APPENDIX A

MEDIA ANNOUNCEMENTS REGARDING PLAN UPDATE



Superstorm Sandy of August 2012, Winter Storm Nemo of February 2013, and the winter storms of January-February 2015, are recent events that caused severe damage and resulted in Federal disaster declarations for Connecticut. Natural disasters like flooding, heavy snow, wind, wildland fires cause damage to property, disrupt our daily routines, close our schools and businesses, and jeopardize the health and safety of citizens.

What can be done to minimize our vulnerabilities to natural hazards? The Southeastern Connecticut Council of Governments (SCCOG) is updating its regional hazard mitigation plan to make sure it continues to be relevant and useful. This plan discusses the occurrence and consequences of floods, winter storms, tornadoes, hurricanes and tropical storms, wildfires, earthquakes, and dam failure. The plan identifies activities that communities can perform before natural hazards occur in order to minimize property damage, risk of life, and the costs that are shared by all. This update will identify significant changes in risks, vulnerabilities, capabilities, and mitigation actions that have developed since adoption of the previous plan in 2012.

The Council of Governments is offering two opportunities for the public to attend an informational meeting where regional residents can learn about the plan, ask questions, and provide input:



Senate Bill Dies; Walmart Racism; Baby's Overdose Treatment: Patch Morning Briefing

Also: Harry Potter to the rescue, world's best dog and Tropical Storm Don brews.

- Monday, November 28 at 7 PM in the Groton Town Library (52 Newtown Road)
- Thursday, December 1 at 7 PM in the SCCOG office in Norwich (5 Connecticut Avenue)

Additionally, those interested are encouraged to share their thoughts through an online survey available at www.surveymonkey.com/r/SCCOGHazard.

Comments or questions can also be emailed to the SCCOG office at office@seccog.org.

For more information, please contact the SCCOG office at (860) 889-2324.

Send Patch your feedback:

Originally published November 4, 2016. This post is contributed by a community member. The views expressed in this post are the author's. Registered users are welcome to post on Patch.

More from New London Patch



WOW House: Dutch Colonial Offers In-Ground Pool, Convenient Location In New London



The Most Expensive Listings in New London and Nearby

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Email or Phone

Password

Forgot account?

NOV
28

Public input sought on regional hazard-mitigation plan

Public · Hosted by Southeastern Connecticut Council of Governments

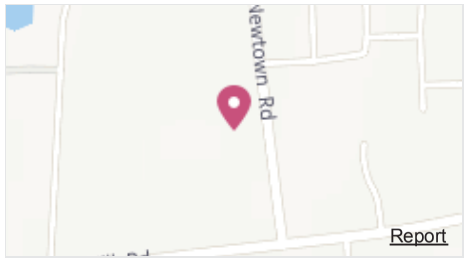
Interested | Going | ...

Monday, November 28, 2016 at 7:00 PM - 9:00 PM EST
about 7 months ago

Groton Public Library
52 Newtown Rd, Groton, Connecticut 06340

Show Map

Hide Map



Library

(860) 441-6750
reference@groton-ct.gov

Get Directions

About | Discussion

0 Went · 0 Interested
Share this event with your friends

Details

The Southeastern Connecticut Council of Governments will host two meetings to hear public input about updating its regional hazard-mitigation plan.

The meetings will take place at 7 p.m. Nov. 28 at the Groton Public Library, 52 Newtown Road, and at 7 p.m. Dec. 1 in the SCCOG office at 5 Connecticut Ave., Norwich.

Milone & MacBroom, the consulting firm hired by SCCOG, is working to create a plan to deal with natural disasters that is both relevant and useful, the company said in a news release Friday. The plan will address the consequences of floods, earthquakes, dam failures and other extreme events, identifying activities communities can take to minimize property damage, risk of life and costs. The update will identify significant changes in risks, vulnerabilities, capabilities and mitigation actions that have developed since the previous plan was written in 2012.

The meetings will provide information about the plan to the public, and give local residents a chance to offer input. People also are encouraged to comment through an online survey at www.surveymonkey.com/r/SCCOGHazard.

Comments and questions can be sent to office@seccog.org. For more information, call (860) 889-2324.

About Southeastern Connecticut Council of Governments



Southeastern Connecticut Council of Governments

Government Organization · Norwich, Connecticut

The Southeastern Connecticut Council of Governments (SCCOG) is a public agency with representatives from 22 towns, cities and boroughs.

About the Venue



2,173 Likes

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More Events at Groton Public Library

Hazard mitigation plan for region being updated

Published November 28. 2016 9:15PM | Updated November 28. 2016 9:26PM

By **Judy Benson** (/apps/pbcs.dll/personalia?ID=j.benson) Day staff writer

j.benson@theday.com (mailto:j.benson@theday.com) BensonJudy (http://www.twitter.com/BensonJudy)

Groton — To make the region less vulnerable to hurricanes, floods and severe winter storms, local officials are updating a hazard mitigation plan that will identify actions that should be taken to reduce the most significant risks.

"It's not just that there are risks, it's also that they take a financial toll on us," said David Murphy, senior project manager at Milone & MacBroom, a Cheshire-based engineering firm.

The firm has been hired by the Southeastern Connecticut Council of Governments to update its hazard mitigation plan, created in 2012 and set to expire next October. As part of the process of creating a new plan, Murphy led a public informational meeting about the current plan and goals for the new one at the public library on Monday. A second meeting is scheduled for 7 p.m. Thursday at the SCCOG offices in Norwich.

The public is also invited to give input in an online survey at www.surveymonkey.com/r/SCCOGHazard. Comments and questions can also be sent to office@sccog.org.

The plan, Murphy said, has been required by the Federal Emergency Management Agency since 2000 as a condition of receiving grants for hazard mitigation projects such as replacing undersized culverts, stabilizing riverbanks, buying properties vulnerable to flooding and enhancing or building new standby power supplies. The law also requires plans be updated every five years. The new plan, he added, will be the region's third.

James Butler, executive director of SCCOG, said that while the new plan is being written for the entire 22-town region the agency serves, it will include chapters specific to each town.

"There's a lot of time being spent with each municipality, with people in the building, wetlands, emergency management, planning and public works departments," he said.

The timeline for the new plan, Murphy said, is to send a draft version to the state for review by next spring, make revisions, and send a final version to FEMA before next October.

As a result of the current plan, he said, several communities replaced culverts, and upgraded sewage treatment plants to reduce vulnerability to flooding and power outages. Norwich bought the Nutmeg Companies property, which had flooded repeatedly, enabling that business to relocate, and the site of the plant became open space.

But some of the recommendations of the current plan have not yet been acted on, Murphy said, including home buyouts in vulnerable neighborhoods.

“That hasn’t happened yet,” he said.

The new plan will identify risks at the region’s unique facilities, including the Naval Submarine Base, Millstone and Electric Boat. A new element, Murphy said, will include risks to historic and cultural resources.

“These resources can be very much at risk, but very hard to mitigate” by elevating or flood-proofing structures, he said. Sea level rise due to climate change was included in the 2012 plan, and will also be included in the new version, he said.

Specific areas that will be examined include tidal flooding on Poquonnock, Clark and Horton coves on the Thames River; the Yantic River corridor in Bozrah and Norwich; and the Groton and Stonington sides of Mystic, where “chronic flooding is already occurring,” Murphy said. Other vulnerable areas include Niantic, coastal Waterford, Bank Street in New London, Latimer Brook in East Lyme and Shewville and Choat brooks in Preston.

Strategies recommended to reduce risk may include placing utilities underground, strengthening shelters and other critical facilities, creating localized power grids, acquiring and preserving vulnerable lands and increasing tree maintenance, Murphy said. FEMA, he added, is requiring that the plans describe concrete steps that would be taken.

“The actions have to be very specific, with time frames and funding sources,” he said.

j.benson@theday.com

APPENDIX B

DATA COLLECTION AND MEETING MINUTES



Input Needed for SCCOG Hazard Mitigation Plan Update

Superstorm Sandy of August 2012, Winter Storm Nemo of February 2013, and the winter storms of January-February 2015, are recent events that caused severe damage and resulted in Federal disaster declarations for Connecticut. Natural disasters like flooding, heavy snow, wind, wildland fires cause damage to property, disrupt our daily routines, close our schools and businesses, and jeopardize the health and safety of citizens.

What can be done to minimize our vulnerabilities to natural hazards? The Southeastern Connecticut Council of Governments (SCCOG) is updating its regional hazard mitigation plan to make sure it continues to be relevant and useful. This plan discusses the occurrence and consequences of floods, winter storms, tornadoes, hurricanes and tropical storms, wildfires, earthquakes, and dam failure. The plan identifies activities that communities can perform before natural hazards occur in order to minimize property damage, risk of life, and the costs that are shared by all. This update will identify significant changes in risks, vulnerabilities, capabilities, and mitigation actions that have developed since adoption of the previous plan in 2012.

The Council of Governments is offering two opportunities for the public to attend an informational meeting where regional residents can learn about the plan, ask questions, and provide input:

- Monday, November 28 at 7 PM in the Groton Town Library (52 Newtown Road)
- Thursday, December 2 at 7 PM in the SCCOG office in Norwich (5 Connecticut Avenue)

Additionally, those interested are encouraged to share their thoughts through an online survey available at www.surveymonkey.com/r/SCCOGHazard.

Comments or questions can also be emailed to the SCCOG office at office@seccog.org.

For more information, please contact the SCCOG office at (860) 889-2324.

Meeting Minutes
Update of Hazard Mitigation Plan for Southeastern Connecticut
Public Information Meeting
November 28, 2016

A meeting to present the planning process and seek public input was held at 7 PM on November 28, 2016 in the Town of Groton Library. Attendees included:

- David Murphy, PE, CFM, Milone & MacBroom, Inc.
- Jim Butler, AICP, Director, Southeastern Connecticut Council of Governments
- Matt Allen, Town of Groton Planning Department
- Bonnie Nault, Groton Town Council
- Judy Benson, The Day
- Jim O'Donnell, CIRCA
- Jennifer O'Donnell, resident of Noank
- Katie Lund, resident of Mystic
- Carol Zeilman, Groton CERT and resident
- Suzanne Roy, resident of Groton
- Peter Georgetti, resident of Groton

An open discussion followed the presentation. Topics and questions included the following:

- Will the hazard mitigation plan consider methods of natural flood protection and erosion control like living shorelines? Mr. Murphy answered that the current plan (adopted in 2012) considers these, but they were called "soft shoreline" solutions back then. The updated plan will continue to consider natural protection, which is typically cited as "green infrastructure," or "green/gray" for hybrid approaches.

- Why is the City of Groton participating separately than the Town? Mr. Butler provided an explanation of the different municipalities and their separate membership in the Council of Governments. Mr. Murphy added that each municipality would need to apply for its own mitigation grants after the plan is updated.

- Can anything be recommended to address earthquakes regionally? Mr. Murphy explained that most earthquake recommendations are town or site specific, but some regional approaches to mitigating earthquake losses could include sharing of resources and ensuring that backup facilities are in place. He noted that the critical facilities assessment being conducted by the COG is another example of what could be done regionally.

- Ms. Benson asked which actions from the current plan have been completed, and which have not. Mr. Murphy responded that this varies based on municipality, but some of the actions that have been completed are capital improvement projects and resilience upgrades to wastewater treatment facilities. He noted that one are that all municipalities have not made progress is in the promotion of building elevations, floodproofing, or acquisitions. However, he noted, the Nutmeg Industries property in Norwich was acquired using mitigation funds.

