NATURAL HAZARD MITIGATION PLAN

TOWN OF OLD SAYBROOK
Individual Town Mitigation

Prepared by the Connecticut River Estuary Regional Planning Agency
For the Town of Old Saybrook, Connecticut

Adopted by the Town of Old Saybrook, Connecticut

______, 2006

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I. INTRODUCTION

A. PLAN DEVELOPMENT

The Old Saybrook Natural Hazards Mitigation Plan has been developed to identify hazards or risks and the town's existing capabilities and activities for hazard mitigation. There are numerous tasks which can be undertaken by the town which will prevent loss of life, and reduce property damages associated with natural hazards. The full Natural Hazards Mitigation Plan for Old Saybrook includes: the Risk and Vulnerability Assessment , the Natural Hazards Regional Mitigation Overview Plan, this town specific plan and attached appendices.

Within Old Saybrook, there are mitigation strategies that are unique to the town. Recommendations that require regional or inter-town cooperation are included in the Natural Hazards Regional Mitigation Overview Plan. The property specific addendum attached to this document outlines repetitive loss properties that will need assistance to mitigate future losses. Another example of individual town mitigation efforts includes bridge replacement or relocation/improvement of utilities or important buildings. Addendum II identifies the implementation strategies listed in the document by board or committee.

B. GENERAL TOWN DESCRIPTION

1. Geography

The municipality of Old Saybrook possesses an integral relationship with adjoining waters; Long Island Sound and the lower Connecticut River and its estuary abayments. Influence by the creation of early roads, then the railroad and, finally, I-95, Old Saybrook has long been considered the lower valley's center of commerce. Similar to neighboring towns on Long Island Sound, high density of residential development, both seasonal and year-round, exists along the coast in Old Saybrook's beach communities. (See Map 1) The close proximity of the municipality and residential development to the waters of Long Island Sound exposes town residents and their properties to hazards associated with coastal storms and the winds and flooding that often accompany them. Additionally, the hilly ridge and valley topography of the northern area of town provides an opportunity for stream belt flooding that can be associated with either coastal storms or non-coastal heavy rain events. Either way, flooding and winds associated with coastal storms are the primary hazards in Old Saybrook.

The Town of Old Saybrook is located along the south shore of Middlesex County on Long Island Sound in south-central Connecticut. It is bordered to the west by the Town of Westbrook, to the north by the Town of Essex, and to the east by the Connecticut River.

2. Demographics

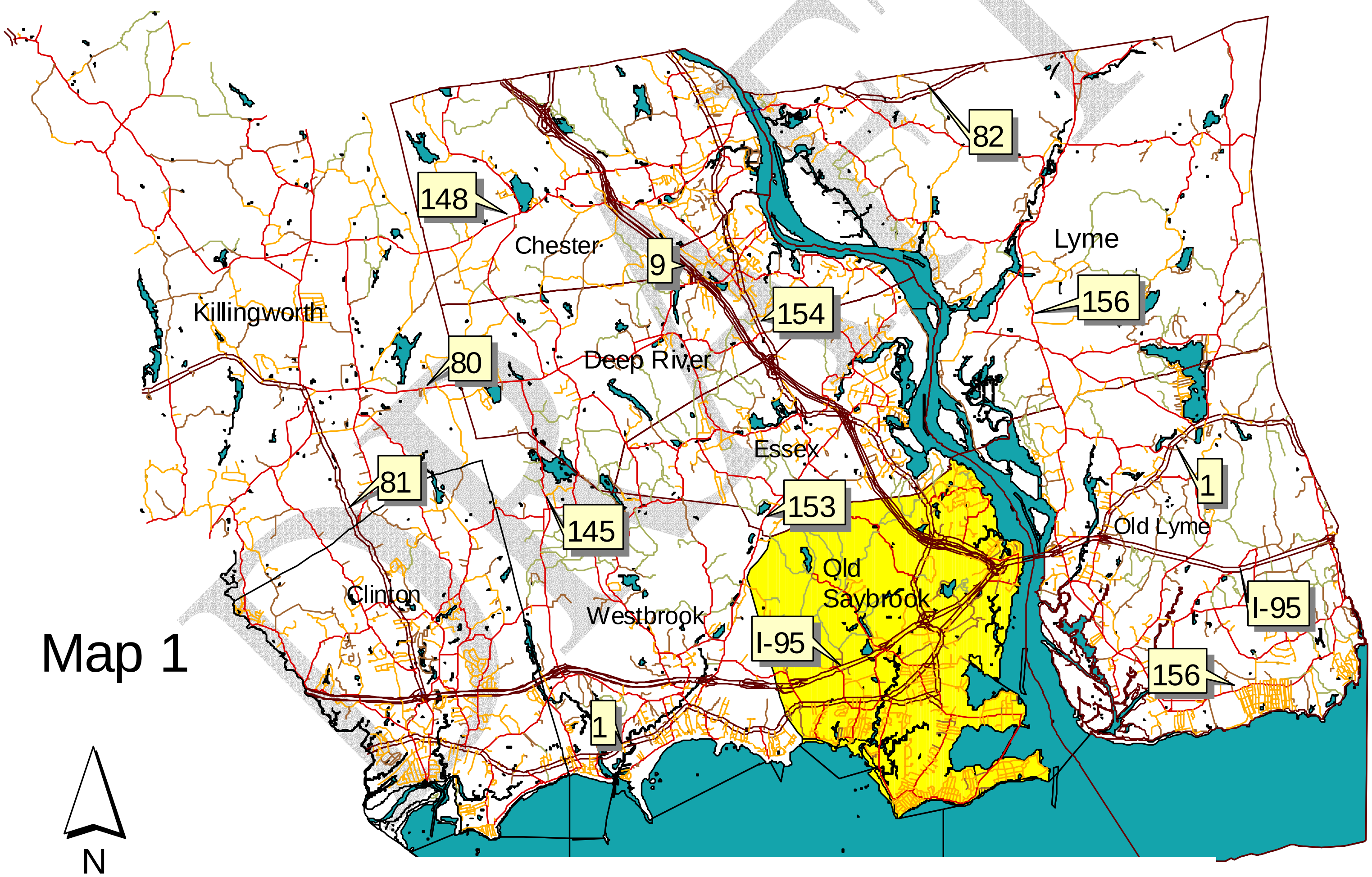
In the year 2000, the Old Saybrook population was 10,367, an 8½% increase over the 1990 census figure of 9552. The increase in population that occurred between 1990 and 2000 was higher than the 3% increase that occurred during the previous decade from 1980 to 1990. The total area of Old Saybrook is 18.3 square miles, with over 17 miles of its shore being located on Long Island Sound and the Connecticut River. The shoreline from Cornfield Point eastward to Lynde Point rises to an elevation of 20 to 25 feet above sea level and forms a protective barrier for the quieter coves and marsh areas immediately to the north along the Connecticut River. Commercial and industrial development in Old Saybrook is primarily concentrated along the I-95 and Route 1 east-west corridor with residential development located along the immediate shoreline (seasonal beach cottages and homes) and to the north of I-95 (larger subdivisions and home lots).

3. Geology and Soils

The topography of Old Saybrook is typified by low-lying coastal areas which have been described in the Town's Flood Insurance Study (January, 1978) document as "…*mostly tidal marsh and coastal plain with scattered projections of hills and knolls*." The most significant stream draining to the coast is the Oyster River with its tributary Fishing Brook, the only stream in Old Saybrook to have a designated "floodway". Upland areas north of I-95 are typified by rolling hills with ledge outcroppings and a relatively thin veneer of glacial till and soil. The veneer of till is Wisconsinan in age, and results from the most recent glacial advance and retreat which occurred within that last 50,000 years. In some locations, an earlier (older) Illinoian-age till is said to occur in patches. The glacial till is the ground and pulverized rock debris located directly underneath the glacial mass as it advanced southward and retreated back to the north. In that the material is created by the movement and weight of the ice sheet itself, it is undifferentiated and very compact. Soil and till profiles vary in range from 0 feet to a thickness of approximately 25 feet in northern areas of town. Glacial tills cover less than 50% of the town's 18.3 square miles with the other 50% being comprised of glacial recessional moraine, meltwater-deposited deltaic sediments and more recent marsh sediments and artificial fill. Topographic elevations range from sea level along Long Island Sound to a maximum of 215 feet at Prospect Hill in the center of town.

The soil characteristics for Old Saybrook include primarily Agawam fine sandy loam and Charlton- Chatfield complex interspersed with various soils of more complexity and smaller areas. Throughout the north/central part of town and a combination of soils with primarily Charlton- Chatfield complex and Paxton-

Old Saybrook and Neighboring Towns



Map 1

Montauk soils are characteristic. Throughout the coastal plain area south of I-95, Agawam Fine Sandy Loam and Agawam Urban characterize the soil layer. Wetland soils such as Merrimac and Hinckley soils are located in the Oyster River area and northward through the Fishing Brook stream belt. Wetlands soils are also located around the pond systems including Pequot Pond and swamp in the northern part of town and around the numerous natural and artificial ponds throughout Old Saybrook. Other soils complexes are found within the above-noted major complexes include Woodbridge, Agawam, Carlisle Muck, Sutton Fine Sandy Loam, Hollis Chatfield, Adrian and Palm, Walpole, Hinckley Gravelly Sandy Loam, Rippowam, Sutton Fine Sandy Loam, and Ridgebury Leicester.

4. Land Use

Development density can be separated into relatively low density, one and one and a half acre zoning in the northern upland areas of town, and high density seasonal beach areas along Long Island Sound. Although most of the available land south of I-95 has been developed throughout the years, the residential areas north of I-95 still include several larger tracts of land that are still viable for future subdivision. One piece in particular, known as the “Lyons property” is 900 acres and will soon be the subject of a large residential subdivision application. A large development of this type will have the potential to create significant downstream flooding if not designed properly. A previous application for the property proposing approximately 300 residential lots and an 18-hole country club golf course raised significant concerns, numerous application denials through numerous Commissions in Old Saybrook, Westbrook and Essex, and resulted in the developer evidently filing for bankruptcy.

Land use in Old Saybrook is dominated by residential use, totaling 24% of the total area of the town. Commercial and industrial uses comprise approximately 5.5% of the total with institutional uses totaling 2.5% and transportation totaling 8%. Open space totals close to 10% of the land area, this because of recent significant open space purchases by the Town, primarily in areas north of I-95. That committed open space is owned by the Town of Old Saybrook in cooperation with The Nature Conservancy and the Old Saybrook Land Trust.

II. EVALUATION AND PROPOSALS FOR HAZARD MITIGATION

A. EXISTING MITIGATION FOR FLOOD HAZARDS

Of the major natural hazards which impact Old Saybrook, flood and wind damage associated with coastal storms is the most critical item for mitigation planning within Town. Hazards resulting from upland flooding of rivers and streams that may or may not be associated with coastal storms is also a considered a relatively high mitigation priority. Although Old Saybrook experiences floods in the rivers and streams which flow southerly toward the coast, it is the flooding experienced along Long Island Sound and its tidal rivers and creeks that is most severe.

1. CURRENT REGULATORY GUIDELINES

a. Flood Zones

Within the Old Saybrook Zoning and Subdivision Regulations, there are standards and criteria which govern the location of structures and the placement or removal of fill within designated flood zones. The regulations/ordinances within which these standards and criteria are found dictate parameters such as structure setbacks and structural configurations in flood-prone areas. State Building Code also includes parameters for construction in such hazard zones as well. State policies regarding minimizing potential impacts within flood zones are also found within the Connecticut Coastal Management Act (C.G.S. Sec. 22a-90 through 22a-112, et. seq.).

When the federal flood program was initiated, an ordinance model was used based upon the forms of governments most likely to adopt such standards. This was particularly true in the mid-west where jurisdictions were commonly found at the township and county level and within city government where Special Acts had been established. In Connecticut, the primary jurisdiction as established in state statute is located at the municipal level where Planning & Zoning Commissions oversee municipal land use. Although many Connecticut municipalities first adopted the national ordinance format, many adopted zoning regulations as well, acknowledging the primary Planning & Zoning jurisdiction. Where ordinances were adopted, the State administrator of the federal flood program, the CTDEP, subsequently urged Towns to rescind such ordinances so as to simplify the regulation of property in areas prone to flooding.

