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# TOWN OF EAST LYME ANNEX DOCUMENT

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Southeastern Connecticut Council of Governments  
Multi-Jurisdictional Hazard Mitigation and Climate Adaptation Plan Update

March 2023



PREPARED FOR:  
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# 1. Introduction

## 1.1. Purpose of Annex

The planning process for the multi-jurisdiction hazard mitigation plan update commenced in April 2022 and ended in December 2022, spanning a period of nine months. The planning process included 24 jurisdictions (22 municipalities and two tribal governments) with two participating together (Griswold and Jewett City) for a net total of 23 local planning teams represented. For this 4<sup>th</sup> edition of the plan, SCCOG elected to link the planning process to a parallel planning process administered by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) that is known as “Resilient Connecticut 2.0” (stylized as *Resilient Connecticut*). The *Resilient Connecticut* program is described on CIRCA’s web site at <https://resilientconnecticut.uconn.edu/> and the expansion of the program into southeastern Connecticut is described at <https://circa.uconn.edu/2022/02/23/resilient-connecticut-expands-statewide/>.

The linkage of the two planning processes was advantageous for the following reasons:

- Incorporation of climate change into the hazard mitigation plan update
- Increased interest from the local communities, especially for those interested in developing climate adaptation strategies.
- Direct incorporation of climate change vulnerability products developed by CIRCA including the Climate Change Vulnerability Index (CCVI) for flood and extreme heat vulnerabilities.
- Direct incorporation of combined sea level rise and coastal flood inundation simulations from CIRCA
- Positioning of the SCCOG jurisdictions for new funding sources in Connecticut such as the new Department of Energy and Environmental Protection (DEEP) Climate Resilience Fund (DCRF)
- Consistency with the Governor’s Council for Climate Change (GC3) outcomes from the 2020-2021 planning process
- Positioning of the actions for incorporation on the State’s “resilience project pipeline” per Executive Order (EO) 21-3 issued at the end of 2021.

The planning process commenced for the local communities on April 20, 2022, with a presentation to the SCCOG Board. During this presentation, the consultant and CIRCA described the planning process and the approach for incorporating the *Resilient Connecticut* program into the hazard mitigation plan update, and notified the chief elected officials that invitations to local planning meetings would follow at the end of April. Local planning team meetings commenced on May 23, 2022, and ended on July 8, 2022. Workshops with local coordinators were conducted in July and September 2022, and supplemental meetings with water utilities in the region and specific stakeholders continued through November 2022.

The purpose of this HMP annex is to provide an update to the hazard risk assessment and capability assessment provided in the previous HMP, and to evaluate potential hazard mitigation measures and prioritize hazard mitigation projects specific to mitigating the effects of hazards on the Town of East Lyme. Background information and the regional effects of pertinent hazards are discussed in the main body of the Southeastern Connecticut Council of Governments (SCCOG) Multi-Jurisdictional Hazard

Mitigation and Climate Adaptation Plan. Thus, this annex is designed to supplement the information presented in the Multi-Jurisdictional HMCAP with more specific detail for East Lyme and is not to be considered a standalone document.

## 1.2. Hazard Mitigation and Climate Adaptation Goals

The primary goal of the previous hazard mitigation plans adopted in 2013 and 2018 was to identify risks to hazards and potential mitigation measures for such hazards in order to **reduce the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources**. This included the reduction of public and private damage costs. Limiting losses of and damage to life and property was also meant to reduce the social, emotional, and economic disruption associated with a natural disaster.

Coinciding with the incorporation of climate adaptation and the alignment of this HMCAP with the *Resilient Connecticut* planning process administered by CIRCA, the five goals of this HMCAP are:

- Ensure that critical facilities are resilient, with special attention to shelters and cooling centers.
- Address risks associated with extreme heat events, especially as they interact with other hazards.
- Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.
- Reduce losses from other hazards.
- Invest in resilient corridors to ensure that people and services are accessible during floods and that development along corridors is resilient over the long term.

## 2. Community Profile

The Town of East Lyme is a coastal community with a significant inland area located in the southeastern portion of Connecticut. The area was first settled in the 1640s and the Town was incorporated in 1839. East Lyme is approximately 34.8 square miles in land area and includes several historical villages including Niantic and Flanders. The Town is bordered by the Salem to the north, Montville to the northeast, Waterford to the east, Niantic Bay and Long Island Sound to the south, and Old Lyme and Lyme to the west. The Town can be accessed via several major transportation arteries including Interstate 95, Route 1, Route 156, Route 161, and the Amtrak/Metro North Railroad. Railroad stations are located nearby in New London and Old Saybrook.

While the northern area of town is relatively rural to suburban in nature, the shoreline area is more densely developed. The Town includes several beach communities in the Niantic area, including Attawan Beach, Black Point, Crescent Beach, Giants Neck Beach, Giants Neck Heights, Oak Grove Beach, Old Black Point, Pine Grove, and Saunders Point. Some of these communities have their own Zoning regulations.

### 2.1. Physical Setting

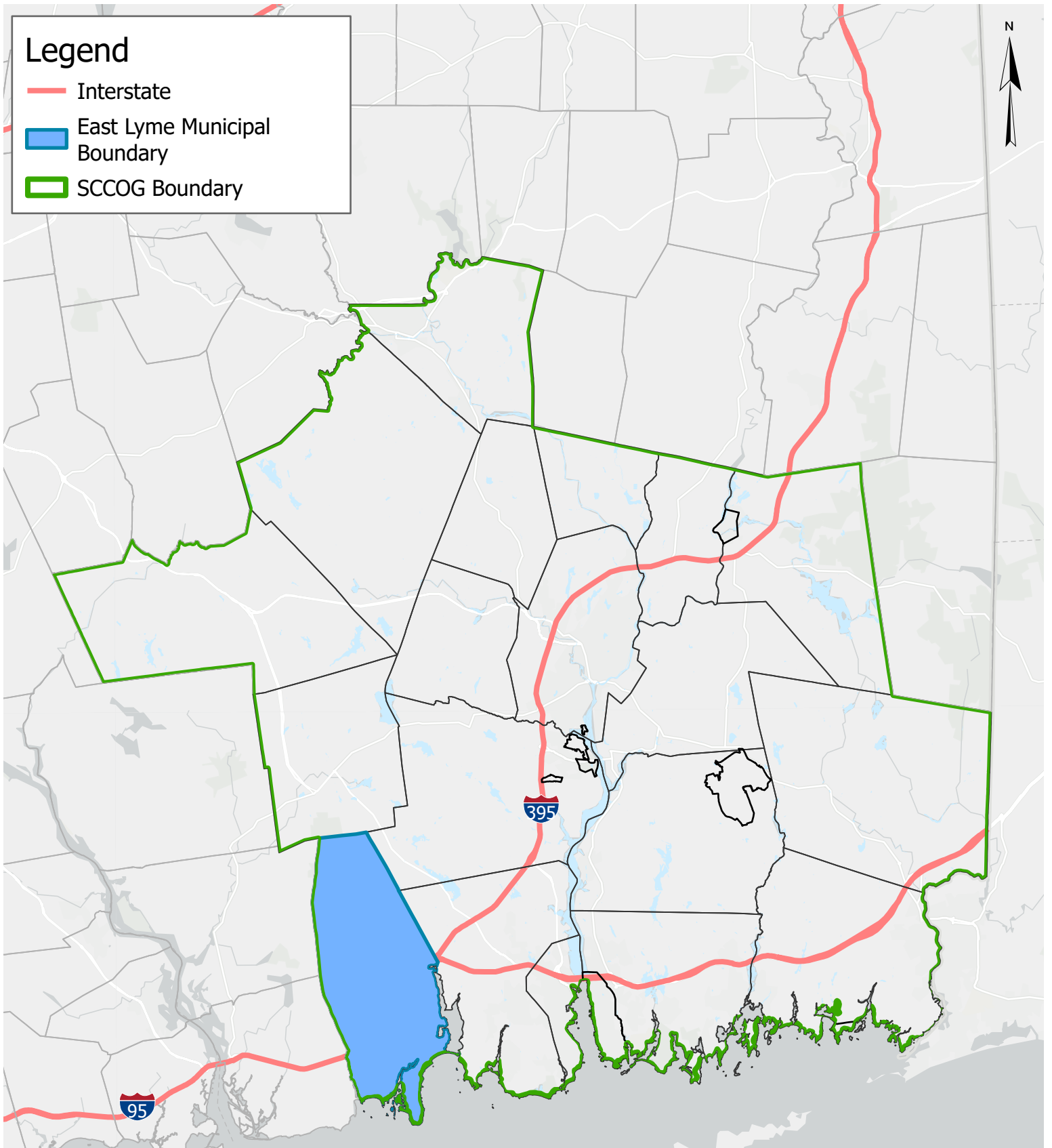
The Town of East Lyme is a geographically large community located on the Connecticut shoreline that also has a significant inland area. Elevations range from sea level to just over 460 feet on hilltops in the Nehantic State Forest in the northwestern portion of town. Several inhabited islands are located along the East Lyme shoreline, including Griswold Island and Brainard Island.

Geology is important to the occurrence and relative effects of natural hazards such as earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in lands underlying the Town of East Lyme. The town lays above several bedrock types which trend southwest to northeast across the area. These formations include the Hope Valley Alaskite Gneiss, Mamacoke Formation, New London Gneiss, Plainfield Formation (including a quartzite unit), Potter Hill Granite Gneiss, Rope Ferry Gneiss, Tatnic Hill Formation, and Westerly Granite. Each of these formations consists primarily of gneiss which is a relatively hard metamorphic rock with the exception of the Westerly Granite which is a hard igneous rock. Bedrock fault lines are not known to be mapped in East Lyme.

The surficial geologic formations in the town include glacial till, stratified drift, and coastal formations. Refer to the Multi-Jurisdictional HMP for a generalized view of surficial materials. The majority of the town is underlain by glacial till. Till contains an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. Areas in the vicinity of the Four Mile River, Bride Brook, the Pattagansett River, Latimer Brook, and Oil Mill Brook are underlain by stratified drift, as is the majority of Niantic, Golden Spur, and the area between the State Department of Correction and Indian Woods. The amount of stratified drift present is important as areas of stratified materials are generally coincident with floodplains. The amount of stratified drift also has bearing on the relative intensity of earthquakes and the likelihood of soil subsidence in areas of fill.

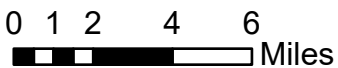
# Legend

- Interstate
- East Lyme Municipal Boundary
- SCCOG Boundary



## Regional Location of East Lyme

SCCOG Hazard Mitigation and Climate Adaptation Plan  
Town of East Lyme  
Date: 7/22/2022



Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

## 2.2. Drainage Basins and Hydrology

The town lies within three regional drainage basins that eventually drain to Long Island Sound. These include the Eight Mile River, Southeast Western Complex, and the Southeast Shoreline regional basins as delineated by the Connecticut DEEP. Sub-regional drainage basins include those associated with Latimer Brook in the northeastern part of town, the Niantic River in the southeastern part of town, the Pattagansett River and Bride Brook in the central to southern part of town, and the Fourmile River on the western edge of the town. In addition, small areas of town drain to Harris Brook and the East Branch Eightmile River in Salem, Beaver Brook in Lyme, and the Lieutenant River in Old Lyme. One minor drainage basin also exists that drains an unnamed stream in the Giants Neck area to Long Island Sound.

There are many impoundments throughout the town including Bride Lake on Bride Brook, Dodge Pond in Niantic, Gorton Pond, Pattagansett Lake, and Powers Lake on the Pattagansett River, and Darrow Pond above Latimer Brook. Along the shoreline, recreational boaters enjoy protected harbors and coves such as the Niantic River, Smith Cove, and the Pattagansett River estuary. These areas are protected by from wave action by islands in Long Island Sound and the spit of land known as "The Bar" across the mouth of the Niantic River. Niantic Bay is located to the southeast of Niantic but does not have any protection from wave action on Long Island Sound.

## 2.3. Land Cover

According to the 2016 1-meter resolution land cover developed by the NOAA Office of Coastal Management, East Lyme is predominantly comprised of mixed forest, with approximately 68.39% of the town classified as such. The second largest land cover type is developed open space, which covers about 9.13%, and next is developed impervious which is about 8.32% of land cover. All land covers and their percent coverage can be found in Table 2-1.

*Table 2-1 Town of East Lyme Land Cover*

Land Cover Type (2016)	% Coverage
Barren Land	0.67
Cultivated Crops	0.65
Developed, Impervious	8.32
Developed, Open Space	9.13
Estuarine Emergent Wetland	0.92
Estuarine Scrub/Shrub Wetland	0.00
Grassland/Herbaceous	1.53
Mixed Forest	68.39
Open Water	2.83
Palustrine Aquatic Bed	0.42
Palustrine Emergent Wetland	0.65
Palustrine Forested Wetland	3.61
Palustrine Scrub/Shrub Wetland	0.32
Pasture Hay	0.88
Scrub/Shrub	1.32
Unconsolidated Shore	0.36

## 2.4. Population, Demographics, and Development Trends

As of the 2020 Decennial Census, the population for the town is 18,693, which equates to about 537 people per square mile. East Lyme is a suburban community which relies on diversified industries and commercial businesses rather than large industries to support its tax base. The northern section of the community is rural with increasing development density towards the coastline. Businesses are concentrated in the village centers of Flanders and Niantic, and extend west from Niantic along Route 154, with nine marinas located on the Niantic River. The largest employer in the community is the State Department of Corrections which operates several rehabilitation facilities for men and women.

Historically, East Lyme was an agricultural community supported by a modest textile industry in Golden Spur (a small village at the headwaters of the Niantic River), and maritime industries in Niantic. After the completion of Interstate 95, suburban expansion followed in the 1960's through the 1980's with many residential homes built outside of the major villages during this time period. Recent development has included additional single-family homes as well as infill development in Niantic and Flanders.

According to the 2020 Plan of Conservation and Development (POCD), there has been robust development throughout town, much of which is a product of the 2009 POCD. Some of the major projects include the development of the Gateway Planned Development District and the implementation of POCD recommendations for Niantic such as the inclusion of diversified housing options, a new park, and improvements to the Niantic Bay Boardwalk. On the residential front, the town has replaced traditional subdivision layouts with cluster developments by way of the Conservation Designs Developments (CDDs), and commercial development continues, but is limited to the commercial districts.

The town has also made significant headway in protecting natural resources since the 2009 POCD. The town has coordinated with and supported various entities on expanding and establishing nature trails. In 2020 East Lyme received two state grants for the acquisition of open space. One parcel, the Pattagansett River Watershed Preserve, is a 38.7-acre parcel surrounded by protected and includes wetlands and vernal pools. The other, in conjunction with the Town of Montville, is the Nehantic Nature Preserve. This is a 320-acre tract of open space in the Latimer Brook watershed which feeds into the Niantic River.

Overall, new development and redevelopment in East Lyme is not increasing risks to natural hazards. Redevelopment throughout the community offers significant opportunities for flood mitigation to be incorporated into buildings and stormwater management to be addressed on-site; and new development is constructed per the flood damage prevention, wind loading, and snow loading requirements in the State Building Code.

The 2020 American Community Survey 5-year estimates identified the annual average median income for East Lyme to be \$93,705, with an average of 48.5% of the population holding a bachelor's degree or higher, and an average unemployment rate of 5.8% throughout town.

## 2.5. Governmental Structure

The Town of East Lyme is governed by a Board of Selectman – Town Meeting form of government as authorized by the Town Charter most recently revised in December 2009. The First Selectman is the

chief executive officer of the Town and is directly responsible for the administration of all departments, agencies, and offices. The Board of Selectman reviews and approves all Town business.

The Town has several departments that provide municipal services. Departments pertinent to natural hazard mitigation include the Building Official, Engineering, Fire, Land Use, Police, Public Safety, and Public Works. In addition, there are several boards and commissions that can take an active role in hazard mitigation, including the Commission for the Conservation of Natural Resources, Inland Wetland Agency, the Harbor Management-Shellfish Commission, the Planning Commission, the Water & Sewer Commission, the Zoning Board of Appeals, and the Zoning Commission. The general roles of most of these departments and commissions are common to most municipalities in SCCOG and were described in Section 2.9 of the Multi-Jurisdictional HMP. More specific information for certain departments and commissions of the Town of East Lyme is noted below:

- The Building Official inspects new development and substantial redevelopment for compliance with current building codes. The Building Official is authorized by ordinance to review all applications and building permits for consistency with flood hazard regulations. The Town of East Lyme utilizes the Connecticut Building Code.
- The Commission for the Conservation of Natural Resources supervises the Town's open space and manages farmland preservation programs.
- The Public Safety Department oversees Police, Fire, and Ambulance services in the Town. It also maintains a comprehensive set of web links on the Town's website regarding how to prepare for natural hazards such as hurricanes and lightning strikes, how to sign up for the CT Alerts "Everbridge" notification system, as well as general safety tips. It also has a Facebook page that it uses to broadcast safety tips and reminders to residents.
- The Town Engineer, with the assistance of the Engineering staff, supports the Town's Land Use Commissions and Public Works, oversees certain construction projects, provides flood awareness information, and manages the Town's Community Rating System compliance including maintaining elevation certificates, distributing an annual awareness newsletter regarding the availability of flood mapping, and maintaining documents regarding flooding and mitigation in the local library.
- The Town of East Lyme has three volunteer fire departments that provide emergency medical, fire suppression, fire/ disaster prevention, rescue, hazardous materials, and disaster mitigation services to the town. Public Water Service for fire protection is provided by the East Lyme Water Department in certain areas. The Public Safety Director is also the Town's Fire Marshall. Patients are transported to Lawrence & Memorial Hospital in New London.
- The Harbor Management - Shellfish Commission maintains and enforces a Harbor Management Plan and ordinance.
- The Inland Wetland Agency reviews plans for compliance with the Town's Inland Wetland and Watercourse Regulations.
- The Planning Commission and the Zoning Commission oversee orderly and appropriate use and development of residential, commercial, and industrial land and the conservation of natural resources. They review and approve a wide range of land use applications, zoning regulation



amendments, planning and development projects, and grant opportunities to ensure that development and growth in the town is consistent with existing land use, environmental policy, regulations, and the objectives of the Plan of Conservation and Development. They are assisted by the professional staff of the Land Use Department who administer the Town's Zoning Regulations, Subdivision Regulations, administer the Coastal Management Program, perform planning studies, and provide technical assistance to developers. The Zoning Enforcement Officer is authorized by ordinance to review all applications and building permits for consistency with flood hazard regulations.

- Police services are provided by a Resident State Trooper of the Connecticut State Police and the Town of East Lyme Police Department. The Police Department consists of 21 full-time, paid personnel, one-part time officer, and support staff. The Department provides situation containment and traffic direction services during emergencies.
- The Public Works Department provides services including safe, efficient, and well-maintained infrastructure of roads and rights-of-way, bridges, and stormwater management. The Public Works Department also conducts snow removal and deicing on roads; tree and tree limb removal in rights-of-way; and maintains and upgrades storm drainage systems to prevent flooding caused by rainfall. Public Works also performs drainage system inspections and maintenance to ensure continued credit with the Community Rating System.