- Mr. Butler described some of the regional hazard mitigation and disaster-related grants secured by his office, including the critical facilities assessment and the FEMA Community Rating System (CRS) assistance.

- Ms. Nault inquired about the cost-sharing of this planning grant. Mr. Butler explained that the COG is required to provide a 25% match, and this is being met with SCCOG funds and using in-kind funds based on the amount of time the numerous municipal officials are dedicating to the project. Additionally, his office explained to the member municipalities that the regional approach was more cost-effective than each municipality preparing its own plan.

- Ms. Zeilman and Ms. Roy asked whether the plan will include actions for making critical facilities and other buildings more resilient to storm and wind damage. Mr. Murphy explained that there are typically actions for constructing and improving certain buildings (such as critical facilitates) to be more resilient that required by the State Building Code. For example, the State Building Code design wind speed is about 100 mph whereas the ASCE recommends using a higher design wind speed for critical facilities. He explained how the Town of Guilford used its hazard mitigation plan to leverage for a stronger roof at the new high school, which was going to be the new shelter. Ms. Zeilman described the challenges associated with new buildings like schools and commercial establishments that use lots of glass, and posed the question that this may not be the most resilient way to construct buildings.

- Ms. Zeilman and Ms. Roy noted that communications, evacuation, and pet sheltering are very important topics in disaster management and response. They noted that the Town of Groton facebook page was useful after the last few disasters. Mr. Murphy explained that these issues are not always directly aligned with hazard mitigation, but they are important topics that can be discussed. He also noted that ten years ago, the questions centered on topics like whether to choose Everbridge or CodeRED for communications, and whether sufficient radio equipment was on hand. With the explosion in mobile phones, texting, and social media, people are finding information in other ways.

- Attendees asked about placing utilities underground, and Mr. Murphy noted that this can be costly and is sometimes not desired by communities. However, it is a common action listed in hazard mitigation plans. He noted that utilities are often placed underground when opportunity arises, such as the Mystic streetscaping project in Groton several years ago.

Meeting Minutes
Update of Hazard Mitigation Plan for Southeastern Connecticut
Public Information Meeting
December 1, 2016

A meeting to present the planning process and seek public input was held at 7 PM on December 1, 2016 at the Southeastern Connecticut Council of Governments. Attendees included:

- Scott Bighinatti, CFM, Milone & MacBroom, Inc.
- Sam Alexander, Planner II, Southeastern Connecticut Council of Governments, salexander@sccog.org
- Bill Eyberse, Town of Franklin Fire Marshall / Emergency Management Director, signal54tr@gmail.com
- Charles Primiano, Director of Harbor & Beaches and resident of Groton Long Point, twonafsh@aol.com

An open discussion followed the presentation. Topics and questions included the following:

- Mr. Eyberse noted that the Town of Franklin has evaluated ponds for additional dry hydrants, and would be interested in obtaining mitigation grant funds for dry hydrants. Mr. Bighinatti explained that while FEMA does not fund studies, the STEAP program is a source of funding for small towns that can be used for a variety of projects. Mr. Bighinatti further noted that each recommendation in the plan is provided a list of potential grant programs for which the activity is eligible.

- Mr. Eyberse also noted that the Town of Franklin is interested in establishing new regulations for dry hydrants and cisterns. In addition, he identified Franklin's use of Petrowski Auctioneers parking area as a staging area for emergency supply distribution for the town, and that while the site itself is not a critical facility, ensuring access to this location following a disaster should be considered a critical item mentioned in the plan.

- Mr. Primiano asked who at the State was responsible for prioritization of grant funding each year. Mr. Bighinatti explained that the Connecticut Department of Emergency Services and Public Protection (DESPP), Division of Emergency Management and Homeland Security (DEMHS) currently oversees the HMGP grants, and in coordination with the Office of Storm Recovery set the priority for infrastructure projects in the last major round of HMGP grants a few years ago. The State Hazard Mitigation Plan sets goals for a five-year period which typically include a larger variety of projects eligible under PDM and FMA.

- Mr. Primiano asked why the City of Groton is participating separately than the Town. Mr. Alexander provided an explanation of the different town and city governments and their separate membership in the Council of Governments. Mr. Bighinatti added that each entity could apply for its own mitigation grants as a sub-applicant to the state while the plan is in effect. Mr. Primiano asked if Groton Long Point Association (a quasi-municipal association) could apply for grants as a sub-applicant. Mr. Bighinatti thought that it may not be possible given that the Town and City of Groton are represented by the plan, but suggested that Groton Long Point Association check with the Division of Emergency Management and Homeland Security.

- Mr. Primiano asked how Groton Long Point Association could best get their questions and thoughts into the plan update. Mr. Bighinatti suggested that Mr. Primiano distribute the online survey link to the Board of Directors and residents. This could potentially provide a lot of responses about particular problem areas for consideration.

- Mr. Primiano explained that one of his primary concerns is the elevation of the causeway and bridge along Groton Long Point Road. It is the only means of egress into and out of the association. Consideration of the elevation of this area in relation to coastal surge and the projected impacts of sea level rise against the population that could be affected should be presented in the plan. A potential strategy may be to raise the elevation of the causeway and bridge.

- Mr. Primiano explained that another concern for Groton Long Point Association is the size of the culverts allowing water into and out of the estuaries in the interior of the association. Some of the culverts may be undersized. Mr. Bighinatti cautioned against resizing the culverts without giving consideration to the effects on the stage in the salt marsh, citing an example from Madison.

- Mr. Primiano indicated that Groton Long Point Association has its own zoning regulations which include a freeboard of one foot for new developments. This puts new first floors at elevation 16 feet, which is very high compared to some nearby structures. A review of the zoning and flood protection ordinances for Groton Long Point Association should be considered in the plan.

MILONE & MACBROOM

Update of Hazard Mitigation Plan for the Southeastern Connecticut Region





Presented by:
Noah Slovin, CFM
Milone & MacBroom, Inc.

2017

Purpose and Need for a Hazard Mitigation Plan

- **Authority**
  - Disaster Mitigation Act of 2000 (amendments to Stafford Act of 1988)
- **Goal of Disaster Mitigation Act**
  - Encourage disaster *preparedness*
  - Encourage hazard mitigation *measures* to reduce losses of life and property
- **Status of Plans in Connecticut**
  - Most initial plans developed 2005-2011
  - SCCOG plans were adopted in 2005 and 2012
  - Local/Regional plans are updated every five years

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What is a Natural Hazard?

- **An extreme natural event that poses a risk to people, infrastructure, and resources**







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What is Hazard Mitigation?

- **Actions that reduce or eliminate long-term risk to people, property, and resources from natural hazards and their effects**





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Long-Term Goals of Hazard Mitigation

- **Reduce**
  - **loss** of life
  - **damage** to property and infrastructure
  - **costs** to residents and businesses (taxes, insurance, repair costs, etc.)
  - municipal service costs (**long-term**, e.g. emergency response, infrastructure maintenance)
- **Educate**
  - residents
  - policy-makers
- **Connect**
  - hazard mitigation planning to other community planning efforts
- **Enhance**
  - and preserve natural resource systems in the community

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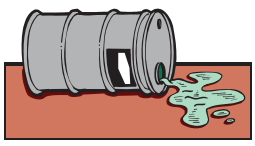
Hazard Mitigation Plan Does Not Address

- **Terrorism and Sabotage**



- **Disaster Response and Recovery**
- **Human Induced Emergencies (some fires, hazardous spills and contamination, disease, etc**



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Update on Hazard Mitigation Grant Programs

- Local communities must have a FEMA-approved Hazard Mitigation Plan in place to receive Federal Grant Funds for Hazard Mitigation Projects
  - PDM (Pre-Disaster Mitigation)
  - HMGP (Hazard Mitigation Grant Program)
  - FMA (Flood Mitigation Assistance)
- Connecticut has allocated its HMGP funds from Hurricane Sandy, Winter Storm Nemo in 2013, and the winter storm of early 2015
- Next opportunity for grant applications is PDM in 2017



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How Can the Plan be Used?

- Grants can be used for:
  - Building acquisitions or elevations
  - Culvert replacements
  - Drainage projects
  - Riverbank stabilization
  - Landslide stabilization
  - Wind retrofits
  - Seismic retrofits
  - Snow load retrofits
  - Standby power supplies for critical facilities



This home in Trumbull was acquired and demolished using a FEMA grant



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Hazards to Include in the Plan

- Floods
- Hurricanes and tropical storms
- Coastal hazards
- Summer storms and tornadoes
- Winter storms and nor'easters
- Earthquakes
- Wildfires
- Dam failure
- Landslides (optional)








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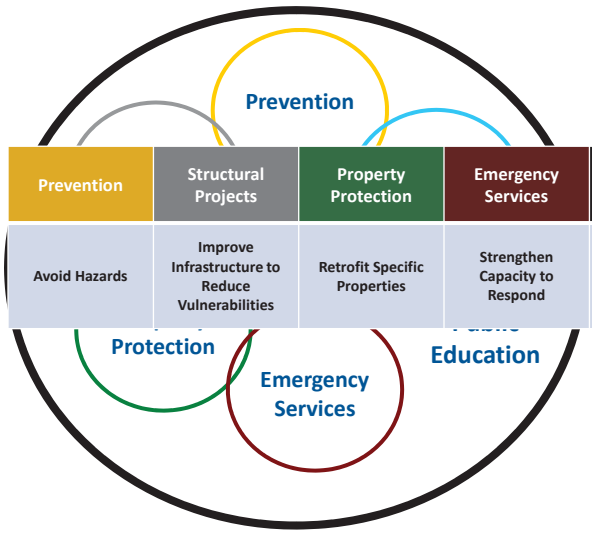
Hazard Mitigation Strategies and Actions



Prevention	Structural Projects	Property Protection	Emergency Services	Public Education	Natural Resource Protection
Avoid Hazards	Improve Infrastructure to Reduce Vulnerabilities	Retrofit Specific Properties	Strengthen Capacity to Respond	Increase Awareness and Knowledge	Protect Natural Resources AND/OR Utilize Natural Mitigation Capabilities

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Flood Mitigation Strategies



Flood Mitigation



Structural Projects

- Replace Bridges and Culverts
- Remove In-Stream Dams
- Remove Obstructions
- Upstream Detention
- Install Stormwater Systems
- Create Floodways
- Enlarge Channels
- Reduce Flow Resistance
- Install Levees
- Install Flood Walls

Property Protection

- Wet Floodproofing
- Dry Floodproofing
- Elevate Buildings
- Relocate Buildings
- Secure Utilities
- Anchor Floatables
- Remove Hazardous Materials
- Re-Grade Properties
- Purchase Flood Insurance
- Join the Community Rating System (CRS)

Prevention

- Modify Zoning
- Modify Comp Plan
- Stormwater Management Regulations
- Increase Flood Damage Prevention Standards
- Freeboard
- Low Impact Development
- Minimize Impervious Cover

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Flood Mitigation Strategies

Flood Mitigation



Natural Resources

- Acquire or Preserve Floodplain Land
- Acquire and Remove Structures from Floodplains and Convert to Open Space
- Acquire or Preserve Other Lands
- Increase Wetland Storage
- Re-Connect Streams to Floodplains

Emergency Services

- Build Local Capacities to Respond
- Move Critical Facilities from Flood Risk Areas
- Establish Emergency Shelters
- Elevate Roads or Bridges to Ensure Egress
- Develop Community Evacuation Plans
- Develop Site-Specific Evacuation Plans
- Establish Satellite Facilities in Areas Subject to Isolation

