TOWN OF WEST HAVEN

SCRCOG HAZARD MITIGATION PLAN UPDATE ANNEX

JANUARY 2023

City of West Haven

355 Main Street

West Haven, Connecticut 06516

http://www.cityofwesthaven.com

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This municipality Annex includes details regarding West Haven not included in the main body of the 2023 SCRCOG Mitigation Plan Update. The municipality annexes were developed to assist municipalities with the process of implementing and maintaining their portion of the 2023 SCRCOG Mitigation Plan Update. The Annex includes a Municipality Profile, Risk Analysis, Capability Assessment, and Mitigation Actions.

1. Municipality Profile

West Haven was originally part of the New Haven Colony, where it joined with North Milford to become Orange in 1822. In the late 1800s, for about 50 years, West Haven was a popular seaside resort town, much like Asbury Park and Coney Island. Though it is no longer a resort town, the beach continues to be a large part of the city.[1] It was only in 1921 that West Haven split from Orange to become its own City, taking the title of "Connecticut's Youngest City," though it is one of the oldest settlements.[2] Previously a shipping and industrial center for rubber, West Haven has now become a blue-collar, middle-class suburb of New Haven. The City was home to the Savin Rock Amusement Park running along the harbor, until the 1960s.[3] The jurisdiction also contains the University of New Haven and a portion of West River Memorial Park. West Haven is an emerging college town with the growth of the University of New Haven in the historic Allingtown section of the city. The Yale West Campus also recently occupied the old Bayer campus. Both institutions attract students, faculty, staff, and their families from across the country and around the world, while also providing employment opportunities.[4] West Haven has a mayor-council form of government, with three independent fire districts.[5]

1.1 Demographics

West Haven has a current population of 54,763. As of 2019, there are 22,397 housing units in West Haven of which 48.5% are owner-occupied, 40.3% are renter-occupied and 11.2% remain vacant. The unemployment rate is at 4.1% (down from a peak of 10.8% in 2011). 11.8% of the city's population lives below the poverty level and 30,563 are in the annual labor force.24.3% of residents have a bachelor's degree or higher, which is up by 5.2% since 2000. The median household income in West Haven is $58,843.[6]

[1] "West Haven Plan of Conservation and Development." (2017). West Haven, Connecticut.

[2] "Our Town." (2005). West Haven Historical Society.

[3] "Savin Rock Festival." (n.d.).West Haven, Connecticut.

[4] "West Haven Plan of Conservation and Development." (2017). West Haven, Connecticut.

[5] "City Hall." (n.d.). West Haven, Connecticut.

[6] "South Central Region, CT: Demographic & Socioeconomic Trends." (2021). South Central Regional Council of Governments.

1.2 Geography and Water

West Haven is situated in the middle of the planning region directly to the west of New Haven, with its southern border lying on Long Island Sound. Though it is only 11.0 square miles, the City has 3.5 miles of publicly accessible beaches (1/4 of the total public beaches in Connecticut) and identifies as a "beach town." West Haven is bound in the southwest by the Oyster River, and in the north by the West River. Other water features in the jurisdiction include Lake Phipps, Cove River, the Maltby Lakes and the Maltby Lakes Dams. West Haven is particularly vulnerable to flood damage because of its rivers and coastal proximity and falls under the SCRCOG 2017 Coastal Resilience Plan.

West Haven's coast has many parks and open spaces that include trails, gardens, piers, and beaches. There is a boat ramp and yacht club and much of the land is protected through the Open Space (OS) zoning designation.[7]

The City of West Haven Harbor Management Plan established goals and strategies in the 2017 West Haven Plan for Conservation and Development and are aimed to:

- Protect and enhance environmental resources and the quality of life associated with the City's location on Long Island Sound, New Haven Harbor, and the West River.
- Provide opportunities for appropriate water-dependent and water-enhanced recreational activities and access to the Harbor Management Area (HMA).
- Achieve sustainable economic benefits associated with use of the HMA and waterfront.
- Maintain the health, safety, and welfare of HMA and waterfront users."[8]

1.3 Transportation

Several transportation routes, including Interstate 95, U.S. Route 1, run through the City of West Haven. The Metro-North Railroad service has a stop in the City. West Haven aims to evolve from a car-centric system into one that is multi-modal and accommodates foot, stroller, cane, wheelchair, bicycle, motorcycle, car, and bus. The specific goals outlined for downtown specifically include:

- Explore ways to calm traffic and create a walkable and safe environment for pedestrians as development projects are reviewed.
- Support improvements and enhancements to transit routes to destinations within West Haven and key locations beyond its borders.
- Create or improve on-street bicycle lanes, provide new bicycle facilities where appropriate, and create connections with bicycle routes in Milford, Orange, and New Haven where feasible.

[7] "West Haven Plan of Conservation and Development." (2017). West Haven, Connecticut.

[8] "West Haven Plan of Conservation and Development." (2017). West Haven, Connecticut.

- Enhance the ability of people to navigate through the city and its important institutions and destinations.[9]

As of 2019, 77.0% of West Haven residents drove alone as a means of transportation, while 8.5% carpooled, and 4.2% used public transportation. 78.3% of the population commutes to a different municipality for work, which was an increase from 66.8% in 2000.[10]

1.4 Land Use and Development

West Haven is a densely populated, working-class suburb of New Haven. Alongside its residential community, the City is home to long stretches of shoreline, including the Sandy Point Estuary, and several buildings on the National Register of Historic Places.[11] In the South Central Region: Plan of Conservation and Development 2018-2028, West Haven outlines their concerns as, "Shaping the city into a more vibrant, connected and livable community for residents of all ages, as well as fostering an environment that is attractive to businesses and residents alike."[12] As the City of West Haven continues to develop, it participated in the Regional Framework for Coastal Resilience in Southern CT that encourages beach nourishment, replacing flood protection structures, green infrastructure, protecting roadways and property, and preventing inland river flooding.[13] The University of New Haven works closely with the City to tackle stormwater issues and flooding issues near the University.

Since parts of West Haven were developed before zoning, the general framework of land use patterns still exists today. Commercial land uses are densely located in the downtown and follow former streetcar routes along Campbell Avenue and Elm Street. Factories and other industrial operations remain close to the rail lines and the residential homes occupy the area in between. Duplexes and multi-family homes are concentrated in the southeastern portion of the area close to Savin Rock and Long Island Sound. The neighborhoods near the West Haven shoreline consist of a mix of types, ages, and sizes of residences from single-family to multi-family homes, condominiums, and apartments.[14]

[9] "West Haven Plan of Conservation and Development." (2017). West Haven, Connecticut. Pg. 92.

[10] "South Central Region, CT: Demographic & Socioeconomic Trends." (2021). South Central Regional Council of Governments.

[11] "Visitors." West Haven Connecticut.

[12] "South Central Region: Plan of Conservation & Development 2018-2023 DRAFT Update." (2018). South Central Regional Council of Governments. Pg. 71.

[13] "Southern CT: Regional Framework for Coastal Resilience." (2017). South Central Regional Council of Governments, MetroCOG, Nature Conservancy.

[14] "West Haven Plan of Conservation and Development." (2017). West Haven, Connecticut.

2. Hazard Profiles

2.1 Critical Facilities

There are 28 critical facilities in the City, including 13 pump stations (
Table 1). There is one designated shelter in West Haven which is the Carrigan Middle School.

Table 1. Critical Facilities in the City of West Haven.

Facility	Location	Emergency Power Supply?	Shelter?	In Floodplain or Coastal Flood Hazard Area?	In Surge Zones?
Emergency Services					
Police Department	200 Sawmill Road	Yes	N/A	No	No
Emergency Operations Center	city hall	Yes	N/A	No	No
Fire Station #1	366 Elm St	Yes	N/A	No	No
Fire Station #2	860 Ocean Av	Yes	N/A	Yes	N/A
Fire Station #3	20 Admiral St	Yes	N/A	No	No
Municipal Facilities					
High School	1 Circle St	Yes	N/A	Grounds (Not bldg)	No
City Hall	355 Main St	Yes	N/A	No	No
Shelters					
Carrigan Middle School	2 Tetlow St	Yes	Yes	No	No
Water and Wastewater					
WWTP	Beach Street	Yes	N/A	Yes	Yes

Facility	Location	Emergency Power Supply?	Shelter?	In Floodplain or Coastal Flood Hazard Area?	In Surge Zones?
Main Pump Station	Blohm & Anderson	Yes	N/A	Yes	No
East Ave PS	Beach &East Ave	Yes	N/A	Yes	Yes
Dawson Av PS	1 Dawson Av	Yes	N/A	Yes	Yes
Trumbull PS	4 Trumbull St	Yes	N/A	Yes	Yes
Woodmont Road PS	160 Woodmont Road	Yes	N/A	Yes	No
Oyster River PS	171 Beatrice Dr.	Yes	N/A	No	No
Cove River PS	350 Painter Dr	Yes	N/A	Yes	No
Savin Av PS	423 Captain Thomas Blvd. PS	Yes	N/A	Yes	No
Front Av PS	157 Front Av	Yes	N/A	No	No
Jones St PS	172 Jones St	Yes	N/A	Yes	No
Morrisey Ln PS	69 Morrisey Ln	Yes	N/A	No	No
Woodycrest PS	525 Ocean Av	Yes	N/A	No	Yes
Baybrook PS	1 Bayshore Dr	Yes	N/A	Yes	No
Health Care and Senior Living Facilities					
Morrissey Manor Senior Housing	Bayshore Dr	No	N/A	Yes	No
Surfside	200 Oak St	Yes	N/A	Yes	No
Prete Housing	1187 Campbell Av	Yes	N/A	No	No
VA Medical Center	950 Campbell Av	Yes	N/A	No	No

Facility	Location	Emergency Power Supply?	Shelter?	In Floodplain or Coastal Flood Hazard Area?	In Surge Zones?
Paradigm Health Care	310 Terrace Av	N/A	N/A	No	No
Apple Rehab Center	308 Savin Av	N/A	N/A	No	No

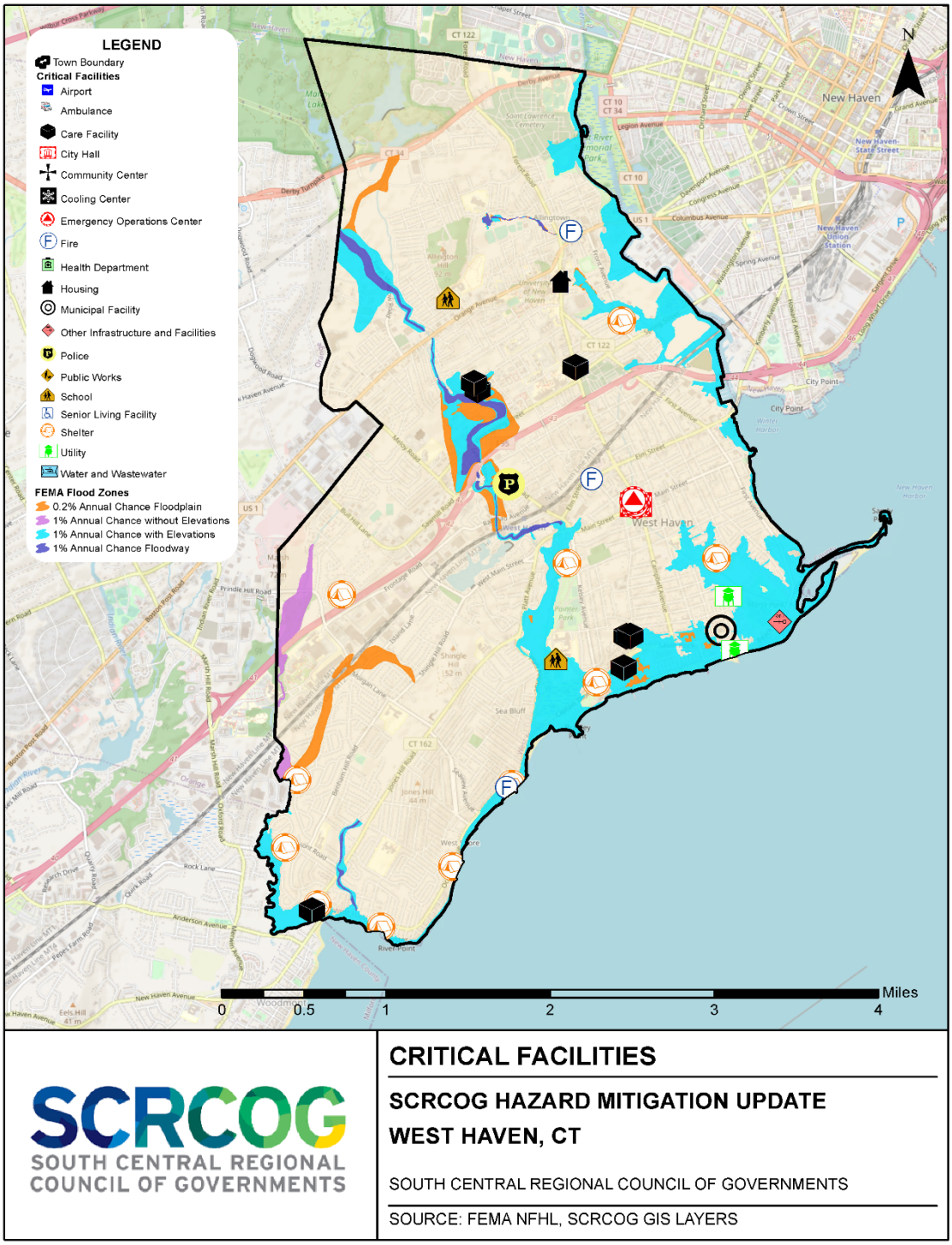

Figure 1. West Haven FEMA Flood Zones and Critical Facilities.

