
TOWN OF STONINGTON ANNEX DOCUMENT

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

March 2023



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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 4th 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 annex document 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 Stonington. 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 Stonington 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 Stonington is located in the southeastern corner of Connecticut. The Town was first settled in 1649 and incorporated in 1662. It is a distinct political entity from the Borough of Stonington although borough residents are also residents of the town and the two entities share some municipal services. The Town is approximately 38.8 square miles in area and includes several historical villages including Lords Point, Pawcatuck, Wequetequock, and the eastern halves of the villages of Mystic and Old Mystic (the remaining halves being in the Town of Groton). The population of the Town (including the Borough) was 17,616 as of the 2010 census and increased slightly to 18,335 as of the 2020 census.

The Town is located in the southeastern portion of the Connecticut shoreline. It is bordered by the Town of North Stonington to the north, Ledyard to the northwest, Groton to the west, Fishers Island Sound and Little Narragansett Bay to the south, and Westerly, Rhode Island to the east. The Town can be accessed via several major transportation arteries including Interstate 95, Route 1, Route 2, Route 27, Route 49, Route 184, Route 201, Route 234, and the Amtrak-Metro North Railroad. A railroad station is located on Route 1 in Mystic.

2.1. Physical Setting

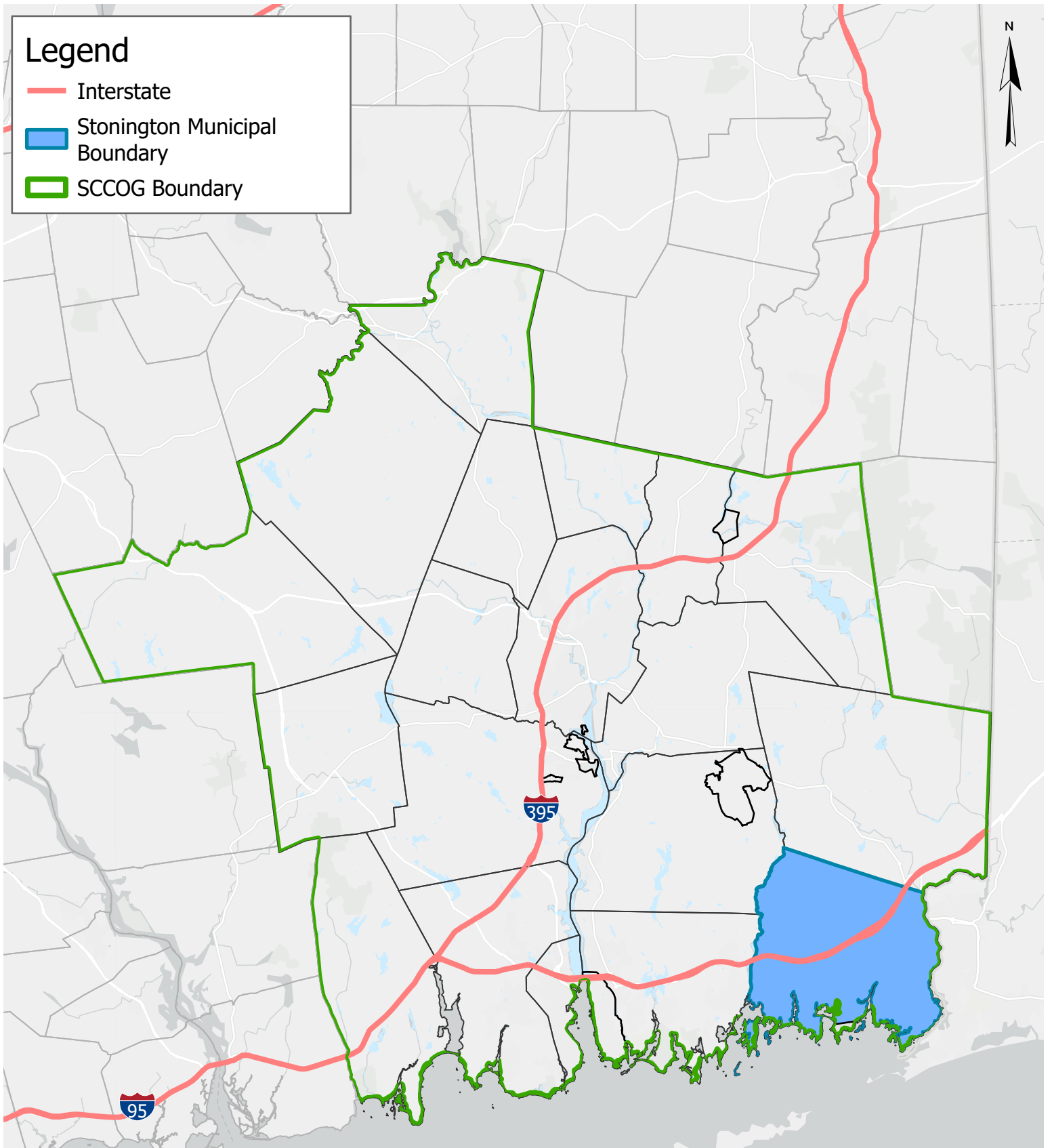
The Town of Stonington is a large community located on the Connecticut shoreline that also has a significant inland area. Elevations range from sea level to just over 270 feet on hilltops in the northern portion of the town. Several inhabited islands are located along the Stonington shoreline, including Ram Island, Mason Island, Enders Island, Andrews Island, Dodges Island, and Elihu 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 Stonington. The town lies above several bedrock types which trend west to east across the area except for circular banding around a fault line located parallel to the western boundary of the town. The majority of the town is underlain by Rope Ferry Gneiss, Hope Valley Alaskite Gneiss, or Potter Hill Granitic gneiss, with small areas of other bedrock formations. Each of these formations consists primarily of gneiss which is a relatively hard metamorphic rock.

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 Mystic River, Whitford Brook, Cops Brook, Pequotsepos Brook, Stony Brook, Anguilla Brook, and the Pawcatuck River are underlain by stratified drift. 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
- Stonington Municipal Boundary
- SCCOG Boundary

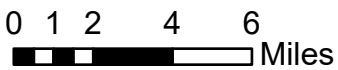


Regional Location of Stonington

SCCOG Hazard Mitigation and Climate Adaptation Plan

Town of Stonington

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 Fishers Island Sound. These include the Southeast Eastern Complex, the Southeast Shoreline, and Pawcatuck Main Stem regional basins as delineated by the Connecticut DEEP. Sub-regional drainage basins include those associated with Whitford Brook and the Mystic River on the western boundary of the town, Cops Brook and Anguilla Brook in the central area of town, and the Pawcatuck River on the eastern boundary of the community. Minor drainage basins include Pequotsepos Brook near Mystic and Stony Brook which drains to Stonington Harbor.

There are many impoundments throughout the town including Silvias Pond on Stony Brook, Whitford Pond and Hyde Pond on Whitford Brook, Wequetequock Pond on Anguilla Brook, Quiambog Cove, Wequetequock River, and Mystic Reservoir on Cops Brook. Along the shoreline, recreational boaters enjoy protected harbors and coves such as Mystic Harbor, Stonington Harbor, Wequetequock Cove, and Little Narragansett Bay. These areas are protected by from wave action by islands, beaches, and breakwaters located in Fishers Island Sound.

2.3. Land Cover

According to the 2016 1-meter resolution land cover developed by the NOAA Office of Coastal Management, Stonington is predominantly comprised of mixed forest, with approximately 54.63% of the town classified as such. The second largest land cover type is developed open space, which covers about 11.83%, and next is developed impervious which is about 8.61% of land cover. All land covers and their percent coverage can be found in Table 2-1.

Table 2-1 Town of Stonington Land Cover

Land Cover Type (2016)	% Coverage
Barren Land	0.67
Cultivated Crops	0.63
Developed, Impervious	8.61
Developed, Open Space	11.83
Estuarine Emergent Wetland	2.79
Estuarine Scrub/Shrub Wetland	0.07
Grassland/Herbaceous	3.03
Mixed Forest	54.63
Open Water	1.84
Palustrine Aquatic Bed	0.10
Palustrine Emergent Wetland	0.66
Palustrine Forested Wetland	7.40
Palustrine Scrub/Shrub Wetland	0.33
Pasture Hay	4.83
Scrub/Shrub	2.10
Unconsolidated Shore	0.42

2.4. Population, Demographics, and Development Trends

As of the 2020 Decennial Census, the population for the town is 18,335, which equates to about 474 people per square mile. As noted in the 2015 *Plan of Conservation and Development*, Stonington is a developmentally-balanced community which is neither a pure residential suburb nor an economic hub. In addition to being a large residential community, Stonington is a major contributor to the region's economy. While nearly 70% of town residents work outside of the community, approximately 57% of the 7,000 jobs within Stonington are held by non-Stonington residents.

The earliest settlements in the 17th century in Mystic, Wequetequock, and Pawcatuck consisted of farming supplemented by fishing and other maritime activities. The first shipyard in the town was constructed in 1669 in Pawcatuck. The maritime industry grew quickly and by the middle of the 19th century the town would have many shipyards that were home to as many as 78 whaling vessels as Stonington became the second-largest whaling port in Connecticut in addition to maintaining a strong sealing, fishing, and shipping industry. By this time, the major villages were densely developed, with textile mills and allied industries developing in Pawcatuck and Old Mystic.

Following the decline of the whaling and sealing industry in the 1920's, the widespread availability of the automobile and interstate highways following World War II allowed residents to commute to jobs further from home. The Town's maritime history became the basis for major tourist attractions such as Mystic Seaport and Mystic Aquarium. Suburban expansion followed in the 1960's through the 1980's as the population grew by nearly 25% with many residential homes built outside of the major villages during this time period.

According to the 2015 *Plan of Conservation and Development*, approximately one-third of the housing units in the town are non-single-family homes, such as multi-family, apartments, or mobile homes that provide a diverse housing stock. As many housing units predate 1990 particularly in the historic villages, it is believed that many structures are not aligned with current building codes. Such structures may be more susceptible to damage from natural hazards.

According to the 2015 *Plan of Conservation and Development*, land in the town is approximately 38% residential, 4% commercial and industrial, 10% agricultural, 9% institutional or transportation related, and 14% committed open space (an additional 6% and 14% is managed open space, and vacant, respectively). Davis Standard (a plastic extrusion equipment company) the Mashantucket Pequot Tribe, The Town of Stonington, Mystic Seaport, and Mystic Aquarium are the five largest employers in the town. Estimates suggest that Stonington could support an additional 2,803 housing units based on available land.

The town has reported some new recent developments in Stonington which could have likely contributed to the slight rise in population between 2010 and 2020. Significant development and redevelopment are reportedly occurring throughout town, especially in Mystic, although projects in Pawcatuck appear to have stalled in 2021-2022. Specific development projects include:

- Perkins Farm on Jerry Brown Road has 200 units complete, with an additional 100 on the horizon. This development also includes a large Hartford Healthcare office expansion.
- Brookside Development is a 100-unit mixed income project approved for South Broad Street.

Stonington is exploring methods of encouraging the redevelopment of mill buildings along the Pawcatuck River. Officials are considering upgrading the Mechanic Street flood protection and floodgate system to a level that will allow it to be accredited by FEMA. This would lower flood insurance rates, as well as flood risk, for the buildings on the landward side of the flood protection system.

Overall, new development and redevelopment in Stonington are not increasing risks to natural hazards. Redevelopment offers significant opportunities for flood mitigation to be incorporated into buildings, and new development is constructed per the flood damage prevention regulations and the State Building Code.

The 2020 American Community Survey 5-year estimates identified the annual average median income for Stonington to be \$97,850 with an average of 48.0% of the population holding a Bachelor's Degree or higher, and an average unemployment rate of 2.9% throughout the town.

2.5. Governmental Structure

The Town of Stonington is governed by a Board of Selectman – Town Meeting form of government as authorized by the Town Charter of 1989. 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, Emergency Management, Town Engineer, Fire Department, Planning, Police, and Public Works. In addition, there are several boards and commissions that can take an active role in hazard mitigation, including the Conservation Commission, Inland Wetland and Watercourse Commission, the Harbor Management Commissions, the Planning & Zoning Commission, and the Zoning Board of Appeals. 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 Stonington is noted below:

- The Building Official inspects new development and substantial redevelopment for compliance with current building codes. The Town of Stonington utilizes the Connecticut Building Code. The Building Department is now using an upgraded permit tracking system which allows coordination with Planning staff and aids in tracking flood-damage in town.
- The Conservation Commission maintains the Town's Open Space Plan and acquires open space from new developments.
- The Emergency Management 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, how to sign up for the CT Alerts "Everbridge" notification system, a map of areas potentially affected by storm surge, and a link requesting residents to sign up for the Special Needs Registry if they need special assistance during an emergency.
- The Town Engineer supports the Town's Land Use Commissions and the Stormwater Task Force, oversees certain construction projects, provides flood awareness information, and manages the Town's Community Rating System compliance. The Town Engineer also prepares and distributes an Annual Flood Awareness Newsletter.

- The Town of Stonington has six volunteer fire departments encompassing six fire districts. The Departments provides fire suppression, fire/ disaster prevention, rescue, hazardous materials, and disaster mitigation to the town. Public Water Service for fire protection is provided by the Aquarion Water Company or the Westerly Water Department. The six districts have four Fire Marshalls, with fire marshal responsibilities for the remaining two districts being performed by the Emergency Management Director. Two of the fire districts extend into the Town of Groton. Emergency medical and ambulance services are provided by Stonington Ambulance, Mystic River Ambulance in Groton, or Westerly Ambulance Corps in Westerly, Rhode Island.
- The Town has three Harbor Management Commissions (Mystic River, Pawcatuck River, and Stonington Harbor) who each maintain and enforce a Harbor Management Plan and ordinance for their jurisdiction. The Town also has a Waterfront Commission who oversees the development and use of the coastal waters in and around the Town of Stonington.
- The Inland Wetland & Watercourse Commission reviews plans for compliance with the Town’s Inland Wetland and Watercourse Regulations
- The Planning & Zoning Commission oversees 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 Department of Planning who administers the Town’s Zoning Regulations, administer the Coastal Management Program, make flood zone determinations for residents, perform planning studies, and provide technical assistance to developers.
- Police services are provided by the Town of Stonington Police Department. Full-time, paid personnel provide situation containment and traffic 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. The department website includes guidelines for residents regarding laws and suggested procedures for hiring arborists and tree contractors.

The roles of Town departments have not changed since the time of the previous HMP. Thus, the Town of Stonington 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 various *Harbor Management Plans* and 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, Emergency Management 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.

The EOP recognizes that the Town of Stonington does not have a town-wide warning system such that emergency response organizations such as the Fire and Police Departments may need to help warn the public before and during emergencies. Emergency communications will be supplemented through a HAM radio operator. The EOP outlines how the public will be contacted, how evacuations will be conducted, and how shelters will be opened and operated. Prior to a hurricane, the EOP has a 96-hour checklist to follow in order to prepare emergency personnel and residents for the impending storm.

Plan of Conservation and Development (2015)

The POCD was most recently updated in 2015 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 Town and recommends the most desirable uses types and population densities in various parts of the municipality.

The 2015 Town of Stonington POCD includes the following actions:

- Town recognizes its responsibility for oversight of the Connecticut Coastal Management Act, including the consideration of the effects of sea level rise, erosion and coastal flooding on coastal development.
- Town should continue to review hazard mitigation plans for recurring events, such as flooding.
- Town maintains flood control barrier on Mechanic Street.
- Town attempts to balance the maintenance of trees and the utility right of ways.
- Town notes that water pressure in some fire hydrants had been marginal in the past, however it was being addressed by Aquarion.
- Through the MS-4 program, residents have been educated on the effects of controlling Stormwater runoff. Although this is motivated primarily by water quality concerns, a reduction of impervious surfaces by homeowners can reduce flooding as well.

Therefore, the Stonington POCD is considered consistent with the current goals and actions of the hazard mitigation plan, as it directly references the HMP. The next update to the POCD (scheduled for 2026, within the life of this HMCAP) should continue to incorporate elements of hazard mitigation.

Harbor Management Plans

The Stonington Harbor Management Plan as adopted May 3, 2000 and revised November 2020, the Pawcatuck River Management Plan (draft as of October 14, 2010), and the Mystic Harbor Management Plan of May 1995 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 Stonington, Connecticut are amended through January 1, 2021. They include a variety of preventative regulations pertinent to mitigating natural hazards. These regulations are applied during the permitting process for new construction and during substantial improvement of existing structures.

Section 7.7 describes the Flood Hazard Overlay District and is the Town's articulation of the NFIP regulations. The regulations require a Flood Hazard Report be filed for properties located within the Flood Hazard Overlay District and utilizes the most recent FEMA SFHAs (based on the Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for New London County published on August 5, 2013 or July 3, 2011 depending on location) to delineate this district. New construction or substantial improvements are required to be resistant to flood damage, and utilities must be located to be free of flooding. All new construction or substantial improvement including mobile homes must be located such that the lowest floor is located one foot above the base flood elevation. The regulations further state that new utilities in Special Permit Areas must be placed underground.