Old Saybrook adopted both a flood ordinance and flood regulations. These two bodies of regulatory structure continue to exist at this point in time. In both cases, the Old Saybrook Town Engineer (Nathan L. Jacobson & Associates), is empowered as the administrator of the flood program. For any construction within the identified flood hazard areas, Jacobson & Associates is responsible for review and issuance of a flood permit, including the follow-up inspections necessary to confirm compliance with the permit. This administration process has been in place in Old Saybrook for over 25 years and has resulted in an organized, well-run program. An important part of the administrative process embodied within the program is that an engineer oversees the flood permit process, this as opposed to municipal regulations which allow the Zoning Enforcement Officer to oversee a flood program.

Floodplain Development Regulations

The primary tool used for preventing flood losses in Old Saybrook is the flood ordinance and regulations. These regulatory tools ensure that new construction and substantial improvements (those improvements whose value exceeds 50% of the value of the existing structure to be altered) are built consistent with the Federal standards. The ordinance and regulations are based upon the Federal government's National Flood Insurance Program (NFIP) administered through the CTDEP and FEMA's Flood Insurance Rate Maps (FIRM). The regulations operate on the basis that construction should be elevated sufficiently (See Figures 1 and 2)

Elevation Requirements – Flood ordinance and regulations standards require that new structures and substantial improvements be elevated to a minimum base flood elevation so as to raise the structure out of harms way. Within the high velocity V-Zone, the structure must be substantially elevated with the area under the structure remaining open to flood water flow or improved with breakaway walls that will fail under minimal flood conditions.

Figure 1 -

These new homes under construction in coastal areas of Old Saybrook must comply with current building code requirements for elevation.

Due to the expense of bringing an existing structure into compliance with flood ordinance and regulations, property owners will often attempt to avoid the expense elevating a non-compliant structure by constructing an improvement which is slightly less than 50% of the value of the structure. Previously, flood regulations and ordinance state that the 50% rule applies for any work done within a <u>one year</u> period. Home owners who wanted to avoid the cost of compliance with flood requirements would then wait until the 13th month to do more work. This essentially allowed a homeowner to do construction that is 49% of the value of the structure every year until the total value of all the work has far exceeded the 50% rule. In effect, by spacing the work over several years, the property owner greatly improved the structure without elevating it or in some way floodproofing it. In October of 2002, the Town amended the flood ordinance substantial improvement time rule from one year to ten years. This approach will greatly increase the long-term effectiveness of the substantial improvement rule by extending the 49% value rule over the ten-year period, as opposed to the one year minimum FEMA guideline.

Figure 2 -

Mitigation of older homes vulnerable to coastal flooding and storm surge includes elevation of existing structures . This view shows one home elevated with another home in the foreground which needs to be

Another problem associated with the substantial improvement rule is the value of the improvement set by responsible enforcement officials. Specifically, the cost of a building permit is based upon construction costs which do not include the finishing improvements within the structure. When considering the total value of a loss, the insured would certainly include the marble counter tops and bathroom fixtures and the numerous other items that would never be a part of the initial substantial improvement analysis. A recommendation is made to determine if the values on which the substantial improvement calculation was based can be submitted to the property owner's insurance company. This record could potentially be used to limit a claim where a property owner claims that an improvement costs one amount and the claim for replacement is three times what the improvement was said to cost.

The development of land for the purposes of residential development (commercial and industrial to a limited extent) is often dictated by Subdivision Regulations adopted by the Planning or Planning & Zoning Commission. Subdivision Regulations in the Town of Old Saybrook include provisions which require flood zone designations to be demonstrated on submitted plans so that final plans filed with the Town Clerk reflect that fact. This alerts appropriate regulators to be aware of the flood zone designation and instructs them to apply appropriate conditions to construction.

There are numerous properties that are within the FEMA flood zones. Of these properties, there are 22 structures which have been classified since 1979 as repetitive loss properties with claims submitted after the floods of 1979, 1982,1984, 1985, 1990, 1991, and 1993 floods. These structures will in all probability experience flood damage during a hundred year flood event with a number receiving some damage yearly. It is expected that in the event of a severe coastal flood from a hurricane or coastal storm similar to the Hurricane of 1938, that specific districts within Old Saybrook would experience severe flooding and damage.

b. Stormwater Guidelines

Stormwater maintenance is becoming more and more important to flood hazard planning due to the fact that vacant land is being developed in upstream areas and, as a result, flood storage capacity and infiltration into the ground is being decreased. In addition, as of March of 2003, municipalities including Old Saybrook will have to comply with the "Small MS4 Storm Water Program" established by the EPA. This program will require (1) the reduction of discharge of pollutants to the "maximum extent practicable" (MEP), (2) the protection of water quality, and (3) the satisfaction of appropriate water quality requirements of the Clean Water Act. The program would comprise six (6) elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving water bodies. The six elements are (1) public education and outreach, (2) public participation/involvement, (3) illicit discharge detection and elimination, (4) construction site runoff control, (5) post-construction runoff control, and (6) pollution prevention/good housekeeping. The provisions of the program will be administered by the Old Saybrook land use commissions and boards.

Stormwater Management

With the increased level of development within the Estuary region, more and more pressure is brought to bear on efforts to minimize or eliminate the impacts of runoff on downstream properties. Both the Planning Commission and the Zoning Commission operate under a "zero rate of runoff" increase policy, which means that more runoff from a single property may occur after development, but the rate of runoff is controlled using detention basins or other stormwater structures. Such a policy is practiced despite there being no actual language requiring developers to develop to such a standard, at least using that specific terminology. When queried as to whether a mandatory "zero rate of runoff increase" policy should be included in development standards, it was suggested that there are circumstances where such a high standard is unnecessary. Whether or not a "zero rate of runoff increase" is applied to any particular development should be on a case-by-case basis.

With the increased amount of impervious surface that accompanies development, efforts are being made to reduce the amount of impervious surface installed. New zoning regulations have been written within the past decade that require a minimum area of landscaped area, with regulations for commercial areas (where significant impervious surface is most common) requiring up to 25% non-impervious area calculated as a function of total lot size. The Town's recently adopted 2000 Plan of Conservation & Development also includes strong policy guidelines regarding the reduction of impervious surface both for water quality and storm drainage purpose.

The Town should continue the efforts to improve flooding caused by undersized drainage facilities or less frequent maintenance by:

- Continuing to use engineering methods which will alleviate any drainage into the town system which will exacerbate flooding downstream or cause damage including GIS mapping and monitoring of storm-water outlets and infrastructure.

- Using specific engineering methods for determining final flow;

- Adopting a flexible "zero rate of runoff increase" standard in Zoning Regulations, Subdivision Regulations and the Road & Drainage Standards (which is currently under review and revision) if the Commission or its engineer determine drainage to town system will cause adverse impacts;
- Continued promotion and use of vegetative planting to retain water on-site.

<u>Drainage System Maintenance</u>

Drainage system maintenance includes the cleaning of catch basins and can also include removal of obstructions within drainage swales along town roads.

In the past, such maintenance is often lower on the priority list, occurring on more of an as-needed basis. In recent years, however, a more rigorous maintenance schedule has been developed. As a result, flooding caused by clogged and backed-up drainage systems has become less common. Areas where improvements to drainage facilities and rigorous maintenance have resulted in less or infrequent flooding include College Street leading to Saybrook Point near North Cove Road, the Elm Street railroad underpass (although this area still floods during more major rain events), and the Stage Road intersection with North Main Street. (See Figure 3)

Figure 3 - Where Elm Street passes under the railroad tracks drainage maintenance and repair continues to be a targeted area for mitigation.

Photo - LJD

Within the past several years, the Old Saybrook has developed a policy that discourages total reliance on structural drainage facilities to carry stormwater from roadways. As a result, the Town is attempting to systematically eliminate catch basins and the curbed roadways that guide stormwater to those basins where possible. In their place, the Town is creating shallow, vegetated drainage swales. The effect of this less intrusive drainage scheme is to recharge the groundwater by infiltrating stormwater through the filtering effects of a vegetated swale. An additional benefit to this approach is the reduced time spent by Public Works employees on catch basin maintenance and cleaning.

c. Open Space Guidelines

By actively pursuing an open space program, a municipality can achieve goals of reduction in development while at the same time preserving land for future generations. Many feel this is also an effective way to reduce taxes as well, due to the comparison of the higher municipal costs of services for development versus lower costs for vacant land. From the perspective of hazard mitigation, a program of municipal purchase or set-aside of open space within flood-prone areas will be effective in reducing the ultimate vulnerability of the town to flood damage and, more dramatically, loss of life. Open space is more often reserved in small pieces in association with the subdivision of land. In such cases, between 10 and 20% of a subdivision area is dedicated for the one of several purposes. Most commonly, the dedication is offered for the protection of environmental resources (skeptics may say that such environmental dedications are more because such land, usually inland wetlands, cannot be developed anyway).

Within Old Saybrook, the largest flood-prone areas are adjacent to the coastline of Long Island Sound and inland up the Oyster and Back Rivers and Fishing Brook systems. With the exception of a few undeveloped parcels, the limited open areas along the coastline in Old Saybrook are state-protected tidal wetlands. Flood-prone areas in the north of Old Saybrook are located in the non-tidal areas of Fishing Brook as it extends northward to Crystal Lake within Town Park on Schoolhouse Road, and along the upper reaches of the Oyster River. Flooding in northern tributaries can create access difficulties in the more populated areas south of Interstate 95. This is due to the more confined stream channels and narrow flood plains. (See Map 2 – Vacant Land and Flood Zones)

Open space purchases in Old Saybrook have been purchased with Connecticut's Open Space Grant Program and town funding. Recently purchased parcels are located within central and northern areas of town, in and around Ingham Hill Road. Through strategic purchase of additional parcels nearby, the town has been able to succeed in creating greenway connections, consistent with recommendations in the 1994 Conservation Commission Open Space Plan. Western portions of the open space include flood-prone areas at

Crystal Lake and within the associated wetlands system. With the purchase of these properties for environmental preservation and greenway development reasons, the Town also reduces flood hazard risk through the purchase of flood-prone land that is currently for residential development.

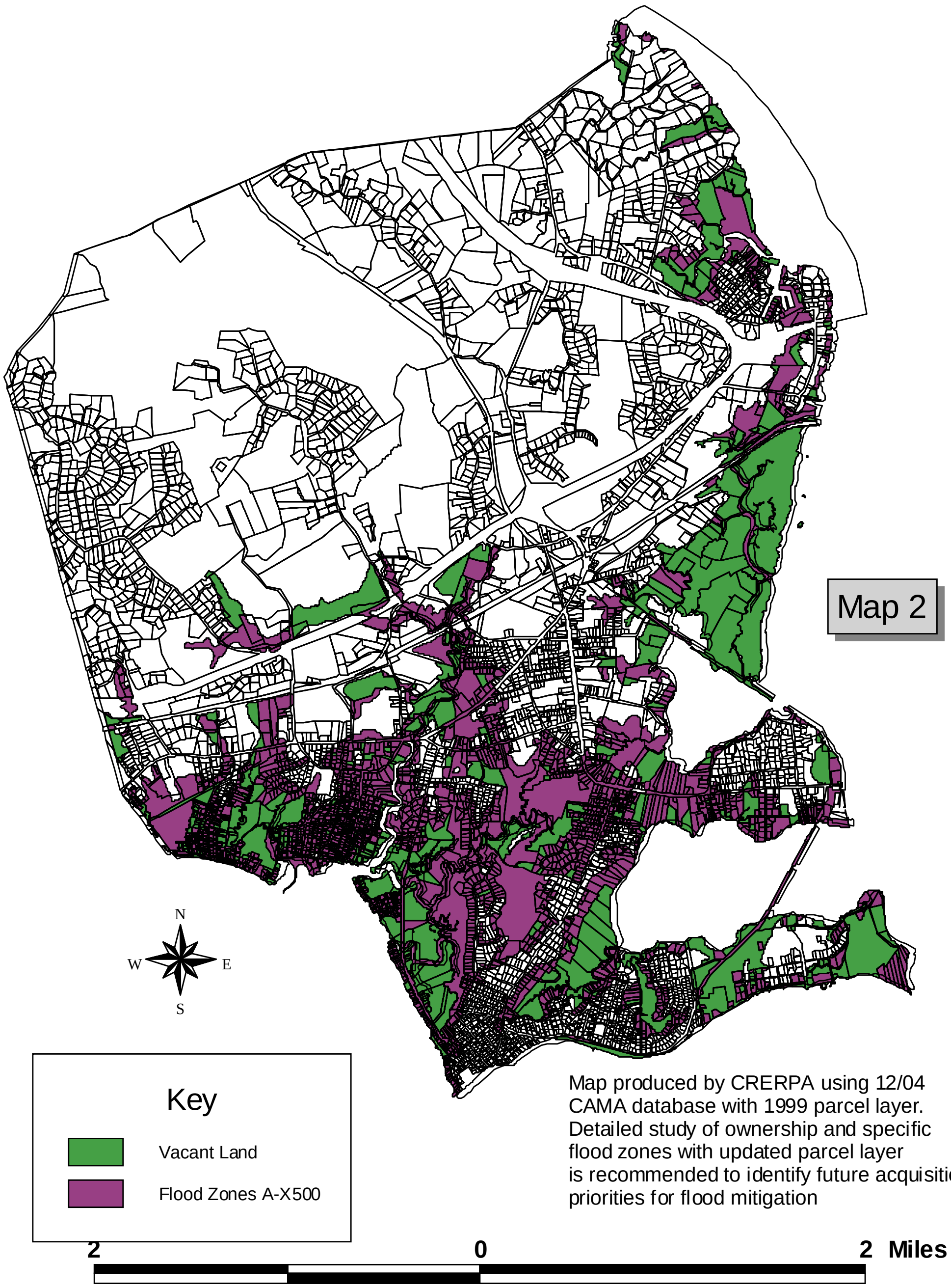
The Old Saybrook Planning Commission, established in the late 1940's, has a requirement for dedication of open space with a subdivision proposal. Original subdivision regulations, dated 1948, required that "…*provisions for open space for use as parks or playgrounds should be considered by the subdivider and may be required by the Commission*…". Today, subdivision standards require that an open space dedication of <u>at least</u> 10% be made by a subdivider, and for reasons including environmental preservation and resource protection as well as for parks and playgrounds. Open space is often dedicated in the form of wetlands areas (such areas seldom can be developed anyway), thereby often preserving flood plain areas. Although the Town has an Open Space Subdivision regulation, it has been seldom used for various reasons. Similar to a cluster development regulation, it is thought to be cumbersome and expensive to acquire the required Special Permit through this process. As a result, the Town is currently working on a residential conservation district regulation that will reportedly allow for the dedication of substantial open space in exchange for the allowance of increased development density. As a result, additional areas of flood plain may be preserved through this process in the future.