1.1 Vulnerable Assets

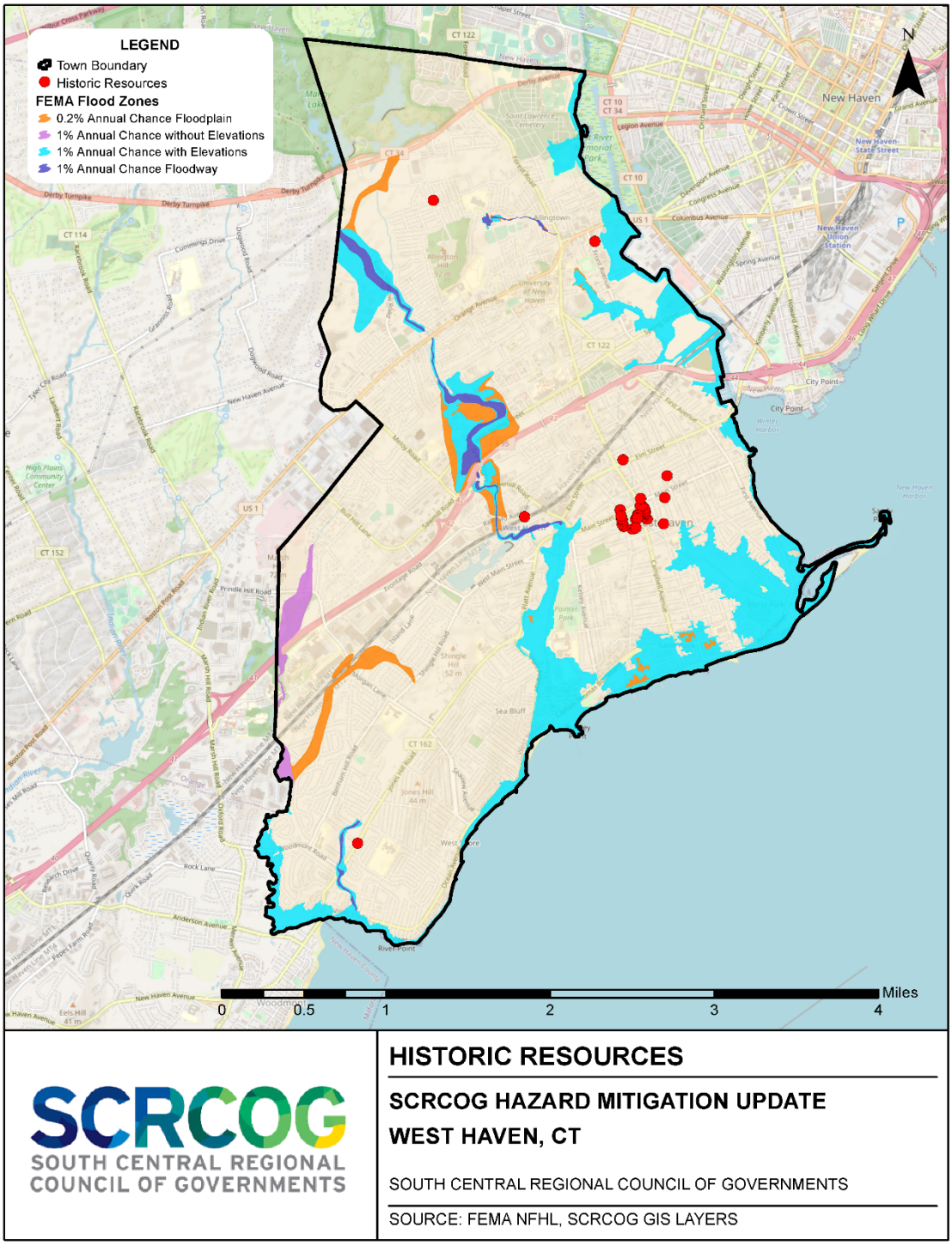

Figure 2. West Haven FEMA Flood Zones and Historic Resources.

Repetitive Loss and Severe Repetitive Loss Properties
In addition to the spatial analysis conducted above, summary information for repetitive flood loss and severe repetitive flood loss properties within the City of West Haven also provides an indication of vulnerable assets, especially with regard to properties insured under the National Flood Insurance Program that have experienced repeated flooding (
Table 2).

Table 2. West Haven Repetitive and Severe Repetitive Flood Loss Summary.

	Number of Losses	Number of Properties	Building Payments	Contents Payments	Total Payments
Repetitive Loss	163	64	$2,730,875	$215,299	$2,946,175
Severe Repetitive Loss	26	2	$875,882	$0	$875,882

Most of the RL properties are single-family homes. Three are residential condominium or apartment units and eight are multi-family homes. Only five RL properties are non-residential, and these appear to be commercial and industrial uses. As of December 31, 2012, the City of West Haven had a total of 490 claims totaling $3,506,261 in losses for all NFIP-insured structures. By July 31, 2017, that number had grown to 498 claims totaling $4,841,463.

Since 2017, and as of March 31, 2022, the City has had 516 flood claims totaling $5,086,847.

2.2 Historic Disasters

2.2.1 Federally Declared Events

Over the past two decades alone, six historic disaster events have occurred that have shaped how disaster response and recovery is handled across the United States. These events include Hurricanes Katrina, Sandy, Irma, Maria, and Harvey, along with the California wildfires in 2017. While not all of these events directly impacted the SCRCOG region, or the State of Connecticut, hazard mitigation planning has been driven by these catastrophic events.

The first federal act of relief occurred in 1803 following a destructive fire in Portsmouth, New Hampshire where Congress provided relief in the form of suspended bond payments. Over a century and a half later in 1979 the Federal Emergency Management Agency (FEMA) was created and tasked with nationwide emergency management. However, emergency and disaster declarations for the State of Connecticut

have been made since 1954. These have included hurricanes, blizzards, severe wind and rainstorms, and tornadoes.

Since 2016, specifically for New Haven County, there have been three FEMA Disaster Declarations (DR), and two Emergency Declarations (EM) (Table 3). These are in addition to the COVID-19 DR and EM that were declared in March 2020. FEMA declarations are made when it is determined that federal assistance is needed to supplement State and Tribal efforts in the wake of an event.

In addition to the FEMA declarations, the United States Department of Agriculture (USDA) declared eight agriculturally related disasters in the same time frame; two of which were also declared by FEMA. These USDA declarations make emergency loans available to agricultural producers in the designated counties.

Table 3. FEMA and USDA Disaster Declarations for New Haven County.

Event	Disaster	Date of Event	Date Declared
FEMA Disaster Declarations for New Haven County			
Severe Storms, Tornadoes, and Straightline Winds	DR-4385-CT	May 15, 2018	August 20, 2018
Tropical Storm (T.S.) Isaias*	DR-4580-CT EM-3535-CT	August 4, 2020	January 12, 2021
Hurricane Henri	EM-3564-CT	August 21-24, 2021	August 22, 2021
Hurricane Ida*	DR-4629-CT	September 1-2, 2021	October 30, 2021
USDA Declared Disasters for New Haven County			
Frost and Freeze	S4048	February 12, 2016	September 21, 2016
Drought	S4055	August 2, 2016	September 28, 2016
Excessive Rainfall	S4478	August 1, 2018	March 20, 2019
Drought	S4814	September 22, 2020	October 14, 2020
Drought	S4825	September 29, 2020	October 15, 2020
Tropical Storm Elsa	S5069	July 9, 2021	August 30, 2021
* Indicates FEMA declaration that was also made by USDA			

In New Haven County, the May 2018 storms (DR-4385) caused $8,187,833 worth of damage, with federal assistance totaling $6,213,312. Tropical Storm Isaias (DR-4580) resulted in $4,656,424 worth of damage and a federal assistance totaling $3,915,143. For reference, Hurricane Sandy resulted in over $14 million of damage. Public assistance (PA) was requested by most communities in the region.

In addition, Individual Assistance (IA) housing assistance for owners and renters was distributed in the wake of Hurricane Ida (DR-4629). Homeowners throughout the region received $570,033 in assistance and renters received $37,112.

2.2.2 National Centers for Environmental Information

The NOAA National Centers for Environmental Information (NCEI) maintains a storm events database that documents significant weather events and their impacts including injuries and loss of life, and economic impacts and property damage. Event types in this database generally include severe storm events such as hurricanes, thunderstorm, or windstorms, hail events, snow and freezing events, and several types of flood events such as flash or coastal floods.

Between 2017 and 2021 the SCRCOG region experienced 70 different events including floods, hail, high windstorms, and tornadoes (
Table 4). Property damage throughout the region for these 70 events was estimated to be $1,054,500. Losses specific to the City of West Haven are discussed in section 0.

Table 4. NCEI Events Between 2017 and 2021.

Event Type	Number of Events
Flash Flood	25
Flood	1
Hail	2
Thunderstorm Wind	39
Tornado	3
Total	**70**

2.2.3 Drought Occurrences

The United States Drought Monitor (USDM) is a nation-wide map depicting which areas throughout the U.S are in drought, and the intensity of that drought. The USDM is developed via data syntehsis and

observations from drought experts and local observers. The chart seen in Figure 3 is a graphictal representation of the drought periods in New Haven County from 2015 to the end of 2021. The dark organge and red areas indicate a more severe drought period. Most recently, New Haven County has experienced an extreme drought (D3) in 2016 into 2017, with a severe drought (D2) in 2020.

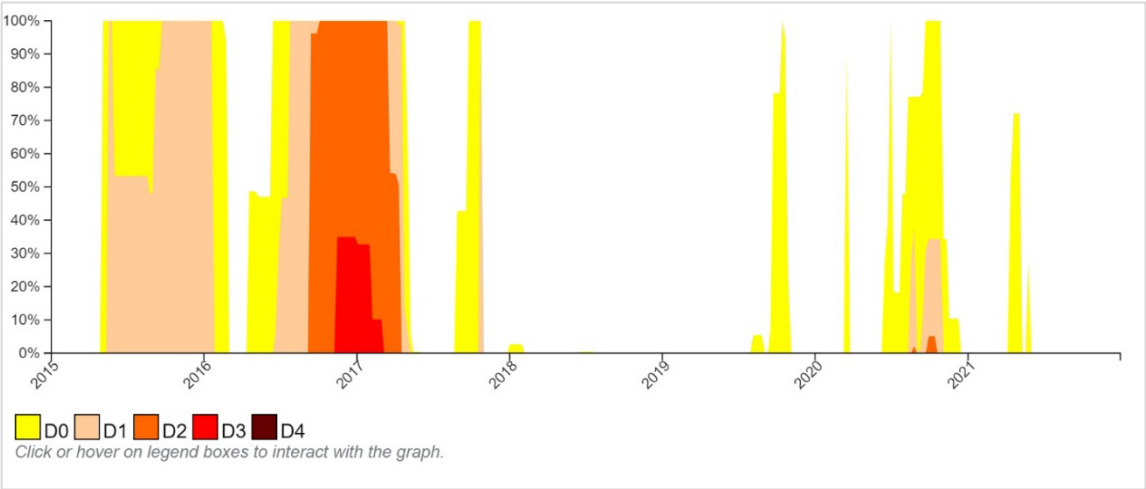

Figure 3. United States Drought Monitor (USDM) Drought Intensity for New Haven County from 2015 through 2021.

Another tool used to charcterize drought conditions is the Standardized Precipitation Index (SPI). This index identifies drought areas based on the deviation of recent preiciptation levels in comparison to the long-term average. Ultiamtely, if rainfall levels have been “lower than normal” or “wetter than normal” in a certin timeframe, the SPI represents these highs and lows at a nationl scale. The chart seen in Figure 4 shows the SPI for New Haven County from 2015 to the end of 2021. In comparison to the USDM, the fluctuations in drought periods are relatively synonmous, however, the SPI indiciated a more severe period of droght between 2015 and 2017 than the USDM. This is because the USDM is based on several other factors aside from just precipitation, hence why the USDM is typically used to determing local drought measures and needs. The blue areas on the chart are the priods of time that were wetter than usual with higher precipitation.

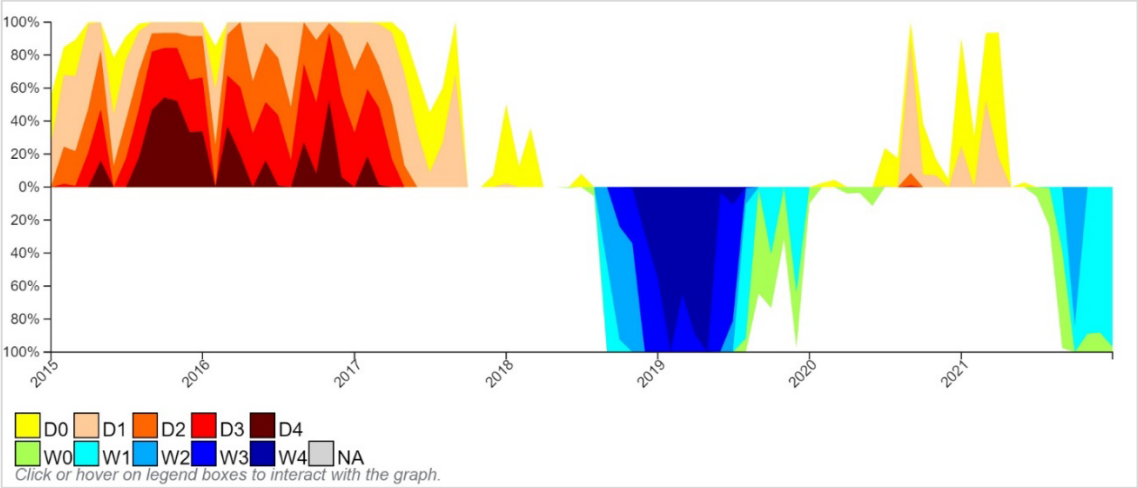

Figure 4. Standardized Precipitation Index (SPI) for New Haven County from 2015 through 2021.

The impacts of drought vary throughout the SCRCOG region and are often felt over a longer period of time and are related to social, ecological, and economic concerns. The 2016 drought, the most extreme in recent years, resulted in mandated water conservation measures, and required some water utilities in the region, to make necessary water management changes. In addition, eight farm operations received assistance from the United States Department of Agriculture in the wake of the event in the amount of $78,590.

The severe drought in 2020 also impacted the region in various ways. At a statewide level, drinking water reservoirs were at 67% of capacity and 83.5% of normal. With decreased precipitation, and drinking water reservoir levels low, the Connecticut Interagency Drought Workgroup placed New Haven County in a Stage 1 drought per the State Drought Plan. Specifically, the Northeast Regional Climate Center identified the City of New Haven as having one of the highest rainfall deficits in the State at -11.09 inches average rainfall. During the 2020 drought, private wells were reportedly drying up, there were reports of livestock farms needing water, and water utilities throughout the region and state were experiencing reduced supply.

On October 15, 2020 the USDA identified New Haven County as a contiguous disaster county, making farm operators eligible to be considered for assistance from Farm Service Agency (FSA). Three farms in the region received assistance as a result of the drought in the amount of $17,982.

