to high bluffs fronted by rocky shores, providing an unspoiled and encyclopedic sample of the coastal environments found on the north shore of the Town.

The geological origin of Gardiner's Island is unknown, but one theory holds that it represents evidence of a post-Ronkonkoma, pre-Harbor Hill moraine (Town of East Hampton Comprehensive Plan, 1984). It's soils have more in common with Shelter Island and North Haven than other parts of East Hampton.

(b) Natural Protective Features

The central portion of the island is composed of knob and kettle topography with peaks ranging in elevation from 50' to 100'. Beaches extend around the entire perimeter of the island. The most extensive are associated with the major coastal ponds, Great Pond, Bostwick Creek and Tobaccolot Pond. Cliffs with elevations ranging from 25' to 100' run from Bostwick Creek to Eastern Plain Point. The steepest cliffs are found at Whale Hill on Block Island Sound, at an elevation of 130' the highest point on Gardiner's Island. Steep banks ranging from 25' to 75' are also found from Crow Head to Cherry Hill Pond. A portion of the eastern coast south of Tobaccolot Pond also contains cliffs which range from 25' to 47'. The exposed glacial till of the cliffs on Gardiner's Island is subject

to slumping and erosion, particularly on the west side where they face the full fetch of Block Island Sound. A World War II observation bunker on the Whale Hill cliff is getting ominously close to the bluff edge, demonstrating substantial shoreline retreat in the half-century interval.

On the north side of the island, Bostwick Creek has been closed off from Gardiners Bay and Block Island Sound by two sand spits, and marsh deposits have formed in the creek. On the west side, both Cherry Hill Pond and Home Pond have also been closed off from Gardiners Bay by littoral drift, with substantial marshes forming along the perimeter of Home Pond. Home Pond opens periodically to the bay.

The pattern of coastal ponds closed by baymouth bars and dunes formed from littoral drift is typical of the island. Tobaccolot and Lily Ponds on the eastern coast and Little Pond, Gales Pond and Airport Pond in the southern section of the island are similarly closed off from Gardiners Bay. Great Pond on the southern tip of the island, with a shallow inlet opening to Gardiners Bay, is connected to a long sand spit forming to the south.

In general the northern tip of the island has been eroding while the spit at the southern tip has been accreting. The best example of this is a Spanish American War era fort, Fort Tyler, known locally as the Ruins, which was originally joined to Bostwick Point but is now separated by several thousand feet of open water. There was also a lighthouse on the north end of the island from 1855-94. This peninsula was destroyed by the Great Blizzard of 1888.

Littoral drift on the east side of the island divides northwest and south at Eastern Plains Point, while on the west side it is probably westward along Cherry Harbor and then turns south following the coastline.

The island contains numerous freshwater ponds, marshy swales, springs and streams. Wolfie's Hole, the largest inland pond on the island, is a large kettle pond. This pond is the source for Willow Brook, one of three streams feeding into Tobaccolot Pond. Another smaller kettlehole, Casey Pond, is found at the western edge of Rogue Woods. Another body of freshwater, Gaylor Hole, is presumably a kettlehole. Several streams, including Upper Willow Brook and spring-fed Canoe Place flow into Bostwick Creek. The coastal ponds and low-lying streams would likely become flood corridors in times of storm surge.

As noted on the FIRM's there are several CBRA zones on Gardiner's Island, including Bostwick Creek, Tobaccolot Pond, Cherry Hill Pond, Little Pond and Home Pond and their environs; and the southern tip from Great Pond to Cartwright Shoal including all of the barrier spit and its shores.

(c) Coastal Structures

The only coastal modification on Gardiner's Island that currently affects coastal processes is the dredged inlet and small marina with associated bulkheading about a half mile east of Home Pond. This man-made cove is relatively small but disrupts littoral drift to a visible extent, as evidenced by the relatively greater shoreline recession to its south.

Remains of an open water pier extending into the bay from the shore near Home Pond mark the previous docking site. Any effects of this structure have been obscured by dredge spoil from the present inlet deposited on the intervening beach.

The Fort Tyler ruins can be construed as a coastal structure related to Gardiner's Island but probably have little effect on present coastal dynamics since being severed from the island itself.

(d) Flooding and Erosion Zones

FIRM #360794-0010C dated 10/1/83, and #360794-0011D, -0014D, and -0015D dated 5/18/92, show Velocity Zones along the entire shoreline of the island, and extending inland to cover the coastal ponds including Bostwick Creek, Home Pond, Little Pond, Gales Pond, Airport Pond, Great Pond and Tobaccolot Pond. Additional A-Zones, B- and C-Zones cover Cherry Hill Pond, the marina cove, and the backshore areas along most of the coastline.

The SLOSH model (Gardiner's Island West Quadrangle #P2 and East Quadrangle #Q2) shows that a Category 2 hurricane could overwash the north end of the island to the southern shore of Bostwick Creek, all of Tobaccolot Pond, and all of Great Pond and the southern end from the tip to the airfield. A Category 4 storm could overwash additional shoreline surrounding the ponds, and some of the west side of the island at Cherry Hill Point and Little Pond.

CEHA gives the south end of the island an unusual designation as a "Natural Protective Feature Area", likewise the north end from Bostwick Creek. The CEHA photo maps also include an unusual note not found on any other map for the Town: "Any emergent land or nearshore area(s) within the boundaries of this map, has been designated a Natural Protective Feature and has therefore been classified a Coastal Erosion Hazard Area." CEHA zones otherwise extend along all of the Gardiner's Island shoreline, moving inland to surround the coastal ponds, and are delineated in the following photo maps: 98-768-84 45GI, 98-802-83 46GI, 98-806-83 47GI, 98-810-83 48GI, 99-818-83 49GI, 100-1124-83 50GI, 100-1126-83 51GI, 101-1130-83 52GI, 102-840-83 53GI, 102-844-83 54GI, 104-1195-83 55GI, 104-1197-83 56GI, 103-830-83 57GI, 103-827-83 58GI, 103-824-83 59GI.

(e) Analysis

Gardiner's Island contains more information about the land and heritage of East Hampton than any other single property in the Town. It retains features rated the highest quality in New York State, is unique in the country and is truly a rare place in the world, a place of national geographic prominence. Because of its unspoiled shoreline it is also an extraordinary laboratory of coastal processes.

The combined State designations of SCFWH's, Natural Protective Feature Areas and Coastal Erosion Hazard Areas; and Coastal Barrier Resource Areas and Velocity and Flood Zones by the Federal government indicate the extreme sensitivity and highly dynamic coastal environment of Gardiner's Island. Severe constraints to development exist all along the fifteen miles of shore and around the ponds because of flooding and erosion. For instance, none of the V7, A8, B or C flood zones within CBRA zones along the shore and surrounding Great Pond, Tobaccolot Pond, Bostwick Creek, Home Pond, Little Pond or Cherry Hill Pond would be eligible for Federal Flood Insurance.

Given the dynamic character and high energy environment of the island's shores, particularly the north and east coasts, structural erosion controls would probably be ineffective, or worse, damaging and disruptive to the dynamic equilibrium of shorelines, barrier beaches and habitats, and should not be permitted. The shoreline of the reach is therefore designated Condition 1 on Map V-2. Other than the existing marina basin, the coastal systems should be left to their natural workings without additional human interference. Any increase in human use or development of the island would necessitate an expansion of existing transportation facilities (the marina cove on Cherry Harbor) and infrastructure, which would likely also affect coastal dynamics.

The extraordinary catalog of natural and historic features and habitats that characterize Gardiner's Island underscores the need to develop long-range plans for its preservation in a cooperative effort with the Gardiner heirs and relevant agencies.

C. TOWNWIDE CONDITIONS

1. Summary

The Flooding and Erosion component of the LWRP provides the foundation for a comprehensive long-term response to flooding and erosion issues in East Hampton. The Inventory and Analysis provides an overview of the wave forces, storm conditions, natural features and manmade structures interacting in the coastal environment, and the historical changes that have lead to present shoreline conditions. It should be used to develop community consensus for flooding and erosion problems townwide, and forms the basis for the Policies that follow.

Flooding and erosion are the result of long-term geologic, oceanic, and climatic processes and cycles, punctuated by calamitous weather events. While manifesting locally, the origins of flooding and erosion problems are often truly global in nature, and while short-term storm events may precipitate public responses, many of these problems are accurately viewed only within the longer term context of natural cycles and migrating shorelines. While the future may be uncertain for accelerating sea level rise or increased storm activity, it is well established that present sea level is rising and statistically certain that storms will be an ever-present threat to the coastal zone.

The Town has a wide variety of coastal environments, from the low-energy tidal conditions of the enclosed harbors, to the open nor'east exposures of the bay beaches, and the high-energy wave-dominated environment of the south shore. To accommodate this diversity the report examines each reach in terms of its specific conditions using existing planning tools, known data and applicable regulations, confirmed by field inspections and local input (see A.3. Methodology in the Introduction to this section).

The primary causes of flooding and erosion problems in the Town are storms and the interference of human development with coastal processes. Secondary causes include rising sea level and the littoral processes themselves. Among long-term concerns are manmade disruptions of sediment transport from inlets and shore protection structures, landward shoreline migration trends, and

accelerating sea level rise with associated shoreline recession linked to the global warming of the greenhouse effect, and an accompanying increase in frequency and severity of hurricanes.

2. Planning Priorities

Planning horizons are necessarily limited to human time frames of years or decades, in contrast to millennial coastal processes or meteorological cycles timed by hundred-year storms. Man's coastal edifices are frail compared to the power of storm surf and hurricane winds, and coastal planning must consider the inexorable force of the elements for the foreseeable future. It is incumbent on local government to bring collective wisdom to bear in understanding these forces and adapting development to them. Living with the changes wrought on the coast, as a community we must learn to avoid the mistakes of the past.

Primary flooding and erosion issues on the Town's coast include:

- Formulating Town priorities and policy for coastal zone land use regulations in flood and erosion-prone areas.
- Minimizing damage to private property and public resources from flooding and erosion.
- Establishing flooding and erosion protection criteria that meet Town planning priorities.

The Town's flooding and erosion protection priorities, as reflected by the State Coastal Program Policies, are to maintain the natural features and resources that protect against flooding and erosion, and to balance the public interest in coastal resources with public safety and protection of private property. Ideally, the LWRP will be flexible enough to adapt to long-term environmental changes as well as to short-term consequences of storms and other events.

In relation to flooding and erosion protection, to simplify the complex forces and varied conditions on the shore the LWRP consolidates them into three Conditions, with related Recommendations that are meant to apply townwide. A summary of the Conditions and Recommendations is included under Methodology in the Introduction to this section, and in **Policy #13/13A**.

D. TOWNWIDE ISSUES AND RECOMMENDATIONS

1. Storm damage

As coastal storms are a primary cause of flooding and erosion of the Town's coast, what can be done to prepare for and mitigate storm damage?

Issues include:

- Improving emergency response and identifying critical areas for evacuation
- Short-term measures to preventing flooding and erosion in storms

- Pre-storm measures to mitigate damage, e.g. conservation, improved building codes
- Planning for post-storm recovery and redevelopment
- Addressing private insurance concerns
- Long-term planning to mitigate damage from future storms
- Standards for erosion protection measures

The infrequency of major hurricanes in recent years has resulted in complacency by government and property owners about flood hazards from a severe storm. A catastrophic hurricane has not struck the area since 1938, when a large proportion of the residences in the Town were not yet built. Recent hurricanes such as Gloria (1985) and Bob (1991) either made landfall at low tide (Gloria) or were lesser category storms (Bob was a Category 2 and passed east of Montauk). In some densely built low lying areas of the Town, if a tidal surge of the magnitude predicted in a direct hit from a Category 3 or 4 hurricane were to overwash, the threat to life and property could be equal to or worse than the '38 Hurricane. Damage from storm propelled debris and salt contamination of drinking water supplies in areas with shallow surface wells could also prove hazards in a major hurricane. Provisions for emergency response, shelter, water, power needs, reconstruction and recovery in the event of a disaster should be coordinated with relevant State, Federal and private disaster relief agencies, particularly important for Montauk since it could be isolated by flooding at Napeague.

A local post-storm *Hurricane Damage Mitigation Plan* and *Hazard Mitigation Plan* (see **Projects**) should be drafted to promote better land-use and coastal management in the aftermath of major coastal events. The SLOSH model suggests the need to thoroughly reevaluate setbacks, flood zone designations, post-storm rebuilding criteria and civil defense planning for catastrophic storms and hurricanes. The Town Civil Defense Coordinator has completed a draft *Hurricane/Coastal Storm Emergency Response Plan* (Town of East Hampton, 1995) which addresses immediate post-storm exigency and relief issues. However, planning components for post-storm reconstruction and redevelopment require considerably more attention.

Pre- and post-storm planning measures require extensive public education for the public to understand their necessity and to support them with cooperation. This effort should be integrated into a broad public education effort so there will be better understanding of flooding and erosion hazards and solutions, coastal issues and the LWRP as a whole (see **Projects**).

2. Future Planning Needs

What additional tools and resources are needed to adequately assess flooding and erosion problems? How can critical areas of flooding and erosion be accurately identified and erosion rates quantified?

An *Erosion Monitoring Program* on both local and state levels will help to quantify shoreline changes and sea level rise over time, to quantify erosion rates and identify erosion hazard areas (see **Projects**). This data will assist the Town in formulating future policy for changing coastal conditions such as shoreline recession and wetlands migration, increased flooding and vulnerability of infrastructure due to storms or accelerating sea level rise, etc. Additional information should continue to be acquired on localized coastal processes and erosion rates, and the effects of coastal

structures, sea level rise, sediment movement and beach vehicles. A tide gauge network should be established to yield flooding data in cooperation with the National Weather Service at Brookhaven Lab (see *Storm and Flood Monitoring Cooperative with National Weather Service* in **Projects**).

To provide useful data, the *Erosion Monitoring Program* must be kept up over the long-term. While the Town has proposed looking intensively at erosion hot spots such as Ditch Plains beach, additional studies analyzing historical shoreline change for the whole town, mapping vulnerable parcels, and finding creative ways to fund needed mitigation are also needed. Erosion problems should be periodically reevaluated, and mitigation activities prioritized as to urgency and funding availability.

Present resources to identify vulnerable areas and infrastructure, such as those used in this inventory, include the Town's Comprehensive Plan, NFIP FIRM's, CEHA photo maps, and the SLOSH model. This information is presently in disparate formats and should be integrated in an overlay map of the Town along with erosion monitoring data (see **Projects**).

A detailed Town strategy to implement LWRP flooding and erosion recommendations needs to be further developed through initiatives such as those outlined in the **Projects**, including the *Hurricane Damage Mitigation Plan, Hazard Mitigation Plan, Erosion Monitoring Program, Sea Level Rise Model* and a number of area-specific measures such as the *Ditch Plains Erosion and Remediation Study, Montauk Harbor Channel Sand Bypass System,* and *Reduce Impacts of the Federal Groins on Wainscott Beach*.