The roles of Town departments have not changed since the time of the previous HMP. Thus, the Town of East Lyme is technically, financially, and legally capable of implementing mitigation projects for natural hazards to the extent that grant funding is available. As discussed in the next section and the historic record throughout this annex, the Town is densely developed in certain areas and undeveloped in others, presenting particular vulnerabilities to different types of natural hazards in different areas.

## 2.6. Review of Existing Plans and Regulations

The Town has several Plans and regulations that suggest or create policies related to hazard mitigation. These policies and regulations are outlined in the Emergency Operations Plan, Plan of Conservation and Development, the Coastal Area Development Plan and Harbor Management Ordinance, Inland Wetland and Watercourse Regulations, Subdivision Regulations, and Zoning Regulations.

### Emergency Operations Plan

The Town has an Emergency Operations Plan (EOP) that is updated and certified by the Board of Selectmen annually. This document provides general procedures to be instituted by the First Selectman, Public Safety Director, and/or designee in case of an emergency. Emergencies can include but are not limited to natural hazard events such as hurricanes and nor'easters. The EOP is directly related to providing emergency services prior to, during, and following a natural hazard event.

### Plan of Conservation and Development (2020)

The POCD was most recently updated in 2020 with contributions from local boards, commissions, committees, citizens, and citizen groups. The Plan seeks to be a statement of policies, goals, and standards for the physical and economic development of the



The East Lyme POCD is relatively consistent with the current goals and actions of the HMCAP. The plan discusses several natural hazards, and the impacts on future development, along with some of the secondary impacts of responding to events, such as salt impacts on roadways from winter storms. Some of the specific POCD goals that align with hazard mitigation include:

- Protect East Lyme’s native ecosystems, biodiversity and maintain the quality of East Lyme’s wetlands, watercourses, and groundwater.
- Promote wise use of land in the coastal area, which recognizes the importance of the Town’s coastal resources and existing water-dependent uses.
- Develop adequate water supply to meet current and future demand for public water in the Town.
- Prepare for the impacts of climate change and sea level rise along our town’s coastline.

The East Lyme POCD is considered relatively consistent with the goals and actions of the HMCAP as it addresses flooding, sea level rise, and climate change as a whole. However, there is room for incorporation of additional hazards as events like winter storms are not addressed. The next POCD updated will continue to incorporate elements of the HMCAP.

#### Coastal Area Development Plan and Harbor Management Ordinance

The East Lyme Coastal Area Development Plan was originally adopted by the Planning Commission in 1982 but is now included in the Plan of Conservation and Development. The Harbor Management Ordinance authorizes the individual Harbor Masters to carry out harbor management directives and enforce all provisions of the Plan, including collecting fees for mooring permits and assigning mooring locations; standardizing mooring tackle requirements; and enforcing wake and speed, waterskiing, motor, noise, and refuse regulations. In particular, these ordinances allow the Town to maintain a list of persons who currently have moored boats such that removal or emergency response can be coordinated.

#### Zoning Regulations

The Zoning Regulations of the Town of East Lyme, Connecticut have been amended through October 21, 2021. They include a variety of preventative regulations pertinent to mitigating natural hazards, including development limitations with regards to slopes, drainage, wetlands, and floodplains. These regulations are applied during the permitting process for new construction and during substantial improvement of existing structures.

Hazard-related regulations include:

- Private driveways must be wide enough and cleared to a sufficient height to ensure passage of fire and emergency vehicles. (S20.23)
- All structures must be more than 25 feet from a tidal wetland or watercourse. (S20.15)
- Conservation Design Development regulations provide more flexible standards to permit residential lots in specified districts to be reduced in dimension and designed to occupy less than the total tract to be subdivided, allowing designation of additional dedicated open space. (S23)

- A certain percentage of developments must be dedicated as open space, depending on the development zone and size (10% minimum).

New construction or substantial improvements are required to be elevated or resistant to flood damage, and utilities must be located to be free of flooding (such as underground) and specifically must be located underground for elderly housing developments in special use districts. Sections pertinent to flood hazard mitigation include:

- Section 14, Coastal Area Management outlines specific site plan requirements for development in areas located fully or partially within the coastal boundary as delineated on the Coastal Boundary Map for the Town of East Lyme. This section requires the applicant to conform to Section 22a-105 through 22a-109 of the Connecticut General Statutes.

Section 15, Flood Hazard Areas addresses specific requirements for development in Flood Plain Zone, Flood Hazard Areas, and the Coastal Area Boundary; construction adjacent to bodies of water and in wetland areas; and design standards in special flood hazard areas in conformance with NFIP regulations. Section 16, Tidal Marsh Districts addresses specific requirements for development in coastal areas and islands characterized by tidal wetlands. Subdivision Regulations

The Subdivision Regulations in the Town of East Lyme were last amended in February 2011. The regulations require that a Stormwater Management Plan be developed and submitted as part of the application process and that the peak runoff leaving the site under proposed conditions can be no greater than under existing conditions. The regulations further require fire protection water to be available dependent upon subdivision size and require that utilities be located underground whenever feasible.

#### Inland Wetland and Watercourses Regulations

The Inland Wetlands and Watercourses Regulations in the Town of East Lyme were last amended on March 24, 2016. The regulations require a permit for certain regulated activities which take place within 100 feet of a wetland or watercourse or that may impact a wetland or watercourse. These regulations build on the preventative flood mitigation provided by the Zoning Regulations and Subdivision Regulations by preventing fill and sedimentation that could lead to increased flood stages.

#### Water Supply Plan

East Lyme is in the process of updating its municipal Water Supply Plan, last updated in 2005. The Water Supply Plan outlines the capital improvements and operations necessary to meet the Town's water needs, and the steps to be taken to ensure a safe adequate source of future water supply. This plan includes the locations and needs of the Town's critical facilities, and addresses firefighting needs; therefore, it is relevant to hazard mitigation. The update is expected to be completed by the end of 2017.

## 2.7. Critical Facilities, Sheltering Capacity, and Evacuation

The Town of East Lyme considers several facilities to be critical to ensure that emergencies are addressed while day-to-day management of the Town continues. These include both buildings and

utility infrastructure. Critical facilities that are buildings are presented on figures throughout this annex and summarized in Table 2-2.

As shown in Table 2-2, critical structures in East Lyme are not located within the 1% annual chance floodplain. Note that several sewer pumping stations and Town water supply wellfields are partially located in the floodplain and could also be impacted by hurricane storm surge. These facilities are described in more detail below.

Table 2-2 Town of East Lyme Critical Facilities

Facility	Address or Location	Emergency Power	Shelter	Cooling Center	In SFHA
<b>Emergency Services</b>					
Flanders Fire Department	151 Boston Post Road	✓			
Niantic Fire Headquarters	8 Grand Street	✓			
Niantic Fire Station	227 West Main Street	✓			
Police Department	278 Main Street, Niantic	✓			
Public Safety Building: Police/EOC/Dispatch/Fire Marshal	277 West Main Street	✓			
Communications/state fiber hub	171 Boston Post Road	✓			
Public Works Field Services Complex	8 Capitol Drive	✓			
Public Works Sanitation Department	91 Roxbury Road				
Town Hall	108 Pennsylvania Avenue				
<b>Shelters</b>					
Community Center (Local)	41 Society Road	✓	✓	✓	
East Lyme High School (Secondary/pod)	30 Chesterfield Road		✓		
East Lyme Middle School (Regional)	31 Society Road	✓	✓		
<b>Elderly Housing &amp; Health Services</b>					
Bride Brook Rehab Center	23 Liberty Way, Niantic	✓			
Charter Oak (Medical Clinic)	324 Flanders Road				
Crescent Point	417 Main Street	✓			

### Volunteer Fire Departments and Emergency Services

The Town of East Lyme has a fire station headquarters in downtown Niantic, a station in Flanders, and a third station on Route 156 near Rocky Neck State Park. Equipment includes pump trucks, towers, ambulances, and forestry equipment. The Fire Departments and town staff perform emergency services training with local utilities each year. None of these facilities are susceptible to flooding or storm surge.

### Police Department

# Climate Change Summary Sheet for Town of East Lyme

## What are the Town's Top Climate Change Concerns?

**Flooding:** Direct coastal flood risks are a major concern for the Town. Furthermore, coastal flooding can isolate specific areas by inundating roads. Therefore, the coastal flood risks involve both direct damage and loss of egress/access.

**Extreme Heat:** Lack of extreme heat respite in the northern part of East Lyme is a potential risk in the town. Despite the relative lack of heat vulnerability in this part of East Lyme, cooling options need to be nearby and accessible.

**Others:** The Town owns and operates its own public water and sewer systems, which can lead to incremental burdens during extreme events. Climate change can also lead to drought concerns.

## Which Hazard Mitigation and Climate Adaptation Actions Will Address Climate Change Concerns?

**Flooding:** Fund and construct secondary egress for the Bush Hill Drive neighborhood along the town-owned right-of-way. Conduct feasibility studies to elevate at-risk sections of Atlantic Street, Bush Hill Road, and Brook Road.

**Extreme Heat:** Evaluate the feasibility of a new cooling center in the northern part of East Lyme; and secure reliable transportation options for people to access cooling centers.

**Others:** Identify mitigation techniques and funding sources for water and sewer infrastructure such as wells, water pump stations, and sewer pump stations. Floodproof or relocate facilities located in hazard areas to reduce service disruptions and environmental releases during disaster events.

The Town's Police Department has a generator and is protected from coastal flooding and storm surge by the Amtrak-Metro North railroad embankment located to the rear of the building.

#### Public Safety Building / Emergency Operations Center

The Town's Public Safety Building houses the Town's Fire Marshall, Emergency Management, and 9-1-1 dispatch services. This building is also the Town's Emergency Operations Center and has a generator and a radio antenna. The Town of East Lyme broadcasts government information and daily announcements on cable channel 22 from this building, and this channel can be used to broadcast emergency messages.

#### Public Works Facilities

East Lyme's primary Public Works facility is the relatively new Field Services Complex at 8 Capitol Drive (on the corner of Colton Road). This is the Town's primary fueling facility and operational center. It is used for vehicle and equipment storage and houses the Town's salt and sand supply. Public Works vehicles need to travel briefly through Old Lyme to leave the facility. This facility has had a generator installed since the previous HMP. The East Lyme Sanitation Department is located at the Old Public Works garage on Roxbury Road. This site focuses on water and sewer services and is a backup fueling facility.

The transfer station is the designated location for a brush-disposal operation for debris removal and processing following windstorms.

#### Town Hall

The East Lyme Town Hall houses records, plans, and other documents important for administering the Town. It is also the media center during emergencies. A generator is desired for this facility.

#### Utilities

The Town of East Lyme provides public water service to Niantic, Flanders, and the surrounding areas via water supply wells located along the Pattagansett River and Bride Brook. In general, well heads are elevated above the 100-year floodplain, although buildings may be susceptible to storm surge during a major hurricane event. As the public water supply wells diminish the flow in nearby watercourses, the Town has limitations on the amount of water it can withdraw during the summer months. The Town typically imposes mandatory water conservation measures each summer in order to reduce demand on its water system. This limitation does not apply to emergency situations. In order to increase summertime supply, the Town recently performed a \$10 million water main extension to Lake Konomoc in Waterford. The Town has formed an agreement with the New London Water Department to pump water into Lake Konomoc in the winter and spring and buy it back during the summer when demand is high.

East Lyme's water resources have improved in the past five years. A new interconnection has been developed with New London, facilitating water exchange between the two municipalities, and creating a water system redundancy. A new water tower constructed in Montville provides additional water supply during dry periods and adds water pressure to East Lyme's distribution system.

The Town of East Lyme has 22 sewer pumping stations and associated infrastructure that they consider to be critical facilities. Sewage is directed to the New London Wastewater Treatment Facility. Many of these pumping stations are also located in the 1% annual chance floodplain and/or coastal surge zones. The town has completed mapping and a vulnerability analysis of wastewater pumping stations throughout town. Some resilience improvements are already being incorporated into pump station upgrades. The town has previously identified one station (in the Black Point area) that is at-risk of flooding, and which they wish to relocate to a higher elevation.

#### Shelters

East Lyme Middle School is the Town's primary shelter and can hold approximately 700 people. The school has a generator, and the shelter is American Red Cross certified. The Town's backup shelter is the Community Center which can hold less than 50 people. This building also has a generator but is not American Red Cross Certified. East Lyme High School is also considered a backup shelter and can hold approximately 1,600 people. In addition to Town departments, the local Community Emergency Response Team (CERT), the American Red Cross and the Salvation Army provide services related to mitigation and emergency management. The CERT provides support to emergency personnel during large-scale emergencies and fulfills tasks that do not require a high level of training, leaving trained emergency personnel available to respond to incidents. The American Red Cross and the Salvation Army help provide shelter and vital services during disasters and participate in public education activities. If additional space was needed, the Town would send evacuees to a regional American Red Cross shelter.

The town has also identified the community center as a cooling center for residents during a heat wave or extreme heat event.

#### Communications

The Town's communication capability is considered adequate for most circumstances. Emergency communications are good except during long power outages. The Town relies on radios, cellular phones, and email for much of its communications. The Town is also part of the CT Alerts "Everbridge" Reverse 9-1-1 system for emergency notification of residents. Typically, Town personnel post notifications on bulletin boards and on the Town website prior to major storms and also utilize local media (newspapers, television, and radio) to pass information during and after storms. Residents can also contact the First Selectman or any Town staff directly with comments related to natural hazards or emergency response.

Communication was difficult during the power outages following Hurricane Irene and Winter Storm Alfred due to downed trees and power outages at the nearby cellular towers. Town personnel posted information in public locations made personal contact with many residents by going door-to-door during the outage to pass along necessary information.

#### Health Care and Senior Living Facilities

The Town has three walk-in medical clinics but only the Charter Oak Walk-In Medical Center is considered to be a critical facility. The Town has 150 units of elderly housing that they do not consider to be critical facilities, but they do consider the Bride Brook Rehabilitation Center and the Crescent Point

assisted living facility to be critical facilities since these house patients who almost certainly require additional assistance during an emergency. None of these facilities are susceptible to flooding.

#### Evacuation Routes

East Lyme has identified evacuation routes for hurricane events. Typically, residents utilize State roads or local roads to exit the town. The highest capacity egress routes from East Lyme include Interstate 95, Route 1, Route 156, or Route 161 into Old Lyme or Waterford.

### 2.8. Repetitive Loss Properties

A repetitive loss (RL) property is defined as any insurable building that has had two or more claims exceeding \$1,000 that were paid by the National Flood Insurance Program (NFIP) within a ten-year period. As of June 2022, the Town of East Lyme has 23 inland RL properties, with NFIP payments totaling \$1,512,677.31. There are also 13 coastal RL properties that have been flooded from the Niantic Bay, Niantic River, and Long Island Sound. All 36 RL properties in town are residential.

### 2.9. Exposure to Climate-Affected Natural Hazards

Properties, people, historic resources, and critical facilities in the Town are exposed to natural hazards affected by climate change (i.e., severe storms, coastal flooding, droughts) as well as hazards that are not affected by climate change (i.e., earthquakes). As an initial screening of exposure to hazards, areas of risk have been overlaid onto parcel and point data in a GIS to understand the maximum potential exposure to hazards. The results of this analysis are found in Table 2-3.

Table 2-3 Town of East Lyme Exposure Analysis

Hazard	At-Risk Parcels		At-Risk Facilities		At-Risk Historic Assets	
	Value	Number	Value	Number	Value	Number
<b>Hurricane/Tropical Storm</b>	\$2,548,547,623	9,384	\$305,026,950	10	\$267,521,130	15
<b>Severe Thunderstorm</b>	\$2,548,547,623	9,384	\$305,026,950	10	\$267,521,130	15
<b>Severe Winter Storm</b>	\$2,548,547,623	9,384	\$305,026,950	10	\$267,521,130	15
<b>Tornado</b>	\$2,548,547,623	9,384	\$305,026,950	10	\$267,521,130	15
<b>Drought</b>	\$822,154,772	2,214	\$294,224,200	4	\$821,720	2
<b>Flood</b>						
1% Annual Chance	\$870,592,893	1,574	\$271,116,150	3	\$40,766,870	4
Coastal (VE)	\$451,262,020	529	-	-	-	2
0.2% Annual Chance	\$1,076,564,263	2,511	\$272,792,020	4	\$41,227,310	6
<b>Storm Surge</b>						
Category 1	\$451,377,940	543	\$1,527,330	1	-	2

Category 2	\$540,742,530	848	\$5,370,470	2	-	2
Category 3	\$618,462,330	1,111	\$7,046,340	3	-	2
Category 4	\$755,098,200	1,488	\$7,046,340	3	\$40,431,300	3
<b>Earthquakes</b>	\$2,548,547,623	9,384	\$305,026,950	10	\$267,521,130	15
<b>Wildfire</b>	\$501,092,260	1,365	\$294,224,200	4	\$821,720	2

## 2.10. Community Climate Change Challenges

As is with all of the SCCOG communities, the Town of East Lyme has several concerns regarding climate change challenges. Most communities in the region are typically most concerned with the impacts of increased flooding and extreme heat events, however, there are often concerns about other climate driven hazards. The following summary sheet identifies the top flooding, heat, and other climate change concerns for the town, along with the hazard mitigation and climate adaptation actions that will work to address these concerns.



## 3. Extreme and Severe Storms

### 3.1. Climate Change Impacts

Climate change projections indicate varying changes in the frequency and intensity of severe storms and their relative hazards like precipitation and wind. It is expected that as global mean temperatures continue to rise, storms like hurricanes, tropical storms, and severe thunderstorms, may become more frequent and more intense. The degree to which these events might change, and the confidence levels in the models, vary by event type.

Hurricanes and tropical storms are likely to be accompanied by higher wind speeds and an overall increase in intensity. Warm water and air temperatures are essentially the fuel source for the storm, therefore warmer temperatures mean an increase in fuel which can produce more intense winds and high precipitation levels.

While the future behavior of tornado and high wind events is a little more challenging to predict in comparison to hurricanes, it has been noted that the number of days of tornadic activity has decreased in recent decades, though the number of tornadoes in a single day has increased.<sup>1</sup> There is a similar lack in confidence when projecting severe thunderstorm and wind events. Because these events are short-lived and relatively small-scale, monitoring and modeling are more challenging. Overall, however, future climate conditions are likely to become more conducive to the development of such events, therefore increasing the potential for occurrence.

Severe winter storm events, similar to hurricanes, are expected to become more intense under future climate conditions, however they are expected to become less frequent. These storms will continue to be capable of producing large amounts of precipitation, though in future decades this precipitation will consist of less snow and more wintry mix or rain.

These changes in storms could mean an increase in risk throughout town or for specific populations, more severe storm damages and impacts, or an increase in flooding occurrences.