Public Education

- Newsletters
- Community Meetings
- Information Kiosks
- Web Site with Flood Risk Maps
- Education of Municipal Staff
- Leverage State and FEMA Education Programs
- Establish a Standing Committee or Board to Oversee Outreach

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Other Hazard Mitigation Strategies

- Strengthen or reinforce shelters and critical facilities
- Create backup critical facilities
- Bury utilities
- Harden utilities
- Expand and fund tree maintenance programs
- Snow load removal plans and programs
- Shutters, load path, and roof projects
- Enhance fire suppression capabilities with dry hydrants, cisterns, etc.
- Bracing for potential earthquake damage
- Public education programs and resources





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Components of Hazard Mitigation Plan Process

- Review natural hazards that could occur
- Update the vulnerability and risk assessments for structures and populations
- Identify critical facilities and areas of concern
- HAZUS analysis and loss estimates
- Incorporate effects of federally declared disasters that have occurred since the current plan was adopted:
  - Hurricane Sandy in October 2012
  - Winter Storm Nemo in February 2013
  - Winter Storm of January 2015

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Components of Hazard Mitigation Plan Process

- Outreach to neighboring towns
- Public participation
- Assess adequacy of mitigation measures currently in place such as regulations and drainage projects
- Update mitigation goals, strategies, and actions
- Develop plan document
- State (DEMHS) and FEMA reviews
- Local adoptions
- Annual plan maintenance and reporting



Tree Down in Montville
Image: wtnh.com

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Next Steps

- **Provide information still needed**
- **Outreach and public involvement**
  - Coordination with other SCCOG municipalities
  - Public information meetings
    - November 28, 7:00 pm: Town of Groton Library
    - December 1, 7:00 pm: City of Norwich
  - Online Survey
    - https://www.surveymonkey.com/r/SCCOGHazard

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Data Collection and Discussion

Town Overview
- Development and redevelopment trends
- What are the critical facilities?
- Shelters and evacuation routes
- Standby power supplies
- Discussion of recent storms
- Loss Estimates
  - Public Assistance reimbursements needed (2012-2016)
  - Typical costs to recover from a severe thunderstorm
  - Typical costs to recover from a severe winter storm
  - Typical costs to address a wildfire or brush fire



Flooding
- Update on areas of flooding
- How are drainage and flooding complaints received and tracked?
- Have any bridges, culverts, or stormwater systems been replaced or upgraded?
- Dams and effects of dam failure

Wind
- Update on areas prone to wind damage or increased wind damage risk
- Tree maintenance and tree warden budget

Snow
- Update on snow and ice removal routes and capabilities
- Update on areas prone to icing or drifts in winter

Fire
- Areas prone to wildfires, fire department capabilities, coordination with nearby municipalities
- Areas without fire protection and use of dry hydrants and cisterns



Future Actions
- Review prior actions
- New mitigation actions?
- What one or two things can be done with current budgets?
- What one or two things would be done if funding was not a concern?

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END

How Can the Plan be Used?

Culvert Replacement to be funded by HMGP





Floyd 1999



Irene 2011

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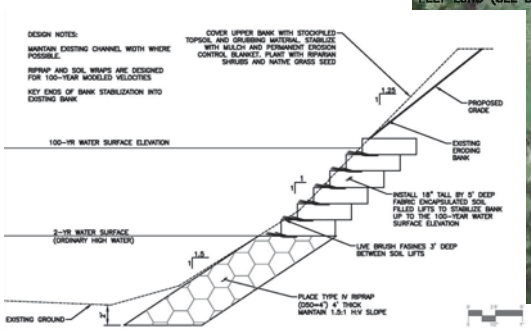
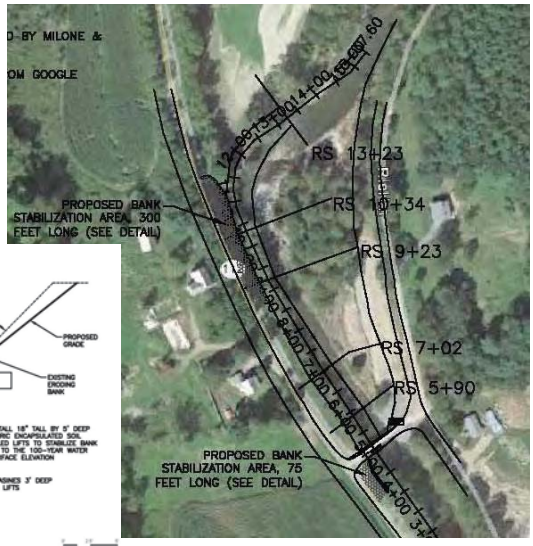
How Can the Plan be Used?

Riverbank Stabilization to be funded by HMGP





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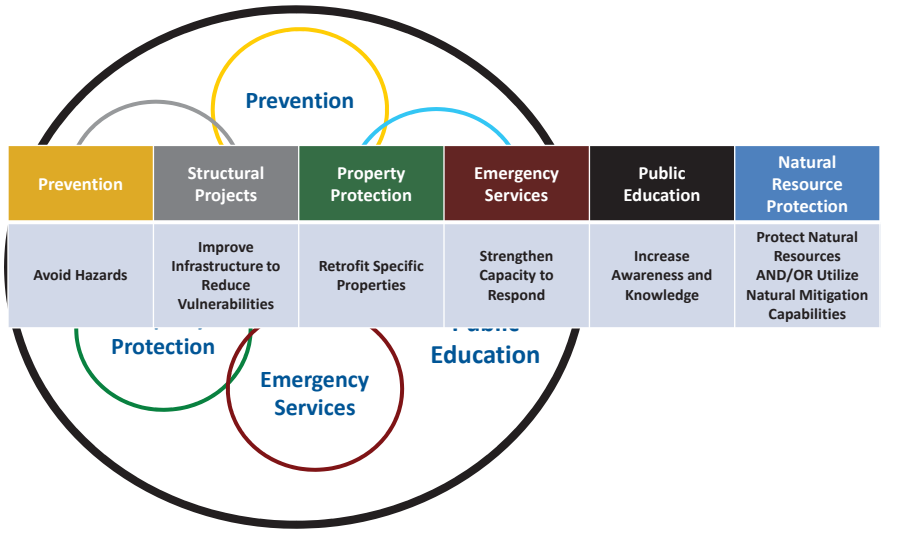
Hazard Mitigation Strategies and Actions



Prevention	Structural Projects	Property Protection	Emergency Services	Public Education	Natural Resource Protection
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MILONE & MACBROOM

Bozrah
Data Collection Meeting

Bozrah Hazard Mitigation Plan Update for SCCOG Municipalities

DATE: December 12, 2016
PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:
Glenn Pianka - First Selectman, Bozrah, CT
Noah Slovin - CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave Glenn a copy of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The two of them worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 - New Developments and Developments in Progress:

Name	**Location**	**Use/Units/Size**	**Vulnerabilities** (if any)	**Notes** (complete, expanded, continuing…)
Stockhouse Rd/Rachel Dr Commerce Park		*Industrial / Commercial*	*[bounded by Driscoll Brook, Susquetonscut Brook, Yantic River]*	*Collins and Jewell constructed at the end of Rachel Drive [opened in 2014, adjacent to Susquetonscut]*
Route 82 corridor in the southern part of town		*Industrial / Commercial*		*Town currently developing a water line in this area to promote further development*
Large farms owned by senior citizens could possibly be subdivided				*One farm has been divided into two lots, and each transferred to one child of the previous owner. No longer any development potential.*
Hillandale Chicken Farm	*Shwartz Road*	*14 chicken houses, each around 60x300ft*		*1 house constructed so far.* *In progress*
Revelation Church	*Former Boyscout Camp Tadma [Bishop Road]*	*[326 acres, 29 acre lake, campgrounds, camp ranger home]*		

1.5 - Any changes to government structure

NONE_____

1.6 - Plans and Regulations

Plan/Document	**Year**	**Status/Relevant Changes** (updated, being updated soon, new hazard aspects)
EOP	Original 2007	*Just updated in 2016*
POCD	2002	*Updated*
Zoning	5/12/2011	
Subdivision	2011	
Inland WW Regs		

1.7 - Critical Facilities

Facility	**Changes**
Bozrah Volunteer Fire Company (EOC)	*New generator installed around 2014*
Fields Memorial School (ARC Shelter)	*Emergency generator safety switch replaced*
Highway Department Garage	
Bozrah Moose Lodge 950 (alternate shelter)	
Fitchville Residential Care Center	
Reliance House Substance Abuse Rehabilitation	
Home for People with Disabilities	
Chicken Farms	*New Hillandale Farm*
Norwich Public Utilities	
Infrastructure	
Warnings/Emergency Communication	*No local reverse-911 system* *Dispatch switched from KX dispatch (Colchester-based) to Quinebaug Valley Dispatch (QV Dispatch) based in Killingly*
Shelters	

2. Flooding

2.1 - Setting/Historic Record

First Selectman does not feel that flooding poses a significant risk in Bozrah

Recent Significant Events	Date	Impact

2.2 - Capabilities

Capability	Notes/Changes
Community Rating System Participation	*First Selectman is not aware of the Community Rating System. Noah explained generally that the CRS is a system by which FEMA rates municipalities that go above and beyond minimum NFIP requirements, and that higher CRS ratings will lower flood insurance premiums for policy-holders.*
Bridge/Culvert/Drainage Improvements	*Bridges completely rebuilt in the last 5 years:* *1. Bozrah Street Extension [note: appears to have been rebuilt in 2006. Over Gardner Brook]* *2. Stanton Hill Road [note: Stanton Road or Stanton Road Ext?. Over Yantic. Completed September 2012]* *3. Bashon Hill Road [over Austin Brook?]* *4. Gager Road [over Gardner Brook. Completed 2012?]* *5. Bishop Road [over Pearsons Brook]* *6. [Was Scott Hill Bridge renovated?]* *There are ongoing drainage improvements being implemented on Wahconah Drive. Mr. Pianka explained that culverts installed in the 1970s are being replaced with modern risers, rather than the older cinderblock systems. Additionally, in a sporadic manner as issues arise, old corrugated metal pipes are being replaced with PVC pipes.*
Road Acquisitions, Elevations, Protection	
Regulations, Codes, Ordinances	
Property Acquisitions, Elevations, Protection	
Other	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

First Selectman does not feel that flooding poses a significant risk in Bozrah
Town approved a proposal to install a skating rink with a membrane roof. This rink is in the flood zone, but is not causing any terrain alteration, and the membrane is non-permanent and can be removed during a flood.

