



Western Connecticut Council of Governments Multi-Jurisdiction Hazard Mitigation Plan Update 2021 – 2026

Municipal Annex for **Stamford, CT**

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1.0 INTRODUCTION

1.1 Purpose of Annex

The purpose of this Hazard Mitigation Plan (HMP) annex is to provide a community-specific hazard risk assessment, capability analysis, and evaluation and prioritization of hazard mitigation measures and projects. Background information and the regional effects of pertinent natural hazards are discussed in the main body of the Western Connecticut Council of Governments (WestCOG) Multi-Jurisdictional Hazard Mitigation Plan. This annex is designed to supplement the information presented in the Multi-Jurisdictional HMP with more specific detail for the City of Stamford and is not to be considered a standalone document.

The primary goal of this HMP, including this Municipal Annex, is to identify natural hazard risks and mitigation opportunities in order to reduce the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources. This includes the reduction of public and private damage costs. Limiting losses of and damage to life and property will also reduce the social, emotional, and economic disruption associated with a natural disaster.

2.0 COMMUNITY PROFILE

2.1 Geography

2.1.1 Physical Setting

Incorporated in 1893, the City of Stamford is located in southern Fairfield County and home to a population of 129, 636 (according to the US Census Bureau 2019 American Community Survey Population Estimates). Stamford is bordered by the municipalities of Greenwich to the west, New Canaan and Darien to the east, as well as Long Island Sound along the south, and New York State to the north. Refer to Figure 2-1 for a map showing the location of Stamford within the region.

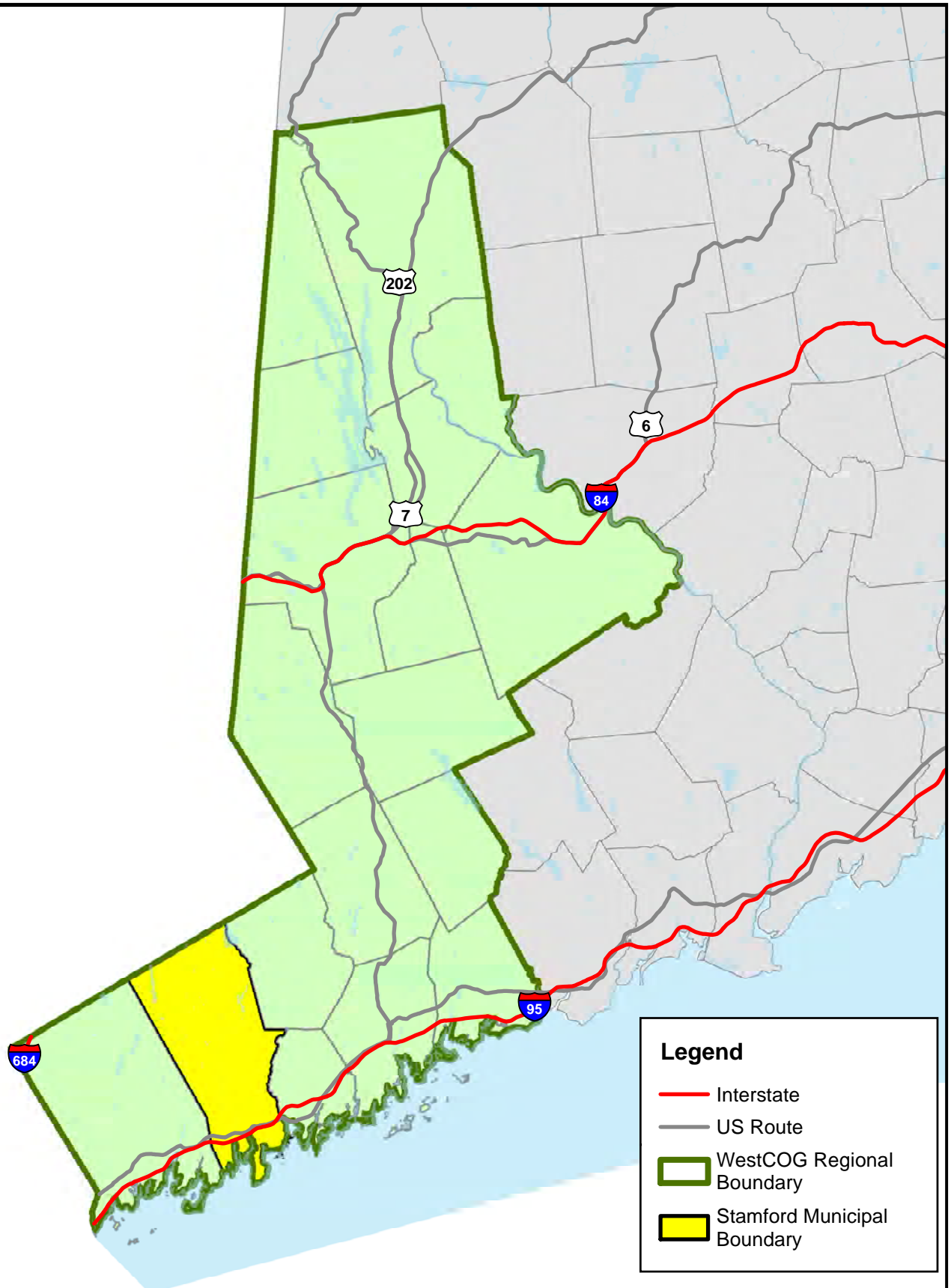
Stamford is a coastal community, with several rivers and streams flowing throughout the community. The City is characterized by highly developed, lower elevations adjacent the shoreline, with suburban development sprawling northward away from the urban areas. The Rippowam River flows south through the center of the City cutting through the suburban and urban areas before it eventually flows into Long Island Sound. Three large waterbodies are also located in Stamford: North Stamford Reservoir, Samuel J. Barch Reservoir, and Laurel Reservoir. The highest elevation in Stamford is about 520 feet in the northern most areas bordering New York. With the southern area of Stamford being at, or close to sea level. The varying terrain of Stamford makes the City vulnerable to an array of natural hazards.

The Center for Land Use Education and Research (CLEAR) has developed a land cover dataset derived from 2016 satellite imagery to depict statewide land cover. The land cover by percent of total land can be found in Table 2-1.

Table 2-1: Land Cover by Area

| Land Cover Class | Acres | % of Total Land |
|-----------------------------|---------------|-----------------|
| Developed | 11,068.1 | 45.01% |
| Turf & Grass | 3,886.8 | 15.81% |
| Other Grasses | 171.4 | 0.70% |
| Agricultural Field | 129.8 | 0.53% |
| Deciduous Forest | 7,574.1 | 30.80% |
| Coniferous Forest | 401.0 | 1.63% |
| Water | 677.7 | 2.76% |
| Non-Forested Wetland | 15.2 | 0.06% |
| Forested Wetland | 492.4 | 2.00% |
| Tidal Wetland | 6.5 | 0.03% |
| Barren Land | 168.1 | 0.68% |
| TOTAL | 24,591 | 100% |

Barren Land is defined by UConn CLEAR as mostly non-agricultural areas free from vegetation (such as sand and gravel, bare rock, mines and quarries), some urban areas, and some bare soil agricultural fields.



2.1.2 Land Use

Stamford is a large City with both high urbanized areas, and suburban development. Most higher density development and commercial activity lies south of the Merritt Parkway, with the highest concentration of commercial activity concentrated in the southern part of the City along the Interstate 95 corridor. The areas north of the Parkway are primarily larger lot residential neighborhoods, in comparison to the smaller lots found south of the Parkway.

According to the City's 2015 Master Plan 65% of Stamford's total land area is currently occupied by residential development. Historically, low-density single-family residential uses have been scattered throughout the northern areas in the City, with multi-family units in closer proximity to the commercialized areas along Interstate 95 and along the shoreline. Table 2-2 summarizes 2014 land use data identified in the Master Plan.

Table 2-2: 2014 Land Use by Area

| Use | Percent of Total Land |
|--|-----------------------|
| Residential | |
| Low-Density Residential: One Family | 59% |
| Medium-Density Residential: 2-4 Family | 3% |
| High-Density Residential: 5+ Family | 3% |
| Business | |
| Commercial | 8% |
| Mixed-Use | 3% |
| Light-Industrial | <1% |
| Heavy Industrial | <1% |
| Public & Institutional Uses | |
| Institutional | 3% |
| Public Land and Open Space | |
| Dedicated Open Space | |
| Parks & Open Space | 9%* |
| Other | |
| Transportation/Utility | <1% |
| Vacant | |
| Vacant | 8% |
| Developed/Committed | 91% |
| Vacant/Undeveloped | 8% |
| Total Land Area | |

2.1.3 Climate and Climate Change

Current Conditions

Over the course of the year, the temperature in Stamford typically varies from 24°F to 83°F and is rarely below 10°F or above 90°F. The warm season lasts from June 1 to September 15, with an average daily high temperature above 74°F. The hottest day of the year is July 20, with an average high of 83°F and low of 68°F. The cold season lasts from December 3 to March 12, with an average daily high temperature below 46°F. The coldest day of the year is January 29, with an average low of 24°F and high of 37°F.

Precipitation falls throughout the year in Stamford. The wetter season lasts from March 31 to August 19, with a greater than 29% chance of a given day being a wet day. The chance of a wet day peaks at 36% on May 29. The smallest chance of a wet day is 22% on January 29.

The most rain falls during the 31 days centered on June 3, with an average total accumulation of 3.8 inches. The least rain falls around February 6, with an average total accumulation of 2.0 inches.

The snowy period of the year lasts from November 19 to April 5, with a sliding 31-day liquid-equivalent snowfall of at least 0.1 inches. The most snow falls during the 31 days centered on January 26, with an average total liquid-equivalent accumulation of 0.7 inches.

Climate data was sourced from Weather Spark based on analysis of the years 1980 to 2016.

Climate Change

Climate change projections for Connecticut were sourced from the 2019 Connecticut Physical Climate Science Assessment Report, which was developed by the University of Connecticut (UConn) Atmospheric Sciences Group, commissioned by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) with funding from the Department of Energy and Environmental Protection (DEEP). All projections are based on the IPCC high CO₂ emission scenario (RCP8.5).

Temperature

Annual temperatures have been increasing throughout Connecticut and are projected to continue to do so in the future. By mid-century, average annual temperature is projected to increase by 5°F. Seasonal average temperatures are also expected to rise, with the greatest increase (6°F) experienced in summer (June to August). The number of nights over which temperature remains above 68°F will quadruple from 10 days per year to more than 40 days, and the number of extremely hot days will increase from above 4 a year to 48 per year.

Precipitation

Rainfall data in "Technical Paper No. 40" by the U.S. Weather Bureau (now the National Weather Service) (Hershfield, 1961) dates from the years 1938 through 1958. According to these data, the 24-hour rainfall amount for a 50% annual-chance storm in Fairfield County is 3.3 inches.

The continued increase in precipitation only heightens the need for hazard mitigation planning as the occurrence of floods may change in accordance with the greater precipitation.

The Northeast Regional Climate Center (NRCC) has partnered with the Natural Resources Conservation Service (NRCS) to provide a consistent, current regional analysis of rainfall extremes (<http://precip.eas.cornell.edu/>). In 2020 this dataset listed the 24-hour rainfall amount for a 50% annual-chance storm in Stamford as 3.45 inches.

The NOAA Atlas 14, released on September 30, 2015 puts the 24-hour rainfall amount for a 50% annual-chance annual storm in Stamford at 3.58 inches.

These precipitation amounts, and more details, are summarized in Table 2-3, below.

Table 2-3: 24-Hour Rainfall Amounts by Annual-Chance Occurrence

| Source | 24-Hour Rainfall Amount (inches) by Annual-Chance Occurrence | | |
|-------------------------------|--|------|------|
| | 50% | 4% | 1% |
| Technical Paper No. 40 | 3.3 | 5.7 | 7.2 |
| NRCC | 3.45 | 6.41 | 9.02 |
| NOAA Atlas 14 | 3.58 | 6.60 | 8.39 |

Annual precipitation has been increasing statewide and is projected to continue to increase. By mid-century, annual precipitation is projected to increase by 8.5%, with the greatest increase (13.4%) occurring in the winter months. Extreme precipitation events are projected to increase in both frequency and magnitude. Based on this increase and the precipitation figures above, by 2050 Stamford can expect the 24-hour rainfall amount for a 50% annual-chance storm to be around 3.7 to 3.9 inches or greater.

Impervious surfaces and infrastructure in the City have increased over time as well, leading to increasing runoff and peak discharge values.

Despite overall increases in precipitation, drought risk is projected to increase, especially during summer, due to changing precipitation patterns and projected increases in potential evapotranspiration (plants taking up more water in hotter temperatures and longer growing seasons).

2.1.4 Drainage Basins and Hydrology

Stamford is divided among seven sub-regional watersheds as shown in Table 2-4. The majority of the sub-regional basins drain into Long Island Sound, with one basin draining into the Rippowam River basin, and another feeding the Mianus River basin. All of the water that passes through Stamford eventually empties into Long Island Sound.

Table 2-4: Sub-Regional Drainage Basins

| Drainage Basin | Overall Sub-regional Area (sq. mi) | Area within City (sq. mi) | Area within City (acres) | Percent of City |
|---------------------------------|------------------------------------|---------------------------|--------------------------|-----------------|
| Rippowam River | 23.53 | 17.03 | 10,898.89 | 44.41% |
| Mianus River | 28.64 | 6.40 | 4,092.23 | 16.69% |
| Southwest Shoreline | 11.54 | 7.34 | 4,699.36 | 19.14 |
| East Branch Mianus River | 5.39 | 3.76 | 2,403.62 | 9.81% |
| Noroton River | 11.03 | 3.00 | 1,920.69 | 7.82% |
| Mill River | 13.35 | 0.81 | 516.04 | 2.08% |
| Greenwich Creek | 8.89 | 0.004 | 3.14 | 0.01% |
| Total | n/a | 38.344 | 24,800.97 | 99.96% |

Source: Connecticut Department of Energy & Environmental Protection GIS Data

Stamford is entirely encompassed within the Southwest Coast drainage basin, which drains directly into Long Island Sound. Of the seven subregional drainage basins and their respective streams, the Rippowam River running through central Stamford is the largest, followed by the Mianus River in the western part of City.

The Rippowam River is approximately 17 miles long, and originates as the Mill River in Ridgefield, Connecticut. The Rippowam Basin drains 23.53 square miles of land, and ultimately flows directly into Long Island Sound. The final few miles of the river, before feeding into the sound, are also referred to as the Mill River.

The Mianus River is approximately 20 miles long, and originates in North Castle, New York. The basin drains 28.64 square miles directly into Long Island Sound in Greenwich, Connecticut.

2.2 Society, Culture, and Government

2.2.1 Population and Demographic Setting

According to the 2010 U.S. Census, Stamford had a population of 122,643, with 3,198 persons per square mile. According to the 2019 American Community Survey five-year estimates, Stamford's population between 2014 and 2019 was approximately 129,636.

One important aspect of natural hazard mitigation planning is to identify a community's demographic trends in relation to natural hazards. The Center for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) is used to identify vulnerable populations in Stamford. The SVI uses census data to identify populations within the City that may be more vulnerable to natural hazards. As a result of this analysis, the City is identified to have a certain level of overall social vulnerability with a rank of 0 to 1; 1 being the most vulnerable and 0 being the least.