### 3.2. Hurricanes and Tropical Storms

#### 3.2.1 Setting and Recent Occurrences

Several types of hazards may be associated with tropical storms and hurricanes including heavy or tornado winds, heavy rains, and flooding. Flooding and storm surge hazards are discussed in Section 5.2 and Section 4.3 of this annex. Wind hazards are widespread and can affect any part of the town. However, some buildings and areas in the town are more susceptible to wind damage than others.

Tropical Storm Irene impacted the town in August 2011. Trees fell throughout the town and the region, causing power outages that on average lasted several days. Many town facilities were operated with generators. Debris removal took a few weeks to complete because a significant number of trees were damaged.

Super Storm Sandy in 2012 is still one of the most remembered and impactful events in the region's recent history. Although coastal flooding was the primary damage vector from the storm, wind gust of

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<sup>1</sup> <https://nca2018.globalchange.gov/chapter/2/>

over 60 mph damaged trees and brought down power lines as well. East Lyme received over half a million dollars in FEMA federal aid immediately after the event in order to facilitate the cleanup.

On August 2, 2020, Tropical Storm Isaias swept through the State bringing severe winds which resulted in the highest number of outage events Connecticut has ever experienced. With over 620,000 outages reported by Eversource alone, the state's largest electric supplier, residents across the SCCOG region were without power, cable, and internet for extended periods of time. While this storm did not generate typical amounts of rainfall experienced during a tropical storm event, the wind damage exceeded expectations bringing down trees and power lines across the state.

In 2021, there were four tropical storm events that passed through, or within 50 miles of, the state. Some of these events, which are described in more detail below, resulted in flooding along several brooks and stream crossings, including roadway washouts. During Hurricane Ida, the Town reported that the areas that "are known to flood" did so during this heavy precipitation tropical event. Power outages during these events, and other severe storms, were still a challenge for the town.

The 2021 events included Elsa, Fred, Henri, and Ida.

- July 9, 2021 (T.S. Elsa) – Elsa made landfall as a tropical storm in Florida and traveled along the eastern seaboard. It passed through Southeastern New England bringing high winds and rainfall. Gusts were reported over 40 mph, and residents throughout the region and state were left without power.
- August 19, 2021 (Extratropical Storm Fred) – This tropical event passed north of the state bringing heavy rain to some areas in Connecticut; there was a reported 5.14 inches in West Hartford. Fred also produced an EF-0 tornado in Windham County.
- August 22, 2021 (T.D. Henri) – Hurricane Henri made landfall in Rhode Island as a tropical storm and then traveled northwest across the State of Connecticut. While the impacts for Henri were projected to be more severe than they actually were, the storm did result in heavy rainfall and thousands of power outages.
- September 1, 2021 (Extratropical Storm Ida) – Though Hurricane Ida made landfall in Louisiana as a category 1, the storm moved south of Long Island as an extratropical storm and is reported to be costliest storm even since Hurricane Sandy a decade earlier. Ida caused major flooding across Connecticut and the Southeastern Region. For the first time, a statewide flash flood warning was issued. Several communities in the state, including the City of Norwich, warned residents to have minimal contact with surface waters due to the discharge of untreated sewage. There were reports of 7 to 8 inches of rainfall in the Southeastern Region, and as high as 8.58 inches in Uncasville.

### 3.2.2 Existing Capabilities

Wind loading requirements are addressed through the state building code. The Connecticut State Building Code was most recently adopted with an effective date of October 1, 2016. The code specifies the design wind speed for construction in all the Connecticut municipalities. The ultimate design wind speed for East Lyme ranges from 125 to 145 miles per hour depending on the building use (for example, hospitals must be designed to the higher wind speed). Note that changes in design wind speed figures

since the previous HMP are largely the result of a shift from "nominal" to "ultimate" wind speeds, for compatibility purposes; see the Connecticut Building Code or the American Society of Civil Engineers website for more information. East Lyme has adopted the Connecticut Building Code as its building code. Town personnel note that recent buildings all meet the building code for wind loading.

The Town has a Tree Warden who can post notifications and schedule tree removal for damaged or dangerous trees located in rights-of-way or on Town land. The Highway Department also monitors trees as part of their normal rounds and has a budget for minor tree maintenance. The Town hires outside contractors for larger jobs such as tree removal. The Town also has links regarding hurricane preparedness and disaster preparedness on the Public Safety webpage on its website.

The Tree Warden coordinates tree removal and maintenance with the local power utility. Since the previous HMP, CL&P has been acquired by Eversource. In response to the major power-outages caused by Tropical Storm Irene and Hurricane Sandy, as well as significant winter storm events, Eversource has taken an aggressive approach to tree maintenance and has improved communication and coordination with municipalities. Municipal staff report that Eversource has enhanced its tree clearing efforts, has updated its facilities, and has been working to strengthen the power grid and build in redundancies. Communication and coordination have improved due to Eversource's liaison program.

Eversource reportedly maintains a list of critical facilities and uses that to prioritize outage prevention and response. The Town also has access to a circuit map, which shows the power distribution grid and includes critical facilities locations.

The Town requires that new subdivisions and new Elderly Housing developments must locate utilities underground and that utilities must be protected from flooding damage. The Town also encourages that utilities be placed underground for all new developments. However, utility lines are located underground in only a few areas of the town. While the Town of East Lyme would be interested in placing utilities underground (particularly along Main Street in Niantic), such activities would need to be localized and combined with private projects since the Town does not own any of the overhead utilities. For example, Town officials noted the estimated cost of burying power lines along Main Street would be \$2.5 million. The Town would need to work with Connecticut Light & Power and acquire grant funding to complete any large-scale utility relocation project since the Town could not fund it themselves.

Warning is one of the best ways to prevent damage from hurricanes and tropical storms, as these storms often are tracked well in advance of reaching Connecticut. The Town can access National Weather Service forecasts via the internet as well as listen to local media outlets (television, radio) to receive information about the relative strength of the approaching storm. This information allows the Town to activate its EOP and encourage residents to take protective or evacuation measures if appropriate. During Tropical Storm Irene, a voluntary evacuation notice was issued for areas of the town, and many people heeded the evacuation and moved inland.

Prior to severe storm events, the Town ensures that warning/notification systems and communication equipment are working properly and prepares for the possible evacuation of impacted areas. The statewide CT "Everbridge" Reverse 9-1-1 system can be utilized to warn coastal residents of an impending evacuation. Although hurricanes that have impacted the Town have historically passed in a

day's time, power outages can last for several days following a storm. Additional shelters could be outfitted following a storm with the assistance of the American Red Cross on an as-need basis for long-term evacuees.

### Summary

In general, municipal capabilities to mitigate hurricane damage have not increased significantly since the 2017 edition of the hazard mitigation plan was adopted. This is likely because the Town increased its capabilities sharply a decade ago in response to the damage from Tropical Storm Irene in 2011 and Hurricane Sandy in 2012.

### 3.2.3 Vulnerabilities and Risk Assessment

The entire town is vulnerable to hurricane and tropical storm wind damage and from any tornadoes (Section 3.3) accompanying the storm, as well as inland flooding (Section 5.2) and coastal flooding and storm surge (Section 4.2). Of particular concern are the blockage of roads and the damage to the electrical power supply from falling trees and tree limbs. The town is also susceptible to damage occurring in other communities cutting off the electrical supply as occurred following Tropical Storm Irene.

Direct wind damage to newer buildings from hurricane or tropical storm-level winds is rare in the town since the new buildings were constructed to meet or exceed current building codes. Many buildings in the town are greater than 50 years old and do not meet current building codes. Older buildings in the town are particularly susceptible to roof and window damage from high wind events, although this risk will be reduced with time as these buildings are remodeled or replaced with buildings that meet current codes. For example, many homes have been renovated recently and some property owners have installed shutters and other wind mitigation measures.

East Lyme has a diverse housing stock with rental properties and campgrounds. These areas are also at particular risk of damage during a hurricane or tropical storm because rental properties are not owner-occupied and therefore may not be properly maintained, and because campgrounds contain recreational vehicles that are not as structurally sound as permanent buildings. Fortunately, recreational vehicles in such campgrounds can be evacuated relatively easily given the usually long lead time prior to a hurricane or tropical storm event.

### 3.2.3.1 Hazard Losses

The Town of East Lyme received \$74,746 in FEMA Public Assistance (PA) funds in the wake of Hurricane Isaias. These funds are the federal share of the eligible costs associated with the hurricane, which were a total of \$83,051. Roughly half of the funds were received for public utilities, with the remainder for debris removal (Figure 3-1). Since 2012, the town has received \$2,242,023 in FEMA PA funds (including Isaias) for project costs of \$2,972,754.

In addition to PA, FEMA also provides individual assistance (IA) for private property owners and renters. In the wake of Ida, a total of 9 property owners received funding in the amount of \$52,138.

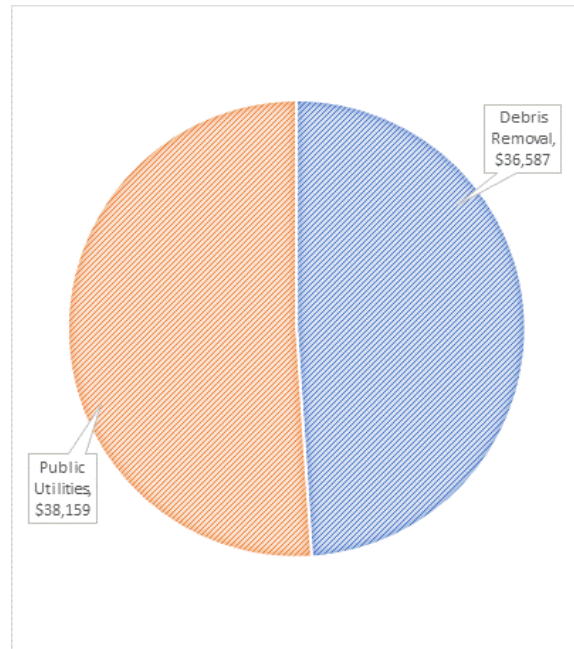


Figure 3-1 Hurricane Isaias Funding Categories

FEMA HAZUS-MH 6.0 was used to develop losses associated with seven probabilistic hurricane scenarios from the 10 year to 1,000 year return period. Losses include economic loss, building damages, debris, and sheltering needs. Table 3-1 through Table 3-3 presents hurricane related damages for the Town of East Lyme. Additional HAZUS-generated losses for the town and region can be found in the Multi-Jurisdictional document.

Downscaled tropical storm losses based on the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdictional document.

Table 3-1 HAZUS-MH Hurricane Related Economic Impacts

East Lyme	Return Period	Residential	Commercial	Industrial	Others	Total
	10-year	\$221,980	\$2,520	\$20	\$890	\$225,410
	20-year	\$4,883,650	\$112,630	\$10,830	\$34,930	\$5,042,040
	50-year	\$26,950,060	\$1,834,940	\$134,590	\$834,890	\$29,754,480
	100-year	\$66,010,750	\$6,098,790	\$624,590	\$2,750,530	\$75,484,660
	200-year	\$139,139,190	\$16,236,630	\$1,579,870	\$6,556,810	\$163,512,500
	500-year	\$275,768,900	\$33,836,520	\$3,839,530	\$13,228,110	\$326,673,060
	1,000-year	\$409,791,090	\$52,600,690	\$6,018,000	\$19,094,040	\$487,503,820

Table 3-2 HAZUS-MH Hurricane Related Building Damage

East Lyme	Return Period	Minor	Moderate	Severe	Destruction	Total
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	10-year	3	0	0	0	3
	20-year	51	2	0	0	53
	50-year	582	75	3	2	663
	100-year	1,289	248	21	14	1,572
	200-year	1,791	508	83	53	2,436
	500-year	2,371	900	207	134	3,613
	1,000-year	2,529	1,157	342	232	4,261

Table 3-3 HAZUS-MH Hurricane Related Debris and Sheltering Needs

<b>East Lyme</b>	<b>Return Period</b>	<b>Debris Generated (Tons)</b>	<b>Households Displaced</b>	<b>Individuals Seeking Temporary Shelter</b>
	10-year	0	0	0
	20-year	432	0	0
	50-year	4,117	3	0
	100-year	8,359	20	3
	200-year	15,001	70	11
	500-year	27,573	190	40
	1,000-year	38,555	340	85

### 3.3. Tornadoes and High Wind Events

#### 3.3.1 Setting and Recent Occurrences

Similar to hurricanes and winter storms, wind damage associated with summer storms and tornadoes has the potential to affect any area of the town. Furthermore, because these types of storms and the hazards that result (flash flooding, wind, hail, and lightning) might have limited geographic extent, it is possible for a summer storm to harm one area within the town without harming another. Such storms occur in the town each year, although hail and direct lightning strikes to the town are rarer. No tornadoes have occurred in the town since the last HMP. There have however been multiple severe thunderstorms, although only one caused even moderate damage. Other recent severe storm events include:

- On September 6, 2017, a cold front triggered severe storms in the county and caused tree damage in multiple communities in the region. Nearby Colchester reported trees and wires down, and the Groton-New London Airport measured sustained winds at 44 mph and gusts of 56 mph.
- On April 13, 2020, a low pressure system resulted in high winds throughout New London County.
- On November 13, 2021, a tornado touched down in the Pawcatuck section of Stonington, and another further north in Plainfield. There were reports of uplifted trampolines, downed trees and powerlines, and an uplifted metal shed. This same storm also caused damage in other surrounding communities.

#### 3.3.2 Existing Capabilities

Warning is the most viable and therefore the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. The NOAA National Weather Service issues watches and warnings when severe weather is likely to develop or has developed, respectively. The Town can access National Weather Service forecasts via the internet as well as listen to local media outlets (television, radio) to receive information about the relative strength of the approaching storm. This information allows the Town to activate its EOP and encourage residents to take protective measures if appropriate.

Aside from warnings, several other methods of mitigation for wind damage are employed by the Town as explained in Section 3.2 within the context of hurricanes and tropical storms. In addition, the Connecticut Building Code includes guidelines for the proper grounding of buildings and electrical boxes to protect against lightning damage.

#### Summary

In general, municipal capabilities to mitigate thunderstorm and tornado damage have not increased significantly since the 2017 edition of the hazard mitigation plan was adopted.

#### 3.3.3 Vulnerabilities and Risk Assessment

Summer storms are expected to occur each year and are expected to at times produce heavy winds, heavy rainfall, lightning, and hail. All areas of the town are equally likely to experience the effects of

thunderstorms. The density of damage is expected to be greater near the more densely populated sections of the town.

Most thunderstorm damage is caused by straight-line winds exceeding 100 mph. Experience has generally shown that wind in excess of 50 miles per hour (mph) will cause significant tree damage during the summer season as the effects of wind on trees is exacerbated when the trees are in full leaf. The damage to buildings and overhead utilities due to downed trees has historically been the biggest problem associated with windstorms. Heavy winds can take down trees near power lines, leading to the start and spread of fires. Such fires can be extremely dangerous during the summer months during dry and drought conditions. Fortunately, most fires are quickly extinguished due to the Town's strong fire response.

Lightning and hail are generally associated with severe thunderstorms and can produce damaging effects. All areas of the town are equally susceptible to damage from lightning and hail, although lightning damage is typically mitigated by warnings and proper grounding of buildings and equipment. Hail is primarily mitigated by warning, although vehicles and watercraft can often not be secured prior to the relatively sudden onset of a hailstorm. Lightning and hail are considered likely events each year, but typically cause limited damage in the town. Older buildings are most susceptible to lightning and hail damage since they were constructed prior to current building codes.

Although tornadoes pose a threat to all areas of Connecticut, their occurrence is least frequent in New London County as compared with the rest of the State. Thus, while the possibility of a tornado striking the town exists, it is considered to be an event with a very low probability of occurrence.

#### *3.3.3.1 Hazard Losses*

There are no reported losses for the Town of East Lyme from tornadoes and high wind events. Downscaled losses based on the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdictional document.

### **3.4. Severe Winter Storms**

#### **3.4.1 Setting and Recent Occurrences**

Similar to hurricanes and severe thunderstorms, winter storms have the potential to affect any area of the town. However, unlike summer storms, winter storms and the hazards that result (wind, snow, and ice) have more widespread geographic extent. In general, winter storms are considered highly likely to occur each year (major storms are less frequent), and the hazards that result (nor'easter winds, snow, and blizzard conditions) can potentially have a significant effect over a large area of the town.

Within the past decade, the town endured some extremely severe winter events. The winter storms of 2010-2011 had the most significant effects in the last decade. The Town inspected and ordered many roofs cleared based on visual assessments due to excessive snow accumulations. Heavy snow from two storms impacted the region in February and March 2013. Several feet of snow fell between the two storms, taxing the town's snow removal abilities. The town received nearly \$120,000 to cover expenses related to the storms.



Winter storms and nor'easters have affected the town since the last HMP. Some of the more recent significant events include:

- A heavy storm came through the region on February 9, 2017, bringing blizzard conditions and heavy snowfall. Colchester reported 14.5 inches of snow, and 13 inches were reported along the coast in Groton.
- A late winter storm on March 12, 2018, resulted in 23 inches of snowfall in Oakdale, with reports of one to two feet in other parts of Northern New London County. The southern part of the region experienced 10 to 18 inches of snow, and strong wind gusts. There were also reports of downed trees throughout the region as a result of this storm.
- On January 28, 2022, the region was hit by a heavy snowstorm and blizzard like conditions. Parts of the region reported up to 22 inches of snowfall, and gusts up to 65 mph. There were also several hours of less than ¼ mile visibility. Snow drifts were also reported to be a challenge, with some areas experiencing drifts up to three and a half feet deep.

### 3.4.2 Existing Capabilities

Existing programs applicable to winter storm winds are the same as those discussed in Sections 3.2.2 and 3.3.2. Programs that are specific to winter storms are generally those related to preparing plows and sand and salt trucks; tree trimming and maintenance to protect power lines, roads, and structures; and other associated snow removal and response preparations. In addition, the Town website seasonally includes information regarding winter safety, including shoveling tips, energy assistance information, and tips to prepare for a winter power outage.

As it is almost guaranteed that winter storms will occur annually in Connecticut, it is important to locally budget fiscal resources toward snow management. Snow is the most common natural hazard requiring additional overtime effort from Town staff, as parking lots and roadways need constant maintenance during storms. This is particularly important in Niantic where on-street parking is frequently utilized for businesses.

The Public Works Department oversees snow removal in the town. Salt and sand are stored at the Town of East Lyme Public Works facility. The Town has established plowing routes that prioritize access to and from critical facilities. Plows are diverted to address emergency service needs whenever necessary. The Connecticut Department of Transportation plows the four State roads in the town.

The Connecticut Building Code specifies that a pressure of 30 pounds per square foot be used as the base "ground snow load" for computing snow loading for roofs. The Town performed visual assessments of many buildings during the winter of 2010-2011 and cleared many town-owned roofs. Many residents also shoveled their own roofs or hired contractors to clear their roofs of excessive snow.

### Summary

In general, municipal capabilities to mitigate snowstorm damage have not increased significantly since the 2017 edition of the hazard mitigation plan was adopted. This is because the Town continues to experience heavy snow each winter.