B. <u>MITIGATION OF FLOOD HAZARDS AND AFFECTED PROPERTIES</u>

1. HISTORICAL PERSPECTIVE

As Old Saybrook developed over the past 300 or so years, or certainly within the last seventy to eighty years when development began in areas close to Long Island Sound, many of the existing structures were built within the existing flood zones prior to the existence of flood regulations, or zoning regulations at all. The mapped flood plain along Old Saybrook's coast constitutes approximately 1,264 acres, almost 12% of the Town's total area. The Federal Emergency Management Agency (FEMA) has provided baseline information to demonstrate areas within Old Saybrook that are vulnerable to flooding. This includes Flood Insurance Rate Maps, Flood Boundary and Floodway Maps, and Flood Insurance Study. These materials were last updated for Old Saybrook as of June of 1992. All areas adjacent to Long Island Sound, tidal and non-tidal rivers and streams are subject to recurring flooding events. Significant flooding events have occurred in March of 1936, September of 1938, September of 1954, January of 1978, and June of 1982.

Vacant Land within Flood Zones



Map produced by CRERPA using 12/04 CAMA database with 1999 parcel layer. Detailed study of ownership and specific flood zones with updated parcel layer is recommended to identify future acquisition priorities for flood mitigation

C. MITIGATION OF FLOOD HAZARDS AND AFFECTED PROPERTIES

2. HISTORICAL PERSPECTIVE

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The upland version of a "severe" flooding hazard last occurred in the Estuary region in 1982. Everything that was to be wiped out in riverine flood-prone areas – houses, businesses, roads and bridges were damaged during that flooding event. At that time, the current flood and coastal planning initiatives were in place to a great extent. Reconstruction afterward 1982 occurred in a manner consistent with today's flood standards– bridges and roads were elevated, structures were rebuilt outside of the flood-prone areas or built so that they would withstand similar floods. The <u>coastal</u> version of such an event last occurred in 1938 – the *Great New England Hurricane*. The beach areas, the primary target of the force of that event, were reclaimed with reconstruction taking place in the same, damage-prone areas. The primary concern is that most reconstruction occurred in the late thirties, forties and fifties when modern flood standards had not yet been adopted. Therefore, most of the coastal construction that occurred post-1938 remains vulnerable to significant damage. Most structures are not built to current flood standards. As a result, Old Saybrook along with other shoreline towns are vulnerable to significant coastal events. Mitigation for coastal events is described in more detail in Section IV C-5 (Hurricanes)

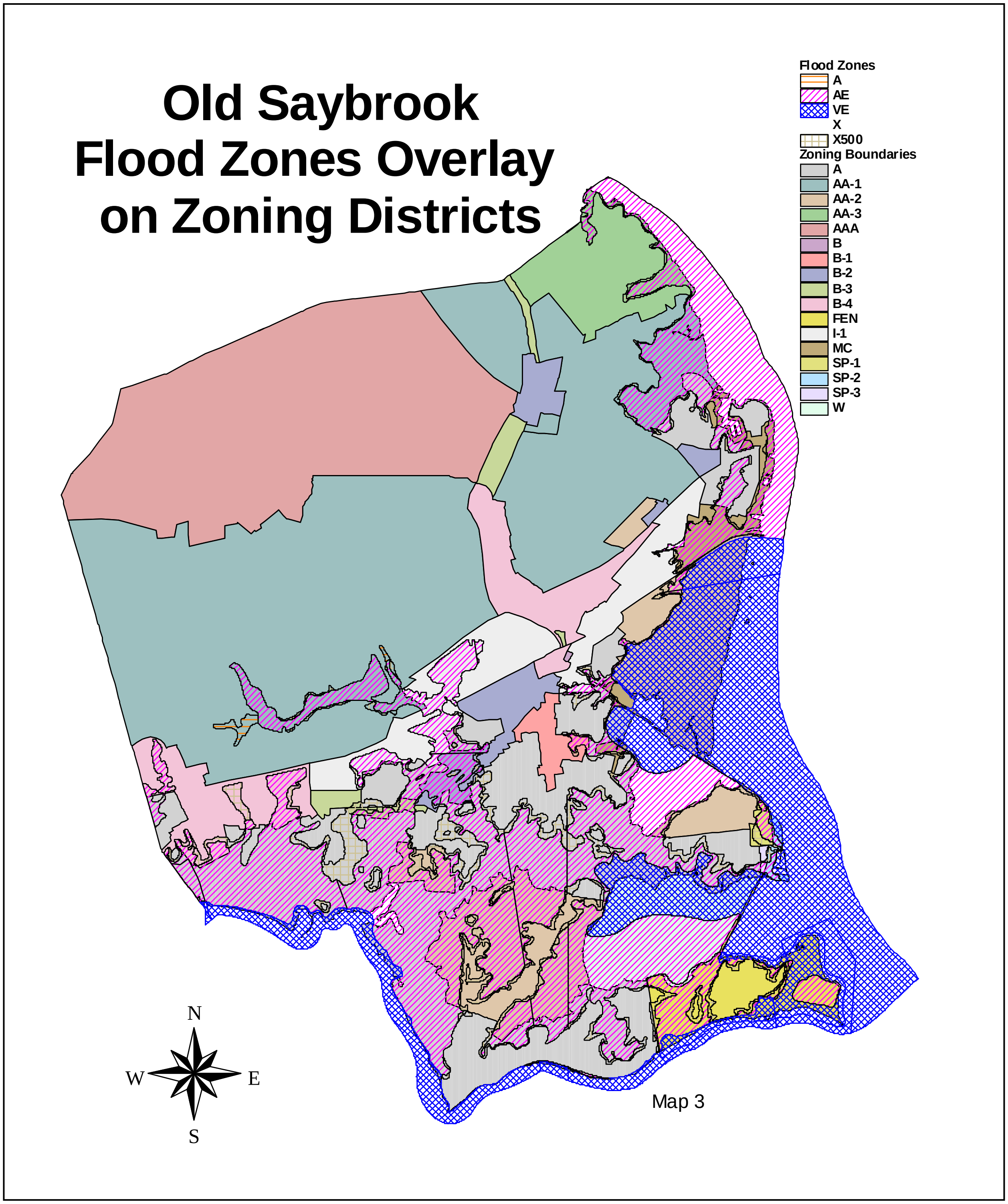
Most land within flood zones adjacent to Long Island Sound has been developed. Therefore, mitigation efforts for these primarily non-compliant residential structures would be organized through town efforts within the building codes and flood ordinances. Where severe flood damage is expected to flood prone structures within flood zones, the town could assist in the application for hazard mitigation funding to renovate structures towards compliance with flood standards. Some examples are provided in the following section. It should be noted that the patterns of property values within the waterfront areas and historical family ownership within these areas will make government acquisition unlikely. The exception may occur in a post hazard situation where total property destruction causes the property owner to request acquisition on the part of the town or state. (See Map 3 – Old Saybrook Flood Zones and Current Zoning)

2. EXISTING INFRASTRUCTURE

Another significant repercussion of flooding events is the adverse impacts such events have on evacuation and emergency access. The Town experiences significant road flooding in several locations. Areas of particular concern are located at the Elm Street underpass where the roadway passes underneath the railroad right-of-way, Plum Bank Road entering the Cornfield Point area, and College Street entering the Saybrook Point area. The latter two areas are important in that they represent two of the three roads that access the residential areas of Cornfield Point, Knollwood Beach, Fenwood Beach, Fenwick, and Saybrook Point. Fortunately, these areas are located on relatively high bluffs that are protected from all but the most significant storms. Problem areas are depicted on Map 4, "Old Saybrook Infrastructure Hazard Areas"

In some cases, flooding events are exacerbated by inadequate stormwater management infrastructure. In particular, undersized culverts cause flooding along Route 1 near the entrance of the Chalker Beach community. The culvert, which passes underneath Route 1, drains areas within the Center Road development area and eventually leads to the tidal marshes of the Chalker Beach area. During times of high tides and storm surge, storm water drainage can back up and cause flooding associated with this restriction point. The Elm Street underpass, previously mentioned, is another such point. In this case, the previously existing railroad overpass, constructed during the early part of the 1900's, dictated the elevation of the Elm Street roadway constructed underneath it. What resulted was a depression under the railroad overpass that often floods, even during relatively small rain events. The installation of a floodgate on the Oyster River immediately north of the overpass improved the situation by reducing the flooding effects of the tidal Oyster River. A Town-wide effort to mitigate hazards on properties and utilities specifically identified for flood-proofing should include the following:

- Strengthen enforcement of the floodplain regulations to either optimally prevent road or house construction within the floodplain, or alternatively, ensure that flood proof construction standards for structures within the flood plain are strictly enforced.