3. Sea level rise

What can the Town do to assess, plan for, and mitigate the effects of sea level rise, both present and future?

Aspects of this issue include:

- assessment and evaluation at regular intervals
- devising ways to include sea level rise in planning procedures, e.g. adjusting wetland and coastal setbacks on a periodic basis
- developing policies of strategic retreat and/or selective protection of infrastructure and natural protective resources, e.g. wetland migration

It is important for Town residents and officials, both elected and appointed, to familiarize themselves with the issues surrounding global warming and sea level rise, and their potentially large consequences for the community. Monitoring, research, staying abreast of current knowledge, and formulating a flexible program of responses will help prepare the Town for the effects of sea level rise, keep them in the public awareness, and reduce the uncertainties associated with the problem. A program of ongoing seminars or white papers, as suggested in the *LWRP Public Education* **Project**, will assist in this regard, as will the monitoring programs above. Building in periodic reevaluations of setbacks and other coastal regulations into the Town's NRSP requirements would be one way of adapting permitting and planning procedures to future sea level rise.

4. Preserving coastal resources

Coastal development has sometimes disrupted the natural protective systems of beaches, dunes, bluffs, tidal flats and wetlands. How should the Town balance human activities and natural forces, protection of private property with stewardship of coastal public resources?

While the Town's primary obligation is to preserve the public resources of the coast for all its residents, this is really consistent with the enlightened protection of individual properties. The best protections against flooding and erosion for individual property owners are the same natural protective features the public enjoys: beaches, wetlands, dunes, and bluffs. Practical difficulties occur when development encroaches on dynamic shorelines and property owners seek to artificially alter natural features, and to halt the effects of wind and sea.

In the past the reaction to erosion has been construction of erosion protection structures by private property owners, primarily along the bay beaches. The interaction of these coastal erosion structures, the littoral system, and the beach is extraordinarily complex. Improperly placed structures can result in unnecessary loss of public and private property, with negative impacts on beaches and other coastal resources. Hard structures "can cause localized scour during storms, both in front of and at the end of the armoring", and "may be responsible for the redistribution of sand and can prevent sand from entering the system." (National Research Council, 1990) Construction of hard coastal structures also involves aesthetic, environmental, economic and engineering considerations. Areas of the Town's shore where armoring has already extensively altered coastal processes must realistically be treated differently from areas where natural processes remain unaffected.

In these areas reasonable allowances should be made for maintenance and reconstruction of existing structures, however, only after or in conjunction with other alternatives such as moving buildings back from the shore, dune reconstruction, beach nourishment or other 'soft' strategies. Measures beyond in-place-in-kind reconstruction of existing erosion control devices should be subject to restrictive permitting, with a sunset provision for phasing out such devices should shorelines retreat at increased rates due to catastrophic storms or sea level rise, or if the properties they are designed to protect are substantially damaged or destroyed.

The permitting process for hard structural erosion control solutions on north shore bay beaches should allow such devices only where soft solutions have not been effective, where other shore-hardening devices are present, or where remaining natural protection is minimal and hard structures provide the only remaining protection, and if the likelihood of damage to existing beaches or neighboring property is insignificant or adequately mitigated. While a structure may in some cases legitimately serve to provide public access or preserve a water-dependent use, no structure should interfere with access to existing public beaches or nearshore areas. Neither should structures increase the risk of damage to existing resources, as when an eroding shore recedes to a bulkhead or revetment and storm surge or wave action washes out the beach in front of it.

Permitted erosion protection structures should not interfere with natural processes such as beach formation, dune building, or wetland retreat or advance. Where structures result or have resulted in accelerated beach erosion, owners of structures should be required to renourish affected beaches with

clean sand of compatible grain type and size. Consideration should be given to making this policy retroactive to existing erosion control structures, either as a condition for in-place-in-kind replacement or through creation of erosion protection districts. Where structures have damaged adjacent property or beaches, replacement should be restricted and installation of structures on neighboring properties discouraged so as not to compound the problem.

In the areas of Town coastline that remain largely in a natural state, such as the south shore ocean beaches, construction of new hard erosion protection structures should be prohibited, and any existing structures rendered non-conforming, requiring full permit review before any reconstruction. Existing shore-parallel structures in these areas should be replaced only under conditions of exceptional hardship. See Flooding and Erosion Protection Map V-2, for specific geographic recommendations for erosion protection structures, as well as individual reach analyses and recommendations. Shore normal or perpendicular structures such as groins and jetties which interfere with littoral transport should be phased out or prohibited Townwide because of their downdrift effects, except where they protect navigational inlets as at Montauk and Three Mile Harbors.

Erosion control policy in general should encourage use of environmentally benign soft solutions such as beach grass plantings, snow fencing and other methods that encourage natural deposition of sand without interfering with littoral transport and other coastal processes. Standards should be revisited periodically to allow for changing technology and to incorporate effective new techniques.

To provide adequate protection for development, wetland and waterfront setbacks should be periodically reexamined, e.g. every ten years,, and if necessary, revised. Minimum lot sizes for undeveloped land along the shore should be increased to permit relocating buildings as an alternative to "hard" structural erosion controls. Existing setback exceptions for small lots should be excised from the Town Code, as should other anomalies such as the reduced setbacks in Reach 9 along the bluffs of Old Montauk Highway. Town Code **§153-4-32B** should be amended to require a minimum 100' bluff line or primary dune crest setback for all structures, regardless of the lot size, and **§153-4-37B** should be revised to make setbacks along Old Montauk Highway uniform with other areas of the Town.

Calculation of setbacks from eroding bluffs or primary dunes should be altered to measure from a point of intersection of the top of the bluff and a calculated angle-of-repose of the bluff-face, rather than from the current bluff edge or dune crest. Setback provisions to allow landward migration of wetlands may be necessary if sea level rise accelerates, as predicted by some models, in order to preserve these vital coastal resources.

5. Existing programs

How can the Town best adapt to program changes and new policies for flooding and erosion at other levels of government, the National Flood Insurance Program, NYS Building Codes, and ACOE priorities for local erosion mitigation and channel dredging?

Recent reforms in the NFIP encourage floodproofing and landward relocation of storm damaged structures, and incorporate erosion hazard mitigation. The Town Code has been revised to include these measures in its Flood Hazard Overlay District. All Town residents in vulnerable areas should be encouraged or required to obtain NFIP coverage and to maintain it. The Town should consider participating in the NFIP Community Rating System if applicable guidelines will reduce flood insurance rates for residents.

The Town should also undertake a cooperative planning effort with local insurance agents, private insurance carriers and State regulators to forestall gaps in homeowner and waterfront business coverage and to facilitate a post-storm recovery.

When catastrophic storms cause substantial erosion or destruction in NYS CEHA zones or other identified erosion hazard zones, Town policy should discourage reconstruction or rebuilding of structures in the most hazardous areas, especially structures that interfere with coastal processes. By adopting local enabling legislation and taking over local administration of the New York State Coastal Erosion Hazards Act, the Town can simplify permitting for residents and coordinate and consolidate local and State erosion policy. Incorporating CEHA provisions into Town Code is recommended as part of the LWRP, to provide integrated management of erosion hazard areas.

E. VULNERABLE AREAS, ISSUES AND RECOMMENDATIONS BY REACH

The following section is intended to highlight key areas and key issues and to summarize recommendations inferred from the individual reach analyses. Please see the respective reach analyses above for further background and details.

1. Reach 1 - Northwest Harbor

(a) Vulnerable areas

Flooding Homes at end of Northwest Landing Road, homes along coast of Grace Estate, Colony at Northwest.

Erosion Bluffs at Cedar Point park, Cedar Point Light.

(b) Issues

- With a largely natural coastline, large tracts of preserved open space and few existing erosion protection structures in a relatively low-energy environment, are erosion protection structures desirable or necessary? Should existing structures be rebuilt or reconstructed?

- The County dock at Northwest Creek is overbuilt considering the minimal use it receives. Should the filled bulkhead/dock be reconfigured to reflect its current use and the fragile character of its surroundings? How can the deteriorated launch ramp be improved ?

- Homes in the vulnerable areas above are at risk of flooding in hurricanes or severe nor'easters. What strategies should be implemented to protect existing and future development in these flood and erosion hazard areas?

- The Northwest Creek channel shoals up rapidly, impeding navigation and flushing. Dredge spoil from periodic maintenance dredging of the channel is not needed on the spit protecting the harbor. Can this inlet be better managed, and can dredge spoil be better used?

- Excessive beach vehicle use is contributing to erosion and habitat degradation at Cedar Point Park. Should vehicles be restricted to conserve natural protective features and habitat such as colonial shorebird nesting areas?

(c) Recommendations

- Do not permit additional erosion protection structures. Existing structures should not be reconstructed or replaced, except revetment protecting historic Cedar Point lighthouse.

- Limit development, including additions and accessory structures in vulnerable flood areas at Northwest Landing, place any additions or new structures on landward side, and require floodproofing to NFIP standard.

- The County Dock in Northwest Creek is underutilized, serves no flooding or erosion protection function, and should be reconfigured when it deteriorates. Reconstruction of the launch ramp should be undertaken.

- Consider relocating the Northwest Creek inlet channel to its original position at the eastern end of the spit. Consider depositing dredge spoil on Barcelona Neck or toe of bluff south of Cedar Point for beach nourishment or bluff stabilization. The Town Trustees must approve of any relocation of the Northwest Creek inlet channel. See **Projects**.

- Restore natural saltmarsh tidal flooding and drainage patterns in Northwest Creek wetlands with expanded OMWM program.

- Restrict beach vehicle access, especially in colonial shorebird nesting season (April 1 - August 15); see also recommendations in **Significant Habitats Policy #7**, and **Public Access and Recreation Policies #9 & 19-22**. Note: The Town Trustees do not agree with the recommendations to restrict beach vehicle access and wish to see reasonable measures taken to protect nesting shorebirds while at the same time protecting the public's right to use and enjoy our beaches.

- Maintain coastal systems and uplands in their pristine condition.

2. Reach 2 - Three Mile Harbor/Hog Creek

(a) Vulnerable areas

Flooding Sammy's Beach, Maidstone Park, Three Mile Harbor shorelines, Hog Creek and Three Mile Harbor Roads, Hog Creek interior shore, ponds west of Hog Creek.

Erosion Gardiners Bay shorelines at Hedges Bank, Flaggy Hole Road to end of Runnymede Drive, Hog Creek to Hog Creek Point.

(b) Issues

- Sammy's Beach is characteristic of a barrier beach and part of it is a designated Federal CBRA zone. It presents special problems for evacuation in severe storms, and because of its potential for storm surge overwash should receive special treatment in terms of planning and zoning. How should existing and future development be regulated in the Sammy's Beach area?

- With the large number of hard erosion protection structures in Reach 2, what should Town policy be to manage the coastal zone to protect both public resources and private property? The dock, acting as a groin, at Camp Blue Bay, the groins and bulkheading along Runnymede Drive to Hog Creek, and the bulkheading within Hog Creek and extending along the bay from the creek mouth to Hog Creek Point are cases in point.

(c) Recommendations

- Limit expansion of existing structures and do not permit secondary structures at Sammy's Beach. Do not grant relief from setbacks, and require floodproofing to NFIP standards for any additions or remodeling, but do not permit additional stories. Do not permit hard erosion protection structures. Town should acquire vacant parcels on Sammy's Beach whenever possible, and the area should be further evaluated in the *Hurricane Damage Mitigation Plan* (see **Projects**).

- Minimize use of hard flooding and erosion protection structures within Three Mile Harbor (see Flooding and Erosion Protection Map V-2), except for the east side water-dependent businesses and municipal docks. Maintain inlet jetties for navigation, and maintain navigation channels at sufficient depth for a designated small boat harbor. Utilize dredge spoil materials for beach nourishment or habitat enhancement at other sites, after dewatering and temporary deposition at designated Marina Lane and Maidstone Park or Sammy's Beach spoil sites.

- Maintain natural bluffs at Hedges Bank and in front of Camp Blue Bay and do not replace perpendicular structures or permit new structures. Do not repair or replace erosion protection structures within Hog Creek, except at community marinas.

- Any future permits for new or substantially rebuilt structures should incorporate downdrift mitigation and beach maintenance requirements, with appropriate financial surety. The financial surety will pay for required mitigation if necessary, and should include a legally binding mechanism guaranteeing removal of the structure if mitigation requirements are not met (see **Policy #13**).

- Use the SLOSH model to reexamine potential flooding risks in reach and evaluate in *Hurricane Damage Mitigation Plan* (see **Projects**).

3. Reach 3 - Accabonac

(a) Vulnerable areas

Flooding Gerard Drive, Louse Point Road, Accabonac Harbor, Fireplace Road and Fort Pond Boulevard, Pussy's Pond area, Chapel Lane to Fresh Pond wetland system.

Erosion Gerard Drive, Accabonac Cliff (Waters Edge Road), Bell Estate bluffs, Cross Highway between Fresh Pond and Devon Yacht Club.

(b) Issues

- The sandy spits of Gerard Drive and Louse Point are characteristic barrier beaches and have Federal CBRA zones covering their undeveloped portions. Most of the residential development in these areas is within NFIP V- and A- flood hazard zones. What can be done to minimize problems of storm flooding and erosion in these areas?

- Reach 3 is characterized by fragile bay beaches. Parts of Gerard Drive have been extensively armored for erosion protection, and there are pending applications for shore hardening erosion protection devices on the bay side of Louse Point. In several areas, notably along Waters Edge Road in Barnes Landing, and Cross Highway between Fresh Pond and Devon, homes are sufficiently close to the water to be threatened by flooding and/or erosion. Erosion has been exacerbated by erosion protection structures in these areas, which have eliminated beaches and restricted sediment. Particularly at the interface zones where hardened structures end and municipal beaches begin, permitting of additional structures must be carefully considered.

- Given the threat to homes and the destruction of coastal resources that has resulted from attempts to protect them, how should these areas be managed? Can public beaches and natural protective features be enhanced or restored?

- Circulation in the enclosed water bodies in Reach 3, Accabonac Harbor and Fresh Pond, has decreased as a result of human interference with inlet openings, which may also increase flooding in time of storms. The relocation of the Accabonac channel

and closing of the north end sluice, and the Fresh Pond jetties have restricted openings and captured sediment. In the case of Fresh Pond the inlet jetties have caused the opening to shoal up and caused scouring downdrift to the south. What can be done to improve circulation and minimize flooding and erosion problems in these water bodies?

(c) Recommendations:

- Limit new construction and expansion of existing residences on Gerard Drive and Louse Point. Any building permits in flood zones should require flood-proofing; this should not, however, be construed as allowing multi-story construction. Educate present owners and prospective buyers on flood/erosion hazards. Include areas within NFIP flood and CEHA zones in evaluation of *Hurricane Damage Mitigation Plan* (see **Projects**).