2.2.4 Wildland Urban Interface (WUI)

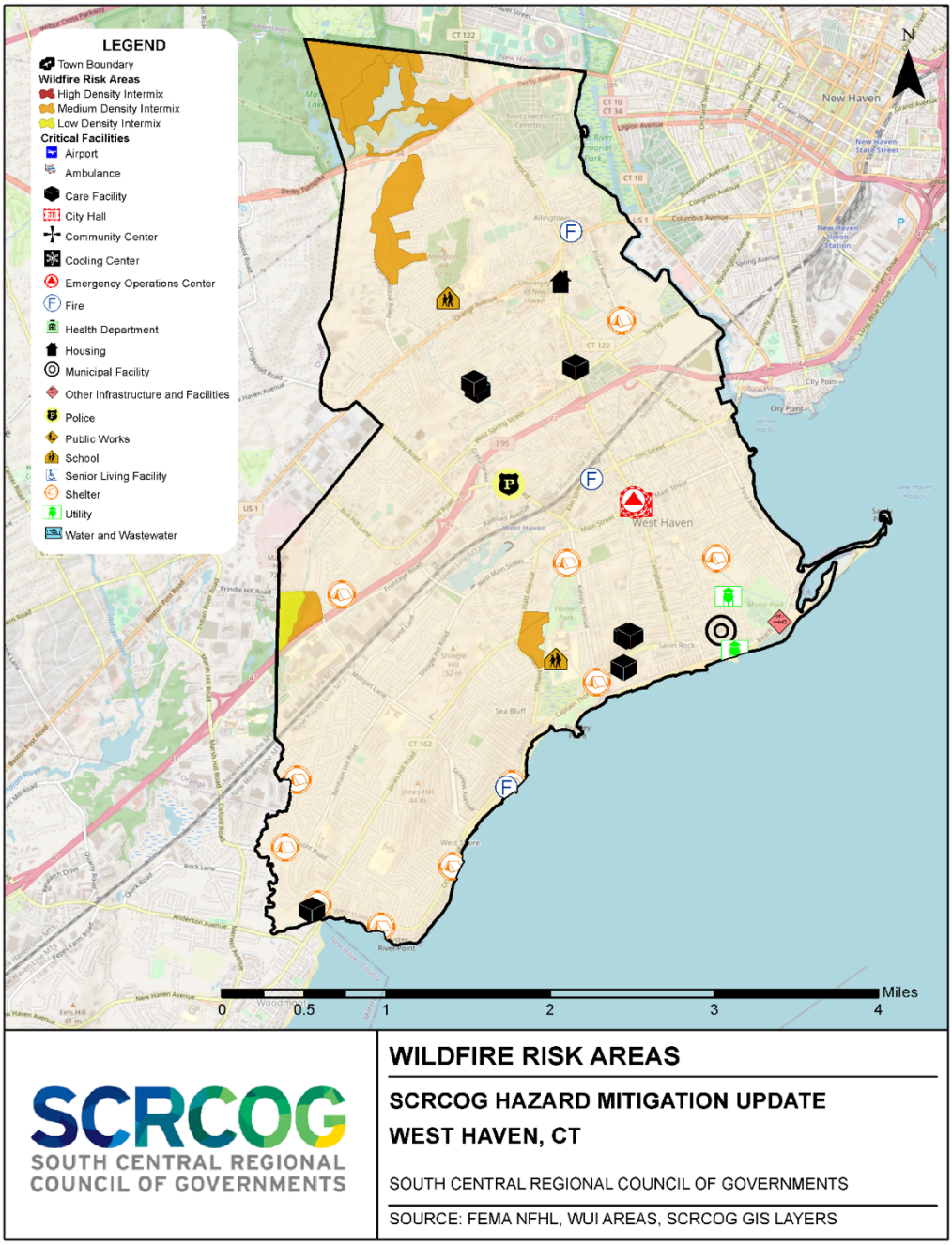

Figure 5. West Haven WUI and Critical Facilities.

3. Risk Analysis

3.1 Hazard Losses

3.1.1 Vulnerable Assets: Exposure Analysis

Vulnerable assets were identified by intersecting GIS-based asset inventories with known hazard boundaries to determine the numbers of parcels, critical facilities, and historic assets. This results in an estimation of vulnerable assets for the entire region, by hazard as shown in
Table 5. Drought exposure was estimated using the Connecticut DPH assumed private well data develop in 2021. The wildfire hazard boundary was defined by those parcels within the wildland-urban interface and intermix *and* that were also assumed to be a private well. The assumed presence of a private well indicates a lack of public water supply, and potentially reduced firefighting capacity. The estimated value of at risk assets is based on the City's latest property tax values. Scenarios are cumulative, i.e., the 0.2% annual chance estimates also include the values and numbers of the 1% annual chance event.

Table 5. City of West Haven Vulnerable Assets Exposure Analysis.

Hazard	At-Risk Parcels		At-Risk Facilities		At-Risk Historic Assets	
	Value	Number	Value	Number	Value	Number
Hurricane/Tropical Storm	$3,327,457,754	16,953	$251,775,440	28	$20,449,590	28
Severe Thunderstorm	$3,327,457,754	16,953	$251,775,440	28	$20,449,590	28
Severe Winter Storm	$3,327,457,754	16,953	$251,775,440	28	$20,449,590	28
Tornado	$3,327,457,754	16,953	$251,775,440	28	$20,449,590	28
Drought	$2,239,160	16	-	-	-	-
Flood						
1% Annual Chance	$685,771,949	2,599	$31,204,400	5	$2,816,870	1
0.2% Annual Chance	$720,706,119	2,864	$31,204,400	5	$2,816,870	1
VE Zone	$77,398,860	186	$10,078,320	3	-	-

Hazard	At-Risk Parcels		At-Risk Facilities		At-Risk Historic Assets	
Storm Surge						
Category 1	$161,265,440	538	$41,277,670	6	-	-
Category 2	$455,976,010	2,080	$72,249,870	12	$2,816,870	1
Category 3	$659,757,350	3,315	$74,023,880	14	$2,816,870	1
Category 4	$874,980,280	4,461	$81,852,260	17	$20,049,750	21
Earthquakes	$3,327,457,754	16,953	$251,775,440	28	$20,449,590	28
Wildfire	-	-	-	-	-	-

3.2 Hazard Losses

3.2.1 Federal Assistance

The City of West Haven has not received any FEMA funds for any of the recent disaster or emergency declaration aside from the COVID-19 pandemic. (
Table 6).

Table 6. Federal Funds Received from Disaster Declarations.

Event	Disaster	Assistance Type	Federal Funding Received	Total Project Need (Damages)
Covid-19	DR-4500-CT EM-3439-CT	PA	$2,251,340	$2,251,340

Funds received by the City were entirely received for COVID-19 protective measures (Figure 6). Funds were specifically allocated for testing efforts in spring 2021 for the University of New Haven.

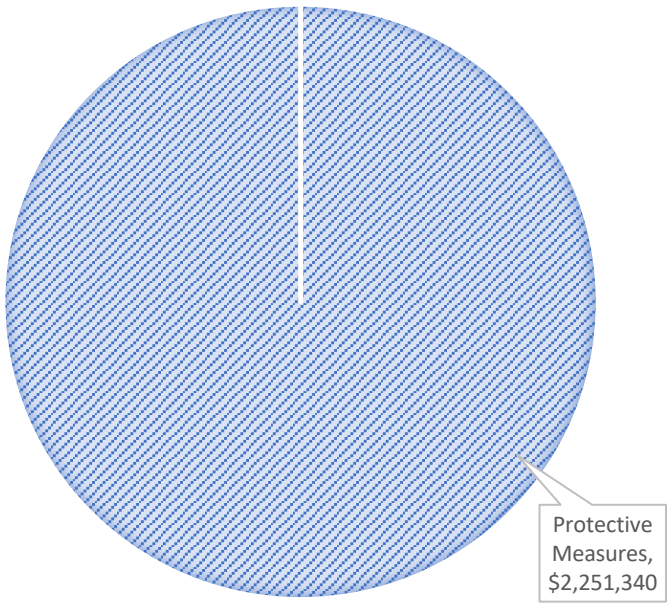

Figure 6. Federal Funds Received by Category.

In addition to FEMA PA funds, 22 property owners and one renter received FEMA IA funds. Property owner payments totaled $158,022 and the renter payment totaled $7,749

3.2.2 National Centers for Environmental Information (NCEI)

The NCEI documentation has identified seven events for the City of West Haven since 2017, including three flash flood events, one hail event, and three thunderstorm and wind events. Property damages were only reported for the thunderstorm events which resulted in $30,000 in property damage.

The flash flood events resulted in a closure of Glade Street between Terrace Avenue and Coleman Street leaving cars stranded, a closure at Campbell Avenue, and a landslide episode along the Metro-North railroad tracks near Callegari Drive. Thunderstorm events resulted in several downs trees throughout the City including reports specifically at the Veteran's Affair Medical Center, Island Lane, and on Danenberg Place which also resulted in two damaged homes.

3.3 Loss Estimates

3.3.1 Sea Level Rise (SLR)

Table 7. Buildings in West Haven affected by the SLR Base Scenario.

West Haven	Buildings Affected	Critical Facilities	Historic Resources
Base Scenario			
Mean Higher High Water (MHHW)	1	0	0
10-year Flood Event	66	2	0
30-year Flood Event	131	2	0
50-year Flood Event	162	4	0
100-year Flood Event	162	4	0
500-year Flood Event	194	4	0

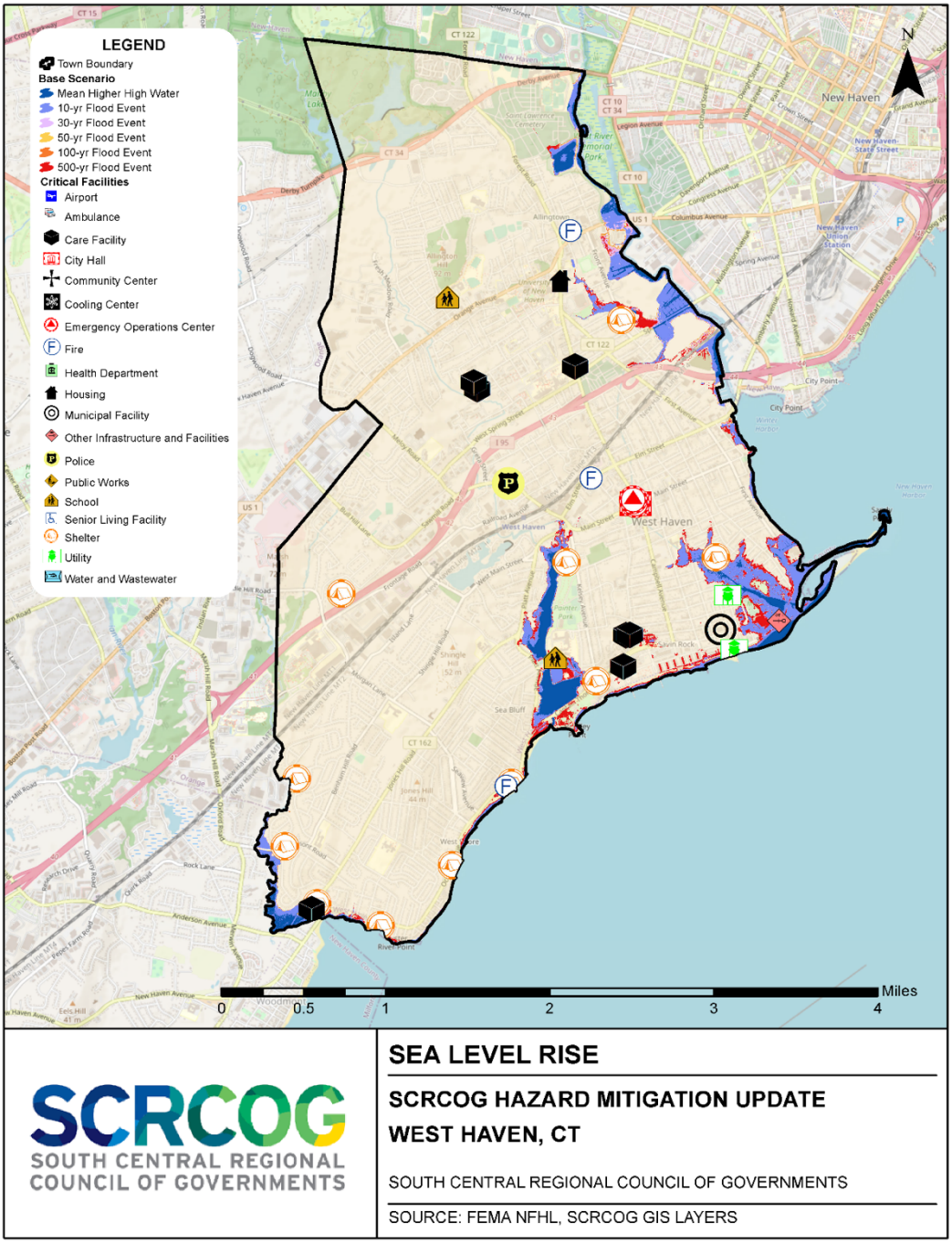

Figure 7. West Haven SLR Base Conditions Scenario.

Table 8. Buildings in West Haven affected by the SLR Future Conditions Scenario.