### 3.4.3 Vulnerabilities and Risk Assessment

Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain and ice pellets, flooding, heavy winds, and extreme cold. Further "flood" damage could be caused by flooding from frozen water pipes. Often, tree limbs on roadways are not suited to withstand high wind and snow or ice loads.

This section focuses on those effects commonly associated with winter storms, including those from blizzards, ice storms, heavy snow, freezing rain, and extreme cold. Warning and education can prevent most injuries from winter storms. This is particularly important as the town includes many residents who are elderly and additional elderly developments are proposed. Most deaths from winter storms are indirectly related to the storm, such as from traffic accidents on icy roads and hypothermia from prolonged exposure to cold. Damage to trees and tree limbs and the resultant downing of utility cables are a common effect of these types of events. Secondary effects can include loss of power and heat.

The majority of buildings in the town are recently constructed and therefore not susceptible to damage from heavy snow. While some Town buildings could be susceptible to heavy snow loads, they will be cleared quickly if safety is a concern. Some buildings in the town have flat roofs which are more susceptible to damage from heavy snow than sloped roofs. Schools were considered particularly vulnerable to heavy snow loads during the winter of 2010-2011. A more detailed response plan is necessary to ensure that town buildings, including schools, are properly inspected and cleared if excessive snow is an issue in the future.

Icing is not a significant issue in the town. In general, there are few steep slopes such that extra sanding and salting of the roadways in necessary locations alleviates any trouble spots.

#### *3.4.3.1 Hazard Losses*

There have been no reported winter storm losses for East Lyme since 2017. In the past decade, the town has received FEMA PA funds in the amount of \$219,490 for winter storms. Downscaled losses based on the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdictional document.

## 4. Sea Level Rise

### 4.1. Climate Change Impacts

Sea levels are rising at an increased rate across the globe. These rising waters are attributed to melting glaciers and ice sheets, as well as thermal expansion from warming ocean waters. Global sea level rise takes into account the major causes of rise, and the averages of rise around the world. Local sea level rise estimates consider the global changes, in addition to what is happening more locally such as changes in currents or land subsidence.

The University of Connecticut, Connecticut Institute for Resilience and Climate Adaptation (CIRCA) has, in accordance with state statute, developed local sea level rise projections for communities to use as a planning threshold (Figure 4-1). CIRCA recommends that communities plan for 0.5 meter (1.64 feet) of sea level rise above 2001 levels by 2050. CIRCA intends to revisit this estimate and update the planning thresholds in the lifespan of this plan (2023-2028).

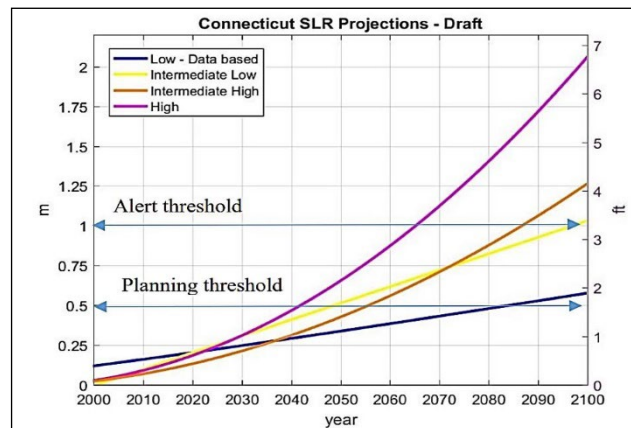


Figure 4-1 Four Localized Sea Level Rise Scenarios for

Even though sea level rise occurs over a longer time period than other hazards, coastal communities are becoming increasingly concerned with the cascading impacts. Increased sea levels can also cause a greater geographic reach for coastal flooding events, an increase in frequency or extent of “sunny day” flooding, an increase in storm surge extent, and saltwater inundation along the shoreline. All of these impacts can damage properties, deteriorate infrastructure, cause access and egress challenges, and exacerbate coastal erosion processes.

### 4.2. Coastal Flooding

#### 4.2.1 Setting and Recent Occurrences

The coastal resources found in Connecticut and described by DEEP are defined in the Multi-Jurisdictional HMCAP and in DEEP resources. The shorefront of East Lyme primarily contains rocky shorefront, modified bluffs and escarpments, and beaches and dunes. Coastal bluffs and escarpments, islands, developed shorefront, and tidal wetlands are also present but are more limited in area. Developed shorefront is located only in the Niantic area along the Niantic River. Significant areas of tidal wetlands are located in Rocky Neck State Park, in the Pattagansett River estuary, along Niantic Bay, and along the Niantic River.

Nearby coastal water bodies are defined as estuarine embayments (defined as a protected coastal water body with a direct connection to Long Island Sound), near-shore waters, or offshore waters. Estuarine embayments include the Pattagansett River and areas along the Niantic River. Niantic Bay and areas south of Rocky Neck State Park are designated as nearshore waters. The mapped islands include inhabited areas such as Griswold Island (approximately 10 structures) and Brainard Island (three structures). Other smaller islands also exist but are uninhabited.

Homes, businesses, and industry are located in close proximity to the coastline along the majority of the shoreline of East Lyme. Structures and infrastructure in the southern section of the town are closer to sea level than in northern areas and are therefore more susceptible to coastal flooding. Hurricanes, tropical storms, and nor'easters have the potential to induce coastal flooding and storm surge that can impact structures, and these types of storms have caused the greatest amount of flood damage to the town in the past. Astronomical high tides can also cause coastal flooding of low-lying areas.

Roadway closures are the most common result of coastal flooding although structures are also affected during moderate events. For example, flooding during Tropical Storm Irene in late August 2011 washed out a seawall in front of houses on Atlantic Street and flooded nearby homes. Only a few structures are known to have received damage by coastal floodwaters since 2005. However, as of 2012, the Town was concerned with the potential long-term effects of sea level rise and its potential to exacerbate flooding conditions in the future.

In October 2012, Super Storm Sandy caused significant coastal flooding in East Lyme. The event occurred after the FEMA approval pending adoption (APA) of the hazard mitigation plan and therefore was not described in the document. Areas along Oak Grove Beach saw significant flooding of roads and homes. Crescent Beach was also hard hit, with part of a walking path washed out, and significant erosion occurring. East Lyme received over half a million dollars in FEMA federal aid immediately after the event in order to facilitate the cleanup. In addition, the Crescent Beach Association reportedly received three million dollars for beach restoration.

On January 17, 2022, the town experienced severe coastal flooding along Atlantic Street in the Niantic area. The floodwaters reportedly created an island and took about 10 hours to drain. Public works crews worked into the evening to remove sand and water. Residents reported floodwaters damaging siding, and waves cresting as high as rooftops. The town reportedly made a water rescue using a public works backhoe as waters were rising too rapidly for vehicular access.

Most recently, a significant coastal flood event occurred on December 23, 2022 during the final stages of the planning process for this document. The coastal water surface elevation at the New London tide gauge was reportedly the sixth highest on record. Numerous roads and structures experienced flooding in coastal southeastern Connecticut, including parts of East Lyme.

#### 4.2.2 Existing Capabilities

The Town primarily attempts to mitigate coastal flood damage and flood hazards by controlling and restricting activities in areas of flood risk, encouraging the elevation of homes and roadways, maintaining hard structures in good condition, and providing signage and warning systems. The Town of East Lyme is a Class 8 participant in the Community Rating System (CRS). The Town has been active in the program since 1991, and this participation has helped sustain enhanced capabilities for flood risk management.

As noted in Section 2.6 and Section 5.2.2, the Town utilizes the 1% annual chance floodplains delineated by FEMA. These consist of the 1% annual chance floodplain with elevations (Zone AE), and the 1% annual chance floodplain subject to wave velocity (Zone VE) for coastal flooding areas. As noted by the

Zoning Regulations and the Subdivision Regulations, building activities in these areas are restricted and new construction or substantial redevelopment must prove that the lowest horizontal member of the new construction will be above the base flood elevation. The Town requires elevation certificates to certify such work as part of its Community Rating System efforts. The Planning Commission, Zoning Commission, Land Use Department, and the Building Official are all required to review and approve portions of applications that involve structures within FEMA Special Flood Hazard Areas.

The Town has conducted outreach to residents about flood mitigation, but most residents are not interested in acquisitions or elevations. As such, the Town has further attempted to streamline restrictions to its regulations through its recent amendments to the Zoning Regulations and by maintaining its activities with the Community Rating System.

As explained elsewhere in this HMCAP, the National Weather Service issues a flood watch or a flash flood watch for an area when conditions in or near the area are favorable for a flood or flash flood, respectively. A flash flood watch or flood watch does not necessarily mean that flooding will occur. The National Weather Service issues a flood warning or a flash flood warning for an area when parts of the area are either currently flooding, highly likely to flood, or when flooding is imminent. The Town of East Lyme utilizes these warnings and forecasts to prepare emergency responders for flooding events.

The shoreline of East Lyme contains many coastal flood control structures. Small, private seawalls and bulkheads can be found in many of the residentially developed coastal neighborhoods such as on Giants Neck, Seal Rock, Black Point, Attawan Beach, Crescent Beach, and Atlantic Avenue. The seawall on Atlantic Avenue washed out during Tropical Storm Irene and the property owners are repairing it without the Town's assistance. Larger structures are associated with the breakwaters at Rocky Neck and the Amtrak-Metro North Railroad at Rocky Neck and the Pottagansett River estuary that protects landward areas from wave velocity. Groins and jetties are also common in beach areas. Most of these structures were designed to retain land as well as protect against wave action, but have the secondary effect of reducing coastal erosion.

"The Bar" that carries Route 156 and the Amtrak Railroad is also an important mitigation structure that helps to protect areas along the Niantic River. The National Railroad Passenger Corporation (Amtrak) is currently replacing the bridge leading from The Bar to Waterford. The replacement includes the construction of a protective wall, a stone scour protection system, and relocation of a beach seaward of its existing location. Approximately 2,500 feet of beach will be restored as part of the project.

Like many communities, the Town lacks existing policies and mitigation measures that are specifically designed to address sea level rise. However, important pieces are in place in the form of the codes and regulations cited in this HMCAP that have been enacted to minimize storm, erosion, and flood damage. The Town completed the process of identifying its vulnerability to this hazard, including a completed planning effort with The Nature Conservancy (TNC) in 2011-2012 and a separate planning initiative with SCCOG and TNC in 2016-2017. As of the date of the previous plan, the Town has not yet embarked on detailed coastal hazard planning to the degree that nearby communities like Waterford and Groton have done. However, East Lyme received funding from CIRCA several years ago and completed a coastal vulnerability assessment and report (<https://circa.uconn.edu/east-lyme/>) as a major step toward local resilience planning.

As explained in Section 2 of the regional part of this multi-jurisdiction hazard mitigation plan, the State Historic Preservation Office (SHPO) embarked on a resiliency planning study for historic and cultural resources beginning in 2016. During winter 2016-2017, individual meetings were held with the shoreline SCCOG communities. Reports were issued to these communities in DECEMBER 2017. The East Lyme report outlines eight strategies that can be employed to make historic and cultural resources more resilient:

- Identify Historic Resources
- Revisit Historic District Zoning Regulations
- Strengthen Recovery Planning
- Incorporate Historic Preservation into Planning Documents
- Revisit Floodplain Regulations and Ordinances
- Coordinate Regionally and with the State
- Structural Adaptation Measures
- Educate

Subsequently, a best practice guide for planning techniques to make historic resources more resilient was distributed in September 2017.

#### Summary

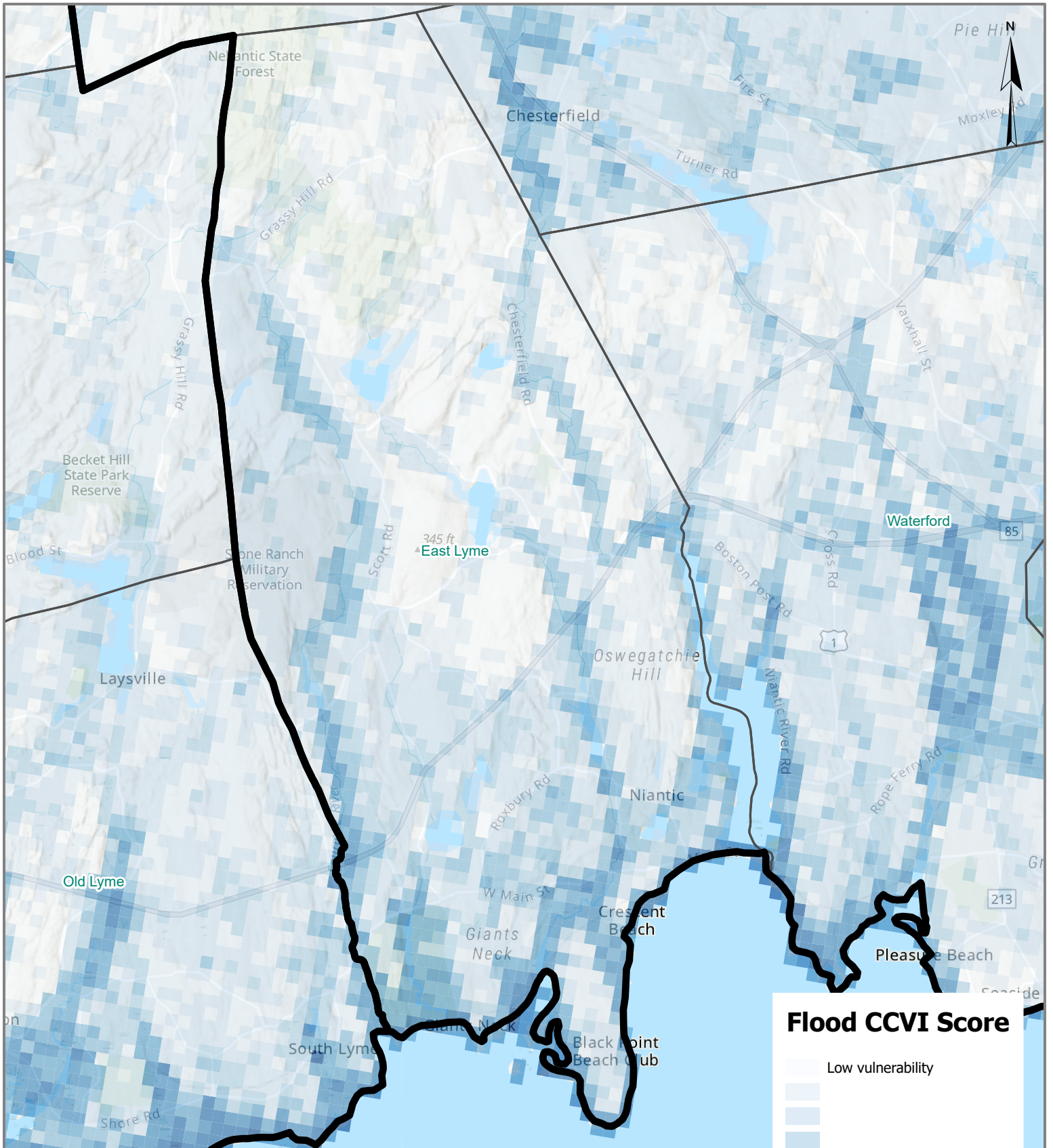
Municipal capabilities to mitigate coastal flood damage have increased significantly since the 2012 edition of the hazard mitigation plan was adopted. This is because the Town continued working with TNC on its resiliency planning, participating in the historic resources resiliency planning, and generally increased its capabilities sharply in response to the flooding associated with storms Irene and Sandy. Since the 2017 plan the Town continues to work toward strengthening regulations, protecting infrastructure, and planning for future sea level rise and climate change.

#### 4.2.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to coastal flooding within the Town. This flooding can be the result of astronomical high tides, hurricanes, nor'easters, or storm surge. As shown by the historic record, coastal flooding can impact many roads and neighborhoods, potentially cause severe damage, and impede transportation in the Town. Refer to Figure 5-1 for a depiction of areas susceptible to coastal flooding, and Figure 4-3 for areas susceptible to storm surge from hurricanes.

*UConn CIRCA has developed a tool to aid in understanding flood vulnerability for communities across the state. This tool, known as the Climate Change Vulnerability Index (CCVI), is comprised of dozens of factors that contribute to a community's flood sensitivity, exposure, adaptive capacity, and ultimately the overall flood vulnerability. The CCVI has been used as a tool to characterize flood vulnerability for the town. The distribution of flood vulnerability throughout the community can be seen in*

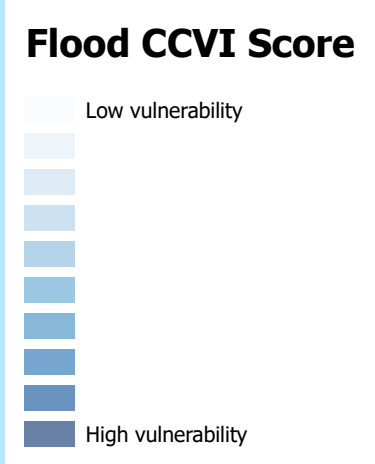




## Flood CCVI Score

SCCOG Hazard Mitigation and Climate Adaptation Plan  
 Town of East Lyme  
 1/17/2023

0 0.30.6 1.1 1.7  
 Miles



Esri, NASA, NGA, USGS, FEMA, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS,

## Vulnerability Analysis of Areas Along Coastal Waters

The low-lying shoreline areas of the town are subject to periodic flooding. The most severe flooding in East Lyme occurs during hurricanes or coastal storms which can occur during any season. Such storms have intense winds and rainfall that can create high tidal surges, wave runoff, and peak runoff to drainage systems where coastal outlets are submerged. Areas along Long Island Sound, Niantic Bay, and the Niantic River are at the highest risk of experiencing damage from coastal flooding, and tidally influenced flooding also occurs along the lower portion of major watercourses including the Fourmile River, Bride Brook, Pattagansett Brook, and Latimer Brook. FEMA has defined 1% annual chance and 0.2% annual chance floodplains associated with coastal flooding, as well as 1% annual chance floodplains with wave velocity for the Town.

The southern portion of the town and the lower section of the Niantic River are exposed to the wave action from Long Island Sound. An additional concern for these areas of the Town is that the primary roadways may flood due to drainage issues before structures are affected making subsequent evacuation very difficult. The Town of East Lyme has identified several important roads that could potentially flood during major storms as presented in Table 4-1. Important roads include major roadways or those that are the only mode of egress into a neighborhood.