- In Condition 3 areas of the reach that are already extensively armored, with no remaining natural protection, existing shore parallel structures should be permitted to be repaired or reconstructed within the 30-year storm parameter. However, they should not be expanded to larger or more permanent structures, though soft solutions can be added or combined to enhance protection or restore resources. Any future permits should incorporate downdrift mitigation and beach maintenance requirements, with appropriate financial surety. See Flooding and Erosion Protection Map V-2.

- Perpendicular erosion protection structures throughout the reach interfere with littoral drift and sediment transport, have either produced unconsidered downdrift effects, are too large for the design conditions or are simply unnecessary. Groins and other perpendicular structures should not be replaced or repaired except to protect navigational channels, as at Gerard Point.

- The remainder of the Reach 3 shoreline, including the interior shore of Accabonac Harbor, should have no hard structures, and is designated Condition 1 on Flooding and Erosion Protection Map V-2.

- The Town should conduct a feasibility study to reopen the former north end sluice for Accabonac Harbor along Gerard Drive in conjunction with reconfiguring the causeway, which is regularly overwashed. At the inlet to Fresh Pond, the jetties should be removed to allow natural movement of the opening and improved flushing of the pond (**Projects**). The Town Trustees support restoring the Accabonac Harbor channel to its original location, reopening the north end sluice along Gerard Drive and improving flushing in Fresh Pond.

- Use of erosion control districts should be explored to renourish beaches that have been lost due to impacts of erosion protection structures. Dredge spoil from

maintenance dredging at both Accabonac Harbor and the Devon Yacht Club should be used to nourish beaches in Reach 3.

4. Reach 4 -- Napeague North

(a) Vulnerable areas

Flooding Devon Yacht Club, Cranberry Hole Road, end of Mulford Lane, Lazy Point, mobile home parks at Lazy Point along Mulford Lane and Crassen Boulevard, all shores of Napeague Harbor, and much of the reach in a Category 3 or greater hurricane.

Erosion Devon Yacht Club, Cranberry Hole Road, old fish factory site, end of Mulford Lane, Shore Road to Lazy Point.

(b) Issues

· The potential for storm and hurricane overwash at Napeague is particularly high, and in a severe hurricane or nor'easter all of the homes in the Lazy Point area are potentially in the way of floodwaters. Several of the waterfront homes at the west end of Shore Road and near the road ends of Mulford Lane and Bay View Avenue are already at risk from existing erosion, including two houses at Mulford Lane virtually out in the water.

· During the '38 hurricane Napeague was almost entirely inundated, cutting off Montauk from the rest of the Town for nearly a week. Since then many new homes have been built in the Lazy Point area, along Cranberry Hole Road and on the east side of Napeague Harbor. What can be done to protect these residences in a major storm, and what should Town policy be if they are destroyed?

· The hodgepodge of groins and other erosion protection structures along Shore Road at Lazy Point have had a negative impact on the beach and provide little protection. Within Napeague Harbor, a low energy tidal environment, hard structures also have minimal function. Should erosion protection structures be replaced or otherwise permitted in this flood and erosion prone area?

(c) Recommendations

· Napeague was a study area for the *Hurricane Damage Mitigation Plan for the South Shore* (LIRPB, 1984), which recommended (in part):

  · Accept the natural shoreline regression along the headlands portion of the reach as beyond practical control.

  · Expand public open space in areas vulnerable to overwash and flood damage.

- Seek to expand undeveloped coastal barrier designations under the Coastal Barrier Resources Act on storm-damaged portions of the island.

- Develop plans for emergency response procedures in the event of a breach at Napeague.

- Limit additional development in the Lazy Point area, and protect Montauk Highway as the only major east-west transportation corridor. The plan recommends phasing out Trustee leases on Lazy Point and returning those lands to public ownership and use. The Town Trustees do not agree with this approach.

- Two homes at the end of Mulford Lane are out on the beach due to erosion, and the land should be reclaimed by the Trustees or New York State.

- Except for the Devon Yacht Club, the relic structures at the old fish factory site at Promised Land, and some structures in the interior of Napeague Harbor, the Reach 4 shoreline is predominantly free of erosion protection structures and should remain so (Condition 1, Flooding and Erosion Protection Map V-2). Remaining structures are designated as Condition 2, and should be evaluated versus non-structural alternatives if requiring replacement or repair. Perpendicular structures such as groins should not be replaced.

- On the east side of Napeague Harbor excessive ORV use is damaging the narrow beach, back-dune wetlands, and dune areas. ORV's should be restricted and dune cuts revegetated. See also **Public Access and Recreation Policies #9 & 19-22**. Note: The Town Trustees do not support further restrictions on beach vehicle use.

5. Reach 5 -- Hither Woods/Fort Pond Bay

(a) Vulnerable areas

Flooding South shore of Fort Pond Bay, Industrial Road including LIRR station and LIPA substation, shores of Fort Pond, Tuthill Pond and Tuthill Road

Erosion Southwest shore of Fort Pond Bay, steep banks in Fort Pond, Culloden shoreline

(b) Issues

- The primary concerns in Reach 5 are the shore of Fort Pond Bay and Fort Pond which could be overwashed in a direct hit from even a Category 1 hurricane. Fort Pond could act as a flood corridor into the Montauk business district. What should the Town's planning responses be to these concerns?

- Erosion protection structures erected on the southwest shore of Fort Pond Bay along Navy Road have caused evident downdrift scouring to neighboring beaches. Should these structures be replaced or reconstructed, or new erosion protection structures permitted?

(c) Recommendations

- Evaluate potential overwash of Industrial and Navy Road sites in *Hurricane Damage Mitigation Plan* (see **Projects**). Commercial sites on Industrial Road between Fort Pond Bay and Fort Pond should be checked for potential flood-borne dispersion of hazardous or toxic materials and potentially hazardous water-borne debris, e.g. lumber, fuel or chemical tanks, etc. Facilities with potential hazards should be sited elsewhere. Relocate the LIPA emergency substation from the 100-year floodplain to an alternative site such as the former Town landfill in Hither Woods, or elsewhere out of the flood zone.

- Revetments and other shore-parallel hard structures along the south shore of Fort Pond Bay should be carefully evaluated versus soft solutions before any new permitting or replacement occurs (Condition 2, Flooding and Erosion Protection Map V-2).

- Endangered plants along the shore of Culloden Point should be protected from ORV activity (see also **Significant Habitats Policy #7**).

6. Reach 6 -- Montauk North Side

(a) Vulnerable areas

Flooding Sound View Drive, docks in Coonsfoot Cove, area surrounding Big and Little Reed Ponds, all shores of Lake Montauk.

Erosion Captain Kidd's Path/Sound View Drive shore, shore of Montauk County Park.

(b) Issues

- The Sound View Drive area west of the Montauk harbor jetties has suffered extensive erosion and periodic flooding. The area is characterized by low dunes, insufficient setbacks, direct exposure to nor'easters, downdrift scouring from the jetties, and progressive installation of shore-hardening erosion protection devices, which have accelerated beach erosion. Can flooding and erosion and potential property loss be alleviated in this area? Can beaches be restored?

- Star Island, the Montauk airstrip, and the shores of Lake Montauk are in flood zones subject to hurricane overwash. Coonsfoot Cove is the heart of the Town's commercial waterfront with the largest number of recreational boat slips, as well as home to much of the commercial fishing fleet. How should the Town plan to

mitigate future hazards, and to aid recovery and redevelopment of these areas in the wake of a catastrophic storm?

- Erosion protection and other shore-hardening devices within the low-energy tidal environment of Lake Montauk have minimal utility. Should the Town permit replacement or reconstruction of existing devices, or new structural devices in the Lake?

- Seasonal beach vehicle use for camping and fishing in Montauk County Park is intensive and increases erosion and beach habitat loss in the Gin Beach area. Will proposed limits of 250 vehicles with a maximum of 200 campers, in the Montauk County Park Management Plan, adequately reduce damage?

(c) Recommendations

- Two houses have been lost in the Sound View Drive area in the last decade to storms and wave forces. Spoil deposited from the periodic maintenance dredging of the inlet does not compensate sufficiently for the sediment deficit and storm erosion, so the problem will recur. Erosion protection structures along Sound View Drive should be permitted emergency replacement or reconstruction (Condition 3, Flooding and Erosion Protection Map V-2) because in most instances they are the only remaining protection, although they are also a factor in increased erosion rates. Maintenance of erosion protection structures will not solve the erosion problem. A Federal sand by-passing program should be implemented as part of the maintenance of the inlet. The inlet jetties are vital to navigation and must also be maintained, but sand by-passing plan can be incorporated in the periodic maintenance dredging. All dredge spoil should be placed on the west (downdrift) side. An erosion protection district should be considered for the area.

- The marinas at the north end of Lake Montauk in the Coonsfoot Cove and Star Island areas are essential water-dependent uses and provide public access to the harbor. They are designated Condition 3 on Flooding and Erosion Protection Map V-2, permitting emergency in-place in-kind replacement within the parameters of a 30-year storm.

  Plans for rebuilding this area following a catastrophic storm or major hurricane should be addressed in the *Hurricane Damage Mitigation Plan* (**Projects**). The plan should include desirable improvements for hazard mitigation and remediation including floodproofing, relocating structures, upgrading of aging septic systems (see **Water Resources Policies #30-40 & 44**), restoration of vegetative buffers and natural shorelines, etc. It could also provide opportunity for other improvements, such as an integrated harbor walkway to facilitate public access (**Projects**).

- In the low-energy tidal environment of Lake Montauk south of Star Island erosion protection structures are few and serve little function in retarding erosion. Erosion

protection structures in this section of the Lake should not be replaced except under conditions of exceptional hardship, especially perpendicular structures such as groins, and are designated Condition 1 on Flooding and Erosion Protection Map V-2.

- To better protect the substantial amount of residential construction surrounding the Lake, it is important to maintain natural features such as wetlands, ponds, and streams that increase flood retention capacity (see **Development Policies #1-6**). Development in flood hazard areas around the Lake should be brought into conformity with NFIP standards.

7. Reach 7 -- Oyster Pond/North Montauk Point

(a) Vulnerable areas:

Flooding and Erosion — Montauk Lighthouse, barrier spit at Oyster Pond.

(b) Issues

- The Montauk Lighthouse is the most heavily armored coastal structure in the Town, probably in the state. As an exposed headland it receives the full intensity of sea and weather. If the massive rock revetment does not withstand the elements, what other alternatives for its preservation will be considered?

- The armoring of Montauk Point has removed material from the longshore sediment budget. What effect will this reduction have on beaches and coastal features to the west?

- The gut at Oyster Pond is vulnerable to storm overwash. Should the pond be breached and remain open, significant damage could occur to the rare and endangered plant communities on its fringe. How should government plan for such a contingency?

(c) Recommendations

- If rising sea level or increased storm activity render the newly constructed revetment at the Montauk Lighthouse ineffective, other alternatives such as relocating the Lighthouse may have to be evaluated. Consequences of the armoring at the Lighthouse and resultant reduction in the sediment budget on coastal processes to the west are not well understood and should be investigated before any further work at the Point.

- Contingency plans should be developed to close a sustained breach of the barrier spit at Oyster Pond, which could drastically alter this habitat for a number of threatened and endangered species (see **Significant Habitat Policy #7**).

8. Reach 8 -- Montauk Bluffs

(a) Vulnerable areas

Flooding Montauk Shores Condominium trailer park

Erosion Residences close to eroding clay bluffs, perched ponds and wetlands on bluffs, hoodoo bluff formations

(b) Issues

· Reach 8 is home to unusual blufftop communities of rare plants surrounding perched ponds and wetlands, as well as spectacular fluted "hoodoo" formations of the clay bluffs. Occasional attempts to forestall erosion of the bluffs has involved regrading and revegetating, and toe armoring with rock. Given the large tracts of publicly owned open space and generally sparse residential development with adequate setbacks in the reach, should these extraordinary natural features be further disrupted by erosion protection structures or construction of waterfront homes?

· The Montauk Shores Condominium trailer park is located in a low-lying flood zone, and subject to erosion in recent winter storms (1992-93). Part of the condominium is in an NFIP hazard zone, and few residences are even minimally floodproofed. Should they be replaced if destroyed by a hurricane or severe nor'easter? How should the Town respond to requests for structural erosion protection at the site, given its proximity to the Town bathing beach at Ditch Plains?

(c) Recommendations

· The scenic hoodoo bluffs and unique geology and biology of the Montauk moorlands area should be maintained in a natural state. Public acquisition of remaining large tracts should be pursued. With the impermeable clay soils of the area, water draining over the bluff face is a significant erosion force, though secondary to the ocean surf on the bluff toe. Where minimal interventions, such as enhanced drainage via a simple pipe, can prevent loss of significant habitats, such measures would be consistent with LWRP goals. Homes close to the bluff edge should be moved back where possible if threatened by shoreline recession. No new shore-hardening erosion protection structures should be permitted in the reach. Existing shore-parallel structures should not be repaired or reconstructed except under hardship conditions and existing perpendicular structures should not be repaired or reconstructed (Condition 1, Flooding and Erosion Protection Map V-2).

· The Montauk Shores condominium trailer park is particularly vulnerable to flooding and erosion, and does not meet NFIP flood-proofing requirements. Flood-proofing and relocating structures landward are preferable to hard erosion protection in this otherwise low lying area. Flooding and erosion solutions and post-storm reconstruction at Montauk Shores should be further examined in the *Hurricane Damage Mitigation Plan* (**Projects**).

9. Reach 9 -- Hamlet of Montauk/ Hither Hills

(a) Vulnerable areas

Flooding Ditch Plains subdivision, Montauk business area, Kirk Park, lower levels of resorts along bluff on Old Montauk Highway.

Erosion East Deck Motel, Ditch Plains bathing beach, beach and motels along South Emerson Street, dunes at Kirk Park, shore resorts on Old Montauk Highway.

(b) Issues

- Both Ditch Plains and the Montauk business area have experienced extensive beach erosion in recent years, and are in the 100 year floodplain, with velocity (V-) zones backed by A-flood zones extending to Lake Montauk and Fort Pond respectively. Many structures are also in CEHA zones. A Category 2 or greater hurricane poses substantial risk of overwash. What can be done to mitigate the hazards, both pre- and post-storm?

- Hard erosion protection structures cause downdrift scouring and other erosion damage in the high-energy environment of the ocean shore, and the Otis Avenue groin has affected the Town bathing beach at Ditch Plains. Should this structure be altered to mitigate its impact on the bathing beach?

- Bluff setbacks along Old Montauk Highway are less than in other parts of the Town, on the supposition that these bluffs are relatively stable. Given the bluff toe erosion and shoreline recession that has occurred in recent winter storms, should the Town reconsider this assumption along with area setbacks?