West Haven	Buildings Affected	Critical Facilities	Historic Resources
Future Conditions Scenario			
Mean Higher High Water (MHHW) +1 foot	2	0	0
Mean Higher High Water (MHHW) +20 inches	4	0	0
10-year Flood Event + 20 inches	81	2	0
30-year Flood Event + 20 inches	340	7	0
50-year Flood Event + 20 inches	385	7	0
100-year Flood Event + 20 inches	446	7	0
500-year Flood Event + 20 inches	654	9	0

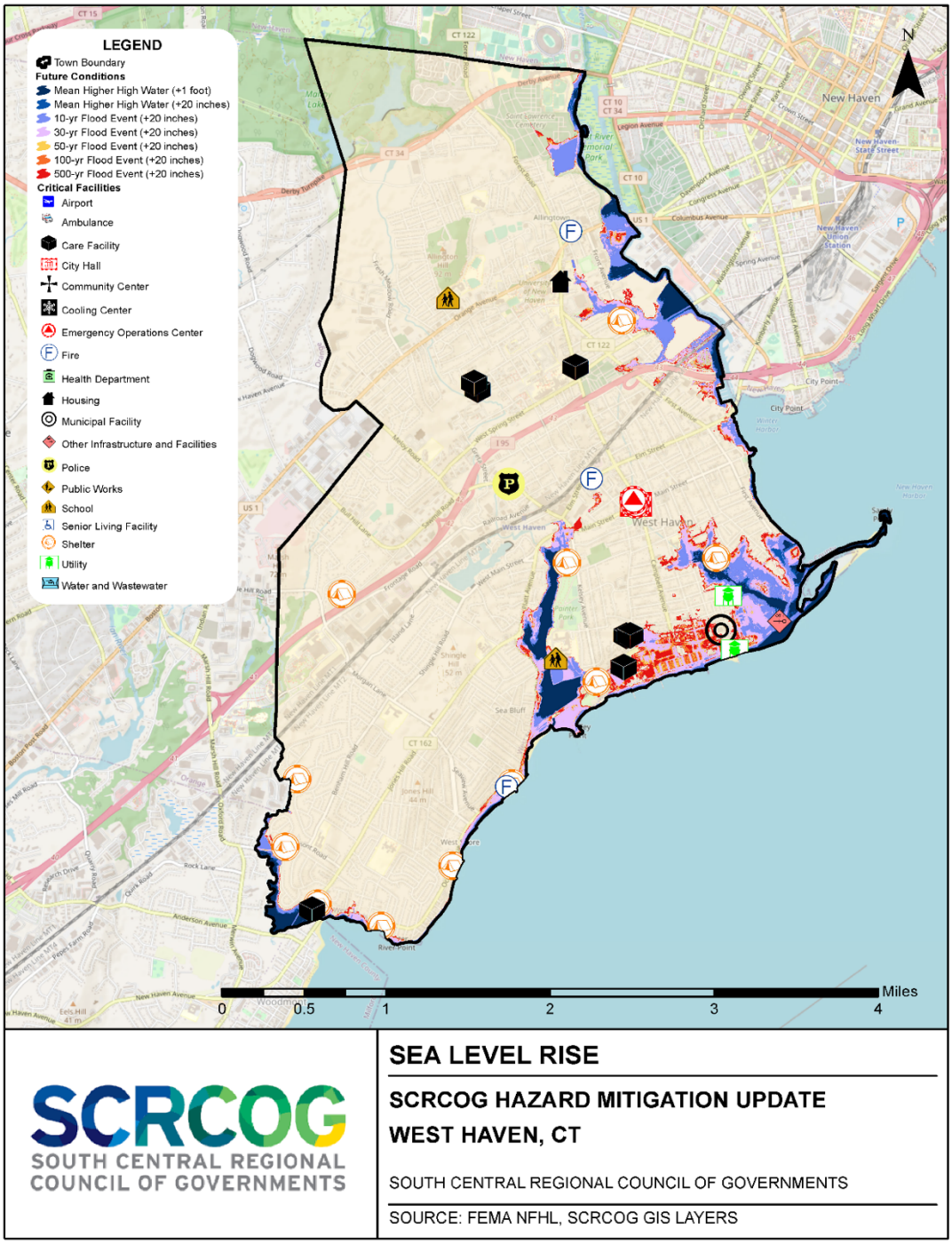

Figure 8. West Haven SLR Future Conditions Scenario.

3.4 HAZUS-MH Analysis

Hazus-MH (Hazus) v5.1 was used to complete the earthquake, hurricane wind, and both riverine and coastal flood analyses for vulnerability and loss estimates for the 2022 plan update. The Hazus software was developed by FEMA and the National Institute of Building Sciences. For the earthquake module, the U.S. Census tracts are the smallest extent in which the model runs; for the hurricane and flood modules, U.S. Census blocks were used. Multi-frequency depth grids were used for the riverine flood analysis, but only the 100-year coastal depth grid was available and used for analysis. Hazus was also used to calculate Storm Surge using the National Hurricane Center's (NHC) Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Maximum of the Maximum Envelope of Waters (MEOWs) (MOM) depth grid.

3.4.1 Earthquake

The earthquake analysis was run based on the largest earthquake in Connecticut history, which occurred in East Haddam on May 16, 1791. Specific parameters include:

- Longitude of epicenter: -72.40
- Latitude of epicenter: 41.50
- Depth: 10.00 km.
- Magnitude: 6.40
- Attenuation function: CEUS 2008

After the earthquake analysis was performed, two tables for each municipality were created based off the tables for the 2018 update: Numbers of Buildings Damaged and anticipated extent of damage (Table 9) and Total Building-Related Economic Loss (Table 10) which includes the total economic loss by general occupancy type. An additional table was also created: Other Earthquake Impacts (Table 11) which includes information related to debris generated, number of displaced households, and the number of individuals who need to seek temporary shelter. Including this table allows these impacts to be compared across different hazards.

Table 9. Number of Buildings Damaged from the East Haddam Earthquake Scenario for the Town of West Haven.

West Haven	**Slight**	**Moderate**	**Extensive**	**Complete**	**Total**
2022 Count	33,197	31,748	31,068	30,920	126,933

Table 10. Total Building Related Economic Loss from the East Haddam Earthquake Scenario for the Town of West Haven.

West Haven	**Residential**	**Commercial**	Industrial	**Others**	**Total**
2022 Losses	$98,701,735	$44,461,919	$15,357,245	$8,817,252	$167,338,151

Table 11. Other Earthquake Impacts from the East Haddam Earthquake Scenario for the Town of West Haven.

West Haven	Debris Generated (Tons)	Households Displaced	Individuals Seeking Temporary Shelter
2022 Results	53	252	168

3.4.2 Hurricane

Hazus uses historical hurricane tracks and computer modeling to identify the probable tracks of a range of hurricane events and then assigns potential wind gusts that result. Widespread extreme thunderstorm wind events, such as those associated with well-developed squall lines, may have wind gusts of a similar magnitude to those of the 50- or 100-year hurricane wind event. A 1000-year event is the rough equivalent of a strong Category 1 or low-end Category 2 hurricane (or weak to mid-strength EF-1 tornado) with 3-second wind gusts of up to around 95 mph.

For the hurricane hazard, three tables for the Town of West Haven were created based off the tables for the 2018 update: Numbers of Buildings Damaged and anticipated level of damage (Table 12), Building-Related Economic Loss (Table 13), and Other Hurricane Impacts (Table 14) which includes information related to debris generated, number of displaced households, and the number of individuals who need to seek temporary shelter. These tables broke down the values for the six hurricane return periods (10-, 4-, 2-, 1-, 0.2-, and 0.01-percent-annual-chance).

Table 12. Number of Buildings Damaged from the Probabilistic Hurricane Scenario for the Town of West Haven.

West Haven	Return Period	Minor	Moderate	Severe	Destruction	Total
2022 Results	10-year	0	0	0	0	0
	20-year	19	1	0	0	20
	50-year	101	9	0	0	110
	100-year	586	77	3	0	666
	200-year	1,828	344	16	4	2,192
	500-year	3,611	1,063	88	38	4,800
	1,000-year	5,005	2,200	316	150	7,670

Table 13. Total Building Related Economic Loss from the Probabilistic Hurricane Scenario for the Town of West Haven.

West Haven	Return Period	Minor	Moderate	Severe	Destruction	Total
2022 Results	10-year	$0	$0	$0	$0	$0
	20-year	$32,808	$1,601	$39	$0	$34,448
	50-year	$183,165	$14,773	$960	$0	$198,898
	100-year	$1,135,860	$130,050	$5,213	$213	$1,271,336
	200-year	$3,622,135	$608,206	$30,953	$8,492	$4,269,786
	500-year	$7,238,059	$1,956,909	$175,381	$78,259	$9,448,607
	1,000-year	$10,126,036	$4,126,737	$629,871	$306,187	$15,188,831

Table 14. Other Hurricane Impacts from the Probabilistic Hurricane Scenario for the Town of West Haven.

West Haven	Return Period	Debris Generated (Tons)	Households Displaced	Individuals Seeking Temporary Shelter
2022 Results	10-year	0	0	0
	20-year	309	0	0
	50-year	1,857	1	1
	100-year	6,825	36	23
	200-year	16,384	147	95
	500-year	32,567	405	260
	1,000-year	57,458	930	595

3.4.3 Riverine Flood

Floods are often described in terms of annual percentage chance of occurrence. Floodplains have been delineated by FEMA to reflect the 1- and 0.2-percent-annual-chance flood events previously known as 100-year and 500-year floods, respectively. The area that has a 1 percent chance annually to flood each year is delineated as a Special Flood Hazard Area (SFHA) for the purposes of the National Flood

Insurance Program (NFIP). The 0.2-percent-annual-chance floodplain indicates areas of moderate flood hazard.

Hazus-MH v5.1 was used to complete the riverine flood analysis for vulnerability and loss estimates for this plan. The Hazus software was developed by FEMA and the National Institute of Building Sciences. A The flood loss estimation methodology consists of two modules that carry out basic analytical processes: flood hazard analysis and flood loss estimation analysis. The flood hazard analysis module uses characteristics, such as frequency, discharge and ground elevation to estimate flood depth, flood elevation and flow velocity. The flood loss estimation module calculates physical damage an economic loss from the results of the hazard analysis.

A Hazus Level 2 analysis was performed for the Town of West Haven with a user-provided depth grid. The flood model was used to run a single-frequency depth grid scenario which included the 1-percent - annual-chance flood (100-year) scenario. The average annualized losses (AAL) was not able to be calculated as a full suite of depth grids run in the multi-frequency scenario is required. The Town of West Haven is outside the multi-frequency depth grid footprint. For analysis purposes, the U.S. Census blocks are the smallest extent in which the model runs. Hazus generates economic loss estimates based on direct building damages and business interruption.
Table 15 shows the 1-percent-annual-chance losses for the riverine flood scenario.

Table 15. 1-percent-annual-chance Riverine Flood Loss Estimates for the Town of West Haven.

West Haven	**2022 Results**				
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Direct					
Building	$10,498,000	$1,136,000	$602,000	$98,000	$12,334,000
Contents	$5,869,000	$3,368,000	$1,452,000	$817,000	$11,506,000
Inventory	$0	$90,000	$227,000	$0	$317,000
Subtotal	$16,367,000	$4,594,000	$2,281,000	$915,000	$24,157,000
Business Interruption					
Income	$358,000	$13,522,000	$67,000	$1,907,000	$15,854,000
Relocation	$11,775,000	$2,911,000	$81,000	$1,199,000	$15,966,000
Rental Income	$7,984,000	$2,143,000	$13,000	$158,000	$10,298,000

West Haven	2022 Results				
	Residential	Commercial	Industrial	Other	Total
Wage	$854,000	$12,389,000	$124,000	$18,902,000	$32,269,000
Subtotal	$20,971,000	$30,965,000	$285,000	$22,166,000	$74,387,000
Total	**$37,338,000**	**$35,559,000**	**$2,566,000**	**$23,081,000**	**$98,544,000**

3.4.4 Coastal Flood

Hazus-MH v5.1 was used to complete the coastal flood analysis for vulnerability and loss estimates for this plan. The Hazus software was developed by FEMA and the National Institute of Building Sciences. A The flood loss estimation methodology consists of two modules that carry out basic analytical processes: flood hazard analysis and flood loss estimation analysis. The flood hazard analysis module uses characteristics, such as frequency, discharge and ground elevation to estimate flood depth, flood elevation and flow velocity. The flood loss estimation module calculates physical damage an economic loss from the results of the hazard analysis.

A Hazus Level 2 analysis was performed for the Town of West Haven with a user-provided coastal depth grid. The flood model was used to run a single-frequency depth grid scenario which only included the 1-percent-annual-chance (100-year) return period. While annualized loss is the preferred manner with which to express potential risk for hazard mitigation planning, as it is useful for creating a common denominator by which different types of hazards can be compared, an annual loss was not able to be generated with only the coastal 100-year depth grid developed for this analysis. Future work to improve this assessment would involve creating a full suite of return periods, either independently or through a Flood Risk Project. For analysis purposes, the U.S. Census blocks are the smallest extent in which the model runs. Hazus generates economic loss estimates based on direct building damages and business interruption. Table 16 shows the 1-percent-annual-chance losses for the coastal flood scenario.

Table 16. 1-percent-annual-chance Coastal Flood Loss Estimates for the Town of West Haven.

West Haven	2022 Results (thousands of dollars)				
	Residential	Commercial	Industrial	Other	Total
Direct					
Building	$36,313,000	$3,165,000	$1,610,000	$124,000	$41,212,000
Contents	$30,313,000	$9,322,000	$3,603,000	$703,000	$43,941,000

West Haven	2022 Results (thousands of dollars)				
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Inventory	$0	$174,000	$450,000	$0	$624,000
Subtotal	$66,626,000	$12,661,000	$5,663,000	$827,000	$85,777,000
Business Interruption					
Income	$337,000	$19,187,000	$355,000	$358,000	$20,237,000
Relocation	$13,083,000	$4,123,000	$332,000	$263,000	$17,801,000
Rental Income	$7,843,000	$3,070,000	$64,000	$15,000	$10,992,000
Wage	$801,000	$18,944,000	$399,000	$19,088,000	$39,232,000
Subtotal	$22,064,000	$45,324,000	$1,150,000	$19,724,000	$88,262,000
Total	**$88,690,000**	**$57,985,000**	**$6,813,000**	**$20,551,000**	**$174,039,000**

3.4.5 Storm Surge

Hazus-MH v5.1 was used to complete the storm surge analysis for vulnerability and loss estimates for this plan. The Hazus software was developed by FEMA and the National Institute of Building Sciences. A Hazus Level 2 analysis was performed using user-provided depth grids. The NHC's SLOSH MOM model was used for this analysis. The flood model was utilized to run four separate single-frequency depth grid scenarios for the Category 1 to 4 hurricanes and a loss estimate was determined for each hurricane Category (Table 17 to

Table 20). Figure 9 shows the location of the storm surge areas in West Haven and their relation to critical facilities.

Table 17. Category 1 Storm Surge using Maximum of MEOWs for the Town of West Haven.

West Haven	2022 Results				
	Residential	Commercial	Industrial	Other	Total
Direct					
Building	$49,149,000	$4,549,000	$2,358,000	$306,000	$56,362,000
Contents	$38,744,000	$14,587,000	$5,410,000	$2,119,000	$60,860,000
Inventory	$0	$269,000	$654,000	$2,000	$925,000
Subtotal	$87,893,000	$19,405,000	$8,422,000	$2,427,000	$118,147,000
Business Interruption					
Income	$447,000	$29,187,000	$446,000	$1,455,000	$31,535,000
Relocation	$17,246,000	$7,171,000	$488,000	$809,000	$25,714,000
Rental Income	$11,290,000	$5,335,000	$90,000	$76,000	$16,791,000
Wage	$1,059,000	$29,041,000	$535,000	$23,992,000	$54,627,000
Subtotal	$30,042,000	$70,734,000	$1,559,000	$26,332,000	$128,667,000
Total	**$117,935,000**	**$90,139,000**	**$9,981,000**	**$28,759,000**	**$246,814,000**

Table 18. Category 2 Storm Surge using Maximum of MEOWs for the Town of West Haven.