To determine social vulnerability, the CDC incorporates 15 factors into the overall SVI calculation under four categories, or themes:

socioeconomic status, household composition and disability, minority status and language, and housing type and transportation. Figure 2-2 represents the breakdown of the SVI process. These themes and their ranking are based on census statistics. By evaluating these factors and determining a level of social vulnerability, a community can identify specific needs for before, during, and after an event. Such needs may include sheltering capacity, evacuation routes, or to decide how many emergency personnel may be required to respond after an event.

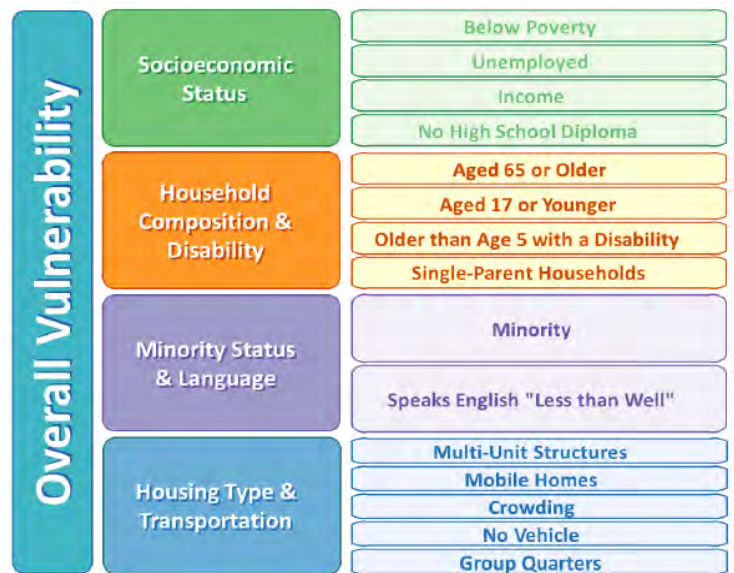


Figure 2-2: The CDC SVI Index Factors. Graphic: svi.cdc.com

The City of Stamford is considered to have a low to moderate level of vulnerability, with their most vulnerable social aspect being minority populations and those that do not speak English well. In addition, there are socioeconomic concerns, as well as high density housing populations

and transportation disparities. These vulnerable populations are concentrated in the southern tracts along Interstate 95 in more urbanized areas. It is important to note that four of the southeastern tracts in the City are considered highly vulnerable, with one tract ranking 0.93 on the SVI scale. Appendix B explores the SVI for Stamford in more depth.

2.2.2 Development Trends

During the 18th century Stamford was a hub for water dependent activity, such as merchandising, fishing, and agriculture. As time progressed, the shoreline of Stamford became developed with summer homes for New York residents, and soon became settled by those who wished to live in Stamford, and commute to Manhattan. Meanwhile, inland areas of Stamford rapidly shifted from a farming community with few families, to a vibrant, urbanized City. With the construction of the railroad, and demand for better transportation, Stamford was more accessible to outsiders. Thousands of immigrants from Europe populated the City, and by the late 1880's the City was growing more industrial due to cheap labor allowing growth and expansion.

The start of the 20th century brought about many of the modern structures that are recognizable in the downtown area, with large commercial and industrial buildings replacing earlier era construction. Stamford was soon one of the fastest growing cities in the state by any measure, whether population increases or development levels. The City is one of the three largest in Connecticut.

Stamford has maintained the commercial and water dependent character along the shoreline with the urban areas concentrated within Waterside and Harbor Point. The immediate shoreline continues to be predominantly residential, with pockets of commercial activity extending from Harbor Point. The large downtown area on the north side of Interstate 95 continue to enjoy significant redevelopment. Residential development and larger parcel sizes increase moving northward away from the downtown. A recent significant development is Ainslie Square at 159 Colonial Road. This planned residential community constructed by RMS Companies includes approximately 50 three- and four-bedroom homes. Previously the property had been vacant undeveloped land.

The Stamford POCD encourages the promotion of transit-oriented development (TOD) around the Springdale, Glenbrook, and Stamford passenger rail stations as well as the proposed Stamford East Transit Node. While development and redevelopment continue, the City has taken steps to reduce risks. For example, The City is currently underway with Phase III of the Mill River Corridor Plan. Specifically, the City has acquired parcels along the Rippowam River and designated these parcels as open space in the downtown area.

Stamford will continue to balance development and redevelopment with reducing risks to natural hazards. Although the hurricane barrier system (refer to Section 3.1.2.) will provide protection from storm surges, projects such as the Mill River Corridor Plan will reduce riverine risks. Overall, vulnerabilities to natural hazards will not increase over time.

2.2.3 Governmental Structure

The City of Stamford has a Mayor guided government, with an appointed cabinet which works closely with the Mayor. In addition to the Mayor's office, there are boards, commissions and

committees providing input and direction to City administrators. City departments provide municipal services and day-to-day administration. Many commissions and departments play a role in hazard mitigation, including the Planning and Zoning, Environmental Protection Board, the Building Official, the Land Use Bureau, the Fire Department, Emergency Management, and the Public Works Department.

2.2.4 Historic and Cultural Resources

Historic and cultural resources include sites, structures, and objects that are significant in history, architecture, archaeology, engineering, and culture. Protection of these resources grows economies and enhances community character, and following a natural disaster they can help to reinforce neighborhood connections and reestablish a sense of community and normalcy. Consideration of these resources in this HMP is critical.

Historic preservation planning helps protect historic properties and cultural resources from demolition or alteration.

Hazard mitigation planning helps protect life and property from damage caused by natural and manmade hazards.

Integrating these two planning processes helps create safe and sustainable historic communities.

- Paraphrased from FEMA Report 386-6

Historic resources in Stamford are concentrated in the Dolsen Place, Forest Street, Hubbard Heights, Long Ridge, Revonah Manor, South End, and Sterling Farms Historic Districts. Other historic resources are located throughout the community. There are numerous historic sites in the Harbor Point and South End Neighborhoods that could be vulnerable to flooding, whether it be coastal, riverine, or poor drainage. There are also resources in the Ridgeway neighborhood that may be at risk during an extreme event. See Figure 2-3 for a map of historic resources in the community.


Historic buildings and structures may be particularly susceptible to natural hazards because they were built prior to the establishment of more recent construction standards. Additionally, some of the structural integrity of these resources may have been degraded over the decades or centuries since their original construction. Structural retrofits and hazard mitigation methods may be challenging or restricted in cases where alteration of a resource will also diminish its cultural or historical aesthetic and value. Finally, miscommunications or lack of knowledge may lead to historic resources being damaged during the disaster recovery process.


Steps to incorporate historical and cultural preservation into hazard mitigation planning include:

- Inventory and survey historic and cultural resources
- Implement appropriate mitigation measures for those resources
- Take steps to move portable resources, such as artwork or documents, to safe locations prior to the occurrence of a hazard, if possible
- Consider these resources in emergency operations plans to prevent accidental damages during recovery efforts


Specific actions to mitigate natural hazard risks to historic resources are listed at the end of this Annex.


LEGEND


 National Park Service Cultural Site

 Cultural District


SHPO Historic Sites


 National Register


 State Register


 Local Register


Flood Zones

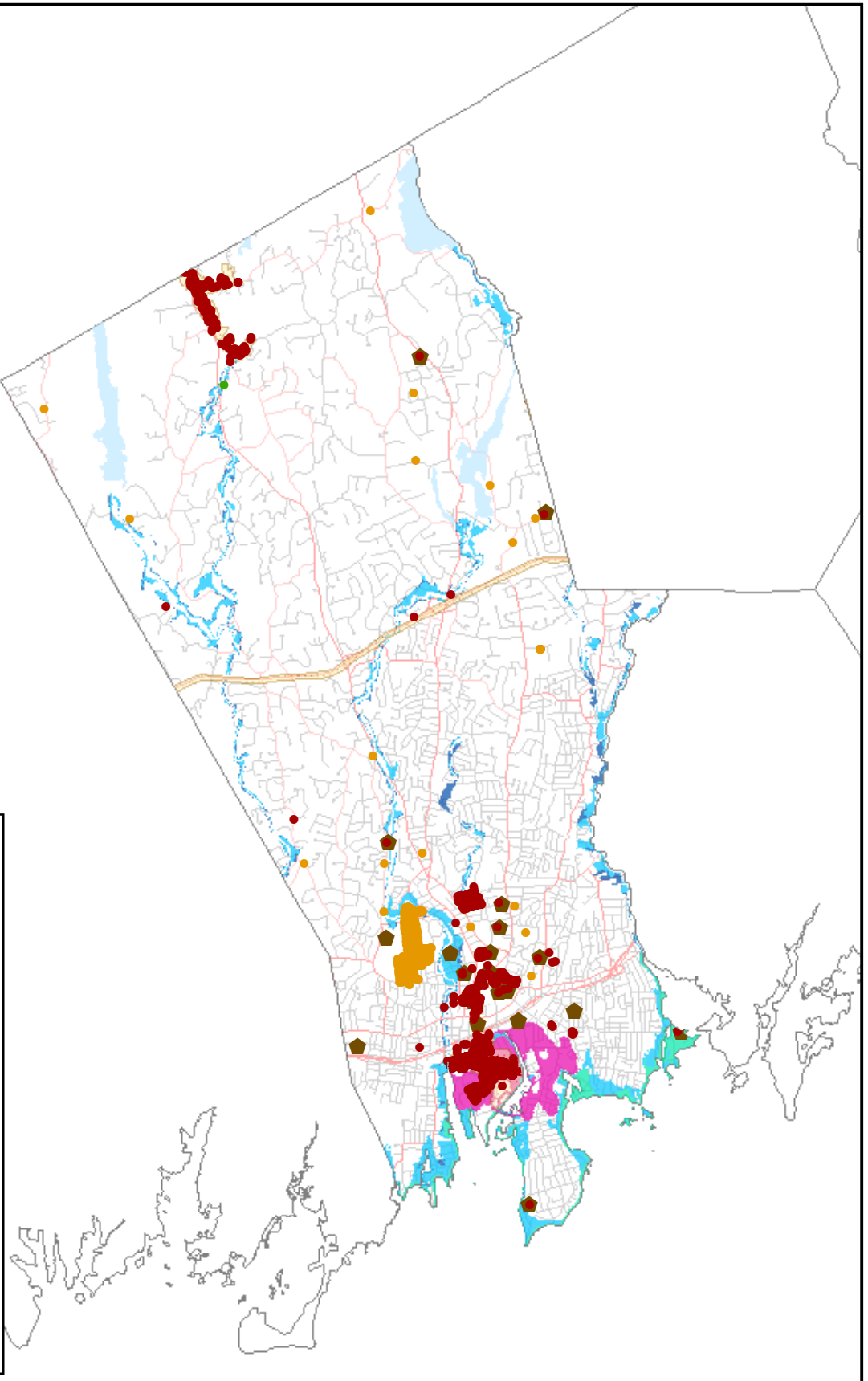
 A

 AE

 VE

 0.2% Annual Chance Flood Hazard

 X, Area with Reduced Risk because of Levee





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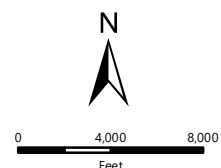
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
WWW.MMINC.COM

Historic Resources with Flood Zones and
Dam Failure Inundation Areas

WestCOG Hazard Mitigation Plan

Town of Stamford

NPS: Cultural Resources CT DEEP: DFA FEMA: DFRIM & Q3



| | |
|-----------|-------------|
| SCALE | 1" = 8,307' |
| DATE | 1/6/2021 |
| PROJ. NO. | 3101-22 |

FIG. 2-3

2.3 Infrastructure

2.3.1 Transportation

Major transportation routes in Stamford include Interstate 95 and the Merritt Parkway (Route 15), which runs east to west through the City. The Parkway runs through the central part of the City, while I-95 runs through the southern region of Stamford. Route 104 runs from the New York border south, where it ultimately merges with Route 137, which also runs north from the border south to I-95. These two parallel routes are the main routes running north to south.

In addition, the Metro North/Amtrak rail lines also run through the City, just south and parallel to Interstate 95. There is one station located on Washington Boulevard, at the terminus of Route 137. The CTtransit bus system is also active in the City with several stops throughout the community.

2.3.2 Utilities

Aquarion Water Company owns and operates one public water system in Stamford; this is the utility's largest main system. This system provides water for the southern half of the City, with some northeastern service lines along Route 137 and west along Mill Road. The remaining properties rely on a private well for drinking water.

The Stamford Water Pollution Control Authority maintains the sewer systems in the southern half and northeastern areas of the City.

Residents and businesses use oil, propane, or natural gas for heat. Natural gas is in the southern region of the City numerous distribution lines from Eversource.

According to geolSP (geolSP.com), access to Broadband Internet is available to most residents in Stamford. There are 3 DSL providers (MegaPath, AT&T, and Verizon), 1 Cable Internet provider (CSC Holdings), and 6 Fiber Internet providers (CSC Holdings, Fibertech Networks LLC, Level(3) Communications, Zayo Enterprise Networks, Connecticut Education Network, and COGENT). There are also 4 Mobile Broadband (cellular) providers with service available in Stamford.

2.4 Planning and Regulatory Capabilities

Stamford has in place a number of community planning mechanisms, regulations, and policies that serve to mitigate natural hazards by limiting development in hazardous areas, requiring buildings be constructed to certain standards, or otherwise directing development and construction toward increased resilience. These are summarized below.

2.4.1 Review of Existing Local Plans

Stamford has a number of plans that are relevant to hazard mitigation. These are noted here:

- **Stamford Master Plan 2015-25:** The City of Stamford does not maintain a POCD; rather, it includes development goals in its Master Plan. The Master Plan addresses natural hazard concerns within the community and includes strategies that will mitigate risks from such hazards as the community continues to develop. Many of these strategies are included in Chapter 7.0, "A Sustainable Future."
- **Stormwater Management:** Stamford recently adopted the *City of Stamford Stormwater Drainage Manual* (dated 6/19/2020). The manual complies with the requirements of the US

EPA 2017 updated *General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems* (MS4 General Permit).

- **Capital Improvement Plan (CIP):** Stamford maintains a CIP that is updated annually and lays out capital investments for a five-year period. The CIP often includes road, drainage, and other infrastructure improvement projects relevant to hazard mitigation.
- **Economic Development Plan:** Stamford is included within the Western Connecticut Economic Development Plan of 2017, developed by WestCOG. The plan aligns with the COG's other efforts to promote climate sustainability and resiliency in the region. The City also has a local economic development plan called the Choose Stamford Campaign.
- **Emergency Operations Plan (EOP):** Stamford's EOP is reviewed annually and updated as needed. Dam failure Emergency Action Plans (EAPs) for dams with failure inundation zones that may impact Stamford, and for which EAPs are available, are on file locally.
- **Watershed Management Plan:** Watershed Management Plans have been developed for the Mianus River Watershed and the Mill/Rippowam River Watershed. The Mianus River Watershed Based Plan was developed for the South Western Regional Planning Agency (SWRPA) by AKRF, Inc. in 2012, while the Mill/Rippowam River Watershed Plan was developed for the City of Stamford in 2012 by CDM Smith. These plans are focused on water quality but can help the community mitigate inland flood risks by incorporating watershed management best practices into its planning efforts.
- **Open Space:** Stamford does not maintain a stand-alone Open Space Plan; instead, open space planning is incorporated into the community's Master Plan.