(c) Recommendations

- Complete the study of flooding and erosion factors at the Ditch Plains beach and propose a strategy to mitigate bluff recession and protect the inland residential area (see *Ditch Plains Erosion and Remediation Study* in **Projects**). Continue to monitor beach profiles and erosion. Consider shortening/removing the Otis Avenue groin to bypass more sand to Ditch Plains bathing beach; also consider dune enhancement to protect residential area from overwash. Address dangers of an overwash and strategies to close a potential breach from a catastrophic storm in the *Hurricane Damage Mitigation Plan*.

- Include the Montauk business area in a *Hurricane Damage Mitigation Plan*. Undertake remedial steps to rebuild dune and repair damage from pedestrian traffic to dune system at Kirk Park with over-dune catwalks and a revegetation program.

- In the wave-dominated high-energy environment of the south shore structures should not be permitted to disrupt coastal processes. The Town should therefore not permit hard erosion protection structures in Reach 9, and the entire reach is designated

Condition 1 on Flooding and Erosion Protection Map V-2. Soft solutions enhancing natural protective features are preferable (**Policies #13 & 17**).

- Along the bluffs of Old Montauk Highway the Town should consider increasing the bluff setbacks to bring them into line with setbacks in the rest of the Town. They are presently measured from the toe rather than the edge of the bluff on the assumption that this is a stable or accreting shoreline which, judging from the effects of recent storm activity, is probably not the case. If a catastrophic storm substantially damages or destroys these structures they should not be rebuilt, and native bluff flora should be planted to stabilize the bluff. This area should also be carefully evaluated in the *Hurricane Damage Mitigation Plan*, especially as the amount of investment in resort properties will generate impetus for reconstruction and erosion protection. Protection of private property should not outweigh potential damage to public coastal resources in Reach 9. No hard structures should be permitted along the Atlantic Ocean shore.

10. Reach 10 -- Napeague South/ Amagansett

(a) Vulnerable areas

Flooding Napeague, especially Montauk-by-the-Sea subdivision and condominiums on Napeague stretch, Beachampton (Atlantic Avenue to east end of Marine Boulevard), Indian Wells Highway, some beach homes between Indian Wells Highway and East Hampton Village boundary.

Erosion Entire ocean shoreline and associated primary dune systems.

(b) Issues

- Much of Reach 10 consists of low-lying dune systems with migratory characteristics of barrier beaches, including vulnerability to storm flooding and erosion. Flood and erosion hazard zones are continuous along all of the reach shoreline. Natural beach and dune systems have been effective defenses against flooding and erosion forces, and almost no shore hardening erosion protection structures are present in the reach. Development and human uses, construction of beachfront homes and intensive beach use, including by recreational vehicles, has in some areas compromised the natural systems.

- How should the Town manage these coastal resources to maintain their integrity, especially if shoreline flooding and erosion threaten residences? What kind of erosion protection measures are appropriate on these dynamic high-energy shores?

- If a catastrophic storm causes widespread destruction of homes and businesses, as occurred in the 1938 Hurricane when the reach was far less developed, are there areas where reconstruction should not occur, and what standards (e.g. floodproofing and other hazard mitigation) should govern post-storm redevelopment?

(c) Recommendations

- Since beaches and the dune system provide the primary defense against storms and the elements, everything possible should be done to maintain these natural features and to discontinue practices that degrade them.

- Town maintained road-ends provide public access to the water, but conversely can also be significant flood corridors. The Town should consider redesigning and revegetating paved road-ends (which in Reach 10 include Navahoe Road, Dolphin Drive, Atlantic Drive, Napeague Lane, the east end of Marine Boulevard, Atlantic Avenue, and Indian Wells Highway) to restore the primary dune while continuing to provide parking, and visual, pedestrian and limited vehicular access. The Village-maintained beach at Two Mile Hollow is a possible prototype (see *Road-end and Beach Access Modifications* in **Projects**).

- ORV use for fishing and recreation in Reach 10 has caused significant damage both to the dunes, at the east end of Marine Boulevard, and to the foredune area and beaches in Napeague State Park, where growth of vegetation has been retarded, especially after major storms. Flooding and erosion in this area will continue if beach vehicle traffic is not reduced or redirected. Vehicles should be prohibited within 20 ft. of the beach grass line, as is required at Fire Island National Seashore (see Analysis for Reach 10). Plant communities must be given time to naturally reestablish following major storm events, with temporary post-storm restrictions on beach vehicles until beach grass regenerates and the vegetation line is redefined. Note: In general, the Town Trustees do not agree with this assessment of the impacts of beach driving.

- Dynamic coastal conditions and potential negative impact of erosion protection structures require their prohibition in Reach 10, reflected in the Condition 1 designation on the Flooding and Erosion Protection Map V-2.

- Where property or residential structures are threatened by erosion or receding shorelines, it is essential to maintain the primary dune system with setbacks and soft solutions such as dune rebuilding and revegetation. However, it is important to remember this is a dynamic system and to allow for natural dune migration. Conservation recommendations for the Double Dunes area include selective use of snowfencing to close blowouts in the dune and trap sand, beach grass planting, consolidation of access paths to the beach, and annual evaluations of erosion conditions each spring (TNC, 1978).

- Although NYS CEHA regulates construction and other activities on both primary and secondary dunes, the extensive secondary dune system in Reach 10 have not been included on current CEHA photo maps. Inclusion is recommended in future mapping by New York State, and any adoption of local CEHA administration. Local

administration of CEHA will help to integrate State and local planning, and provide more rapid response in the wake of a storm.

- Pre-storm planning to mitigate future flooding and erosion related damage in CEHA zones, NFIP V-zones, etc. should be instituted through the *Hurricane Damage Mitigation Plan* and/or *Hazard Mitigation Plan* (see **Projects**), or other planning mechanisms in cooperation with NYS and Federal NFIP authorities. The Town should also consult with private insurers and local insurance agents as well as the NFIP to set up a framework for rapid assessment and repair of property damage in the aftermath of a storm. To insure consistent coastal zone management, the Village of East Hampton should be encouraged to undertake its own LWRP, and to coordinate consistency review with the Town.

11. Reach 11 -- Wainscott

(a) Vulnerable areas

Flooding All shores of Georgica Pond, Wainscott Pond, the Atlantic shoreline and residences in the primary dune area, Montauk Highway at the head of Georgica Pond, low-lying area between Georgica Pond and Town Line Road.

Erosion Atlantic Ocean shoreline including homes built near the primary dune.

(b) Issues

- Beach erosion and shoreline recession in Reach 11 are aggravated by downdrift scouring from the federal groins in the Village immediately to the east. Can appropriate measures be undertaken to mitigate the effects of these groins?

- Are hard erosion protection structures appropriate in the high-energy wave-dominated environment of Reach 11's ocean beaches and dunes? Are soft solutions more benign and/or effective?

- In the low-energy environment of Georgica Pond, are hard shoreline structures necessary or effective for flooding or erosion protection, should new ones be permitted, and should existing structures be repaired or reconstructed?

- Stormwater from watersheds outside the coastal area, (from East Hampton Village for Georgica Pond, and from Southampton Town for Wainscott Pond) increases flooding in Reach 11's coastal ponds. Can these waters be otherwise diverted or impounded?

(c) Recommendations:

- Wainscott is particularly vulnerable to flooding and erosion in hurricanes and severe winter storms because of the low dune system and the near sea-level barrier at Georgica Pond. There is no back dune system as in the double dunes of Reach 10, therefore flood waters breaching the pond, the dunes or road-ends could move inland

unimpeded. Measures to mitigate flooding and erosion in the reach should also be addressed in the Town's existing emergency response plans and the proposed *Hurricane Damage Mitigation Plan* (**Projects**).

- The Federal groins in East Hampton Village to the east have increased erosion and shoreline recession rates on the Wainscott Beach. Potential remediation includes removal or, more probably, shortening of the groins to improve sand bypass and restore littoral drift. The Town should petition Congress, the ACOE and other involved agencies to fund mitigation or removal of the groins (see *Reduce Impacts of Federal Groins on Wainscott Beach* in **Projects**).

- As in the other highly dynamic ocean reaches of the Town, hard structures constitute an undesirable interference with coastal processes, wave dynamics, potential storm surge from hurricanes, and natural dune building and migration. Hard structures should not be permitted on the ocean beaches in Reach 11, and the Town should continue to encourage removal of the anomalous shore-parallel revetment in the reach, since the residence in question is within the CEHA zone, and has sufficient property to relocate further back from the dune.

- Relocation, dune rebuilding and enhancement, through sand-trapping with snow-fencing or revegetation by beach grass planting, and other soft solutions should continue to be the erosion protection methods of choice in high-energy ocean shore situations.

- In the confines of Georgica Pond bulkheading and revetments interfere with the flood absorption capacity of wetlands and should not be permitted except under conditions of extreme hardship. All of Reach 11 is designated Condition 1 on Map V-2.

- Periodic high water and water quality problems in Georgica between pond openings can be partially mitigated by redirecting or otherwise impounding the stormwater runoff from Route 114 that empties into Georgica Cove, which would require a coordinated effort with the Village of East Hampton (see *Drainage Mitigation, Georgica Cove* in **Projects**).

- A number of the flooding and erosion related problems in Reach 11 originate in or are affected by conditions in the Village of East Hampton, for instance the Federal groins and the drainage inputs into Georgica Pond. The Town and other agencies should encourage East Hampton Village to undertake its own LWRP to complement Town efforts.

- Similarly, since some of the drainage and flooding problems affecting Wainscott Pond originate in Southampton Town, mitigation efforts should be undertaken in conjunction with Southampton Town and NYS DOT for the watershed (see *Cooperative Run-off Mitigation, Wainscott Pond* in **Projects**).

12. Reach 12 -- Gardiner's Island

(a) Vulnerable areas

Flooding Entire shoreline of the island, the coastal ponds and marina/boat basin.
Erosion Entire shoreline, especially high bluffs along the eastern coastline.

(b) Issues

- Gardiner's Island is a unique laboratory of coastal processes, delicate coastal habitats and natural coastal land forms, all of which would be adversely impacted by development. What planning measures can the Town take to help preserve the natural state of the island, given present private ownership? What procedures should be put in place to maintain natural coastal processes if development occurs in the future?

(c) Recommendations

- Gardiner's Island contains more information about the land and heritage of East Hampton than any other single property in East Hampton. It retains features rated the highest quality in New York State, is unique in the country and is truly a rare place in the world, a place of national geographic prominence.

- The combined designations of Significant Fish and Wildlife Habitat, Natural Protective Feature Areas and Coastal Erosion Hazard Areas by the State; and Coastal Barrier Resource Areas and Velocity and Flood Hazard Zones by the Federal government are indicative of the extreme environmental sensitivity and highly dynamic coastal conditions prevailing on Gardiner's Island. Severe constraints to development exist all along the fifteen miles of shore and around the ponds because of flooding and erosion. None of the V7, A8, B or C flood zones within the CBRA zones along the shore and surrounding Great Pond, Tobaccolot Pond, Bostwick Creek, Home Pond, Little Pond and Cherry Hill Pond would be eligible for Federal Flood Insurance.

- The dynamic character and high energy environment of the shore, particularly of the north and east coasts, dictate maintaining the natural shore without human interference. Erosion control devices in this environment would likely be ineffective or disruptive to shoreline equilibrium, barrier beaches and habitat, and should not be permitted. The entire shoreline is designated Condition 1 on Flooding and Erosion Protection Map V-2.

- While the Town can undertake limited measures through its planning and zoning powers, the extraordinary catalog of natural and historic features and habitats that characterize Gardiner's Island underscore the need to develop long-range plans for its preservation in a cooperative effort with the Gardiner heirs and relevant government agencies or private non-profit groups.

F. FLOODING AND EROSION CONTROL POLICIES # 11-17

POLICY 11 BUILDINGS AND OTHER STRUCTURES WILL BE SITED IN THE COASTAL AREA SO AS TO MINIMIZE DAMAGE TO PROPERTY AND THE ENDANGERING OF HUMAN LIVES CAUSED BY FLOODING AND EROSION.

Explanation of Policy:
Wherever possible, buildings and other structures in the coastal zone should be sited away from flooding and erosion hazard areas. Siting should also minimize flooding and erosion to neighboring property and natural protective features (see Policy 12) caused by the presence of the building(s) or structure(s). When it is not possible to site buildings or structures out of hazard areas or natural protective features, or when previously sited existing buildings or structures require modification, special attention must be given to hazard prevention and mitigation as required by the laws of the Town, State and Federal governments.

The NYS Coastal Erosion Task Force report states this policy succinctly: "... Development should not occur in locations with high risk of flooding or erosion damage, i.e., V-zones and Coastal Erosion Hazard Areas. Local governments and individuals have acknowledged that the first step in management of flooding and erosion hazards is prevention of new development in coastal hazard areas. Where appropriate, municipalities should improve their zoning regulations to provide for new development on larger lots with greater setbacks in such areas. However, increased area requirements will not resolve the problems of existing small lots or existing residences with limited setback. Acquisition of such properties may be the only viable alternative." To this end, adequate funding should be provided for the voluntary buy-outs and relocation and demolition provisions of the National Flood Insurance Program ... and similar programs." (NYS Coastal Erosion Task Force, 1994, Vol. II, p. 94) A local *Hazard Mitigation Program* should be designed to implement these provisions (see **Projects**).

This policy applies to structures within the Town's coastal zone, especially within Flood Hazard (A-Zone) and Coastal High Hazard (V-Zone) Areas of the Town, as designated by the National Flood Insurance Program on the Federal Insurance Rate Maps (FIRM's) for the Town, administered by the Federal Emergency Management Agency, and enabled locally through the Town Zoning Code **§ 153-3-40 to 45, Flood Hazard Overlay District**.

It also applies to the hazard zones designated by the **Coastal Erosion Hazard Act (CEHA)**, presently administered in the Town by the NYS DEC, under **NYS Environmental Conservation Law, § 3-0301 & 34-0108**. The Town may in the future adopt enabling legislation to administer CEHA locally as recommended in the Inventory and Analysis.

Residents and prospective residents of the Town should be educated and informed of the risks of flooding and erosion. Disclosure of Flood Hazard Overlay District, Coastal Erosion Hazard Areas, and Coastal Barrier Resource Act designations with their accompanying restrictions should be

required in all real estate transactions in affected areas of the Town. Flood hazards as designated by the FIRM's and purchase of flood insurance under the NFIP are now required by mortgage lenders under the requirements of NFIP changes (Public Law 103-325) enacted in 1994. However, Town government lacks authority to enact broader disclosure requirements of State and locally designated hazards. The Town recommends such flooding and erosion hazard disclosure legislation be enacted by New York State.

The SLOSH (Sea Lake and Overland Surge from Hurricanes) model formulated by the ACOE has also been used to inventory areas of the Town prone to storm and hurricane flooding. In the future the Town expects to monitor erosion locally in the coastal zone (see **Projects**) and, where necessary, to designate local erosion hazard areas where additional conservation and flood-prevention measures may apply.