Old Saybrook
Flood Zones Overlay
on Zoning Districts
Flood Zones
A
AE
VE
X
X500
Zoning Boundaries
A
AA-1
AA-2
AA-3
AAA
B
B-1
B-2
B-3
B-4
FEN
I-1
MC
SP-1
SP-2
SP-3
W
N
W
E
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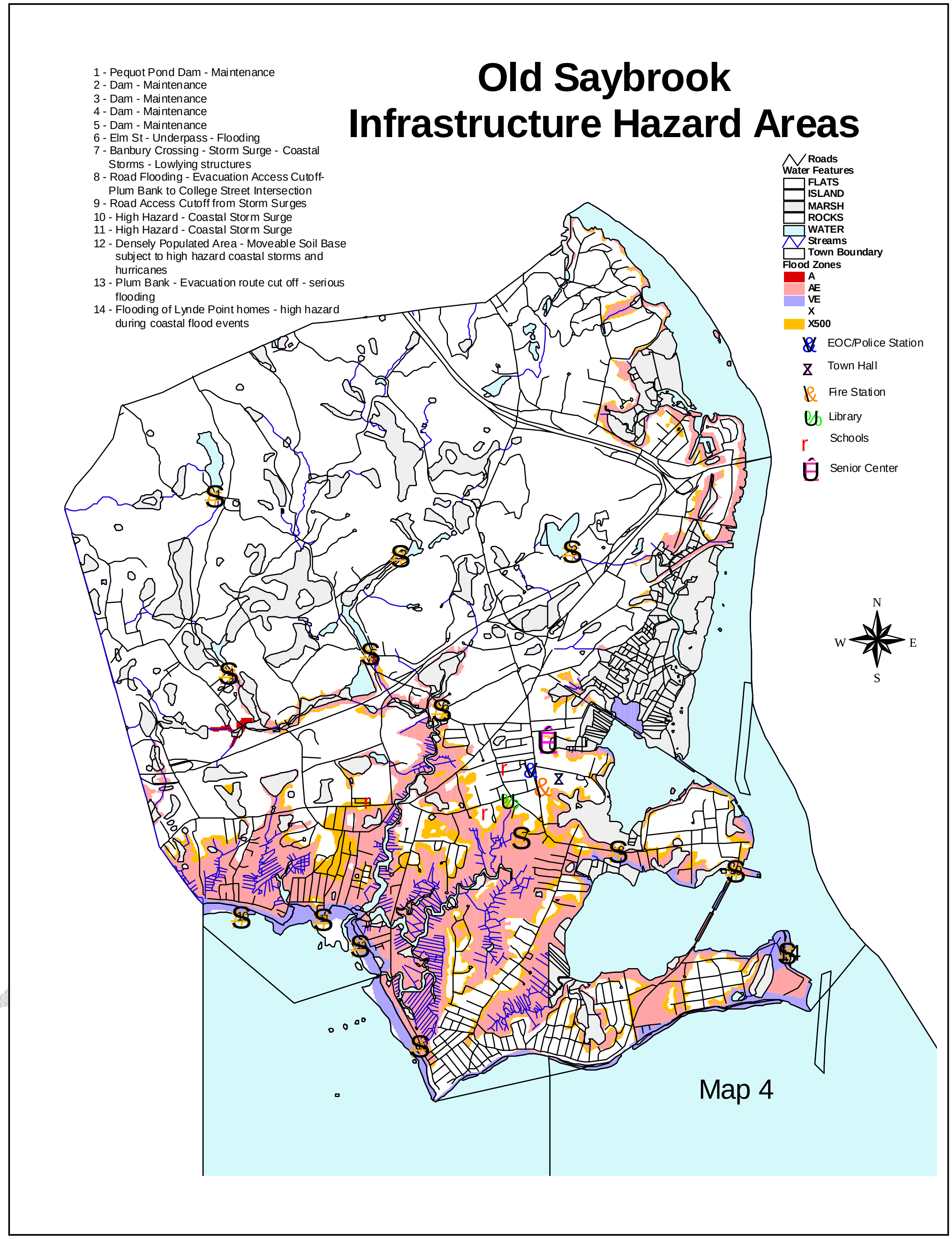
Map 3



- Update the flood zone study. Changing conditions upland and within the floodplain, in addition to topographic changes as a result of the 1982 flood, and an expected sea level rise over the next twenty years, warrant a complete update of the flood zone limits along with a study of critical areas and flows.

- Conduct a full evaluation of dams in conjunction with state review, including a timeline and allocation of funding for repairs.

- Update regional Geographic Information System (GIS) mapping through increased use of GIS databases and coordinate with CRERPA for accuracy with FEMA layers and location of flood prone buildings on a regional level. Using HAZUS software supported by recently acquired ESRI software, the region will be able to evaluate local flood problems that possess an inter-town component.

3. FLOODPROOFING EXISTING STRUCTURES

Principal areas of residential housing are located within the "V" and "A" flood zones. A significant number of seasonal and year-round beach dwellings are located on waterfront lots. Unlike the neighboring towns of Westbrook and Clinton, a large percentage of Old Saybrook's waterfront properties are either located on elevated bluffs are fronted by seawalls (*Cornfield Point through Knollwood Beach to Fenwood Beach*) or bulkheads (*Plum Bank area*). Similar to nearby communities located on Long Island Sound, the densest residential development is located in the beach communities located directly on the sound. Much of this development occurred in the early 20th century at a time when there were no standards for construction within areas subject to flood hazards. Some of the densest and most flood prone areas are located in the Chalker Beach, Indiantown and Saybrook Manor communities toward the western part of Old Saybrook. Chalker Beach, in particular, is prone to damage as a result of a significant number of cottages being located directly on the beach with no seawall or protective dunes. Mitigation measures appropriate for both business and homeowners include structural alterations and hazard planning which are noted in the repetitive loss report attached to this document. (See - Appendix 2003 Repetitive Loss Property Review) Also see Appendix III outlining the estimated building exposure by type and cost for Old Saybrook. This document was produced through the Hurricane Event Summary within the HAZUS software. It does not include river or stream flood events.

Examples of Mitigation Options for Flood Prone Structures

<u>Relocation</u>

Relocation is often used for structures that are particularly significant such as historic structures and landmarks. In Old Saybrook, the history of the Town is such that significant historic structures and landmarks are located in areas away from the immediate coast and, for the most part, out of designated flood areas. The structures within designated flood areas are residential and are not good candidates for relocation for several reasons. First, most of the structures are not of tremendous value when compared to the overall value of the property on which they sit. Second, waterfront or coastal property owners often have such emotional ties to their home and location that they wouldn't consider relocation under any circumstances. It is more likely that these property owners will consider either elevation of their homes or reconstruction consistent with flood regulations.

Acquisition

Acquisition is considered one of the most effective methods of flood hazard mitigation because it assures that buildings in harm's way will cease to be subject to flood damage. This approach to flood hazard mitigation tends to be most cost effective in areas subject to storm surge and other severe hazards – where protection measures aren't feasible. Acquisition is primarily undertaken by Government agencies and tends to be more cost effective in areas subject to storm surge and other severe flood hazards where other mitigation measures are not effective.

Although the ideal method of eliminating flood damage risk for structures within flood hazard areas is to remove them entirely, this alternative is unlikely in Old Saybrook. Acquisition is the least feasible mitigation measure for political reasons. The largest density of structures within flood areas is located within the seasonal beach areas – areas where the properties are expensive and the lifestyle is emotionally attached to summertime and memories of vacations and ownership is often passed down through the family. For this reason, it is doubtful that residents would willingly sell their properties under most circumstances and for any reasonable price that a government agency (the likely purchaser) could offer.

Building Elevation

The more likely measure would be a program of elevation of the structures most prone to flood damage. Most beachfront structures in Old Saybrook are not built to current flood requirements, specifically elevations which will sustain flood damage. Many of the structures are located at grade within several feet of sea level, a situation that leaves the area prone to substantial damage and loss in the event of a significant nor'easter or hurricane. Elevation of these V and A Zone structures will greatly reduce potential losses under most conditions and is likely the most effective flood mitigation proposal that can be made. Although such a proposal would change the appearance of the area, it would go far in achieving the hazard mitigation necessary to protect life and property.

Experience has shown that, due to the small size of the average beach property, variances of zoning regulations would likely be necessary for most of the elevations as most structures are nonconforming in some way. If a government program of subsidizing the elevation of these structures is undertaken, it would have to be with the understanding that many individual projects should be given to the consideration of streamlining zoning regulations to allow for elevation of properties. Proper oversight by local officials would ensure that structures are elevated to resist flooding to be sure that non-code septic systems are replaced with code-compliant systems, especially if reconstruction and potential expansion of structures is anticipated.

<u>Floodproofing</u>

Floodproofing measures are often utilized where flooding conditions are not as severe as other areas, including areas of infrequent low-velocity shallow flooding. In such areas, barriers and dry/wet floodproofing can be effective. In Old Saybrook, areas of such infrequent low-velocity shallow flooding would be beach areas slightly landward of the coast – the A-Zone properties which are elevated and inland areas associated with streams further north. In the beach areas, the small size of residential properties (4000 – 6000 square feet) makes the construction of barriers such as levees, floodwalls and berms infeasible for the most part because of the lack of sufficient area on the property. Berming in larger areas would be more feasible but may be unacceptable due to the appearance.

Within the larger residential developments further north and along Fishing Brook, the Oyster River and Back River flood plains, barriers are more feasible. Flooding in these areas is a result of significant rainfall events and include a significant velocity component. Structures in these areas are newer than in beach areas and have been built with enough distance from the floodplain to avoid intermittent flooding.

<u>Insurance</u>

Flood insurance protects the property and the insured from the substantial losses that can accompany floods and other catastrophic events. The two primary types of insurance that can be used include flood insurance acquired through the National Flood Insurance Program (NFIP) and basement backup insurance. In order for property owners to have access to subsidized flood insurance, the community must join the NFIP. Membership allows local insurance agents to sell a separate flood insurance policy under rules and rates set by FEMA at the federal level. Rates do not change after claims are paid; they are set on a national basis. Basement backup insurance is issued by the NFIP and covers seepage and sewer backup for an added deductible provided the problem was caused by a flooding event in the area. Although several insurance companies offer this type of insurance, the coverage, exclusions, deductibles and arrangements can differ widely.

<u>Natural Resource Protection</u>

Preserving and/or restoring natural areas or the natural functions of floodplain and watershed areas produce flood loss reduction benefits as well as improve water quality and habitats. For over 25 years, Connecticut's inland wetland and tidal wetland laws have succeeded in dramatically slowing the rate of wetland loss. Along with the wetland's many ecological values, the preservation of wetlands is important due to their ability to act as flood storage area during flooding events. In addition, the wetlands serve to filter water and reduce downstream flows.

In Old Saybrook, the primary tidal wetland area is within the lower Connecticut River in and around North Cove and Ragged Rock Creek slightly north. Other significant tidal wetland areas exist around South Cove and throughout the Oyster and Back River areas, as well as near Chalker Beach. Much of these wetlands exist south of the Amtrak railroad right-of-way and are therefore not impacted by restrictions caused by filling of tidal creeks. These restrictions, which create more of an impact in the neighboring towns of Westbrook and Clinton, can cause a slow degradation of the wetlands due to inadequate flushing – a problem that can cause an accumulation of wetlands soil and debris in the fringes of the marsh, allowing the invasion of upland vegetation, particularly phragmites. Flood storage capacity of the wetlands areas can be slowly reduced in this manner.

Erosion and Sediment Control

When development occurs and construction is begun, much of a site is often stripped of its protective cover exposing the easily eroded soil beneath. When that soil is eroded and transported downstream to stream and wetlands, the soil can accumulate and reduce the flood storage ability of those resources. Although any one project would not likely be significant in the amount of flood storage reduction that occurs, a lax attitude on the part of a municipality toward insuring that soil erosion and sediment control measures are required, installed and maintained properly can lead to a cumulative reduction to flood storage capacity. Old Saybrook's Zoning and Subdivision Regulations have provisions which require Commission Certification of a Soil Erosion and Sediment Control Plan and the installation of sediment control measures so as to minimize the transport of soils off-site and into resource areas.

Best Management Practices

Best Management Practices are used to prevent non-point source pollution from entering waterways. Non-point source pollutants are carried by storm water and include things like fertilizer, pesticides, and various chemicals and petroleum products. In Old Saybrook, the local Commission commonly includes provisions for mitigation of such non-point source pollution by approval of detention and retention basins within developments where storm water is to be held on-site and metered out, requiring catch basins equipped with oil and grease separators for impervious parking areas

a. Residential Property Owners

The National Flood Insurance Program collects data on repetitive losses in the flood hazard area. Repetitive loss properties are those that possess insurance claims for more than one event at a given property. There are close to 1000 structures located within the A and XE flood zones in Old Saybrook, over 80% of which are located within coastal flood areas. Of the structures, twenty two (22) properties are listed as repetitive-loss locations with all twenty two being located within the coastal zone along Long Island Sound and the Connecticut River. This number of repetitive loss properties is significantly more than those in surrounding towns (Clinton – 13, Westbrook – 7, Essex – 4). Of the twenty two properties, twenty are located in areas directly impacted by flooding associated with Long Island Sound. Of those twenty, eleven are located in Chalker Beach and four are located in neighboring Indiantown. Another three are located on Plum Bank Road opposite Long Island Sound in an area fronted by a concrete seawall. The only two non-Long Island Sound repetitive loss properties were the Dock & Dine Restaurant at Saybrook Point on the Connecticut River, and along Main Street on the way out to Saybrook Point. Most claims were related to flooding from coastal storms, both nor'easter and hurricane. These statistics reinforces the importance for mitigation of coastal flooding for properties on Long Island Sound. Mitigation measures appropriate for both business and home owners include structural alterations and hazard planning which are noted in the repetitive loss report attached to this document. Also note the recommendations under Section IV C-5 (Hurricanes)