West Haven	2022 Results				
	Residential	Commercial	Industrial	Other	Total
Direct					
Building	$180,810,000	$19,530,000	$8,317,000	$1,457,000	$210,114,000
Contents	$139,121,000	$61,946,000	$18,542,000	$10,623,000	$230,232,000

West Haven	2022 Results				
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Inventory	$0	$995,000	$1,993,000	$17,000	$3,005,000
Subtotal	$319,931,000	$82,471,000	$28,852,000	$12,097,000	$443,351,000
Business Interruption					
Income	$852,000	$57,251,000	$670,000	$4,773,000	$63,546,000
Relocation	$40,658,000	$14,283,000	$679,000	$2,181,000	$57,801,000
Rental Income	$26,712,000	$10,420,000	$127,000	$206,000	$37,465,000
Wage	$2,006,000	$59,082,000	$831,000	$41,566,000	$103,485,000
Subtotal	$70,228,000	$141,036,000	$2,307,000	$48,726,000	$262,297,000
Total	**$390,159,000**	**$223,507,000**	**$31,159,000**	**$60,823,000**	**$705,648,000**

Table 19. Category 3 Storm Surge using Maximum of MEOWs for the Town of West Haven.

West Haven	2022 Results				
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Direct					
Building	$423,526,000	$56,230,000	$18,796,000	$6,484,000	$505,036,000
Contents	$315,045,000	$165,327,000	$40,736,000	$42,577,000	$563,685,000
Inventory	$0	$2,215,000	$4,174,000	$56,000	$6,445,000
Subtotal	$738,571,000	$223,772,000	$63,706,000	$49,117,000	$1,075,166,000
Business Interruption					
Income	$1,177,000	$107,210,000	$977,000	$15,219,000	$124,583,000
Relocation	$72,949,000	$28,184,000	$1,014,000	$7,359,000	$109,506,000
Rental Income	$48,811,000	$20,284,000	$182,000	$906,000	$70,183,000

Wage	$2,773,000	$117,652,000	$1,264,000	$92,943,000	$214,632,000
Subtotal	$125,710,000	$273,330,000	$3,437,000	$116,427,000	$518,904,000
Total	**$864,281,000**	**$497,102,000**	**$67,143,000**	**$165,544,000**	**$1,594,070,000**

Table 20. Category 4 Storm Surge using Maximum of MEOWs for the Town of West Haven.

West Haven	**2022 Results**				
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Direct					
Building	$814,289,000	$130,132,000	$36,041,000	$16,810,000	$997,272,000
Contents	$552,990,000	$286,257,000	$72,177,000	$70,112,000	$981,536,000
Inventory	$0	$4,554,000	$7,447,000	$126,000	$12,127,000
Subtotal	$1,367,279,000	$420,943,000	$115,665,000	$87,048,000	$1,990,935,000
Business Interruption					
Income	$1,880,000	$159,842,000	$1,322,000	$23,080,000	$186,124,000
Relocation	$110,917,000	$43,515,000	$1,422,000	$10,958,000	$166,812,000
Rental Income	$76,146,000	$31,568,000	$256,000	$1,415,000	$109,385,000
Wage	$4,418,000	$183,604,000	$1,798,000	$126,647,000	$316,467,000
Subtotal	$193,361,000	$418,529,000	$4,798,000	$162,100,000	$778,788,000
Total	**$1,560,640,000**	**$839,472,000**	**$120,463,000**	**$249,148,000**	**$2,769,723,000**

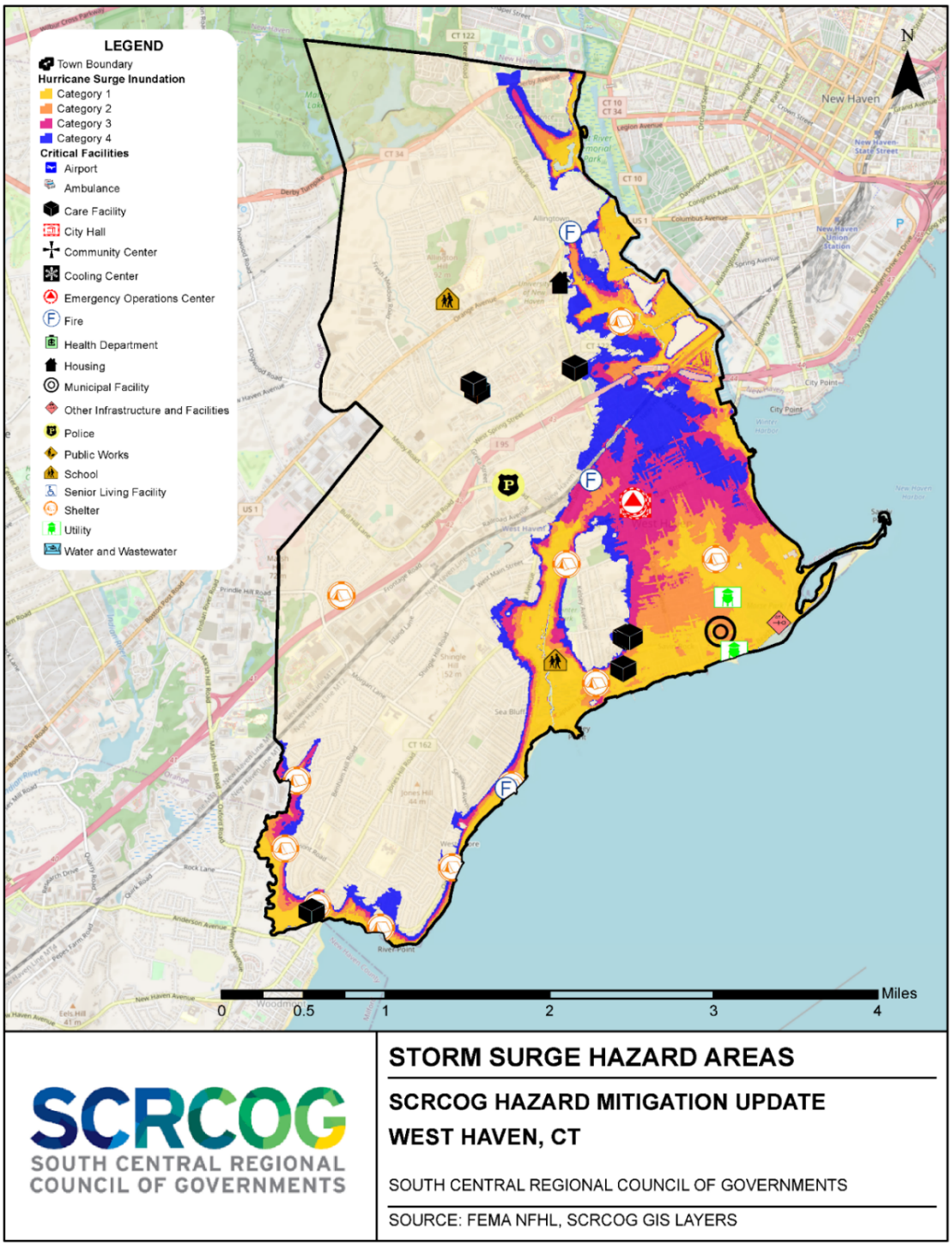

Figure 9. Storm Surge Hazard Areas in the Town of West Haven, Connecticut.

3.5 Annualized Losses

Annualized loss estimates (
Table 21) have been developed for each hazard discussed in the regional hazard profiles. These estimates have been derived from a number of sources, including:

- Historic FEMA PA funds received by the community
- Historic FEMA IA funds received by property owners and renters
- Historic NFIP claims made within the community
- Connecticut State 2019 Hazard Mitigation Plan estimates
- HAZUS-MH modeling results performed for the region
- HAZUS-MH results from the Connecticut State 2019 Hazard Mitigation Plan

Table 21. Annualized Loss Estimates for the City of West Haven.

Hazard	Source or Method	Losses in West Haven	Years of Record	Annualized or Annual Loss
Coastal Erosion	Refer to Multi-Jurisdiction document	$2,000,000	---	---
Dam Failure	CT HMP NPDP	$2,181	1	$2,181
Drought	USDA	$0	10	$0
	CT HMP NCEI	$1,052	1	$1,052
Earthquake	FEMA P-366	$105,053	1	$105,053
Extreme Heat	None Available	$0	10	$0
Flood	PA	$984,265	10	$98,427
	NFIP	$5,090,246	44	$115,687
	IA (Sandy and Ida)	$474,213	10	$47,421
Hurricanes	FEMA PA	$1,224,689	10	$122,469
Severe Thunderstorm	NCEI direct calculation	$34,000	10	$3,400
	CT HMP NCEI	$3,414	1	$3,414
Severe Winter Storm	FEMA PA	$952,905	10	$95,291
	CT HMP NCEI	$11,567	1	$11,567

Hazard	Source or Method	Losses in West Haven	Years of Record	Annualized or Annual Loss
Tornado	FEMA PA	$0	10	$0
	NCEI direct calculation	$0	10	$0
	CT HMP NCEI	$547,598	1	$547,598
Wildfire	CT HMP NFIC	$10,467	1	$10,467

3.6 Problem Statements

Problem statements were developed upon the completion and review of all risk assessment tasks. These statements are designed to briefly summarize the key hazard risks and vulnerabilities to the municipality based on potential impacts and losses from future events. They are among the issues of greatest concern and were used to assist in the identification and analysis of potential mitigation actions for. These problem statements will be reviewed and revised as needed during future plan updates to reflect the most current information resulting from the risk assessment.

Table 22. West Haven Problem Statements.

Problem Area	Description
Primary Hazards of Concern	
Trees	Trees-related hazards are cited as the City's biggest concern, particularly the downing of electric and communication lines during hurricane/tropical storm and severe winter storm events. The City has lost a tremendous number of trees in storms. The City has moved ahead with "smart tree" planning.
Urban flooding	Urban flooding is also a widespread concern, with major stormwater drainage issues in many localized areas across the City that are exacerbated by riverine and coastal sources of flood inundation along much of the City's borders, and backflow from existing stormwater systems caused by bottlenecks and inadequate detention/retention areas. Potential solutions/mitigation actions: update stormwater management/master drainage study and plan.

Problem Area	Description
Coastal flooding	Coastal flooding (storm-related and often resulting from high tides) and sea level rise.
Coastal Erosion	Coastal Erosion – constant, recurring erosion along shoreline in addition to episodic storm events. Sand is replaced every year. Existing granite/rock structures along shoreline have exacerbated coastal erosion problems.
Snow Management	Snow Management – finding an adequate place to stage huge amounts of snow is a challenge. When the snow melts quickly it may flood an area, and may erode the surface it is placed on. Need to designate areas to stage snow.
Geographic Areas of Concern	
Morgan Lane @ Railroad Underpass	Morgan Lane @ Railroad Underpass (between Heffernan Drive and Island Lane, near Yale West) – frequent and severe flash flooding concern with one recorded fatality.
Allingtown area	Allingtown area (Route 1 @ Campbell Avenue, near University of New Haven) – very frequent urban flooding problems across area (2-3 times per year) caused by inadequate drainage, and backflow from existing stormwater system. Has resulted in flooding to dormitories, vehicles, etc.
West Main Street @ Painter Drive	West Main Street @ Painter Drive – urban flooding problems, even with minimal rainfall amounts (much of water comes down from Allington area). Some basement flooding reported in area. Potential solutions/mitigation actions: Elm Street drainage project was designed to alleviate some problems but hasn't fully done so.
Lydia Street to West Spring Street	The entire area from Lydia Street and Homeside Avenue down to West Spring Street is in the Cove River watershed, located east of the river. Several small streams were placed in culverts decades ago. Drainage-related flooding is a challenge in this region. West Spring Street (near Veterans Affairs hospital campus) experiences flooding caused by runoff from the hospital site, with impacts to public housing located along Glade Street. Increasing precipitation intensities have contributed to more

Problem Area	Description
	frequent flooding. This is a primary focus area for 2023 and onward.
Campbell Avenue and Washington Avenue at Railroad Underpasses	Campbell Avenue and Washington Avenue at Railroad Underpasses; Elm Street – area subject to roadway and intersection flooding.
Water Street Bulkhead	Water Street Bulkhead – ongoing project to extend the bulkhead, but not long enough to protect areas currently planned for future commercial development (brownfield site).
Ocean Avenue	Ocean Avenue (areas south of South Street) – significant concerns regarding coastal erosion (south of existing shoreline protection structures).
Area around 3rd Avenue Extension	Area around 3rd Avenue Extension (Morris Cove area) – this area includes Court Street, Peck Avenue, and the Old Field Creek floodplain and experiences repetitive residential flooding. NRCS-funded property acquisitions have occurred, lowering flood risk to properties along these streets.
West Haven Beach/West Walk	The West Haven Beach/West Walk area was a significant focus of the City's Coastal Resilience Plan in 2017. Sea level rise will lead to future flood risks increasing in this area, and drainage-related flooding occurs often. The Coastal Resilience Plan demonstrates how to adapt different building typologies for future flood risks. The City wishes to develop a dune ridge along the beach to help reduce flood risks.
West Haven RR Station, Sawmill Road, and Railroad Avenue	CIRCA's Resilient Connecticut program identified West Haven's TOD area as a climate adaptation and resilience opportunity area due to the potential for flooding to increase the risks to TOD, regional assets like the MetroNorth station, and numerous community assets along Railroad Avenue and Sawmill Road.
Vulnerable Community Assets	
Sewage Treatment Plant, Sandy Point, and Old Field Creek	Sewage Treatment Plant on Beach Street - located in coastal floodplain, with history of frequent flooding issues at plant and flash flooding of access road. The City has several grants underway to help advance aspects of the

Problem Area	Description
	WWTP resiliency, including the outfall pipe and the WWTP facility itself. CIRCA's Resilient Connecticut program identified West Haven's WWTP area as a climate adaptation and resilience opportunity area due to the potential for flooding to increase the risks to the WWTP and Beach Street in general. Partial elevation of Beach Street was pursued.
High school	High school grounds are in floodplain of Cove River, but building is not. Facility does not serve as shelter but does serve as a public health dispensing site and does house the City's mainframe computer systems.
Evacuation routes	Evacuation routes are threatened by flooding, which may quickly become impassable on short notice. Potential solutions/mitigation actions: Regional evacuation study or plan could address deficiencies in system; must be coordinated with surrounding jurisdictions and State.
Surfside Senior Housing and Savin Rock Area	Surfside Senior Housing (200 Oak Street) is located along the coast and has required mandatory evacuation during past storms. CIRCA's Resilient Connecticut program identified the somewhat larger "Savin Rock area" as a climate adaptation and resilience opportunity area due to the potential for flooding to increase the risks to several affordable housing complexes east of Oak Street and south of Captain Thomas Blvd (Surfside and others). Extreme heat vulnerabilities are also a concern per Resilient Connecticut.
Morrissey Manor Senior Housing	Morrissey Manor Senior Housing (Bayshore Drive) –located along coast and has required mandatory evacuation during past storms.
Critical Facilities	Many critical facilities are in various storm surge inundation areas.
University of New Haven	University of New Haven has problems with stormwater. The system can handle the water that is generated on their campus, however the water that flows downhill onto the campus overloads the system and causes flooding. A detention basin at the top of the hill would slow the flow of water onto the campus so it could handle the flow and Campbell Avenue would not flood.