Flood Hazard (A-Zone) areas, Coastal High Hazard (V-Zone) areas, Coastal Erosion Hazard Areas, and SLOSH areas are noted for each reach under Flooding and Erosion Hazard Zones in the Inventory and Analysis. Flood Hazard areas are located throughout the Town's shoreline on the Atlantic Ocean and Peconic Estuary, including Gardiner's Bay, Block Island Sound and the Town's inner embayments, tidal creeks, harbors and coastal ponds. The A-zone is located within the 100-year floodplain, extending from the boundary of the V-zone to the limit of the 100-year flood hazard area. Coastal High Hazard Areas (V-zones) are located along much of the extent of the Town's outer shoreline. The V-zones extend from seaward of the shoreline landward to the A-zone. V-zones have special flood hazards associated with high-velocity waters from tidal surges accompanied by wind-driven waves.

Flood Hazard Overlay District
The East Hampton Town Code codifies the rules and regulations governing construction activities in NFIP Flood Hazard Zones in the **Flood Hazard Overlay District,** under **Chapter 153, § 153-4-40 through -47**, as amended in 1998 to conform to changes in the National Flood Insurance Program regulations. The Town law includes standards for construction, elevation, and placement of structures and utilities, and prohibits alteration of natural features within hazard zones (see also **§153-4-20, Natural Resources Special Permit**).

Other Local Laws
Other sections of the Town Code in addition to **§ 153-3-40 to 45, Flood Hazard Overlay District,** which govern siting of buildings and other structures in the coastal area are summarized as follows (for direct citations please consult the current edition of the East Hampton Town Code):

Chapter 43 -- Beaches and Parks
§ 43-4 Prohibited Conduct
Prohibits placing fill or any other material, or any structure including erosion control devices on the beach without authorization and proper permits from the Town Board or Town Trustees.

Chapter 131 -- Subdivision Law
§ 131-1.04 (also **§ 153-1-20 of Zoning**), in the definitions for Lot Area, removes from lot area computation "that portion of any lot which is underwater land or ... which is seaward of the bluff line or primary dune crest or which is beach, wetland or watercourse."

Chapter 153 -- Zoning
Section 153, Article IV, Protection of Natural Resources, in **§ 153-4-15** designates, "Wetlands, Watercourses, Tidal waters, Beaches, Beach grass, Dunes and Bluffs" as protected natural resources.

§ 153-4-20
Regulates and requires a Natural Resource Special Permit for any activities within specified distances from these features including those involving wetlands, beach grass, dunes or bluffs. Some of the activities specified that require permits include filling, construction, alteration of any kind, or siting of septic systems on or within 150 feet of any wetland, surface water body, or beach (septic systems require 200 feet distance). Additionally, beach grass may not be damaged or removed, nor any sand dune removed, cleared, graded, or otherwise altered without a Natural Resources Special Permit.

§ 153-4-25, Emergency and minor maintenance exceptions
No Natural Resources Special Permit is required for in place and in kind replacement of existing coastal erosion structures, docks or pilings which have been damaged or destroyed, provided that a building permit is first obtained, and materials are approved by the Natural Resources Department. Also allows minor maintenance work not exceeding 25% of a structure by area or extent. A 1992 amendment permits in place and in kind restoration of bluffs, dunes, beaches or other natural erosion protection features which have been damaged or destroyed.

§ 153-4-30 through 39, Setbacks
Provides for minimum setbacks from the bluff (dune crest) line (100' along the ocean, except 150' east of Montauk hamlet, 50' on bay on lots of 40,000 sq. ft. or less, 100' on lots of 40,000 sq. ft. or more, 150' on lots of 84,000 sq. ft. or greater); also wetland setbacks for structures, wastewater systems and landscaping.

§ 153-4-39
Contains an exception to the setbacks for coastal structures for which a natural resources special permit has been issued and for which all other necessary federal, state, county and local approvals have been obtained.

§ 153-5-50 of the Zoning Code sets standards for Natural Resources Special Permits for coastal structures. It requires that they not interfere with tidal flow, with marine life or habitat, or destroy other than minimal areas of existing wetland vegetation or beach grass. Structures are only eligible for a permit if refusal to permit the structure would make likely a rapid or sudden loss of the property to erosion, and there is an explicit determination that similar results are impossible using nonstructural controls. There is an exception for water-dependent facilities in Waterfront (WF) Districts or that are part of a lawful marina or recreational marina, which are held to lesser standards.

Coastal structures on Town Trustee owned beaches or bottomlands also require Town Trustee permits.

Federal Coastal Barrier Resource Act (CBRA) Zones

The Flood Insurance Rate Maps (FIRM's) for the Town also identify undeveloped coastal barriers designated under the federal Coastal Barrier Resources Act as areas where federal financial assistance is prohibited for new development. CBRA zones are present in Reach 1 including Cedar Point, Northwest Harbor and Northwest Creek; in Reach 2 at Three Mile Harbor including Sammy's Beach and Maidstone Park, and at the mouth of Hog Creek; in Reach 3 at Accabonac Harbor including parts of Gerard Park and Louse Point; in Reaches 4 and 10 extending from the mouth of Napeague Harbor to the ocean; in Reach 6, Big Reed Pond; in Reach 8, Oyster Pond and the north side of Montauk Point; Reach 10, in Amagansett through the Double Dunes from near Atlantic Avenue to west of Indian Wells Highway; in Reach 11 Georgica and Wainscott Ponds extending to the ocean; and Reach 12, the spits and coastal ponds of Gardiner's Island.

NYS Coastal Erosion Hazard Areas

Coastal Erosion Hazard Areas, as identified on the NYS Coastal Erosion Hazard Maps for the Town of East Hampton, are seaward of the Erosion Hazard Line and are described for each reach in the Inventory and Analysis. At present, siting of structures within Coastal Erosion Hazard Areas is governed by the Coastal Erosion Management Regulations (6 NYCRR Part 505, as amended March, 1988) administered by the NYS DEC, and requires a permit issued by NYS DEC. Incorporating Coastal Erosion Hazard Act provisions into Town Code and local administration of the regulations is recommended but has not yet occurred. Until such time as a local Coastal Erosion Hazards ordinance is adopted, the Town urges vigorous enforcement of the regulations by NYS DEC. The **Coastal Erosion Management Regulations** promulgated by NYS DEC are excerpted in **Appendix E.**

CEHA regulates activities in secondary dune systems; however, secondary dune systems such as the extensive double dune system in Reach 10, have not been delineated on the CEHA photo maps and NYS DEC has generally not required CEHA permits for activities in secondary dunes. The Town recommends these dune systems be included in future updates of CEHA mapping, and that activities in these areas be actively regulated under the requirements of the law.

Where proposed structures do not meet existing standards under National Flood Insurance Program regulations, NYS Coastal Erosion Hazard Act regulations or Town Code, property owners must obtain variances from the NYS DEC and/or the Town Zoning Board of Appeals. It is the policy of the Town to grant relief only in situations of exceptional hardship, where no reasonable alternative exists, and where siting of the structure will not cause damage to natural protective features such as dunes or beach vegetation, or cause erosion to neighboring property or public resources such as beaches. To date no variances from FEMA regulations have been applied for or granted (see also **Policies 12, 13, 13A, 14, 14A, 16, 17 and 17A**).

POLICY 12 ACTIVITIES OR DEVELOPMENT IN THE COASTAL AREA WILL BE UNDERTAKEN SO AS TO MINIMIZE DAMAGE TO NATURAL RESOURCES AND PROPERTY FROM FLOODING AND EROSION BY PROTECTING NATURAL PROTECTIVE FEATURES INCLUDING BEACHES, DUNES, BARRIER LAND FORMS AND BLUFFS. PRIMARY DUNES WILL BE PROTECTED FROM ALL ENCROACHMENTS THAT COULD IMPAIR THEIR NATURAL PROTECTIVE CAPACITY.

Explanation of Policy

In the Town of East Hampton, beaches, dunes, barrier land forms, bluffs, nearshore areas and underwater lands and wetlands help safeguard coastal lands and property from flooding and erosion damage, as well as reduce the danger to human life. Excavation of coastal features, improperly designed structures, inadequate site planning, or other similar actions which fail to recognize their fragile nature and high protective values, or lead to the weakening or destruction of these resources, must be avoided. Any development or other activity in proximity to natural protective features must be limited and steps taken to ensure that adverse effects are minimized.

It is the Town's intent in these policies and in the Town Code to preserve and protect these natural protective features, and where they have been damaged or destroyed by development or other activities to require wherever possible restoration of the resource and prevention of further degradation. See also **Public Access and Recreation Policies #9 & 19-22; Historic Resource and Visual Quality Policies #23-25; and Policy #44 (Tidal and Freshwater Wetlands) of the Water and Air Resources Policies**, particularly standards 2) and 3) of **Policy #44**, which state in part that, "No structure shall be permitted which would unduly interfere with tidal flow, with marine life or habitat or which would destroy other than minimally practicable areas of existing wetland vegetation or beach grass."

An exception to the policy of prohibiting excavation of coastal features is the Town Trustees' traditional opening of the gut to Georgica Pond in Reach 11. As long as the gut remains open only briefly it probably exerts little effect on the Wainscott beach, and does not damage the coastal resource. In general, the Town considers the opening of the gut an appropriate activity and a positive measure to enhance fishery productivity and flushing in the pond.

The natural protective features in each reach are identified and discussed in the Inventory and Analysis. Many features such as beaches are nearly ubiquitous throughout the Town's extensive coastal perimeter.

Federal Coastal Barrier Resources Act (CBRA) Zones

Natural protective features in certain designated areas of the Town are protected under the Federal Coastal Barrier Resources Act and are precluded from receiving federal financial assistance, including (effective 10/1/83) insurance under the National Flood Insurance Program. CBRA zones are designated in Reach 1 to include Cedar Point, Northwest Harbor and Northwest Creek; in Reach 2 at Three Mile Harbor including Sammy's Beach and Maidstone Park, and at the mouth of Hog Creek; in Reach 3 at Accabonac Harbor including parts of Gerard Park and Louse Point; in Reaches

4 and 10 extending from the mouth of Napeague Harbor to the ocean; in Reach 6, Big Reed Pond; in Reach 8, Oyster Pond and the north side of Montauk Point; Reach 10, in Amagansett through the Double Dunes from near Atlantic Avenue to west of Indian Wells Highway; in Reach 11 Georgica and Wainscott Ponds extending to the ocean; and Reach 12, the spits and coastal ponds of Gardiner's Island.

NYS Coastal Erosion Hazard Areas
The New York State Coastal Erosion Hazards Act (CEHA) also provides mechanisms to preserve natural protective features including nearshore areas, beaches, bluffs, primary dunes and secondary dunes within designated CEHA zones in the Town. These areas extend throughout most of the immediate coastline, are discussed and described in the Inventory and Analysis, and are delineated on aerial Photo Maps provided by the NYS DEC. CEHA regulation and permitting is presently administered in East Hampton Town by NYS DEC. NYS Coastal Erosion Management Regulations are excerpted in **Appendix E**.

Local Laws
The East Hampton Town Code additionally contains a number of provisions to protect natural features and to regulate activity near them. These sections are summarized as follows (for direct citations consult current edition of the East Hampton Town Code):

Chapter 43 -- Beaches and Parks
This section of the Code contains specific protections for beaches, dunes and vegetation, including the following:

§ 43-4 Prohibited Conduct
Prohibits placing fill or any other material, or any structure including erosion control devices on the beach without authorization and proper permits from the Town Board or Town Trustees.

§ 43-5 Vehicles on the beach.
Regulates beach vehicles, including requiring vehicles to stay at least fifty feet seaward of the beach grass line, if possible, and prohibits driving over dunes, bluffs, and vegetation.

§ 43-12 Temporary Closure
Allows the Trustees or Town Board to temporarily close or restrict any beach at any time if deemed appropriate and necessary. Either Board shall advise the other of its decision to order any closure.

Note that a cooperative arrangement between the Town Board and Town Trustees creates joint management responsibility for beach management. Coastal structures on Town Trustee owned beaches or bottomlands are regulated by and require Town Trustee permits as well as permits required under provisions of the Town Code.

Chapter 131 -- Subdivision Law
§ 131-1.04 (also **§ 153-1-20 of Zoning**), in the definitions for Lot Area, removes from lot area computation "that portion of any lot which is underwater land or ... which is seaward of the bluff line or primary dune crest or which is beach, wetland or watercourse."

§ 131-1.05, Subdivision Law General Policies,
Provides for protection of coastal features and all wetlands areas. Natural coastal features and systems, wetlands and habitats shall be identified and shall be protected by preservation in their natural state by conservation or by such other means as the Planning Board shall deem necessary.

In Flood Hazard areas states that protective measures shall be taken in flood hazard areas so as to minimize possible flood, storm and tide damage and pollution under the Special Tidal Flood Hazard Overlay District zones and definitions found in Chapter 153.

Chapter 153 -- Zoning
Section 153, Article IV, Protection of Natural Resources, in **§ 153-4-15** designates, "Wetlands, Watercourses, Tidal waters, Beaches, Beach grass, Dunes and Bluffs" as protected natural resources.

§ 153-4-20
Regulates and requires a Natural Resource Special Permit for any activities within specified distances from these features including those involving wetlands, beach grass, dunes or bluffs. Some of the activities specified that require permits include filling, construction, alteration of any kind, or siting of septic systems on or within 150 feet of any wetland, surface water body, or beach (septic systems require 200 feet distance). Additionally, beach grass may not be damaged or removed, nor any sand dune removed, cleared, graded, or otherwise altered without a Natural Resources Special Permit.

§ 153-4-20 (E)
Prohibits clearing, grading, construction or renovation of structures within 100' of the bluff line without a Natural Resources Special Permit.

§ 153-4-25, Emergency and minor maintenance exceptions
No Natural Resources Special Permit is required for in place and in kind replacement of existing coastal erosion structures, docks or pilings which have been damaged or destroyed, provided that a building permit is first obtained, and materials are approved by the Natural Resources Department. Also allows minor maintenance work not exceeding 25% of a structure by area or extent. A 1992 amendment permits in place and in kind restoration of bluffs, dunes, beaches or other natural erosion protection features which have been damaged or destroyed.

§ 153-4-30 through **39**
Provides for minimum setbacks from the bluff (dune crest) line (100' along the ocean, except 150' east of Montauk hamlet, 50' on bay on lots of 40,000 sq. ft. or less, 100' on lots of 40,000 sq. ft. or more, 150' on lots of 84,000 sq. ft. or greater); also wetland setbacks for structures, wastewater systems and landscaping. **§ 153-4-39** contains an exception to the setbacks for coastal structures for

which a natural resources special permit has been issued and for which all other necessary federal, state, county and local approvals have been obtained.

§ 153-3-40 to 45, Flood Hazard Overlay District
This section of Town code, excerpted in **Policy #11** above, conforms to the National Flood Insurance Program regulations, which include standards for construction and elevation of structures and placement of utilities, and also prohibit alteration or grading of sand dunes. The sand dunes provision states: "There shall be no alteration of any sand dune in any special flood hazard area which cuts down the height of the dune at any point, undermines the dune or which would increase the potential for flood damage. A natural resource special permit, pursuant to **§153-4-20B and C** ... shall be obtained when required."