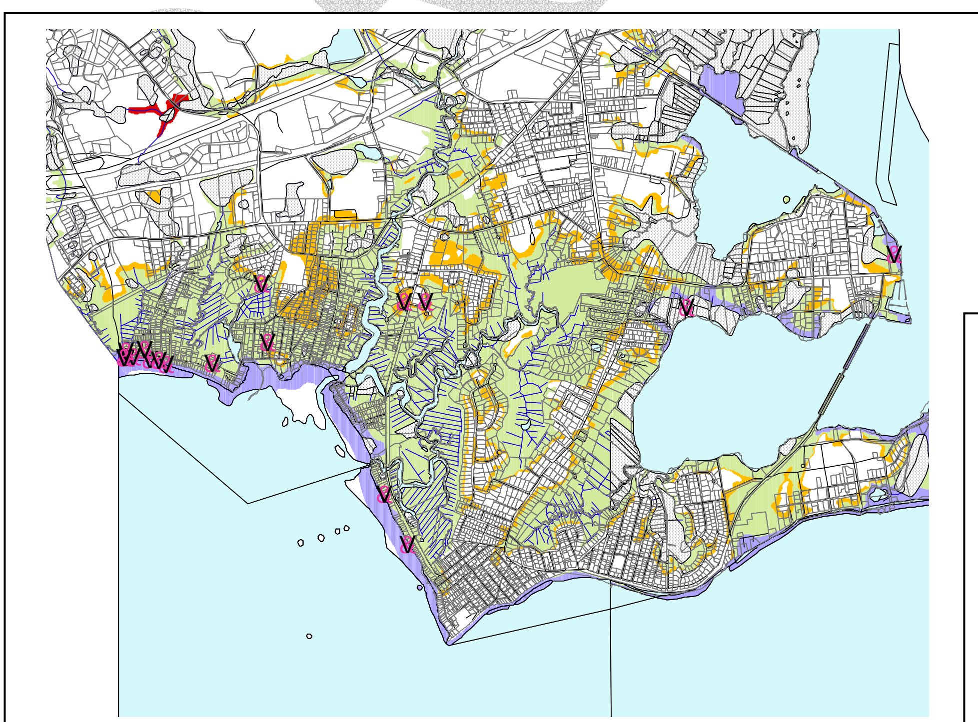


Figure 4 - The red house shaped symbol denotes structures that have had repetitive losses from flooding since 1978.

b. Business Owners

For business, the primary mitigation objective is to minimize revenue loss due to a flood or hazard event. Structural alterations are the similar to those recommended for residential structures. Additional measures for structural alterations include: elevated HVAC units above the 100 year flood elevation, flood proofing where feasible for inventory, and insurance for flood events. An accurate record of all expenses, including hours worked, is important for insurance company reimbursement. Maintenance of a client list enables communication for a business that will be closed for a while due to storm damage. Potential damage and loss estimates, as well as maintenance of a construction/repair vendor list can lend a sense of preparedness when hazard strikes. It is also important to keep a record of the business needs off-site in the event of a flood. These procedures will equip a business with the tools for a quick recovery from a hazard event.

c. Beach Community Specific Recommendations

Beach Associations provide an excellent opportunity for residents to gather and disseminate information relating to flooding/coastal storm events, and hazard mitigation. As noted above, each beach community share similar issues relating to hazard mitigation with respect to coastal storms and flooding, and mitigation measures may differ for each of the various beach communities. The Town of Old Saybrook could efficiently use these organizations as a conduit for hazard mitigation education. Feasible and affordable mitigation measures, explanation of funding for mitigation coupled with graphic diagrams using GIS Hazus mapping and illustrations of storm surge damage may be instrumental in allaying complacency in these areas.

d. Dam Structures

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. As of 1990, there were eleven such dams in Old Saybrook. Some have been built within the last 50 years or so, but a number of them were constructed for agricultural and manufacturing purposes during the time shortly after the settlement of the Saybrook Colony in the late 1600's and early 1700's. As a result of their ages and private ownership, the dams are in varying conditions of repair. One dam in particular which is considered a high priority and dangerous in the event of a breach is the Obed Heights Reservoir dam, located in the east-central area of Old Saybrook. The reservoir was once used to supply water for steam train locomotives. (See Map 5– Map of Old Saybrook Dams and Flood Zones) The primary concern in mitigating the damage that might be inflicted by dam failure is that each of the dams is privately owned. Private owners are generally reluctant to repair dams on their property due to the high costs. Mitigation includes prioritizing dams using the DEP classification systems and inspection. The high hazard dams should be repaired by utilizing grant funding, low interest loans to the property owners, or other types of incentives. Lower priority dams should be evaluated for repair as funding is available.

C. MITIGATING FOR ADDITIONAL NATURAL HAZARDS IN OLD SAYBROOK

HIGH WINDS AND TORNADO

While historically tornado damage is minimal in Middlesex County, there are several logical measures to protect for wind damage and cyclonic events such as small tornadoes in Old Saybrook. Owners of older mobile homes should be particularly aware of mitigation measures to protect their homes from damage. Business owners should follow the same mitigation plan as they would for those listed under mitigation measures for flood damage.

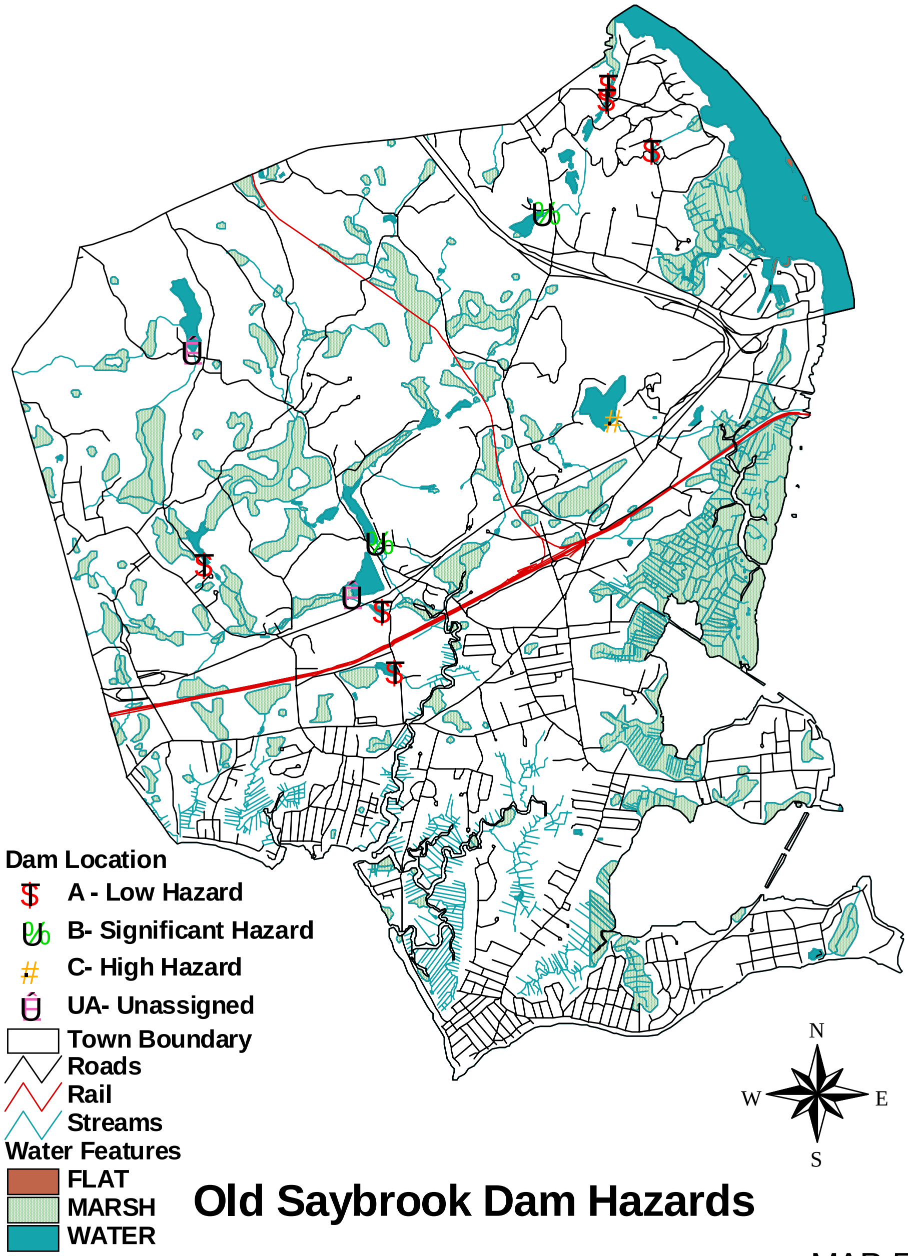
Specific mitigation measures for wind damage include:

- Enforcement and update for building code standards for light frame construction, especially wind resistant roofs. FEMA articles on bracing for gable trussed roofs and bracing for door and windows are available for review. There are also articles on placement of HVAC systems and electrical utilities to resist both wind damage as

and increased demands for water. Land-use planning techniques can be applied to existing, new, and redeveloping areas alike.

Mitigation for wildfires in Old Saybrook would include:

- Land-use and natural resource planning which encourages groundwater retention within existing, new, and redeveloping areas.
- Work with region EMD group to develop a wildfire management plan and protocol, in conjunction with neighboring towns to ensure that outside fire-fighting resources, such as the National Guard are available.
- Recommendations for future land use patterns including recharge into existing aquifers, including site design to encourage water conservation through such techniques as: strict regulation of vegetative buffers for stream and river corridors, rain gardens for site drainage, and prohibition of wetlands alteration.



Old Saybrook Dam Hazards

MAP 5

- Where water supplies are insufficient, new development should include dry hydrants.

- Pamphlets and web-based information for property owners for hazard mitigation that include structural alterations to protect against wind damage.

2. DROUGHT & WILDFIRE

There are few areas within the Old Saybrook that have the potential for wildfires unless drought conditions become extreme. Large expanses of deciduous forest are located in the northern areas of town and areas of phragmites in coastal areas are prime areas of concern. (See Figure 5) At times of severe drought, communities face growing rural -urban interface problems. Drought can exacerbate potential for small wildfires and hinder the ability of the town to control outbreaks. The primary issue for Old Saybrook, along with other

- Connecticut towns that rely on aquifers and local well systems is that potential for increase problems during drought conditions can increase with population growth
- During vulnerable periods, a system of warnings about campfires and open fires should be posted in public locations.
- Training and education of firefighters should include brush and agmites

Figure 5 - Large areas of phragmites located near coastal structures have the potential to catch fire during times of severe drought.

3. WINTER STORMS

As with many of the other hazards listed in this report, information on reducing damage from winter storms could be promoted through town hall and regional agencies. It is recommended that this be accomplished through web site links to town, regional, state and federal sites for information on reducing damage from natural hazards. Information for winter storms would include:

- Evaluating dangers of being outside or traveling, the danger of carbon monoxide poisoning in motor vehicles and from portable heaters and power generators in homes, the danger of house fires.
- Evaluating danger of hypothermia from prolonged exposure to cold weather.
- Landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce to probability of damage structures
- Specific recommendations for coastal structures for flooding and wind protection during the winter months
- Buried utilities in new subdivision development and onsite within new commercial developments

4. EARTHQUAKES

Though the likelihood of an earthquake in Old Saybrook is small, mitigation for the possibility of low magnitude earthquakes include: obtaining a low cost earthquake rider for homeowners and businesses. This would protect property owners for damage to chimneys, windows or foundations. In the overall publication of mitigation options for the public on the website or in pamphlets, this option should be included.