2.4.2 Review of Regulatory Structures

Stamford regulates development through a number of regulations, codes, and ordinances. These are summarized below. More detailed information about how these regulations relate to specific natural hazards are described in Section 3.

- **Building Code:** Stamford enforces the Connecticut State Building Code locally.
- **Zoning Regulations:** Most recently updated in June 2020.
- **Inland Wetlands and Watercourses Regulations:** Most recently updated in June 2009.
- **Subdivision Regulations:** Most recently updated in November 2019. Include provisions promoting installation of firefighting water sources, construction of adequate emergency access and egress, burial of utilities, and use of Low Impact Development techniques and Green Infrastructure.

2.5 Emergency Services, Critical Facilities, Sheltering, and Evacuation

The City considers its police, fire, and governmental facilities to be critical since these are needed to ensure that emergencies are addressed while day-to-day management of Stamford continues. The City also considers various facilities housing higher-risk individuals (such as elderly individuals or children) and large populations to be critical facilities; and privately-owned fueling stations are also considered critical facilities. Table 2-5 identifies all of these critical facilities.

Table 2-5: Critical Facilities

| Facility | Address or Location | Type | Emergency Power | Shelter | In 1% Floodplain |
|--|---------------------------|----------------|-----------------|---------|------------------|
| Stamford Government Center | 888 Washington Blvd | EOC/City Hall | | | |
| Long Ridge Fire Company Incorporated Station 1 | 366 Old Long Ridge Rd | Fire | | | |
| Springdale Fire Department | 987 Hope Street | Fire | | | |
| Stamford Fire and Rescue Department Station 1 - Headquarters | 629 Main St | Fire | | | |
| Stamford Fire and Rescue Department Station 2 | 215 Washington Boulevard | Fire | | | |
| Stamford Fire and Rescue Department Station 3 | 80 Fairfield Avenue | Fire | | | |
| Stamford Fire and Rescue Department Station 4 | 364 Shippan Avenue | Fire | | | |
| Turn of River Fire Dept 1 | 268 Turn of River Road | Fire | | | |
| Turn of River Station 2 | 50 Roxbury Road | Fire | | | |
| Long Ridge Fire Company Incorporated Station 2 | 2619 High Ridge Road | Fire/Ambulance | | | |
| Stamford Fire and Rescue Department Station 5 | 1620 Washington Boulevard | Fire/Rescue | | | ✓ |
| Belltown Fire Department | 8 Dorlen Rd | Fire/Shelter | | ✓ | |
| Stamford Fire and Rescue Department Station 6 | 17 Arthur Pl | Fire/Shelter | | ✓ | |
| Stamford Emergency Medical Services Incorporated | 684 Long Ridge Road | Ambulance | | | |
| Stamford Health System | 166 W Broad St | Hospital | | | |
| Stamford Hospital | One Hospital Plaza | Hospital | | | |
| Stamford Police Department | 725 Bedford Street | Police | | | |
| University of Connecticut - Stamford Campus Police Sub-Station | 16 Broad Street | Police | | | ✓ |
| Highways Department | 90 Magee Ave | Public Works | | | |
| Stamford Leaf Compost Facility | 130 Magee Ave | Public Works | | | |
| Water Pollution Control Facility | 111 Harbor View Avenue | Public Works | | | |
| St. John Lutheran's Church | 884 Newfield Avenue | Church/Shelter | | ✓ | |
| Cloonan Middle School | 11 W North Street | School/Shelter | | ✓ | ✓ |
| Rippowam Middle School | 381 High Ridge Rd. | School/Shelter | | ✓ | |
| Scofield Middle Magnet | 641 Scofieldtown Road | School/Shelter | | ✓ | |
| Westhill High School | 125 Roxbury Rd. | School/Shelter | | ✓ | |
| Academy of Information Technology & Engineering | 411 High Ridge Rd | School | | | |
| All Care Medical Training | 1492 High Ridge Road | School | | | |
| Apples Early Childhood Education Center | 381 High Ridge Road | School | | | |
| ARTS Tutoring Program Boys and Girls Club | 347 Stillwater Avenue | School | | | |

| Facility | Address or Location | Type | Emergency Power | Shelter | In 1% Floodplain |
|--|-----------------------------------|--------|-----------------|---------|------------------|
| Beauty Tech Academy | 848 High Ridge Road | School | | | |
| Bi-Cultural Day School | 2186 High Ridge Road | School | | | |
| Career Blazers Learning Center | 9 West Broad Street | School | | | ✓ |
| Children School | 118 Scofieldtown Road | School | | | |
| Conn Inst For Real Est & Appr | 27 Strawberry Hill Ave, Suite 200 | School | | | |
| CT Inst For Paralegal Studies | 26 Sixth St, Suite 253 | School | | | |
| Davenport Ridge School | 1300 Newfield Ave | School | | | |
| Dolan School | 51 Toms Rd. | School | | | |
| EMS Institute | 684 Long Ridge Rd | School | | | |
| Grace Daycare and Learning Center | 602 High Ridge Road | School | | | |
| Hart School | 61 Adams Ave | School | | | |
| J.M. Wright Technical High School | 120 Bridge St | School | | | |
| Jewish High School of Connecticut | 1937 West Main Street | School | | | |
| Julia A. Stark School | 398 Glenbrook Rd. | School | | | |
| K. T. Murphy School | 19 Horton St | School | | | |
| King & Low-Heywood Thomas School | 1450 Newfield Avenue | School | | | |
| Mater Salvatoris College-Prep Schpp; | 403 Scofieldtown Rd | School | | | |
| Newfield School | 345 Pepper Ridge Rd. | School | | | * |
| Northeast School | 82 Scofieldtown Rd. | School | | | ✓ |
| Our Lady of Grace Nursery School | 635 Glenbrook Road | School | | | |
| Pinacle, Spire | 201 High Ridge Rd | School | | | |
| Preschool Team | 888 Washington Blvd | School | | | |
| Rogers School | 83 Lockwood Ave | School | | | |
| Roxbury School | 751 W Hill Rd | School | | | |
| Sacred Heart Academy Stamp | 200 Strawberry Hill Ave | School | | | |
| Sacred Heart University Landmark Square | 3 Landmark Sq | School | | | |
| Springdale | 1127 Hope St | School | | | |
| St Cecilia Elementary School | 1186 Newfield Avenue | School | | | |
| Stamford Academy | 229 North Street | School | | | |
| Stamford Charter School for Excellence | 1 Schuyler Avenue | School | | | |
| Stamford High School | 55 Strawberry Hill Ave | School | | | |
| Stamford Hspt School of Radiologic | 1 Hospital Plaza | School | | | |
| Stamford Public Schools Office of Adult and Continuing Education | 175 Atlantic Street | School | | | |
| Stillmeadow School | 800 Stillwater Rd. | School | | | |

| Facility | Address or Location | Type | Emergency Power | Shelter | In 1% Floodplain |
|--|----------------------------|---------------|-----------------|---------|------------------|
| Strawberry Hill - An Extension of Rogers International School (New School) | 200 Strawberry Hill Avenue | School | | | |
| The Catholic Academy of Stamford ΓÇô Lower Campus | 1186 Newfield Avenue | School | | | |
| The Catholic Academy of Stamford ΓÇô Upper Campus | 926 Newfield Avenue | School | | | |
| The Children's School | 12 Gary Road | School | | | |
| The Long Ridge School | 478 Erskine Road | School | | | |
| The Mead School | 1095 Riverbank Rd | School | | | |
| Toquam Magnet School | 123 Ridgewood Ave | School | | | |
| Trailblazers Academy | 83 Lockwood Avenue | School | | | |
| Trinity Catholic High School | 926 Newfield Avenue | School | | | |
| Turn of River | 117 Vine Rd | School | | | |
| University of Bridgeport Stamford Center | 5 Riverbend Drive | School | | | |
| University of Connecticut Stamford | 1 University Pl | School | | | |
| Villa Maria Education Center | 161 Skymeadow Drive | School | | | |
| Waterside School | 770 Pacific Street | School | | | |
| Westlawn Inst Of Marine Technology | 733 Summer Street | School | | | |
| Westover School | 412 Stillwater Ave | School | | | |
| Atria Assisted Living, Stamford | 59 Courtland Avenue | Care Facility | | | |
| Atria Assisted Living, Town Center | 26 Mill River St | Care Facility | | | |
| Atria Stamford | 77 Third St | Care Facility | | | |
| Brighton Gardens of Stamford Also | 59 Roxbury Rd | Care Facility | | | |
| Catholic Family Services | 30 Myano Lane | Care Facility | | | |
| Connecticut Renaissance, Inc. | 141 Franklin St | Care Facility | | | |
| Courtland Gardens Health Center, Inc. | 53 Courtland Ave | Care Facility | | | |
| Dental Center of Stamford, Inc. | 587 Elm Street | Care Facility | | | |
| Edgehill Health Center | 122 Palmers Hill Road | Care Facility | | | |
| Fairfield Family Care | 27 5th Street | Care Facility | | | |
| Families in Recovery Program | 141 Franklin St | Care Facility | | | |
| Family Centers Inc. | 60 Palmers Hill Rd | Care Facility | | | |
| Hillandale School Based Health Center | 195 Hillandale Avenue | Care Facility | | | |
| Homestead Health Center | 160 Glenbrook Rd | Care Facility | | | |
| Jewish Family Service, Inc. | 111 Prospect Street | Care Facility | | | |
| Liberation Clinic | 125 Main Street | Care Facility | | | |
| Liberation House | 119 Main Street | Care Facility | | | |
| Long Ridge Post-Acute Care | 710 Long Ridge Rd | Care Facility | | | |
| Main Street Clinic | 115 Main Street | Care Facility | | | |

| Facility | Address or Location | Type | Emergency Power | Shelter | In 1% Floodplain |
|--|---------------------------|---------------|-----------------|---------|------------------|
| Mediplex Of Stamford | 710 Long Ridge Road | Care Facility | | | |
| Meridian Center | 159 Colonial Road | Care Facility | | | |
| Meridian House | 929 Newfield Avenue | Care Facility | | | |
| School Based Health Ctr At Westhill H.S. | 125 Roxbury Road | Care Facility | | | |
| School Based Hlth Ctr At Stamford High | 55 Strawberry Hill Avenue | Care Facility | | | |
| Scofield Manor | 614 Scofieldtown Rd | Care Facility | | | |
| Smith House Skilled Nursing Facility | 88 Rock Rimmon Rd | Care Facility | | | |
| St Camillus Center | 494 Elm Street | Care Facility | | | |
| Stamford Community Health Center | 137 Henry Street | Care Facility | | | |
| Stamford Community Health Center | 90 Fairfield Avenue | Care Facility | | | |
| Stamford Dialysis Center | 30 Commerce Road | Care Facility | | | |
| Stamford Health Department | 141 Franklin St | Care Facility | | | |
| Stamford Surgical Center | 1290 Summer Street | Care Facility | | | |
| Stamford Youth Options | 159 Colonial Road | Care Facility | | | |
| Sterling Glen Assisted Living Services Agency, Llc | 77 Third St | Care Facility | | | |
| Sunrise Assisted Living of Stamford | 251 Turn of River Rd | Care Facility | | | |
| The Stamford Rehabilitation Hospital | 128 Strawberry Hill Ave | Care Facility | | | |
| The William And Sally Tandent Center for Continuing Care | 146 W Broad St | Care Facility | | | |
| Activities for Kids | 35 Crescent Street | Daycare | | | |
| All About Kids | 115 Waterbury Avenue | Daycare | | | |
| Baby Cottage I | 1109 Newfield Avenue | Daycare | | | |
| Baby Cottage II | 1116 Hope Street | Daycare | | | |
| Bright Beginnings | 430 High Ridge Road | Daycare | | | |
| Bright Horizons Child Development Center | 4 High Ridge Park | Daycare | | | |
| Bright Horizons Child Development Center | 778 Long Ridge Road | Daycare | | | |
| Bright Horizons Children Center | 300 First Stamford Pl | Daycare | | | |
| Bright Minds Daycare Center | 20 Forest Street | Daycare | | | |
| Brookdale Nursery School | 29 Brookdale road | Daycare | | | |
| Building Blocks | 72 Camp Avenue | Daycare | | | ✓ |
| Building Blocks II | 816 High Ridge Road | Daycare | | | |
| Chelsea Piers | 1 Blachley Road | Daycare | | | |
| Children's Corner | 68 Southfield Avenue | Daycare | | | |
| Cottontails | 143 Minivale Rd | Daycare | | | |

| Facility | Address or Location | Type | Emergency Power | Shelter | In 1% Floodplain |
|---|----------------------|--------------|-----------------|---------|------------------|
| Creative Care Child Care | 1231 Washington Blvd | Daycare | | | |
| Edgewood Academy | 18 Edgewood Avenue | Daycare | | | |
| First Presbyterian Church Nursery School | 1101 Bedford Street | Daycare | | | |
| First United Methodist Church Nursery | 6 Cross Road | Daycare | | | |
| Gans Yeladin Preschool | 752 High Ridge Road | Daycare | | | |
| Gray Farms Nursery School | 884 Newfield Avenue | Daycare | | | |
| Italian Center Nursery School | 1620 Newfield Avenue | Daycare | | | |
| Jewish Community Center | 458 Lakeside Drive | Daycare | | | |
| Just a Helping Hand | 595 Hope Street | Daycare | | | |
| Kinder Place | 1035 Newfield Avenue | Daycare | | | |
| Mark of Excellence | 29 Grove Street | Daycare | | | |
| Mother's Little Helper Day Care | 133B Connecticut Ave | Daycare | | | |
| Noah's Ark Nursery School | 132 Glenbrook Road | Daycare | | | |
| Our Lady of Grace | 635 Glenbrook Road | Daycare | | | |
| Playland | 802 Ponus Ridge Road | Daycare | | | |
| Room to Grow | 535 Fairfield Avenue | Daycare | | | |
| Shiny Little Stars | 2510 Bedford Street | Daycare | | | |
| Stamford Museum and Nature Center | 39 Scofieldtown Road | Daycare | | | |
| The Learning Center at Piper's Hill | 17 Roxbury Road | Daycare | | | |
| UBS-Bright Horizons | 29 Federal Street | Daycare | | | |
| Union Memorial | 58 Church Street | Daycare | | | |
| Villa Divino Amore Nursery School | 117 Hope Street | Daycare | | | |
| Stormwater pumping station Dyke Ln | 71 Dyke Lane | Pump Station | | | |
| Stormwater pumping station Cummings Park | 500 Shippan Avenue | Pump Station | | | |
| Stormwater pumping station Halloween Blvd | 90 Magee Avenue | Pump Station | | | |
| Stormwater pumping station Wampanaw | 800 Shippan Avenue | Pump Station | | | |
| A & K Service | 524 Newfield Ave | Fuel | | | |
| BP | 351 Hope St | Fuel | | | |
| BP | 224 Magee Ave | Fuel | | | |
| BP | 59 W Broad St | Fuel | | | |
| Citgo | 953 Hope St | Fuel | | | |
| Citgo | 493 Glenbrook Rd | Fuel | | | |
| Citgo | 939 High Ridge Rd | Fuel | | | |
| Citgo | 780 Pacific St | Fuel | | | |
| Citgo | 355 W Main St | Fuel | | | |
| Citgo | 16 Long Ridge Rd | Fuel | | | |
| Dagostino Bros Foreign Car Service | 316 Long Ridge Rd | Fuel | | | |
| Global | 1199 High Ridge Rd | Fuel | | | |

| Facility | Address or Location | Type | Emergency Power | Shelter | In 1% Floodplain |
|---------------------|---------------------|------|-----------------|---------|------------------|
| Global | 765 E Main St | Fuel | | | |
| Gulf | 250 Hope St | Fuel | | | |
| Gulf | 1285 High Ridge Rd | Fuel | | | |
| Gulf | 1492 High Ridge Rd | Fuel | | | |
| Gulf | 1125 E Main St | Fuel | | | |
| Gulf | 527 Glenbrook Rd | Fuel | | | |
| Gulf | 10 West Ave | Fuel | | | |
| Gulf | 1095 Long Ridge Rd | Fuel | | | |
| Gulf | 280 West Ave | Fuel | | | |
| Irving | 1335 Hope St | Fuel | | | |
| Long Ridge Services | 1095 Long Ridge Rd | Fuel | | | |
| Mini Mart | 314 Cove Rd | Fuel | | | |
| Mobil | 920 High Ridge Rd | Fuel | | | |
| Shell | 582 Newfield Ave | Fuel | | | |
| Shell | 179 Shippan Ave | Fuel | | | |
| Shell | 243 West Ave | Fuel | | | |
| Shell | 339 Hope St | Fuel | | | |
| Shell | 1039 Hope St | Fuel | | | |
| Shell | 899 High Ridge Rd | Fuel | | | |
| Shell | 2666 Summer St | Fuel | | | |
| Shell | 38 W Broad St | Fuel | | | |
| Sunoco | 910 High Ridge Rd | Fuel | | | |
| Sunoco | 136 Myrtle Ave | Fuel | | | |
| Sunoco | 316 Long Ridge Rd | Fuel | | | |
| Sunoco | 2661 Long Ridge Rd | Fuel | | | |
| Turnpike Shell | 243 West Ave | Fuel | | | |

* Facility is adjacent to a 0.2% annual-chance flood zone.