§ 153-5-50 of the Zoning Code sets standards for Natural Resources Special Permits for coastal structures. It requires that they not interfere with tidal flow, with marine life or habitat, or destroy other than minimal areas of existing wetland vegetation or beach grass. Structures are only eligible for a permit if refusal to permit the structure would make likely a rapid or sudden loss of the property to erosion, and there is an explicit determination that similar results are impossible using nonstructural controls. There is an exception for water-dependent facilities in Waterfront (WF) Districts or that are part of a lawful marina or recreational marina, which are held to lesser standards.

§ 153-4-85 references Town Trustee prerogatives over lands and waters under their ownership. Nothing in this LWRP or the Town Code should be construed to abrogate, dilute, limit or abridge any rights the Town Trustees may possess, now or in the future, to regulate and manage properties within their control.

POLICY 13 THE CONSTRUCTION OR RECONSTRUCTION OF EROSION PROTECTION STRUCTURES SHALL BE UNDERTAKEN ONLY IF THEY HAVE A REASONABLE PROBABILITY OF CONTROLLING EROSION FOR AT LEAST THIRTY YEARS AS DEMONSTRATED IN DESIGN AND CONSTRUCTION STANDARDS AND/OR ASSURED MAINTENANCE OR REPLACEMENT PROGRAMS.

POLICY 13A EROSION PROTECTION STRUCTURES MUST BE MAINTAINED BOTH WITH REGARD TO THE STRUCTURE AND TO ADJOINING NATURAL PROTECTIVE FEATURES. REQUIRED MAINTENANCE MAY INCLUDE BEACH NOURISHMENT AND MITIGATION OF EROSION TO NEARBY PROPERTY AND RESOURCES CAUSED BY CONSTRUCTION OR RECONSTRUCTION OF THE EROSION PROTECTION STRUCTURE.

Explanation of Policy:
These policies are designed to reinforce the Town's view that structural erosion protection solutions often have unpredictable impacts on adjoining or neighboring property or coastal resources, may disrupt coastal processes, and that mitigation of potential impacts must be incorporated into the construction and maintenance requirements for the thirty-year design lifetime of the structure specified by New York State. While effects on coastal processes and natural protective features can be subtle, far reaching and difficult to quantify, maintenance of fronting beaches and other natural protective features within defined parameters in the immediate vicinity of the structure itself will go a long way toward minimizing these impacts downstream or on neighboring property.

These provisions are required for permitting of new structures and modifications of existing erosion protection structures, and may at minimum include specifications for coverage of the structure and fronting beach profile, sediment size and composition, vegetative plantings, permitted sand sources, and a performance guarantee that maintenance will be carried out within a reasonable and regular interval while itself minimizing impacts to natural resources. See also **Policies #12 and #17-17A** for additional guidance on maintenance of natural protective features and non-structural solutions.

These policies apply to all areas of the Town's coastal zone where erosion control structures are present or may be permitted, including NYS designated CEHA zones and Flood Hazard Areas designated on the Flood Insurance Rate Maps (FIRM's) within the Town's Flood Hazard Overlay District. CEHA zones and Flood Hazard Areas are described for each reach in the Inventory and Analysis, and are located throughout the extent of the Town's coastline. NYS Coastal Erosion Management Regulations governing erosion protection structures in Coastal Erosion Hazard Areas are presently administered in the Town by the NYS DEC. The regulations are excerpted in **Appendix E**.

Erosion protection structures are also regulated by the East Hampton Town Code. The Town Code (**§153-1-20, Definitions**) defines *COASTAL EROSION CONTROL STRUCTURE* as *"Every structure sited in or under any body of water, on on or near any shoreline, wetland, beach or bluff adjacent thereto, designed to limit, slow or prevent rain, wind, waves, or water currents from causing natural recession or advance of the shoreline, damage to, or loss of, one or more natural or man-made shoreline area features or silting or filling in of a natural or dredged harbor or channel. Boulders, bulkheads, gabions, jetties, revetments, riprap, seawalls, sta-pods and every other 'coastal erosion control structure' shall be included in this definition. Any such fabrication shall also constitute a coastal structure as defined herein."*

In developing policy for erosion protection structures, the Town has attempted to look at sections of the coastline with similar overall conditions, examine the consequences of past development activity, and consider appropriate future responses given the present state of affairs. Along most of the Town's coast natural protective features provide the simplest, most effective and lowest cost flooding and erosion protection, with the least damage to the public resources of the shore. Wherever possible, therefore, the Town's policy is to maintain or enhance the system of natural protective features, and where practical to restore coastal systems to a natural state.

Where natural protective features are lacking, whether from natural or human activities, or where previous installation of erosion protection structures has already disrupted sections of coastline, the Town has attempted to address specific conditions in the area. Pre-existing (or unpermitted) erosion protection structures may in some cases be old, deteriorated, buried or invisible and their specific effects may no longer be readily apparent. Policies are therefore designed to address overall conditions for an area as they presently exist, and specific determinations are left to Town permitting and review procedures.

Erosion protection structures are designed to protect property or upland structures at specific locations. However, the coastal processes, storm events and rising sea level that precipitate flooding and erosion are regional or global rather than localized in nature. Erosionary forces are exerted over extended areas of coastline. Erosion protection structures by design interrupt these larger systems, and as a consequence also frequently affect downdrift or adjacent property and resources. Increased erosion, esthetic impairments, loss of important public recreational resources such as beaches, loss of habitats, and water quality degradation can result from hardening the shoreline. The cumulative impact of these structures is potentially large, and must be addressed in both policy and permitting procedures, as well as the impacts of individual structures.

Erosion and receding shorelines are chronic problems in East Hampton Town. While information on erosion rates along most shorelines in the Town remains anecdotal, the Town is making efforts to gain more quantitative information on these phenomena (see *Erosion Monitoring* and *Ditch Plains Erosion and Remediation Study* in **Projects**). As shorelines recede and more data accumulates the Town should periodically reevaluate erosion rates and flood conditions, and use the information to help determine permitting criteria and setback requirements in the coastal zone.

There is evidence that sea level is currently rising, and some theories predict that changes in global climate may accelerate the rate of future sea level rise and increase the frequency and severity of tropical storm (hurricane) activity (see Introduction). Accelerated sea level rise and more storm activity may increase shoreline recession and erosion, and frequency or extent of coastal flooding, and with them the risk of damage to coastal property. These risks should be factored into permitting and siting of erosion protection structures.

Structures may become ineffective and interfere with coastal processes in vulnerable areas of the Town's coast, particularly those that are low-lying, have rapidly receding bluffs, or highly dynamic shorelines where sediment may shift rapidly, as on the Atlantic Ocean beaches. Structures that interfere with coastal processes on dynamic shorelines have a greater risk of causing downdrift damage and of exacerbating erosion of public beaches because of higher wave energies. Structures such as rock revetments constructed of heavy materials are impractical to relocate or remove if isolated or submerged and may become navigational hazards if the shoreline recedes rapidly. These structures may also exacerbate flooding when overtopped in hurricanes or storm events by retaining floodwaters behind them and extending property damage when floodwaters recede.

Construction of erosion protection structures is expensive and often only partially effective over time, as well as posing a risk to nearby properties or natural resources. Historically in the Town of

East Hampton, attempts to preserve eroding shorelines with erosion control structures have resulted in damage to beaches and neighboring property. Along several sections of the Town's coastline extensive shore-hardening erosion control devices have resulted in loss of fronting or neighboring beaches, leaving properties with little or no natural protection. This is evident in the area east of Flaggy Hole Road (Reach 2), from Hog Creek to Gerard Drive (Reach 2-3), at Accabonac Cliff north of Barnes Landing (Reach 3), along Cross Highway north of Abraham's Landing Road (Reach 3), and at Sound View Drive in Montauk (Reach 6).

The *NYS Coastal Erosion Task Force Report* describes the shoreline dynamic: "The long-term trend of beaches along the marine coast of New York is to migrate landward. .... As beaches move landward and upward, they do so at the expense of bluffs and the upland area behind them. Littoral transport moves material from beaches in front of bluffs to adjacent barrier land forms, narrowed beaches then allow for further bluff erosion. Over the long-term, a dynamic equilibrium is reached where the amount of bluff erosion equals the amount of sediment necessary to maintain a beach of sufficient width to prevent further bluff erosion. Unlike beaches or dunes, bluffs cannot recover from sediment loss."

"Beaches will maintain themselves so long as there is a supply of sediment from bluffs. Efforts to stabilize the toe and face of the bluff will block natural resupply of sediment to beaches. ...if bulkheads are widely used, beaches are likely to erode rather than migrate." (NYS DOS, 1993, Vol. II, pp. 27-28)

Structures designed for erosion protection often perversely contribute to erosion problems both on and off the site due to poor design and siting and lack of downdrift remediation. These structures may reflect wave energy back onto the beach or interfere with the natural supply of sand to the beach from the littoral system or from the area behind the structure causing sand to be scoured away. Under these circumstances a beach often can only be maintained by adding sand through regular beach nourishment, which results in ever increasing costs to both the private and public sector.

There is great variety in the types of erosion protection structures present in the Town's coastal zone, ranging from homemade driftwood bulkheads to the massive rock revetment protecting Montauk Lighthouse. From observation and experience in the Town it is clear that shore-parallel structures such as bulkheads and revetments cause less disruption of littoral processes. At the same time, it is also clear that perpendicular structures such as groins and jetties cause substantially greater alteration of sediment flow and littoral patterns.

Where previous development has placed property at risk and hard erosion protection structures have greatly diminished or eliminated natural protection from beaches or bluffs, there is little choice but to acknowledge the past mistakes, try to learn from them by not compounding future problems, and deal with existing conditions in the best way possible. Therefore in areas with extensive existing armoring and where natural protection is lacking, the Town's policy is to permit maintenance and in-place in-kind replacement or reconstruction of shore-parallel structures. However, the Town will not permit new perpendicular structures, but phase out existing ones, and not permit their

maintenance or reconstruction, except in cases of dominant public interest, such as stabilization of inlets.

In some areas existing structures may not be functioning as designed, or may be disrupting coastal processes and damaging public resources, and therefore should be carefully evaluated when their reconstruction or replacement becomes necessary. In such areas structures should not receive emergency permits for replacement, but should be required to meet the full standards for a permit.

The inherent risks posed by shore-hardening erosion protection structures, experienced in East Hampton as disruption of littoral processes, loss of beaches and public resources, and damage to neighboring property, compel the Town to classify them as a solution of last resort. Because of these risks new structures are discouraged and Town policy is to permit them only after strenuous attempts to explore other alternatives, and then only when downdrift scouring and other adverse impacts can be mitigated, and where such mitigation can be continued for the life of the structure. Before a permit is granted to allow construction of erosion control structures, the need, purpose, function, impact, and alternatives to the project need to be carefully evaluated.

Proposed erosion protection structures must therefore include provisions for maintenance and to provide mitigation of any increased erosion to neighboring property or public resources such as beaches, for the same thirty year period of the design life or the actual life of the structure.

Policies #17/17A detail the Town's policy of giving preference to non-structural erosion protection solutions such as beach nourishment, dune building and beach grass planting, and not permitting new erosion protection structures in most of the high energy wave-dominated south shore Atlantic Ocean reaches. Other areas of the Town that are inappropriate for hard structures have been noted in the Inventory and Analysis and in **Policies #14/14A**. These include areas that predominantly do not contain existing shore-parallel hard structures, dynamic shorelines where structures would put public resources at risk, or sheltered inner harbors where erosionary forces are reduced and structures may damage or eliminate fragile beaches or wetland fringes. To help visualize overall conditions for the coastline, the areas where structural erosion control measures are not recommended, as well as recommendations for areas with existing structures have been outlined on Flooding and Erosion Protection Map V-2. In some cases, the non-structural areas may also include isolated structures which were either too insignificant to map, or whose replacement is not recommended. Each reach, however, has been examined with considerable care. Please refer to the Inventory and Analysis for discussions of specific conditions in each reach.

To organize policy for erosion protection structures each area of the Town's coastline has been designated with one of three categories reflecting coastal conditions and resultant policy recommendations. The recommendations are intended to apply to current conditions and for storm events within 30-year storm parameters. If a catastrophic storm event of this magnitude or greater occurs, then these recommendations should be reevaluated in light of a Town *Hurricane Damage Mitigation Plan* for redevelopment following a catastrophic storm (see **Projects**). These categories have been depicted on Flooding and Erosion Protection Map V-2, and as discussed in the Introduction, are described as follows:

Condition 1: Area predominantly contains no shore-parallel hard structures.

Recommendation 1: Do not allow new hard structures. Existing shore parallel structures are to be replaced only under conditions of exceptional hardship. Do not replace groins and other perpendicular structures, except where used to protect navigational channels.

Condition 2: Area with existing hard structures which are isolated or discontinuous and where natural protective features could furnish erosion protection, or the structure is interfering with access to public beaches, or unduly interrupting coastal processes.

Recommendation 2: Do not issue permits automatically for rebuilding or emergency replacement of structures. Analyze erosion protection function of structure versus natural or non-structural protection. Some shore-parallel structures should not be replaced. Do not replace groins and other perpendicular structures, except where used to protect navigational channels.

Condition 3: Area with existing hard structures and minimal natural protection where structures provide the only remaining protection against flooding or erosion, provide public access, or preserve a public water dependent use.

Recommendation 3: Structures may be rebuilt in-place in-kind under an emergency permit, or modified with full NRSP permit review, in order to mitigate adverse effects on neighboring property or resources. Do not permit expansion of structures into larger or more permanent types, e.g. from bulkheads to rock revetments; however, soft or non-structural solutions may be used to enhance protection or restore resources. Do not replace or permit groins and other perpendicular (shore-normal) structures, except where used to protect navigational channels.

In areas of the Town (#2 or #3 above) where hard structures are preexisting, and in those instances where non-structural erosion protection solutions are not possible or in cases of exceptional hardship, through variance provisions, properly designed and constructed shore-parallel erosion protection structures may be permitted in some cases when likely to minimize or prevent damage or destruction to public or private property. Perpendicular structures will not be permitted, except in cases of overriding public interest such as inlet stabilization.

Where permitted the construction, modification, or reconstruction of shore-parallel erosion protection structures is subject to the following requirements:

(1) All erosion protection structures must be designed and constructed according to generally accepted engineering principles and where there will be a strong likelihood of success in controlling long-term erosion. The protective measures must have a reasonable probability of controlling erosion on the immediate site for at least 30 years. Erosion protection structures shall not unreasonably interfere with public access to or use of public resources such as beaches.

(2) All materials used in such structures must be non-toxic, durable and capable of withstanding inundation, wave impacts, icing, weathering, and other effects of meteorological and hydrographic conditions for a minimum of 30 years. Individual component materials may have a working life of less than 30 years only when a maintenance program ensures that they will be regularly maintained and replaced as necessary to attain the required 30 years or erosion protection.