Coastal Area Management is addressed in Section 7.3 of the Zoning Regulations. The Zoning Regulations define the Coastal Area Management overlay district as being all areas within DFIRM areas subject to coastal flooding, within 1,000 feet of the mean high-water mark for coastal waters, and within 1,000 feet of State-designated tidal wetlands. Building-height restrictions within 150 feet of Mean High Tide are determined based on the base flood elevation.

There are now FIRMS dated April 3, 2020 that cover some areas in town. These should be incorporated into future revisions of the zoning regulations.

Subdivision Regulations

The Subdivision Regulations in the Town of Stonington were last amended August 8, 2016. The regulations require that any drainage system located within the floodplain be designed for the 1% annual chance flood event and prohibit fill within 100 feet of watercourses, marshes, swamps, and bogs. The regulations further authorize the Tree Warden to move the proposed location of trees to not interfere with overhead utility lines and require that utilities be located underground whenever feasible.

Inland Wetland and Watercourses Regulations

The Inland Wetlands and Watercourses Regulations in the Town of Stonington were last amended in July 2004. 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 and Subdivision regulations by preventing fill and sedimentation that could lead to increased flood stages.

Bridge Asset Program

The town recently established a Bridge Asset Program which includes planning for replacement and repairs of infrastructure throughout Stonington. The town works closely with in-house staff and consultant on these endeavors. While sea level rise is not automatically taken into consideration during planning and incorporated into projects, the town feels this may be something to address in the future.

Other Land Use Regulations and Plans

Stonington maintains Aquifer Protection Regulations (effective date December 5, 2005) and an Open Space Plan (effective August 10, 2007). These documents help guide the Town’s development in a way that preserves open space and manages pollution.

2.7. Critical Facilities, Sheltering Capacity, and Evacuation

The Town of Stonington 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 and transportation infrastructure. Critical facilities that are buildings are presented on figures throughout this annex and summarized in Table 2-2. Several critical facilities are located within the 1% annual chance floodplain including fire departments, water treatment plants, waste water treatment plants, and elderly housing facilities. In addition, critical facilities are located in areas that could be impacted by hurricane storm surge. These facilities are described in more detail below.

Table 2-2 Town of Stonington Critical Facilities

Facility	Address or Location	Emergency Power	Shelter	Cooling Center	In SFHA	Hurricane Surge Zone
Emergency Services						
Police Department / EOC	173 South Broad Street	✓		✓		
Town Hall / Backup EOC	152 Elm Street	✓				
Mystic Fire Department	34 Broadway Avenue	✓			✓	✓
Old Mystic Fire Department	21 North Stonington Road	✓				✓
Pawcatuck Fire Department	33 Liberty Street	✓				
Quiambaug Fire Department	50 Old Stonington Road	✓			✓	✓
Stonington Borough Fire Department	100 Main Street	✓			✓	✓
Wequetequock Fire Department	6 Farmholme Road	✓				
Stonington Ambulance	86 Alpha Avenue	✓				
Public Works Garage	86 Alpha Avenue	✓				
Municipal Facilities						
Stonington High School	176 South Broad Street	✓	✓	✓		
Stonington Middle School	204 Mistuxet Avenue	✓	✓			
Utility Services						
Deans Mill Water Treatment Plant (Aquarion)	Mistuxet Avenue	✓			✓	
Pawcatuck Water Pollution Control Facility	38 Mary Hall Road	✓				
Mystic Water Pollution Control Facility	Edgemont Street	✓			✓	✓

Borough Water Pollution Control Facility	High Street	✓			✓	✓
Other Infrastructure/Facilities						
Stone Ridge	186 Jerry Browne Road	✓				
Brookside Village	Brookside Lane					
Stonington Arms	133 South Broad Street					
Edythe K. Richmond Elderly Housing (Town)	45 Sisk Drive					
Avalon Health Center	186 Jerry Browne Road	✓				
Pendleton Health & Rehabilitation	44 Maritime Drive	✓				
Apple Rehabilitation	28 Broadway Avenue	✓			✓	✓

Police Department

The Town’s Police Department facility includes the Town’s Emergency Operations Center. This building has a generator and has a communication tower. The Town utilizes an Enhanced 911 system to route all emergency calls. The community room at the police department can also be used as a cooling center during an extreme event.

Town Hall

The Stonington Town Hall houses records, plans, and other documents important for administering the Town. It has emergency backup power and houses the Town’s backup EOC with 90% redundancy of the primary EOC. This facility also has a repeater antenna.

Public Works Garage

The Town Public Works garage is located behind the Town Hall. It is used for vehicle and equipment storage and the facility also houses the Town’s salt and sand supply. This facility also has a generator for emergency power.

Volunteer Fire Departments and Emergency Services

The Town of Stonington has Department has six fire districts that provide fire suppression, rescue, and emergency medical services out of six fire stations located in the respective village areas. Several of these facilities are located within the 1% annual chance floodplain and/or hurricane surge zones. The Stonington Borough Fire Department (discussed in the Borough’s annex) was recently constructed and has floodproofing measures installed at each of its doors. The Fire Departments and town staff perform emergency services training with local utilities each year.

SCCOG completed an assessment of critical facilities in the region in 2017, fulfilling an action listed in the 2012 edition of the multi-jurisdiction hazard mitigation plan. Three fire district facilities in Stonington were included: Old Mystic, Quiambaug, and Mystic. The assessment determined that all three faced current flood risks and would experience increasing flood risks. Recommendations are incorporated into the list of actions in Section 8 of this annex and summarized below in Table 2-3.

Table 2-3 SCCOG Critical Facilities Assessment Summary for Town of Stonington

Facility	Address	Short-Term (0-20 years)	Long-Term (>20 years)
Old Mystic FD	21 North Stonington Rd	No action needed	Wet and dry floodproofing or low berm or flood wall
Quiambaug FD	50 Old Stonington Rd	Wet and dry floodproofing	Relocate facility

Mystic FD	34 Broadway	Dry floodproof the utility room	Wet floodproof all remaining lower areas
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Emergency medical services are provided by Mystic Ambulance in Groton, Stonington Ambulance, and Westerly Ambulance. Patients are transported to Westerly Hospital in Westerly, Rhode Island or to Lawrence & Memorial Hospital in New London for advanced care. The Stonington Ambulance facility was constructed in 1984 on fill material and was to be a temporary facility. The Stonington Ambulance building was renovated in 2016. This has addressed previously reported issues of settling due to the weight of the ambulances.

Utilities

The Aquarion Water Company Mystic System provides public water service to Mystic, Old Mystic, the northern portion of Mason Island, Lords Point, and to Stonington Borough and the nearby portion of the town. The Deans Mill Water Treatment Plant is considered a critical facility as the Town of Stonington must respond to emergencies there. A portion of this facility is located within the mapped floodway and 1% annual chance floodplain of Cops Brook. Recent improvements to the spillway of Mystic Reservoir and the downstream channel along Cops Brook were constructed due to flooding damage. The channel improvements may mean that the water treatment plant is no longer in the floodway. In addition to the treatment plant and water supply infrastructure, the two Aquarion water storage tanks in town are also considered critical facilities.

The Westerly Water Department provides public water service to most of Pawcatuck and extends westward towards Wequetequock. A water storage tank is located off Asher Avenue that is considered a critical facility. In addition, some of the Westerly Water Departments wells are located in Pawcatuck adjacent to the Pawcatuck River and are at risk of flooding.

The three water pollution control facilities are considered critical facilities. The Mystic and the Borough Water Pollution Control Facilities are both located within the 1% annual chance floodplain and hurricane surge zones. The Mystic Water Pollution Control Authority has undergone significant renovations for operational and water quality reasons; some coastal resilience measures were implemented during this work, such as elevating the generator. It is noted that the Town did not require complete NFIP adherence during this renovation; some variances were granted. Nevertheless, the resilience of this facility has increased.

The Town of Stonington also has 17 sewer pumping stations and associated infrastructure that they consider to be critical facilities. Many of these pumping stations are also located in the 1% annual chance floodplain and/or coastal surge zones.

Shelters

Stonington High School is the Town’s shelter and can hold approximately 1,200 people with a bedding-down capacity of 520 people. The school has a generator and the shelter is American Red Cross certified. The High School can also be used as a cooling center during an extreme heat event. The Town’s backup shelter is Stonington Middle School which can hold approximately 500 people with a bedding-down capacity of 200. The Middle School also has a generator and is American Red Cross Certified. In addition to Town departments, the American Red Cross and the Salvation Army provide

services related to mitigation and emergency management. 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.

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.

As the Town's communication system is more than ten years old, the Town is finding that they are relying more and more on cellular communication during emergencies. Thus, the Town considers the five cell towers in town to be critical facilities. Note that these are not listed on Table 2-1 because they are not buildings. One of the cellular towers (in Quiambaug) is located in the 1% annual chance floodplain and the hurricane surge zone. The Borough, Quiambaug and Wequetequock Fire Departments as well as Stonington Volunteer Ambulance Corp reportedly have obsolete communications equipment. Radio repeaters have been recommended to close gaps in radio coverage.

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

Three elderly housing facilities and three nursing homes in town are considered critical facilities. The Stonington Housing Authority and several private entities operate Elderly Living Facilities as noted in Table 2-2. Only Apple Rehabilitation in Mystic is located within the 1% annual chance floodplain and hurricane surge zones, and only the Avalon Health Care is known to have backup power. Town of Stonington residents utilize the Seaport Walk-In Medical Center for minor ailments, but the Town does not consider this to be a critical facility.

Evacuation Routes

Stonington 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 Stonington include Interstate 95, Route 1 into Groton or Westerly, Rhode Island, Route 2 into North Stonington towards Norwich, Route 27 into Groton to Route 184, Route 49 into North Stonington to Route 184, Route 78 into Westerly, Route 184 into Groton or North Stonington to Route 2, and Route 201 into North Stonington to Route 2. Residents could also evacuate the town using the Amtrak-Metro North Railroad out of the Mystic Station but only prior to a flood event as the railroad station is also located in the floodplain.

In addition to these critical transportation routes, the Town considers the Masons Island Road bridge to be critical infrastructure since it is the only mode of egress for a year-round population of approximately 400. This bridge was submerged during Tropical Storm Irene. The Elihu Island Road bridge is important for the same reason although this population of the island is much smaller than at Masons Island.

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 Stonington has 18 RL properties, with insurance payments totaling \$1,027,451.30. Of these, 16 are residential and 2 are commercial. In addition, 2 of the total residential properties are thought to be primarily affected by coastal flooding. The total reported in June is one more than the 17 reported RL properties in the 2017 HMP.

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 2-4.

Table 2-4 Town of Stonington Exposure Analysis

Hazard	At-Risk Parcels		At-Risk Facilities		At-Risk Historic Assets	
	Value	Number	Value	Number	Value	Number
Hurricane/Tropical Storm	\$2,913,618,913	9,230	\$58,661,400	17	\$180,106,80	574
Severe Thunderstorm	\$2,913,618,913	9,230	\$58,661,400	17	\$180,106,800	574
Severe Winter Storm	\$2,913,618,913	9,230	\$58,661,400	17	\$180,106,800	574
Tornado	\$2,913,618,913	9,230	\$58,661,400	17	\$180,106,800	574
Drought	\$812,545,950	2,732	\$47,101,300	11	\$510,200	3
Flood						
1% Annual Chance	\$816,286,320	2,917	\$15,223,800	9	\$116,690,400	276
VE	\$396,181,900	666	-	-	-	-
0.2% Annual Chance	\$991,886,691	3,587	\$43,243,200	13	\$129,443,900	328
Storm Surge						
Category 1	\$512,997,360	1,450	\$3,278,300v	2	\$70,874,300	151
Category 2	\$700,069,810	2,242	\$11,356,900	6	\$109,815,700	242
Category 3	\$838,667,800	2,840	\$40,224,200	9	\$124,391,600	299
Category 4	\$867,141,200	2,980	\$40,224,200	9	\$126,290,900	308

Earthquakes	\$2,913,618,913	9,230	\$58,661,400	17	\$180,106,800	574
Wildfire	\$532,960,920	2,676	\$47,101,300	11	\$510,200	3

2.10. Community Climate Change Challenges

As is with all of the SCCOG communities, the Town of Stonington 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.

Climate Change Summary Sheet for Town of Stonington

What are the Town's Top Climate Change Concerns?

Flooding: Most of Mystic has high coastal flood risk, affecting numerous historic and cultural resources that are difficult to make resilient, as well as complicating redevelopment pressures. The Town also shares Ledyard's concerns about Lantern Hill Road risks along Whitford Brook.

Extreme Heat: Like other communities, Stonington wishes to maintain access to its cooling centers for vulnerable populations such as the elderly.

Others: The town relies on three sewage treatment plants, which is unique among Connecticut communities; all three face coastal flood risks. Additionally, the Mason's Island Causeway is a unique transportation challenge

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

Flooding: Numerous actions are listed in the annex document for addressing flood and erosion challenges in the Mystic area including the boat house, Mystic Seaport facilities and parking lots, and Holmes Street. All are considered important. Actions are also included for Lantern Hill Road.

Extreme Heat: Ensure that the cooling centers (Police Station and High School) are accessible from transit lines or alternate transportation options.

Others: Determine appropriate methods of floodproofing the WPCFs (WWTPs) and sewer pumping stations; and develop a design for elevating the Mason's Island causeway.

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.¹ 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 equate to an increase in risk throughout town, 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 4.2 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. Some of the most impactful events in the past decade for the town include Tropical Storm Irene and Super Storm Sandy; both are described below.

Tropical Storm Irene impacted the region in August 2011. Trees fell throughout the town and the region, causing power outages that on average lasted five days. Some areas were out for as many as

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

eight days including several town facilities that were operated with generators. Debris removal took a few weeks to complete because a significant number of trees were damaged.

In 2012, Super Storm Sandy, a hybrid storm with both tropical and extra-tropical characteristics, brought high winds and coastal flooding to southern New England. Record breaking high tides and wave action was combined with sustained winds of 40 to 60 mph and wind gusts of 80 to 90 mph. Widespread significant statewide power outages of 667,598 lasted up to 8 days. The town saw significant coastal flooding, with damage to boats, docks, and structures. The town received over \$270,000 dollars in federal assistance to aid in storm cleanup.

In more recent history, the Town has experienced multiple tropical system events. 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.

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 Super Storm 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. There were reports of flooding in town in the typically flooded, low lying areas such as near Barn Island.

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, 2022. The code specifies the design wind speed for construction in all the Connecticut municipalities. The basic design wind speed for Stonington ranges from 120 to 145 miles per hour, and the ultimate design wind speed is 129 miles per hour. Design speeds used varies 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. Stonington has adopted the Connecticut Building Code as its building code.

Parts of trees (limbs) or entire tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. The town receives electrical service from Eversource who has an active tree pruning program. In the case of an extended power outage, residents would be directed to the shelter at Stonington High School or Stonington Middle School.

The Town requires that new developments or substantial redevelopment in Special Permit areas locate utilities underground and that utilities must be protected from flooding damage. The Town also determines on a case-by-case basis whether to require that utilities be placed underground for new developments. However, utility lines are located underground in only a few areas of the town. While the Town of Stonington would be interested in placing utilities underground, 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 that a streetscape project on the Groton side of Mystic included underground utilities. The Town would need to work with Eversource and acquire grant funding to complete any large-scale utility relocation project since it would be very expensive. Burial of utilities is not a high priority for the Town.

The Town has a volunteer Tree Warden who can post notification 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. For example, the Town recently removed 34 trees on North Main Street that were considered hazardous. The Town hires outside contractors for larger jobs such as tree removal. The Town does anything possible to ensure that dangerous trees and debris are cleaned up following a storm. For example, a commercial building in Town was damaged by winds from Tropical Storm Irene and the property owner refused to clean up or repair the damage. The Town placed a lien on the building to remove the debris, and the property is now abandoned.

In response to the major power-outages caused by Tropical Storm Irene and Super Storm 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 has improved due to Eversource’s liaison program.

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 the town, and many people heeded the evacuation and moved inland. An evacuation order was also issued ahead of Storm Henri in August 2021.

The Town also has links regarding hurricane preparedness and disaster preparedness on the Emergency Management webpage on its website. Links are provided to NOAA, the CT Alert “Everbridge” Reverse 9-1-1 system, a copy of the local hurricane inundation map, and the Special Needs Registry. Residents are encouraged to sign up for the Special Needs Registry if they need specific assistance during an emergency situation. The Public Works webpage on the Town website also has guidelines and advice for residents who wish to hire tree contractors.

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 Town also participates in Mock Hurricane Exercises to prepare for such events. 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, coordination with the Borough of Stonington is important since many Borough residents will be utilizing the Town's shelters, and one of the Town's fire districts is also shared with the Borough. Additional shelters could be outfitted following a storm with the assistance of the American Red Cross on an as-needed 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 in response to the damage from Tropical Storm Irene in 2011 and Super Storm Sandy in 2012 and continue to operate at this level.

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 areas damaging 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.

Stonington has a diverse housing stock with many rental properties, several mobile home parks, 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 mobile home parks and recreational vehicles 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. Mobile home parks often have structures that are difficult to relocate such that these areas require an additional level of effort to inform the public about shelters and evacuation prior to a hurricane or tropical storm event.