5. HURRICANE

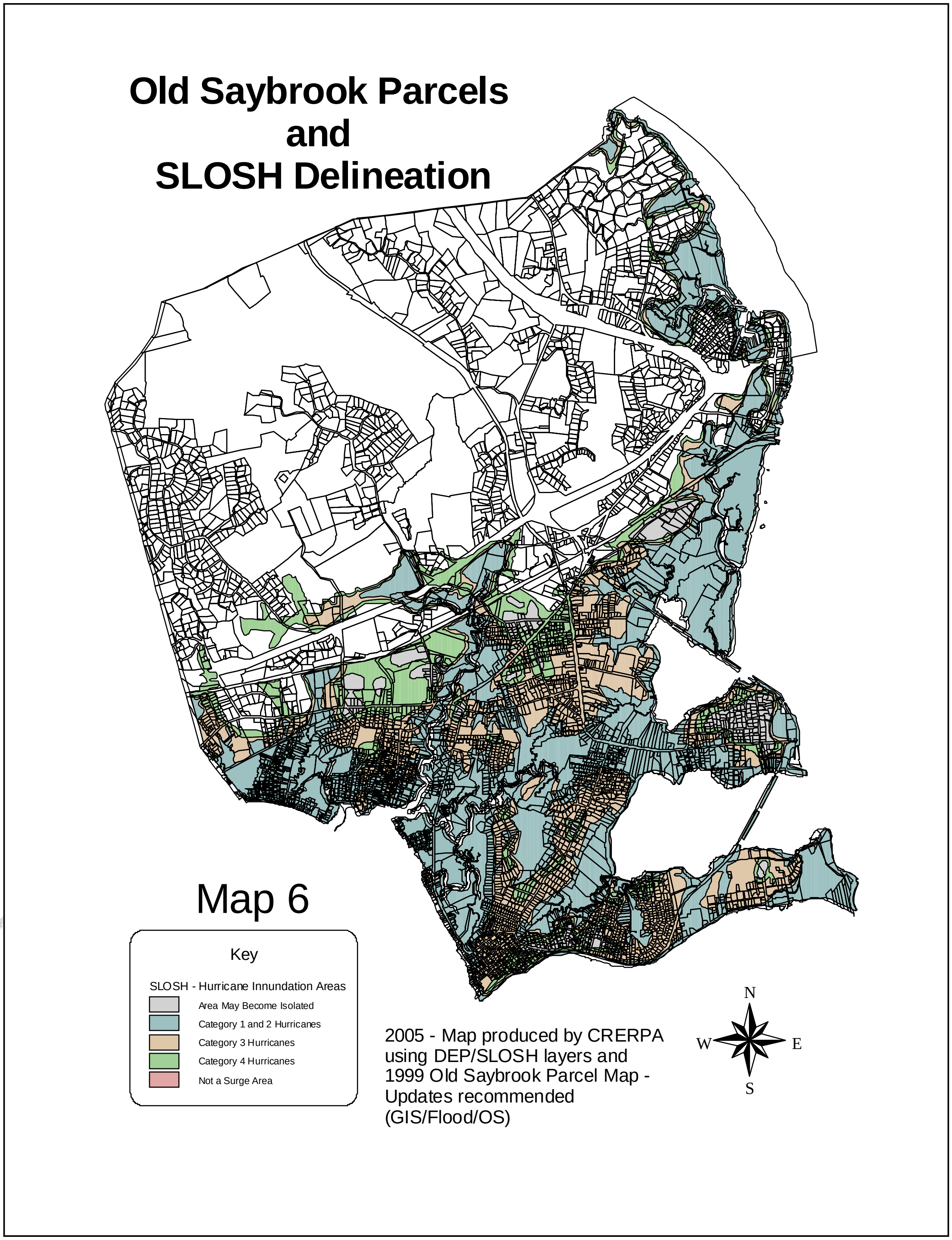
Although reconstruction and remodeling has slowly upgraded non-compliant structures and has reduced vulnerability, the majority of structures still exist at low elevations, prone to damage and destruction the next time a significant coastal storm passes through the area. Many of the waterfront structures were built soon after the great “Hurricane of 1938”. Since that time, the area has not experienced a storm with such damaging capabilities. Old Saybrook’s 1970 Plan of Development includes a map that shows an “Approximate Standard Project Hurricane Flooding” line developed by the U.S. Army Corps of Engineers (Plan Map B-3, Drainage). The line, described as an estimated theoretical hurricane flood level line, shows the inundation of most areas south of Interstate 95, with the exception of “islands” of high ground at Saybrook Point, Cornfield Point and northern areas of Saybrook Manor and Chalker Beach near Route 1. Old Saybrook’s largest flood of record occurred during the September, 1938 hurricane where the flood level was reported as 11.6 feet NGVD at the Saybrook Outer Breakwater. At that level, the aforementioned USACOE hurricane flooding line would prove to be prophetic. Heaviest property damages from the 1938 hurricane and other coastal storms have occurred within the Chalker Beach area and, to a lesser extent, in the Indiantown and Saybrook

Manor areas. This data is replicated in storm surge model produced with layers from the Connecticut DEP/ FEMA HAZUS in draft form depicted in Map 6.

Figure 6 - Photograph of Town Hall depicting damage from 1938 Hurricane **Photo courtesy of Old Saybrook Historical Society**

Figure 7 - Significant damage occurred inland from wind during the 1938 hurricane

Photo courtesy of Old Saybrook Historical Society



Old Saybrook Parcels
and
SLOSH Delineation
Map 6
Key
SLOSH - Hurricane Innundation Areas
Area May Become Isolated
Category 1 and 2 Hurricanes
Category 3 Hurricanes
Category 4 Hurricanes
Not a Surge Area
2005 - Map produced by CRERPA
using DEP/SLOSH layers and
1999 Old Saybrook Parcel Map -
Updates recommended
(GIS/Flood/OS)
N
W
E
S

Figure 8 - Photograph of Plum Bank where 15 cottages were washed inland during the 1938 Hurricane – Photo courtesy of Old Saybrook Historical Society

Figure 9 - Photograph of showing the same area of Plum Bank in 2004 depicts infill development that would be affected by a similar hurricane – Photo – LJD 04

Figure 10 - Photograph of damaged houses at Cornfield Point in 1938 – Photo courtesy of Old Saybrook Historical Society

Figure 11 - Photograph of looking toward same area at Cornfield Point in 2004 notes that increased density in year and conversions to year-round housing increase risk to life and property - Photo LJD04

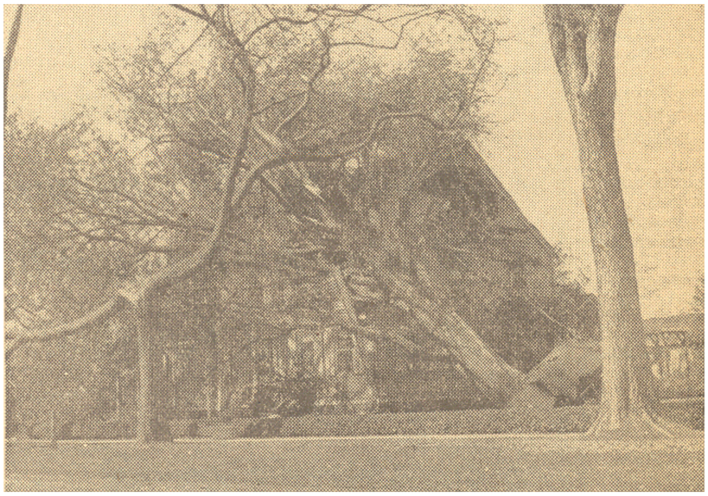


Figure 12 - Damage inland from hurricane was also severe due to intensive rain and high winds with gusts exceeding 180 mph – Photo courtesy of Old Saybrook Historical Society

The primary risk for Old Saybrook in the event of a hurricane is high wind and storm surges with flooding on small streams and rivers from heavy rain. Of immediate concern for hurricane mitigation in Old Saybrook is increased awareness for affected property owners of measures to protect property and structures. This would include wind damage retrofitting, brochures on self inspection of structures for mitigation, and floodproofing through the following sample measures:

Town Measures

- Encourage neighborhood preservation/revitalization for wind damage retrofitting
- Provide information to contractors and homeowners on the risks of building in hazard prone areas
- Develop a list of techniques for homeowner self-inspection
- Implement dune restoration and marshland protection
- Acquire shorefront land for open space
- Identify refuges of last resort for those unable to reach designated shelters
- Implement a Tree Hazard Management Program to encourage responsible planting practices and minimized future storm damage to buildings, utilities, and streets
- Encourage building inspection by a hazard mitigation professional
- Encourage private property owners to re-landscape with native species and implement program on town owned properties.
- Distribute hurricane preparedness information including pet sheltering plans
- Encourage the purchase of flood insurance

Homeowner Measure

- Wet floodproofing (Allow water to enter uninhabited areas of the house)
- Venting on roofs
- Dry floodproofing (Sealing the structure to prevent floodwaters from entering)
- Installation of in place shutters for glazed openings
- Bracings with struts on walls
- Elevation of structures by piers, posts or column
- Anchoring and connections in walls
- Reinforce entry doors
- Install hurricane straps and hurricane clips
- Garage doors with stiffer horizontal members
- Glider tracks and track supports should be strengthened
- Bracing struts pilaster columns in walls perpendicular to freestanding walls
- Renail sheathing
- Create a secondary water barrier
- Provide support for sliding glass doors and double doors opening to outside
- Improve anchorage of windows to openings
- Add ridge ventilators to reduce uplift of wood sheathing
- Strengthen garage doors
- Anchor adjacent structures, including fences, pool enclosures, and patio roofs
- Improve connections of porch roofs and overhangs
- Reinforce entry doors

Figure13 – Infill of structures since the 1938 hurricane shows the vulnerability of the Old Saybrook coastline to damage from storm flooding and wave action. Structural alterations or elevation would alleviate some damage. structure across the street is built to FEMA building code standard which

Town officials can also assist with structural renovations, rehabilitation, and new construction by recommending or enforcing hip roofs over gable roofs, consistent mortar pad placement, a full ten inches of mason's trowel on tile roofs, 4-6 inch nail spacing on sheathing panel, venting on roofs, total window and door openings as no more than 30% of wall's total area, improved adherence to attachment procedures, and other measures noted in building manuals and FEMA brochures.

Specific measure for flooding include: elevating structures above 100 year flood level, maintenance program to clear debris from stormwater drainage areas (referred to in section for flooding as improvement to the town's Phase II Stormwater Management Plan and associated GIS mapping. Also included would be the acquisition of flood prone property as open space where the property owner is willing to sell.

6. SEA LEVEL RISE & TSUNAMIS

Sea Level Rise

It is recommended that residents and public policy officials become aware of mitigation options for lower lying areas of Old Saybrook. The town should include a discussion of sea level rise in pamphlets or public education material for hazard mitigation. The town should also avail itself of funding opportunities by the State or Federal government for structural or non-structural armoring where erosion could be a severe problem. In addition, it is strongly recommended that any future flood studies and mitigation efforts with regard to structures and property reference data provided by the current evaluations for sea level rise.

Tsunamis

Mitigation efforts for tsunamis fall within the same category of mitigation efforts as those for flooding, where tsunamis originate as those postulated by Charles Mader. For tsunamis which occur as predicted by Simon Day and his associates, the scale of mitigation is beyond the scope of this project. It is likely that Old Saybrook would experience water levels similar to a storm surge for a category 3 or 4 hurricane which could do significant damage to shoreline areas. Prevention measures for flood damage in the flood zones adjacent to the Connecticut River are likely to provide the required mitigation for the unlikely possibility of a tsunami reaching the east coast of the United States.

2003 Repetitive Loss Property Review

Connecticut River Estuary RPA

Natural Hazards Mitigation Plan

Kenneth W.Kells, P.E.

December 2003

Task Assignments

- Information gathering and interviews
- Field inspections
- Development of recommendations
- General review of plan(s)

Presentation

The order in which the information is presented herein is by Connecticut River Estuary town in the same sequence as was on the repetitive property loss basic data disc provided by the CRERPA staff.

The mitigation references for each property are those described in the “Before the Hurricane” section for homes on the FEMA CD-ROM, *New England Hurricane, Are you Ready?*

Mitigation References

1. Elevation
2. Reinforcing Roofs
3. Protecting Utilities
4. Storm Shutters
5. Reinforcing Doors
6. Financial Preparation
7. Records and Inventory
8. Yard Maintenance
9. Sewer Backflow
10. Floodproofing
11. Generator
12. Building Materials

Town of Old Saybrook

- Made a field inspection with Town Planner Christine Nelson 7/31/03 to overview 22 properties
- Also attended a meeting with FEMA and local officials regarding the progress being made to improve the town’s flood insurance rating. See e-mail of update 8/4/03.