** Pump station is incorporated into FEMA-accredited levee.

❖ The WPCF is adjacent to a 1% annual-chance flood zone and portions of the property are within an "Area with Reduced Flood Risk Due to Levee." Much of the facility is mapped as outside the flood zone.

LEGEND

Dams

Unclassified

AA

A

BB

B

C

Dam Failure Inundation Area

Ambulance

Care Facility

Municipal

EOC

Fire

Hospital

Police

School

Shelter

Flood Zones

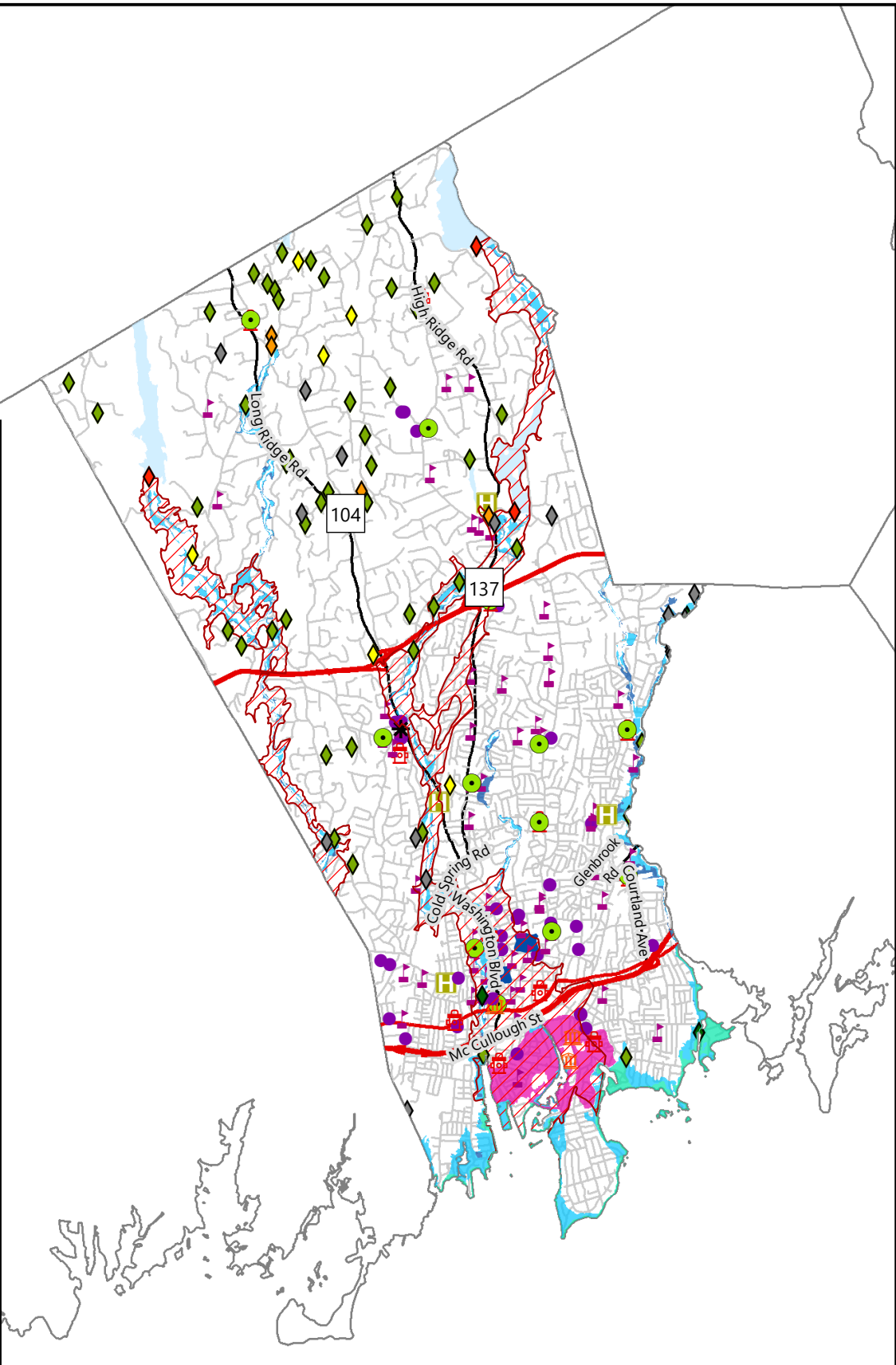
A

AE

VE

0.2% Annual Chance Flood Hazard

X, Area with Reduced Risk because of Levee



MILONE & MACBROOM

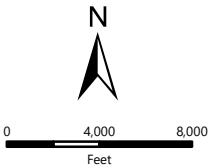
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
WWW.MMINC.COM

Critical Facilities with Flood Zones and
Dam Failure Inundation Areas

WestCOG Hazard Mitigation Plan

Town of Stamford

NPS: Cultural Resources CT DEEP: DFA FEMA: DFRIM & Q3



SCALE

1" = 8,296'

DATE

7/29/2021

3101-22

PROJ. NO.

FIG. 2-4

There are several shelters for residents throughout the City, including schools, fire houses and a church.

Emergency Response

The City's Emergency Operations Center (EOC), including its Emergency Communications Center, is located in Stamford Government Center. Stamford is located in the Connecticut Department of Emergency Services and Public Protection (DESPP) Region 1, consisting of 14 municipalities in southwestern Connecticut.

The City's Operations Department performs tree and shrub removal and trimming on City-owned lands and rights-of-way. During emergencies and following storms, the Operations Department, in conjunction with the Parks Department, responds to calls related to downed trees.

The City also prepares for the possible evacuation and sheltering of some populations that could be impacted by the upcoming storm (especially the elderly and special needs persons).

Emergency Communication Capabilities

The City of Stamford utilizes the CT Alert notification system to alert residents of emergency situations. This system allows the state to direct geographically specific emergency notification telephone calls into affected areas. Various media outlets are also used to relay information to the public. These resources are identified in Table 2-6

Table 2-6: Emergency Notification Media Outlets

| Outlet | Media Type |
|---|-------------------|
| Primary Emergency Notification Outlets | |
| Fairfield County Public Radio – 91.1 FM & 1400 AM | Radio |
| WGCH Radio – 1490 AM | Radio |
| Fox Radio – 95.9 FM | Radio |
| News12 Connecticut – Channel 12 | Television |
| Secondary Emergency Information Outlets | |
| Stamford Advocate | Newspaper |
| The Greenwich Time | Newspaper |
| The Hartford Courant | Newspaper |
| WNLK 1350 AM (Cox Radio) | Radio |
| WEBE 107.9 FM | Radio |
| Cablevision Channel 78 | Television |

Information about natural hazards and hazard preparedness are posted on the City Website through the Public Safety Health & Welfare Department.

Changes to Emergency Services since the Previous HMP

The City of Stamford has constructed a new, upgraded Police Station.

3.0 HAZARD ASSESSMENT

3.1 FLOODING (COASTAL, INLAND, AND ICE JAMS)

3.1.1 Setting

The potential for flooding exists across Stamford, with the majority of major flooding occurring along established riverine and coastal SFHAs. The areas impacted by overflow of river systems are generally limited to river corridors and floodplains. Indirect flooding that occurs outside floodplains and localized nuisance flooding along tributaries can also be a concern. This type of flooding occurs particularly along roadways as a result of inadequate drainage and other factors. Coastal flooding can occur during a severe storm event by way of storm surge, and can also occur as nuisance flooding, which is experienced during extremely high tide events. The frequency of flooding in Stamford is considered likely for any given year, with flood damage potentially having significant effects during extreme events.

A regulatory floodplain with AE designation has been mapped along the Mianus River, East Branch Mianus River, Rippowam River, and Springdale Brook. There are also regulatory floodplain areas with a VE or an AE designation along the Long Island Sound shoreline. The Areas identified as providing flood storage are identified with A Zone designations, meaning they are regulated as floodplain, but flood elevations have not been established. The Laurel, Samuel J. Bargh, and North Stamford Reservoirs distribute these traits. Floodplain and floodway designations have also been established along the rivers with AE designations. Refer to Figure 2-4 for the areas of Stamford susceptible to flooding based on FEMA flood zones.

In general, potential flooding problems in Stamford are concentrated along the multiple rivers, and the coastline. City officials have noted that coastal events have become an increasing concern, with some flooding events challenging the capacity of certain bridges.

Coastal flood events, especially storm surge during hurricanes and tropical storms, can cause some of the most severe damage with high economic impacts to the City and residential properties. Figure 3-1 shows hurricane storm surge inundation zones.

3.1.2 Capabilities

The City primarily attempts to mitigate future flood damage and flood hazards by restricting building activities in floodprone areas. This process is carried out through both the Planning and Zoning process. All watercourses are to be encroached minimally or not at all to maintain the existing flood-carrying capacity. These regulations rely primarily on the FEMA-defined 1% annual chance flood elevations to determine flood areas.

There is a large area, including portions of the Harbor Point and South End neighborhoods, that are designated as an area with a reduced flood risk due to a levee. The Stamford Hurricane Protection Barrier, which is comprised of three elements, is a United States Army Corps of Engineers structure that reduces flood risk to the areas behind the barrier. It consists of a 2,850 foot-long, 17 foot-high earthfill dike which has stone slopes in the East Branch of Stamford Harbor. This dike was constructed with a 90-foot -wide opening to allow for navigation, as well as a pump station to discharge interior drainage. Along the West Branch of Stamford Harbor is a concrete wall which is 1,350 feet long, and a 2,950 earthfill dike, and a pumping station. There is

also a 4,400 earthfill dike at Westcott Cove. This dike is 19 feet high and has two pumping stations.

Floodplain Management, NFIP and CRS

The City has consistently participated in the NFIP since January 16, 1981 and intends to continue participation in the NFIP. SFHAs in Stamford are delineated on a Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS). The FIS and FIRMs for the City were most recently revised in 2013. The City also participates in the FEMA Community Rating System (CRS) program, which recognizes and rewards more stringent floodplain regulations. By participating in the program, City residents receive a discount on flood insurance.

The NFIP administrator for the City oversees the enforcement of NFIP regulations. The degree of flood protection established by the variety of regulations in the City meets the minimum reasonable for regulatory purposes under the NFIP. The City has a minimum elevation standard to include one foot of freeboard.

Ordinances, Regulations, and Plans

Stamford enforces regulations, codes, and ordinances to mitigated potential damages due to flood hazards. NFIP regulations are incorporated into the City's Inland Wetlands Regulations, Zoning Regulations and Subdivision Regulations.

➤ Zoning Regulations:

- Section 15 – Sustainability and Resiliency: this section covers coastal area management regulations, flood prone area regulations, soil erosion and sediment control, and stormwater management.
- Section 15.B – Flood Prone Area Regulations
Updated in 2020, these regulations comply with FEMA standards.
Defines Substantial Improvement as being cumulative over a five-year period.
Requires one foot of freeboard for residential structures and utilities. Other elements of the regulations, including those pertaining to critical uses and facilities and hazardous materials, are more strict than the NFIP standard and are credited under CRS.
- Section 1.D – Stormwater Management
Updated in 2020 to require compliance with MS4 requirements.

Drainage and Street Flooding

The Stamford Highway Department is responsible for the ongoing maintenance and inspections of drainage systems. The installation of storm drains, catch basins, and curbs, along with efficiency improvements and upgrades, has been budgeted for in the capital improvement program.

When complaints are made regarding drainage issues, the Citizens Service Bureau in the Operations Department takes record of report and forwards the issue to the Highway Department or Engineering. Each department then addresses the complaint as appropriate and keeps records of the work done.

Public Information

The City receives regular weather updates through Division of Emergency Management and Homeland Security (DEMHS) Region 1 email alerts as well as watches and warnings through the National Weather Service. A tidal gauge in Bridgeport and a flood gauge on the Rippowam River (waterdata.usgs.gov/monitoring-location/01209901) helps City officials watch for flooding conditions and respond accordingly. Additional data gained from a tide monitor on the Hurricane Barrier also informs the City.

As part of the City's CRS requirements, the City annually sends a letter to the owners of Repetitive Loss Properties and nearby properties at risk to inquire about mitigation undertaken and suggest options for mitigating flooding in those areas.

Actions Completed and New Capabilities

The City has been working to secure funding for several infrastructural upgrades with much success, including a recent bridge upgrade along River Bank Road. Upgrades are also in the process at the Greenwich Avenue pump station, this includes back up power restoration.

3.1.3 Vulnerabilities and Risk Assessment

Repetitive Loss Properties

There are 102 repetitive loss properties (RLPs) located in the City of Stamford; 98 are residential and 4 are commercial. There are 12 properties along the Rippowam River, 1 along the Mianus River, 2 along the Springdale Brook, 68 within coastal zone, and the remaining along smaller tributaries or not adjacent to a significant stream. Data is based on the most current FEMA list; the city is consistently working to keep this list up-to-date.

Critical Facilities

There are four facilities located within the 100-year flood zones. Of these facilities, the fire department is critical to emergency response during a hazard event.

The at-risk facilities include:

- Stamford Fire and Rescue, Station 5
- Our Lady of Grace Nursery School
- Stamford Surgical Center
- Rippowam Manor Senior Housing

Additionally, the properties of the Springdale School, Hart School, and Cloonan Middle School are each located partially within or immediately adjacent to 0.2% annual-chance flood zones.