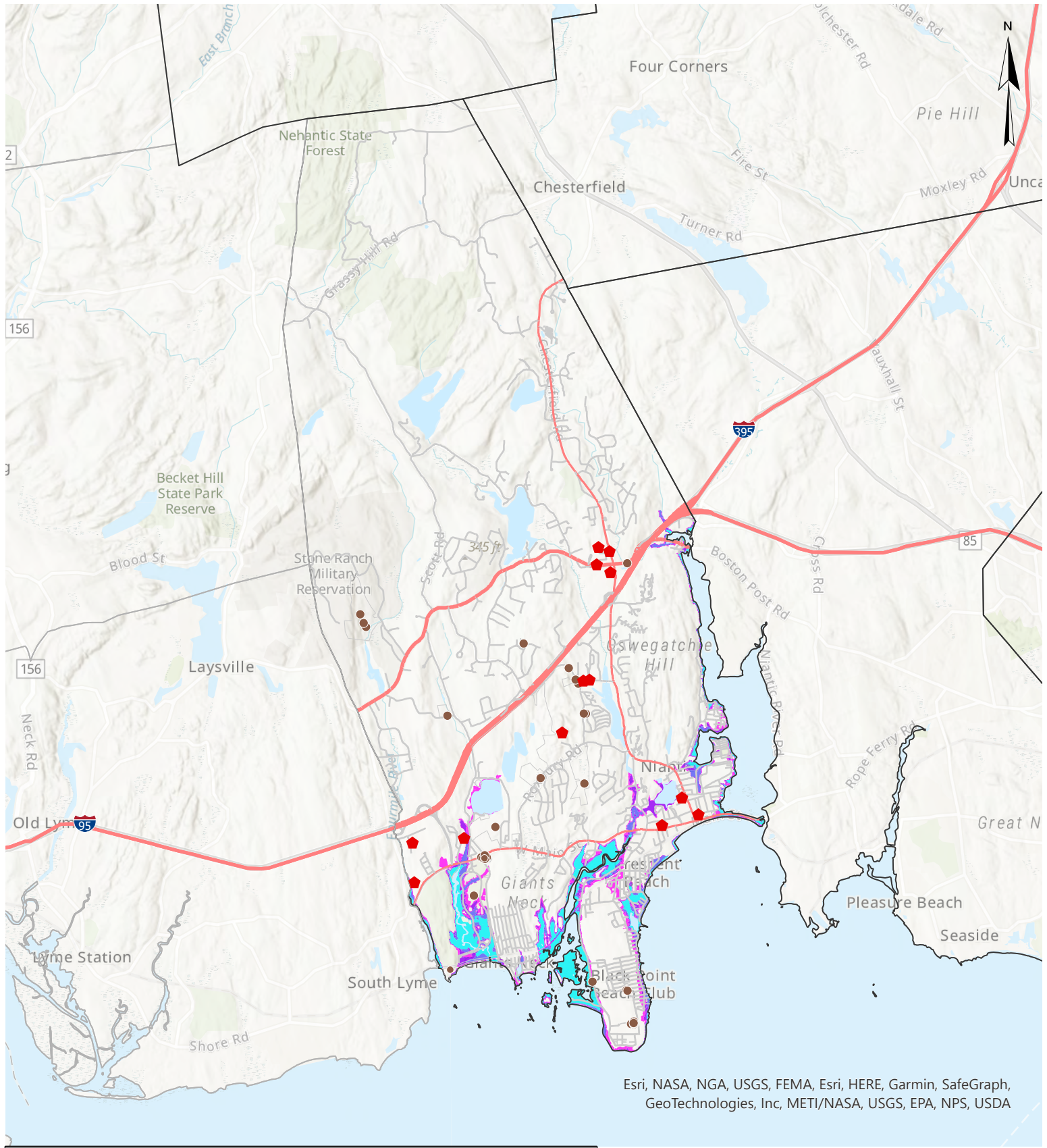
*Table 4-1 Important Roadways at Risk of Overtopping During Coastal Flooding*

Roads	
<u>Boston Post Road (Route 1)</u>	<u>Old Black Point Road</u>
<u>Fairhaven Road</u>	<u>Pine Grove Road</u>
<u>Giants Neck Road</u>	<u>Shore Road</u>
<u>Main Street Route 156</u>	<u>West Main Street (Route 156)</u>

Atlantic Street is a particular area of concern as it can be overtopped by a moderate coastal flood event and the flooding both cuts off access to a small neighborhood and inundates the sanitary and storm sewer systems. When this occurs, the Town has to pump water from the systems into Niantic Bay. Other roads that provide access to coastal structures are also located in the 1% annual chance coastal floodplain as described in Section 4.3.2.

As shown on Figure 5-1, areas of storm surge are generally coincident with the areas of coastal flooding described above. In general, a Category Two Hurricane is expected to produce storm surges that are equivalent to the 1% annual chance flood event, while a Category Three Hurricane is expected to produce storm surges that approximate the 0.2% annual chance flood event. Storm surge from a Category Four Hurricane would affect additional areas, while storm surge from a Category One Hurricane is expected to affect many low-lying coastal areas to a slightly lesser extent than those from a Category Two hurricane. Areas potentially affected by storm surge from a Category One Hurricane include areas of Giants Neck, the Pattagansett River estuary, coastal areas in Black Point, the Indian Pond and Shore Road area, the marina area in Niantic, low-lying roads, and properties around Smith Cove, as well as smaller portions of other coastal areas.



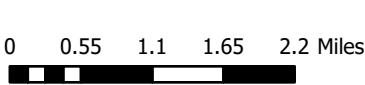


Esri, NASA, NGA, USGS, FEMA, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA

**Hurricane Storm Surge Inundation Areas**

**SCCOG Hazard Mitigation and Climate Adaptation Plan**

Town of East Lyme  
Date: 8/2/2022



**Legend**

- Historic Resources
- ⬠ Critical Facilities

**Hurricane Category**

- 1
- 2
- 3
- 4

#### 4.2.3.1 Hazard Losses

There are no reported losses for the Town of East Lyme related to coastal flooding. Table 4-2 presents the direct and business interruption related losses for the 100-year coastal flood event. Additional HAZUS-generated loss estimates for coastal floods and downscaled flood losses based on the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdictional document.

Table 4-2 HAZUS-MH Coastal Flood Related Economic Impacts

East Lyme	2022 Results				
	RES	COM	IND	OTHER	TOTAL
<b>Direct</b>					
Building	\$65,280,000	\$4,320,000	\$1,500,000	\$1,070,000	\$72,170,000
Contents	\$62,710,000	\$13,220,000	\$2,470,000	\$6,800,000	\$85,200,000
Inventory	\$0	\$2,140,000	\$350,000	\$60,000	\$2,550,000
Subtotal	\$127,990,000	\$19,680,000	\$4,320,000	\$7,930,000	\$159,920,000
<b>Business Interruption</b>					
Income	\$1,240,000	\$15,390,000	\$100,000	\$3,040,000	\$19,770,000
Relocation	\$23,800,000	\$4,200,000	\$110,000	\$2,480,000	\$30,590,000
Rental Income	\$9,810,000	\$3,050,000	\$10,000	\$610,000	\$13,480,000
Wage	\$2,920,000	\$15,280,000	\$180,000	\$47,350,000	\$65,730,000
Subtotal	\$37,770,000	\$37,920,000	\$400,000	\$53,480,000	\$129,570,000
<b>TOTAL</b>	<b>\$165,760,000</b>	<b>\$57,600,000</b>	<b>\$4,720,000</b>	<b>\$61,410,000</b>	<b>\$289,490,000</b>

### 4.3. Shoreline Change

#### 4.3.1 Setting and Recent Occurrences

Shoreline change is primarily a natural process caused by wind, waves, and currents; however, it can also be attributed to human driven processes such as development, grading, and beach armoring or nourishment. As climate change impacts hazards such as severe storms, hurricanes and tropical storms, and sea level rise, shorelines have the potential to change at different rates than in decades past. As tidal ranges increase, and storm surge becomes higher and potentially more intense, these processes may become exacerbated. Rapidly changing shorelines can have an impact on coastal ecosystem (particularly those that provide natural buffers), erode natural shorelines resulting in encroaching seas onto developed land, and may alter those shorelines that have been hardened to protect development and infrastructure.

#### 4.3.2 Existing Capabilities

As discussed above in Section 4.2.2, the Town has implemented regulations and codes that aid in preventing and minimizing the occurrence and impacts of erosion and shoreline change. In addition, there are structures along the shoreline that while are primarily for flood control, also prevents or reduces excessive erosion during high tide and coastal flood events.

#### 4.3.3 Vulnerabilities and Risk Assessment

In general, it is assumed that as sea level rises, the frequency and magnitude of coastal flooding in the Town will increase with structures and roadways closest to existing sea level being affected more

quickly. In addition, tidal marsh areas located in Rocky Neck State Park, the Pattagansett River estuary, the Niantic River, and nearby Indian Pond will either migrate inland or be eroded by constant inundation. Tidal wetland islands such as Watts Island could disappear completely.

Aside from the tidal marshes, coastal erosion is generally not a serious issue in East Lyme since the majority of the shorefront is either developed (particularly along the Niantic River), rocky shorefronts consisting of stones and boulders, or modified bluffs and escarpments consisting of seawalls, bulkheads, or revetments. The beach and some tidal wetland areas are susceptible to coastal erosion but are generally protected from direct wave action by local islands, groins, jetties, and breakwaters. However, as sea level rises, the effectiveness of these structures will be undermined such that erosion will be able to occur more easily during coastal flooding events.

#### *4.3.3.1 Hazard Losses*

There are no reported losses for the Town of East Lyme related to shoreline change. Despite the record of past events, shoreline changes losses such as coastal erosion are difficult to quantify because they are not reported via the tools typically reviewed for plan updates such as the NCEI Severe Storm database and the NFIP. Shoreline change losses are not quantified in the 2019 Connecticut Natural Hazard Mitigation Plan.

For beaches, one representation of loss is the total cost of beach nourishment, even though this does not account for occasional property damage. Beach nourishment has been infrequent in East Lyme, and figures are difficult to compile.

Another measure of shoreline change loss is the total unmet need associated with living shoreline project costs, which have only recently become well-understood over the last five years. Some areas of East Lyme have been identified as suitable for living shoreline applications. For example, the Coastal Resilience, Climate Adaptation, and Sustainability Study<sup>2</sup> has identified those grassy laws that extend seaward as suitable for native shoreline plantings, the banks of the Pattagansett River suitable for marsh enhancement, and beach enhancement along the Niantic Boardwalk area. While these specific projects have not been conceptualized, neighboring SCCOG communities anticipating living shoreline applications are likely facing costs between \$1 million to \$1.5 million based on engineering opinions of probable cost.

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<sup>2</sup> <https://eltownhall.com/wp-content/uploads/2019/09/FINAL-REPORT-CRCASS-2018-12-10.pdf>

## 5. Changing Precipitation

### 5.1. Climate Change Impacts

Across the United States, annual precipitation has increased in the past century, however, this change *is* dependent upon the region. Here in the northeast, precipitation totals, and intensity are believed to have increased, and are projected to continue to increase during spring and winter months. However, climate change has also been linked to a reduction in snow cover extent, and an earlier spring melt. Winter precipitation may also change from snow to a wintry mix or rainfall due to warmer temperatures; so, while precipitation may increase it may not necessarily be an increase in snow.

Changes in precipitation can also shift the frequency and severity of droughts. As the climate warms, surface soil moisture is likely to decrease as evaporation rates rise. This decrease in soil moisture, and potentially longer periods of time between intense precipitation events, could potentially mean longer and stronger droughts.

These changes in precipitation can have various types of impacts. With an increase in intense precipitation, flooding events may become more frequent, damage to crops may occur, and spring flood trends may shift with less snow and more rain. Droughts on the other hand can also cause damage to crops, stress livestock and agricultural operations, and also reduce drinking water supplies or private wells.

### 5.2. Riverine and Pluvial Floods

#### 5.2.1 Setting and Recent Occurrences

Flooding is the primary hazard that impacts the town each year as documented in the previous edition of this plan. While riverine flooding along watercourses is a concern, shallow nuisance flooding and poor drainage have also caused flooding at several locations in the town. Flooding is typically caused by heavy rainstorms but can also be caused by relatively light rains falling on frozen ground. Flooding of roadways is more common than damage to structures during pluvial and riverine floods.

One of the largest inland flood events in recent history occurred in June 1982. According to the 2011 Flood Insurance Study for New London County, a heavy rainstorm produced widespread flooding and several dam failures in southern Connecticut. This flood damaged bridges and structures along the Fourmile River and Latimer Brook in East Lyme. The event is the flood of record at the USGS gaging station on the Fourmile River.

Sustained heavy rainfall in late March 2010 caused a 1% annual chance flood throughout southeastern Connecticut. This is now the flood of record for East Lyme replacing the storm of June 1982. Many roads throughout the community were closed, including the Exit 74 and Exit 75 ramps from southbound Interstate 95, and Route 161 was closed in both directions at Route 156. North Bride Brook was closed with deep flooding, Bush Hill Drive was flooded for three days, and flooding was severe enough at the intersection of Route 161 and Walnut Hill Road that water rescues were necessary. The March 2010 storms continue to be considered the event that caused the most widespread inland flooding in East Lyme since the town began participating in the multi-jurisdiction hazard mitigation plan.



At least one additional heavy rain event occurred in East Lyme in 2011. The NCDC reported that heavy rainfall produced flash flooding on North Bride Brook Road in East Lyme on June 23, 2011. The road was closed with four feet of standing water on the road. On September 10, 2015, a wave of low pressure riding along a cold front stalled just south of Long Island. It brought heavy rain and isolated flash flooding to New London County, Connecticut.

The region has experienced severe rainstorm events since the 2017 plan, with many neighboring communities having experienced serious flooding as a result.

The September 2018 rain event caused severe flooding throughout the state, with several communities in the SCCOG region receiving FEMA PA reimbursements for the event. Neighboring Norwich received 4.85 inches of rainfall and Lebanon reported 6.79 inches.

Storm Ida, which produced several inches of rain across the state, caused flooding in many SCCOG communities. Norwich Public Utilities recorded 6.34 inches of rainfall and Groton-New London Airport recorded 2.05 inches.

After the severe flashy drought of summer 2022, a severe rainstorm event on September 5-6, 2022, caused flooding throughout southeastern Connecticut. Lebanon experienced road closures and washouts, while Norwich Public Utilities observed 5.85 inches of rainfall. There were flood and flash flood warnings throughout the region and across the state. Neighboring Rhode Island reported 11 inches of rainfall in some communities.

### 5.2.2 Existing Capabilities

The Town attempts to mitigate inland flood damage and flood hazards by utilizing a wide range of measures including restricting activities in areas of flood risk, replacing and upsizing bridges and culverts, promoting flood insurance, acquiring floodprone structures, maintaining drainage systems, advancing education and outreach, and by utilizing warning systems. As noted earlier, the Town of East Lyme is a Class 8 participant in the CRS, and this participation has helped sustain enhanced capabilities for flood risk management.

Many mitigation measures are common to all hazards and therefore were listed in Section 2.6 and Section 2.7. No major inland flood control structural projects are in place within or upstream of East Lyme. Bridge Replacements, Drainage, and Maintenance The Department of Public Works cleans and inspects catch basins and culverts at least annually or more often if problems are noted. The Town fields phone calls related to drainage complaints. Roadway drainage complaints are directed to the Director of Public Works. When flooding occurs, the Public Works department or the Fire Department would handle complaints depending on the location. For example, Public Works would inspect bridges and culverts and erect barricades to close roads, while the Fire Department responds to calls requesting help for flooded basements.

### Regulations, Codes, and Ordinances

The Town of East Lyme has planning and zoning tools in place that incorporate floodplain management. The Town's flood protection regulations are found in section 15 of its Zoning Regulations as noted in Section 2.6, and were most recently revised on October 28, 2021; this is the Town's articulation of the FEMA NFIP regulations. The Town utilizes the 1% annual chance floodplain as defined by FEMA to regulate floodplain and floodway activities, and the most recent edition of its Zoning Regulations refer

specifically to the New London Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) published by FEMA on August 5, 2013 for coastal areas and July 18, 2011 for inland areas. The Town requires 100 percent compensatory storage for any encroachment in the floodplain. The Town also requires new construction or substantial renovations to be located at an elevation greater than the base flood elevation and requires the preparation of elevation certificates to verify that a structure has been elevated or built to the proper height. The Zoning Regulations define substantial improvement cumulatively over a two-year period.

The Town's Building Official was a founding member of the Connecticut Association of Flood Managers (CAFM) and continues to participate in the organization, attending meetings and annual conferences. This ensures that the Town's Building Department is aware of the most up to-date flood regulations and policies.

The Town's Subdivision Regulations require that adequate drainage be provided to reduce exposure to flood hazards and that buildings and utilities are located to minimize the effects of flood damage. Regulations covering development in or within 100 feet of inland wetland or watercourse areas were last updated in 2011 and are enforced by the Town's Inland Wetlands and Watercourses Commission. The Town has also adopted a map prepared by the Inland Wetland and Watercourse Commission which regulates building in wetland areas.

In general, partly for the CRS program, the town is working to bolster floodplain related zoning regulations and improving stormwater management across town for MS4 compliance.

#### Acquisitions, Elevations, and Property Protection

The Town of East Lyme has not performed acquisitions or elevations of floodprone property. Property protection has focused instead on preventive measures and maintaining and upgrading drainage systems. The Town is not opposed to performing acquisitions, elevations, or relocations if property owners were willing and grant funding was available. For example, the Town has approached the owners of repetitive loss properties about this level of mitigation for their properties, but homeowners are either unwilling to move at this time or not willing to fund 25% of the cost for an elevation or relocation project.

#### Flood Watches and Warnings

The Public Safety Director and the Fire Department access weather reports through the National Weather Service and local media. Residents can also sign up for the Connecticut Alerts "Everbridge" Reverse 9-1-1 system to receive warnings when storms are imminent. The Town can telephone warnings into potentially affected areas using this system.

#### Community Rating System

The Town of East Lyme joined the Community Rating System in 1991 and currently has policies and procedures in place that exceed the minimum standards for an NFIP-compliant community. East Lyme is currently a Class 8 (as of April 2022) Community which qualifies flood insurance policy holders in the town a 10% discount on flood insurance. The Town performed several accomplishments to earn this rating including: providing and maintaining flood elevation certificates, conventional flood maps, and

digital flood data for public information purposes; completing a public information outreach project; preserving open space; improving stormwater management.

### Summary

In general, municipal capabilities to mitigate flood damage have not increased significantly since the 2017 edition of the hazard mitigation plan was adopted. This is likely because the Town increased its capabilities in response to flooding of 2011 and 2012 associated with Tropical Storm Irene and Hurricane Sandy, which are discussed in previous chapters.

### 5.2.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to inland flooding within the Town. Overbank flooding is the most common type of flooding experienced in East Lyme, although poor drainage and nuisance flooding also occur.

#### Vulnerability Analysis of Areas Along Watercourses

Major inland watercourses and water bodies in East Lyme have the 1% annual chance floodplain defined by FEMA. Bride Brook, the Fourmile River, Latimer Brook, and the Pattagansett River, each have inland sections mapped as Zone AE indicating that flood elevations are available. The upper reaches of each of these streams are mapped as Zone A (except for Latimer Brook), and smaller streams such as Beaver Brook and Cranberry Meadow Brook have also had sections mapped as Zone A. Refer to Figure 5-1 for the location of the 1% annual chance floodplains related to inland flooding within East Lyme.

Based on the information in the previous HMP and that provided by Town officials, the following areas along watercourses are vulnerable to flooding damage. This flooding occurs due to insufficient culvert sizes at crossings or due to overbank flooding from heavy rainfall. Ice jams have not previously been an issue along watercourses in East Lyme.