The strength of a large hurricane could cause a significant economic impact to the town. The potential economic effect of wind damage to SCCOG was evaluated in the Multi-Jurisdictional HMCAP. A separate analysis was not performed specifically for the Town of Stonington.

3.2.3.1 Hazard Losses

The Town of Stonington received \$9,000 in the wake of Tropical Storm Isaias. Since 2012, the town has received \$30,672 in FEMA PA funds for project costs of \$40,896. This was all received for Super Storm Sandy. These funds were received for public buildings (Figure 3-1).

In addition to PA, FEMA offers Individual Assistance (IA) for property owners and renters in the wake of a declared disaster. One property renter received \$300 in IA funding after Storm Ida of 2021.

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 Stonington. Additional HAZUS-generated losses for the town and region can be found in the Multi-Jurisdictional document.

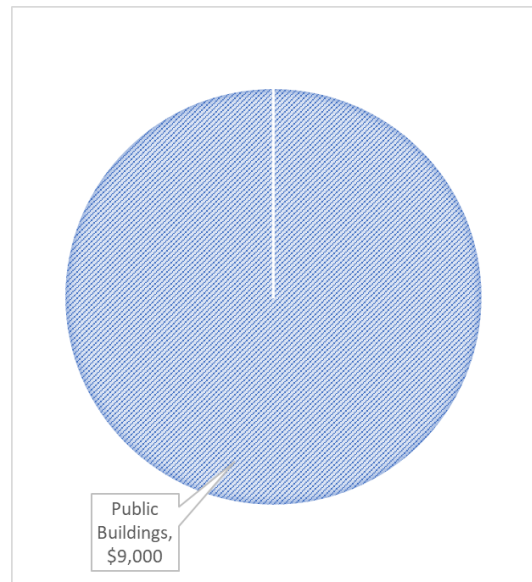


Figure 3-1 Tropical Storm Isaias FEMA Funding Categories

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

Stonington	Return Period	Residential	Commercial	Industrial	Others	Total
	10-year	\$402,210	\$5,040	\$360	\$190	\$407,800
	20-year	\$6,098,370	\$268,880	\$49,030	\$62,330	\$6,478,610

	50-year	\$29,565,820	\$3,250,360	\$653,950	\$789,840	\$34,259,970
	100-year	\$66,383,650	\$11,501,870	\$2,531,320	\$3,206,810	\$83,623,650
	200-year	\$126,285,780	\$26,218,880	\$6,337,570	\$7,232,460	\$166,074,690
	500-year	\$247,711,360	\$54,485,180	\$16,616,310	\$14,949,250	\$333,762,100
	1,000-year	\$359,636,740	\$90,091,530	\$23,939,430	\$21,403,280	\$495,070,980

Table 3-2 HAZUS-MH Hurricane Related Building Damage

Stonington	Return Period	Minor	Moderate	Severe	Destruction	Total
	10-year	6	0	0	0	6
	20-year	63	4	0	0	67
	50-year	574	76	3	1	654
	100-year	1,168	251	21	11	1,451
	200-year	1,678	505	67	32	2,282
	500-year	2,186	920	186	93	3,385
	1,000-year	2,342	1,182	312	158	3,994

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

Stonington	Return Period	Debris Generated (Tons)	Households Displaced	Individuals Seeking Temporary Shelter
	10-year	60	0	0
	20-year	750	0	0
	50-year	5,129	2	0
	100-year	9,897	13	2
	200-year	17,072	47	7
	500-year	29,199	169	38
	1,000-year	39,788	308	77

3.3. Tornadoes and High Wind Events

3.3.1 Setting and Recent Occurrences

Similar to hurricanes and winter storms, wind damage associated with severe thunder or 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. For example, the NCDRC reported that the July 1, 2009 thunderstorms produced lightning that struck several houses in Stonington resulting in minor house fires.

Other recent severe storm events include:

- On September 6, 2017 a cold front triggered severe storms in 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. The town reported approximately \$5,000 in damages from this event. The NCDRC report for this event is in the text box.

“At approximately 4:54 PM EST on Saturday, November 13th, 2021 a tornado touched down on Robinson Street in the Pawcatuck neighborhood of Stonington, Connecticut. Several hardwood trees were uprooted or snapped about halfway up the trunk. A gutter was ripped off of one home while shutters were ripped off of another. Several trampolines were lifted, with one becoming stuck on a powerline approximately 20 feet in the air. On Robinson Street, crossroad Race Street, a metal shed was lifted and flipped before being crushed by a large maple branch, with an approximate diameter of 15 inches. Several street signs were also snapped at their base.”

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 3.2.2 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 summer storms. 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 wind storms. 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

Since 2017, two NOAA report events have been associated with a severe thunderstorm and tornado. Both reports occurred on November 13, 2021, with an associated report of \$18,500 in damage. Town staff reported an estimated \$5,000 in damages and costs associated with the 2021 tornado event in Pawcatuck. 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 summer storms, 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.

Winter storms and nor'easters have affected the town, with the storms occurring in the winter of 2010-2011 having the most significant effect in the past decade. For example, one business (Connecticut Castings) was known to have a roof collapse in January 2011.

The year 2013 featured exceptional snow events that severely taxed snow removal abilities of towns in the region. The blizzard of 2013 in early February dumped one to two feet of snow on the region. Another snowstorm struck the region in mid-March 2013 dumping upwards of one to two feet of snow in some parts of the county. The Town of Stonington received over \$70,000 dollars in public assistance in order to aid the cleanup.

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. The Town of 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 with 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.

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 Mystic and Pawcatuck where off-street parking is sometimes unavailable.

The Public Works Department oversees snow removal in the town. Salt and sand is stored at the Town of Stonington Public Works facility. The Town has established 16 plowing routes and 11 salt 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 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 did not experience significant snow load problems at its buildings during the winter of 2010-2011, although the Town checked its flat-roofed buildings and the school system followed its evaluation / inspection procedure that they have in place. Some residents shoveled roofs and at least one business had a roof collapse as noted in the

historic record. The Town has an unwritten protocol for roof monitoring and clearing during winter storms that it finds sufficient. The Town participated in the SCCOG critical facilities assessment, which evaluating the snow load capacity of some critical facilities in the region including three fire district facilities in Stonington. Recommendations related to snow risk were not advanced for these three facilities.

Summary

In general, municipal capabilities to mitigate snowstorm damage have increased slightly 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 have been 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.

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 the Town of Stonington since 2017. In the past decade, the town has received FEMA PA funds in the amount of \$166,573 for winter storms in 2013 and 2015. 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).

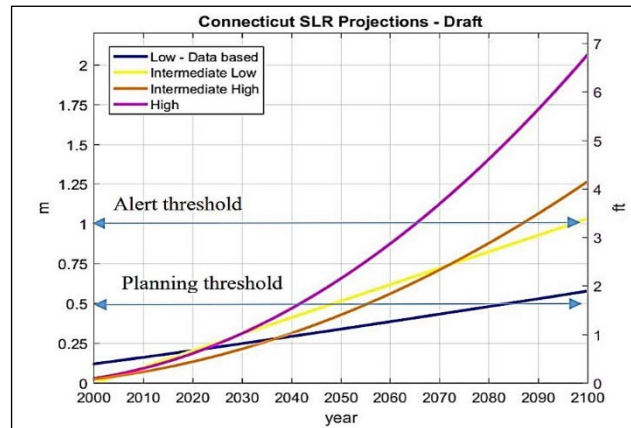


Figure 4-1 Four Localized Sea Level Rise Scenarios for

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 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 shoreline of Stonington primarily contains developed shoreline, modified bluffs and escarpments, rocky shorefronts, islands, and tidal wetlands. Modified beaches and dunes, coastal bluffs and escarpments, and beaches and dunes are also present but are more limited in area. Much of the Mystic River has developed shoreline; the majority of the remaining shoreline of the town consists of rocky shorefront, modified bluffs and escarpments, or tidal wetlands. The largest area of tidal wetlands is within the Barn Island Wildlife Management Area located to the northwest of Pawcatuck Point near the Rhode Island border. This 1,013-acre area is the State's single largest coastal property managed for wildlife conservation.

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 Pawcatuck River, Wequetequock Cove, Stonington Harbor, Quiambog Cove, Mystic Harbor, and the Mystic River.

The mapped islands include inhabited areas such as Masons Island (approximately 400 year-round residents with approximately twice that population in the summer), Andrews Island (two homes), Dodges Island (three homes), Elihu Island (six homes), Enders Island (six structures), and Ram Island (one home). 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 Stonington. 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. 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 overtopped the causeway to Masons Island, and a minor storm surge and high tide on January 12, 2012 caused flooding in downtown Mystic. Only a few structures are known to have received damage by coastal floodwaters since 2005. However, the Town is concerned with the potential long-term effects of sea level rise and its potential to exacerbate flooding conditions in the future.

In 2012, Super Storm Sandy, a hybrid storm with both tropical and extra-tropical characteristics, brought high winds and coastal flooding to southern New England. Record breaking high tides and wave action was combined with sustained winds of 40 to 60 mph and wind gusts of 80 to 90 mph. Widespread significant statewide power outages of 667,598 lasted up to 8 days. The town saw significant coastal flooding, with damage to boats, docks, and structures. The Town received over \$270,000 dollars in federal assistance to aid in storm cleanup. The picture to the right is from the Stonington side of Mystic.



Town personnel report that complaints related to nuisance high-tide flooding in Mystic have increased in recent years. For example, a king tide occurring on a sunny day caused water to flow onto, and inundate, many sections of roads in the Stonington side of Mystic.

Though the Town has experienced coastal storms in recent years, few major coastal flooding events have occurred in the last five to ten years. However, 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 Mystic and other parts of Stonington.

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.

As noted in Section 5.2.2 and Section 2.6, 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 one foot above the base flood elevation. The Town requires elevation certificates to certify such work as part of its Community Rating System efforts. The Planning and Zoning Commission, Department of Planning, 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 further attempted to streamline restrictions to its regulations through its recent amendments to the Zoning Regulations and Subdivision Regulations. Stonington currently participates in the FEMA Community Rating System (CRS), and is currently a Class 7 Community, the highest rating in the State (along with the City of New Haven). The Town has secured assistance from consultants in the past five years to help review complex proposals involving home elevations and coastal structures, and this has resulted in a modest increase in capabilities for flood damage prevention.

As a CRS community, the Town has conducted outreach to residents about flood mitigation but most residents are not interested in FEMA-funded acquisitions or elevations. Instead, residents are typically more interested in elevating structures when this action can coincide with renovations. There is one waterfront home that the Town is actively attempting to acquire and to convert into a small park.

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 Stonington utilizes these warnings and forecasts to prepare emergency responders for flooding events.

The shoreline of Stonington 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 Enders Island, Lords Point, and Wamphassuc Point. Larger structures are associated with the breakwaters and seawalls outside of Stonington Harbor and the causeways leading to Masons Island, Enders Island, and Elihu Island. Developed shorefront areas in Mystic also have a variety of natural and manufactured seawalls. Groins and jetties do not appear to be in use in Stonington due to the lack of widespread 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.

Stonington plans to secure funding to conduct an evaluation of the Pawcatuck flood protection system and determine if it can be accredited, and how that might occur. The current Stonington Capital Improvement Plan has budgeted for the performance of Pawcatuck flood protection system improvements.

Community Coastal Resilience Plan

The Town of Stonington developed a Community Coastal Resiliency Plan in 2017. This plan includes information about risks due to climate change and sea level rise, lists vulnerabilities that exist in the Town, and recommends adaptation and resilience options (including regulatory changes) to implement in the future.

Prior to developing the Community Coastal Resiliency Plan, the Town participated in a resiliency planning initiative with SCCOG and TNC in 2016-2017².

The town has been working toward executing actions from the Resilience Plan. In recent years two projects have been identified as having incorporated beach nourishment and/or green infrastructure into the project in accordance with the Plan. The “Boathouse” project in town is considering various options, and there are property owners on Mason’s Island that have received a NFWF grant to evaluate these options along their stretch of shoreline.

Historic and Cultural Resources Resiliency Planning

As explained in the Multi-Jurisdictional document and the previous edition of this annex, 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 Town of Stonington 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 practices guide for planning techniques to make historic resources more resilient was distributed in September 2017.

Summary

Municipal capabilities to mitigate coastal flood damage have not increased significantly since the 2017 edition of the hazard mitigation plan was adopted. As noted above, the Town has secured assistance from consultants in the past five years to help review complex proposals involving home elevations and coastal structures, and this has resulted in a modest increase in capabilities for flood damage prevention. Even if the Town reverts to in-house reviews for all projects, the experience will have increased capabilities for floodplain management.

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,

² <https://tnc.app.box.com/s/8nne60yjk2g3m1mgzkfa86rndxyjiawf>

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 Stonington. The distribution of flood vulnerability throughout the community can be seen in Figure 4-2. The CCVI demonstrates that flood vulnerability in the town ranges from low to high. Most of the high vulnerability scores are due to coastal flood exposure, the Pawcatuck River, Anguilla Brook, Stony Brook, Copps Brook, and the Mystic River.

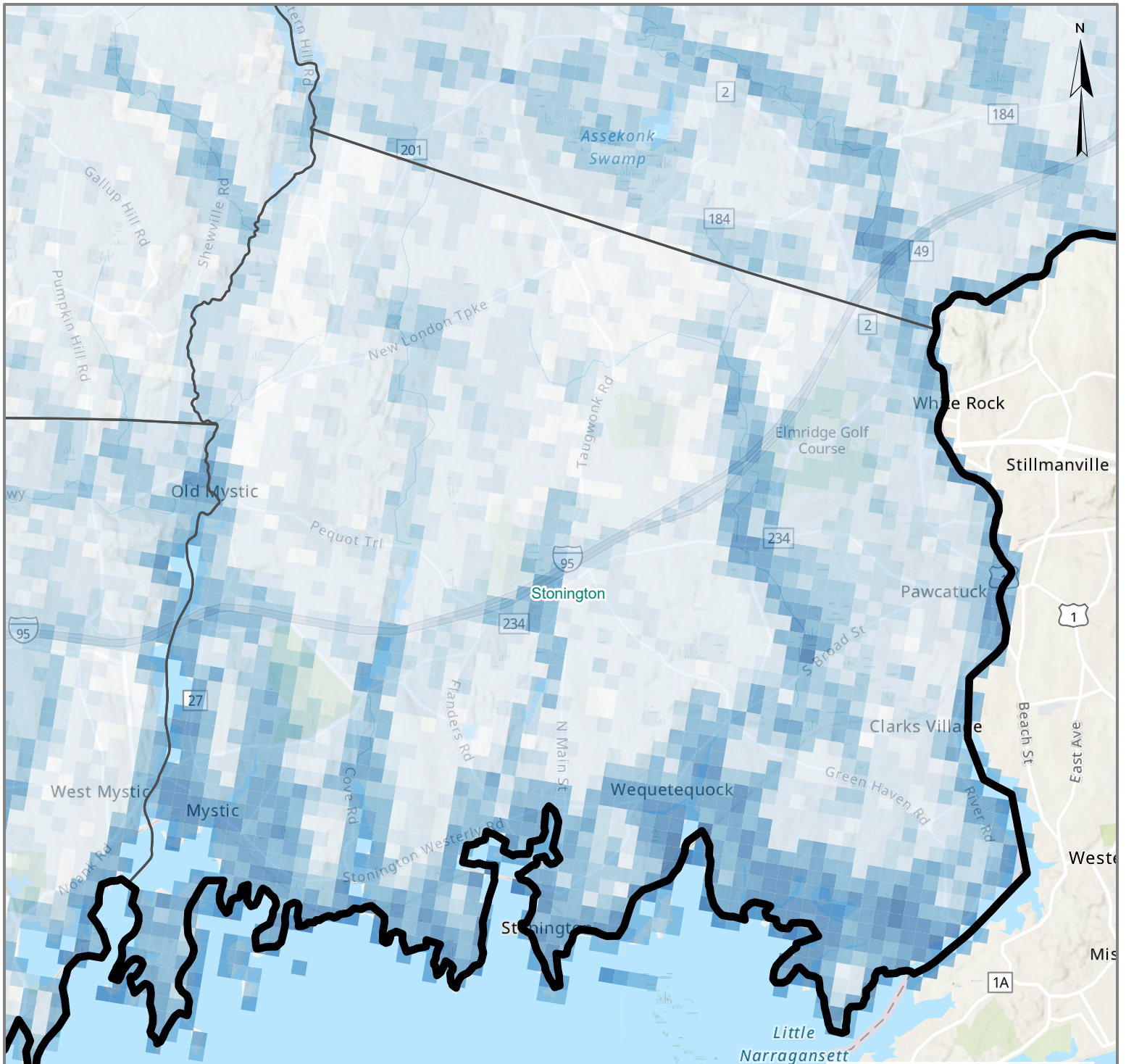
Vulnerability Analysis of Areas Along Coastal Waters

The low-lying shoreline areas of the town are subject to periodic flooding. The most severe flooding in Stonington 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. Tidally-influenced flooding also occurs along the lower portion of major watercourses including the Mystic River, Pequotsepos Brook, Copps Brook, Stony Brook, Anguilla Brook (Wequetequock Pond), and the Pawcatuck River. 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 is exposed to the wave action from Fishers Island Sound. An additional concern for this area of the Town is that the primary roadways may flood before structures are affected making subsequent evacuation very difficult. The Town of Stonington 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.