The Stamford Water Pollution Control Facility is adjacent to a 1% annual-chance flood zone and portions of the property are protected by a FEMA-accredited levee. Much of the facility is mapped as outside the flood zone. Despite these protections, the risk of flooding at the facility during an extreme event is a concern for the City, as the facility's operation is essential for public health and safety, and flooding of the facility would present an immediate health risk to surrounding areas.

Other features of the sanitary sewer system, such as the Greenwich Avenue pump station, may also be susceptible to flooding.

The four stormwater pumping stations (located at 500 Shippan Ave, 71 Dyke Lane, 90 Magee Ave, and 800 Shippan Ave) support the city's levee system by pumping stormwater out of the at-risk area. While the risk to these facilities from flooding is minimal due to their design, their functioning during a flood event is critical.

At-Risk Areas

Stamford has reported flooding to be a concern along the entire Long Island Sound coastline.

Additionally, riverine floodplains are present along many rivers and streams in the City. These are summarized below:

| Zone AE (with elevation data) | Zone A (no elevation data) | Coastal Zones AE or VE |
|---|-------------------------------|---------------------------|
| Mianus River | Haviland Brook | Southwest Shoreline |
| Mianus River East Branch | Poorhouse Brook | |
| Rippowam River (Including Haviland Brook, Poorhouse Brook, Ayres Brook and Toilsome Brook) | Ayres Brook | |
| Noroton River (Including Springdale Brook) | | |

FEMA A-Zones (no elevation data) are also present around localized drainage areas, reservoirs, and lakes throughout the city.

Rippowam River

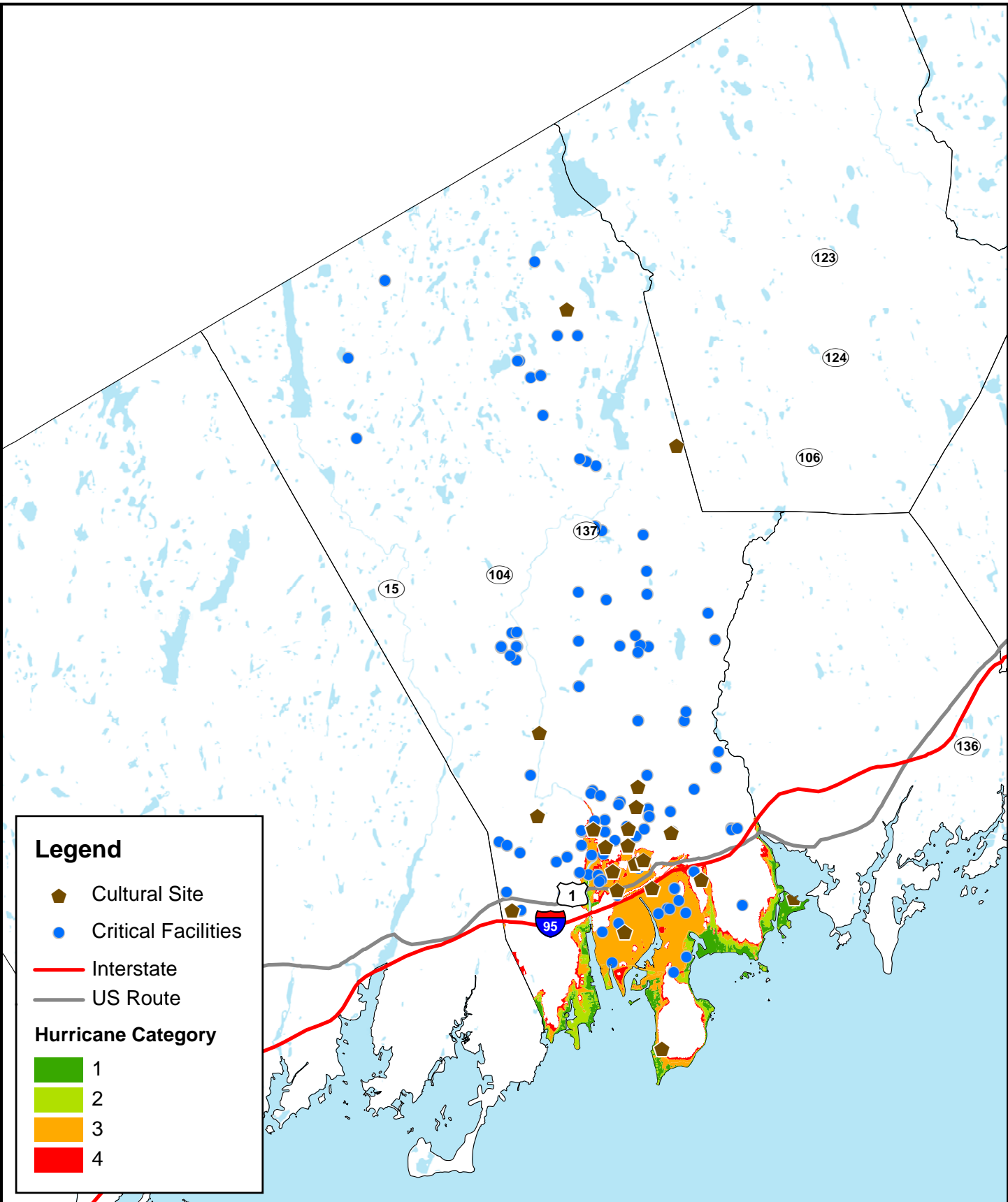
Southern reaches of the river have the largest delineated floodplains, and therefore may be considered to be the most at-risk areas along the river. Within this southern half there are 11 RLPs, indicating past flood challenges. There are several road crossings over the river, in the downtown area, which may present challenges in regard to infrastructural capacity during a heavy event. It is also important to note that a stretch of this river has been restored to promote increased flood storage, and properties have been acquired and conserved as open space.

Long Island Sound Coastline

The shoreline of Stamford is primarily residential, with pockets of commercial activity. The entire coastline, specifically Shippan Point, Waterside, and the East Side (particularly Cummings Park), are all identified to have low lying, coastal stretches which may be at risk of both nuisance and storm surge flooding.

Changes and Improvements

The City is currently underway with Phase III of the Mill River Corridor Plan. The City has recently acquired parcels along the Rippowam River and designated these parcels as open space.



3.2 DAM FAILURE

3.2.1 Setting

Dam failures can be triggered suddenly, with little or no warning, and often from other natural disasters such as floods and earthquakes. Dam failures often 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 moderate geographic extent, the effects are potentially catastrophic. Fortunately, a major dam failure is considered very unlikely in any given year.

3.2.2 Capabilities

Dam failure inundation areas are included in the CT Alert emergency notification system contact database. The City has the Emergency Action Plan (EAP) for the Aquarion owned dams on file in the event of a potential failure. The high hazard dams including the Samuel J. Bargh (Mianus) Reservoir Dam and the North Stamford Reservoir Dam.

Actions Completed and New Capabilities

Stamford continues to maintain copies of EAPs and mitigates dam failure impacts as necessary.

3.2.3 Vulnerabilities and Risk Assessment

As of 2013, there were 76 DEEP-inventoried dams within the City of Stamford. These dams are shown in Figure 2-4. Two of these dams are a Class C, or high hazard dam, and four others are a Class B, or significant hazard dam. As shown in Table 3-1, the high hazard dams located in the City pose a risk to the City of Stamford, along with some portions of the Town of Greenwich.

Table 3-1: High Hazard Dams with Potential to Affect the City of Stamford

| # | Name | Location | Class | Owner |
|-------|------------------------------|---|-------|---------------------------------|
| 13501 | North Stamford Reservoir Dam | North Stamford Reservoir, Stamford | C | Aquarion Water Company of CT |
| 13503 | Samuel Bargh Reservoir Dam | Mianus Samuel Bargh Reservoir, Stamford | C | Aquarion Water Company of CT |
| 13502 | Laurel Reservoir Dam | Laurel Reservoir, Stamford | B | Aquarion Water Company of CT |
| 13506 | Bendels Pond Dam | Bendels Pond, Stamford | B | Stamford Museum & Nature Center |
| 13511 | Pound Pond Dam | Pound Pond, Stamford | B | Private |
| 13516 | McManus Pond Dam | McManus Pond, Stamford | B | Private |

Failure of a high hazard dam can affect properties downstream of the impoundment both in and outside of the City, with potential large inundation zones traveling along each respective waterway.

The North Stamford Reservoir Dam is 350 feet in length, with a maximum height of 40 feet. It is an earth and concrete structure that impounds roughly 111 acres at normal water levels with a contributing watershed of 23.20 square miles. The primary purpose of the dam is for public water supply containment.

The Samuel Bargh Reservoir Dam, also owned by Aquarion Water Company, is a 950-foot-long and 75-foot-high earth and concrete dam. This dam impounds roughly 265 acres, with a contributing watershed of 13.40 square miles.

Changes and Improvements

Stamford continues to be at low risk from dam failure.

3.3 HURRICANES AND TROPICAL STORMS

3.3.1 Setting

A hurricane striking Stamford is considered a possible event each year and could cause critical damage to the City and its infrastructure. Several types of hazards may be associated with tropical storms and hurricanes including heavy or tornado winds, heavy rains, and flooding. While only some of the areas of Stamford are susceptible to flooding or storm surge damage caused by hurricanes, wind damage can occur anywhere in the City. Hurricanes, therefore, have the potential to affect any area within the City of Stamford. A hurricane striking the City is considered a possible event each year and could cause critical damage to the City and its infrastructure.

Connecticut is located in FEMA Zone II regarding maximum expected wind speed. The maximum expected wind speed for a three-second gust is 160 mph. The American Society of Civil Engineers recommends that new buildings be designed to withstand this peak three-second gust.

3.3.2 Capabilities

Wind loading requirements are addressed through the state building code. The 2018 Connecticut State Building Code was amended in 2009 and adopted with an effective date of October 1, 2018. The code specifies the design wind speed for construction in all the Connecticut municipalities. Effective 2018, the design wind speed for Stamford is 110 miles per hour for a Category 1, 120 miles per hour for a Category 2 and 130 for Category 3 or greater. Stamford has adopted the Connecticut Building Code as its building code. The City website provides links to the State Building Codes so that developers are able to find design standards for wind.

As discussed in section 3.1.2, the City has a large hurricane barrier that provides storm surge protection to those neighborhoods located behind the system.

Actions Completed and New Capabilities

The City is working to coordinate with Eversource, the local utility company, to conduct a tree inventory throughout Stamford.

3.3.3 Vulnerabilities and Risk Assessment

Most of the damage to the City from historical tropical cyclones has been due to the effects of flooding and wind. Areas of known and potential flooding problems are discussed in Section 3.1

The City of Stamford is vulnerable to hurricane damage from wind, flooding, storm surge, and from any tornadoes accompanying the storm. In fact, most of the damage to the City from historical tropical cyclones has been due to the effects of flooding. Factors that influence vulnerability to tropical cyclones in the City include building codes currently in place, local zoning and development patterns, and the age and number of structures located in highly vulnerable areas of the community.

Changes and Improvements

Stamford has upgraded some communication systems which allow for robust emergency response during an event.

3.4 SUMMER STORMS AND TORNADOES

3.4.1 Setting

Summer storms and tornadoes have the potential to affect any area within the City of Stamford. 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 City without harming another.

Based on the historic record, it is considered highly likely that a summer storm that includes lightning will impact Stamford each year, although lightning strikes have a limited effect. Strong winds and hail are considered likely to occur during such storms but also generally have limited effects. A tornado is considered a possible event in Fairfield County each year that could cause significant damage to a small area.

3.4.2 Capabilities

Stamford addresses the hazards associated with summer storms and tornadoes via capabilities outlined under the flooding and hurricane sections. The City is continuously working to reduce high wind damages with building code enforcement and controlling drainage concerns with robust maintenance. The City's capabilities regarding mitigation of high wind events are described in Section 3.3.2.

Warning is 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. Stamford's emergency communication capabilities are described in Section 2.5.

Actions Completed and New Capabilities

Stamford has updated communication capabilities.

3.4.3 Vulnerabilities and Risk Assessment

The entire City of Stamford is at relatively equal risk for experiencing damage from summer storms and tornadoes. Based on the historic record, a few summer storms have resulted in costly damages to the City. Most damages are relatively site specific and occur to private property (and therefore are paid for by private insurance). For municipal property, the City budget for tree removal and minor repairs is generally adequate to handle summer storm damage.

According to the 2019 State Natural Hazard Mitigation Plan Update, Fairfield County has a moderate to high risk of tornado activity based on historical occurrences. Therefore, by virtue of its location in Fairfield County, the City of Stamford has moderate to high potential to experience tornado damage. In general, thunderstorms and hailstorms in Connecticut are more frequent in the western and northern parts of the state and less frequent in the southern and eastern parts. The majority of these events do not cause any measurable damage. Although lightning is usually associated with thunderstorms, it can occur on almost any day. The likelihood of lightning strikes in the Stamford area is very high during any given thunderstorm although no one area of the City is at higher risk of lightning strikes. The risk of at least one hailstorm occurring in Stamford is considered moderate in any given year.

Thunderstorms are expected to impact the region about 20 days each year. The majority of these events do not cause any measurable damage. Although lightning is usually associated with thunderstorms, it can occur on almost any day.

The risk of downbursts occurring during such storms and damaging the City of Stamford is believed to be low for any given year. All areas of the City are susceptible to damage from high winds although more building damage is expected in densely developed areas, such as downtown Stamford and surrounding areas, while more tree damage is expected in the less densely populated more rural areas in northern areas of the City.

Secondary damage from falling branches and trees is more common than direct wind damage to structures. Heavy winds can take down trees near power lines, leading to the start and spread of fires. Most downed power lines in Stamford are detected quickly, and any associated fires are quickly extinguished. Such fires can be extremely dangerous during the summer months during dry and drought conditions. It is important to have adequate water supply for fire protection to ensure the necessary level of safety is maintained.

Changes and Improvements

Stamford continues to mitigate summer storms and tornadoes.

3.5 WINTER STORMS AND NOR'EASTERS

3.5.1 Setting

The entire City of Stamford is susceptible to winter storms and, due to its variable elevation, can have higher amounts of snow in the northern neighborhoods of the City than in the downtown area. In general, winter storms are considered highly likely to occur each year (although 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 City.

According to the 2019 Connecticut State Natural Hazard Mitigation Plan the state can expect to experience at least two or more major snow events each year, with an average of 14 winter events in a season. It is estimated that Stamford's average annual snowfall is about 2.5 to 4 feet.

3.5.2 Capabilities

Prior to a winter weather event, the City ensures that all warning/notification and communications systems are ready and ensures that appropriate equipment and supplies, especially snow removal equipment, are in place and in good working order. In some known problem areas, especially bridges and elevated roadways, prestorm treatment is applied to reduce the accumulation of snow. Once snow begins to accumulate the City has developed steps to ensure timely and efficient snow clearing. Main roadways, emergency routes, and primarily neighborhood streets are the initial focus, with an overall goal to have all City roads treated within two hours of the first snowfall assuming the snowfall accumulation rate is within this manageable time frame.

The City has also developed snow emergency routes. These routes are posted on the Road Maintenance section of the City website. Emergency routes are utilized in the event of a major snowstorm, and if the mayor declares a snow emergency.