(3) A long-term maintenance program must be provided for the construction, modification, or restoration of an erosion protection structure for its 30-year design life. The maintenance program must include specifications for the normal maintenance of degradable materials, replacement of sand and vegetation covering and surrounding the structure, etc. and guarantee such maintenance by financial or other surety agreed to by the Town.

(4) In permitting any erosion protection structure provision must be made for mitigation, including beach nourishment, of any erosion, increased bluff recession or damage to fronting beaches or other natural protective features, and other resources including affected neighboring sites. The owner of the structure is responsible for the mitigation program which must continue for the 30-year design life of the structure, with a guarantee backed by financial or other surety agreed to by the Town.

(5) Provision must be made for the removal of the structure at the end of its 30-year design life if the shoreline has receded around the structure leaving it surrounded by open water, or if the structure has failed to halt erosion, or interferes unreasonably with access to or use of public resources such as beaches. Cost of removal is to be borne by the owner of the structure, and guaranteed by financial or other surety agreed to by the Town.

Provisions of the East Hampton Town Code governing the construction of erosion protection structures are summarized as follows (refer to East Hampton Town Code for precise language):

Chapter 43 -- Beaches and Parks
This section of the Code contains specific protections for beaches, dunes and vegetation, including the following:

§ 43-4 Prohibited Conduct
Prohibits placing fill or any other material, or any structure including erosion control devices on the beach without authorization and proper permits from the Town Board or Town Trustees.

Chapter 153 -- Zoning

Section 153, Article IV, Protection of Natural Resources, in **§ 153-4-15** designates, "Wetlands, Watercourses, Tidal waters, Beaches, Beach grass, Dunes and Bluffs" as protected natural resources.

§ 153-4-20
Regulates and requires a Natural Resource Special Permit for any activities within specified distances from these features including those involving wetlands, beach grass, dunes or bluffs. Some of the activities specified that require permits include filling, construction, alteration of any kind, or siting of septic systems on or within 150 feet of any wetland, surface water body, or beach (septic systems require 200 feet distance). Additionally, beach grass may not be damaged or removed, nor any sand dune removed, cleared, graded, or otherwise altered without a Natural Resources Special Permit.

§ 153-4-25, Emergency and minor maintenance exceptions
No Natural Resources Special Permit is required for in place and in kind replacement of existing coastal erosion structures, docks or pilings which have been damaged or destroyed, provided that a building permit is first obtained, and materials are approved by the Natural Resources Department. Also allows minor maintenance work not exceeding 25% of a structure by area or extent. A 1992 amendment permits in place and in kind restoration of bluffs, dunes, beaches or other natural erosion protection features which have been damaged or destroyed.

§ 153-4-39
Contains an exception to the setbacks for coastal structures for which a natural resources special permit has been issued and for which all other necessary federal, state, county and local approvals have been obtained.

§ 153-5-50 of the Zoning Code sets standards for Natural Resources Special Permits for coastal structures. It requires that they not interfere with tidal flow, with marine life or habitat, or destroy other than minimal areas of existing wetland vegetation or beach grass. Structures are only eligible for a permit if refusal to permit the structure would make likely a rapid or sudden loss of the property to erosion, and there is an explicit determination that similar results are impossible using nonstructural controls. There is an exception for water-dependent facilities in Waterfront (WF) Districts or that are part of a lawful marina or recreational marina, which are held to lesser standards.

§ 153-4-85 Town Trustee prerogatives. Coastal structures on Town Trustee owned beaches or bottomlands also require Town Trustee permits.

POLICY 14 ACTIVITIES AND DEVELOPMENT INCLUDING THE CONSTRUCTION OR RECONSTRUCTION OF EROSION PROTECTION STRUCTURES, SHALL BE UNDERTAKEN SO THAT THERE WILL BE NO MEASURABLE INCREASE IN EROSION OR FLOODING AT THE SITE OF SUCH ACTIVITIES OR DEVELOPMENT, OR AT OTHER LOCATIONS.

POLICY 14A MINIMIZE THE CONSTRUCTION OF EROSION PROTECTION STRUCTURES AND NEW DEVELOPMENT IN HAZARDOUS AREAS IN REACHES 1, 4, 5, 7, 8, 9, 10, 11, 12, AND PARTS OF REACHES 2, 3, AND 6.

Explanation of Policy:
Erosion and flooding are processes which occur naturally. However, human activity can increase the severity and adverse effects of those natural processes, causing loss of or damage to property, and endangering human lives. These actions may include placement of erosion protection structures such as groins or impermeable docks which block the littoral transport of sediment to adjacent shore lands, thus increasing their rate of recession; use of bulkheads which reflect wave energy or interfere with upland sediment supply, causing scouring of fronting beaches; or failure to observe proper drainage abatement and landscaping practices, increasing run-off and causing erosion of natural protective features such as bluffs.

Erosion protection structures eventually interfere with coastal processes and sediment transport, particularly under storm conditions, often accelerating erosion or exacerbating the effects of floodwaters. Downdrift effects of erosion protection structures on neighboring property have in several reaches of the Town precipitated a chain reaction of shoreline fortification. One structure is built to compensate for downdrift damage from another, until entire sections of the coastline are armored. The cumulative impact of these structures is demonstrated dramatically in these areas by drastic loss of beaches and shoreline habitat, not to speak of esthetic impairments and the loss of public recreational resources. Examples in the Town include the area along Runnymede Drive in Reach 2, from Hog Creek Point to Gerard Park in Reach 3, from Accabonac Cliff to Barnes Landing in Reach 3, along Cross Highway between Fresh Pond and Devon in Reach 3, and Sound View Drive on Block Island Sound in Montauk, Reach 6.

Aside from their effects on nearby resources and property, hard erosion protection structures are difficult to install and maintain. Access is often restricted or dependent on precarious weather and tidal conditions, or available only over fragile public beaches, bluffs, intertidal zones or shallow inshore flats. The work often cannot be reasonably accomplished without heavy equipment that damages beach, bluff or wetland vegetation and benthic habitat.

The problems associated with installation of erosion protection structures are magnified when considering long-term maintenance of the structure. One-time access over a fragile resource for construction may be granted. However, repeated access for heavy machinery needed for maintenance may cause unacceptable damage. Maintaining fronting or neighboring beaches is

problematic because of these access difficulties, unreliability of sand sources, and vagaries of tidal and storm conditions which may deposit or remove sand with great rapidity and seasonal irregularity.

Without maintenance, experience in East Hampton demonstrates that there is a high likelihood of adverse impacts on coastal resources from shore hardening structures (see **Policy #13/13A**).

Under these conditions it is difficult to create standards for erosion protection device permits that will protect both upland property and coastal resources without increasing potential flooding and erosion on and off-site. It is hard, for instance, to develop municipal permitting procedures and financial security mechanisms that will ensure long-term maintenance of erosion protection structures and beaches and mitigation of downdrift damage for the thirty-year design life of structures specified in **Policy #13**.

For these and other reasons detailed in the Inventory and Analysis and **Policies #11-13,** it is the Town's view that construction or reconstruction of erosion protection structures in some reaches of the Town cannot practicably be undertaken without increasing the risks of erosion and flooding and/or damage to public resources. These areas include Reaches 1, 4, 5, 7, 8, 9, 10, 11, 12 and parts of Reaches 2, 3, and 6. This policy applies particularly to perpendicular structures such as groins or jetties which interfere directly with littoral processes, and are therefore prohibited except when used to protect navigational channels.

Where existing hard structures are isolated or discontinuous, and where natural protective features could furnish erosion protection, or the structure is interfering with access to public beaches, or unduly interrupting coastal processes, permits will not be issued automatically for reconstruction or emergency replacement of the structure, but will be subject to analysis and full permit review, with the exception of those protecting the historic sites at Cedar Point Lighthouse in Reach 1 and the Montauk Lighthouse in Reach 7. Some shore parallel hard structures may not be permitted to be replaced. Groins and other perpendicular structures will not be permitted to be reconstructed or replaced, except where used to protect navigational channels.

Construction of new hard erosion protection structures is prohibited in Reaches 1, 4, 5, 7, 8, 9, 10, 11, 12, and in designated parts of Reaches 2, 3, and 6, except in cases of exceptional hardship, and soft solutions such as beach grass planting, dune building and beach nourishment will be encouraged, as noted in **Policy #17-17A**. No new flooding and erosion protection structures will be permitted on south-facing ocean shore beaches in Reaches 8, 9, 10, or 11 (see **Policy #17A**).

In those areas of Reaches 2, 3, and 6 with existing shore-parallel hard structures and minimal natural protection where structures provide the only remaining protection against against flooding or erosion, provide public access, or preserve a public water dependent use, structures may be reconstructed in-place in-kind under an emergency permit, or modified with full NRSP permit review, in order to mitigate adverse effects on neighboring property or resources. Existing structures may not be expanded into larger or more permanent types, e.g. from bulkheads to rock revetments; however, soft or non-structural solutions may be used to enhance protection or restore resources. Groins and other

perpendicular structures may not be reconstructed or replaced, except where used to protect navigational channels.

The policies and the affected areas have been delineated in Flooding and Erosion Protection Map V-2.

As indicated in these policies, because of the potential for harm to neighboring property or resources, new hard erosion protection structures are prohibited except in cases of exceptional hardship. In no case will new perpendicular structures be permitted, except to stabilize or protect navigational channels. Before a structure is permitted, it will be incumbent on an applicant to demonstrate that a proposed structure:

(1) Will not damage neighboring property or public resources, including the cumulative impact of the proposed structure with other structures in the area;
(2) Will not interfere with littoral processes, including tidal flow, littoral drift, longshore transport and deposition of sand, dune building, and beach vegetation;
(3) Will not interfere with receding floodwaters;
(4) Will not cause loss of an identified habitat for wildlife or important native vegetation, including marine life or marine habitats, either by the structure itself or by the process of its installation;
(5) Will not exacerbate flood damage by generating flood borne flotsam;
(6) Is the only remedy available after examination of alternatives, including relocation of buildings (with relaxation of front/sideyard setbacks);
(7) Will not change the character of the neighborhood, including natural coastline features such as Montauk's hoodoo bluffs, etc.;
(8) Will be covered or planted so as not to deteriorate scenic or esthetic values for the area;
(9) Is the only solution to an exceptional hardship that justifies construction or restoration of an existing structure;
(10) Is of the minimum size, design, and physical extent needed to lessen the erosion rate to a rate comparable to that of similar shorefront properties in the vicinity without, at the same time, increasing the erosion rate or the risk of storm damage to nearby properties or public resources, while still meeting the 30-year construction standard in **Policy #13**.
(11) Will not degrade or cause loss of public access to the public resources of the shore or foreshore, as defined in **Public Access and Recreational Resource Policies #9 & 19-22**.

Construction of erosion protection structures in the Town is also subject to the policy considerations and standards cited in **Policies #11, 12 and 13** above. See also **Policy #44 (Tidal and Freshwater Wetlands)** of the **Water and Air Resources Policies**, standards 2) and 3), which state in part that, "No structure shall be permitted which would unduly interfere with tidal flow, with marine life or habitat or which would destroy other than minimally practicable areas of existing wetland vegetation

or beach grass." Activities and development in the coastal zone, including erosion protection structures, are regulated in the Town Code under the provisions summarized in **Policies #11-13**.

New York State regulates coastal activities causing flooding and erosion and erosion protection structures under the Tidal Wetlands Act and the Coastal Erosion Hazards Act. Regulations and permitting are administered by the NYS DEC. See excerpts of CEHA regulations in **Appendix E**.

POLICY 15 MINING, EXCAVATION OR DREDGING IN COASTAL WATERS SHALL NOT SIGNIFICANTLY INTERFERE WITH THE NATURAL COASTAL PROCESSES WHICH SUPPLY BEACH MATERIALS TO LAND ADJACENT TO SUCH WATERS AND SHALL BE UNDERTAKEN IN A MANNER WHICH WILL NOT CAUSE AN INCREASE IN EROSION OF SUCH LAND.

Explanation of Policy:
Any mining, excavation or dredging in Town coastal waters has the potential to significantly disrupt coastal and littoral processes, including the movement of beach materials, changing the supply of sediment and depriving beaches and shore lands of their natural regenerative powers. Mining, excavation and dredging should therefore be minimized, and where permitted, accomplished without causing a reduction of sediment supply or increasing erosion. Mining, excavation or dredging can also significantly affect surface water quality and inshore fisheries, especially shellfisheries. Please refer to **Dredging and Dredge Spoil Disposal Policy #35**, **Public Access and Recreational Resources Policies #9 & 19-22, and Commercial Fishing Policy #10**.

Mining, excavation or dredging in the Town's coastal waters is primarily for the purpose of channel, inlet or marina maintenance. Channels in the Town's two primary harbors, Lake Montauk and Three Mile Harbor, require periodic maintenance dredging, Lake Montauk to greater depths as a Federal channel, and Three Mile Harbor as a designated small boat harbor. To date most dredging permits have required spoil deposition in sites immediately adjacent to the work site. However, a secondary use of the dredge spoil is for beach nourishment, particularly for clean sandy spoil. Future permits should encourage use of clean dredge spoil from maintenance dredging in the following order of priorities:

(1) to nourish public bathing beaches
(2) to restore habitat, primarily for nesting shorebirds
(3) to nourish other public trust lands and beaches
(4) for erosion control, possibly through future erosion control districts, though none presently exist in the Town.

The Town maintains a working list of priority sites for dredge spoil, which should be consulted during the dredge permitting process on a case by case basis by private owners or contractors, or relevant public agencies such as the Suffolk County Department of Public Works or the ACOE. If

clean dredge spoil is not required or feasible for use on public lands at the time dredging occurs, the spoil may be stockpiled temporarily for future use, or used for private beach nourishment projects.

The Town does not presently permit excavation or dredging solely for beach nourishment. While it is the policy of the Town to permit maintenance dredging of existing inlets, channels and marinas, no other mining or excavation in coastal waters is practiced in Town coastal waters, none is proposed, and the Town prohibits excavating, grading, or mining in coastal waters except for: construction or maintenance of existing navigation channels, or reconstruction of historic channels; bypassing sand around natural and man-made obstructions; and improving habitat for shellfish, finfish and other wildlife. Where dredging is permitted, clean sand or gravel of an equivalent or slightly larger grain size is the only material which may be deposited within nearshore areas. Offshore mining is against Town policy because of inevitable alterations to bottom topography or nearshore areas that interfere with coastal processes and fisheries.

Inlets and channels within the Town requiring periodic dredging are noted for each reach in the Inventory and Analysis. Further details and recommendations regarding dredge sites, seasonal windows for dredging activity, and disposal of dredge spoil are contained in **Water Resources Policies #30-40 & 44**. **Dredging and Dredge Spoil Disposal Policy #35** contains guidelines and standards for dredging in the Town with depth and other recommendations for specific inlets and channels. **Table XII-6, Alternative Dredge Spoil Disposal Options**, contains sites and recommendations for spoil disposal. These standards shall apply to any dredging undertaken in the Town of East Hampton.