4. Capabilities

The City of West Haven is an urbanized, coastal community with a high degree of capabilities and resources to support the implementation of hazard mitigation actions. This jurisdictional annex provides some additional documentation on the existing local authorities, policies, programs, and resources to support mitigation and the City's ability to enhance or build upon these existing capabilities. This includes more detailed information on the updated capability findings for the community as highlighted in Chapter 6 (Capability Assessment), as well as the identification of some specific opportunities to expand and improve local mitigation capabilities for consideration as potential new actions for Chapter 7 (Mitigation Strategy).

4.1 Summary of Local Findings

4.1.1 Planning and Regulatory Capabilities

Planning and regulatory capabilities include the local plans, policies, codes, and ordinances that are relevant to reducing the potential impacts of hazards. The following planning and regulatory capabilities are currently in place for West Haven:

- Comprehensive/Master Plan (Plan of Conservation and Development)
- Capital Improvements Plan
- Local Emergency Operations Plan
- Continuity of Operations Plan
- Transportation Plan
- Stormwater Management Plan
- Coastal Zone Management Plan
- Coastal Resilience Plan
- Building Codes Adequately Enforced
- Zoning Ordinance Adequately Enforced
- Land Use Planning
- Zoning Ordinance
- Subdivision Ordinance
- Acquisition of Land for Open Space & Recreation

Given their direct relevance and significance to long-term hazard risk reduction, all current versions of formally adopted POCDs for participating jurisdictions were reviewed during the plan update process to ensure general consistency and integration as appropriate. Content from the City of West Haven's POCD that is particularly relevant to this hazard mitigation plan is detailed below and hereby incorporated by reference. Additional information on how adequately the POCD and related planning tools are being

used for hazard mitigation purposes can be found under the Safe Growth Survey section of this annex (see Section 4.2).

West Haven CT Plan of Conservation & Development (2017)

- Under the Beachfront and the Beach section of Chapter 4, the plan establishes a goal to "Coordinate POCD implementation with the Harbor Management Plan and Coastal Resilience Plan." (p. 76) It also more specifically identifies the strategy to "Follow Coastal Resilience Plan Recommendations and Guidance for Coastal Development," in which it describes those beachfront areas that are at risk to periodic flooding. (p. 78)
- As part of the strategy to revitalize Beach Street, the plan notes "the need for redevelopment and revitalization in the Beach Street corridor should also consider and mitigate the potential risks of damage from flooding." (p. 82)
- As part of the section on Parks, Recreation, and Open Space within the Community Facilities element, the plan notes that recent storm surges and flooding has elevated the importance of open space. It goes on to describe how (and where) the City is using available post-disaster grant funds to purchase floodplain easements to help make the city more resilient to future flood and storm surge events. (p. 110-112)
- Under the Natural and Coastal Resources element, the plan includes a specific subsection on Coastal Flooding. The narrative includes reference to FEMA floodplain maps as well as the Coastal Resilience Plan which "provides a framework for policy, regulatory, and infrastructure solutions to protect the coastal area from flooding." (p. 129) Goals under this element include but are not limited to the following:
    1. Promote the utilization of green stormwater infrastructure in public and private infrastructure and real estate development projects.
    2. Promote the conservation and protection of natural and coastal resources as part of future development and redevelopment. Future development and redevelopment at locations with direct frontage on coastal waters should be dominated by water-dependent uses. Water-related uses should be relegated to locations separated by a road, other land and/or public beach.
    3. Promote low-impact development, or environmentally sustainable construction, building, and landscape techniques, designs, and technologies in future development and redevelopment projects.
    4. Support the goals of and coordinate the implementation of POCD strategies with the Coastal Resilience Plan and the Harbor Management Plan.

    (p. 133)
- Under the section on Utilities within the Community Facilities element, the plan establishes a goal to "Manage flood risks for existing and planned community facilities within the coastal management area and within Special Flood Hazard Areas (SFHAs)." (p. 123)
- Under the Historic Resources element, as part of the strategy to Review, Update, and Digitize the Local Inventory of Historic Structures, the plan states that "the city should note whether any

historically-significant properties are located within a Special Flood Hazard Area or otherwise susceptible to flooding and evaluate them for special protection." (p. 138)

Fortunately, as evidenced above, the City of West Haven has some other important mitigation capabilities in place that work in conjunction with the POCD to reduce hazard risk. This includes the adoption and enforcement of building codes and land use and development ordinances/regulations that support mitigation by ensuring new or substantially improved development projects meet specific standards for public safety and protection from natural hazards. These standards are administered the city's enforcement of the State Building Code in addition to its zoning regulations and other land use regulations, as well as area-specific development plans. The administration and enforcement of these codes and development regulations are considered among the most effective and cost-beneficial measures to protect people and future development from the impact of natural hazard events. Some additional information on how effectively these regulatory tools and methods are being used for hazard mitigation purposes can be found in the Safe Growth Survey and NFIP Participation and Compliance sections of this annex. Some specific opportunities to enhance these tools are identified at the end of this Capabilities annex.

4.1.2 Administrative and Technical Capabilities

Administrative and technical capabilities include the local human resources and their skills/tools that can be used to support mitigation activities. The following administrative and technical capabilities are in place for West Haven:

- Planning Commission
- Maintenance Programs to Reduce Risk
- Mutual Aid Agreements
- Chief Building Official
- Floodplain Manager
- Emergency Manager
- Community Planner
- Civil Engineer
- GIS Coordinator
- Warning Systems

The City of West Haven has strong administrative and technical capabilities across many departments under the general supervision of the Mayor, the Chief Executive of the City. Key departments s as it relates to hazard mitigation and long-term risk reduction to natural hazards include Planning and Development, Public Works (including the City Engineer), Parks and Recreation, and Emergency Management. The Department of Planning and Development plays a critical role in terms of the current and future development of the city through planning and development staff along with the Building Department, Community Development Administration, and Grants Office as described further below. City staff are supported by other community members who are appointed to local boards and

commissions which goes a long way in supporting local administrative capabilities and technical expertise. Examples include the Planning and Zoning Commission, Redevelopment Agency, Conservation and Open Space Land Commission, Parks and Recreation Commission, Inland Wetlands Watercourse Agency, and Harbor Management Commission.

Coordination across departments and with local boards and commissions is described as effective for most purposes, including hazard risk reduction. Existing staff resources are generally considered adequate in terms of fulfilling day-to-day functions, especially as it relates to regulating new development projects, but it was noted that several departments could use more resources. For example, the City no longer has an Assistant Engineer, a critical position that needs to be filled to keep up with service demands routinely placed on the City Engineer.

4.1.3 Financial Capabilities

Financial capabilities include the fiscal resources the community has access to for helping to fund the implementation of hazard mitigation projects and related risk reduction activities. The following financial capabilities are in place for West Haven:

- Capital improvement project funding
- Authority to levy taxes for specific purposes
- Fees for water, sewer, gas, or electric services
- Community Development Block Grant
- Federal Funding
- State Funding

The City of West Haven has strong financial capabilities in terms of supporting local investments in infrastructure and funding for hazard mitigation projects. The Finance Director is the chief fiscal officer of the City and is responsible for the accounting of all city funds and for showing all financial transactions for all commissions, boards, departments, offices, agencies, authorities, and other entities of the City, except the Board of Education. The Finance Director, along with the Treasurer, issues and markets all bonds and invests and reinvests idle funds of the City.

The City's Grants Office, within the Department of Planning and Development, searches federal, state and foundation funding sources for aid that will assist and support the city's quality of life. Staff uses the city's POCD, capital improvement plan, and the priorities of city commissioners to seek grants (including those from FEMA such as BRIC, FMA, and HMGP). City staff indicated that one impediment to capturing available grant funding is the need to compete with the neighboring City of New Haven for competitive grants and noted how they believe future collaboration between the two cities can help address the region's coastal risks and resiliency needs in a more holistic and comprehensive way.

The City of West Haven is fortunate in terms of having leaders and constituents who recognize the importance of hazard mitigation and in particular investing in stormwater management and coastal resilience projects. Among its most vulnerable assets is the City's wastewater treatment plant, which continues to be a major priority in terms of pursuing grant funding for necessary resiliency improvements. Another major concern is the expenditures required for sand management and replenishment along shoreline areas that continue to experience chronic long-term erosion.

4.1.4 Education and Outreach Capabilities

Education and outreach capabilities include the local programs and methods already in place that can be used to support mitigation activities. The following education and outreach capabilities are in place for West Haven:

- CERT Team
- Website
- Email Listserv
- Social Media
- Everbridge

4.2 Safe Growth Survey

As introduced and described in Chapter 6 (Capability Assessment), the Safe Growth Survey was used again during the plan update process to help evaluate the extent to which the City of West Haven is positioned to grow safely relative to its natural hazards. The survey covered six topic areas including the following:

- Land Use
- Transportation
- Environmental Management
- Public Safety
- Zoning Ordinance
- Subdivision Regulations
- Capital Improvement Program and Infrastructure Policies

The results of the Safe Growth Survey are summarized in Table 23. This includes describing how strongly current City staff agrees or disagrees with 25 statements as they relate to existing plans, policies, and programs for guiding future community growth and development, according to the following scale:

1=Strongly Disagree 2=Somewhat Disagree 3=Neutral 4=Somewhat Agree 5=Strongly Agree

Survey results provide some helpful information on how effective existing planning mechanisms are currently being used to address hazard mitigation and long-term risk reduction. The results were also

incorporated into the analysis of possible new mitigation actions for the City of West Haven to consider in terms improving or expanding upon its planning and regulatory capabilities to reduce the effects of natural hazards, including but not limited to the vulnerabilities identified in the risk assessment.

Table 23. Safe Growth Survey Results, City of West Haven.

COMPREHENSIVE/MASTER PLAN *(i.e., Plan of Conservation and Development)*					
Land Use					
1. The comprehensive/master plan includes a future land use map that clearly identifies natural hazard areas.	1	**2**	3	4	5
2. Current land use policies discourage development and/or redevelopment within natural hazard areas.	1	2	3	**4**	5
3. The comprehensive/master plan provides adequate space for expected future growth in areas located outside of natural hazard areas.	1	2	3	**4**	5
Transportation					
4. The transportation element limits access to natural hazard areas.	1	2	**3**	4	5
5. Transportation policy is used to guide future growth and development to safe locations.	1	2	**3**	4	5
6. Transportation systems are designed to function under disaster conditions (e.g., evacuation, mobility for fire/rescue apparatus, etc.).	1	2	3	**4**	5
Environmental Management					
7. Environmental features that serve to protect development from hazards (e.g., wetlands, riparian buffers, etc.) are identified and mapped.	1	2	3	**4**	5

COMPREHENSIVE/MASTER PLAN *(i.e., Plan of Conservation and Development)*						
8.	Environmental policies encourage the preservation and restoration of protective ecosystems.	1	2	3	**4**	5
9.	Environmental policies provide incentives to development that is located outside of protective ecosystems.	1	2	3	**4**	5
Public Safety						
10.	The goals and policies of the comprehensive/master plan are related to and consistent with those in the hazard mitigation plan.	1	2	3	**4**	5
11.	Public safety is explicitly included in the comprehensive/master plan's growth and development policies.	1	2	3	4	**5**
12.	The monitoring and implementation section of the comprehensive/master plan covers safe growth objectives.	1	2	3	**4**	5
ZONING BYLAWS						
13.	The zoning bylaws conform to the comprehensive/master plan in terms of discouraging development and/or redevelopment within natural hazard areas.	1	2	3	4	**5**
14.	The bylaws contain natural hazard overlay zones that set conditions for land use within such zones.	1	**2**	3	4	5
15.	Rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density of use.	1	2	3	**4**	5
16.	The bylaws prohibit development within, or filling of, wetlands, floodways, and floodplains.	1	2	3	4	**5**

COMPREHENSIVE/MASTER PLAN *(i.e., Plan of Conservation and Development)*						
SUBDIVISION REGULATIONS						
17.	The subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas.	1	2	**3**	4	5
18.	The regulations provide for conservation subdivisions or cluster subdivisions to conserve environmental resources.	1	**2**	3	4	5
19.	The regulations allow density transfers where hazard areas exist.	1	**2**	3	4	5
CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES						
20.	The capital improvement program limits expenditures on projects that would encourage development and/or redevelopment in areas vulnerable to natural hazards.	1	2	**3**	4	5
21.	Infrastructure policies limit the extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.	1	2	**3**	4	5
22.	The capital improvements program provides funding for hazard mitigation projects identified in the hazard mitigation plan.	1	2	**3**	4	5
OTHER						
23.	Small area or corridor plans recognize the need to avoid or mitigate natural hazards.	1	2	3	**4**	5
24.	The building code contains provisions to strengthen or elevate new or substantially improved construction to withstand hazard forces.	1	2	3	4	**5**
25.	Economic development and/or redevelopment strategies include provisions for mitigating natural hazards or	1	2	**3**	4	5

COMPREHENSIVE/MASTER PLAN *(i.e., Plan of Conservation and Development)*	
otherwise enhancing social and economic resiliency to hazards.	

4.3 NFIP Participation and Compliance

The City of West Haven has actively participated in the National Flood Insurance Program (NFIP) since 1979. The current effective Flood Insurance Rate Map (FIRM) is dated July 8, 2013. As of August 31, 2022, there are a total of 906 NFIP policies in force. The total annual premium is $873,275 for a total of $178,994,900 in coverage. A total of 516 claims amounting to approximately $5,086,847 have been paid to NFIP policyholders in West Haven since joining the program.[15] More information on NFIP-insured structures, including those that have been repetitively damaged by floods, is provided in Chapter 5 (Risk Analysis).

Table 243 describes the City of West Haven's participation and continued compliance in accordance with NFIP requirements and as specified in FEMA's 2022 Local Mitigation Planning Policy Guide.[16]

Table 24. NFIP Participation and Compliance, City of West Haven.