The City also prepares for the possible evacuation and sheltering of some populations that could be impacted by the upcoming storm (especially the elderly and special needs persons).

CTDOT plows all State roads and Interstates. City plowing is typically ahead of CT DOT plowing. Priority is given to plowing egresses to critical facilities. Homeowners, private associations, and businesses are responsible for plowing their own driveways and roads.

Actions Completed and New Capabilities

Stamford's winter storm mitigation capabilities continue to be significant, although there has not been a significant change in these capabilities since the previous HMP was adopted.

3.5.3 Vulnerabilities and Risk Assessment

The entire City of Stamford is at relatively equal risk for experiencing damage from winter storms although some areas (such as icing trouble spots and neighborhoods with a high concentration of flat roofs) are more susceptible. The public assistance reimbursement from Winter Storm Alfred was \$228,000, proving that winter storms can be very costly. However, many damages are relatively site specific and occur to private property (and therefore are paid for by private insurance) while repairs for power outages are often widespread and difficult to quantify to any one municipality.

For municipal property, the City budget for tree removal and minor repairs is generally adequate to handle winter storm damage although the plowing budget is often depleted.

The structures and utilities in Stamford are vulnerable to a variety of winter storm damage. Tree limbs and some building structures may not be suited to withstand high wind and snow loads. Ice can damage or collapse power lines, render steep gradients impassable for motorists, undermine foundations, and cause "flood" damage from freezing water pipes in basements. Drifting snow can occur after large storms, but the effects are generally mitigated through municipal plowing efforts.

The elderly population in Stamford is particularly susceptible to the impacts created by winter storms due to resource needs (heat, electricity loss, safe access to food, etc.).

Changes and Improvements

The City of Stamford continues to mitigate snowstorm wind and accumulation risks.

3.6 WILDFIRES AND DROUGHT

3.6.1 Setting

The City of Stamford is generally considered a moderate risk area for small wildfires but a low risk area for large wildfires. Wildfires are of particular concern in outlying areas without public water service and other areas with poor access for fire-fighting equipment. Such areas in Stamford are limited to the northern stretches of the City. Hazards associated with wildfires include property damage and loss of habitat.

In addition, Stamford, and Fairfield County overall, has experienced drought challenges over recent years. The U.S. Drought Monitor (USDM), which has been monitoring nationwide drought conditions since 2000, estimates that over the past two decades Connecticut experienced its longest drought of 46 weeks beginning June 21, 2016 and lasting until May 2, 2017. It was also estimated that the most intense period of this extended drought occurred the week of November 15, 2016, where approximately 44.5% of Connecticut lands were impacted. Figure 3-2 depicts the various drought conditions in Fairfield County since 2000, where the warmer colors represent more advanced drought stages.

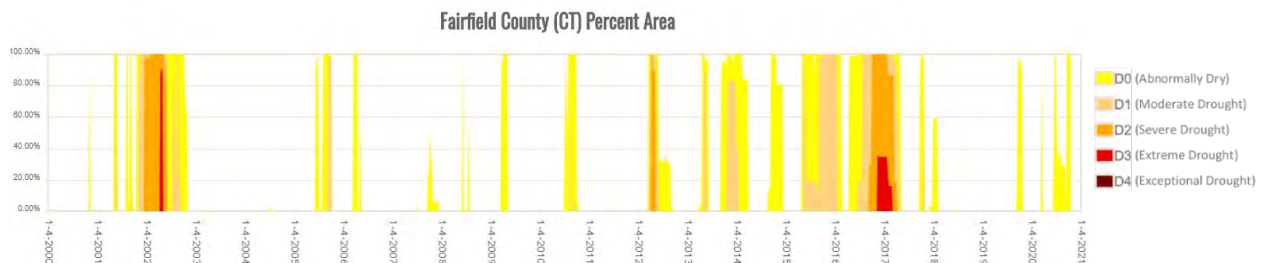


Figure 3-2: USDM Drought Time Series for Fairfield County

The 2019 Connecticut Natural Hazard Mitigation Plan assumes that the State of Connecticut has a medium probability of future drought events. This assumption is based on climate change projections anticipating hotter and wetter conditions in the near future. Climate forecasts often suggest that while precipitation may increase, the overall pattern will generally be higher intensity storms, with longer than average dry periods between events. The State Plan also identifies that Fairfield County accounts for roughly 7.34% of the state's total number of farms, with a market value of over \$34 million in product sold from these farms.

3.6.2 Capabilities

Regulations regarding fire protection in Stamford are outlined in the *Zoning Regulations* and the *City Code of Ordinances*:

- Section 7-2(g): Adequate provision shall be made for emergency vehicle access, fire lanes, and safe fire flows, upon the recommendation of the Fire Marshall and the public water utility.
- Section 127-6: No person shall leave any outdoor fire unattended.
- Section 127-5: Open burning prohibited, any open burning must be conducted in accordance with all applicable Statues and Regulations.

The City's Fire Department is a dual level service, with both volunteer and career firefighters staffing the firehouses throughout the community. The career department has 238 employees, including staff, and operates out of 5 fire stations throughout the City.

Actions Completed and New Capabilities

The City continues to mitigate wildfire and drought.

3.6.3 Vulnerabilities and Risk Assessment

According to the Connecticut DEEP, the actual forest fire risk in Connecticut is low due to several factors. First, the overall incidence of forest fires is very low. According to the 2019 State Hazard Mitigation Plan, an average of 109 fires per year occurred in Connecticut from 2013 to 2017, which is less than one per municipality per year. Secondly, as the wildfire/forest fire prone areas become fragmented due to development, the local fire departments have increased access to those neighborhoods for firefighting equipment. Third, the problematic interface areas such as driveways too narrow to permit emergency vehicles are site specific. Finally, trained firefighters at the local and state level are readily available to fight fires in the state, and inter-municipal cooperation on such instances is common.

Most wildfires in Connecticut are relatively small. In the drought year of 1999, the average wildfire burned five acres in comparison to the two most extreme wildfires recorded since 1986 that burned 300 acres each. Given the availability of firefighting water in the City – including the use of nearby water bodies – and the historic record, it is believed that the average size of a wildfire in a drought year would be less than one acre, although the extreme value of five acres is likely applicable to the City. Wildfire Risk Areas are mapped in Figure 3-3.

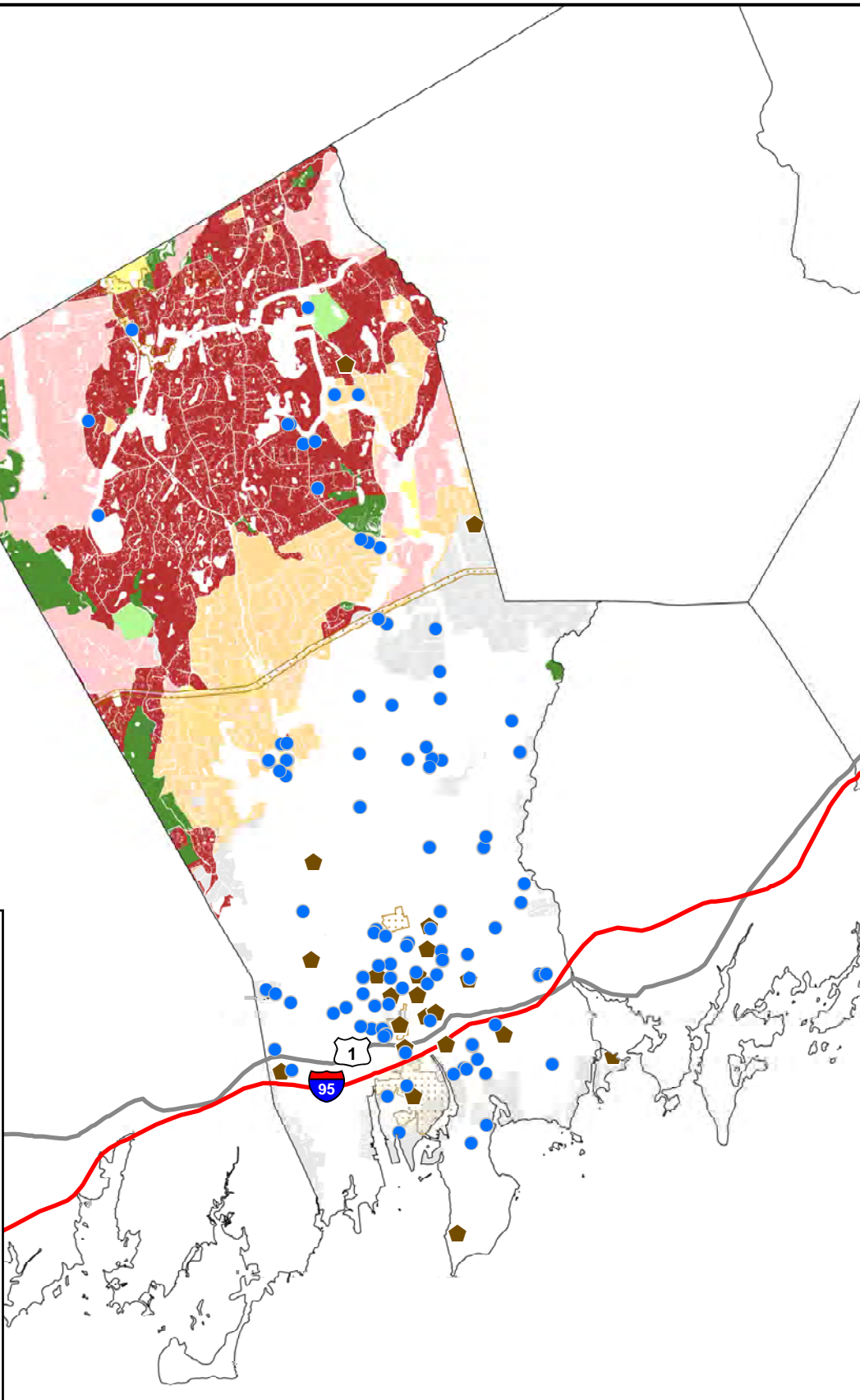
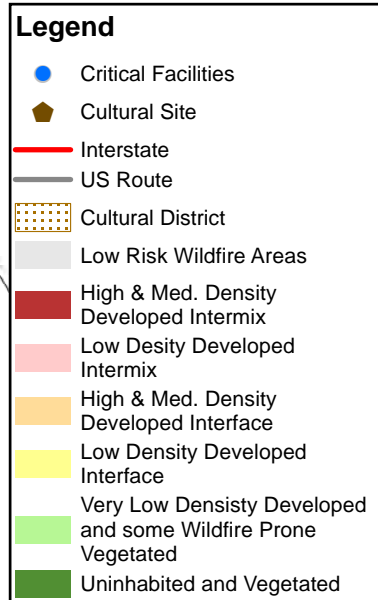
Wildfires are more common in rural areas than in developed areas as most fires in populated areas are quickly noticed and contained. The likelihood of a severe wildfire developing is lessened by the vast network of water features in the state, which create natural breaks likely to stop the spread of a fire. During long periods of drought, these natural features may dry up, increasing the vulnerability of the state to wildfires.

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. The extensive forests and fields covering the state are prime locations for a wildfire. In many areas, structures and subdivisions are built abutting forest borders, creating areas of particular vulnerability.

The Wildland-Urban Interface (WUI) index is used to identify areas that may be at greater risk of wildfires based on the density of development in comparison to the amount of wildfire prone vegetation. The northern areas of Stamford, specifically north of the Merritt Parkway, could be considered at greater risk due to moderate to high levels of development intermixed with fire prone vegetation. However, given firefighting capacity and water availability, it is likely that the City has effective capabilities to minimize damage from fires that may occur.

Changes and Improvements

The City's vulnerability to wildfires continues to be low.



3.7 EARTHQUAKES AND LANDSLIDES

3.7.1 **Setting**

The entire City of Stamford is susceptible to earthquake damage. However, even though earthquake damage has the potential to occur anywhere both in the City and in the northeastern United States, the effects may be felt differently in some areas based on the type of geology. In general, earthquakes are considered a hazard that may possibly occur but that may cause significant effects to a large area of the City.

According to the 2019 *Connecticut Natural Hazard Mitigation Plan Update*, Connecticut is at a low to moderate risk for experiencing an earthquake of a magnitude greater than 3.5 and at a moderate risk of experiencing an earthquake of a magnitude less than 3.0 in the future. No earthquake with a magnitude greater than 3.5 has occurred in Connecticut within the last 30 years, and the USGS currently ranks Connecticut 43rd out of the 50 states for overall earthquake activity.

3.7.2 **Capabilities**

The City has adopted the state building codes for new construction, and they are enforced by the Building Official. Due to the infrequent nature of damaging earthquakes, land use policies in the City do not directly address earthquake hazards. However, various documents do indirectly discuss areas susceptible to earthquake damage and regulations that help to minimize potential earthquake damage.

- Subdivision Regulations:
 - Encourage the conservation of existing undeveloped land by preserving water bodies, wetlands, watercourses, major stands of trees, steep slopes, ridge lines, significant geological features and other areas of environmental value.
 - Require that soil erosion and sediment control plans be developed for proposed projects.
- Master Plan:
 - Conserve and manage natural areas by way of partnerships, with typical aim at areas of erosion or with steep slopes.
- Zoning
 - Applications and plans must identify slopes greater than 25%
 - Excavation finished slope requirements shall not exceed 1:1.5 (vertical to horizontal) in undisturbed earth, 1:2 in earth fill, and 4:1 in rock, whether or not the ground surface will be below water, provided further that all slopes of the perimeter bank or shore of any pond or lake shall not exceed 1:3 (vertical to horizontal).

Actions Completed and New Capabilities

Stamford continues to have appropriate capabilities for mitigating earthquake events.

3.7.3 Vulnerabilities and Risk Assessment

Some areas in Stamford are underlain by sand and gravel and artificial fill, particularly within the more urban areas such as the Cove neighborhood, which is underlain by artificial fill, and along the Rippowam and Noroton Rivers, which are primarily sand and gravel. Structures in these areas are at increased risk from earthquakes due to amplification of seismic energy and/or collapse. Most of the remaining area is underlain by glacial till and is therefore not at increased risk during an earthquake due to unstable soils.

A series of earthquake probability maps was generated using the 2009 interactive web-based mapping tools hosted by the USGS. These maps were used to determine the probability of an earthquake of greater than magnitude 5.0 or greater than magnitude 6.0 damaging the City of Stamford. Results are presented in Table 3-1 below.

Table 3-1: Probability of a Damaging Earthquake in the Vicinity of Stamford

| Time Frame (Years) | Probability of the Occurrence of an Earthquake Event > Magnitude 5.0 | Probability of the Occurrence of an Earthquake Event > Magnitude 6.0 |
|-----------------------|--|--|
| 50 | 2% to 3% | < 1% |
| 100 | 4% to 6% | 1% to 2% |
| 250 | 10% to 12% | 2% to 3% |
| 350 | 12% to 15% | 3% to 4% |

Changes and Improvements

The City's vulnerability to earthquakes continues to be low.

3.8 SEA LEVEL RISE AND SHORELINE CHANGE

3.8.1 Setting

The coastal areas of Stamford are susceptible to sea level rise and shoreline change. With most of the shoreline being residential, and commercial and water dependent activity in pockets throughout, residential properties are at a greater risk of future inundation. Sea level rise may not be considered a high hazard risk in and of itself, however, rising seas in conjunction with extreme weather may result in inundation farther inland than seen during past events. In addition to extreme weather, nuisance flooding may also become a more frequent issue during extreme high tides.