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	*This is required as part of the zoning approval process and the Inland Wetlands Commission review. It is addressed on a case-by-case basis.*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*There are one a couple of locations that fit this description, and they are readily visible from public roads, allowing for ongoing continuous inspection. These locations are:* *1. Off of Lower Stockhouse Road, along the Yantic River* *2. Off of Scott Hill Road / Route 163, along Pearson Brook*
Upgrade culverts along Old Salem Turnpike to reduce flooding near Wawecus Hill	*Complete*	*Culverts were upgraded as part of general drainage management activities performed with the road resurfacing project in 2016.*
Property Protection		

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*Town does not hold public workshops about flood hazards. Flooding has not been a significant concern in the Town, and this action is not deemed necessary by the First Selectman.*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Drop*	*Flooding has not been a significant concern in the Town, and encouragement by realtors and banks to purchase flood insurance is deemed sufficient, making this action unnecessary.*
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flooding measures	*Capability*	*Flooding has not been a significant concern in the Town, and no flood damage has occurred in the last five years that would require this action.*
Encourage residents to submit flood insurance claims following damage events	*Capability*	*Flooding has not been a significant concern in the Town, and no flood damage has occurred in the last five years that would require this action.*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Complete & Drop*	*Town has mutual aid agreements with surrounding communities to provide support. Unwritten agreements exist between the Town and local nonprofits such as Churches to provide assistance for response activities. Due to difficulties posed by utilizing volunteer labor (such as training requirements, unreliability, etc), the Town does not feel it is necessary to secure more formal agreements.*
Public Education and Awareness		
Conduct a "Natural Hazards Fair" and consider working different "Hazard Weeks" into the town's public education program	*Drop*	*The Town does not consider flooding to be a significant concern, or this action to be necessary. Some public education is done around fire safety.*
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*The Town does not consider flooding to be a significant concern, or this action to be necessary. Some public education is done around fire safety.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*First Selectman has found builders, etc., to already be familiar with NFIP land use and building standards, and other requirements are enforced through regulations. Additional workshops are not necessary.*
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	*Drop*	*A certain percentage of new development must be designated open space. Town does not feel that more open space than what is secured through that process is necessary.*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Complete*	*Completed through the efforts of the Inland Wetlands Commission*
Structural Projects		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Complete*	*First Selectman believes this is done for new subdivisions. For example, when a new driveway was constructed at Maple Farms Park, the culvert pipes were very large, and probably able to pass a much larger rainfall than a typical "100-year storm."*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Complete*	*This is done regularly. Such a survey is what lead to the Wakona Drive culvert replacement.*
Investigate funding and feasibility of mitigating frequent drainage problems	*Drop*	*Selectman is not aware of frequent drainage problems in Town.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Summer Storms, Tornadoes and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance Tree Warden:	*DPW has a small budget for in-house maintenance work, including tree trimming and removal. There is also a separate budget available for tree-maintenance related to specific events or situations. This latter budget can be used to contract out work to private companies. For example, if there is a tree that is higher, or if a situation is more complex, than what the Town's equipment can handle.* *Town has designated their own Tree Warden (they used to share with another Town). It is currently the 3rd selectman. He is called out for tree questions, but is not full-time.*
Debris Collection & Disposal	*DPW is responsible for this. The Fire department will help with road clearing after an event.*
Underground Utilities	
Completed Projects	
Coordination with Power Utility	*The Town regularly interfaces with the power utility, and finds them to be very responsive.* *Bozrah Light and Power (subdivision of Groton Public Utilities)*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Encourage BL&P to also cut down trees as opposed to just trimming trees near their power lines	*Capability*	*Town feels that BL&P does a good job of maintaining trees.*
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	*Town does not feel that window blowout is a significant issue, or that functional shutters are necessary.*
Make information on wind-resistant construction techniques available to all building permit applicants	*Drop*	*This information is made available through the building code requirements. Bozrah is right on the edge of the 110 mph wind rating.*
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	*Drop*	*Town does not perform this action, and feels that any emergency preparedness encouraged by the building owner's insurance company is sufficient.* *The Town does maintain an emergency response plan for the School.*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Capability*	*The Town has three tiers of brush disposal plan, depending on the magnitude of an event.* *The lowest tier is to manage debris on-site using a chipper, and placing mulch back on site.* *The second tier is to collect debris at the Town transfer station and chip and mulch at that site.* *The third tier is to collect excess debris at the Adelman Sand & Gravel, Inc., site on Caroline Road.*
Consider surveying all town-owned buildings, particularly historic buildings, to determine their ability to withstand wind loading	*Drop*	*All town-owned buildings have been renovated fairly recently. This process included an Engineering Review. Performing an additional survey seems redundant to the Selectman.*

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Capability*	
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*This is not performed, however the Board of Education has a disaster plan for the school.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Road	
Snow Loading/Removal from Roofs	*Two new used plow-trucks and 1 new Mason-style dump truck have been purchased, to be delivered 12/2016*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping or incomplete, why?
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	*Drop*	*Written plan is not necessary - structures are inspected and snow removed as needed*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Information, including about impending weather, is provided on Town website.* *A robust senior-citizen network in Town helps homebound residents.*
Consider posting snow plow routes in Town Hall and on the town's web site so residents and businesses better understand procedures	*Drop*	*Plow routes change*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*Plows are sent out with school buses during surprise midday storms, when children have to be sent home during a snow event.* *Drifting is an issue in some places, but is monitored.*

- Other Actions since Previous Plan (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions of Interest (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Snow-fencing has not been utilized in Town in recent years, however it may be reinstituted on Brush Hill Road near the new Hallindale Chicken Farms complex. A lot of vegetation was removed during construction, and there is concern that cross-field winds may now lead to drifting on the road. The Town plans to monitor the situation during the 2016-2017 winter and determine what needs to be done.

4. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	*None*
Zoning Ordinances, etc.	*None*

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping or incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	*The First Selectman indicated that there are many generators around Town, including new generators at municipal buildings. The Fire Department, which is also the EOC, had a new generator installed 2 years ago. Additionally, a new safety-switch-system was installed on the school generator, making that shelter more functional.* *Town has Homeland Security and Red Cross emergency kits with supplies.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	*This is incorporated into zoning regulations.*

- Other Actions since Previous Plan (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions of Interest (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response
		Town experiences occasional brush fires. No expansive areas are affected by fire.

6.2 - Capabilities

Capability	Notes/Changes
Water Supply	*Hydrants in the Town Center. Dry Hydrants are located all around Town.* *A new water line is proposed in the Route 82 commercial development area.*
Fire Department)	
Equipment (300 Gallon Forestry Truck	*Town has the 300 Gallon Forestry truck referenced in the previous plan. It is a "quad/gator" type of vehicle with a tank, and it is very versatile and nimble.* *The Fire Department has also replaced an old pickup truck with an upgraded one.*
Open Burning Official	
Fire Marshall	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping or incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town	*Capability*	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	

- Other Actions since Previous Plan (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Recommendations / Actions of Interest (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams in Town (note any changes)

Dam Name	Owner	Class	EOP?	Status/Notes/Changes
Fitchville Pond Dam	Private (Commercial)	C	*Yes*	
Gardner Lake Dam	CTDEEP	B	*Yes*	

- Capabilities

Capability	Changes
EOPs, Monitoring	Fitchville EPO still out of date? *Updated in 2016*
Dam Removals	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Beaver Dams are a problem

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping or incomplete, why?
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Capability*	*EOPs updated in 2016*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Carry Forward*	*First Selectman says the Town does not have any lesser ranked dams, but he wants to consider this action.*

- Other Actions since Previous Plan (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions of Interest (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping or incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the town EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage town officials to attend FEMA-sponsored training seminars at EMI	*Carry Forward*	*Town has limited staff, and so not enough time to send staff to training. Carry Forward and determine ways of finding this time (for example, online seminars)*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Pursue American Red Cross-certification of Fields Memorial School, Bozrah Moose Lodge 950, and the Volunteer Fire Company	*Carry Forward*	*This action is ongoing.* *The Fields memorial school certification could not be acquired before the emergency generator's safety-switch had been fixed. Now that this has been completed, certification should be pursued.* *Moose Lodge is an alternate shelter, and certification is a lower priority.* *First Selectman is not sure about Fire Company certification. Carry forward.*
Continue to promote dissemination of public information regarding natural hazard effects into local government and community buildings	*Carry Forward*	*Town does not currently disseminate public information. Town is currently developing a new website that will be more user-friendly. This action can be carried forward and specify inclusion of hazard education materials and links on the updated website. Educational pamphlets can also be made available at the Town Hall or other public spaces.*
Enroll Bozrah in the CT Alert Emergency Notification System, then encourage residents and businesses to register on the State web site	*Complete*	*Selectman was not sure if Town was enrolled.* *[CTAlert website indicates Bozrah is enrolled]*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Drop*	
Integrate additional elements of this HMP into the Plan of Conservation and Development into the 2013 update and beyond	*Carry Forward*	*Carry forward to next update*
Consider requiring underground installation of utilities for new development to the greatest extent/feasibility	*Drop*	

Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	*Very few companies exist in area to install rods. Additionally, Town is not sure they help.*
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
  - *Town removed many (more than 6) very large downed trees from the Yantic River in 2016.*
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)
  - *Repair and Replace the Fitchfield Dam (constructed in the mid-1800s)*
  - *Dredge and restore Fitchfield Pond*
- Notes
  - *22 Acre Solar Farm has been built on old industrial land*
  - *Stormwater regulation improvements will be made through new DEEP regulations*

Attendance

Name	Department and Role	Email
Glenn Pianka	First Selectman	FirstSelectman@bozrahct.org

Colchester
Data Collection Meeting

2017 SECCOG HMP Update - Colchester Town Update Worksheet

Meeting Agenda

PROJECT		ATTENDEES:
SCCOG Regional Hazard Mitigation Plan Update	**Sal Tassone**	- Engineering
	Art Shilotsky	- First Selectman
	James Paggioli	- Director, Public Works
DATE	**Randy Benson**	- Director, Planning Department
December 15, 2016	**N. Reed Gustafson**	- Building Official
	Jay Gigliotti	- Planning & Zoning, Environmental Planner/Wetlands Agent
MMI# 3570-09	**Noah Slovin**	- CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

> *One comment made by meeting attendees was that the language in the sample plan adoption resolution provided as an appendix in the previous version of the HMP was overly "flowery," and more straightforward language was requested for the sample resolution this time.*

Noah then gave out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.4 – Status of Developments and Developments in Progress:

Name	Location	Use/Units/Size	Vulnerabilities	Notes
Route 11/2 area (Tractor Supply, Retail Development)	Route 11/2 area			*Tractor Supply and other retail locations have been built.* *Additional space for development is available.*
Karate Studio				*Complete*
Settler's Green and Adjacent Parcel				*Not built* *This projects continues to be pushed back, making Town staff skeptical as to its future.*
White Oak Farm	520 Lebanon Avenue	*There will be 142 total* *About 100 still to be built*		*25% complete* *2 miles of road are complete*
North Woods	351 Lebanon Avenue			*75% Complete*
30 Unit Development *Note change in size →*	Adjacent to North Woods	*There will be 99 condo/apartment units*		*No construction completed, permit expired, and a new plan is being submitted. New plan has more than 30 units.*
Usher Swamp	*UsherSwamp Road*	*7 lots*		*Ongoing*
Gavire Estates (nivsira[?])	*Off Bull Hill Road*	*[9 residential lots?]*		
Park Place Holdings	*Nature Avenue* *[309 Old Hebron Road]*	*17 lots [16 duplex houses, 1 single family. 27 acres]*		
Alpha-Q	*Upton Road*	*Adding 49K square feet to existing building*		

1.5 - Any changes to government structure

*NONE*_____

1.6 - Plans and Regulations

Plan/Document Name	Year	Status/Relevant Changes (updated, being updated soon, new hazard aspects)
EOP	?	
POCD	2001	*Updated July 2015*
Zoning	2010	*Updated January 2015. Floodplain Regulations are unchanged.*
Subdivision	2010	
Town Code	2010	
Inland WW Regs	2009	
Open Space Plan	2006	