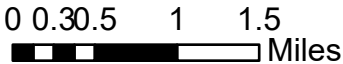
Table 4-1 Important Roadways at Risk of Overtopping During Coastal Flooding

Road	Road
Chippechaug Trail	River Road
East Main Street (Route 1)	Riverside Drive
Elihu Island Road	Roosevelt Street (Route 1)
Elm Street	Route 1 at Pequotsepos Brook estuary
Greenmanville Avenue (Route 27)	Route 1 at Quannaduck Cove
Latimer Point Road	Route 1 at Quiambog Cove
Main Street (Route 27)	Route 1 at Lamberts Cove
Masons Island Road	Route 1 near Long Wharf Drive
North Water Street	Wamphassuc Point Road
Osbrook Point Road	Yacht Club Road

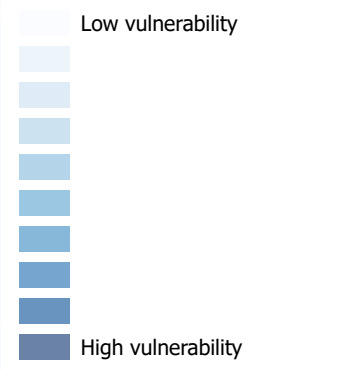


Flood CCVI Score

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



Flood CCVI Score



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

The Masons Island Road causeway is a particular area of concern as it can be overtopped by a moderate coastal flood event and is the only mode of egress for 400 to 800 people on Masons Island and Enders Island. In addition, the Amtrak-Metro North railroad can be overtopped by storm surge in several areas by a Category Two hurricane (except for a small area between Matthews Street and Cutler Street near the Borough which can be overtopped by storm surge from a Category One hurricane). Other roads that provide access to coastal structures are also located in the 1% annual chance coastal floodplain as described in Section 5.2.3.

As shown on Figure 4-2, 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 approximate the 0.2% annual chance flood event. A Category Four Hurricane would affect additional areas, while a Category One Hurricane is expected to only impact low-lying coastal areas. Areas potentially affected by storm surge from a Category One Hurricane include significant portions of downtown Mystic, Masons Island, Lords Point, and low-lying areas adjacent of the Pawcatuck River as well as smaller portions of other coastal areas.

Vulnerability Analysis of Private Properties

The coastal areas of the Town of Stonington have properties that are inhabited year-round. This intensifies risk to life and property in coastal areas. Waterfront properties are very susceptible to damage, not only as a result of flooding but also due to the velocity zones located along the Stonington's shoreline.

Buildings located in flood hazard areas are primarily residential but also include some commercial, industrial, and critical facility structures. Most of the structures that are threatened by flooding are located within the 1% annual chance floodplain, but some are also in the coastal velocity zone. Location in the velocity zone poses an increased threat to structures due to high wind and potential wave damage, as well as inundation by flood waters. Other areas located more inland or behind protective seawalls are only subject to coastal flooding without wave action.

The above is particularly true in Mystic where nearly the entire area is located within the 1% annual chance floodplain. Businesses located in the floodplain include many shops, restaurants, marinas, and hotels in the downtown area, with residences located on side streets and areas set slightly away from downtown. The roads that service such properties are also susceptible to damage or drainage system failures that exacerbate flooding conditions. For example, in addition to being low-lying, many drainage system outlets in Mystic are located below the high tide line. As such, during high tides sea water backs up into the drainage system which can cause flooding of Washington Street and Holmes Street. In addition, portions of Route 27 can flood which isolates neighborhoods in the Clipper Drive area. A system of dikes and pumping stations may be the only possible solution for resolving long-term flooding issues in very low areas that are as densely developed as downtown Mystic.

Commercial and industrial areas along the Pawcatuck River are also susceptible to coastal flooding, although a large area on Mechanic Street is protected from storm surge by the levee system (see Section).

A total of 1,381 homes appear to be located within the 1% annual chance floodplain in Stonington. A total of 140 of these properties are located within Zone VE, and nearly 1,000 properties are located within Zone AE that are vulnerable to coastal flooding. The most concentrated development in floodplains occurs in Mystic, east of the Pequotsepos Brook estuary, at Lords Point, north of the Borough, in Wequetequock in the vicinity of Route 1, and on Riverside Drive. Areas with relatively fewer floodprone homes include Latimer Point and Masons Island. Areas located in the coastal velocity zone are believed to be particularly at risk. Table 4-2 presents roadways with nearby structures located within the 100-year coastal floodplain that is subject to wave velocity in Stonington. The majority of structures in Stonington that are located in the floodplain are located in Zone AE but for brevity are not listed here.

Historically, Lords Point has experienced the most damage from coastal flooding caused by hurricanes in the town. Lords Point is a small private community with an average summer population of about 800 people and over 200 homes and summer cottages. The majority of the homes are located in the 1% annual chance coastal floodplain. Approximately 46 homes are located in Zone VE with the majority of the remaining homes are located in Zone AE. In addition, the majority of the area would be inundated by storm surge caused by a Category Two hurricane, and many homes would be affected by storm surge associated with a Category One hurricane. A flood control project was proposed for this area including sand fill, diking along the rocky portions of the shore, and tieback dikes to higher ground. However, no flood protection structures have been completed to date in this private community. Town officials have also expressed an interest in performing structural elevations in this area if property owners are interested.

Table 4-2 Roads Near Structures Located in Zone VE

Road	Road
Alley Way	Oak Street
Andrews Road	Osbrook Point Road
Boulder Avenue	Quarry Path
Chippechaug Trail	Ram Point Road
East Forest Road	Riverside Drive
Elihu Island Road	Roseleah Drive
Gled Hill Street	School House Road
Harbor View Terrace	Shore Drive
Hill Avenue	Skiff Lane
James Street	Skipper Street
Jerome Avenue	Solon Avenue
Joy Avenue	Stafford Street
Lamberts Lane	Sylvia Avenue
Lindberg Road	Walnut Street
Masons Island Road	Water Street
North Water Street	Wilcox Road
Noyes Avenue	Yacht Club Road

At the time of the 2005 edition of the HMP, two repetitive loss properties existed in the Town of Stonington related to coastal areas. Between 2005 and 2012, five additional repetitive loss properties related to coastal flooding were listed in the town. These repetitive loss properties are located near the

Mystic River (two), Mystic Harbor (two), Stonington Harbor (two), and the Pawcatuck River as noted in Table 4-3. Five of the repetitive loss properties are single family homes with the remaining two which containing businesses. Since the majority of these properties were damaged during known heavy rainfall events, it is assumed low-lying topography and poor drainage near the coastline contributes to flooding at these properties.

Table 4-3 Storms Causing Repetitive Loss Damage Claims in Stonington

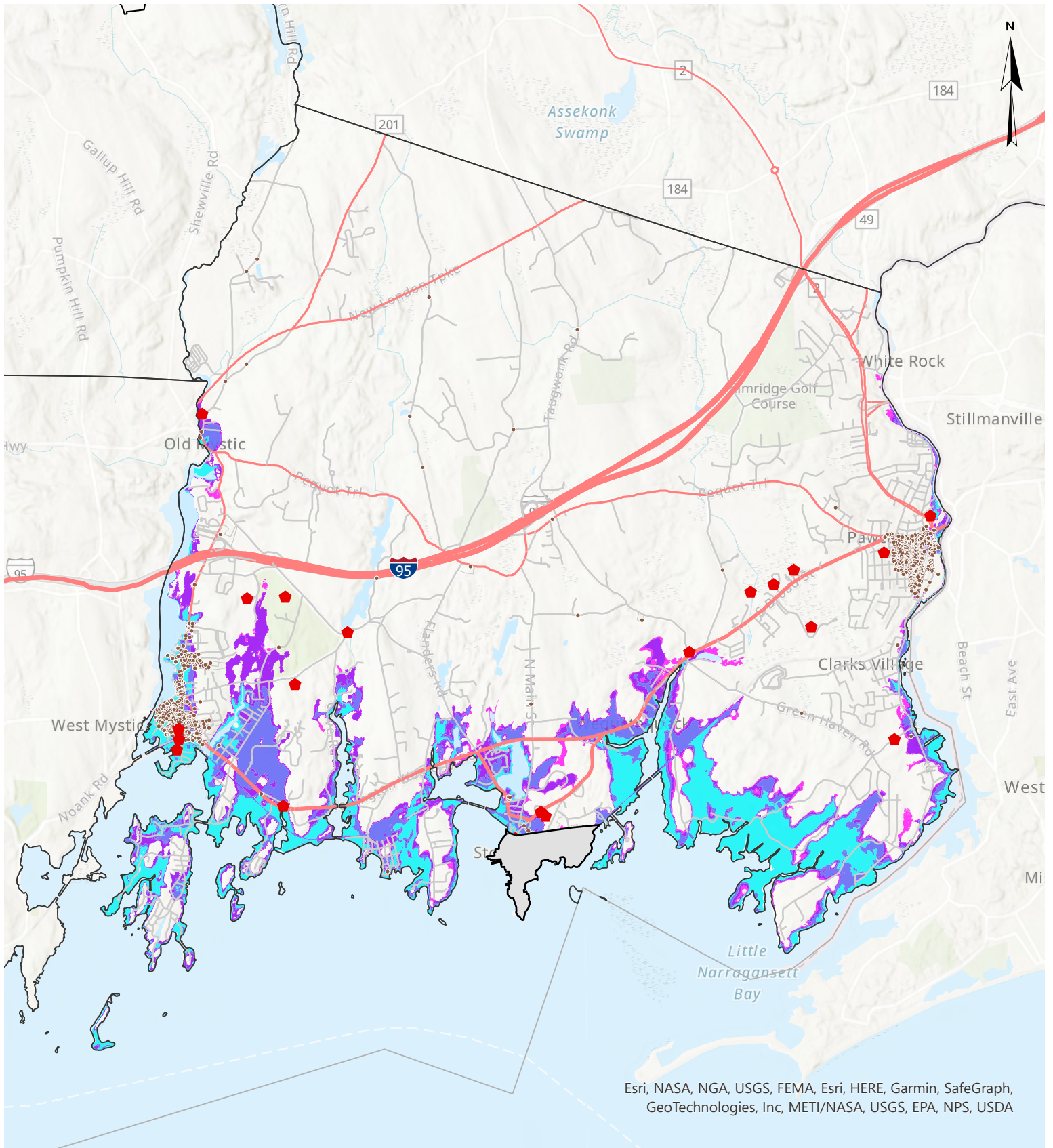
Repetitive Loss Property	October 2005	July 2009	March 2010
"Mystic River #1"	✓	✓	
"Mystic River #2" (Note 1)			
"Mystic Harbor #1"	✓		✓
"Mystic Harbor #2" (Note 2)			
"Stonington Harbor #1"		✓	✓
"Stonington Harbor #2"		✓	✓
"Pawcatuck River"	✓	✓	✓

1. This property reported damages in 1999 (Tropical Storm Floyd) and 1996.
2. This property reported damages twice in 1991, and once in 1987, 1985 (Hurricane Gloria), and 1978. Based on aerial photos, it appears the property owner installed a small floodwall around the home which may have mitigated flooding events since 1991.

As of 2017, 13 repetitive loss properties are located in areas of coastal flood risk in Stonington, an increase of six from 2012, with most of the new listings located in the Mystic area and one located near Stonington Borough. This increase was likely due to claims related to Tropical Storm Irene and Super Storm Sandy. Detailed loss and claim information was not available for this HMCAP update, however, the Town still has 13 RL properties that are affected by coastal flooding as of June 2022. One of these is commercial and the remaining 12 are residential.

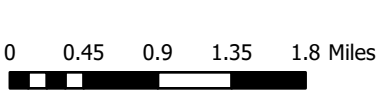
As stated previously, coastal flooding is a particular concern in the town because these areas are low-lying and existing drainage systems do not operate effectively. The Town recognizes that many private properties may suffer coastal flood damage that is not reported because the structures are not insured under the NFIP, or because they choose to not report the damage. These residents and business owners are likely repairing structures on their own. Coastal flood mitigation as recommended in this HMP will likely assist many of these property owners. The Town of Stonington is interested in all forms of flood mitigation, including acquisitions, elevations, drainage upgrades, and other structural projects provided property owners are interested and funding is available.

The Town of Stonington has no formalized program currently in place to identify the location or the number of structures that are susceptible to flooding. Such information would be valuable in directing hazard mitigation efforts to locations with the greatest risk. Town planning staff should use the recently released DFIRM to identify the approximately 1,381 structures in the town that are located in the 1% annual chance floodplain (with or without wave velocity). This could provide a list of areas to inspect following a storm event and allow for the town to track building permits from repairs following a natural hazard. This information, in turn, would provide supporting data for future grant applications.



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 Stonington
 Date: 8/3/2022



Legend

- Historic Resources
 - ⬠ Critical Facilities
- Hurricane Category**
- 1
 - 2
 - 3
 - 4

Vulnerability Analysis of Critical Facilities

As noted in Section 2.7 and shown on Figure 5-1, several critical facilities in Stonington are located within the 1% annual chance floodplain including three fire stations, two waste water treatment plants, and an elderly housing development. The same facilities and one additional fire station are also located in hurricane surge zones. For example, Apple Rehabilitation in Mystic is vulnerable to storm surge from a Category Two hurricane.

The Mystic Fire Department and the Quiambog Fire Department are susceptible to storm surge from a Category Two hurricane, while the Old Mystic Fire Department and the Borough Fire Department are only susceptible to flooding from a Category Three hurricane. As noted in Section 2.7, only the Borough fire station is known to have specific mitigation measures installed to resist flooding.

The wastewater treatment facility in Mystic is not vulnerable to wave velocity but would be inundated by storm surge from a Category One hurricane. The wastewater treatment facility in the Borough is vulnerable to wave velocity but is partially protected by a sea wall. This facility is vulnerable to storm surge from a Category Two hurricane. It is understood that if the water level rose high enough either of the wastewater treatment facilities would be rendered inoperable.

Storm surge flooding can also hinder emergency response, particularly in low-lying roads located along the coastline. For example, the causeway on Masons Island Road is a particular concern for emergency personnel because it is the only mode of egress to the mainland for a large number of residents (approximately 400). The timing of evacuations from the southern part of the town prior to a hurricane event is therefore very important as the majority of the roads in this area will be flooded or washed out by a major hurricane.

SCCOG completed an assessment of critical facilities in the region in 2017 as noted in Section 3.3. Three fire district facilities in Stonington were included: Old Mystic, Quiambaug, and Mystic. All three have some coastal risk, although the Old Mystic facility is primarily at risk of riverine flooding.

Recommendations are incorporated into the list of actions in Chapter 11 of this annex and summarized below in Table 4-4.

Table 4-4 SCCOG Critical Facilities Assessment Summary for Town of Stonington

Facility	Address	Short-Term (0-20 years)	Long-Term (>20 years)
Old Mystic FD	21 North Stonington Rd	No action needed	Wet and dry floodproofing or low berm or flood wall
Quiambaug FD	50 Old Stonington Rd	Wet and dry floodproofing	Relocate facility
Mystic FD	34 Broadway	Dry floodproof the utility room	Wet floodproof all remaining lower areas

4.2.3.1 Hazard Losses

According to NFIP statistics, as of June 30, 2022, the Town of Stonington has had a total of 305 flood related losses, with a total of \$3,929,865 paid towards the claims. Many of these (but not all) are coastal flood losses.

Table 4-5 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 4-5 HAZUS-MH Coastal Flood Related Economic Impacts

Stonington	2022 Results				
	Residential	Commercial	Industrial	Other	Total
Direct					
Building	\$183,650,000	\$77,110,000	\$29,940,000	\$11,090,000	\$301,790,000
Contents	\$171,970,000	\$237,260,000	\$61,280,000	\$53,730,000	\$524,240,000
Inventory	\$0	\$28,850,000	\$8,460,000	\$12,650,000	\$49,960,000
Subtotal	\$355,620,000	\$343,220,000	\$99,680,000	\$77,470,000	\$875,990,000
Business Interruption					
Income	\$14,050,000	\$167,300,000	\$2,000,000	\$13,130,000	\$196,480,000
Relocation	\$45,990,000	\$43,470,000	\$1,800,000	\$7,870,000	\$99,130,000
Rental Income	\$36,500,000	\$31,530,000	\$320,000	\$690,000	\$69,040,000
Wage	\$33,090,000	\$169,380,000	\$2,810,000	\$124,770,000	\$330,050,000
Subtotal	\$129,630,000	\$411,680,000	\$6,930,000	\$146,460,000	\$694,700,000
TOTAL	\$485,250,000	\$754,900,000	\$106,610,000	\$223,930,000	\$1,570,690,000

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

Like many communities, the Town does not have specific mechanisms to address the impacts of shoreline change, however, there are several regulatory standards and planning efforts that address prudent shoreline development and conservation. One specific purpose of the zoning regulations is also to control erosion caused by water. The Town reviews permit applications that include retaining wall installations to evaluate potential negative impacts from the walls, specifically erosion and sedimentation. In section 7.7.9.3 of the zoning regulations, certain considerations for flood hazard variances are outlined. These considerations include the danger to life and property due to flooding or erosion damage, and the availability of alternative locations to not subject to erosion damage.