#### Beaver Brook

The headwaters of Beaver Brook are located in the northwestern section of East Lyme. The FEMA DFIRM indicates that Beaver Brook could overtop Beaver Brook Road in this area during the 1% annual chance flood.

#### Bride Brook

Bride Brook is a repeated flooding area and typically floods at least once per year. Bride Brook is conveyed beneath North Bride Brook Road in two places and both crossings can potentially be inundated by the 1% annual chance flood event. The upstream crossing was inundated to a depth of five feet during the March 2010 floods. Flooding becomes tidally influenced downstream of Route 156 when Bride Brook enters Rocky Neck State Park.

#### Cranberry Meadow Brook

The lower reach of this brook is mapped as Zone A above Chesterfield Road (Route 161). The brook is mapped as Zone AE and impounded by a small dam downstream of Route 161 with the outlet stream

quickly reaching its confluence with Latimer Brook. The Route 161 crossing is a repeated flooding area that overtopped several feet during the March 2010 floods.

#### Fourmile River

The Fourmile River has its headwaters in western East Lyme. The headwaters of the river are mapped as Zone A downstream to the Boston Post Road (Route 1). The river could potentially overtop Stone Ranch Road in the Stone Ranch Military Reservation during a 1% annual chance flood event. Downstream of Route 1, the river is mapped as Zone AE and based on the flood profile in the FIS roads would not be overtopped by the 1% annual chance flood event.

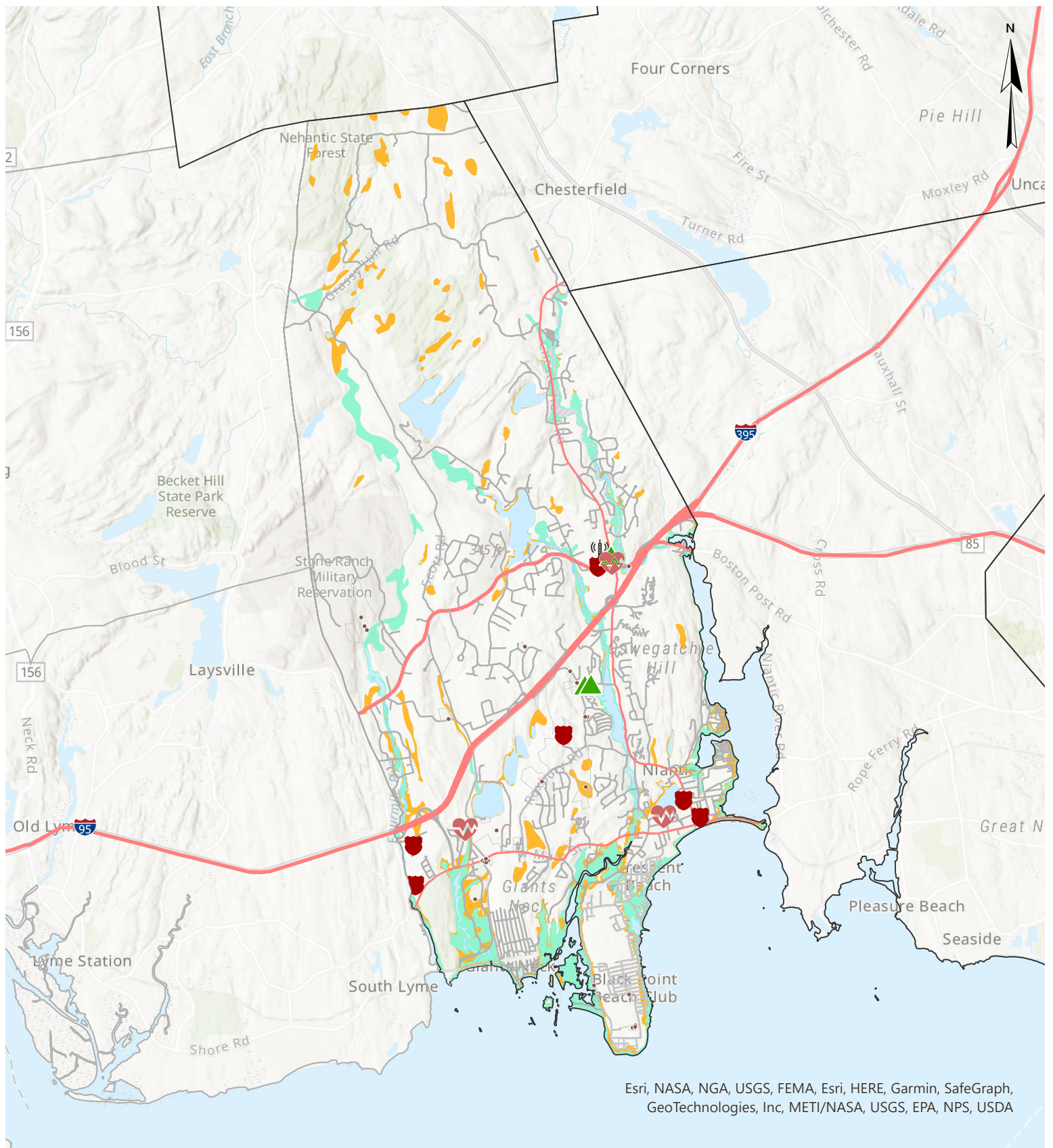
#### Latimer Brook

Latimer Brook has its headwaters in Montville. The brook enters East Lyme just downstream of Silver Falls Road and is mapped as Zone AE throughout its reach. The Town of East Lyme performed many culvert upgrades following the 1982 flood to improve egress to neighborhoods located across the brook. Based on the flood profile in the FIS, roadways that cross Latimer Brook should not overtop during the 1% annual chance flood event. The only road at risk of overtopping is Boston Post Road just upstream of Interstate 95. The removal of a small dam located between Route 1 and Interstate 95 could alleviate this flooding issue. However, many roads adjacent to Latimer Brook could be overtopped by minor flooding from the 1% annual chance flood event, including Latimer Drive, Bob White Lane, the cul-de-sac of Brookfield Drive, Quailcrest Road, and Chesterfield Road (Route 161) near both ends of Mostoway Road. Downstream of Interstate 95, Latimer Brook becomes vulnerable to tidal flooding.

#### Pattagansett River

The Pattagansett River is formed at the outlet of Powers Lake located near the Yale Engineering Camp. The river is mapped as Zone AE downstream of Upper Pattagansett Road and could potentially overtop that road and Hathaway Road during a 1% annual chance flood event. The river is impounded by a significant dam downstream forming Pattagansett Lake. The section of river downstream from this lake is mapped as Zone AE. A 1% annual chance flood event would overtop the Boston Post Road (Route 1), Industrial Park Road, Roxbury Road, and Bush Hill Drive. Bush Hill Drive floods annually and was flooded for three days during March 2010. Roxbury Road would overtop during more frequent floods than the 1% annual chance flood event, and Brook Road would be close to overtopping. The Pattagansett River is tidally influenced downstream of Brook Road, but 1% annual chance inland flooding event should not overtop West Main Street (Route 156).





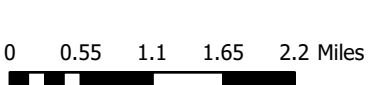
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**Critical Facilities and Historic Resources with Flood Zones**

**SCCOG Hazard Mitigation and Climate Adaptation Plan**

Town of East Lyme

Date: 8/1/2022



**Legend**

- Historic Resources
- ♥ Care and Medical Facility
- ♠ Communication Infrastructure
- ♣ Emergency Services
- ▲ Shelter or Cooling Center
- 1% Annual Chance Flood Hazard Area
- .2% Annual Chance Flood Hazard Area
- ▨ Floodway

## Poor Drainage Flooding

Flooding due to poor drainage occurs throughout East Lyme including in coastal areas. Recently, a nuisance flooding problem has developed on Flanders Road (Route 161) near Industrial Park Road. There has been a lot of development nearby (for example, on Chapman Woods Road) and the older sections of the drainage system on Flanders Road are being overwhelmed since they are likely undersized. This section of roadway typically needs to be closed for several hours during heavy rainfall, and Town personnel have observed manholes overflowing. Drainage improvements along Route 161 may alleviate the flooding issue.

## Vulnerability Analysis of Private Properties

The vast majority of at risk structures are residential, but a few commercial and industrial structures are also located within inland floodplains. In many cases, these structures are located near the edge of the mapped floodplain and therefore may actually be elevated above the floodplain. Nevertheless, the Town of East Lyme should make an effort to identify properties within the 1% annual chance floodplain and distribute information regarding floodproofing and home elevation to the owners of these properties. As of June 2022, 23 repetitive loss properties related to inland flooding damage were reported in East Lyme.

## Vulnerability Analysis of Critical Facilities

As noted in Section 2.7, critical facilities in East Lyme are not located within the 1% annual chance floodplain. While the public water supply wellfields and some pump houses appear to be located within the 1% annual chance floodplain, these buildings are not designed for permanent habitation and the associated infrastructure can withstand minor flooding. Other structures, such as sewer pump stations, are not affected by inland flooding but rather by coastal flooding.

The Town of East Lyme is concerned with several roads that are the only egress into large neighborhoods that are also located within the 1% annual chance floodplain. For example, Bush Hill Road floods at the Pattagansett River, and this bridge is the only mode of egress for more than 80 properties. An emergency egress should be considered between either Bush Hill Road and Romangna Road or between Highwood Road and Whiting Farms Lane. Homes on North Bride Brook Road can also become isolated if Bride Brook overtops the road at both locations. Furthermore, if Brook Road over the Pattagansett River was washed out, residents would not be able to leave the neighborhood although they could walk to Park Place for assistance.

### *5.2.3.1 Hazard Losses*

According to NFIP statistics, as of June 30, 2022, the Town of East Lyme has had a total of 243 flood related losses, with a total \$4,503,269 paid towards the claims.

There was one NOAA report of a flash flood event in town on September 12, 2018. The event occurred at Main Street and Pennsylvania Avenue in the Niantic Area. No damage figures were reported for this event other than the closure of the intersection.

FEMA HAZUS-MH 6.0 was used to develop losses associated with the 100-year riverine flood event. Table 5-1 presents flood related damages for the Town of East Lyme. Additional HAZUS-generated losses for the town and region can be found in the Multi-Jurisdictional document.

Table 5-1 HAZUS-MH Riverine Flood Related Economic Impacts

East Lyme	2022 Results				
	Residential	Commercial	Industrial	Other	Total
<b>Direct</b>					
Building	\$7,900,000	\$1,590,000	\$300,000	\$300,000	\$10,090,000
Contents	\$3,560,000	\$6,490,000	\$350,000	\$1,820,000	\$12,220,000
Inventory	\$0	\$840,000	\$60,000	\$0	\$900,000
Subtotal	\$11,460,000	\$8,920,000	\$710,000	\$2,120,000	\$23,210,000
<b>Business Interruption</b>					
Income	\$370,000	\$8,310,000	\$50,000	\$1,600,000	\$10,330,000
Relocation	\$4,130,000	\$2,090,000	\$50,000	\$970,000	\$7,240,000
Rental Income	\$1,600,000	\$1,440,000	\$10,000	\$120,000	\$3,170,000
Wage	\$880,000	\$11,630,000	\$90,000	\$10,550,000	\$23,150,000
Subtotal	\$6,980,000	\$23,470,000	\$200,000	\$13,240,000	\$43,890,000
<b>Total</b>	<b>\$18,440,000</b>	<b>\$32,390,000</b>	<b>\$910,000</b>	<b>\$15,360,000</b>	<b>\$67,100,000</b>

### 5.3. Drought

#### 5.3.1 Setting and Recent Occurrences

A drought can occur during any season when there is a long, abnormally dry period of time. These events are naturally occurring during periods of limited precipitation. The effects of drought may vary throughout Town, with some sectors impacted more than others.

In recent years, droughts have become flashier and more frequent throughout the region. During recent events, there have been reports in the region of wells going dry on residential and farming properties. Some of the more severe and impactful events include:

- **2016** – a statewide drought that lasted almost two years and peaked in 2016, resulted in water conservation efforts throughout the southeastern part of the region, elevated fire risks in some areas, and was noted as the 11<sup>th</sup> driest spring on record.
- **2020** – From June to December, New London County experienced a moderate to severe drought, with the county being declared a Stage 3 by the Connecticut Interagency Drought Work Group.
- **2022** – During the development of this plan, the region was in an ongoing drought, with severe drought conditions in August 2022. The County was declared a Stage 3 drought emergency on August 18, 2022.

### 5.3.2 Existing Capabilities

The Town of East Lyme, like many other communities, does not have specific regulations that are geared toward drought mitigation. The Zoning Regulations have been developed with one purpose being to facilitate adequate provisions for water, and to provide for environmentally important lands.

In section 52.03 of the Town Code, there is a water emergency conservation ordinance. This ordinance outlines the process for which the Water and Sewer Commission monitors water supply levels, the steps taken to declare a water emergency, and what possible restrictions may be enacted during an emergency.

The town also has its own water utility which primarily serves the southern and central parts of the town. While this could be seen as a challenge in some instances, having public water in some of the more densely populated areas of town provides a higher level of drinking water resilience during a drought. The town has also noted that the system is in good working condition, and that operators are diligent about leveraging state revolving funds for improvements.

### 5.3.3 Vulnerabilities and Risk Assessment

The entire Town of East Lyme is vulnerable to drought, but the degree of vulnerability varies. About half of the town relies on private wells for their residential or commercial drinking water. These wells could be also impacted during a drought, limiting water supplies.

#### 5.3.3.1 Hazard Losses

There have been no reported drought losses for the Town of East Lyme. Downscaled drought losses from the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi Jurisdiction document.

## 5.4. Dam Failure

### 5.4.1 Setting/Historic Record

Dam failures can be triggered suddenly with little or no warning and often in connection with natural disasters such as floods and earthquakes. Dam failures can occur during flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail. While flooding from a dam failure generally has a limited geographic extent, the effects are potentially catastrophic depending on the downstream population. A dam failure affecting East Lyme is considered a possible event each year with potentially significant effects. No dam failures have impacted the town since the previous HMP.

### 5.4.2 Existing Capabilities

The dam safety statutes are codified in Section 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted, which govern the registration, classification, and inspection of dams. Dams must be registered by the owner with the DEEP according to Connecticut Public Act 83-38. Owners of high and significant hazard dams are required to maintain EAPs for such dams.

The Connecticut DEEP administers the Dam Safety Section and designates a classification to each state-registered dam based on its potential hazard. As noted in the Multi-Jurisdictional HMP, East Lyme is

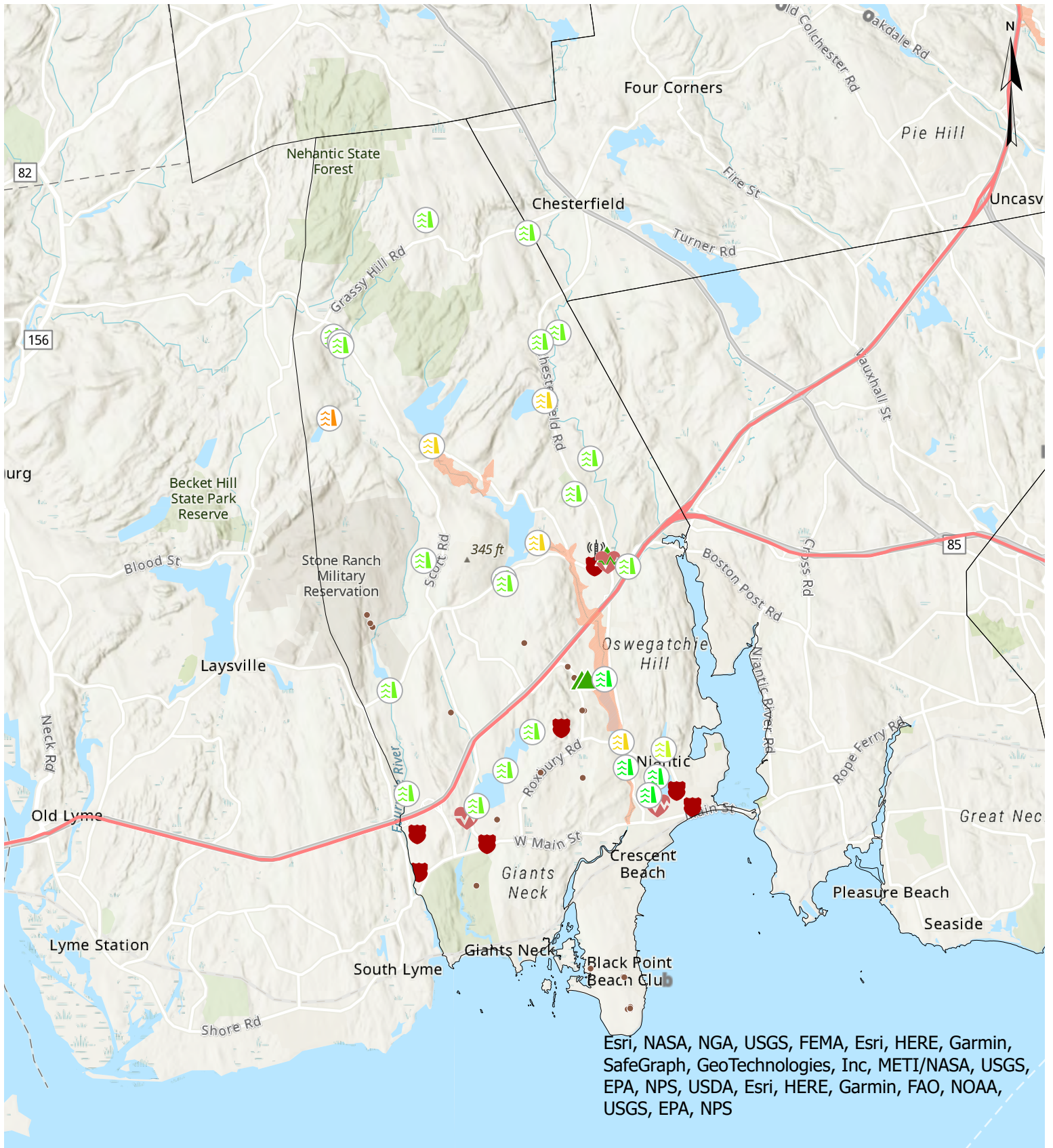


home to four Class B (significant hazard) dams, and one additional Class B (significant hazard) dam is located upstream of East Lyme whose failure could potentially lead to flooding within the town. These dams, and all others in town, are listed on Table 5-2.