1.7 - Critical Facilities

Facility	Changes
Emergency Services	
Municipal	
Nursing Homes, Senior Living, other Vulnerable Housing Developments	*Town acquired Senior Center and its land 2 months ago (October 2016). Not an open space acquisition.*
Communications Infrastructure	
Health Care Facilities	
EOC	
Pumping Stations	*1 new pumping station next to the DOT Garage*
Other Infrastructure	
Warnings/Emergency Communication	*Implemented Everbridge*
Shelters	*Red-Cross Certified Shelter at Bacon Academy. Red Cross no longer runs shelter - during a previous event [Sandy?] they ignored the Town's instructions and incorrectly operated the emergency generator, breaking it. The shelter is now run by other certified shelter operators.*
State Facilities	*Consolidated 3 other facilities into one DOT Maintenance Garage*

2. Flooding

2.1 - Setting/Historic Record

Recent Significant Events	Date	Impact
None		

2.2 - Capabilities

Capability	Notes/Changes
Community Rating System Participation	*Does not participate*
Bridge/Culvert/Drainage Improvements	- *State: Upgraded New London Road (Route 85) at Lake Hayward Road (over Cabin Brook)* - *Norwich Avenue (Route 616) at Caverly Mill Road: upgraded box culverts installed*  - *Bridge in Lebanon Upgraded [relevance?]*
Drainage Maintenance	
Regulations, Codes, Ordinances	
Road Retirement, Elevations, Protection	
Property Acquisitions, Elevations, Protection	- *Norton Mill Property Acquisition and Dam Removal - November 2016*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Caverly Bridge
Paper Mill Road Bridge: Scour Protection installed, vulnerability decreased

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	
Conduct annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	
Update Zoning & Subdivision regs to integrate NFIP regs associated with current DFIRM mapping updated on July 18, 2011	*Complete*	*Zoning regulations have been updated and are associated with July 18, 2011 mapping.* *Subdivision regulations have not been updated.*
Property Protection		

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*Information is posted on website.*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*Included in information posted on website*
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flooding measures	*Drop*	*Town is not aware of any non-residential structures that suffer flood damage*
Encourage residents to submit flood insurance claims following damage events	*Drop*	*Events have not caused structural damage, even floods of 2010.*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Drop*	*Volunteer labor is unreliable. CERT volunteers are often not available during hazard events because they are each dealing with their own issues. Reliable volunteers already volunteer in the Fire Department.*
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare	*Capability*	*Jay goes to elementary school and talks about environmental protection. He feels that the topics he teaches cover much flood-hazard related information. Town does not think hazard education will be helpful for very young children - rather, they will just be afraid. They prefer to focus on educating adults.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*Town does not allow building in the SFHA.* *They provide information as necessary on a case by case basis.*
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	*Capability*	*Ongoing acquisition activity through the Open Space Advisory Committee*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
Structural Projects		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Capability*	*As part of permit reviews, drainage analysis must be performed for new projects, and that analysis must use available rainfall data.* *Upgrades are encouraged.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	*Performed as needed.* *Catch basins and culverts are inspected at the same time they are cleaned.* *Note: Town switched from sand to salt, decreasing the buildup of sediment in drainage infrastructure.*
Pursue funding to place riprap in areas of scouring throughout town to limit further erosion	*Complete*	*Paper Mill Road Bridge: Scour Protection (riprap) installed*
Work with the homeowners at the end of Caverly Mill Road to convert it into a private driveway	*Drop*	*Town does not feel this action is viable any longer.* *There are multiple parcels at the end of the road that may be developed, making it more important for the Town to maintain the road.* *Additionally, Town staff believe it is against CT law for them to cede a road that is in need of repair, as Caverly Mill Road is.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Caverly Mill Road: new culvert installed
Upgraded Marvin Road Culverts in 2011
Removed Paper Mill Dam (on Paper Mill Road) - affected 1.5 miles upstream

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Caverly Mill Road: Elevate Road and Bridge, install Rip Rap and additional scour protection as needed - *First get cost estimates* - *Risk is to temporary flooding (scour not as much of an issue)*

Update Subdivision regulations to integrate NFIP regs associated with most current FIS and FIRM
Update Flood Hazard Areas section of Town Code to integrate NFIP regs associated w/most current FIS & FIRM

3. Hurricanes and Tropical Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Sandy	*2012*	*$96,976 in contractor labor, forced labor. No projects. Trees/wires/power down.*

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance Tree Warden	*Replaced Chipper with a new one with higher capacity* *Contract with more in-town tree companies, so they do not have to wait in line (which they used to for larger, non-local companies)* *Tree Maintenance budget increased from $13K to 18 K in 15/16 budget.* - *Town rates maintenance as increasing from "insufficient" to "marginally poor." They would like to work on improving maintenance program.*
Underground Utilities	
Completed Projects	
Coordination with Power Utility	Eversource: - Planning to double substation capacity at one site and remove another from service - Enhanced tree clearing - Updated facilities - Circuit strengthening & building of redundancies. - Town works with them continuously

3.2 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Work with ~~CL&P~~ *Eversource* to improve communications and coordination to limit future outages such as following T.S. Irene and Winter Storm Alfred	*Complete*	*Liaison Program has improved communication and coordination. Response is better than it was 5 years ago (better than after Irene), but capacity is still limited - Eversource does not have enough personnel. Town has to wait for a "make-safe" crew to address downed wires before they are able to do anything.*
Encourage CL&P to also cut down trees as opposed to just trimming trees near their power lines	*Capability*	*Enhanced tree clearing program has been implemented post-storms.*
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	*Town does not think that installing shutters is feasible within their budget constraints. Additionally, they believe that this action does not work well with historic commission's priorities.*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Town believes that wind-resistant construction techniques are required by the new CT building code*
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	*Complete*	*Emergency Management Director has done this through general hazard public information campaigns.*
Emergency Services		

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider surveying all town-owned buildings to determine their ability to withstand wind loading giving priority to the oldest buildings	*Drop*	*Town does not feel this action is warranted. All town buildings constructed in the last 40 years were built to code and are wind resistant. Older buildings have already demonstrated wind resistance. Colchester is in 105 mph zone.*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

First selectmen send out emergency information via email blast, etc., before storms arrive.
Debris storage/management areas designated: - *Transfer station* - *Athletic fields [Parks and Rec Fields?]*

- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Add links to FEMA information on Town website. EMD will be responsible for this action.

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
2013 Blizzard	*2013*	*$105,000. Contractor/Forced Labor. No Projects. Trees/wires/power down.*
2015 Snow Events	*2015*	*$104,000*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*No change since previous plan. Snow removal capabilities are mostly good - residents seem to be satisfied.* *Town has heavy equipment.* *Town contracts out to supplement municipal force.*
Emergency Power	*All critical facilities have backup power.* *Many private properties have acquired backup power in past years.* *NONE OF THE GAS STATIONS IN TOWN HAVE EMERGENCY POWER - this has caused difficulties in the past.*
Snow Loading / Removal from Roofs	*Town is capable. Volunteers are sometimes used. Roofs are monitored as necessary. Schools have their own protocols.*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	*[Drop]*	*Load capacity for school roofs has been calculated.* *Roofs are monitored, and removal procedures are in place - however there is no written prioritization.* *[Written prioritization plan is not expected to increase Town's roof monitoring and snow removal capabilities. Drop]*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	*Town has instituted a snow reserve - excess snow removal/maintenance budget for a particular year is put into a reserve that can only be used for future snow removal activities. During light years, money is saved to go to years with large events.*
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Information is sent out in emails*
Consider posting snow plow routes in Town Hall and on the town's web site so residents and businesses better understand procedures	*Drop*	*Snow routes are not posted due to variability.* *Snow and Ice Control Policy is posted on website, so public can understand how decisions are made.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*No difficult-to-access areas have been found.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
  Instituted snow reserve budget.
- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Require or incentivize facilities that provide critical services (for example, gas stations, possibly groceries) to have backup power.

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Drop*	*Not financially feasible given low likelihood of an earthquake that would require backup supplies.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	*Zoning regulations set limits to grade on which construction can occur.* *No areas prone to liquefaction in Town.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

No significant wildfires in Town

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*Ongoing dry hydrant development*
Fire Department	
Equipment	
Fire Pond/Dry Hydrant for new developments	*84 Waterhole Road: dry hydrant has been redeveloped.* *Lost dry hydrant at Papermill Road when dam was removed (impoundment was water source)*
Open Burning Official	*Town has 2 open burning officials*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town	*Capability*	*Town just installed a new well within the water supply area.* *High pressure zone was developed relatively recently.*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	*Information is available on the Town website.* *Fire Danger level from DEEP is available on the Town Website.* *Handouts are available at Town Hall*
Consider placing fire pond or dry hydrants language into Subdivision Regulation amendments	*Complete*	
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

In new developments, emergency access is required.
Town purchased out of commission early warning sirens from Connecticut Yankee. The Town will revamp those sirens and locate them around Town. They will use these to broadcast warnings about weather and fire events - they are PA-capable.

- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams in Town (note any changes)

Name	Owner	Class	EOP?	Status/Notes/Changes
Deep River Reservoir	Norwich Public Utilities	C		*Colchester staff believe this dam is located in Lebanon [it is not]*
18 additional DEEP Registered Dams, all of which are below class B		<B		

- Capabilities

Capability	Changes
EOPs, Monitoring	
Dam Removals	
Other	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with the CT DEEP to provide assistance to the 18 owners of low-ranking dams, specifically Paper Mill and Linwood Dams	*Capability*	*Paper Mill Dam Removed* *Town has acted as go-between for DEEP and private owners. Has been active in helping private owners.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	*Mutual Aid Agreements in Place, effective*
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the town EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage town officials to attend FEMA-sponsored training seminars at EMI	*Capability*	*Most critical Town staff are trained, up to ICS 400 to 700. Includes elected officials (Lower ICS ratings)*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Ensure that emergency procedures are in place to minimize the potential for any releases of propane, fires or explosions at the town center business	*Capability*	
Identify a replacement EOC as the Town Hall has become outdated	**N/A**	➔ Wrong Town
Pursue American Red Cross-certifcation of the Elementary School and Gardner Lake Fire Company	**N/A**	➔ Wrong Town
Continue to promote dissemination of public information regarding natural hazard effects into local government and community buildings	*Capability*	
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Capability*	*Town has a checklist affiliated with the fee schedule for permit applications. It is a list of all application requirements. Includes references to specific regulations and codes.*
Integrate elements of this HMP into the Plan of Conservation and Development during the next update and beyond	*Capability*	*There are a number of POCD actions with the goal of "not interfering with natural features" for the purpose of preservation - in reality, these actions aim to lower vulnerability to hazards.*
Consider requiring underground installation of utilities for new development to the greatest extent/feasibility	*Capability*	*Required for new developments*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	*Required for new developments*
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	

Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	*Updated Zoning and Plan of Conservation and Development hand-in-hand. Zoning and POCD, as well as Inland Wetlands Regulations, all include natural resource protections and encourage creation/preservation of open space.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Developed and implemented pre-event checklist to help ensure Town is prepared for incoming weather.
Red Cross no longer runs shelter - during a previous event [Sandy?] they ignored the Town's instructions and incorrectly operated the emergency generator, breaking it. The shelter is now run by other certified shelter operators.

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Revamp Connecticut Yankee early warning sirens and locate them around Town. Develop protocol to use sirens to broadcast warnings about emergency events.