As discussed earlier, Stonington participated in the Community Coastal Resilience Plan, which directly addressed shoreline change. The Town is actively advancing several living shoreline projects to help reduce shoreline change, including sites on Masons Island and at the Mystic River Boathouse. These living shoreline projects are in different states of design and construction.

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 Mystic, Old Mystic, north of Latimer Point, at Lords Point, west of Wequetequock Cove, and at Barn Island State Wildlife Management Area will either migrate inland or be eroded by constant inundation.

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

4.3.3.1 Hazard Losses

There are no reported losses for the Town of Stonington 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 Stonington, 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. Living shoreline projects are anticipated in two parts of Stonington (Mystic Boathouse and Masons Island) and probably approach a total of \$1 million to \$1.5 million based on engineering opinions of probable cost.

Summing beach nourishment budgets and living shoreline implementation needs, shoreline change losses over the last decade have likely exceeded \$2,000,000 in Stonington.

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, damages 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.

The town has been affected by many flooding events over the past several years including the following discussions. For example, on October 28, 2006 local fire departments responded to flooded basements in Old Mystic. The heaviest storms in recent memory to impact the town occurred on July 1, 2009 and at the end of March 2010.

- A severe thunderstorm on July 1, 2009 produced up to 6.5 inches of rainfall in four hours that resulted in local fire departments pumping water out of more than 100 basements in Mystic, Groton, Stonington, and Ledyard. Flooding was widespread throughout Stonington. Approximately 50 to 60 cars were inundated with water and trapped in the Mystic Aquarium parking lot. Several vehicles were also stranded in high water on Coogan Boulevard near the aquarium. A portion of Route 1 in Mystic was closed due to flooding, and a bridge on Collins Road overtopped and was damaged. Emergency responders in Stonington pulled an occupied vehicle out of the area of Washington Street and Broadway Avenue. In addition, this storm caused two dams to overtop as described in Section 10.

- The flooding of July 2009 was extreme but not as extensive in comparison to the heavy widespread flooding experienced during March 29-30, 2010. A nor'easter produced an extended period of heavy rainfall totaling 8.6 inches that caused widespread flooding in Stonington. The March 2010 storms continue to be considered the event that caused the most widespread flooding in Stonington since the town began participating in the multi-jurisdiction hazard mitigation plan. Over \$4.5 million in damage was reported in Stonington and North Stonington. The 2010 storm is most notable to Town officials for destroying the Route 184 bridge and submerging a large area of Old Mystic. Numerous homes throughout the town had serious basement flooding of three feet. Several basement offices in Stonington Town Hall on Elm Street were flooded. Residents on Milan Terrace also experienced basement flooding.

Numerous roads in throughout the town were closed due to flooding. Route 1 was closed due to flooding from Anguilla Brook and also closed near Long Wharf Drive in Mystic. Route 27 was closed at the Groton-Stonington boundary with water rescues being performed by the Old Mystic Fire Department. Portions of Pequot Trail (at Cops Brook, Stony Brook, and Anguilla Brook), Coogan Boulevard (poor drainage) and Mistuxet Avenue (Cops Brook, Pequotsepos Brook) were closed due to flooding.

Many roads and bridges were also damaged. A small bridge on Collins Road that passes an unnamed stream was destroyed by the flooding. In Wequetequock, a bridge on Green Haven Road over Anguilla Brook was damaged by flood waters. A large section of the road was also washed away and several nearby homes were flooded. Raging waters from Whitford Brook entered the Mystic River and destroyed a small bridge on Route 184 and flooded numerous homes and businesses such as the Old Mystic General Store, Post Office, and Old Mystic Mill on Main Street as well as trapped cars. The intersection of Jerry Browne Road and Mistuxet Avenue at Cops Brook was closed due to flooding and the culvert was damaged, prompting a culvert and channel upgrade project in 2011.

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, maintaining drainage systems, advancing education and outreach, and by utilizing warning systems. Many mitigation measures are common to all hazards and therefore were listed in Section 2.6 and Section 2.7. Additional mitigation measures have been put in place by the Federal government along the Pawcatuck River to reduce nearby flooding.

Flood Control Structural Projects

As noted in the Multi-Jurisdictional HMP, the USACE constructed a 0.36-mile flood protection system of “levee” in Pawcatuck in 1962 and 1963. The levee protects an industrial area and surrounding residential area on Mechanic Street that totals approximately 28 acres. However, the levee is not currently accredited to protect against the 1% annual chance flood event. The Town has installed a \$100,000 pumping system to remove water from behind the dike and clears trees and brush as needed. The Town commissioned an engineering study of the closure structures in 2021 to help budget funds for repairs and maintenance of the closure structures.

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.

The current Stonington Capital Improvement Plan has budgeted for the following projects that will mitigate flood hazards:

- Replacement of the North Stonington Road bridge (damaged in 2010 flood)
- Completion of the Meadow Avenue drainage project
- Rehabilitation of the Stillman Avenue Bridge
- Completion of the Toll subdivision drainage Projects

Other flood problems are sometimes addressed in connection with privately-funded projects. During completion of the Toll Brothers “Old Mystic Estates” project, the Town required the developer to make detention and drainage improvements that benefited downstream properties, taking care of longstanding nuisance flood problems in the area.

Regulations, Codes, and Ordinances

The Town of Stonington has planning and zoning tools in place that incorporate floodplain management. The Town has recently updated its flood protection regulations in its Zoning and Regulations in July 2015 as noted in Section 2.6. The Town utilizes the 1% annual chance floodplain as defined by FEMA to regulate floodplain and floodway activities and 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 of one foot 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. Substantial Improvement is defined cumulatively over a one-year period (amended August 7, 2018).

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 2010 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.

The Town Engineering carefully reviews development and redevelopment proposals in the town. For example, a recent proposal for a house with a walkout basement was not permitted, despite the location of the house outside the VE zone on the FIRM, because the ground surface elevation was below the VE zone and could have allowed connection to flood waters.

Acquisitions, Elevations, and Property Protection

The Town of Stonington has not performed acquisitions or elevations of private property at risk of flooding. Property protection has focused instead on privately-funded elevations during major renovations or redevelopments, 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.

Flood Watches and Warnings

The Emergency Management Director and the Fire Department access weather reports through the National Weather Service and local media. Residents can also sign up for the Statewide Reverse 9-1-1 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 Stonington joined the Community Rating System in 2004 and currently has policies and procedures in place that exceed the minimum standards for an NFIP-compliant community. The Town is currently a Class 7 community.

CRS actions in Stonington include providing and maintaining flood elevation certificates, conventional flood maps, and digital flood data for public information purposes; completing public information outreach projects such as newsletters; pursuing open space preservation; improving stormwater management; and maintaining a flood warning and response plan.

Stormwater Management

The Town is in the early stages of potentially organizing and implementing a stormwater utility. To help understand the benefits of implementing a stormwater utility, the Town participated in a stormwater

utility feasibility study in fall 2022. A final report was issued to SCCOG and the Town in 2023, and one of the proposed hazard mitigation and climate adaptation actions builds on the completion of the study.

Summary

In general, municipal capabilities to mitigate flood damage have increased slightly since the 2017 edition of the hazard mitigation plan was adopted. This is because the Town is active in the CRS program and has commissioned assistance in floodplain management as explained in the section on coastal flooding.

5.2.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to inland flooding within the Town. Nuisance flooding and poor drainage and overbank flooding are about equal in occurrence in the Town, with additional areas affected during more severe events.

Vulnerability Analysis of Areas along Watercourses

Major inland watercourses and water bodies in Stonington have the 1% annual chance floodplain defined by FEMA. The majority of the inland watercourses and water bodies south of Interstate 95 in Stonington are mapped as Zone AE, while watercourses north of Interstate 95 are generally mapped as Zone A. The Mystic River, Copps Brook, Stony Brook, Anguilla Brook, and the Pawcatuck River each have inland sections mapped as Zone AE, indicating that flood elevations are available. The remaining streams mapped as Zone A include the upper reaches of Anguilla Brook, Wheeler Brook, the upper reaches of Stony Brook, the upper reaches of Copps Brook, and Whitford Brook. Refer to Figure 5-1 for the location of the 1% annual chance floodplains related to inland flooding within Stonington.

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 Stonington.

Anguilla Brook

While the upper reaches of Anguilla Brook are generally free from flooding, Anguilla Brook caused flooding of Pequot Trail (Route 234), South Anguilla Road, South Broad Street (Route 1), and at Green Haven Road (just downstream of Wequetequock Pond) during March 2010. In particular, the 2010 storm washed out the bridge at Green Haven Road. Flooding of yards and sometimes structures occurs nearby Green Haven Road each year. Route 1 is also a repeated problem area for flooding and is also overtopped by a small tributary stream to Wequetequock Pond. Anguilla Brook enters Wequetequock Cove downstream of Green Haven Road where it is susceptible to coastal flooding.

Copps Brook

Similar to Anguilla Brook, the majority of the upper reaches of Copps Brook are generally free from flooding with the exception of an unnamed tributary to Copps Brook which occasionally floods Al Harvey Road. Copps Brook overtopped Pequot Trail (Route 234) near the head of the Mystic Reservoir, and the July 2009 flooding also caused damage to the outlet structure and downstream channel from the

reservoir as well as damage to the culverts beneath Jerry Browne Road and Mistuxet Avenue. This damage was repaired by Aquarion Water Company in 2011. In addition, Deans Mill Road is located to the east of the Mystic Reservoir and has low areas within the 1% annual chance floodplain.

Further downstream, an unnamed tributary to Copps Brook flooded Mistuxet Avenue in March 2010. Cove Road, the next road downstream, was not affected. Copps Brook enters Quiambog Cove downstream of this area where it is susceptible to coastal flooding.

Mystic River

Hyde Pond lies at the confluence of Whitford Brook with the Mystic River. The pond is impounded by a small dam that does not protect against flooding. The Mystic River was inundated with floodwaters from Whitford Brook during the March 2010 storms and overtopped the Gold Star Highway (Route 184) washing out the bridge. The river then flows into Old Mystic where several roads are at risk of being inundated by the 1% annual chance flood including North Stonington Road, Lantern Hill Road, Main Street, Route 27, Smith Street, and Haleys Way. The Mystic River enters its tidal portion downstream of Old Mystic where it is susceptible to coastal flooding.

Pawcatuck River

The Pawcatuck River forms the eastern boundary of Stonington with Westerly, Rhode Island. Areas vulnerable to inland flooding lie adjacent to the river from the North Stonington boundary to just downstream of Route 78. Areas downstream of this point can be inundated by both inland and coastal flooding. For example, flooding along the Pawcatuck River reached sufficient stages as to be dangerous such that the Town closed access across the bridge that connects Stillman Avenue in Pawcatuck with Canal Street in Westerly as well as the Route 1 bridge. Fortunately, neither bridge was overtopped by flood waters. Route 78 and White Rock Road also span the river but based on the 2011 FIS both are elevated above the 0.2% annual chance floodplain and thus are not susceptible to overtopping.

Pequotsepos Brook

Pequotsepos Brook does not typically present inland flooding issues. However, the intensity of the 2009 and 2010 storms was sufficient to cause flooding of Mistuxet Avenue, and an unnamed tributary also overtopped Pequotsepos Road. Pequotsepos Brook enters its tidal portion downstream of Mistuxet Avenue where it is susceptible to coastal flooding.

Stony Brook

Similar to other streams in Stonington, the upper reaches of Stony Brook do not typically present issues with flooding. Floodwaters overtopped Pequot Trail (Route 234) during the March 2010 storm. Floodwaters during the July 2009 storm caused the dam at Silvias Pond, an impoundment of Stony Brook, to overtop causing downstream damage as described in Section 10. Flanders Road and Route 1 downstream are also located within the 1% annual chance floodplain of Stony Brook. After passing beneath Route 1, Stony Brook immediately reaches its confluence with Stonington Harbor.

Whitford Brook

Whitford Brook forms the boundary between Stonington and Groton from the North Stonington boundary until its confluence with Hyde Pond. Based on the DFIRM, the 1% annual chance flood has the potential to overtop Wolf Neck Road, Campground Road, and a portion of the Seaport Campground on Campground Road.

Other Small Streams

Several small streams in Stonington also can overtop roadways. An unnamed stream at Collins Road caused extensive damage to the culvert during the March 2010 flood. A small unnamed pond in Pawcatuck between West Vine Street and West Arch Street has caused flooding of West Arch Street near the outlet to the pond as well as minor flooding in the neighborhood between West Arch Street and Garden Street. Some of this problem could be related to poor drainage.

Poor Drainage Flooding

Flooding due to poor drainage occurs throughout Stonington including in coastal areas. One example was provided in Section 5.2.2 for the overtopping drainage swale near Mistuxet Avenue. Another example from the historic record is the July 1, 2009 thunderstorm that produced poor drainage flooding in downtown Mystic on Route 1 and near the intersection of Washington Street and Broadway Avenue.

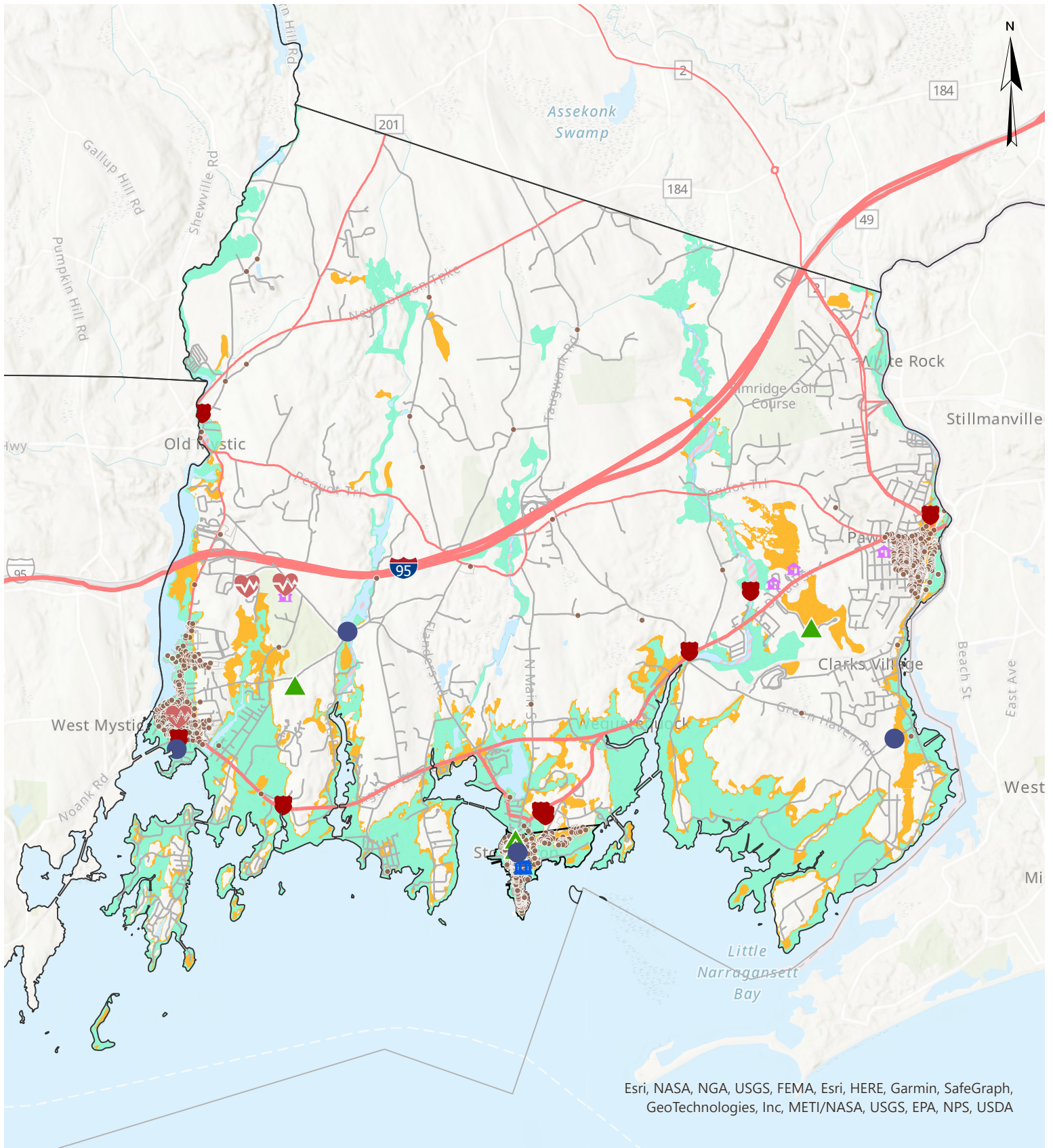
Poor drainage flooding is also an issue along Coogan Boulevard and in the parking lot of the Mystic Marinelife Aquarium as noted in the historic record. Drainage systems are believed to be undersized in this area which can cause up to three feet of water to collect in the parking lot and the road. Eventually, this water drains out to the Mystic River. Businesses located north of Interstate 95 near the Aquarium are also subject to flooding from poor drainage.