*Table 5-2 Dams Registered with DEEP in the Town of East Lyme*

<b>CT Dam#</b>	<b>Dam Name</b>	<b>Dam Class</b>	<b>Owner Type</b>
4521	Dodge Pond	-	State Owned
4509	Ponderosa Park Dam	A	Private
4510	Fourmile Pond I	A	Private
4511	Fourmile Pond II	A	Private
4512	Fourmile Pond III	A	Private
4515	Cranberry Pond Dam	A	Private
4516	Latimer Brook Pond Dam	A	State Owned
4518	Havens Pond	A	State Owned
4519	Bride Lake Dam	A	State Owned
4520	Plants Dam	A	Municipal
4525	Real Pond	A	Private
4526	Natural Pond	A	Private
4530	Beaver Brook Dam	A	State Owned
4531	Drabik Pond Dam	A	Private
4532	Zaist Pond Dam	A	Private
4517	Clark Pond Dam	AA	Municipal
4501	Powers Lake Dam	B	State Owned
4502	Darrow Pond Dam	B	Municipal
4503	Gorton Pond Dam	B	State Owned
4505	Pataguanset Lake Dam	B	State Owned
4504	Dodson Pond Dam	BB	Private

Dams in the region whose failure could impact East Lyme are under the jurisdiction of the Connecticut DEEP. The dam safety statutes are codified in Section 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted, which govern the registration, classification, and inspection of dams. Dams must be registered by the owner with the DEEP according to Connecticut Public Act 83-38.

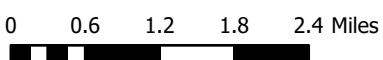


Esri, NASA, NGA, USGS, FEMA, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS

### Dams and Dam Failure Inundation Areas

Southeastern Connecticut Council of Governments Town of East Lyme

Date: 2/23/2023



### Legend

#### Dams

- Unknown/Unclassified
- A
- AA
- B
- BB

- Historic Resources
- Communication Infrastructure
- Emergency Services
- Shelter or Cooling Center
- Care and Medical Facility
- Dam Failure Inundation Area

Owners of high and significant hazard dams are required to maintain EAPs for such dams. The Town of East Lyme is part owner of Darrow Pond dam when it acquired half of the pond several years ago. Since 2017, an EAP has been developed for Darrow Pond Dam. The Connecticut DEEP maintains EAPs for the remaining dams in East Lyme, and the New London Water Department operates a dam in Montville that is in the headwaters of Latimer Brook. The Town of East Lyme does not currently possess copies of EAPs for high and significant hazard dams, aside from Darrow Pond.

#### Summary

In general, municipal capabilities to mitigate dam failure damage have slightly increased since 2017 with the development of the municipally owned Darrow Pond Dam. changes in the State's regulation of dams have increased Statewide capabilities sharply.

#### 5.4.3 Vulnerabilities and Risk Assessment

The potential impacts related to the failure of Class B dams within or upstream of East Lyme are described below. Where information was available, the descriptions below are based on information available at the Connecticut DEEP Dam Safety files.

- *Bogue Brook Reservoir Dam* – This dam is owned by the City of New London Water Department and impounds Bogue Brook for water supply purposes. The dam is believed to be in good condition. Neither an EOP nor a dam failure analysis was found in the Connecticut DEEP Dam Safety files. Failure of this dam would likely impact areas along Bogue Brook and Latimer Brook in Montville and cause minor to moderate flooding along Latimer Brook in East Lyme.
- *Darrow Pond Dam* – Darrow Pond dam is co-owned by a private owner and the Town of East Lyme, and the dam is believed to be in good condition. The Town does not believe that an EOP or dam failure analysis has been prepared for this dam. According to records in the Connecticut DEEP Dam Safety files, this dam overtopped during the 1982 floods causing minor damage downstream. Failure of this dam would likely washout Mostowy Road immediately downstream as well as causing damage at Route 161 and one structure downstream. Minor flooding would also likely be experienced by homes located along Latimer Brook.
- *Gorton Pond Dam* – This dam is owned and maintained by the Connecticut DEEP. Repairs to this dam were completed just prior to the previous HMP and the dam is believed to be in good condition. An EOP for this structure is on file with the DEEP. This dam originally provided water supply for Niantic Mills in the 19th century but currently impounds the Pattagansett River for recreational purposes. A 1981 inspection report prepared by the USACE included a dam failure analysis that suggested inundation would occur downstream to Route 1, that four downstream bridges would be damaged, and that four to five homes could be inundated downstream with moderate flooding. A review of the inundation mapping against current aerial photography suggests that as many as 22 homes could be flooded between the dam and Route 156.
- *Pattagansett Lake Dam* – This dam is owned and maintained by the Connecticut DEEP. An EOP for this structure is on file with the DEEP. This dam originally provided water supply for mills in the 19th century but currently impounds the Pattagansett River for recreational purposes. A 1999 EOP prepared by the USACE is on file at the Connecticut DEEP including a dam breach

analysis that suggested inundation would occur downstream at Mill Road, Route 1 (which would overtop by four feet), Pattagansett Road, Church Lane, I-95, Industrial Park Road, Flanders Road, Society Road, Roxbury Road, Romagna Road, East Pattagansett Road, Bush Hill Drive, Brook Road, Lake Avenue, Herster Drive, Route 156, Whittlesey Place, McElaney Drive, Huntley Court, and Fairhaven Road would be impacted by downstream flooding. A review of the inundation mapping against current aerial photography suggests that upwards of 100 homes, apartment complexes, schools, and businesses could be flooded if the dam failed.

- *Powers Lake Dam* – This dam is owned and maintained by the Connecticut DEEP. An EOP was not found in the Dam Safety files at Connecticut DEEP for this structure. This dam impounds the Pattagansett River for recreational purposes. A 1984 inspection report prepared by Keyes Associates included a dam failure analysis for the dam which suggested that at that time the downstream hazard was minimal. A review of the inundation mapping against current aerial photography suggests that approximately five homes on Upper Pattagansett River, Hathaway Road, and Pepperidge Lane could be flooded if the dam failed.

#### *5.4.3.1 Hazard Losses*

There are no reported losses for the Town of East Lyme related to dam failure. Downscaled losses from the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdictional document.



## 6. Rising Temperatures

### 6.1. Climate Change Impacts

On average, the annual temperature across the U.S. has increased by 1.8 degrees Fahrenheit when looking at the entire period of record (1895-2016). Accelerated warming patterns between 1979 and 2016 have been observed with satellite and surface data, and paleoclimate records show that some of the recent decades have been the warmest in the past 1,500 years.<sup>3</sup>

In general, periods of freeze and frost have decreased, therefore lengthening the period of time between the first winter freeze and spring thaw, since the early 1900's. These warming temperatures impact snowfall and accumulation, alter seasonal patterns, and can disrupt certain natural processes. In addition, warming temperatures can act as fuel for other natural hazards such as wildfires, droughts, hurricanes, and severe storms, and also play a role in changing precipitation patterns.

In addition to exacerbating some natural hazards, extreme heat waves are becoming more frequent, which can also have a serious impact on public health. In recent years, the region has experienced numerous heat waves, with several consecutive days of extremely hot temperatures and high heat indexes. Infrastructure can also be at risk during heat waves as some components, such as roadways or bridges, have not been designed to withstand ongoing, extreme temperatures.

### 6.2. Extreme Heat

#### 6.2.1 Setting and Recent Occurrences

An extreme heat event can occur at any time during warmer months, and can be defined as temperatures that hover 10 degrees or more above the average high temperature for the region. These events typically last for a prolonged period of time and is accompanied by high humidity. A heat wave, typically lasts three or more days with temperatures over 90 degrees for those days.

Since 2012, 480 days over 85 degrees have been recorded at the Norwich Public Utilities weather stations, 165 of which were over 90 degrees. During the summer of 2022, there were 45 days over 85 degrees were recorded, 21 of which were at least 90 degrees. A majority of these high temperature days occurred in July and August, with some of these extreme temperatures occurring outside summer months in May and October. Table 6-1 presents the daily maximum temperatures recorded at the Groton New London Airport and Norwich Public Utilities weather stations. Those values that are bold were above 90 degrees.

Table 6-1 Daily Maximum Temperatures from May to September Since 2017

	May		June		July		August		September	
	<i>GNL</i>	<i>NPU</i>	<i>GNL</i>	<i>NPU</i>	<i>GNL</i>	<i>NPU</i>	<i>GNL</i>	<i>NPU</i>	<i>GNL</i>	<i>NPU</i>
2017	85	<b>93</b>	89	<b>94</b>	88	<b>92</b>	87	89	86	89
2018	80	<b>91</b>	87	<b>90</b>	89	<b>101</b>	91	<b>94</b>	90	92
2019	83	85	88	<b>91</b>	94	<b>96</b>	88	<b>91</b>	87	84
2020	75	81	82	<b>91</b>	<b>92</b>	<b>96</b>	89	<b>92</b>	87	87
2021	88	87	86	<b>96</b>	86	<b>94</b>	88	<b>96</b>	82	85
2022	<b>93</b>	<b>92</b>	85	<b>92</b>	<b>91</b>	<b>96</b>	<b>91</b>	<b>94</b>	<b>94</b>	85

<sup>3</sup> <https://nca201758.globalchange.gov/chapter/2/>

## 6.2.2 Existing Capabilities

Similar to the monitoring methods used for hurricanes, severe storms, and winter storms, the Town monitors National Weather Service and local forecasts for anticipated extreme heat event, and also monitors for NWS heat warnings and advisories. The Town of East Lyme has identified the Community center as a cooling center in town. In the event of a projected heat event or heat wave, the Town is prepared to open up the community center for residents for cooling use.

## 6.2.3 Vulnerabilities and Risk Assessment

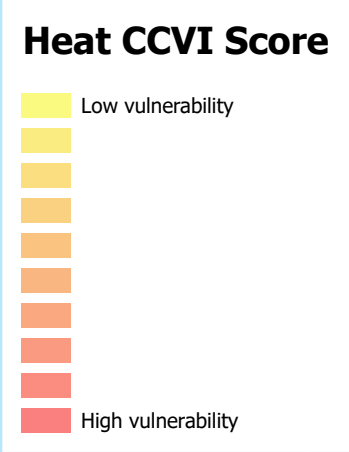
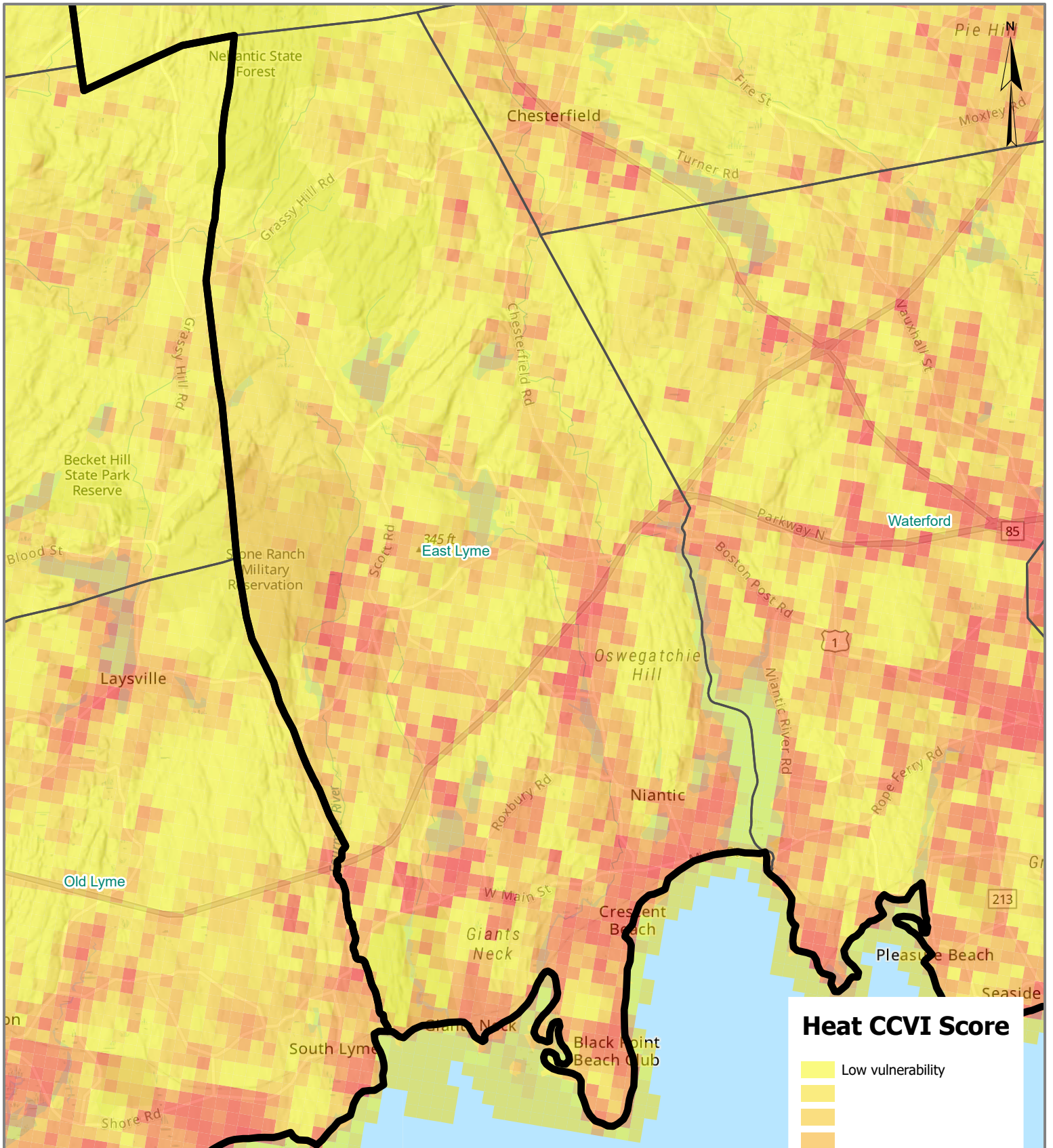
While the entire town is at risk of an extreme heat event, vulnerability can widely vary based on age, health, or the type of property owned in East Lyme. The elderly populations in town are more vulnerable to extreme heat events, particularly when in home cooling is not available. Also, those with certain health conditions may also be more vulnerable to the health factors associated with extreme temperatures.

UConn CIRCA has developed a tool to aid in understanding extreme heat vulnerability for communities across the state. This tool, known as the Climate Change Vulnerability Index (CCVI), is comprised of dozens of factors that contribute to a community's heat sensitivity, exposure, adaptive capacity, and ultimately the overall heat vulnerability. The CCVI has been used as a tool to characterize heat vulnerability for East Lyme. The distribution of heat vulnerability throughout the community can be seen in Figure 6-1.

Heat exposure and sensitivity are relatively low across most of East Lyme, with higher scores for both metrics along Rt 156 and in the area where Flanders Road crosses I-95 and Rt 1. There is only one cooling center serving East Lyme, but the southern part of the town has access to coastal waters. Therefore, the overall heat vulnerability for East Lyme is low to moderate depending on the location.

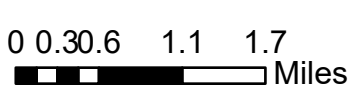
### 6.2.3.1 Hazard Losses

There are no reported losses for the Town of East Lyme related to extreme temperatures. Future editions of this plan will revisit this topic.



### Heat CCVI Score

SCCOG Hazard Mitigation and Climate Adaptation Plan  
 Town of East Lyme  
 12/9/2022



Esri, NASA, NGA, USGS, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS,

## 6.3. Wildfires

### 6.3.1 Setting and Recent Occurrences

Wildfires are considered to be highly destructive, uncontrollable fires. The most common causes of wildfires are arson, lightning strikes, and fires started from downed trees hitting electrical lines. Thus, wildfires have the potential to occur anywhere and at any time in both undeveloped and lightly developed areas of the town. However, the town has strong fire coverage and therefore does not typically experience major wildfires. Town personnel recall that fires occurred more often in the past than they do today. Small wildfires from one to three acres in size occur occasionally but they are quickly contained. Structural fires in higher density areas of the town are a larger concern for the Town, although these are not directly addressed herein.

### 6.3.2 Existing Capabilities

Monitoring of potential fire conditions is an important part of mitigation. The Connecticut DEEP Forestry Division uses the rainfall data recorded by the Automated Flood Warning system to compile forest fire probability forecasts. This allows the DEEP to monitor drier areas to be prepared for forest fire conditions. The Town can access this information over the internet. The Town also receives "Red Flag" warnings via local media outlets.

Existing mitigation for wildland fire control is typically focused on building codes, public education, Fire Department training, and maintaining an adequate supply of equipment. The Town Fire Departments have strong inter-municipal cooperation agreements with other municipalities to fight wildfires and structure fires. Fire protection water is obtained from the Town's public water system in the Niantic and Flanders areas. The Water & Sewer Department tests fire flows regularly and informs the fire departments of the pressure available.

A large area of town (primarily the north-central area) is not serviced by public water service. Fire fighters responding to these areas rely on dry hydrants, cisterns, tanker trucks, and drafting of surface water sources to provide fire protection water. New developments are required to install cisterns and/or dry hydrants to provide fire protection water, so most subdivisions have a source of firefighting water available. The Town goes to the fires as quickly as possible and has good access to most areas for fire-fighting and has gators and brush trucks to access less accessible areas.

A new water tower constructed in Montville provides additional water supply to East Lyme during dry periods and adds water pressure to East Lyme's distribution system. This has improved the Town's ability to utilize its public water supply for firefighting. The new interconnection with New London also increases East Lyme's water supply and water system redundancy.

The level of fire protection afforded by the existing public water service and other water sources in outlying areas is considered to be good for the development level of the Town. The Fire Department will continue to evaluate the level of risk and the need for additional public water system hydrants or other water sources in the future.

The Connecticut DEEP has recently changed its Open Burning Program. It now requires individuals to be nominated and designated by the Chief Executive Officer in each municipality that allows open burning and to take an online training course and exam to become certified as an "Open Burning Official."



Permit template forms were also revised that provide permit requirements so that the applicant/permittee is made aware of the requirements prior to, during, and after burn activity. The regulated activity is then overseen by the Town.

#### Summary

In general, municipal capabilities to mitigate wildfire damage have not significantly increased since the 2017 edition of the hazard mitigation plan was adopted due to the extensive water system improvements and redundancies created in years prior, along with changes in the State's regulation of open burning.

#### 6.3.3 Vulnerabilities and Risk Assessment

East Lyme has a mix of densely developed areas such as Niantic, Flanders, Giants Neck, and Black Point and rural areas in the north and central areas of the town. The most vulnerable area for a wildfire is the Nehantic State Forest in northwestern East Lyme. This area has relatively limited access for firefighting equipment and limited surface water sources to draft such that firefighting water must be transported. The Stone Ranch Military Reservation in western East Lyme also has limited access and a lack of surface water in many areas. These areas are considered to be at moderate risk for a major wildfire occurrence. Finally, Oswegatchie Hill overlooking the Niantic River is a large undeveloped area that has limited access and steep slopes which could make fire containment difficult although firefighting water is located nearby. The remaining areas of the town that are located nearby water sources are considered to be a low-risk area for wildfires. Refer to Figure 9-1 in the Multi-Jurisdictional HMP for a general depiction of wildfire risk areas within East Lyme.

##### 6.3.3.1 Hazard Losses

There are no reported losses for the Town of East Lyme related to wildfires. Downscaled losses from the 2019 Connecticut Natural Hazard Mitigation Plan using WUI acreage are developed in the Multi-Jurisdictional document.