REQUIRED INFORMATION	RESPONSE
Adoption of NFIP minimum floodplain management criteria via local regulation.	Adopted via City Ordinance 04/11/1983. Regulations promulgated by the Planning Commission, in Article 7 of the City's Zoning Regulations (Section 70: Floodplain Management), revised 07/08/2013.
Adoption of the latest effective Flood Insurance Rate Map (FIRM), if applicable.	Adopted via the above cited Zoning Regulations (section 70.3: Floodplain Management District Maps). Latest effective FIRM is dated 7/8/2013.
Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.	Floodplain management is carried out jointly by the Engineering and Building Departments. There are three influencing regulations regarding flood plain development permitting: (1) City of West Haven Ordinance and the Planning Regulations

[15] FEMA NFIP, HUDEX Report, Policy and Loss Data by Community: https://nfipservices.floodsmart.gov//reports-flood-insurance-data
[16] Local Mitigation Planning Policy Guide. FEMA. April 2022. P. 26.

REQUIRED INFORMATION	RESPONSE
	thereunder enforced by the Flood Plain Manager; (2) CT State Building Code enforced by the Building Official; and (3) DEEP regulations where State property, State Funding, and other triggering circumstances control, and DEEP officials have approval authority. These three regulatory requirements overlap and intertwine and need to be evaluated to determine the most restrictive application of the three.
Appointment of a designee or agency to implement the addressed commitments and requirements of the NFIP.	Doug Colter, CFM – Flood Plain Manager
Description of how participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.	The City's Substantial Damage/Substantial Improvement process requires an application on City forms that asks for existing structure value, and an itemized cost estimate for construction work based on the FEMA recommended cost categories. Lacking other reliable data, City staff refer to the assessor's appraised value of the structure. They analyze and confirm that the scope of work is realistic for the values being estimated. They then check for any permits issued in the previous 12 months in respect of the City's 12-month look back window, which may add to the construction cost estimate value. Lacking other reliable elevation data, the City would ask for an elevation certificate.

West Haven's local floodplain management regulations and building code enforcement procedures include the following requirements that exceed minimum NFIP standards:

- Require freeboard (elevation requirements higher than the base flood)
- Require soil tests or engineered foundations
- Require compensatory storage for new developments
- Prohibit or minimize new development in floodplain areas
- Prohibit or enforce higher standards for critical facilities subject to flood hazards

- Provision for cumulative substantial damage/improvement requirements *(substantial damage lookback is 10 years; substantial improvement lookback is one year)*
- Provisions that protect natural and beneficial functions of floodplains

In terms of impediments to running an effective floodplain management program for the community, City staff indicated that West Haven lacks the necessary funding for a full-time flood plain manager and does not have funding for public outreach. It was also noted that the Regulations are not aligned with climate change projections, and large portion of developable land is at risk from seal level rise if it is permitted to be built to current regulations. It was suggested that a freeboard of three feet should be added to the 2013 mapping in coastal influenced areas. Many of the riverine areas do not have flood elevations calculated, so it was also suggested that the City should invest in flood map enhancement with calculated BFE's in the unlabeled areas. Furthermore, the City experiences localized flooding more than once per year in certain locations due to outdated storm water infrastructure, or complete lack of storm water infrastructure. A large portion of the city's lower income households are located where soil does not readily absorb storm water, and they are reliant on surface water runoff management which is lacking or outdated. Finally, improvements to the systematic verification of flood hazard zones and the applicability of the City's floodplain management regulations during the issuance of building permits was identified as an ongoing need.

The City of West Haven does not participate in the Community Rating System (CRS) but this is an activity that will continue to be explored as an option in the future.
Additional information on each jurisdiction's floodplain management program and participation in the NFIP is provided in Chapter 6 (Capability Assessment).

4.3.1 Improvement Opportunities

Although the City of West Haven has relatively high capabilities and is well-positioned to mitigate the natural hazard risks faced by the community, it can expand and improve on the capabilities described in Chapter 6 (Capability Assessment) and this annex. The City is aware of each it's strengths and weaknesses in terms of mitigating risk. Specific opportunities to address existing gaps or limitations in local capabilities to reduce risk have been identified for each capability type and are further described below. Each of these opportunities were then considered by the City during the plan update process as potential new mitigation actions to be included in the updated Mitigation Strategy.

Planning and Regulatory Capabilities

- Conduct a detailed assessment of all relevant zoning bylaws, land use regulations, and the City's permit review process to identify the amendments/improvements needed to better address natural hazards, climate change, and projected future conditions (including coastal vulnerability but also extreme heat, heavy downpour events, etc.). This includes the incorporation of nature-

based solutions such as living shorelines, low impact development, and other green infrastructure techniques into existing rules and regulations where most appropriate.

- Increase the integration of hazard mitigation and climate resiliency into the City's existing CIP planning and project lists. Examples include (1) making resilience a key objective/priority for the City's strategic, operational, and fiscal policies for municipal infrastructure and asset management; and (2) developing methods to help ensure the City limits expenditures on projects or infrastructure improvements that would encourage development and/or redevelopment in areas at high risk to natural hazards.
- Be opportunistic with addressing hazard mitigation and resilience through future amendments/updates and implementation of the City's POCD, especially as it relates to hazards beyond coastal flooding and sea level rise. This includes land use policies that will discourage development and/or redevelopment within other natural hazard areas as well as updated environmental management policies that can reduce risk or provide incentives to infrastructure and development that is located outside of high risk areas and/or protective ecosystems.
- Coordinate between to align the City's economic development plans, goals and strategies with long-term community resilience and this hazard mitigation plan.

Administrative and Technical Capabilities

- Increase current staff capacity to pursue and implement hazard mitigation, climate adaptation, and other community resilience building activities through additional hires as necessary. For example, rehiring an Assistant Engineer to support the City Engineer would help improve and expedite services to the community while also affording Public Works staff to support more hazard mitigation and resilience building activities across the city.
- Build internal staff capacity to identify and pursue external sources of grant funding for mitigation projects through increased opportunities for training/professional development and the ability to invest more time on grant writing, grants management, and related administrative tasks in coordination with the City's Grants Office.
- Continue coordinating with the University of New Haven on issues and solutions related to stormwater management.

Financial Capabilities

- Maximize opportunities through the City's budgeting and CIP process to help fund priority hazard mitigation and climate adaptation projects, especially those focused on coastal resilience and stormwater drainage improvements, and when a local cost-share increases the City's chances for a grant award.
- Leverage the City's Grants Office to continue the pursuit of external funding sources for hazard mitigation and climate adaptation projects.

- Increase coordinate with SCRCOG and neighboring communities in the region (especially New Haven) as it relates to positioning the City to capture future grant funding for regional hazard risk reduction projects that provide co-benefits across jurisdictional boundaries.

Education and Outreach Capabilities

- Increase use of the City's website to support low-cost public education and outreach initiatives on building community resilience to hazards as well as individual mitigation actions for homeowners, business owners, etc.
- Expand opportunities for public/private partnerships to support public education and community outreach initiatives related to hazard awareness and risk reduction efforts.
- Identify and seek to address any unmet needs related to targeted outreach and education for the community's more vulnerable populations (i.e., environmental justice communities, residents with special needs, property owners in high risk hazard areas, new residents who are unfamiliar with Milford's coastal hazards, etc.).

Possible New Actions Related to NFIP Participation and Compliance

- Coordinate with the State NFIP Coordinator on possible updates or revisions to local floodplain management regulations based on CT DEEP's most current Model Floodplain Management Regulations (which are routinely being updated as needed).
- Add 3 feet of freeboard to coastal influenced flood zones for all new construction.
- Develop BFE for riverine areas that currently do not have detailed studies available.
- Add localized storm flood areas to the flood maps.
- Extend the look back period for SI/SD determinations to 10 years.
- Label all escape routes.
- Label historic flood experiences on street signs.
- Require all substantially damaged properties to record the incident on the land records.
- Prohibit development in the Otherwise Protected Areas.
- Enforce the floodplain management regulations on Public Works and Utility projects via an ordinance amendment that requires the City to obtain permits for its own work.
- Require all public works improvements to observe the 500-year flood elevation
- Require all Utility improvements to comply with the elevation regulations for new construction, regardless of value.
- Instruct the Building Official to comply with ISO surveys as required, and to make it is a priority to improve the City's CRS score and class rating. This should be evaluated annually with a report to the City Council.
- Require a staff member to be designated as the Floodplain Manager, and such manager shall have CFM Certification or be a licensed Professional Engineer with flood management training.
- Maintain digital FEMA elevation certificates for all construction in the floodplain.

- Evaluate and consider the adoption of "higher standards" that are proven to reduce flood damage such as additional freeboard, setbacks, limitations on lower-level enclosure size, and the prohibition on use of fill.
- Evaluate current floodplain management activities and coordinate with Insurance Services Office, Inc. to apply for participation in FEMA's Community Rating System (CRS).
- Evaluate permit application forms to determine possible modifications focused on flood hazard prevention. Develop a checklist for review of building/development permit plans and for inspection of development in floodplains (a model is available).
- Establish a goal to have each plan reviewer and building inspector attend a related training periodically (for example, ASFPM's Annual National Conference, chapter conferences, webinars, etc.).
- Sponsor a periodic NFIP workshop for local surveyors and builders.
- Maintain a map of areas that flood frequently (e.g., areas where repetitive loss properties are located) and prioritize those areas for inspection immediately after the next flood. If outside FEMA special flood hazard areas, consider requiring existing NFIP regulatory standards (compliance with existing ordinance) through overlay zoning, etc.
- Hold informative work sessions for newly elected officials and new appointees to planning commissions and appeals/variance boards, to provide an overview of floodplain management, the importance of participating in the NFIP, and the implications of failing to enforce the requirements of the program or failing to properly handle variance requests.
- Develop a local Post-Disaster Substantial Damage Plan to assist with implementing substantial damage provisions of the NFIP, the State Building Code, and local floodplain regulations (guidance available).
- Obtain FEMA's Substantial Damage Estimator and attend training to be prepared to use it when damage occurs; develop mutual aid agreements with other jurisdictions to augment local inspection personnel after major disasters.
- Conduct a review of other regulatory programs and planning tools, such as the comprehensive plan and zoning ordinance, and report on opportunities to improve consistency with the objectives of floodplain management.
- Maintain supplies of FEMA/NFIP materials to help property owners evaluate measures to reduce potential hazard damage. Make available in public buildings, local library, website, etc. and inform people who they can call to learn more information.
- Send information about the flood hazard and promote the availability of flood insurance through regularly scheduled mailings (such as the dissemination of handouts with annual property tax notices, utility bills, etc.).
- Develop handouts for permit applications on specific issues such as installation of manufactured homes in flood hazard areas according to HUD's installation standards (examples available), or guidance on improving/repairing existing buildings to better withstand potential hazards.

5. Mitigation Actions

Mitigation actions are projects or activities identified to reduce current and future vulnerabilities identified through the process of developing this 2023 SCRCOG Mitigation Plan Update. The first table in this section identifies the status of the mitigation actions included in the 2016 version of this plan. Besides current status, actions brought forward to this 2023 plan are identified in the Keep for Plan Update? column. The second table includes all the actions, and their essential details, for this 2023 SCRCOG Mitigation Plan Update. The actions are also listed in the Mitigation Action Tracker (a Google Sheet spreadsheet) maintained by SCRCOG. These actions were prioritized by the Municipality according to the criteria detailed in the main body of the plan.

Table 25. Status of Previous Mitigation Actions – City of West Haven.

Action #	Action Title	Action Description	Current Status	Status Description/Explanation	Keep for Plan Update?
1	Install Mechanized Tide Gates at Captain Thomas Boulevard on Cove River	Existing tide gates are deteriorated and not functioning properly. New self-regulating gates will provide better flow both upstream and downstream to reduce flooding and environmental enhancement of the tidal marsh.	Partially Completed / In Progress	Project is in construction and will be completed by end of 2022.	NO (see explanation at left)
2	Upgrade Sewage Pump Stations	Two pump stations are on the beach and below the 100-year base flood elevation. Six others are below the 100-year base flood elevation. These stations need to be upgraded to make them functional during storm events.	Partially Completed / In Progress	Consultant on board; design for 3 pump stations will start this year to be followed soon thereafter with construction phase. City will continue to implement these upgrades 2-3 at a time.	YES (see Action #1)
3	Outfall Pipe Reconstruction	Existing outfall pipe from Water Pollution Control Plant built in 1968	Partially Completed	Preliminary design is ongoing, and construction will start in 2025 subject	YES (see Action #2)

Action #	Action Title	Action Description	Current Status	Status Description/Explanation	Keep for Plan Update?
		is in danger of damage due to exposure to daily tidal flows and storms and requires lowering to be under the seabed and needs enlarging to carry flows due to expected sea level rise.	/ In Progress	to funding availability. City has Clean Water Fund Loan ($28M) but is in search of additional grant funding to support this project.	
4	Raise Beach Street Phase 2	Phase 2 will raise the Beach Street from Phase 1 terminus to Morse Avenue. This will provide access during storms and reduce flooding in the area.	Partially Completed / In Progress	Construction will start in October 2022 and completion expected in December 2023.	NO (see explanation at left)
5	Nourish Beach and Dune Restoration at Savin Rock Beach	Construct dune and nourish beach to protect the properties from frequent flooding during storms. Install crossovers on the dune for beach access and prevent dune damage.	Partially Completed / In Progress	Beach nourishment is complete, but the City is still looking for funding for dune restoration.	YES (see Action #3)
6	Evaluate Road Access to Promote Economic Development of Commercial Properties in Floodplain	Evaluate access during the 100-year flood to commercial districts along Beach Street and Captain Thomas Boulevard. Determine inaccessible areas under current conditioning. Evaluate steps to provide access. Examine feasibility and costs - make recommendations.	Delayed	Not a high priority at this time. Will be evaluated after storm water study is done in year 2026.	YES (see Action #4)
7	Property Buyout 3rd Avenue Extension and	Buy properties on 3rd Avenue Extension, Blohm Street in the Old	Partially Completed	36 homes removed so far, 8 more in the demolition queue.	YES (see Action #5)

Action #	Action Title	Action Description	Current Status	Status Description/Explanation	Keep for Plan Update?
	related repetitive loss properties	Field Creek Floodplain and demolish houses.	/ In Progress		
8	Beach and Dune Management	Develop a beach and dune management plan to keep them in good condition for protection from flood hazards.	Delayed	Lack of funding but grants continue to be pursued.	YES (see Action #6)
9	Sediment Basin at Peck Avenue	Construct sediment basin at Peck Avenue crossing of Old Field Creek to trap sediments.	Completed	Project complete.	NO (see explanation at left)
10	Bayview Condos and First Avenue East Shoreline Green Infrastructure	Bayview Condominiums sit on a bluff with steep eroding slope causing hazard to the condominium. Slope stabilization with green infrastructure will reduce the hazard.	Delayed	Private property owners will pursue the required improvements with the City's support.	YES (see Action #7)
11	Study, design, and construct Cove River channel and retention basin at Greta Street and West Spring Street	West Spring Street and Greta Street intersection floods during rainstorms and affects adjacent properties. Upstream retention basin will reduce flooding.	Partially Completed / In Progress	City has been awarded NFWF funding to study the cove river issues and develop a remediation plan. The City will use this plan to apply for design funds, followed by an application for construction funding up to $10 million.	YES (see Action #8)
12	Improve bridge and channel on Cove River at Main Street and Painter Drive	Reconstruct bridge and lower utilities below the bed for better flow conveyance. Improve channel and enlarge culvert under driveway to apartments.	Delayed	Lack of funding but grants continue to be pursued.	YES (see Action #9)