Vulnerability Analysis of Private Properties

Approximately 1,381 structures in Stonington appear to be located in the 1% annual chance floodplain. A total of 12 are located in Zone A, 25 appear to be located in the Zone AE floodway, and 1,204 are located within Zone AE. A minority of the structures located in Zone AE are vulnerable to inland flooding. The majority of the structures located in Zone AE are susceptible to coastal flooding but not inland flooding, and with some structure susceptible to both flooding sources. The majority of these structures are residential but some commercial and industrial structures are also located in the floodplain.

As noted in the historic record, numerous structures across Stonington experience basement flooding during severe rain events. The majority of these structures are located outside of the 1% annual chance floodplain. Table 5-1 presents areas where private properties are susceptible to inland flooding damage from poor drainage or nearby watercourses.

In some cases, drainage upgrades may eliminate the flooding issue. For example, the industrial area near Jerry Browne Road could benefit from drainage improvements that would allow the area to drain more quickly, and the West Arch Street flooding is likely drainage related. The remaining areas are generally associated with overbank flooding that will require additional effort to mitigate. Areas in Mystic are also susceptible to poor drainage flooding, particularly Washington Street and Denison Road. This area is further described in Section 4.2.





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

Critical Facilities and Historic Resources with Flood Zones

SCCOG Hazard Mitigation and Climate Adaptation Plan
Town of Stonington

Date: 8/1/2022

0 0.45 0.9 1.35 1.8 Miles

Legend

- Historic Resources
- Senior Housing
- Emergency Services
- Municipal
- Other Infrastructure and Facilities
- Shelter or Cooling Center
- Care and Medical Facility
- 1% Annual Chance Flood Hazard Area
- .2% Annual Chance Flood Hazard Area
- Floodway

Table 5-1 Private Properties Susceptible to Inland Flooding in the Town of Stonington

Flooding Source	Road	Comment
Anguilla Brook	Anguilla Brook Road	Homes in floodplain
	Green Haven Road	Several homes flooded in March 2010
	Pequot Trail	Business in floodplain
	South Broad Street (Route 1)	Homes in floodplain
	Trolley Crossing	Home flooded in March 2010
Copps Brook	Cove Road	Homes in floodplain
	Mistuxet Avenue	Aquarion Water Treatment Plant may be in floodplain / floodway
Mystic River	Main Street (including Route 27)	Homes, businesses in floodplain & floodway
	North Stonington Road	Homes in floodplain
	Smith Street	Homes in floodplain
Pawcatuck River	Cogswell Avenue	Businesses / Industry in floodplain
	Elmata Avenue	Businesses in floodplain
	Mechanic Street	Homes, businesses, industry in floodplain
	Noyes Avenue	Homes in floodplain
	Walnut Street	Homes in floodplain
	West Broad Street	Businesses in floodplain
Poor Drainage	Jerry Browne Road	Industries can flood
Stony Brook	Flanders Road	Homes in floodplain
	Stonington-Westerly Road (Route 1)	Homes in floodplain
Unnamed Pond	West Arch Street / Garden Street	Homes have experienced flooding
Unnamed Stream	Timber Ridge Drive	Homes have experienced flooding
	Liberty Street (Route 2)	Businesses have experienced flooding
White Hall Pond	Whitehall Avenue (Route 27)	The pond has no outlet. Walk-out basements of adjacent condominiums can flood up to two feet of water. The Fire Department has had to pump out the pond in the past.
Whitford Brook	Campground Road	Seaport Campground, businesses, homes

No repetitive loss properties related to inland flooding existed in Stonington at the time of the 2005 edition of the HMP. When the 2012 edition of the HMP was developed, four repetitive loss properties related to inland flooding damage were reported in Stonington. These properties lie along Whitford Brook, an unnamed tributary to the Pawcatuck River, a property in Mystic that floods due to poor drainage, and a property located just north of the Borough of Stonington that appears to be flooded due to poor drainage. Historic damage events are reported in Table 5-2 .

Table 5-2 Storms Causing Repetitive Loss Damages Claims in Stonington

Repetitive Loss Property	October 2005	July 2009	March 2010
"Mystic"	✓	✓	
"Near Borough"		✓	✓
"Pawcatuck"		✓	✓
"Whitford"	✓		*

*Property damaged twice, namely on March 14 and March 30.

The owner of one of the four properties was known to be interested in an acquisition project at least ten years ago, but the current interest level is unknown.

As of 2022, four repetitive loss properties affected by non-coastal flooding remained listed in Stonington. These are the same four as reported in the 2012 and 2017 editions of this plan.

Vulnerability Analysis of Critical Facilities

As noted in Section 2.7, several critical facilities in Stonington are located within the 1% annual chance floodplain including three fire stations, two wastewater treatment plants, a water treatment plant, and an elderly housing development. The majority of these facilities are not affected by inland flooding but rather by coastal flooding.

The Deans Mill Water Treatment Plant owned by Aquarion Water Company appears to lie partially within the floodplain and floodway of Copps Brook based on the current DFIRM. However, recent improvements to the plant and the downstream channel may have resulted in this facility being located above the level of the 1% annual chance floodplain. Other critical facilities are located outside of the 1% annual chance floodplain but are also susceptible to flooding. For example, the basement of the Town hall has flooded during severe storms as noted in the historic record.

SCCOG completed an assessment of critical facilities in the region in 2017, fulfilling an action listed in the 2012 edition of the multi-jurisdiction hazard mitigation plan. Three fire district facilities in Stonington were included: Old Mystic, Quiambaug, and Mystic. The Old Mystic Fire House is located in an area with partial riverine flood risk. The other two fire stations are located in areas of coastal risk and were addressed in Section 4.2.

The Town of Stonington 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, the vicinity of Route 1 and Long Wharf Road has low spots that can flood due to poor drainage in the nearby wetland or due to coastal flooding. Up to 300 residences in the Bishops Cove neighborhood (including condominiums and single-family homes) can become isolated due to the single mode of egress via Long Wharf Road.

5.2.3.1 Hazard Losses

According to NFIP statistics, as of June 30, 2022, the Town of Stonington has had a total of 305 flood related losses, with a total \$3,929,865 paid towards the claims. While it is likely that many of these are coastal flood losses, the Town believes that most of the claims from March 2010 represent pluvial and riverine flood losses.

Since 2017 there has also been one NOAA reported flash flood events; this was associated with the remnants of Hurricane Ida. Uninsured losses for New London County were reportedly over \$706,000.

FEMA HAZUS-MH 6.0 was used to develop losses associated with the 100-year riverine flood event. Table 5-3 presents flood related damages for the Town of Stonington. Additional HAZUS-generated losses for the town and region can be found in the Multi-Jurisdictional document.

Table 5-3 HAZUS-MH Riverine Flood Related Economic Impacts

Stonington	2022 Results				
	Residential	Commercial	Industrial	Other	Total
Direct					
Building	\$3,340,000	\$1,440,000	\$1,420,000	\$130,000	\$6,330,000
Contents	\$1,730,000	\$4,760,000	\$2,340,000	\$760,000	\$9,590,000
Inventory	\$0	\$870,000	\$350,000	\$60,000	\$1,280,000
Subtotal	\$5,070,000	\$7,070,000	\$4,110,000	\$950,000	\$17,200,000
Business Interruption					
Income	\$370,000	\$9,350,000	\$120,000	\$340,000	\$10,180,000
Relocation	\$3,160,000	\$2,160,000	\$100,000	\$210,000	\$5,630,000
Rental Income	\$1,820,000	\$1,570,000	\$10,000	\$10,000	\$3,410,000
Wage	\$890,000	\$9,350,000	\$170,000	\$11,250,000	\$21,660,000
Subtotal	\$6,240,000	\$22,430,000	\$400,000	\$11,810,000	\$40,880,000
Total	\$11,310,000	\$29,500,000	\$4,510,000	\$12,760,000	\$58,080,000

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. Furthermore, Aquarion Water Company was heavily impacted by the droughts of 2016, 2020, and 2022. 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 11th 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. New London County was declared a Stage 3 drought emergency on August 18, 2022.

5.3.2 Existing Capabilities

The Town of Stonington, like many communities, does not have specific regulations geared toward drought mitigation. One of the main purposes of the Town’s zoning regulations is however to facilitate the adequate provision of water throughout the town, and to preserve important natural inland resources.

Stonington does have a Groundwater Protection Overlay District, which has been designed to protect primary and select portions of secondary aquifer recharge areas, and a Watershed Protection Zone which is within the Groundwater Protection Overlay Zone.

The Town is served by public water systems associated with Aquarion Water Company (Mystic and eastward past the Borough) and Westerly Water Department (in Pawcatuck). This is discussed in Section 2.7. Aquarion Water Company's Mystic System is highly vulnerable to droughts. Aquarion developed an interconnection with Groton Utilities in 2018-2019 subsequent to the last edition of this plan. The interconnection is used to purchase water from Groton Utilities and has increased drought resilience for the parts of Stonington served by the water system.

The U.S. Drought Monitor is a national resource that many state and local entities use to monitor regional conditions in relation to drought development. The weekly reporting issued by the partnership includes a drought intensity scale which includes five stages from "abnormally dry" to "exceptional drought". While this resource is available to Town for determining drought conditions, the Connecticut Interagency Drought Workgroup (IDW) uses this and other resources to monitor drought conditions specifically for the state. The Town of Stonington has this IDW and state-specific drought emergency declarations as a resource to prepare for, and respond to, droughts.

5.3.3 Vulnerabilities and Risk Assessment

The entire Town of Stonington is vulnerable to drought, but the degree of vulnerability varies. A majority of the properties in Town rely on public water systems for their water supply. Those residents that rely on public water may be faced with water use restrictions during drought to conserve water supply in the system. Properties that rely on private wells may experience challenges with reduced water supply during droughts due to lower-than-normal groundwater levels. While the Town has not reported any private wells running dry during recent droughts, these properties are vulnerable to loss of supply during extreme events.

5.3.3.1 Hazard Losses

There have been no reported drought losses for the Town of Stonington. Any losses incurred by Aquarion Water Company have not been directly passed onto the Borough's municipal resources, although water users will eventually pay for water system improvements that reduce drought risks. 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 and Recent Occurrences

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.

According to the NCDC, the July 1, 2009, storm produced heavy rainfall that resulted in three dam emergency events in Stonington.

- First, a small farm dam off Lane Way overtopped causing flooding and the temporary closure of Route 1 at Anguilla Brook.
- Around 7:30 p.m., floodwaters at the Mystic Reservoir Dam breached and eroded the banks at the edges of the dam causing overtopping. An unscheduled release of water was performed to protect the integrity of the dam. The release of water in combination with the floodwaters resulted in soil erosion and damage at Jerry Browne Road and Mistuxet Avenue immediately downstream resulting in road closure, as well as the closure of Route 1 at Quiambog Cove.
- Finally, around 10 p.m. Silvias Pond Lower Dam overtopped resulting significant damage to a home just downstream of the dam. This family needed to be rescued by the Fire Department, and two other nearby homes were also evacuated.

The Lane Way dam was also a problem in March 2010 as the Town evacuated downstream residents in case of a dam failure, and Silvias Pond Dam was further damaged during the March 2010 storms.

There have been no reported dam related emergencies or events since those listed above.

5.4.2 Existing Capabilities

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, Stonington is home to four Class C (high hazard) dams whose failure could potentially lead to flooding within the town. These dams are listed on Table 5-4.

Table 5-4 Dams Registered with DEEP in the Town of Stonington

CT Dam#	Dam Name	Dam Class	Owner Type
13716	No Dam	-	Private Corporation
13704	Natural Pond	-	Private
13706	Copps Brook Pond #3 Dam	A	Private
13707	Copps Brook Pond #1 Dam	A	Private
13710	Copps Brook Pond #2 Dam	A	Private Club
13711	Tubbs Pond Dam	A	Private
13712	Silvias Brook Pond Dam	A	Federal
13717	Wequetequock Pond Dam	A	Private
13719	Stony Pond Dam	A	Private
13720	Vargas Ice Pond Dam	A	Municipal
13724	Jones Pond Dam	A	Lake Association
13718	Vargas Farm Pond Dam	A	Private
13721	Barn Island #1 Dam (Culvert)	AA	State Owned
13722	Tate Pond Dam	AA	Lake Association
13725	Miner Pond Dam	AA	Private
13726	Barn Island #2 Dam (Culvert)	AA	State Owned
13727	Barn Island #3 Dam (Culvert)	AA	State Owned

13713	Barn Island #4 Dam (Culvert)	AA	State Owned
13701	Liepold Pond Dam	BB	Private
13702	Silvia's Upper Pond Dam	C	Private
13703	Silvia's Lower Pond Dam	C	Private
13708	Mystic Reservoir Dam	C	Water Utility
13716	Deans Reservoir Dam	C	Water Utility

Dams in the region whose failure could impact Stonington 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.

Owners of high and significant hazard dams are required to maintain EAPs for such dams. The Town of Stonington does not own any dams. Aquarion Water Company maintains EAPs for its two dams in the town. In addition, Aquarion draws down the upper Mystic Reservoir (impounded by the Deans Reservoir Dam) prior to major rain events to prevent backwater flooding of Pequot Trail (Route 234). The Town of Stonington currently possesses copies of the two Aquarion Dam EAPs, and is working to obtain EAPs for the other two high and significant hazard dams.

The Town pursues dam removal when opportunities arise. Two lower-hazard-class dams were removed between 2012 and 2017: the Hyde Park Dam and the White Rock Dam.

Summary

In general, municipal capabilities to mitigate dam failure damage have increased slightly since the 2017 edition of the hazard mitigation plan was adopted. Additionally, changes in the State's regulation of dams have increased Statewide capabilities.

5.4.3 Vulnerabilities and Risk Assessment

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

- Deans Reservoir Dam – This dam is also known as the Mystic Reservoir Upper Dam. The purpose of this dam is to impound Copsps Brook for public water supply purposes. A dam failure analysis prepared by GZA Environmental, Inc. suggests that a complete dam failure could inundate an area a portion of Deans Mill Road east of the Mystic Reservoir, a business on Mistuxet Avenue, and the Aquarion Water Treatment Plant. The Palmer Dam is also expected to fail, washing out Jerry Browne Road and Mistuxet Avenue, and flooding five homes downstream along Cove Road to Quiambog Cove. Flooding in Quiambog Cove would be of a magnitude less than the 1% annual chance flood event and would not cause any additional damage to structures. Floodwaters are expected to be mitigated upon reaching Fishers Island Sound.
- Long Pond Dam – Long Pond Dam impounds Long Pond on the Ledyard – North Stonington boundary. This impoundment (Class BB) is used for recreational purposes and is privately

owned by the Lantern Hill Valley Association. Failure of this dam would likely result in an inundation area downstream similar to the 1% annual chance floodplain. The property most at risk of flooding downstream in Stonington would be the Seaport Campground located on Campground Road. An EOP for this dam was not available at the Connecticut DEEP at the time of file inspection.