- Notes

Attendance

Name	Department and Role	Email
Sal Tassone	Engineering	stassone@colchesterct.gov
Art Shilotsky	First Selectman	
James Paggioli	Director, Public Works	publicworks@colchesterct.gov
Randy Benson	Director, Planning Department	rbenson@colchesterct.gov
N. Reed Gustafson	Building Official	building@colchesterct.gov
Jay Gigliotti	Planning and Zoning, Environmental Planner/Wetlands Agent	jgigliotti@colchesterct.gov

East Lyme
Data Collection Meeting

2017 SECCOG HMP Update - East Lyme Data Collection Meeting

DATE: November 21 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Noah Slovin, CFM	- Milone and MacBroom, Inc
Brad Kargl	- Utility Engineer
Joe Bragaw	- Public Works Director
Steve Mansfield	- Public Health Director
Ted Hunt	- Facilities Supervisor, Board of Education
Bill Scheer	- Public Works, Deputy Director
Gary Goeschel	- Planning Director
Victor Benni	- Town Engineer

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group then worked through much of this worksheet together.

Municipal staff agreed that the information for this update could be gathered more quickly and efficiently if staff members took sheets to their offices and did their own research into the questions. It was decided that this plan would be revisited on December (January?) 13th, after meeting attendees had been given time to review on their own.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Location	Changes
Exit 74 Gateway	Flanders	*Underway - 280 units built with water, sewer, gas from route 161. Costco approved locally.*
Main Street	Niantic	*Streetscape project. Complete.*
Village Crossing	Park Place	*Underway. 2 of 6 buildings completed. 60 units total.*
The Orchards	Plum Hill Road	*Underway. Approximately ½ way through 120 lots. Expected completion in 2018.*
Residential Development	38 Hope Street	*Completed*
Subdivision	Sleepy Hollow Road	*Underway*
	Spring Rock Road	*Will be proposed, 22 units*
JAG Capital Drive, LLC	*Btwn Capital Drive and West Main Street (route 156)*	*Affordable housing development. As of 2014: 24 acres. 60 units. 55+ community. Initially denied by Town, overturned in court. http://law.justia.com/cases/connecticut/court-of-appeals/2016/ac37942.html*
Boardwalk		*1.1 mile boardwalk recently constructed in Niantic*
Crescent Beach Public Access	*Crescent Beach*	*Crescent Beach Association rebuilding a bludd using FEMA money - provides public access. 1,000 foot walkway.*

1.4 - Any changes to government structure

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
Town Charter	2009	
Emergency Operations Plan		
Plan of Conservation and Development	2009	*Amended through 2010. Update to be completed by 2020.*
Zoning Regulations	2011	
Subdivision Regulations	2011	
Inland Wetlands and Watercourse Regulations	2008	
Water Supply Plan	*In Process By 3/31/17*	*Critical facilities section, resiliency & redundancy is part of plan.*

1.6 - Critical Facilities

Eversource has a list of critical facilities. There is also a "circuit map" showing power distribution that includes critical facilities. Municipal staff want to include sewer pumping stations on the list of critical facilities. They are in the process of mapping these. There is at least one station (in Attawan Beach/Black Point area?) that they wish to relocate at higher elevation.

Facility	Changes
Flanders Fire Department	
Niantic Fire Headquarters	
Niantic Fire Station	
Police Department	
Public Safety Building/EOC	
Public Works Garage	*Old Public Works Garage - now focuses on water and sewer services. Backup fueling facility*
Town Hall	
Community Center	
East Lyme High School	
East Lyme Middle School	
Bride Brook Rehab Center	
Charter Oak Medical Clinic	
Crescent Point	
Field Services Complex	*8 Capitol Drive. New Primary Public Works Facility. Primary fueling facility & operational center*
Water System	*New water interconnection with New London. New water tower in Montville. Water tower provides additional water supply during dry periods, and additional water pressure. Firefighting capability improved. Also serves Montville firefighting. New London interconnection provides additional water source & redundancy.*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Community Rating System Participation	
Bridge Replacements, Drainage, Maintenance	
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	
Coastal Resilience Planning	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses

- Private Properties
    - Changes to properties (acquisitions, new constructions) in SFHA

    - Repetitive Loss Properties

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status	Notes
<u>Prevention</u>		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	C	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream		
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.		
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise		
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs		
Continue to maintain good standing with the Community Rating System and consider additional achievements		
Incorporate the results of the Coastal Resilience project into the next HMP update		
<u>Property Protection</u>		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops		
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA		
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flooding measures		

Action	Status	Notes
Encourage residents to submit flood insurance claims following damage events		
Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties in the Niantic Bay area		
Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones		
Ensure that sewer pumping stations have a method for connecting emergency power and are adequately flood proofed		
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities		
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database		
Consider establishing a second mode of egress for the Bush Hill Drive neighborhood		
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops		
Natural Resource Protection		
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and flood proofing		
Visit schools and educate children about the risks of flooding and how to prepare		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops		
Work with homeowners associations to develop a flood proofing workshop		
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized		
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning		
Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation		
Upgrade storm water collection and discharge systems to keep up with rising sea level, particularly in Niantic		
Maintain existing hard structures along the coast in good condition, particularly near Niantic Bay		
Consider removing a small dam downstream of Route 1 to reduce flooding of Route 1 by Latimer Brook		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

3. Hurricanes and Tropical Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Sandy		

3.2 - Capabilities

Capability	Changes
Tree Maintenance	Tree Warden:
Warnings/Communication	
Coordination with Power Utility	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status	Notes
Prevention		
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans		
Consider working with CL&P to obtain funding to place utilities underground in coastal areas such as Main Street in Niantic		
Continue to perform appropriate tree maintenance to the greatest extent possible		
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources		
Make information on wind-resistant construction techniques available to all building permit applicants		
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse		
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading		
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal		
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures		
Visit schools and educate children about the risks of wind events and how to prepare for them		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Tree Maintenance	
Snow Loading/Removal from Roofs	
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Capability	Status
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town		
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures		
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots		
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences		
Consider posting the snow plowing routes in local government buildings and on the Town's website		
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Capability	Status
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake		
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Fire Department	
Equipment	
Fire Pond/Dry Hydrant for new developments	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Capability	Status
Continue to evaluate public water supply hydrants and areas at risk of wildfire in the town		
Encourage the extension of public water supply for fire protection to areas identified as being particularly at-risk		
Continue pursuing additional sources of firefighting water where adequate supplies do not exist through the use of dry hydrants and cisterns		
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes		
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

7. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams in Town

#	Name	Owner	Class	Notes
	Bogue Brook Reservoir	New London Water Dept	B	
	Darrow Pond	Private/Town of East Lyme	B	
	Gorton Pond	CT DEEP	B	
	Pattagansett Lake	CT DEEP	B	
	Powers Lake	CT DEEP	B	

- Capabilities

Capability	Changes
EOPs, Monitoring	
Dam Removals	
Other	

7.3 - Vulnerabilities and Risk

- State of Dams
- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	Capability	Status
Include dam failure inundation areas in the Reverse 9-1-1 contact database		
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies		
Prepare an EOP and dam failure analysis for the Darrow Pond Dam		
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status	Notes
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response		
Continue to promote local and regional planning exercises that increase readiness to respond to disasters		
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available		
Continue to promote regional transportation planning through SCCOG		
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage		
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan		
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually		
Continue to maintain emergency response training and equipment and upgrade equipment when possible		
Encourage Town officials to attend FEMA-sponsored training seminars at EMI		
Continue to evaluate emergency shelters, update supplies, and check communication equipment		
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions		
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies		
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience		
Integrate elements of this HMP into the Plan of Conservation and Development during the next update		
Continue reviewing building plans to ensure proper access for emergency vehicles		
Require the underground installation of utilities for all new development		
Continue to enforce the appropriate building code for new building projects		
Encourage residents to install and maintain lightning rods on their structures		
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

Contacts

Brad Kargl	Utility Engineer	bkargl@eltownhall.com
Joe Bragaw	Public Works Director	jbragan@eltownhall.com
Steve Mansfield	Public Health Director	smansfield@LCHD.org
Ted Hunt	Facilities Supervisor, Board of Education	Ted.Hunt@eastlymeschools.org
Bill Scheer	Public Works, Deputy Director	bscheer@eltownhall.com
Gary Goeschel	Planning Director	ggoeschel@eltownhall.com
Victor Benni	Town Engineer	vbenni@eltownhall.com

2017 SECCOG HMP Update - East Lyme Update Worksheet

Meeting #2 Agenda

HAZARD MITIGATION PLAN UPDATE FOR SCCOG MUNICIPALITIES

January 26, 2017

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1. Data Collection

Town Overview

- **Development** and redevelopment trends
- What are the **critical facilities**?
- **Shelters** and **evacuation routes**
- Standby **power** supplies
- Discussion of **recent storms**
- **Loss Estimates**
  - Public Assistance reimbursements needed (2012-2016)
  - Typical costs to recover from a severe thunderstorm
  - Typical costs to recover from a severe winter storm
  - Typical costs to address a wildfire or brush fire

Flooding

- Update on **areas** of flooding
- How are drainage and flooding **complaints** received and tracked?
- Have any bridges, culverts, or stormwater systems been **replaced** or **upgraded**?
- **Dams** and effects of dam failure

Wind

- Update on **areas** prone to wind damage or increased wind damage risk
- **Tree maintenance** and tree warden budget

Snow

- Update on snow and ice removal **routes** and **capabilities**
- Update on **areas** prone to icing or drifts in winter

Fire

- **Areas** prone to wildfires, fire department capabilities, coordination with nearby municipalities
- Areas without fire protection and use of dry hydrants and cisterns

Future Actions

- Review **prior** actions
- **New** mitigation actions?
- What one or two things can be done with **current** budgets?
- What one or two things would be done if funding was not a concern?

2. Review of Table of Actions from Current Plan

3. Next Steps

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Location	Changes
Exit 74 Gateway	Flanders	*Underway - 280 units built with water, sewer, gas from route 161. Costco approved locally.*
Main Street	Niantic	*Streetscape project. Complete.*
Village Crossing	Park Place	*Underway. 2 of 6 buildings completed. 60 units total.*
The Orchards	Plum Hill Road	*Underway. Approximately ½ way through 120 lots. Expected completion in 2018.*
Residential Development	38 Hope Street	*Completed*
Subdivision	Sleepy Hollow Road	*Underway*
	Spring Rock Road	*Will be proposed, 22 units*
JAG Capital Drive, LLC	*Btwn Capital Drive and West Main Street (route 156)*	*Affordable housing development. As of 2014: 24 acres. 60 units. 55+ community. Initially denied by Town, overturned in court. http://law.justia.com/cases/connecticut/court-of-appeals/2016/ac37942.html*
Boardwalk		*1.1 mile boardwalk recently constructed in Niantic*
Crescent Beach Public Access	*Crescent Beach*	*Crescent Beach Association rebuilding a bludd using FEMA money - provides public access. 1,000 foot walkway.*

1.4 - Any changes to government structure

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
Town Charter	2009	
Emergency Operations Plan		
Plan of Conservation and Development	2009	*Amended through 2010. Update to be completed by 2020.*
Zoning Regulations	2011	
Subdivision Regulations	2011	
Inland Wetlands and Watercourse Regulations	2008	
Water Supply Plan	*In Process By 3/31/17*	*Critical facilities section, resiliency & redundancy is part of plan.*

1.6 - Critical Facilities

Eversource has a list of critical facilities. There is also a "circuit map" showing power distribution that includes critical facilities. Municipal staff want to include sewer pumping stations on the list of critical facilities. They are in the process of mapping these. There is at least one station (in Attawan Beach/Black Point area?) that they wish to relocate at higher elevation.