Action #	Action Title	Action Description	Current Status	Status Description/Explanation	Keep for Plan Update?
13	Implement Woodruff Street Seawall Repair and Upgrade	Raise 100' of seawall by 2' and stabilize backyard to reduce erosion. This section gets damaged, and yard eroded during storms.	Partially Completed / In Progress	This action is near completion.	NO (see explanation at left)
14	Implementation of Floodplain Development Fee	Research BMPs of other municipalities using development fees. Develop draft concept for program. Review with local officials and business to determine how project could work for West Haven and appropriate fees. Work with Council and administration to implement development fee.	Partially Completed / In Progress	The City has implemented Storm Water Permit Fees and will examine the adoption of a Storm Water Authority to create grant matching fund revenue later this year.	YES (see Action #10)
15	Adoption of Changes to Zoning Regulations	Review BMPs for relaxing height restrictions in the 100-year floodplain. Consider changes to "lookback period" in substantial improvements definition. Review BMPs of neighboring municipalities regarding freeboard in excess of 1 foot. Final step would be to develop list of text amendments, review with Planning and Zoning Commission, and schedule for public hearing and adoption.	Delayed	Staffing issues have delayed this action.	YES (see Action #11)
16	Installation of Signs to Educate the Public	Develop educational sign concept. Identify key locations. Develop design. Obtain public and	Delayed	Staffing issues have delayed this action.	YES (see Action #12)

Action #	Action Title	Action Description	Current Status	Status Description/Explanation	Keep for Plan Update?
		commission review. Have signs manufactured. Install signs in key locations. Publicize through press releases and city website.			
17	Join CRS (CRP Action Pr6)	Assess joining the FEMA Community Rating System (CRS) Program.	Delayed	Staffing issues delayed this action.	YES (see Action #13)
18	Coastal Resilience Education and Training for City Staff (CRP Action Ed1)	Perform education and training programs for municipal personnel and staff to identify nexuses between their areas of responsibility and coastal resilience	Delayed	Staffing issues have delayed this action.	YES (see Action 14)

Table 26. Updated Mitigation Actions (2023-2028) – City of West Haven.

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
1	Upgrade Sewage Pump Stations	Two pump stations are on the beach and below the 100-year base flood elevation. Six others are below the 100-year base flood elevation. These stations need to be upgraded to make them functional during storm events.	$18,700,000	FEMA HMA (BRIC, HMGP, FMA); CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
2	Outfall Pipe Reconstruction	Existing outfall pipe from Water Pollution Control Plant built in 1968 is in danger of damage due to exposure to daily tidal flows and storms and requires lowering to be under the seabed and needs enlarging to carry flows due to expected sea level rise.	$77,000,000	FEMA HMA (BRIC, HMGP); EPA 319; CIRCA MRG; CWSRF; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	2023-2024	High
3	Dune Restoration at Savin Rock Beach	Construct/restore dune to protect the properties from frequent flooding during storms. Install crossovers on the dune for beach access and prevent dune damage.	$6,000,000	FEMA HMA (BRIC, HMGP); CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	2023-2024	High
4	Evaluate Road Access to Promote Economic Development of Commercial	Evaluate access during the 100-year flood to commercial districts along Beach Street and Captain Thomas Boulevard. Determine inaccessible areas under current	$65,000	FEMA HMA (BRIC, HMGP, FMA); CIRCA MRG;	Planning and Development	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
	Properties in Floodplain	conditioning. Evaluate steps to provide access. Examine feasibility and costs - make recommendations.		DEEP Climate Resilience Fund; Municipal CIP Budget			
5	Property Buyout 3rd Avenue Extension and related repetitive loss properties	Continue to acquire properties on 3rd Avenue Extension and Blohm Street in the Old Field Creek Floodplain and demolish houses.	$2,000,000	FEMA HMA (BRIC, HMGP, FMA)	DPW / Planning and Development	2018 - 2023	Medium
6	Beach and Dune Management	Develop a beach and dune management plan to keep them in good condition for protection from flood hazards.	$50,000	FEMA HMA (BRIC, HMGP); CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	January 2020 - October 2020	Medium
7	Bayview Condos and First Avenue East Shoreline Green Infrastructure	Bayview Condominiums sit on a bluff with steep eroding slope causing hazard to the condominium. Slope stabilization with green infrastructure will reduce the hazard.	$500,000	FEMA HMA (BRIC, HMGP); CIRCA MRG; DEEP Climate	Public Works	June 2019 - June 2020	Medium

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
				Resilience Fund; Municipal CIP Budget			
8	Study, design, and construct Cove River channel and retention basin at Greta Street and West Spring Street	West Spring Street and Greta Street intersection floods during rainstorms and affects adjacent properties. Upstream retention basin will reduce flooding.	$2,500,000	City has applied for USFWS grant	Public Works	2023-2024	Medium
9	Improve bridge and channel on Cove River at Main Street and Painter Drive	Reconstruct bridge and lower utilities below the bed for better flow conveyance. Improve channel and enlarge culvert under driveway to apartments.	$2,000,000	FEMA HMA (BRIC, HMGP); IIJA BIP/AOP; CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works / State DOT	2023-2024	Medium
10	Update Flood and Erosion Control Board to Storm Water Authority	Based on new state legislation, perform study to create a Storm Water Agency for the City to handle flooding and stormwater infrastructure issues, including the oversight of fee-based revenue	$120,000	FEMA HMA (BRIC, HMGP); CIRCA MRG; DEEP Climate	Planning and Development	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
		streams (e.g., storm water utility) that can provide grant matching funds for necessary flood mitigation and stormwater infrastructure improvements.		Resilience Fund; Municipal CIP Budget			
11	Adoption of Changes to Zoning Regulations	Review BMPs for relaxing height restrictions in the 100-year floodplain. Consider changes to "lookback period" in substantial improvements definition. Review BMPs of neighboring municipalities regarding freeboard in excess of 1 foot. Final step would be to develop list of text amendments, review with Planning and Zoning Commission, and schedule for public hearing and adoption.	$25,000	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	Low
12	Installation of Signs to Educate the Public	Develop educational sign concept. Identify key locations. Develop design. Obtain public and commission review. Have signs manufactured. Install signs in key locations. Publicize through press releases and city website. Emergency Management Director to plan and label all flood hazard	$25,000	FEMA HMA (BRIC, HMGP); CIRCA MRG; DEEP Climate Resilience Fund;	Emergency Management	2023-2024	Low

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
		areas for the safest escape route, install traffic signs. Mark historic flood elevations on landmark signs.		Municipal CIP Budget			
13	Join CRS (CRP Action Pr6)	Evaluate current floodplain management activities and coordinate with Insurance Services Office, Inc. to apply for participation in FEMA's Community Rating System (CRS).	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	Low
14	Coastal Resilience Education and Training for City Staff (CRP Action Ed1)	Perform education and training programs for municipal personnel and staff to identify nexuses between their areas of responsibility and coastal resilience.	Low	Municipal Operating Budget / Staff Time; NROC	Planning and Development	2023-2024	Low
15	Flooding and each erosion control on Colonial Blvd and Lake Street at intersection with Ocean Ave	Study and design improvements and construct new outfalls and related improvements.	$3.3 million	FEMA HMA (BRIC, HMGP, FMA); CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	June 2023 to December 2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
16	Flood Hardening for Water Pollution Control Facility (WPCF).	Study, design, and implement flood hardening for water pollution control plant and main pump station.	$14,000,000	FEMA HMA (BRIC, HMGP, FMA); CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	July 2022 to December 2025	High
17	Underpass drainage for Campbell and Washington Avenue	Study, design and implement flood control for the underpasses.	$3,000,000	FEMA HMA (BRIC, HMGP, FMA); CIRCA MRG; DEEP Climate Resilience Fund; Municipal CIP Budget	Public Works	July 2023 to December 2025	High
18	Tidal River Bank Erosion	Old Kimberly Ave bridge abutment requires bank stabilization.	$14,000	TBD. Need design and permit funding.	Engineering	August 2023	Medium

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
19	Lydia St Basin Area	Redesign Lydia St Basin area to manage storm water and relieve frequent flooding issues due to inadequate storm water infrastructure.	$669,900	DEEP grant applied for to pay for Engineering, FEMA BRIC grant to be pursued, with ARPA matching funds.	Engineering	July 2023	High
20	RR Underpass Flooding	Address storm water deficiencies at RR underpasses.	$5,000,000	Engineering study funds to come from ARPA, will need construction funding grants (TBD).	Engineering	2024	High
21	Coordinate with CIRCA on Resilience Opportunity Areas	Work with CIRCA to determine whether the affordable housing and TOD resilience opportunity areas identified by Resilient Connecticut should be scoped for project development.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	Medium

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
22	Update Floodplain Management Regulations	Complete necessary updates and revisions to local floodplain management regulations (Section 70 of Article 7 of the City's Zoning Regulations) based on ASFPM and DEEP's best practices model Floodplain Management Regulations and other accommodations of climate change predictions. Current regulations need to be professionally updated and reworded to clarify the City's requirements and standards and minimize ongoing challenges to floodplain management regulations. This includes but is not limited to the following updates/revisions (Actions 22a through 22d):	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
22a	Adopt higher elevation standard (freeboard) for coastal areas	Add 3 feet of freeboard to coastal influenced flood zones for all new construction.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
22b	Adopt higher standards for Substantial	Extend the look back period for SI/SD determinations to 10 years.	N/A	Municipal Operating	Planning and Development	2023-2024	High

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	Improvement / Substantial Damage Determinations	Require all lateral additions to be elevation compliant.		Budget / Staff Time			
22c	Adopt Higher Regulatory Standards for DPW Projects	Require all public works improvements to observe the 500-year flood elevation.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
22d	Adopt Higher Regulatory Standards for Utility Projects	Require all utility improvements to comply with the elevation regulations for new construction, regardless of value.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
23	Apply Floodplain Management Regulations to All City Projects	Enforce the floodplain management regulations on Public Works and Utility projects via an ordinance amendment that requires the City to obtain permits for its own work.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
24	Substantial Damage Records	Require all substantially damaged properties to have incidents recorded on the land records.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
25	Update FIRMs with Detailed Studies	Develop BFE for riverine areas that currently do not have detailed studies available.	High	FEMA Risk MAP; CT DEEP	Engineering	2023-2024	Medium
26	BCEGS Participation and Compliance	Encourage the Building Official to maintain the City's BCEGS score	N/A	Municipal Operating	Planning and Development	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
		and make it part of annual review process.		Budget / Staff Time			
27	Formal Designation and Training for the City's Floodplain Manager	Require a staff member to be designated as the Floodplain Manager, and such manager shall have CFM Certification or be a licensed Professional Engineer with flood management training.	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
28	Digital Elevation Certificates	Maintain digital FEMA elevation certificates for all construction in the floodplain.	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
29	Update Permit Application Forms for Improved Floodplain Management	Evaluate permit application forms to determine possible modifications focused on flood hazard prevention. Develop a checklist for review of building/development permit plans and for inspection of development in floodplains (a model is available).	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
30	Floodplain Management Training for City Staff	Establish a goal to have each plan reviewer and building inspector attend a related training periodically (for example, ASFPM's Annual National Conference,	N/A	Municipal Operating Budget / Staff Time	Planning and Development / Building Department	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
		chapter conferences, webinars, etc.).					
31	NFIP Workshop	Sponsor a periodic NFIP workshop for local surveyors and builders.	Low	Municipal Operating Budget / Staff Time	Planning and Development / Building Department	2023-2024	High
32	Flood Hazard Map Maintenance	Maintain a map of areas that flood frequently (e.g., areas where repetitive loss properties are located) and prioritize those areas for inspection immediately after the next flood. If outside FEMA special flood hazard areas, consider requiring existing NFIP regulatory standards (compliance with existing ordinance) through overlay zoning, etc.	Low	Municipal Operating Budget / Staff Time	DPW / Planning and Development	2023-2024	High
33	Floodplain Management Session for Elected and Appointed Officials	Hold informative work sessions for newly elected officials and new appointees to planning commissions and appeals/variance boards, to provide an overview of floodplain management, the importance of participating in the NFIP, and the implications of failing to enforce the requirements of the program or	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
		failing to properly handle variance requests.					
34	Improve Consistency Across Plans for Floodplain Management	Conduct a review of other regulatory programs and planning tools, such as the comprehensive plan and zoning ordinance, and report on opportunities to improve consistency with the objectives of floodplain management.	N/A	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
35	Promote Flood Risk Awareness and Mitigation	Maintain supplies of FEMA/NFIP materials to help property owners evaluate measures to reduce potential hazard damage. Make available in public buildings, local library, website, etc. and inform people who they can call to learn more information.	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
36	Promote Flood Insurance	Send information about the flood hazard and promote the availability of flood insurance through regularly scheduled mailings (such as the dissemination of handouts with annual property tax notices, utility bills, etc.).	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High

Action #	Action Title	Action Description	Estimated Cost	Potential Funding Source	Lead Department	Implementation Schedule	Priority
37	Develop Supplemental Mitigation Handouts for Permit Application Process	Develop handouts for permit applications on specific issues such as installation of manufactured homes in flood hazard areas according to HUD's installation standards (examples available), or guidance on improving/repairing existing buildings to better withstand potential hazards.	Low	Municipal Operating Budget / Staff Time	Planning and Development	2023-2024	High
38	Develop a Post-Disaster Substantial Damage Plan	Develop a local Post-Disaster Substantial Damage Plan to assist with implementing substantial damage provisions of the NFIP, the State Building Code, and local floodplain regulations (guidance available).	Low	Municipal Operating Budget / Staff Time	Emergency Manager	2023-2024	Medium
39	Enhance Substantial Damage Determination Capabilities	Obtain FEMA's Substantial Damage Estimator and attend training to be prepared to use it when damage occurs; develop mutual aid agreements with other jurisdictions to augment local inspection personnel after major disasters.	Low	Municipal Operating Budget / Staff Time	Emergency Manager	2023-2024	High