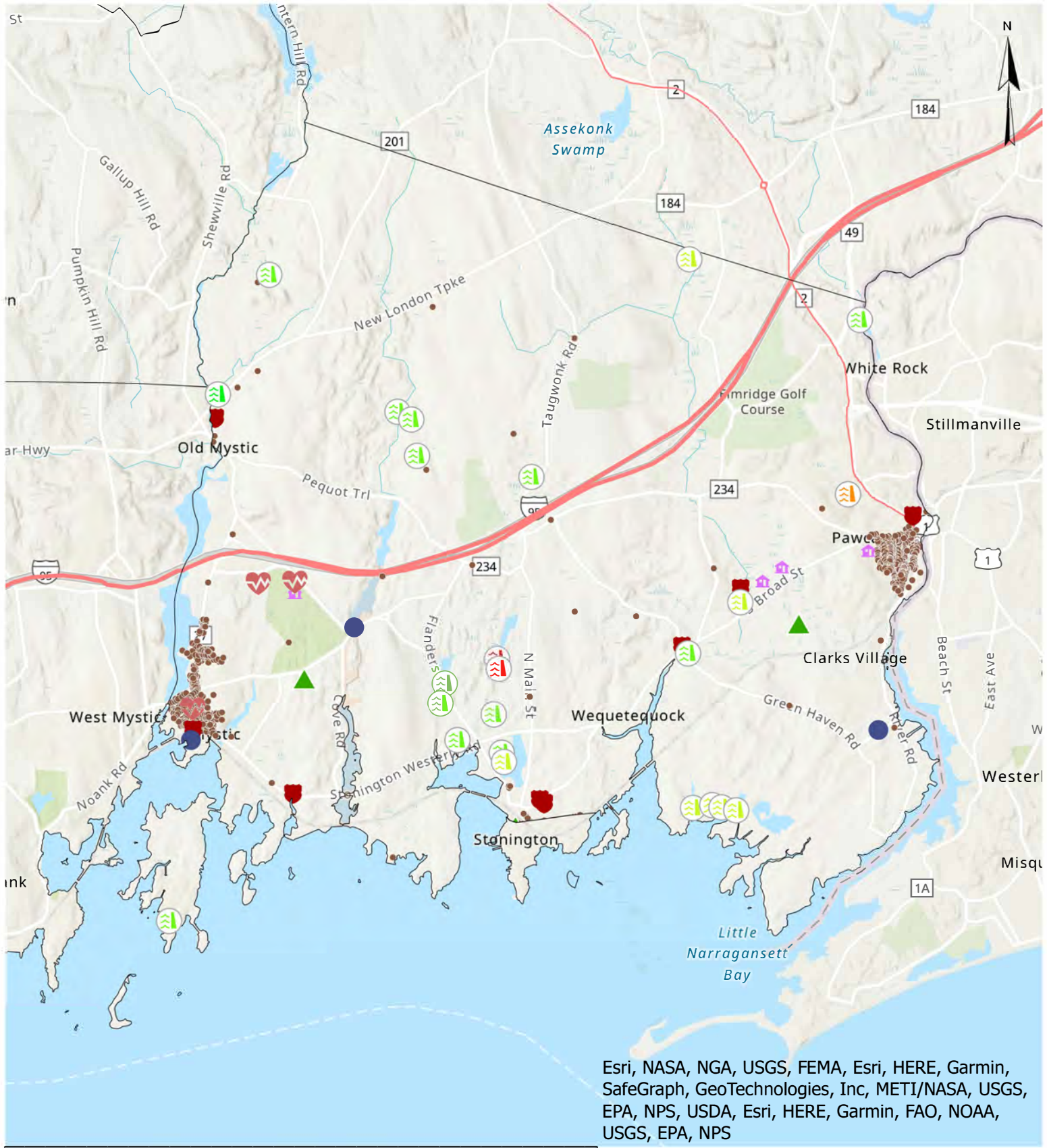
- *Mystic Reservoir Dam* – This dam is also known as the Palmer Dam and is located adjacent to the Deans Mill Water Treatment Plant owned by Aquarion Water Company. The purpose of this dam is to impound Copps Brook for public water supply purposes. The dam failure analysis prepared by GZA Environmental for the Deans Reservoir Dam includes the failure of the Mystic Reservoir Dam such that a similar area would be inundated. This dam was recently repaired by Aquarion including downstream channel and culvert repairs and is believed to be in good condition.
- *Silvias Pond Lower Dam* – While a lower hazard dam impounds the main portion of Silvias Pond along Stony Brook, an outlet structure on that dam allows water to flow into a smaller impoundment known as the Lower Pond. This pond is impounded by a high hazard dam and eventually outflows along an unnamed stream. One home is located immediately downstream of this dam and was flooded when the dam overtopped in July 2009. While the Connecticut DEEP ordered that repairs be performed to the dam and an EOP be created following the damage sustained during the March 2010 floods, Town personnel indicate that such activities have yet to occur.

In addition to the high and significant hazard dams, Town officials have identified other low hazard dams of concern:

- The Hyde Pond Dam, a Class A structure, is located immediately upstream of Route 184. The proximity of the dam to this significant roadway has prompted concerns from the Town.
- The Lane Way Dam located on Anguilla Brook upstream of Route 1 is currently being removed after concerns with the integrity of the dam developed and homes downstream were evacuated during the March 2010 storms. This dam is not currently registered with the Connecticut DEEP.
- Finally, a dam at the end of Alice Court in Pawcatuck may be a concern. The structure is located on the Pawcatuck River at the Rhode Island state line approximately 1,300 feet downstream of the Shunock River confluence. This dam is not currently registered with the Connecticut DEEP, so very little information is available. Aerial mapping indicates that the structure includes a raceway that was most likely historically used for process water at one of the many mills that were located along the river.

5.4.3.1 Hazard Losses

Despite the dam-related incidents described above, there are no reported losses for the Town of Stonington related to dam failure. Downscaled losses from the 2019 Connecticut Natural Hazard Mitigation Plan are developed in the Multi-Jurisdiction document.



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 Stonington
 Date: 2/23/2023

0 0.45 0.9 1.35 1.8 Miles




Legend

 Dams	 Historic Resources
 Unknown/Unclassified	 Senior Housing
 A	 Emergency Services
 AA	 Other Infrastructure and Facilities
 BB	 Shelter or Cooling Center
 C	 Care and Medical Facility
	 Dam Failure Inundation Area

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.³

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 experience 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 the 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, 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 are above 90 degrees.

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

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

GNL = Groton New London station & NPU = Norwich Public Utilities station

³ <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 Stonington has identified the High School and the Community Room in the Police Department as cooling centers in town. In the event of a projected heat event or heat wave, the Town is prepared to open up the cooling centers for resident cooling use.

Summary

In general, the capabilities of mitigating extreme heat have increased since the 2017 edition of this plan as the town has identified multiple cooling centers for use during an extreme heat event.

6.2.3 Vulnerabilities and Risk Assessment

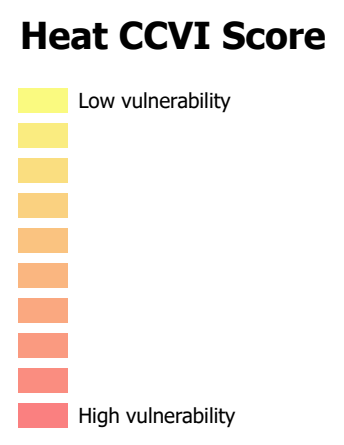
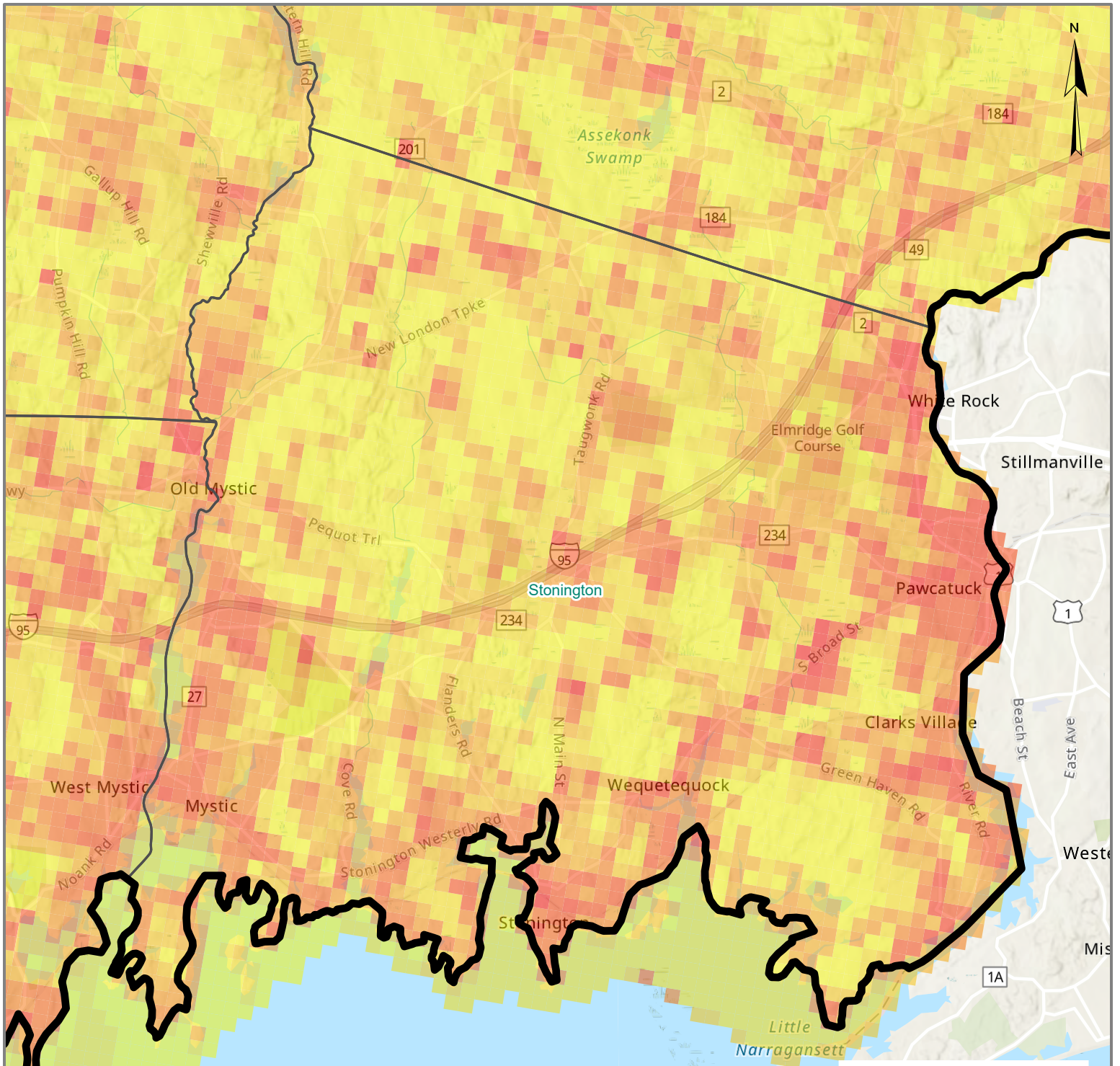
While the entire town is at risk of an extreme heat event, vulnerability can widely vary based on age, health, or the type of property owned in Stonington. The elderly populations in town are more vulnerable to extreme heat events, particularly when in home cooling is not available. Also, those in town 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 Stonington. The distribution of heat vulnerability throughout the community can be seen in Figure 6-1.

Heat exposure is low to moderate across most of the Town of Stonington, with higher exposure in the Mystic and Pawcatuck areas due to denser development. Heat sensitivity is low north of I-95, with pockets of higher sensitivity south of the highway along Route 1. Abundant vegetation as well as relatively easy access to cooling centers and coastal waters result in robust adaptive capacity for the Town. Therefore, the overall heat vulnerability for the Town of Stonington ranges from low to high depending on location.

6.2.3.1 Hazard Losses



There are no reported losses for the Town of Stonington 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 Stonington
 12/9/2022

0 0.30.5 1 1.5 Miles

Esri, NASA, NGA, USGS, FEMA, 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 through six fire districts and therefore does not typically experience major wildfires.

The last major wildfire occurred in the late 1990s when 300 acres burned in the reserve located north of the Barn Island Wildlife Sanctuary. The area of the blaze reached from Palmer Neck Road to Stewart Road to the landfill across Green Haven Road and even crossed the railroad tracks. The blaze required four days to extinguish and required equipment from all six fire districts and the State to contain.

Structural fires in higher density areas of the town are a larger concern for the Town, although these are not directly addressed herein. Fires occurring on the numerous small islands off the coast of the Stonington mainland are an important and unique concern for the Town. Detection of, and response to, such fires can take a relatively long time, and the fires can only be fought by boat and by foot. In February 2013, a fire destroyed a barn on the privately-owned Ram-Island. In June of 2014, a second fire destroyed a large home, the only remaining structure on the island. While not wildfires, these two incidents highlight the risk that island fires pose to people and property in Stonington.

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 public water systems owned and maintained by the Aquarion Water Company and the Westerly Water Department. Aquarion provides water in Old Mystic, Mystic, Lords Point, and the vicinity of the Borough, while Westerly provides water to Pawcatuck and the eastern portion of Wequetequock. An interconnection between Aquarion and Groton Utilities has provided a critical redundancy to the public water system in Mystic and southern Stonington. These water companies test 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 tanker trucks and drafting of surface water sources to provide fire protection water. While the 2004 *Plan of Conservation and Development* encourages the installation of dry hydrants, fire ponds, and cisterns in these outlying areas, Town emergency personnel

discourage their use in new developments because of the maintenance involved. Instead, the Town prefers to rely on its large tanker trucks to fight fires in outlying areas. The Town goes to the fires as quickly as possible and has good access to most areas for fire-fighting.

The level of fire protection afforded by the existing public water service and tanker trucks in outlying areas is considered to be adequate 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 remained consistent since the 2017 edition of the hazard mitigation plan was adopted, with the exception of some water system redundancies which have enhanced capabilities.

6.3.3 Vulnerabilities and Risk Assessment

Stonington has a mix of densely developed areas (Mystic, Pawcatuck), relatively developed areas (Old Mystic, Masons Island, Lords Point), and rural areas such as Wequetequock and the north-central areas of the town. The most vulnerable areas for a wildfire include the Barn Island Management Area and the surrounding area that burned in the late 1990s. Fortunately, public water service is available along Green Haven Road which would provide a steady supply of firefighting water to the area, although access south of Green Haven Road is still difficult due to the undeveloped nature of the area. This area is considered to be at moderate risk for a major wildfire occurrence.

The north-central area of Stonington is relatively rural and does not have public water service. Fire protection in this area is achieved through the use of large tanker trucks quickly bringing water to the site of a fire. The Fire Departments can also draft water from nearby streams, swamps, and ponds. Due to the necessity of transporting water, this area is considered to be at moderate risk for minor wildfires. Access to these areas is generally better than near the Barn Island Management Area since there are many utility easements and north-south roadways that can provide access to fire areas.

Another area that may be vulnerable to wildfires is the Lords Point area. While this area has public water service, a significant amount of *phragmites* vegetation is located east of the developed area. Fortunately, no major wildfires have occurred in this area. 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 3-6 in the Multi-Jurisdictional HMP for a general depiction of wildfire risk areas within Stonington.

6.3.3.1 Hazard Losses

There are no reported losses for the Town of Stonington related to wildfires. Downscaled losses from the 2019 Connecticut Natural Hazard Mitigation Plan 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 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 Stonington. 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.

Summary

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, a 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.

An inactive fault has been mapped along the western boundary of the town. 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 1970'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 several areas with steep slopes greater than 15% in the vicinity of Old Mystic, southeast of Mystic Reservoir, and located sporadically throughout the remainder of the town. Thus, landslides are not a particular concern in the town, but these areas 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 HMCAP, dam failure has been addressed separately in Section 5.4. As noted previously, most utility infrastructure in the town is located above ground. A quick and coordinated response with Eversource 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.

7.2.4 Hazard Losses

There are no reported losses for the Town of Stonington 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.

Table 7-1 HAZUS-MH Earthquake Related Economic Impacts

Stonington	Residential	Commercial	Industrial	Others	Total
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	\$123,180,000	\$155,790,000	\$27,650,000	\$32,290,000	338,910,000
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8. Hazard Mitigation and Climate Adaptation Strategies and Actions

8.1. Status of Mitigation Strategies and Actions

A total of 18 hazard mitigation actions were developed in the previous edition of this plan. The status of each is listed below.

#	Mitigation Actions and Strategies for Stonington 2016 - 2021	Status	Status Details
1	Track drainage-related flooding problems more through the revised and expanded municipal separate storm sewer (MS4) program.	Capability	Ongoing. This can be removed; it is now a capability.
2	Complete wet and dry floodproofing at Quimbaug Fire Department and begin planning for relocation of the facility	Carry Forward	No progress.
3	Floodproof the utility room at Mystic Fire Department	Carry Forward	No progress.
4	Conduct an annual inspection of floodprone areas that are publicly accessible. Recommend drainage improvements as appropriate.	Remove	Remove - Unknown why this action was included in previous plan. The Town Engineer mentioned one possible project that this might have been referring to; can follow up with him if needed. This was the drainage and tidal valve box at the 4 th District Voting Hall.
5	Continue to maintain good standing with the Community Rating System and consider additional achievements	Capability	Remove - This is now a capability.
6	Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties	Carry Forward	Town staff believe this is still an appropriate goal.
7	Consider floodproofing measures for fire departments susceptible to flooding and storm surge	Remove	This is covered through Actions 2 & 3.
8	Ensure that sewer pumping stations have a method for connecting emergency power and are adequately floodproofed	Partially Complete/ Carry Forward with Revision	The generator hookups are present, and this part of the action is complete. The pumping stations have not been floodproofed.
9	Pursue the acquisition and demolition of floodprone properties with conversion to open space, prioritizing repetitive loss properties	Carry Forward	Town staff believe this is still an appropriate goal. One challenge is that there are so many coastal floodprone areas that there would need to be some way to prioritize properties. Maybe revise to establish a prioritization process.
10	Improve the Town's flood-damage tracking system to make sorting and queries easier.	Complete	The Building Department is using a new permit tracking system and coordinates closely with the Planning office and enforcement staff.
11	Allocate funding to make the wastewater treatment plants more resilient in accordance with recommendations of the coastal resilience plan.	Carry Forward	The Town does not believe progress has been made in this area. Town staff believe this is still an appropriate goal.