The State of Connecticut has adopted the recent sea level rise projections developed by the University of Connecticut, Connecticut Institute for Resilience and Climate Adaptation (CIRCA) as the latest planning threshold for coastal municipalities. This projection anticipates a rise of 50 cm (20 inches) by the year 2050.

3.8.2 Capabilities

The City has begun to see an increase in nuisance flooding, and has experienced the impacts of extreme storm surge; leaving City officials aware of the potential impacts of an extreme storm with elevated sea levels.

City staff has begun to identify the areas that are at risk of increased nuisance flooding and solutions and mitigation strategies are being recognized. In an effort to protect municipal infrastructure, projects are also being developed and funded, such as the Greenwich Avenue pump station which is at risk of inundation.

Section 15.A of Stamford's Zoning Regulations lists Coastal Area Management Regulations. These apply to all buildings, uses, and structures fully or partially within the coastal boundary as defined by Section 22a-94 of the Connecticut General Statutes.

One of Stamford's primary coastal mitigation strategies is the maintenance of a Hurricane Barrier and Flood Protection System. The City also maintains seawalls and other shore protection structures along the coast; rehabilitation of a number of these structures is an action included in this plan moving forward.

Actions Completed and New Capabilities

Stamford continues to mitigate damages due to sea level rise and shoreline change through enforcement of coastal and floodplain zoning regulations, preservation of open space in coastal areas, and maintenance of the Hurricane Barrier. The City is working on development of a coastal flood risk assessment. In 2020, the City rehabilitated seawalls along Weed Avenue.

3.8.3 Vulnerabilities and Risk Assessment

The most at-risk areas are those immediately along the shoreline, with risk slightly declining moving inland. The South End neighborhood is particularly at risk of increased nuisance flooding under future sea levels. In addition, a 100-year storm event with one foot of sea level rise has the

potential to inundate many of the coastal areas including Harbor Point, southern areas of Downtown, portions of the East Side neighborhood, along with southern properties in Waterside.

With much of the commercial areas at risk of flooding during a 100-year event with elevated sea levels, there is a large economic factor at risk. Many of the large-scale companies, historic resources, and tourist attractions are in these vulnerable areas.

Changes and Improvements

The City has begun to upgrade infrastructure at risk of inundation.

4.0 MITIGATION STRATEGIES AND ACTIONS

4.1 Goals and Objectives

Municipal goals and objectives have been made consistent regionally and are presented in the Multi-Jurisdictional Plan document.

4.2 Status of Mitigation Strategies and Actions from Previous HMP

The table below lists the mitigation actions developed in the previous HMP and the status of each. Actions to be carried forward are noted as such. Actions that have been institutionalized as capabilities are not carried forward.

| # | Description | Status | Notes |
|---|--|---------------|--|
| 1 | Explore adding clerical and/or technical support staff to EOC. | Carry Forward | Action not yet completed due to lack of funding. Carry Forward. |
| 2 | Work to develop a direct communications link between the EOC and 911 communications center. | Complete | |
| 3 | Identify ways to improve the use of GIS for use in identifying areas and facilities (including transportation assets) vulnerable to disasters and for use to enhance emergency management. Ensure that all critical systems maps are easily accessible to 911 and the EOC, including sewer and drainage system maps. | Capability | The City does do updates as part of CRS, for example, they added the LIMWA to maps. Updates are done at least once a year. Significant progress has been made with stormwater discharge outfall mapping. |
| 4 | Explore and develop a regional communications plan. Includes communications, sharing resources, identifying common strengths, weaknesses, and vulnerabilities. Identify opportunities to mitigate weaknesses and vulnerabilities. | Completed | City is participating in a regional radio communication effort beginning November 2020. |
| 5 | Develop a coordinated evacuation and preparedness plan. Plan should address impacts to transportation corridors. Explore the use of color-coded evacuation signs in vulnerable areas. | Completed | Done by the state |
| 6 | Evaluate current sheltering location's ability to handle large scale evacuations. | Capability | Health Dept. manages shelters |
| 7 | Develop a sheltering/evacuation process to improve collaboration between the Health Department, Operations, Fire and Police and review the process regularly to ensure each department knows their responsibilities and where resources are located. | Capability | |
| 8 | Provide pre-recorded messages for a variety of scenarios for use by the City's Reverse 911 system, including in additional languages. Work to educate citizens on registration and use of system. | Capability | Currently underway |

| # | Description | Status | Notes |
|----|---|------------------------------|---|
| 9 | Acquire snow melting machines to melt excess snow from severe winter storms. | Drop | City no longer sees this action as a priority. |
| 10 | Acquire the site at 128 Magee Avenue as a staging area for excess snow and large wood waste. | Drop | City no longer wishes to pursue this action; current storage capacity is found to be adequate. |
| 11 | Continue to incorporate recommendations from the Mill River Corridor Plan. Specifically, the following actions are planned: Acquisition and demolition of additional structures. | Capability | |
| 12 | Perform an infiltration assessment to reduce inflows to the sewage treatment plant | Completed | This is a WPCA function, not an MS4 function. Detail regarding status and implementation of I&I work to be provided by WPCA New action: implement recommendations identified by WPCA in Infiltration and Inflow Study. |
| 13 | Review the Mill River Corridor Project and identify projects that may be eligible for FEMA natural hazard mitigation grants. | Capability | |
| 14 | Move forward with plans to rebuild the West Main Street Bridge for use by pedestrians and emergency vehicles only. Plans shall include elevating the bridge deck above the 100-year flood plain and removing several piers. | Carry Forward with Revision | Ongoing effort. City would like to remove the current bridge and do fully compliant pedestrian bridge to withstand 100-year event. |
| 15 | Encourage acquisition of wetlands, waterfront land, and drainage easements beneficial to the City. | Capability | Past example: Parcels at 108 and 172 Greenwich Ave were recently purchased and became greenway open space. Numerous MS4 storm pipes located in private property with no filed easement maps. Example: 4 drainage easements acquired on Auldwood Rd. and Lanark Rd. 2019 |
| 16 | Encourage the preservation of undeveloped lands within the 100-year flood zone with the use of Open Space purchase, donation or conservation easement. | Capability | With conservation easements, money is tight, encumbering properties is often an easier thing to work with |
| 17 | Work with Aquarion and the state to evaluate and monitor conditions of all dams and to identify properties that may be impacted by a dam failure for all high-risk dams in Stamford. | Capability | Town has capacity to coordinate with Aquarion and State |
| 18 | Conduct a detailed flood/coastal risk assessment to improve resiliency efforts to key assets and vulnerable populations | Carry Forward with Revisions | LU received \$50,000 in capital funds to conduct initial phases of coastal flood/risk assessment with concentration on Stamford's repetitive loss areas for current fiscal year. Revise to reflect specific project and carry forward to completion. |

| # | Description | Status | Notes |
|----|---|-------------------------------------|---|
| 19 | Assess the integrity of the Hurricane Barrier and dykes to withstand increased flooding and storm intensity (including storm surge). Explore opportunities to retrofit as needed. | Carry Forward with Revisions | The Water Pollution Control Authority (WPCA) is responsible for maintenance and inspections of the Hurricane Barrier and dyke system. Assessment of the Hurricane Barrier and dyke system integrity is a capability. Revise to focus on exploring opportunities to retrofit, as needed. |
| 20 | Work with the City Operations, Parks and Highways Dept. staff, and Connecticut Light and Power staff, to maintain and update a plan for clearing debris in the event of a severe storm. | Carry Forward with Revisions | City was able to collect debris following Tropical Storm Isaias in 2020 due to the availability of federal cleanup money, but otherwise has had to cut debris collection services due to budget cuts. Carry forward development of a plan and budgeting of sufficient funding. |
| 21 | Work with utility companies to improve communications during a storm event and identify a direct contact. | Capability | There is an Eversource liaison |
| 22 | Explore methods to improve and enhance telecommunications, including county wide radio. | Completed | Ongoing, City is moving onto the state radio core as of November |
| 23 | Encourage the study of alternative systems for delivering reliable power to residents. | Carry Forward with Revisions | Add: work with Eversource to identify municipal actions |
| 24 | Conduct a town-wide inventory and assessment of street trees; consider conducting the inventory in conjunction with other municipalities in the region. | Carry Forward | The City has been working to coordinate with Eversource on completing this item. |
| 25 | Increase the funding for public tree maintenance and plantings. | Carry Forward | Capital funding has been requested numerous times for this task. |

4.3 Prioritization of Strategies and Actions

The STAPLEE method, described in the Multi-Jurisdictional document, was used to score mitigation activities. The STAPLEE matrix in Appendix A provides the total scores. Actions have been further prioritized based on implementation cost, project urgency, and municipal and public input. The strategies below are presented in priority order, with qualitative priority levels listed for each.

4.4 Mitigation Strategies and Actions Implementation Table

The City proposed to initiate several new mitigation actions for the upcoming five years. Additionally, a number of actions from the previous planning period are being carried forward or replaced with revised actions. These are listed below.

| Action SFD-01 | |
|--|---------------------------|
| Provide information on the Town website about CT DEEP training and information around small business chemical management for hazard resilience. | |
| Lead | Land Use, EM |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget, CT DEEP |
| Timeframe | 2021 |
| Priority | High |

| Action SFD-02 | |
|--|---------------------------|
| Use the CT Toxics Users and Climate Resilience Map to identify toxic users located in hazard zones within your community. Contact those users to inform them about the CT DEEP small business chemical management initiative. | |
| Lead | EM, GIS, Mayor |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget, CT DEEP |
| Timeframe | 2021 |
| Priority | High |

| Action SFD-03 | |
|---|---------------------------|
| Host a CT DEEP presentation for municipal staff and local businesses about business chemical management for hazard resilience. | |
| Lead | EM, Mayor |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget, CT DEEP |
| Timeframe | 2021 |
| Priority | High |

| Action SFD-04 | |
|--|---|
| <p>Take one of the following actions that will mitigate natural hazard risks while also meeting Sustainable CT objectives:</p> <ul style="list-style-type: none"> - Disseminate a toolkit for pre-disaster business preparedness. - Revise regulations to promote Low Impact Development. - Include the goals of this Hazard Mitigation Plan, and at least three other sustainability concepts, in your next Master Plan update. | |
| Lead | Mayor |
| Cost | \$0 - \$25,000 |
| Funding | Capital Improvement Plan, Sustainable CT Community Match Fund |
| Timeframe | 2021 |
| Priority | High |

| Action SFD-05 | |
|--|---|
| Widen the railroad underpasses at Elm Street, Canal Street, and Greenwich Avenue. | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | High |

| Action SFD-06 | |
|---|--|
| Complete a design to remove the traffic lights at the Magee Ave, Shippan Ave, and Harbor Dr intersection and construct a roundabout to allow for more efficient traffic flow during an emergency, and to reduce the reliance of power during an outage on a main evacuation route. | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, LOTCIP Grant |
| Timeframe | 2024 |
| Priority | High |

| Action SFD-07 | |
|---|--------------------------------------|
| Implement a modern traffic signal with a backup power source at the Shippan Ave, Elm St, and Cove Rd intersection. | |
| Lead | Traffic Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, CMAQ Grant |
| Timeframe | 2025 |
| Priority | High |

| Action SFD-08 | |
|---|--|
| Greenwich Avenue – Davenport Street Waterside Circulator to improve traffic safety and enhance evacuation route for the Waterside neighborhood. | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, LOTCIP Grant, Private Developer Contribution |
| Timeframe | 2023 |
| Priority | High |

| Action SFD-09 | |
|---|--|
| Washington Boulevard and Pulaski Street Roadway Widening to improve traffic safety and enhance evacuation routes for the Waterside & South End Neighborhoods. | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, Private Developer Contribution |
| Timeframe | 2021 |
| Priority | High |

| Action SFD-10 | |
|--|--|
| Lower Atlantic Street Roadway Widening (Washington Boulevard to Station Place/Dock Street) to improve traffic safety and enhance evacuation routes for the Waterside & South End Neighborhoods | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, LOTCIP Grant, Private Developer Contribution |
| Timeframe | 2023 |
| Priority | High |

| Action SFD-11 | |
|---|------------------|
| Collaborate with CIRCA on the "Resilient Connecticut" project | |
| Lead | Land Use, Mayor |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget |
| Timeframe | 2022 |
| Priority | Med |

| Action SFD-12 | |
|--|----------------------------------|
| Coordinate with CT SHPO to conduct outreach to owners of historic properties to educate them on methods of retrofitting historic properties to be more hazard-resilient while maintaining historic character. | |
| Lead | Land Use |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget, CT SHPO, Grant |
| Timeframe | 2022 |
| Priority | Med |

| Action SFD-13 | |
|---|---|
| Increase the City funding allocations for public tree maintenance and plantings. | |
| Lead | Land Use, Parks Maintenance |
| Cost | \$50,000 - \$100,000 |
| Funding | Capital Improvement Plan, New Zoning Certificate Fee Requirements |
| Timeframe | 2021 |
| Priority | Med |

| Action SFD-14 | |
|---|---------------------|
| Coordinate with CT SHPO to conduct historic resource surveys, focusing on areas within natural hazard risk zones (flood zones, wildfire hazard zones, steep slopes) to identify historic resources at risk and support the preparation of resiliency plans across the state. | |
| Lead | Land Use |
| Cost | \$25,000 - \$50,000 |
| Funding | CT SHPO, Grant |
| Timeframe | 2024 |
| Priority | Med |

| Action SFD-15 | |
|--|---------------------------------|
| Conduct an extensive flood and coastal risk assessment to evaluate risks in RL areas, to critical facilities, and to critical infrastructure. | |
| Lead | Land Use |
| Cost | \$100,000 - \$500,000 |
| Funding | Capital Improvement Plan, Grant |
| Timeframe | 2025 |
| Priority | Med |

| Action SFD-16 | |
|--|---------------------------------|
| Conduct a city-wide inventory and assessment of street trees in potential coordination with Eversource. | |
| Lead | Land Use |
| Cost | \$100,000 - \$500,000 |
| Funding | Capital Improvement Plan, Grant |
| Timeframe | 2026 |
| Priority | Med |

| Action SFD-17 | |
|---|---------------------------------|
| Orange Street stormwater drainage improvement project - replace failing corrugated metal piping (surcharges during flood events; manhole covers blow off during rainstorms). | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, Grant |
| Timeframe | 2026 |
| Priority | Med |

| Action SFD-18 | |
|--|---------------------------------|
| West Hill Road stormwater drainage improvement project. | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, Grant |
| Timeframe | 2026 |
| Priority | Med |

| Action SFD-19 | |
|--|--------------------------|
| Work with Eversource to identify municipal actions to improve electric grid resiliency. | |
| Lead | Economic Development, EM |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget |
| Timeframe | 2023 |
| Priority | Low |

| Action SFD-20 | |
|---|------------------|
| Revise floodplain zoning regulations to recognize the "coastal AE zone". | |
| Lead | Land Use |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget |
| Timeframe | 2023 |
| Priority | Low |

| Action SFD-21 | |
|--|------------------|
| Compare local floodplain regulations with Revised State Model Flood Regulations to identify any remaining opportunities for improvement | |
| Lead | Land Use |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget |
| Timeframe | 2023 |
| Priority | Low |