## 7. Earthquakes

### 7.1. Climate Change Impacts

Earthquakes are not a climate related hazard, therefore there are no expected impacts as a result of climate change. There are however secondary impacts that could be a concern and amplify the damages of an earthquake. The deterioration of infrastructure from extreme heat or salt water as a result of coastal flooding or sea level rise, may weaken certain components making them more prone to damage or collapse during an earthquake event. Flooding events can also leave some landscapes at a higher risk of landslides; an earthquake could potentially prompt a landslide in post-flooded areas.

### 7.2. Earthquakes

#### 7.2.1 Setting and Recent Occurrences

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse; disrupt gas, electric, and telephone lines; and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time and often without warning. Detailed descriptions of earthquakes, scales, and effects can be found in Section 3.3.5 of the Multi-Jurisdictional HMP. Despite the low probability of an earthquake occurrence, earthquake damage presents a potentially catastrophic hazard to the town. However, it is very unlikely that the town would be at the epicenter of such a damaging earthquake. No major earthquakes have affected the town since the last HMP.

#### 7.2.2 Existing Capabilities

The Connecticut Building Codes include design criteria for buildings specific to each region as adopted by Building Officials and Code Administrators (BOCA). These include the seismic coefficients for building design in the Town of East Lyme. The Town has adopted these codes for new construction, and they are enforced by the Building Official. Due to the infrequent nature of damaging earthquakes, Town land use policies do not directly address earthquake hazards. However, the potential for an earthquake and emergency response procedures is addressed in the Town's EOP. In general, municipal capabilities to mitigate earthquake damage have not increased since the 2017 edition of the hazard mitigation plan was adopted. This is because the hazard continues to pose a low risk of damage to the Town.

#### 7.2.3 Vulnerabilities and Risk Assessment

Surficial earth materials behave differently in response to seismic activity. Unconsolidated materials such as sand and artificial fill can amplify the shaking associated with an earthquake. As noted in Section 2.1, several areas of the town (particularly near watercourses) are underlain by stratified drift. These areas are potentially more at risk for earthquake damage than the areas of the town underlain by glacial till. The best mitigation for future development in areas of sandy material is the application of the most stringent standards in the Connecticut Building Code, exceeding the building code requirements, or, if the Town deems necessary, the possible prohibition of new construction. The areas that are not at increased risk during an earthquake due to unstable soils are the areas underlain by glacial till.

Bedrock fault lines have not been mapped in the vicinity of East Lyme. Unlike seismic activity in California, earthquakes in Connecticut are not associated with specific known active faults. However, bedrock in Connecticut and New England in general is typically formed from relatively hard

metamorphic rock that is highly capable of transmitting seismic energy over great distances. For example, the relatively strong earthquake that occurred recently in Virginia was felt in Connecticut because the energy was transmitted over a great distance through such hard bedrock.

The built environment in the town primarily includes some more recent construction that is seismically designed. However, most buildings were built before the 1980's and therefore are not built to current building codes. Thus, it is believed that most buildings would be at least moderately damaged by a significant earthquake. Those residents who live or work in older, non-reinforced masonry buildings are at the highest risk for experiencing earthquake damage.

Areas of steep slopes can collapse during an earthquake, creating landslides. The town has numerous areas with steep slopes greater than 15% located throughout the town and these areas have already prevented significant development. While landslides are not a particular concern in the town, areas beneath steep slopes could be vulnerable to landslide damage during a major earthquake.

Seismic activity can also break utility lines such as water mains, gas mains, electric and telephone lines, and stormwater management systems. Damage to utility lines can lead to fires, especially in electric and gas mains. Dam failure can also pose a significant threat to developed areas during an earthquake. For this HMP, dam failure has been addressed separately in Section 10.0. As noted previously, most utility infrastructure in the town is located above ground. A quick and coordinated response with Connecticut Light & Power and other utilities will be necessary to inspect damaged utilities following an earthquake, to isolate damaged areas, and to bring backup systems online. This is covered in the EOPs for these entities.

### 7.2.3.1 Hazard Losses

There are no reported losses for the Town of East Lyme related to earthquakes. Downscaled losses from the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdictional document. In addition, a HAZUS-MH analysis of the potential economic and societal impacts to the SCCOG region from earthquake damage is detailed in the Multi-Jurisdictional HMCAP. The analysis addresses a range of potential impacts from any earthquake scenario, estimated damage to buildings by building type, potential damage to utilities and infrastructure, predicted sheltering requirements, estimated casualties, and total estimated losses and direct economic impact that may result from various earthquake scenarios. Potential economic impacts can be seen in Table 7-1 , with additional information developed in the Multi-Jurisdictional document.

Table 7-1 HAZUS-MH Earthquake Related Economic Impacts

East Lyme	Residential	Commercial	Industrial	Others	Total
	\$363,310,000	\$316,940,000	\$52,580,000	\$160,340,000	893,170,000

## 8. Mitigation Strategies and Actions

### 8.1. Status of Mitigation Strategies and Actions

A total of 24 hazard mitigation actions were developed in the previous edition of this plan. The status of each is listed below.

#	Mitigation Actions and Strategies for East Lyme 2016 - 2021	Status	Status Details
1	Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	Remove	For the CRS program, the Town is bolstering the floodplain management aspect of the zoning regulations; and for MS4 compliance, the Town is improving stormwater management across all land uses. The intent of this action has been met. Should confirm this with the Zoning Official and floodplain manager
2	Integrate elements of this HMP into the Plan of Conservation and Development during the next update	Complete	The latest POCD was approved a year ago, and reportedly included a number of HMP-related actions.
3	Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	Complete	Regulations were revised and voted on by Zoning Board. This reportedly included an increase of freeboard, and specific language to combat rising flood waters. This is in addition to what is already being done at the state level (PA 18-82). This is likely complete but should confirm with Zoning Official and floodplain manager.
4	Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	Remove	This is covered under the CRS program. The town tracks SI and damages.
5	Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties in the Niantic Bay area	Capability	This is covered under CRS activities. The town maintains and updates a log of property owners who have called for advice. The town also sends letters to realtors and insurance agents, advertising mitigation options at least twice each year.
6	Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones	Complete	This was included in zoning regulation revisions. Confirm with Zoning Official and floodplain manager.
7	Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	Complete	The town has a mutual aid agreement in place with the American Red Cross to help staff the multijurisdictional shelter at the East Lyme Middle School.
8	Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	Complete	The town uses Everbridge. The entire community can enroll, not only floodplain residents. The Town periodically tries to boost enrollment. Towns using Everbridge can program specific warnings as needed.
9	Consider establishing a second mode of egress for the Bush Hill Drive neighborhood	Carry Forward with Revisions	This has been designed but not yet built, as the project is waiting on funding. The town does own the right-of-way to develop. This action should be revised to encourage construction.



10	Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation	Carry Forward with Revisions	The town has identified a few candidate areas where roads might be able to be elevated; execution of projects depends mostly on time and funds. Revise this action to specify the roads in question (and separate them into separate actions).
11	Upgrade storm water collection and discharge systems to keep up with rising sea level, particularly in Niantic	Carry Forward with Revisions	Keep this action; this is still an interest, and not only restricted to the Niantic area.
12	Consider removing a small dam downstream of Route 1 to reduce flooding of Route 1 by Latimer Brook	Remove	The town has met with DOT about this issue several times to investigate. There is no history of flooding in this immediate area, so the dam removal is unlikely unless the Town pursues, which will be a challenge since the Town does not own it.
13	Complete mapping and vulnerability analysis of wastewater pumping stations	Complete	The mapping and vulnerability analysis is believed to be done (confirm with utility engineer), and some resilience improvements are being incorporated including resilience upgrades to pump stations. Alex will check. A new action may be needed to advance these efforts.
14	Relocate the wastewater pumping station in the Black Point area so that it is outside of the flood risk area, or pursue other flood mitigation alternatives.		Town will check on this; input from utility engineer may be needed.
15	Develop formalized methodology for culvert and bridge construction and replacement that requires utilization of the most up-to-date extreme rainfall data from <a href="http://precip.eas.cornell.edu">http://precip.eas.cornell.edu</a> .	Remove	The town mostly uses the NOAA atlas data but is aware of the Cornell data. The intent of this action is standard practice.
16	In accordance with the recommendations of the historic and cultural resources resiliency planning effort in 2016-2017, determine if any at-risk structures that are not yet eligible for historic designation will be eligible in the future. This may take the form of a historic resources survey.		Check with Zoning Official and floodplain manager or the Town Planner.
17	Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	Complete	The Transfer Station is used.
18	Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	Carry Forward with Revisions	Status unknown. The Public Safety building, which is relatively new, had to be built to withstand wind loading per the current code. There is still an interest in this action, although no urgency is seen. Carry forward and revise to focus on critical facilities.
19	Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	Complete	Landowners during a storm are authorized to bring debris to the collection point at Transfer Station.

20	Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	Complete	The Public Works Department had a Hazardous Household Waste Pickup event, at which the Emergency Management Department shared brochures about wind and tornado hazards, mitigation, and preparation. This was the most-attended HHW pick-up in eastern Connecticut. The town has also distributed wind information to seniors. All of this was well-received by the public.
21	Visit schools and educate children about the risks of wind events and how to prepare for them	Remove	This has not happened (COVID has prevented most school activities) but see above note about wind education efforts.
22	Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	Remove	This can be retired/merged with #23 below.
23	Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	Carry Forward with Revisions	Merge this with other concerns related to assessing town-owned buildings so that there is only one line item related to assessing vulnerability of these structures.
24	Prepare an EOP and dam failure analysis for the Darrow Pond Dam	Complete	This dam has its own EAP.

During the planning process, CIRCA and consultant staff facilitated a discussion with the Town staff to identify the greatest climate change concerns and challenges. The previous actions were re-evaluated in this context. Elements of five prior actions have been carried forward into the new hazard mitigation and climate adaptation actions.

### 8.2. Prioritization of Specific Actions

The proposed actions for the Town of East Lyme to undertake from 2023 through 2028 are listed in Table 8-1 on the next page. The full list of actions for the region with buildups for the PERSISTS and STAPLEE scores are available in the multi-jurisdiction document.

The actions with the highest PERSISTS score and the highest STAPLEE score are different, which is consistent with the intent of the two scores. PERSISTS scores tend to be higher for actions that maximize public safety while advancing climate science and being transferable to other communities, whereas STAPLEE scores tend to be higher for actions that are highly cost effective and technically feasible for reducing losses from hazards. The actions with the highest combined scores are:

- Execute one additional sewer pumping station resiliency project (floodproofing or standby power).
- Conduct a study and develop a policy and procedure for upgrading stormwater collection and discharge systems to keep up with sea level rise, storm frequency and intensity, and aging infrastructure. This procedure will specify when and how system components should be upgraded or retrofitted, and how this could be integrated into capital improvement, and identify other possible resilient stormwater management infrastructure funding opportunities.

The Town intends to focus on the above actions, along with the sole action about cooling centers:

- Evaluate the feasibility of designating a new cooling center in the northern part of East Lyme; and secure reliable transportation options for people to access cooling centers.

This is consistent with the State’s emphasis on cooling center resilience.

Table 8-1 Town of East Lyme Actions and STAPLEE and PERSISTS Scores

Number	Hazard Mitigation and Climate Adaptation Actions	Hazard Mitigation and Climate Adaptation Goal	Type of Action	Responsible Department	Approx. Cost Range	Potential Funding Sources	Timeframe	Priority	PERSISTS Score	STAPLEE Score	PERSISTS x STAPLEE =
EL1	Research and pursue mitigation strategies and funding to promote the resiliency of Town-owned critical facilities including assessment of flood, wind, and snow loading; backup power, etc. Determine recommendations for subsequent consideration.	Ensure that critical facilities are resilient, with special attention to shelters and cooling centers.	Preparedness & Emergency Response	Building Official	\$25,000 - \$50,000	FEMA HMA; Other preparedness grants; STEAP	7/2023 - 6/2025	Medium	21	6	126
EL2	Acquire and install new communications tower at Public Safety Building.	Ensure that critical facilities are resilient, with special attention to shelters and cooling centers.	Preparedness & Emergency Response	Emergency Management	\$100,000 - \$500,000	Preparedness grants	7/2023 - 6/2025	High	13	3	39
EL3	Distribute hazard mitigation and preparation materials at Town-sponsored events and coordinate with activities needed for CRS maintenance.	More than one goal	Education & Awareness	Emergency Management	\$0 - \$10,000	Municipal Operating Budget	7/2023 - 12/2023	Low	13	5	65
EL4	Evaluate the feasibility of designating a new cooling center in the northern part of East Lyme; and secure reliable transportation options for people to access cooling centers.	Ensure that critical facilities are resilient, with special attention to shelters and cooling centers.	Preparedness & Emergency Response	Office of the Chief Elected Official	\$25,000 - \$50,000	FEMA HMA; Other preparedness grants; STEAP	7/2023 - 6/2025	Low	16	5	80
EL5	Identify any possible hazard mitigation techniques and funding sources for water and sewer infrastructure, particularly water wells, booster pump station and wastewater pump stations. Employ these funds to dry floodproof or	More than one goal	Water & Wastewater Utility Projects	Water & Sewer	\$500,000 - \$1M	CWSRF; DWSRF; FEMA HMA; STEAP	7/2024 - 6/2026	High	21	7	147

Number	Hazard Mitigation and Climate Adaptation Actions	Hazard Mitigation and Climate Adaptation Goal	Type of Action	Responsible Department	Approx. Cost Range	Potential Funding Sources	Timeframe	Priority	PERISTS Score	STAPLEE Score	PERISTS x STAPLEE =
	relocate facilities located in hazardous coastal areas or other areas prone to flooding to mitigate water and sewer service disruption and environmental releases during disaster events.										
EL6	Execute one additional sewer pumping station resiliency project (floodproofing or standby power).	More than one goal	Water & Wastewater Utility Projects	Water & Sewer	\$100,000 - \$500,000	FEMA HMA; CWSRA; STEAP	7/2024 - 6/2026	High	20	9	180
EL7	Enhance resiliency of Water and Sewer Communication Infrastructure, including standby power generation at communication hubs (water towers, relay stations). Primary communication systems should be provided with secondary backup communication systems, preferably using different technologies and/or locations to mitigate outages during disaster events or vandalism.	More than one goal	Water & Wastewater Utility Projects	Water & Sewer	\$500,000 - \$1M	CWSRF; DWSRF; FEMA HMA; STEAP	7/2024 - 6/2026	High	14	7	98
EL8	Increase site security at all water and wastewater facilities by providing video surveillance outside and in some cases inside critical facilities to monitor locations in the event that personnel cannot safely access facilities during a disaster event or to ensure site security is not compromised. Sites should also be evaluated for the integrity of existing barriers such as gates and	More than one goal	Water & Wastewater Utility Projects	Water & Sewer	\$500,000 - \$1M	CWSRF; DWSRF; STEAP; IJJA SLCGP	7/2024 - 6/2026	High	14	3	42

Number	Hazard Mitigation and Climate Adaptation Actions	Hazard Mitigation and Climate Adaptation Goal	Type of Action	Responsible Department	Approx. Cost Range	Potential Funding Sources	Timeframe	Priority	PERISTS Score	STAPLEE Score	PERISTS x STAPLEE =
	fencing and make improvements where necessary.										
EL9	In accordance with the recommendations of the historic and cultural resources resiliency planning effort in 2016-2017, determine if any at-risk structures that are not yet eligible for historic designation may be eligible in the future. Determine possible risks to historic properties and identify possible mitigation efforts.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Land Use Staff	\$10,000 - \$25,000	SHPO	7/2025 - 6/2026	Low	15	7	105
EL10	Conduct a study and develop a policy and procedure for upgrading stormwater collection and discharge systems to keep up with sea level rise, storm frequency and intensity, and aging infrastructure. This procedure will specify when and how system components should be upgraded or retrofitted, and how this could be integrated into capital improvement, and identify other possible resilient stormwater management infrastructure funding opportunities.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Public Works	\$50,000 - \$100,000	Municipal Operating Budget	7/2024 - 6/2026	Medium	22	9	198
EL11	Fund and construct secondary egress for the Bush Hill Drive neighborhood along the town-owned right-of-way.	Invest in resilient corridors to ensure that people and services are accessible during floods and that	Structural Projects	Public Works	\$500,000 - \$1M	Municipal CIP Budget	7/2023 - 6/2025	Medium	14	2	28

Number	Hazard Mitigation and Climate Adaptation Actions	Hazard Mitigation and Climate Adaptation Goal	Type of Action	Responsible Department	Approx. Cost Range	Potential Funding Sources	Timeframe	Priority	PERISTS Score	STAPLEE Score	PERISTS x STAPLEE =
		development along corridors is resilient over the long term.									
EL12	Conduct feasibility study to elevate at-risk sections of Atlantic Street.	Invest in resilient corridors to ensure that people and services are accessible during floods and that development along corridors is resilient over the long term.	Structural Projects	Public Works	\$10,000 - \$25,000	DEEP Climate Resilience Fund; LOTCIP; Municipal CIP Budget	7/2024 - 6/2025	High	17	5	85
EL13	Conduct feasibility study to elevate at-risk sections of Bush Hill Road.	Invest in resilient corridors to ensure that people and services are accessible during floods and that development along corridors is resilient over the long term.	Structural Projects	Public Works	\$10,000 - \$25,000	DEEP Climate Resilience Fund; LOTCIP; Municipal CIP Budget	7/2025 - 6/2026	High	17	5	85
EL14	Conduct feasibility study to elevate at-risk sections of Brook Road.	Invest in resilient corridors to ensure that people and services are accessible during floods and that development	Structural Projects	Public Works	\$10,000 - \$25,000	DEEP Climate Resilience Fund; LOTCIP; Municipal CIP Budget	7/2026 - 6/2027	High	17	5	85

Number	Hazard Mitigation and Climate Adaptation Actions	Hazard Mitigation and Climate Adaptation Goal	Type of Action	Responsible Department	Approx. Cost Range	Potential Funding Sources	Timeframe	Priority	PERISTS Score	STAPLEE Score	PERISTS x STAPLEE =
		along corridors is resilient over the long term.									
EL15	Work with CT DEEP to update the list of repetitive loss properties and ensure that errors and updates are incorporated by FEMA.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Floodplain Manager	\$0 - \$10,000	Municipal Operating Budget	7/2023 - 12/2023	High	12	6	72
EL16	Conduct direct outreach to property owners in repetitive loss areas with information about how to mitigate flood losses, and coordinate with CRS activities.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Floodplain Manager	\$0 - \$10,000	Municipal Operating Budget	1/2024 and annually during January	High	13	4	52
EL17	Require floodplain manager and land use staff to take free training at <a href="https://portal.ct.gov/DEEP/P2/Chemical-Management-and-Climate-Resilience/Chemical-Management-and-Climate-Resilience">https://portal.ct.gov/DEEP/P2/Chemical-Management-and-Climate-Resilience/Chemical-Management-and-Climate-Resilience</a> to reduce risks of spills from businesses during floods.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Education & Awareness	Land Use Staff	\$0 - \$10,000	Municipal Operating Budget	7/2023 - 12/2023	Low	14	6	84