12	Determine the feasibility and cost of establishing a second mode of egress for the Bishops Cove neighborhood.	Carry Forward	Town staff believe this is still an appropriate goal.
13	Implement public outreach and education programs that meet CRS guidelines.	Capability	Remove - This is an ongoing capability.
14	Conduct a beach nourishment or green infrastructure shoreline project in accordance with recommendations of the coastal resilience plan.	Carry Forward	Two projects are addressing this: 1. The Mystic Boathouse project is considering living shoreline options; and 2. Private property owners on Mason’s Island have received a NFWF grant to evaluate options along their shoreline frontage.
15	Develop formalized methodology for culvert and bridge construction and replacement that requires utilization of the most up-to-date extreme rainfall data from http://precip.eas.cornell.edu .	Carry Forward with Revision	The town has a Bridge Asset program that was started two years ago and includes planning for replacement and repairs. The town also works with a consultant. However, evaluation for coastal sea level rise and newer rainfall data is not automatically incorporated into projects. A revised action may be needed here.
16	Determine the feasibility and cost of elevating specific roads in accordance with the recommendations of the coastal resilience plan.	Carry Forward with Revision	No roads have been elevated in the last five years. The cost is an obstacle. Revise to include specific roads.
17	Address coastal structures in accordance with the recommendations of the coastal resilience plan.	Carry Forward with Revision	No major reconstructions come to mind. Consider pulling more specific actions from the coastal resilience plan.
18	Address causeways and bridges to islands in accordance with the recommendations of the coastal resilience plan.	Carry Forward	UConn engineering students produced a preliminary report on Mason’s Island, but no further progress has occurred.

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 12 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 Stonington to undertake from 2023 through 2028 are listed in Table X 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:

- Pursue recommendations from the Southeastern Connecticut Critical Facilities Assessment for the Quiambaug Fire Department. Partner with the Fire District to design wet and dry floodproofing of the building including an opinion of probable costs; in parallel, execute a

planning study for potential relocation of the facility. Compare the two studies and costs, and determine next steps.

- Develop a prioritization process to pursue the acquisition and demolition of floodprone properties with conversion to open space, targeting repetitive loss properties.
- Determine appropriate methods of floodproofing sewer pumping stations and secure funding for improvements. Begin with the one that was funded for 2023-2024.
- Determine appropriate methods of floodproofing the WPCFs (WWTPs) and secure funding for improvements.
- Develop formalized methodology for stormwater infrastructure, culvert, and bridge construction and replacement that requires utilization of the most up-to-date extreme rainfall data from NOAA Atlas 14 as it is updated to become NOAA Atlas 15.
- Determine the feasibility and cost of elevating the following Town-owned road: Holmes Street
- Determine the feasibility and cost of elevating the following Town-owned roads: Cottrell Street and Washington Street
- Determine the feasibility and cost of elevating the following Town-owned roads: Broadway Avenue and Church Street
- Develop locally-adopted recommendations resulting from the stormwater authority and utility feasibility study conducted by CDM Smith for SCCOG in 2022 using CIRCA's municipal resilience grant.
- Partner with Mystic Seaport Museum to execute a DEEP Climate Resilience Fund award for a vulnerability assessment and resilience plan. Study shall identify actions to be taken with or without development of flood protection systems for portions of Mystic. Examples include relocating buildings, elevating buildings that can be elevated, and making other modifications that do not eliminate historicity.
- Support Mystic Seaport Museum in the development of designs for interventions that mitigate risks to the Mystic Seaport Museum's campus from sea level rise, increased storm surge, increased precipitation events, increased heat, and other impacts stemming from the forces of climate change.
 - *Six sub-actions also had high combined scores; refer to the table for details.*
- Execute CIRCA's Municipal Resilience Grant (MRG) to redesign a resilient seawall along Holmes Street.
- Develop final design and construction plans for resilient seawall along Holmes Street.
- Working with the Town of Ledyard, complete the bridge replacement for Lantern Hill Road over Whitford Brook.
- Ensure that plans for the new Pawcatuck Park include resilience measures such as increasing floodplain storage (through removal of the Noyes Well mound), invasive species management, and incorporation of respite from extreme heat.

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

- Ensure that the cooling centers (Police Station and High School) are accessible from transit lines or alternate transportation options.

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

Table 8-1 Town of Stonington 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 =
TS1	Ensure that the cooling centers (Police Station and High School) are accessible from transit lines or alternate transportation options.	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	Transit District	7/2023 - 6/2025	High	16	3	48
TS2	Pursue recommendations from the Southeastern Connecticut Critical Facilities Assessment for the Quiambaug Fire Department. Partner with the Fire District to design wet and dry floodproofing of the building including an opinion of probable costs; in parallel, execute a planning study for potential relocation of the facility. Compare the two studies and costs, and determine next steps.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Office of the Chief Elected Official	\$25,000 - \$50,000	FEMA HMA FMA or HMGP Scoping Grant	7/2023 - 6/2025	High	17	8	136
TS3	Pursue recommendation from the Southeastern Connecticut Critical Facilities Assessment for the Mystic Fire Company. Partner with the Fire Company to acquire funding and floodproof the utility room at Mystic Fire Department.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Office of the Chief Elected Official	\$50,000 - \$100,000	FEMA HMA FMA or HMGP Project Grant	7/2023 - 6/2025	Medium	15	7	105
TS4	Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Planning	\$100,000 - \$500,000	FEMA HMA FMA or HMGP Project Grant	7/2023 - 6/2028	High	14	7	98

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	PERSISTIS x STAPLEE =
TS5	Develop a prioritization process to pursue the acquisition and demolition of floodprone properties with conversion to open space, targeting repetitive loss properties.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Natural Resources Protection	Planning	\$0 - \$10,000	FEMA HMA FMA or HMGP Project Grant	7/2023 - 6/2028	Medium	15	10	150
TS6	Determine appropriate methods of floodproofing sewer pumping stations and secure funding for improvements. Begin with the one that was funded for 2023-2024.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Water & Wastewater Utility Projects	WPCA	\$100,000 - \$500,000	CWSRF; or FEMA HMA HMGP Scoping Grant	7/2023 - 6/2027	High	16	10	160
TS7	Determine appropriate methods of floodproofing the WPCFs (WWTPs) and secure funding for improvements.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Water & Wastewater Utility Projects	WPCA	>\$1M	CWSRF; or FEMA HMA HMGP or BRIC Scoping Grant	7/2023 - 6/2027	High	16	8	128
TS8	Determine the feasibility and cost of establishing a second mode of egress for the Bishops Cove neighborhood.	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	Office of the Chief Elected Official	\$25,000 - \$50,000	DEEP Climate Resilience Fund; CIRCA Resilient Connecticut	7/2026 - 6/2028	Low	12	3	36
TS9	Execute a living shoreline project at the Mystic Boathouse.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases	Natural Resources Protection	Planning and Public Works	>\$1M	NOAA/NFWF; LISS	7/2023 - 6/2025	High	20	6	120

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	PERSISTS x STAPLEE =
		frequency and severity of floods.									
TS10	Develop a design for elevating the Mason's Island causeway and the approaches.	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	Planning and Public Works	\$100,000 - \$500,000	DEEP Climate Resilience Fund; LOTCIP; Municipal CIP Budget	7/2024 - 6/2028	High	17	7	119
TS11	Design a living shoreline at Chippechaug Cove on Mason's Island in accordance with the NFWF grant received for such purpose.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Natural Resources Protection	Office of the Chief Elected Official	\$100,000 - \$500,000	NOAA/NFWF; LISS	7/2023 - 6/2025	Medium	20	4	80
TS12	Develop formalized methodology for stormwater infrastructure, culvert, and bridge construction and replacement that requires utilization of the most up-to-date extreme rainfall data from NOAA Atlas 14 as it is updated to become NOAA Atlas 15.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Public Works	\$0 - \$10,000	Municipal Operating Budget	7/2023 - 6/2024	High	21	12	252
TS13	Determine the feasibility and cost of elevating the following Town-owned road: Holmes 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	Planning and Public Works	\$10,000 - \$25,000	DEEP Climate Resilience Fund; LOTCIP; Municipal CIP Budget	7/2024 - 6/2025	High	20	7	140
TS14	Determine the feasibility and cost of elevating the following Town-	Invest in resilient corridors to ensure that people and services are accessible	Structural Projects	Planning and Public Works	\$10,000 - \$25,000	DEEP Climate Resilience Fund; LOTCIP;	7/2025 - 6/2026	Medium	20	7	140

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	PERSISTS x STAPLEE =
	owned roads: Cottrell Street and Washington Street	during floods and that development along corridors is resilient over the long term.				Municipal CIP Budget					
TS15	Determine the feasibility and cost of elevating the following Town-owned roads: Broadway Avenue and Church 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	Planning and Public Works	\$10,000 - \$25,000	DEEP Climate Resilience Fund; LOTCIP; Municipal CIP Budget	7/2026 - 6/2027	Medium	20	7	140
TS16	Complete evaluation of the Pawcatuck flood protection system and determine if it can be accredited, and how that may occur, to ensure that risks are reduced on the Pawcatuck side of the levee.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Public Works	\$25,000 - \$50,000	Municipal CIP Budget	7/2023 - 6/2025	High	12	9	108
TS17	Assess the feasibility of a large-scale diking project to protect Mystic from flooding. This should be conducted as part of a comprehensive Mystic planning effort, distinct from the next action which refers to the potential Army Corps-funded study.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Office of the Chief Elected Official	\$100,000 - \$500,000	FEMA HMA Scoping; Municipal CIP Budget	7/2024 - 6/2027	Medium	12	1	12
TS18	Assess the feasibility of a large-scale diking project to protect upper Mystic from flooding. This should be conducted as part of a Mystic planning effort by the Army Corps of Engineers. The proposed (pending) study area extends from Isham Street to the Elm Grove	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Office of the Chief Elected Official	\$100,000 - \$500,000	Municipal CIP Budget	7/2024 - 6/2027	Medium	12	1	12

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	PERSISTS x STAPLEE =
	Cemetery. The cost estimate is for the Town's share.										
TS19	Send Planning staff to a State Historic Preservation Office/Connecticut Trust for Historic Preservation training for local historic district commissioners and Certified Local Governments on managing historic districts in Connecticut.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Planning	\$0 - \$10,000	SHPO	7/2025 - 6/2026	Low	13	7	91
TS20	Develop locally-adopted recommendations resulting from the stormwater authority and utility feasibility study conducted by CDM Smith for SCCOG in 2022 using CIRCA's municipal resilience grant.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	More than one category	Office of the Chief Elected Official	\$0 - \$10,000	SCCOG Special Projects; DEEP Climate Resilience Fund; CIRCA Resilient Connecticut	7/2023 - 6/2025	High	18	8	144
TS21	Partner with Mystic Seaport Museum to execute a DEEP Climate Resilience Fund award for a vulnerability assessment and resilience plan. Study shall identify actions to be taken with or without development of flood protection systems for portions of Mystic. Examples include relocating buildings, elevating buildings that can be elevated, and making other modifications that do not eliminate historicity.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	More than one category	Office of the Chief Elected Official	\$100,000 - \$500,000	DEEP Climate Resilience Fund	4/2023 - 9/2024	High	22	8	176
TS22	Support Mystic Seaport Museum in the development of designs for interventions that mitigate risks to	Reduce flood and erosion risks by reducing vulnerabilities and	More than one category	Office of the Chief	\$100,000 - \$500,000	DEEP Climate Resilience Fund; CIRCA	4/2023 - 9/2024	High	22	8	176

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 =
	the Mystic Seaport Museum's campus from sea level rise, increased storm surge, increased precipitation events, increased heat, and other impacts stemming from the forces of climate change.	consequences, even as climate change increases frequency and severity of floods.		Elected Official		Resilient Connecticut; and SHPO					
TS22A	Support Mystic Seaport Museum in the development of designs for green infrastructure in the parking lots combined with additional retention/detention, with the co-benefits of reducing stormwater generation and providing some extreme heat mitigation.	Address risks associated with extreme heat events, especially as they interact with other hazards.	Natural Resources Protection	Planning and Public Works	\$100,000 - \$500,000	Mystic Seaport Museum; DEEP Climate Resilience Fund; LISFF	4/2023 - 9/2024	Medium	22	10	220
TS22B	Support Mystic Seaport Museum in the development of designs additional (incremental) elevation of internal roads to reduce the ponding.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Planning and Public Works	\$100,000 - \$500,000	Mystic Seaport Museum; DEEP Climate Resilience Fund	4/2023 - 9/2024	Low	18	9	162
TS22C	Support Mystic Seaport Museum in the development of designs for pilot project: eliminate basement and elevate an at-risk building.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Property Protection	Building Official	\$100,000 - \$500,000	Mystic Seaport Museum; DEEP Climate Resilience Fund; SHPO	4/2023 - 9/2024	Medium	18	10	180
TS22D	Support Mystic Seaport Museum in the development of designs pilot project: relocate structures (buildings).	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases	Property Protection	Building Official	\$100,000 - \$500,000	Mystic Seaport Museum; DEEP Climate Resilience Fund; SHPO	4/2023 - 9/2024	Low	18	10	180

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 =
		frequency and severity of floods.									
TS22E	Support Mystic Seaport Museum in the development of designs for seawall or bulkhead repairs to make more resilient to sea level rise and wave energy	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Public Works	\$100,000 - \$500,000	Mystic Seaport Museum; DEEP Climate Resilience Fund; SHPO	4/2023 - 9/2024	Medium	19	10	190
TS22F	Support Mystic Seaport Museum in the identification and study of methods to negotiate a shoreline that will allow visitors to engage with the floating museum pieces by replacing hardened, fixed shoreline features with responsive systems that change with water levels (i.e. living shorelines and floating docks).	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Natural Resources Protection	Planning and Public Works	\$100,000 - \$500,000	Mystic Seaport Museum; DEEP Climate Resilience Fund; NOAA/NFWF; LISFF	4/2023 - 9/2024	Medium	19	8	152
TS23	Execute CIRCA's Municipal Resilience Grant (MRG) to redesign a resilient seawall along Holmes Street.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Public Works	\$100,000 - \$500,000	CIRCA MRG	1/2023 - 6/2023	High	21	7	147
TS24	Develop final design and construction plans for resilient seawall along Holmes Street.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Public Works	\$100,000 - \$500,000	Municipal CIP Budget	7/2023 - 6/2024	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 =
TS25	Working with the Town of Ledyard, complete the bridge replacement for Lantern Hill Road over Whitford Brook.	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	\$100,000 - \$500,000	LOTICIP; STEAP; IJJA BIP	7/2023 - 6/2024	High	16	9	144
TS26	Partner with the Town of North Stonington, Town of Ledyard, Town of Groton, and the Native American tribes to ensure that risks downstream of Long Pond are characterized in the new Emergency Action Plan for the Long Pond Dams.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Preparedness & Emergency Response	Office of the Chief Elected Official	\$10,000 - \$25,000	Municipal Operating Budget; SCCOG Municipal Service Funds	7/2023 - 6/2024	High	21	4	84
TS27	Partner with the Town of Ledyard and the Town of Groton to determine appropriate steps to reduce risks associated with additional breaching of the Whitford Pond Dam; document in a report that lists potential solutions.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Structural Projects	Office of the Chief Elected Official	\$25,000 - \$50,000	NOAA/NFWF; DEEP Climate Resilience Fund	7/2024 - 6/2025	High	21	6	126
TS28	Work with SCCOG and CIRCA to scope a corridor study for Lantern Hill Road that evaluates its capabilities and risks relative to providing access between and among MPTN, Ledyard, North Stonington, the Eastern Pequots, Stonington, and the Old Mystic part of Groton	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	Office of the Chief Elected Official	\$100,000 - \$500,000	SCCOG Special Projects; DEEP Climate Resilience Fund; CIRCA Resilient Connecticut	7/2024 - 6/2025	High	24	3	72

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 =
TS29	Participate in a dam failure tabletop exercise for Long Pond with the Towns of Ledyard, Groton, and North Stonington.	Reduce flood and erosion risks by reducing vulnerabilities and consequences, even as climate change increases frequency and severity of floods.	Preparedness & Emergency Response	emergency Management	\$0 - \$10,000	Municipal Operating Budget	7/2025 - 6/2026	High	21	5	105
TS30	Complete the fire suppression water main crossing of Whitford Brook in Old Mystic.	Reduce losses from other hazards that are affected by climate change.	Property Protection	Public Works	\$50,000 - \$100,000	Municipal CIP Budget	7/2023 - 6/2024	Medium	13	9	117
TS31	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
TS32	Conduct direct outreach to property owners in repetitive loss areas with information about how to mitigation 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 this month	High	13	4	52
TS33	Require floodplain manager and land use staff to take free training at https://portal.ct.gov/DEEP/P2/Chemical-Management-and-Climate-Resilience/Chemical-Management-and-Climate-Resilience 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	Planning	\$0 - \$10,000	Municipal Operating Budget	7/2023 - 12/2023	Low	14	6	84

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 =
TS34	Ensure that plans for the new Pawcatuck Park include resilience measures such as increasing floodplain storage (through removal of the Noyes Well mound), invasive species management, and incorporation of respite from extreme heat.	More than one goal	More than one category	Office of the Chief Elected Official	\$100,000 - \$500,000	STEAP; FEMA BRIC Scoping; Municipal Bond funds	7/2023 - 6/2025	High	18	10	180