Facility	Changes
Flanders Fire Department	
Niantic Fire Headquarters	
Niantic Fire Station	
Police Department	
Public Safety Building/EOC	
Public Works Garage	*Old Public Works Garage - now focuses on water and sewer services. Backup fueling facility*
Town Hall	
Community Center	
East Lyme High School	
East Lyme Middle School	
Bride Brook Rehab Center	
Charter Oak Medical Clinic	
Crescent Point	
Field Services Complex	*8 Capitol Drive. New Primary Public Works Facility. Primary fueling facility & operational center*
Water System	*New water interconnection with New London. New water tower in Montville. Water tower provides additional water supply during dry periods, and additional water pressure. Firefighting capability improved. Also serves Montville firefighting. New London interconnection provides additional water source & redundancy.*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Community Rating System Participation	
Bridge Replacements, Drainage, Maintenance	
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	
Coastal Resilience Planning	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses

- Private Properties
    - Changes to properties (acquisitions, new constructions) in SFHA

    - Repetitive Loss Properties

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status	Notes
<u>Prevention</u>		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	C	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream		
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.		
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise		
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs		
Continue to maintain good standing with the Community Rating System and consider additional achievements		
Incorporate the results of the Coastal Resilience project into the next HMP update		
<u>Property Protection</u>		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops		
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA		
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flooding measures		

Action	Status	Notes
Encourage residents to submit flood insurance claims following damage events		
Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties in the Niantic Bay area		
Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones		
Ensure that sewer pumping stations have a method for connecting emergency power and are adequately flood proofed		
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities		
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database		
Consider establishing a second mode of egress for the Bush Hill Drive neighborhood		
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops		
Natural Resource Protection		
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and flood proofing		
Visit schools and educate children about the risks of flooding and how to prepare		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops		
Work with homeowners associations to develop a flood proofing workshop		
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized		
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning		
Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation		
Upgrade storm water collection and discharge systems to keep up with rising sea level, particularly in Niantic		
Maintain existing hard structures along the coast in good condition, particularly near Niantic Bay		
Consider removing a small dam downstream of Route 1 to reduce flooding of Route 1 by Latimer Brook		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

3. Hurricanes and Tropical Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Sandy		

3.2 - Capabilities

Capability	Changes
Tree Maintenance	Tree Warden:
Warnings/Communication	
Coordination with Power Utility	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status	Notes
Prevention		
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans		
Consider working with CL&P to obtain funding to place utilities underground in coastal areas such as Main Street in Niantic		
Continue to perform appropriate tree maintenance to the greatest extent possible		
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources		
Make information on wind-resistant construction techniques available to all building permit applicants		
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse		
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading		
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal		
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures		
Visit schools and educate children about the risks of wind events and how to prepare for them		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Tree Maintenance	
Snow Loading/Removal from Roofs	
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Capability	Status
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town		
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures		
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots		
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences		
Consider posting the snow plowing routes in local government buildings and on the Town's website		
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Capability	Status
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake		
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Fire Department	
Equipment	
Fire Pond/Dry Hydrant for new developments	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Capability	Status
Continue to evaluate public water supply hydrants and areas at risk of wildfire in the town		
Encourage the extension of public water supply for fire protection to areas identified as being particularly at-risk		
Continue pursuing additional sources of firefighting water where adequate supplies do not exist through the use of dry hydrants and cisterns		
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes		
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

7. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams in Town

#	Name	Owner	Class	Notes
	Bogue Brook Reservoir	New London Water Dept	B	
	Darrow Pond	Private/Town of East Lyme	B	
	Gorton Pond	CT DEEP	B	
	Pattagansett Lake	CT DEEP	B	
	Powers Lake	CT DEEP	B	

- Capabilities

Capability	Changes
EOPs, Monitoring	
Dam Removals	
Other	

7.3 - Vulnerabilities and Risk

- State of Dams
- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	Capability	Status
Include dam failure inundation areas in the Reverse 9-1-1 contact database		
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies		
Prepare an EOP and dam failure analysis for the Darrow Pond Dam		
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status	Notes
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response		
Continue to promote local and regional planning exercises that increase readiness to respond to disasters		
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available		
Continue to promote regional transportation planning through SCCOG		
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage		
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan		
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually		
Continue to maintain emergency response training and equipment and upgrade equipment when possible		
Encourage Town officials to attend FEMA-sponsored training seminars at EMI		
Continue to evaluate emergency shelters, update supplies, and check communication equipment		
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions		
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies		
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience		
Integrate elements of this HMP into the Plan of Conservation and Development during the next update		
Continue reviewing building plans to ensure proper access for emergency vehicles		
Require the underground installation of utilities for all new development		
Continue to enforce the appropriate building code for new building projects		
Encourage residents to install and maintain lightning rods on their structures		
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

Meeting 1 Attendees

Brad Kargl	Utility Engineer	bkargl@eltownhall.com
Joe Bragaw	Public Works Director	jbragan@eltownhall.com
Steve Mansfield	Public Health Director	smansfield@LCHD.org
Ted Hunt	Facilities Supervisor, Board of Education	Ted.Hunt@eastlymeschools.org
Bill Scheer	Public Works, Deputy Director	bscheer@eltownhall.com
Gary Goeschel	Planning Director	ggoeschel@eltownhall.com
Victor Benni	Town Engineer	vbenni@eltownhall.com

Meeting 2 Attendance:

Name	Department and Role	Email

Meeting 2 Notes

Notes

Franklin
Data Collection Meeting

2017 SECCOG HMP Update - Franklin Town Update Worksheet

PROJECT	ATTENDEES:	
SCCOG Regional Hazard Mitigation Plan Update	**Richard Matters**	- First Selectman
DATE: December 15, 2016	**William (Bill) Eyberse**	- Emergency Preparedness Director
MMI# 3570-09	**Noah Slovin**	- CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave Bill copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The two of them worked through this worksheet together. At a couple points, Bill left the room to ask other Town employees for more information about certain questions. Later on, the First Selectman joined the meeting. Bill and Noah reviewed the worksheet again with him, and he added his own notes and corrections.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Location	Use/Units/Size	Vulnerabilities (if any)	Notes
Franklin Hills Estate and Country Club Golf course Community-337 acres	East of RTE 32			*There has been no movement on this development in the last 5 years. They are currently waiting on the development of a water supply system in the area.*
Poppins Hills Mixed Use- 274 up to 311 acres	West of RTE 32			*There has been no movement on this development in the last 5 years. Town staff do not think this development is likely to continue.*

1.4 - Any changes to government structure

NONE

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
Emergency Operations Plan	2016	*Currently being updated. Will be completed Jan 1 2017*
Plan of Conservation and Development	In progress 7/2012	*Completed 2013*
Regulation Book (includes zoning, subdivision, wetlands)	2008	
Franklin Elementary School Snow Removal Plan	(response to heavy snow of 2010-2011)	*Still in place*
School Emergency Plan		*Bill is coordinating with the New school principal to determine status of this plan, and ensuring the principal and school staff are aware of its existence*

1.6 - Critical Facilities

Facility	Changes
Volunteer Fire Department	*Primary shelter. Relatively new (5-6 year old) backup generator.*
Town Hall	*Secondary Shelter. Relatively new (5-6 year old) backup generator.*
Public Works Town Garage	
Franklin Elementary School (Shelter)	*Tertiary Shelter. Does not have a generator.*
Elisha Brook (Elderly Housing)	*HUD-funded housing. New generator installed in 2016.*
Private Group Home	
State Group Home	
Holton Road Group Home (State)	
Norwich Orthopedic Group	
A B C's & 123's LLC	*Daycare - relocated in 2016 from the south end of town to route 32 near Pleasure Hill.*
Reach For the Stars Learning	*Out of business. Remove from list.*
Pumping Stations	
Other Infrastructure	
Warnings/Emergency Communication	*Implemented Everbridge.*
Shelters	

2. Flooding

2.1 - Setting/Historic Record

Recent Significant Events	Date	Impact
NONE		

2.2 - Capabilities

Capability	Changes
Community Rating System Participation	*Not a participant. No change.*
Bridge/Culvert/Drainage Improvements	*Murphy Road Bridge upgraded and elevated to above the flood stage (NOTE: First Selectman says this occurred in 2010 [bridge marker is 2001])*
Drainage Maintenance	*Town has a 2-man highway crew. They have arrangements to share equipment with neighboring towns - allows each town to access equipment they would not be able to afford otherwise.* ➔ *Bill directed Noah to ask DPW for more information*
Regulations, Codes, Ordinances	
Property Acquisitions, Elevations, Protection	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Yantic River near Norwich, at the southern end of Town, continues to be an at risk area - however, many homes that used to be there were acquired and demolished 20 years ago. There may be one or two properties that are still located in at-risk areas, but they are built at higher elevations, which is why they were not acquired along with the other properties.

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA
  - Repetitive Loss Properties (notes, new RL properties, etc)
- Vulnerable Critical Facilities

2.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to prohibit new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of storm water is the best option for reducing peak flows downstream	*Capability*	➔ *Bill directed to Noah to check with Planning and Zoning about this*
Conduct an annual inspection of flood prone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*Visual "windshield" inspections are done regularly but informally.*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*Town does not have the capacity to run public education workshops. Additionally, Bill does not believe there are any structures located in the SFHA Town does not feel that lack of awareness of flood insurance is a problem.*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Carry Forward*	*Bill does not believe there are any structures located in the SFHA Town does not feel that lack of awareness of flood insurance is a problem. However they will carry this action forward as part of general public education efforts.*
Make necessary changes to floodplain regulations so that all insured residents are eligible for increased cost of compliance coverage	*Drop*	*Bill was not sure about this action, but thought that most likely it had not been completed. However, Bill does not believe there are any structures located in the SFHA, making this action unnecessary.*

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Encourage residents to submit flood insurance claims following damage events	*Drop*	*There have not been any qualifying events or damages in the last 5 years. Town does not feel that lack of awareness of flood insurance is a problem*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Drop*	*Town does not feel that volunteer labor for response activities would be helpful or practical. They are exploring development of a CERT team.* *Drop this action and replace with "Working with CT DEMHS and local residents, develop a local CERT team."*
Public Education and Awareness		
Conduct a "Natural Hazards Fair" so that interested parties can familiarize themselves with natural hazard mitigation options	*Drop*	*Town does not feel it is necessary or helpful to run such a fair.*
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*Town does not feel it would be helpful to conduct such visits.*
Annually distribute a brochure outlining the risks of flood prone areas, mitigation strategies, and contacts	*Drop*	*Town will incorporate flood education into general education activities. Town does not feel flood hazards are significant enough locally to warrant this action.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*Development is not permitted in flood zones.*
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	*Capability*	*Most SFHA land is already open space. Old Route 32 area bought out 20 years ago. Franklin Swamp Wildlife Management Area covers a large section of floodplain. Other SFHA areas contain farmland.*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	*Capability*	
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Un-resolved*	➔ *Bill directed Noah to ask Zoning department about this*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation	*Un-resolved*	*[Recommend carrying forward with specific road suggestions.* *One road was discussed at the meeting, but Noah cannot remember which it was]*
Work with the CT DOT to improve the roadway drainage at the two problem areas on Route 32		*The first selectman listed the following problem areas along state roads:* - *Route 32: at Manning Road* - *Route 32: at Plains Road - adjacent hillslope washes out onto the road during heavy rain (Bill: this problem seems to have been corrected)* - *Route 87: at Murphy Road - Town is widening Murphy Road, and this will require alterations to drainage that involve working with the State.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

  State will be doing significant drainage work on Route 207:
  - *Just below Gagers Pond*
  - *At Ayer Brook [Ayers Gap?]*
  - *Near Baltic*