| Action SFD-22 | |
|---|---------------------|
| Work with CT DEEP to validate and/or correct the RL list and update the mitigation status of each listed property. | |
| Lead | Land Use |
| Cost | \$25,000 - \$50,000 |
| Funding | FEMA Grant |
| Timeframe | 2024 |
| Priority | Low |

| Action SFD-23 | |
|---|---------------------|
| Annually conduct an emergency operations exercise for a local terrorism, sabotage, or mass casualty event. | |
| Lead | EM |
| Cost | \$25,000 - \$50,000 |
| Funding | Operating Budget |
| Timeframe | 2024 |
| Priority | Low |

| Action SFD-24 | |
|---|----------------------|
| Operations Department (Highways, Parks, Recycling & Sanitation) and Eversource to develop a plan for clearing debris in the event of a severe storm; increase funding for debris management. | |
| Lead | Operations, Mayor |
| Cost | \$50,000 - \$100,000 |
| Funding | Operating Budget |
| Timeframe | 2025 |
| Priority | Low |

| Action SFD-25 | |
|--|---|
| Widen entire Cove Road corridor, Shippan Avenue to Weed Avenue, to allow for increased evacuation capacity. | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-26 | |
|---|---|
| Repair or replace the 5-by-5-foot box culvert on Bouton Street West to mitigate future flooding. | |
| Lead | Traffic Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-27 | |
|--|---|
| Move forward with the plans to remove the West Main Street Bridge and construct a fully compliant pedestrian bridge above the 1% annual-chance floodplain, and also remove several piers. | |
| Lead | Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-28 | |
|---|---------------------------------|
| Pine Hill Avenue stormwater drainage improvement project. | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-29 | |
|--|------------------------------|
| Explore retrofit opportunities as needed for the hurricane barrier system. | |
| Lead | WPCA, Mayor |
| Cost | \$0 - \$25,000 |
| Funding | Operating Budget, FEMA Grant |
| Timeframe | 2023 |
| Priority | Low |

| Action SFD-30 | |
|--|----------------------|
| Explore adding clerical and/or technical support staff to EOC. | |
| Lead | EMD |
| Cost | \$50,000 - \$100,000 |
| Funding | Operating Budget |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-31 | |
|--|--------------------------------------|
| Identify additional segments of seawalls located along coastal roadways that may require rehabilitation. | |
| Lead | Engineering |
| Cost | \$0 - \$25,000 |
| Funding | Capital Improvement Plan, FEMA Grant |
| Timeframe | 2024 |
| Priority | Low |

| Action SFD-32 | |
|--|---|
| Develop sidewalks along Weed Avenue and Cove Road to better control pedestrian traffic and reduce pedestrian-caused congestion during an evacuation. | |
| Lead | Traffic Engineering, Highways |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-33 | |
|--|---|
| Rehabilitate seawalls at Cove Island Park Marina | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-34 | |
|---|---|
| Rehabilitate seawalls at Czescik Marina | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-35 | |
|---|---|
| Complete rehabilitation of West Beach Seawall | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-36 | |
|--|---|
| Complete reconstruction of the seawall at the end of Shippan Avenue. | |
| Lead | Engineering |
| Cost | More than \$500,000 |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

| Action SFD-37 | |
|--|---|
| Dredge Holly Pond and include project elements that reduce coastal risks | |
| Lead | Engineering |
| Cost | More than \$1 million |
| Funding | Capital Improvement Plan, FEMA Grant, Other Grant |
| Timeframe | 2026 |
| Priority | Low |

APPENDIX A

Appendix A: STAPLEE Matrix

| # | Action Description | Regional Theme | Lead Department | Cost Estimate | Potential Funding Sources | Timeframe for Completion | Weighted STAPLEE Criteria | | | | | | | | | | | | | | Total STAPLEE Score |
|--------|---|-----------------------------|-----------------------------|-----------------------|--|--------------------------|---------------------------|----------------|----------------|-----------|-------|---------------|---------------|--------|----------------|----------------|-----------|-------|---------------|---------------|---------------------|
| | | | | | | | Benefits | | | | | | | Costs | | | | | | | |
| | | | | | | | Social | Technical (x2) | Administrative | Political | Legal | Economic (x2) | Environmental | Social | Technical (x2) | Administrative | Political | Legal | Economic (x2) | Environmental | |
| SFD-01 | Provide information on the Town website about CT DEEP training and information around small business chemical management for hazard resilience. | CT DEEP Small Business Chem | Land Use, EM | \$0 - \$25,000 | Operating Budget, CT DEEP | 2021 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-02 | Use the CT Toxics Users and Climate Resilience Map to identify toxic users located in hazard zones within your community. Contact those users to inform them about the CT DEEP small business chemical management initiative. | CT DEEP Small Business Chem | EM, GIS, Mayor | \$0 - \$25,000 | Operating Budget, CT DEEP | 2021 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-03 | Host a CT DEEP presentation for municipal staff and local businesses about business chemical management for hazard resilience. | CT DEEP Small Business Chem | EM, Mayor | \$0 - \$25,000 | Operating Budget, CT DEEP | 2021 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-04 | Take one of the following actions that will mitigate natural hazard risks while also meeting Sustainable CT objectives: - Disseminate a toolkit for pre-disaster business preparedness. - Revise regulations to promote Low Impact Development. - Include the goals of this Hazard Mitigation Plan, and at least three other sustainability concepts, in your next Master Plan update. | Sustainable CT | Mayor | \$0 - \$25,000 | Capital Improvement Plan, Sustainable CT Community Match Fund | 2021 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-05 | Washington Boulevard and Pulaski Street Roadway Widening to improve traffic safety and enhance evacuation routes for the Waterside & South End Neighborhoods. | Emergency Response | Traffic Engineering | More than \$1 million | Capital Improvement Plan, Private Developer Contribution | 2021 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-06 | Greenwich Avenue – Davenport Street Waterside Circulator to improve traffic safety and enhance evacuation route for the Waterside neighborhood. | Emergency Response | Traffic Engineering | More than \$1 million | Capital Improvement Plan, LOTCIP Grant, Private Developer Contribution | 2023 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-07 | Lower Atlantic Street Roadway Widening (Washington Boulevard to Station Place/Dock Street) to improve traffic safety and enhance evacuation routes for the Waterside & South End Neighborhoods | Emergency Response | Traffic Engineering | More than \$1 million | Capital Improvement Plan, LOTCIP Grant, Private Developer Contribution | 2023 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-08 | Complete a design to remove the traffic lights at the Magee Ave, Shippan Ave, and Harbor Dr intersection and construct a roundabout to allow for more efficient traffic flow during an emergency, and to reduce the reliance of power during an outage on a main evacuation route. | Emergency Response | Traffic Engineering | More than \$1 million | Capital Improvement Plan, LOTCIP Grant | 2024 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-09 | Implement a modern traffic signal with a backup power source at the Shippan Ave, Elm St, and Cove Rd intersection. | Emergency Response | Traffic Engineering | More than \$500,000 | Capital Improvement Plan, CMAQ Grant | 2025 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-10 | Widen the railroad underpasses at Elm Street, Canal Street, and Greenwich Avenue. | Emergency Response | Traffic Engineering | More than \$1 million | Capital Improvement Plan, FEMA Grant, Other Grant | 2026 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| SFD-11 | Increase the City funding allocations for public tree maintenance and plantings. | Tree Management | Land Use, Parks Maintenance | \$50,000 - \$100,000 | Capital Improvement Plan, New Zoning Certificate Fee Requirements | 2021 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |

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APPENDIX B

Appendix B: SVI Summary

City of Stamford
Climate Vulnerability Assessment
A Component of Sustainable CT Action 5.4

The City of Stamford, for this Climate Vulnerability Assessment (CVA) is considered an urban coastal community, resulting in various climate change vulnerabilities. Sea level rise, inland flooding, and winter storms may impact the community the most as many issues have been identified.

Hazards

Sea Level Rise

Rising seas have raised concerns in communities throughout the state for various reasons. The City of Stamford is currently experiencing increased occurrences of coastal flooding, both nuisance and storm related, with impacts to neighborhoods and critical infrastructure. Certain areas, such as Shippan Point, are vulnerable to nuisance and coastal events. There are also commercialized areas that may be increasingly impacted under a future climate. For example, Waterside and Harbor Point which are urbanized areas located at the mouth of the Rippowam River. With sea levels rising, and storm intensity increasing, infrastructure and homes are vulnerable to inundation.

Inland Flooding

With FEMA flood zones along a few rivers in Stamford, such as the Rippowam River, there is continuously concern for riverine flooding. North Stamford also has several streams running through the area, presenting the possibility for small scale flooding during heavy rain events. With precipitation expected to increase due to climate change, in addition to highly impervious areas, flooding events may occur more frequently.

Drought and Extreme Temperatures

About half of the City is serviced by public water supply, with the northern half of the City's residential parcels likely serviced by a private well. Therefore, impacts to water supply may be an issue to the City as temperatures rise in the near future, resulting in isolated issues with water scarcity for private well owners. With historic impacts to public water supply availability during droughts, and temperatures expected to rise, the challenge of maintaining adequate supply during these times may also increase.

In addition to water scarcity, increased temperatures can also increase the urban heat island effect throughout the urban, highly impervious areas. This increase in heat island can have impacts on both water quality and human health.

When considering these impacts from climate change, the primary vulnerabilities for the City of Stamford include:

- Coastal municipal infrastructure and neighborhoods
- Riverine and coastal flooding
- Water scarcity & urban heat island effect

Secondary Impacts

Economic Impacts

With vulnerable homes and infrastructure, the City faces an economic challenge of mitigating or relocating city-owned facilities and assisting residents with mitigation efforts. There is also a potential economic impact to local businesses during inland and coastal flooding events.

Private property owners who rely on private drinking water wells may also be impacted economically during droughts or periods of extreme heat. With increasing heat, typically comes increased water demand. This demand would be placed upon local aquifers, potentially resulting in the need for new well construction, or deepening of an existing well.

The many impacts of climate change can result in economic impacts to many citizens, business owners, and municipal budgets as the impacts can be felt on a City level, down to building level.

Social Impacts

To identify social impacts to the City, the Center for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) was used to identify any vulnerable populations within the City. This index was developed to supplement a community's natural hazard preparation actions. To evaluate social vulnerability, the CDC incorporates 15 factors (Fig. 1) into the overall calculation under the categories, or themes, of: socioeconomic status, household composition and disability, minority status and language, and housing type and transportation. These themes and their ranking are based on census statistics. By evaluating these factors and determining a level of social vulnerability, a community can identify specific needs for before, during, and after an event. Such needs may include sheltering capacity, evacuation routes, or to decide how many emergency personnel may be required to respond after an event.

Each municipalities' census tracts were ranked for overall vulnerability, and theme vulnerability, in comparison to other Connecticut municipalities. This rank, 0 to 1, is based on the percentile rank among all tracts within the State of Connecticut. A value closer to 0 indicates a lower vulnerability, while a value closer to 1 indicates a higher vulnerability. Table 1 presents the overall vulnerability and theme rankings for Stamford.

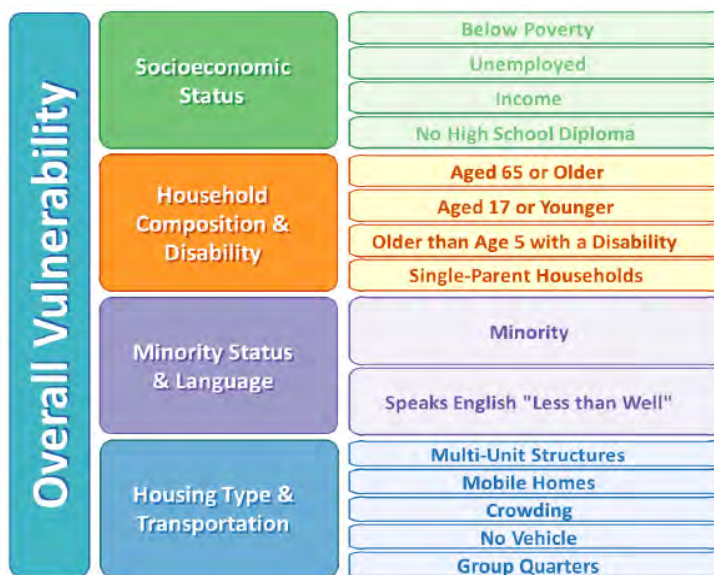


Figure 1: The CDC SVI Index Factors. Graphic: svi.cdc.com

Table 1: Stamford SVI Factor Rankings

| | Overall SVI | Socioeconomic | Household Composition & Disability | Minority Status & Language | Housing Type & Transportation |
|-----------------|-------------|---------------|------------------------------------|----------------------------|-------------------------------|
| STAMFORD | .48 | .44 | .29 | .70 | .53 |

The City of Stamford is considered to have a low to moderate level of vulnerability, with their most vulnerable social aspect being minority populations and those that do not speak English well. In addition, there are socioeconomic concerns, as well as high density housing populations and transportation disparities. These vulnerable populations are concentrated in the southern tracts along Interstate 95 in more urbanized areas. It is important to note that four of the southeastern tracts in the city are considered highly vulnerable, with one tract ranking 0.93 on the SVI scale.

These populations may be vulnerable to impacts from drought and extreme heat, and inland or coastal flooding events based on the geographic concentrations.

Public Health Considerations

Of the primary vulnerabilities identified, drought and flooding can potentially have public health repercussions. During hot summer months, or drought, if private wells were to be impacted, certain populations may find themselves without adequate drinking water supply, resulting in health problems. Also, when considering the environmental shifts occurring during drought periods, drinking water contamination may become an issue as aquifers become stressed due to excessive pumping.

Urban heat islands can also impact human health and water quality. Increased precipitation, in conjunction with high imperviousness, can move pollutants found on these surfaces into nearby water bodies. These water bodies may ultimately flow into water bodies used for drinking water supply or recreation. Also, increased temperatures coincide with reduced air quality. Poor air quality can result in respiratory health concerns for those living in these effected areas.

Inland flooding, or poor drainage flooding, also presents the concern of pollution into nearby water bodies as these commercialized and impervious areas drain, they collect pollutants and excess sediment. Depending upon the drainage areas, this runoff can have environmental impacts in associated ecosystems, or public health impacts if water bodies are used for recreational activities.

Vulnerable Populations

The SVI identified the presence of certain populations within the City that may be more vulnerable to climate change hazards. In addition to the SVI, the Connecticut Department of Public Health (DPH)¹ has identified at least twelve facilities in Stamford that are a convalescent home.

These populations often need additional time for hazard response, so evacuation or preparation, and may find it more challenging to recover due to financial constraints or health concerns. Also, elderly

¹ <https://www.elicense.ct.gov/Lookup/LicenseLookup.aspx>

populations may be more vulnerable to the health impacts of poor air quality associated with urban heat islands.

These populations, in addition to those identified in the SVI, should be considered more vulnerable for the reasons that emergency response and preparation may be more challenging, health issues may be of higher concern, and language barriers may exist when working to communicate with the community on risks, response, and recovery efforts.

In addition to the populations, it is important to identify the facilities that can provide different types of assistance to the populations, and others, during or after an event. These facilities, and their proximity to flood zones, can be found in Figure 2-4.