The Trustees of the Town of East Hampton own most of the bottomlands of the Town's shallow embayments, tidal creeks, harbors, coastal lagoons and salt ponds, with the exception of those east of the westerly boundary of Hither Hills in Montauk and on Gardiner's Island, and their permission is required for any mining, excavation or dredging in these water bodies. Town Natural Resource Special Permits are required for any dredging or related activity in the Town's coastal waters, and ACOE permits are also required for mining, excavation or dredging in coastal waters. The Town Trustees will retain ownership of any public trust or Trustee lands which become uplands due to fill or accretion resulting from beach nourishment or other erosion control projects on or adjacent to their holdings. The Town will retain ownership of any public trust which become uplands due to fill or accretion resulting from beach nourishment or other erosion control projects on or adjacent to Town holdings.

New York State also regulates mining, excavation or dredging in nearshore areas under the Coastal Erosion Hazard Areas Act. Permitting and regulations under CEHA are presently administered by the NYS DEC. Please refer to excerpts of the **Coastal Erosion Management Regulations** in **Policy #11**. Although State Regulations (viz. **§505.8 (a) (1) Nearshore areas**) allow permits to be issued for excavating, grading, mining, or dredging for artificial beach nourishment, Town policy is not to permit these activities solely for beach nourishment, and the Town may wish to adapt these regulations to reflect its policies should it adopt local administration of the CEHA regulations.

Sections of the Town Code regulating mining, excavation or dredging in coastal waters are summarized below. For direct citations please consult the current edition of the East Hampton Town Code.

Chapter 43 -- Beaches and Parks
This section of the Code contains specific protections for beaches, dunes and vegetation, including the following:

§ 43-4 Prohibited Conduct
Prohibits placing fill or any other material, or any structure including erosion control devices on the beach without authorization and proper permits from the Town Board or Town Trustees.

Chapter 153 -- Zoning
Section 153, Article IV, Protection of Natural Resources, in **§ 153-4-15** designates, "Wetlands, Watercourses, Tidal waters, Beaches, Beach grass, Dunes and Bluffs" as protected natural resources.

§ 153-4-20 Regulations
Regulates and requires a Natural Resource Special Permit for any activities within specified distances from these features including those involving wetlands, beach grass, dunes or bluffs. States that, without having first obtained a Natural Resources Special Permit, no person shall:

> A. (2) "Clear, dig, dredge or in any other way add to, alter or remove any material, including natural products, from or within one hundred fifty (150) feet of any boundary of any wetland, watercourse, tidal water or beach."

§ 153-4-85 references Town Trustee prerogatives over lands and waters under their ownership, including Trustee-owned underwater lands.

POLICY 16 PUBLIC FUNDS SHALL ONLY BE USED FOR EROSION PROTECTIVE STRUCTURES WHERE NECESSARY TO PROTECT HUMAN LIFE, AND NEW DEVELOPMENT WHICH REQUIRES A LOCATION WITHIN OR ADJACENT TO AN EROSION HAZARD AREA TO BE ABLE TO FUNCTION, OR EXISTING DEVELOPMENT; AND ONLY WHERE THE PUBLIC BENEFITS OUTWEIGH THE LONG TERM MONETARY AND OTHER COSTS INCLUDING THE POTENTIAL FOR INCREASING EROSION AND ADVERSE EFFECTS ON NATURAL PROTECTIVE FEATURES.

Explanation of Policy:
Public funds are used for a variety of purposes on the State's shorelines. This policy recognizes the public need for the protection of human life and existing investment in development which requires a location in proximity to the coastal area or in adjacent waters to be able to function. However, it also recognizes the adverse impacts of activities and development on the rate of erosion and on

natural protective features and requires that careful analysis be made of benefits and long-term costs, including environmental degradation, increased erosion and loss of or damage to public resources, prior to expending public funds.

In the past public funds have been used for erosion protection structures in the Town of East Hampton only for maintenance of harbor inlets, as at the entrance jetties for Lake Montauk and Three Mile Harbor, and for protection of the Montauk and Cedar Point Lighthouses, structures of state and national historic significance. In the case of the Montauk Lighthouse, if future erosion undermines the structure in its present location after the substantial investment in protective structures, the costs and benefits of further armoring the Point should be carefully evaluated compared to those of moving the structure back.

Where structures constructed with public funds have contributed to erosion of beaches and private property, as in the Sound View Drive area west of the Lake Montauk jetties, provision should be made for mitigation or remediation, through sand bypassing or beach nourishment for the affected areas, as part of the periodic maintenance of the structures or the facility, such as maintenance dredging of the Federal channel to Lake Montauk (Montauk Harbor).

Where public resources and recreation facilities are at risk because of loss of natural protective features from erosion or storm inundation, and human life and property are also exposed, such as at Ditch Plains in Montauk, economic and environmental benefits may be sufficient to justify expenditure of public funds. Costs and benefits will be evaluated in the *Ditch Plains Erosion and Remediation Study* (**Projects**).

There are presently no other areas in the Town where application of public funds for erosion protection are necessary. However, if in the future rising sea level or increased storm frequency increases erosion, public funding may be required to protect vital infrastructure within the coastal zone, for example the low lying sections of NYS Route 27 in Napeague. At such time the costs and benefits of erosion protection should be evaluated according to the policy, and prospective sites should be evaluated and prioritized in a pre-storm *Hurricane Damage Mitigation Plan* (**Projects**). Part of this evaluation should include closing storm breaches in the coastal barrier that cause substantial impacts on natural protective features, infrastructure, habitat or water quality. Potential sites include Northwest Creek, Three Mile Harbor, Accabonac Harbor, Fort Pond, Montauk Harbor, Oyster Pond, Ditch Plains, the Montauk business district, Napeague, and Georgica Pond gut. This preliminary list is not meant to be inclusive.

The Town may also in the future consider such quasi-public funding mechanisms as erosion control tax districts for beach nourishment or other flooding or erosion control projects. While the Town and other government agencies that would undertake public funding of erosion structures are generally exempt from the provisions of the Town Code, it is the Town's policy to take lead agency status for SEQRA review of any such projects.

New York State regulates erosion protection structures through the Coastal Erosion Hazard Areas Act, presently administered in the Town by the NYS DEC. Please refer to excerpts from the Coastal Erosion Management Regulations in **Appendix E**.

POLICY 17 WHENEVER POSSIBLE, USE NON-STRUCTURAL MEASURES TO MINIMIZE DAMAGE TO NATURAL RESOURCES AND PROPERTY FROM FLOODING AND EROSION. SUCH MEASURES SHALL INCLUDE:

- **(I) THE SETBACK OF BUILDINGS AND STRUCTURES;**
- **(II) THE PLANTING OF VEGETATION AND THE INSTALLATION OF SAND FENCING AND DRAINING;**
- **(III) THE RESHAPING OF BLUFFS; AND**
- **(IV) THE FLOOD-PROOFING OF BUILDINGS OF THEIR ELEVATION ABOVE THE BASE FLOOD LEVEL.**

POLICY 17A ALONG SOUTH SHORE OCEAN FACING REACHES 8, 9, 10, AND 11, ONLY NON-STRUCTURAL MEASURES ARE PERMITTED TO MINIMIZE FLOODING AND EROSION

Explanation of Policy:
Policy #17 extends and elaborates on the policies and standards in **Policies #11-16** of this section.

Policy #17A applies to Reaches 8, 9, 10 and 11 of the Town's south shore where, in the wave-dominated high-energy environment of the Atlantic Ocean, flooding and erosion protection structures interfere unduly with coastal processes and have a high probability of adversely affecting public resources like beaches. These reaches, which predominantly do not contain existing shore-parallel hard structures, are areas where new hard structures should not be permitted for flooding or erosion protection. Any existing shore parallel structures are to be replaced only under conditions of exceptional hardship, and groins and other perpendicular structures should not be replaced, except where used to protect navigational channels, of which there are none on the Town's south shore. See Flooding and Erosion Protection Map V-2.

These policies recognize both the potential damage from flooding and erosion to development, and to natural protective features in the Town's coastal areas, as well as the substantial capital costs and adverse environmental impacts associated with shore-hardening coastal structures. The policies consider what measures are appropriate to protect existing structures and development and to preserve the natural protective features of the Town's coastal zone.

Erosion and flooding protection structures can change natural coastal processes, and are generally designed to counteract natural patterns of erosion and flooding by absorbing, diverting or reflecting wave energy and/or capturing littoral sediment, or by diverting floodwaters. Flooding and erosion protection structures can also increase local erosion rates; cause shifts in tidal activity and circulation; alter or destroy natural habitats; cause loss of beaches, backshores, and intertidal zones;

accelerate drowning of tidal wetlands due to rise in sea level; cause loss of public access to the shore; and other harmful impacts. These adverse impacts are particularly acute in the high-energy environment of the Atlantic Ocean where a single storm can produce extensive alterations of the coast. Therefore, non-structural measures are preferred, especially along the south shore.

Consistency with this policy requires exhausting non-structural flooding and erosion protection solutions before consideration of structural solutions. Flooding and erosion protection projects must conform to the other **Flooding and Erosion Policies #11-16, Significant Habitats Policy #7, Public Access and Recreational Resources Policies #9 & 19-22, Historic Resource and Visual Quality Policies #23-25, and Tidal & Freshwater Wetlands Policy #44**.

In addition, to ascertain consistency with this policy a determination must be made if non-structural measures will afford protection appropriate to a given site. If non-structural measures are found to provide adequate protection against flooding and erosion, then consistency with the policy would require the use of such non-structural measures in lieu of structural ones.

The use of erosion and flooding protection structures shall only be considered after such an evaluation of available non-structural measures, and requires a determination that the structure, by itself or cumulatively with other structures in the area, will not adversely affect nearby beaches or other protective features or habitat areas. This evaluation should be based on the coastal geomorphology, local erosion rate, weather exposure and marine energy environment, as well as site and engineering plans, topography, subsoil characteristics, existing development patterns and any other pertinent information required to allow an analysis of the site and alternative protection measures.

As part of this evaluation the Town's policy requires that, prior to permitting erosion protection structures:

(1) Siting of new buildings and accessory structures be outside of Flood Hazard Zones and Coastal Erosion Hazard Areas wherever possible.

(2) That existing buildings and accessory structures be relocated landward to remove them as far from Flood Zones and Coastal Erosion Hazard Areas as site constraints allow.

(3) Existing buildings and accessory structures be flood-proofed, consistent with **Policy #11** and base flood elevation considerations, and taking into account the character of the neighborhood.

In the Town of East Hampton, non-structural measures shall include, but not be limited to:

(a) Artificially nourishing bluffs, dunes, backshores and beaches with compatible grain-size sand above the mean high water (MHW) line,

(b) Reshaping bluff faces to the angle of repose and terracing them, in situ, to the degree that the MHW line is not moved seaward,

(c) Building of dunes, backshores and beaches by sand nourishment,

(d) Sand entrapment with the help of plantings of native strand vegetation species (e.g., beach grass) and the installation of sand fencing on foredunes, backshores and bluff toes,
(e) Stabilizing bluff, dune, backshore and beach formations with appropriate plantings of native strand vegetation including beach grass,
(f) Limiting modes of access over private lands to maintain vegetation across dunes, bluffs or backshores,
(g) Reinforcing bluff and dune toes with biodegradable organic materials including straw and seaweeds landward of existing MHW,
(h) Installing drainage devices to control water flowing over bluffs and bluff faces.

The following provisions of Town Code govern use of non-structural measures for flooding and erosion, summarized as follows (for direct citations please consult the current edition of the East Hampton Town Code):

Chapter 131 -- Subdivision Law
§ 131-1.05, Subdivision Law General Policies,
Provides for protection of coastal features and all wetlands areas. Natural coastal features and systems, wetlands and habitats shall be identified and shall be protected by preservation in their natural state by conservation or by such other means as the Planning Board shall deem necessary. In Flood Hazard areas states that protective measures shall be taken in flood hazard areas so as to minimize possible flood, storm and tide damage and pollution under the Special Tidal Flood Hazard Overlay District zones and definitions found in Chapter 153.

Chapter 153 -- Zoning
§ 153-3-40 through -45, Flood Hazard Overlay District
Requires conforming to FEMA/ National Flood Insurance Program flood-proofing standards within flood hazard zones, implemented through local planning review and building codes.

§ 153, Article IV, Protection of Natural Resources, in **§ 153-4-15** designates, "Wetlands, Watercourses, Tidal waters, Beaches, Beach grass, Dunes and Bluffs" as protected natural resources.

§ 153-4-20
Regulates and requires a Natural Resource Special Permit for any activities within specified distances from these features including those involving wetlands, beach grass, dunes or bluffs. Some of the activities specified that require permits include filling, construction, alteration of any kind, or siting of septic systems on or within 150 feet of any wetland, surface water body, or beach (septic systems require 200 feet distance). Additionally, beach grass may not be damaged or removed, nor any sand dune removed, cleared, graded, or otherwise altered without a Natural Resources Special Permit.

§ 153-4-25, Emergency and minor maintenance exceptions
No Natural Resources Special Permit is required for in place and in kind replacement of existing coastal erosion structures, docks or pilings which have been damaged or destroyed, provided that a

building permit is first obtained, and materials are approved by the Natural Resources Department. Also allows minor maintenance work not exceeding 25% of a structure by area or extent. A 1992 amendment permits in place and in kind restoration of bluffs, dunes, beaches or other natural erosion protection features which have been damaged or destroyed.

§ 153-4-30 through **39**
Provides for minimum setbacks from the bluff (dune crest) line (100' along the ocean, except 150' east of Montauk hamlet, 50' on bay on lots of 40,000 sq. ft. or less, 100' on lots of 40,000 sq. ft. or more, 150' on lots of 84,000 sq. ft. or greater); also wetland setbacks for structures, wastewater systems and landscaping.

§ 153-4-39
Contains an exception to setbacks for coastal structures for which a natural resources special permit has been issued and for which all other necessary federal, state, county and local approvals have been obtained.

§ 153-5-50 of the Zoning Code sets standards for Natural Resources Special Permits for coastal structures. It requires that they not interfere with tidal flow, with marine life or habitat, or destroy other than minimal areas of existing wetland vegetation or beach grass. Structures are only eligible for a permit if refusal to permit the structure would make likely a rapid or sudden loss of the property to erosion, and there is an explicit determination that similar results are impossible using nonstructural controls. There is an exception for water-dependent facilities in Waterfront (WF) Districts or that are part of a lawful marina or recreational marina, which are held to lesser standards.

Coastal structures on Town Trustee owned beaches or bottomlands also require Town Trustee permits. New York State regulates structural and non-structural erosion protection measures under CEHA, as administered by NYS DEC. See Coastal Erosion Management Regulations excerpts in **Appendix E**.