1 Beach Rd. West – Old Saybrook

- Losses April 1993 and November 1995
- Directly on Beach
- Not currently insured
- Mitigation references 1, 2, 3, 4, 5, 10, & 12

15 Beach Rd. West
Old Saybrook

- Losses January 1978 and January 1985
- Directly on Beach
- Not currently insured
- Mitigation references 1, 2, 3, 4, 5, 10 & 12

33 Beach Rd. West
Old Saybrook

- Losses December 1983 and September 1985
- Losses totaled $60,000
- Currently insured
- Appears some rebuilding has occurred since the losses
- Mitigation references 1, 2, 3, 4, 5, 10, & 12

41 Beach Road West
Old Saybrook

- Losses December 1983 and September 1985
- On Beach
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 10, & 12

43 Beach Road West
Old Saybrook

- Losses December 1983 and September 1985
- On Long Island Sound
- Not currently insured
- Mitigation references 1, 2, 3, 4, 5, 10 & 12

44 Beach Road West
Old Saybrook

- Not on Beach
- Losses October 1991 and December 1992
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 10, & 12

6 Beach Rd. East – Old Saybrook

- Losses September 1985and December 1992
- Currently insured
- On beach
- Mitigation references 1, 2, 3, 4, 5, 10 & 12

11 Beach View St. – Old Saybrook

- Losses October 1991 and April 1996
- On marsh not beach
- For sale July 2003
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 10 & 12

6 Blueberry Lane - Old Saybrook

- Losses January 1979 and June 1982
- Not on beach but interior low lot
- Currently insured
- Mitigation references 3, 6, 7, 8, & 10

5 Brooke St.- Old Saybrook

- Losses June 1982 and September 198
- Not on beach but in V7 zone
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 10 &12

21 Barnes Rd. – Old Saybrook

- Losses December 1992 and 2000
- On beach in VE zone
- Currently insured
- Appears to have been recently elevated
- Mitigation references 2, 4, 5, 10 & 12

3 Cottage Avenue – Old Saybrook

- Loses 12/92 &10/91
- On tidal marsh
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 6, 7, 8, 10 & 12

Dock and Dine -145 College Street
Saybrook Point

- Losses December 1995, December 1994, December 1992, and October 1991 – total largest in region
- On Connecticut River
- No longer insured
- Mitigation references 1, 2, 3, 4, 5, 6, 7, 10, & 12

463 Main Street – Old Saybrook

- Losses December 1992, October 1991 and September 1985
- Back on marsh; also near roadway stream crossing
- Currently insured
- Mitigation references 1, 3, 6, 7, 8, 10 & 12

10 Mohican Trail – Old Saybrook

- Losses September 1985, November 1991,and December 1992
- In A7 zone, catch basin backup may be problem.
- Mitigation references 1, 2, 3, 4, 8, 10, & 12

12 Mohican Trail – Old Saybrook

- Losses October 1991 and December 1992
- In B zone near catch basin
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 6, 7, 8, 10 & 12

14 Mohican Trail – Old Saybrook

- Losses September 1985, November 1991 and December 1992
- Not on shore but in an A7 zone
- Catch basin backup in the street could be cause
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 6, 7, 8, 10 & 12

48 Meadowood Lane
Old Saybrook

- Losses January 1979 and June 1982
- Back on marsh in B zone
- Currently insured
- Mitigation references 3, 6, 7, 8, 10 & 12

43 Owaneco Trail – Old Saybrook

- Losses January 1980 and September 1985
- Currently insured
- In A7 zone
- Mitigation references 1, 2, 3, 4, 5, 6, 7, 8, 10 & 12

141 Plum Bank Rd., Old Saybrook

- Losses September 1985,December 1992, November 1995, and December 2000
- On beach in A7 zone
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 10, & 12

143 Plum Bank Rd., Old Saybrook

- Losses October 1991 and December 1992
- On beach in AE zone
- Not currently insured
- Mitigation references 1, 2, 3, 4, 5, 10 & 12

89 Plum Bank Rd. – Old Saybrook

- Losses October 1991 and December 1992
- On beach in VE zone
- Currently insured
- Mitigation references 1, 2, 3, 4, 5, 10 & 12

6 Sharon Lane – Old Saybrook

- Losses January 1979 and June 1982
- Inland in A7 zone
- Catch basin backup possible problem
- Not currently insured
- Mitigation references 3, 5, 6, 7, 8 & 10

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APPENDIX II

OLD SAYBROOK
GOALS AND IMPLEMENTATION

There are various options available to the Town of Old Saybrook for hazard mitigation. Town government officials, boards, commission, and agencies will be the overall responsible parties for educating the public on the need for mitigation and options for reducing damage from natural hazards. The following sections are divided into objectives to meet the goals listed. Listed are the supporting tasks with the board/ commission or individual responsible for implementation and timeline for consideration and the priority of the task. The priority are listed as very high, high, medium, and low based on priorities established by the town during draft review. Modifications may be made after public review and adoption. The primary responsibility will be the application for grant funding and budgeting where appropriate to implement these supporting tasks.

Planning Process: Old Saybrook municipal personnel were interviewed and consulted in the development of each town section for risk, vulnerabilities, municipal challenges, and mitigation objectives as described in the Natural Hazards Mitigation Regional Overview. (Pages 34-36). The following documents were referenced to identify existing mitigation strategies and proposed mitigation strategies:

The town will make every effort to include or incorporate the mitigation goals , tasks, and plan into these plans, codes, regulations, and programs

- Town of Old Saybrook Subdivision Regulations, amended to 10/1/01
- Town of Old Saybrook Zoning Regulations, revised to 9/15/03
- Town of Old Saybrook Plan of Conservation and Development
- Old Saybrook Inland Wetlands and Watercourses Regulations, rev to1/05
- FEMA Flood Study, Old Saybrook, CT – Jan, 1978
- FEMA Flood Insurance Study Supplement – Wave Height Analysis, Jan, 1984

The town will make every effort to include or incorporate the mitigation goals , tasks, and plan into these plans, codes, regulations, and programs.

The individual town review was important for the development of goals and objectives within Old Saybrook. After the supporting tasks were compiled, town personnel evaluated each task using the STAPLEE criteria described in FEMA's " How-to Guide #3: Developing the Mitigation Plan" (FEMA 386-3. The evaluation yielded priority ratings based on the following: (Very High – if the task met 6-7 of the STAPLEE criteria), (High – if the task met 4-5 of the STAPLEE criteria), (Medium – if the task met 2-3 of the STAPLEE criteria), and (Low – if the task met 1 of the STAPLEE criteria)

Areas in yellow denote tasks which qualify for Community Rating System reward points. The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

GOAL 1. Ensure that public funds are used in the most efficient manner.

Objectives: Prioritize mitigation projects based on available funding starting with sites facing the greatest threat to life, health, and property.

#	Supporting Tasks	Who	Timeline	Priority	Completion Goal	CR
1	Develop a strategy for use of public funding to protect public services and critical facilities through municipal capitol improvement program and regional transportation program	BOS OEM Public Works BOF BOEd EDC	**2006 to 2011**	**High**		
2	Evaluate opportunities for public funding for projects on private property where the benefits exceed the costs	BOS BOF, BOEd EDC	**2011 to 2016**	**Medium**		
3	Identify and apply for outside sources of funding	BOS BOF BOEd EDC	**2006 to 2011**	**Very High**		
4	Promote owner participation in mitigation efforts to protect their own properties.	BOS BOF BOEd EDC	**2011 to 2016**	**Medium**		

GOAL 2: Reduce the loss of life and property and associated economic impacts from floods, high winds, severe winter storms, earthquakes and dam failure.

Objective 1 - Ensure that critical facilities continue to function during a hazard event.

#	Supporting Tasks	Who	Timeline	Priority	Completion	CR

					Goal	
1	Update the flood zone study for the town to incorporate changed conditions upland and within the floodplain, and an expected sea level rise over the next twenty years.	BOS Zoning Commission	**2006 to 2011**	**High**		
2	Strengthen existing subdivision and zoning regulations to either optimally prevent road or house construction within the floodplain or increased elevation and flood-proofing	Planning Zoning ZBA Flood Engineer	**2016 2021**	**Low**		
3	Ensure that flood proof construction standards for roads and structures within the flood plain are strictly enforced, flood-proof roads	Building Official/ Planning/ Zoning/ZBA/ BOS	**On-going**	**Medium**		
4	Review and revise storage of critical files and electronics at the Town Municipal Center to ensure that flooding will not destroy valuable records. Provide a back up GIS mapping system at the EOC out of the flood zones and surge areas. Provide training to emergency management volunteers and officials on the use of GIS compatible mapping systems	BOS OEM Flood Engineer	**2006 to 2011**	**Very High**		
5	Implement strategic enforcement actions to include engineering reports for structural expansion or alterations on properties within the 100 year flood zone.	Building Official Zoning ZEO	**2011 to 2016**	**Medium**		
6	Access and incorporate regional Geographic Information System (GIS) mapping to coordinate for accuracy with HAZUS data maintained by the CRERPA GIS system. Updated town GIS layers yearly to reflect future property damage, access issues, and evacuation for residents from flooding events.	BOS Planning Zoning, Assessor OEM	**2011 to 2016**	**Medium**		
7	Encourage property owners listed in repetitive loss report to obtain assistance for hazard mitigation funding from DEP/FEMA for elevation of structures and repairs where applicable	BOS Public Works	**2016 to 2021**	**Low**		
8	Implement mapping and monitoring of storm-water outlets and infrastructure.	BOS Public	**2006**			

	Provide for yearly maintenance programs for storm-water facilities and encourage the update of regulations to provide for no-net runoff from development	Works	**to 2011**	**Very High**		
9	Conduct a full evaluation of dams in conjunction with state review which includes a timeline and allocation of funding for repairs.	BOS, Flood Engineer	**2011 to 2016**	**Medium**		
10	Evaluation of Obed Reservior Heights Dam – work with property owners and State for repairs as needed	BOS, Flood Engineer	**2006 to 2011**	**High**		
11	Evaluation of remaining four dams – work with property owners and State to repair as needed	BOS, Flood Engineer	**2011 to 2016**	**Medium**		
12	Elm Street Underpass – Resolve drainage/flooding problems to improve evacuation options	BOS, Flood Engineer, Public Work	**2016 to 2021**	**Low**		
13	Elevation of College Street near North Cove Road to improve evacuation options	BOS, Flood Engineer, CTDOT	**2006 to 2011**	**High**		
14	Program for elevation of structures at Plum Bank, Great Hammock, Cornfield Point, and Lynde Point to avoid property loss during coastal flood events	BOS, Flood Engineer ZC, ZBA	**2016 to 2021**	**Low**		
15	Improvements to Banbury Crossing to improve evacuation options	BOS, Flood Engineer	**2016-2021**	**Low**		
16	Improvements to South Cove Causeway to improve evacuation options for coastal residents	BOS, Flood Engineer	**2011 to 2016**	**Medium**		
17	Elevation of Plum Bank Road near Cornfield Point to improve evacuation and access options	BOS, Flood Engineer, CTDOT	**2006 to 2011**	**High**		
18	Elevation of Sandy Point Road to improve evacuation and access options	BOS, Flood Engineer	**2011 to 2016**	**Medium**		
19	Elevation of Shetucket Road to improve evacuation and access options	BOS, Flood Engineer	**2011 to 2016**	**Medium**		

Objective 2 – Educate the town residents about natural disasters, mitigation activities and preparedness

#	Supporting Tasks	Who	Timeline	Priority	Completed	

1	Visit schools and educate children about the risks of floods, hurricanes, and other natural hazards and how to prepare for them	OEM, Police, Fire, CRERPA OEM board	**Yearly**	**Medium**		
2	Access existing literature prepare by regional groups and the chamber of commerce and FEMA and display for public distribution in Town Hall and Library	Planning Zoning Commissions Library	**2011 to 2016**	**Medium**		
3	Update town webpage with section on Hazard Preparedness for the public. Include maps of evacuation route, storm surge areas, and shelters. Include options for mitigation for residential structures and business recovery and provide link to FEMA, NOAA, State OEM and CRERPA websites for additional information.	BOS OEM CRERPA State OEM	**Yearly**	**High**		
3a	Swimming Pool – Life Safety Training Facilities	BOS Public Works	**2011-2016**	**Medium**		
4	Provide pamphlets and refer to web-based information for property owners for hazards listed in this document to show options for obtaining additional insurance, structural alterations to protect against various hazard damage, and emergency procedures for families during a hazard even Include information for contractors and homeowners on the risks of building in hazard prone areas	Building Dept. Planning Zoning BOEd OEM Tax Collector Library Chamber of Commerce	**2011 to 2016**	**Medium**		
5	Identify refuges of last resort for those unable to reach designated shelters and review annually program for evacuation of persons without means of transport.	BOS OEM SART	**Annual**	**Very High**		
6	Distribute hurricane preparedness information	BOS OEM	**Annual**	**Very High**		

	including pet sheltering plans					
7	Participate in regional program for sheltering pets during hazard events	State BOHealth CRERPA	**2011 to 2016**	**Medium**		
8	During vulnerable periods, a system of warnings about campfires and open fires should be posted in public locations.	OEM Fire Police	**Annual**	**Low**		
9	Training and education of new firefighters include brush and forest fires	OEM Fire	**Annual**	**Low**		
10	Create a published hotline for public information and volunteer support: family to family assistance, medical assistance, transportation for evacuees, etc.	OEM/ BOS/ RPO Estuary Senior Center	**2006 to 2011**	**Very High**		
10a	Upgrade High School generator	BOS BOF BOEd	**2006 – 2011**	**Very High**		
11	Review established chain of command for hazard mitigation and relief efforts and publish and promote for public knowledge.	BOS OEM	**2006 to 2011**	**Very High**		

Objective 3 - Institute long term goals to enhance short term – high priority mitigation

#	Supporting Tasks	Who	Timeline	Priority	Completed	
1	Advance an assertive open space acquisition plan for unprotected areas that are subject to flooding. Acquire shorefront land for open space	BOS Conservation Commission	**2006-2011**	**Medium**		
2	Implement a Tree Hazard Management Program to encourage responsible planting practices and minimized future storm damage to buildings, utilities, and streets	BOS Tree Warden Utilities	**2016 to 2021**	**Low**		
3	Land-use planning that encourages groundwater retention within existing new,	Planning, Zoning, Conservation	**2011 to**	**Medium**		

	and redeveloping areas (rain gardens, curb-less roads)	Commissions	**2016**			
4	Implement dune restoration and marshland protection techniques, flood storage	HMC, BOS Conservation Commission Inland Wetlands	**2016 to 2021**	**Low**		
5	Advance planning for drought to minimize impacts includes frequent updates to town-wide groundwater studies	BOS	**2016 to 2021**	**Low**		
6	Recommendations for future land use patterns including recharge into existing aquifers, including site design to encourage water conservation through such techniques as: strict regulation of vegetative buffers for stream and river corridors, rain gardens for site drainage, and prohibition of wetlands alteration.	BOS Planning Zoning Conservation Commissions	**2011 to 2016**	**Medium**		
7	Where water supplies are insufficient, new development should include dry hydrants.	BOS Planning Zoning Commissions Fire Marshal	**2016 to 2021**	**Low**		
8	During periods of drought, establish forestry practices that increase the ability of firefighters to access forest fires.	BOS Fire Planning Zoning Commissions	**2016 to 2021**	**Low**		
9	Encourage neighborhood preservation/revitalization for wind damage retrofitting	BOS Planning Zoning Commissions	**2016 to 2021**	**Low**		
10	Require the installation of underground/buried utilities for all new residential and commercial developments	Planning Zoning Commissions	**2016 to 2021**	**Low**		

Objective 4 – Create opportunities for public involvement and investment in hazard mitigation

#	**Supporting Tasks**	**Who**	**Timeline**	**Priority**	**Completed**	

1	Develop a list of techniques for homeowner self-inspection especially for those located in coastal areas as listed below	BOS OEM Building Department	**2011 to 2016**	**Medium**		
2	Adopt regulations and promote low impact development (LID) methods that include storm water on individual lots. Include storm water absorption techniques such as rain gardens, creative use of wetlands, gallery systems to retain water on site for discharge into aquifers	Planning Zoning Conservation Commissions	**2011 to 2016**	**Medium**		
3	Review mitigation goals and objectives with beach associations at the beginning of each season. Encourage the association's help to educate homeowners	BOS OEM	**2011 to 2016**	**Medium**		
4	Publish materials on additional hazards, earthquake, wildfire, and tornado. Encourage additional insurance	BOS OEM	**2016 to 2021**	**Low**		
5	Enlist public participation through public workshops to develop methods for notification of emergencies	BOS OEM Police Fire	**2011 to 2016**	**Medium**		
6	Develop business recovery plan cooperatively with other region's towns and distribute to town businesses	BOS EDC	**2011 to 2016**	**Medium**		
7	Develop strategy and program for flood prone property owners who request a buyout	BOS, BOF	**2016 to 2021**	**Low**		

List of A-Z Strategies for Homeowners of Coastal Properties

a. Wet flood-proofing (Allow water to enter uninhabited areas of the house)
b. Venting on roofs
c. Dry flood-proofing (Sealing the structure to prevent floodwaters from entering)
d. Installation of in place shutters for glazed openings
e. Bracings with struts on walls
f. Elevation of structures by piers, posts or column
g. Anchoring and connections in walls
h. Reinforce entry doors
i. Install hurricane straps and hurricane clips
j. Garage doors with stiffer horizontal members
k. Glider tracks and track supports should be strengthened
l. Bracing struts pilaster columns in walls perpendicular to freestanding walls
m. Renail sheathing
n. Create a secondary water barrier
o. Provide support for sliding glass doors and double doors opening to outside
p. Improve anchorage of windows to openings
q. Add ridge ventilators to reduce uplift of wood sheathing
r. Strengthen garage doors
s. Anchor adjacent structures, including fences, pool enclosures, and patio roofs
t. Improve connections of porch roofs and overhangs
u. Reinforce entry doors
v. Buried utilities in new subdivision development and onsite within new commercial developments
w. Landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce to probability of damage structures
x. Plan for inability or assistance needed to evacuate and strategies for pets.
y. Evaluating dangers of being outside or traveling, the danger of carbon monoxide poisoning in motor vehicles and from portable heaters and power generators in homes, the danger of house fires.
z. Evaluating danger of hypothermia from prolonged exposure to cold weather

HAZUS-MH: Hurricane Event Report

Region Name: oshur

Hurricane Scenario: UN-NAMED-1938-4

Print Date: Monday, January 03, 2005

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Table of Contents

General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 15.45 square miles and contains 2 census tracts. There are over 4 thousand households in the region and has a total population of 10,367 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 4 thousand buildings in the region with a total building replacement value (excluding contents) of 957 million dollars (2002 dollars). Approximately 98% of the buildings (and 77% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 4,766 buildings in the region which have an aggregate total replacement value of 957 million (2002 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Total
Residential	739,028	77.2%
Commercial	153,901	16.1%
Industrial	49,091	5.1%
Agricultural	1,014	0.1%
Religious	8,678	0.9%
Government	1,599	0.2%
Education	3,597	0.4%
Total	956,908	100.0%

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 4 schools, 2 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	UN-NAMED-1938-4
Type:	Historic
Max Peak Gust in Study Region:	146 mph

Building Damage

General Building Stock Damage

HAZUS estimates that about 3,793 buildings will be at least moderately damaged. This is over 80% of the total number of buildings in the region. There are an estimated 1,393 buildings that will be completely destroyed. The definition of the ‘damage states’ is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	5	5.25	7	7.91	19	21.63	54	61.03	4	4.18
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	5.30	0	6.30	0	18.29	1	69.17	0	0.94
Industrial	1	5.38	1	5.98	3	18.18	10	64.22	1	6.23
Religion	0	4.31	0	9.54	1	25.77	2	53.70	0	6.68
Residential	180	3.86	779	16.72	1,181	25.36	1,130	24.26	1,388	29.80
Total	**186**		**787**		**1,204**		**1,196**		**1,393**	

Table 3: Expected Building Damage by Building Type

Building Type	**None**		**Minor**		**Moderate**		**Severe**		**Destruction**	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	1	4.67	1	4.78	3	21.09	10	69.40	0	0.05
Masonry	11	4.76	20	8.51	51	21.81	123	52.97	28	11.95
MH	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	3	5.80	3	5.14	9	16.99	36	70.63	1	1.45
Wood	171	3.84	782	17.50	1,163	26.03	994	22.25	1,357	30.38

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
Fire Stations	2	2	0	0
Police Stations	1	1	0	0
Schools	4	4	0	0

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 38,817 ons of debris will be generated. Of the total amount, Brick/Wood comprises 206% of the total, Reinforced Concrete/Steel comprises of 4% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 3258 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 2,338 households to be displaced due to the hurricane. Of these, 464 people (out of a total population of 10,367) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 772.5 million dollars, which represents 80.73 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 773 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 75% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	354,946.89	54,099.43	19,174.32	4,813.71	433,034.34
	Content	163,343.23	42,504.64	21,128.38	3,614.30	230,590.55
	Inventory	0.00	961.20	2,490.43	25.49	3,477.12
	Subtotal	**518,290.12**	**97,565.27**	**42,793.12**	**8,453.49**	**667,102.01**
Business Interruption Loss						
	Income	830.94	11,536.69	296.90	58.87	12,723.41
	Relocation	44,854.80	8,126.60	1,302.05	995.24	55,278.69
	Rental	16,226.30	5,563.00	340.58	110.72	22,240.61
	Wage	1,955.87	12,564.57	497.48	163.77	15,181.69
	Subtotal	**63,867.92**	**37,790.87**	**2,437.01**	**1,328.60**	**105,424.40**
Total	**Total**	**582,158.04**	**135,356.15**	**45,230.13**	**9,782.09**	**772,526.41**

Appendix A: County Listing for the Region

Connecticut
- Middlesex

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Middlesex	10,367	739,028	217,880	956,908
Total State	**10,367**	**739,028**	**217,880**	**956,908**
Total Study Region	**10,367**	**739,028**	**217,880**	**956,908**

APPENDIX IV

PUBLIC INVOLVEMENT AND IMPLEMENTATION

Each plan for the individual nine towns within the CRERPA region is similar to the other eight towns due to the regional aspect of the communities and the shared hazards that would affect the region overall. That said, each town was evaluated individually to assess hazard characteristics and potential mitigation options unique to that town.

The State of Connecticut does not have a county government system. To facilitate the cooperation of various towns on a regional level, the State of Connecticut established eleven planning regions to provide land use, transportation, and other types of planning for towns within the region. In 1999, a FEMA representative gave a presentation on hazard mitigation planning to land use representatives. During this presentation, the idea of using the Regional Planning Agency to develop hazard mitigation plans for the region's towns was explored and recommended by CTDEP and FEMA. The task of researching and writing the plans was allocated to the three professional planners at CRERPA. The Executive Director, liaison to Old Lyme and Lyme, wrote the plans for those two towns. The Senior Planner, liaison to Old Saybrook, Clinton, and Westbrook was responsible for those individual town plans, and the Transportation/Land Use Planner was responsible for the remaining four towns as well as the overall coordination and final drafts for each of the towns. In the overall development of the plan, the CRERPA region provided plans, data, and process information to many of the other Connecticut RPOs. The exception to this was the Midstate Planning Region. To gain a clearer understanding of needs within this region as they pertain to the CRERPA region, the agency consulted with Emergency Management Directors in adjoining towns through the planning meetings of the Regional Organization of Emergency Management Officials in OEM Region which meet monthly, and coordinated with the consultant working on the Emergency Operations Plan Updates for each of the nine towns.

The overall process to create the final document for the CRERPA region started with frequent site visits to the individual nine towns along with detailed interviews with land use personnel, building permit officials, and emergency management officials to ascertain hazard characteristics for each town. Along with on site interviews with town personnel, various documents and plans were consulted to build an overall description of the town, the region, and applicable hazard vulnerability and mitigation. These documents included: Individual Town Regulations, Plans of Conservation and Development, Regional Regulations and Plans of Development, FEMA flood studies for individual towns, Coastal Area Management Plans, Harbor Management Plans, as well as other documents listed in the Risk and Vulnerability Assessment , Section IV, "Acknowledgements and References.

The “Risk and Vulnerability Assessment” was developed for the region which included descriptions of hazards within each of the nine towns. One component of the Risk and Vulnerability which needs further investigation is the overall dollars that expected from losses due to natural hazard events. The agency made a decision to fully explore the values attributed to various hazards, specifically flooding, once FEMA HAZUS software was updated for compatibility with ARCGIS Version 9. This will allow the agency to provide a more detailed report of property losses and attributed value from those losses. The Assessment was approved by FEMA and DEP officials and reviewed by Emergency Management Officials in each of the towns. It would be included in the adoption process for the full Hazard Mitigation Plan.

The primary component of public involvement with Westbrook and with the other nine towns was numerous interviews with the various public officials involved with land use permitting, building, engineering, and emergency management. To this end, frequent meetings over the course of this project were held with the Regional Organization of Emergency Management Officials. This process was instrumental in identifying the overall role that various town officials and the public play in the assessment and perception of risk and vulnerabilities within the towns. Also, the CRERPA board and the regional forum for the Lower Valley Selectman’s Association were consulted and updated on various aspects of hazard mitigation for the nine towns.

While town officials in the nine towns, specifically the emergency response personnel and emergency managers have an excellent understanding of the need for hazard mitigation and emergency preparedness, complacency and misunderstanding by the general public prevail within these nine communities. Many of the communities have business groups and meetings with these groups have also highlighted the need for further education for commercial and industrial property owners within high hazard areas.

The public hearing and notification process for each town’s hazard mitigation plan provided an excellent opportunity to educate the public and business. As part of the adoption process, several meetings will be held with beach communities, public groups and business organizations to facilitate understanding of hazard mitigation. Part of the implementation of hazard mitigation, as described in Appendix II, includes the continual education and dissemination of information through pamphlets and information on town and regional websites.

The responsibility for various mitigation recommendations within this document are listed in Appendix II and described the extent to which each board, commission, agency, or individual would implement the hazard mitigation tasks for their town.

Maintenance and updates of the plans for these towns would occur every five years with the assistance of the town Emergency Management Directors, or as natural hazards occur and data is re-evaluated.

APPENDIX V

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