- New Actions

3. Hurricanes and Tropical Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	*Lots of trees down, power line damage.* *Tree management has been stepped up since then.*
Irene	2011	

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance Tree Warden	*Town does some tree maintenance [seems to be limited. Bill was not sure about this.]* *Town does have a tree warden.*
Completed Projects	
Coordination with Power Utility	*Eversource. Coordination seems to be good - there is a new person running tree maintenance, and he is making a lot of promises about Eversource's plans - will have to see how it pans out.*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Bill is concerned about the Firehouse - it has a steel frame and steel sheeting, and he's not sure whether it is capable of standing up to extreme winds, such as those from a Category 3 Hurricane

3.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Encourage CL&P to also cut down trees as opposed to just trimming trees near power lines	*Capability*	*Eversource has instituted new maintenance procedures*
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	*Window blow-out has not been an issue in Town. Town does not feel this is a useful or necessary action.*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Responsibility of the Building Inspector*
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	*Drop*	*Town does not actively do this, and has not been approached about this by building owners. Town does not feel this is a necessary action.*
Emergency Services		
Consider surveying all town-owned buildings, particularly historic buildings, to determine their ability to withstand wind loading	*Carry Forward*	*Apply this action specifically to the Volunteer Fire Department.*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Drop*	*Town has sufficient property for storing debris. Additional agreements are not necessary.*
Prioritize wind-related retrofitting for the town's shelters over other critical facilities	*Capability*	*Town will prioritize assessment of Volunteer Fire Department (primary shelter)*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*Town does not feel it is necessary or helpful to run such a fair.*
Conduct an annual workshop so that interested parties can familiarize themselves with wind mitigation	*Drop*	*Town does not feel it would be helpful to conduct such visits.*
Work with local homeowners associations and community groups to provide education regarding wise landscaping and proper tree planting	*Drop*	*Town does not feel it is necessary or helpful to do this.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions

Assess wind loading capability of Volunteer fire department, and address needs if necessary

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
October Storm	*2011*	*Power out 8-10 days at the North end of 87*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*Good capability*
Emergency Power	*Mostly in good shape. Want to acquire generator for the school.*
Snow Loading/Removal from Roofs	*School has a plan. Loading capacity is less than 1 foot of snow.*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Drifting issues on Plains Road, Route 207, Route 32 - in the higher elevation areas along farms. Bill believes snow fencing is used as necessary to protect Pleasure Hill Road and Robinson Hill Road.

4.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Drop*	*Previous heavy snow events have led to empirical observations of vulnerable roofs. Town does not feel a formal study is worth the cost.*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	*Drop*	*Town has written plan in place for School building.* *All other municipal structures have pitched roofs. Written plans are not necessary given that fact, as well as the small number of municipal structures.*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Carry Forward*	*Bill will acquire pamphlets from FEMA and will work on setting up educational programs.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Carry Forward*	*Fire Department and Public Works collaborate during storm events, so formal identification of difficult-to access areas and development of contingency plans has not been necessary. However, Bill feels this action is worth pursuing, and wishes to carry it forward.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Public Works is in the process of assessing the costs and benefits of using sand versus salt for road maintenance.
School snow load capacity study completed. Capacity is less than 1 foot.

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Acquire backup generator for school
Acquire a new plow truck (in process, planned for June 2017)
Determine costs/benefits of using sand versus salt for road maintenance, and implement the best management method. [Consider road safety, culvert sedimentation, and environmental effects.]

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	*Town feels they are sufficiently prepared with backup supplies and facilities for an earthquake*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	*Development applications are assessed on a case-by-case basis*
Consider conducting an assessment of buildings in town in respect to their susceptibility to earthquakes	*Drop*	*Town does not feel this is necessary given the unlikelihood of a large earthquake event and structural requirements laid out in the building code.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Brush fires are a regular occurrence in Town. Typically do not cause property damage.

Location	Date	Impact/Size/Response
Bad winter fire	*Winter of 2015-2016 [February 2016]*	*Took out a house*

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*Industrial Park in the South end of Town is the only area with hydrants*
Fire Department	
Firefighting Equipment	*Fire Department is trying to acquire a new Engine*
Fire Prevention Week/ Education Materials	*Fire Department did some public education about fire safety recently (2016), including at a daycare, senior center, and the elementary school*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town	*Capability*	*The Summer of 2016 tested this fire-flow evaluation protocol, as dry conditions led to very low water levels in ponds that serve dry hydrants. Town had to reevaluate water supply capabilities that historically had been sufficient.*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	*See notes above in "Capabilities"*
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	*Bill is Fire Marshal*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
  - *Town reassessed dry hydrant capabilities during extremely dry summer of 2016*
- New Actions (include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)
  - *Install additional dry hydrants in underserved areas with suitable ponds*
  - *Install cisterns in underserved areas without suitable ponds*
    - *In the area near Town Hall*
    - *In the area near Uncas Gas*
  - *Adopt a new ordinance requiring cisterns to be installed in new developments*
    - *Draft in the first months of 2017*
    - *Adopt by end of 2017*
  - *Acquire a new fire engine*

7. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams in Town

Name	Owner	Class	EOP?	Status/Notes/Changes
Gager's Pond Dam	*Private*	B	*2010*	*DEEP has been trying to get the owner to fix the Dam, but has not been able to get in touch with him.* *Town will work with DEEP to urge dam owner to develop EAP, make necessary fixes*
Mahoney Pond Dam		A	*N/A*	
Kahn Pond Dam		U	*N/A*	

- Capabilities

Capability	Changes
EOPs, Monitoring	
Dam Removals	
Other	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Carry Forward*	*Still unable to secure EOP from owner of Gagers pond. Carry Forward*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Drop*	*Town does not have this capability. They will direct any questions from owners of lesser dams to DEEP.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Town will work with DEEP to urge Gagers Pond dam owner to develop EAP, make necessary fixes

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Carry Forward*	*Town performs tabletop drills locally, and participates in regional drills. They do not have the Personnel to be able to run local drills on their own.* *Bill in interested in exploring the possibility of running local drills. Carry forward.*
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	*Ultra-High Frequency for Region 4* *Low frequency for Fire Department* *High Frequency for DPW Garage*
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the City EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage City officials to attend FEMA-sponsored training seminars at EMI	*Capability*	*Attend local seminars. For example: Grant writing seminar in December 2016.*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	*Currently preparing shelter budgets, and are acquiring additional cots and blankets (insufficiency was noted during regular evaluation).*
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	*Town has flyers.* *Occasionally send out information with Tax Bills.*
Resolve and utilize the Reverse 9-1-1 system to telephone warnings into affected areas, and add DFIRM floodplain areas to the database	*Complete*	*Everbridge*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Carry Forward*	*Interested in incorporating a checklist if provided with a sample template.* *Explore possibility of being given a template by SCCOG*
Integrate additional elements of this HMP into the Plan of Conservation and Development during the next update	*Carry Forward*	
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Continue to require the underground installation of utilities for all new development where possible	*Capability*	
Continue to enforce the appropriate building code for new building projects	*Capability*	

Encourage residents to install and maintain lightning rods on their structures	*Drop*	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Fire Department performed some general hazard educational activities
Post-Irene FEMA funding paid for upgrades on Old Route 32 (Town Road): riprap to stabilize river and protect road in that area. Right on the Norwich Line, off Willimantic Turnpike. Completed in 2011.
Golf Course upgraded drainage system, and flooding has been mitigated downstream from that site.

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

- Notes

Attendance

Name	Department and Role	Email

Griswold
Data Collection Meeting

Griswold / Jewett City Hazard Mitigation Plan Update Kickoff Meeting

DATE: January 26, 2016
PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:
Mario Tristany - Town Planner, Planning & Community Development
Todd Babbitt - Road Superintendent, Public Works
John Connelly - Jewett City Borough Warden
Noah Slovin - CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He covered regulations requiring the Town and Borough to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah explained to the meeting attendees that the Town of Griswold and the Borough of Jewett City were treated as a single unit in the previous version of the Regional Hazard Mitigation Plan; however, the two governments had joined the reorganized Southeastern Connecticut Council of Governments (SCCOG) as separate entities in 2014. Therefore, the representatives of the two governments could decide whether they wanted to have separate annexes in the HMP update, or to have a single annex covering both Griswold and the Borough of Jewett City. The meeting attendees all agreed that a single annex was preferable.

Noah then gave meeting attendees copies of an HMP Update worksheet that provided a comprehensive list of the information needed to update the Plan. The group worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Potential Developments and Developments in Progress:

Name	Location	Details (type, units, hazards, etc.)	Changes
Commercial Subdivision	RTE 138		*Complete*
Hotel	Near I-395	*AmericInn*	*Complete*
Approved Subdivision	*Bishop Crossing Road & Roode Road*	150 Homes	*Scrapped - land returned to forest and farms*
Exxon Petro Max	*Route 164 [near 395]*	*Gas Station*	*Built [used to be residential/farms]*
Hotel	*Route 164*	*Hotel*	*Planning Stage*
Mixed-Use Development	*West side of Route 164 next to Gold Course*	*Commercial/Residential/Dementia-related Assisted-Living. Major development*	*Planning Stage*
United Community and Family Services Medical Facility	*201 Mary Street*	*[Medical Facility. Possible Critical Facility?]*	
Proposed Mixed-Use Development	*Reclamation Site across from Mary Street [Balfour and E Main Street]*	*[Mixed Use] [Next to Ashland Pond]*	*Proposed*
Condominium	*Pleasant View Street*	*102 Unit Condominium*	*Under construction*
Auto Repair	*Off of Route 138*		
Old Mill	*Next to Aspinook/Quinebaug, by train tracks (Anthony Street)*	*Almost finished being rehabilitated and converted into major wind-turbine manufacturing center.*	
Solar Farm	*Intersection of Route 138 and 201*	*7 MG a day Solar Farm (large)*	*Planned*
Generally, development rate has increased since previous plan			

1.4 - Any changes to government structure

*None*_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
POCD	2007	*Update process currently underway*
EOP	2016	*No Change*
Zoning Regulations		*Minor Updates*
Subdivision Regulations		*No Change*
Inland Wetlands		*No Change*
Aquifer Protection		*No Change*

1.6 - Critical Facilities

Facility	Location	Notes/Changes
Griswold Volunteer Fire Department (Shelter)		*Brand-new generator (less than 4 years-old) installed*
A.A. Young Jr. Hose & Ladder Co. (Shelter)		
Griswold Visiting Nurses Association		*No longer exists. Building has been coverted to Youth & Family Services Building.*
Community Ambulance		*Building has been vacated, but continues to be Town-Owned. Ambulance service now contracted to American Ambulance. Located in Jewett City Fire Department. Looking to move to a separate site, considering construction of new site, or reuse of old Community Ambulance Building.*
Town Hall		
Senior Center (Shelter)		

Griswold Public Schools Campus - Elementary School (Shelter) - Middle School - High School		
Ashland Manor (Housing Authority)		*Units have been updated to create additional bedrooms, increase capacity*
McCluggage Manor (H. Authority)		*25 new Assisted Living Units are under construction*
Ledgewood Apartments		
United Community and Family Services		
Wastewater Treatment Plant		
Little ~~H~~*L*og School House (daycare)		
Headstart (daycare)		
Slater Library		
Youth Center		
Electric Light Plant		
Sewer Plant		
Police Department		
Road Department		
Warnings/Communication Capabilities		*- School has a system for contacting parents of students. It is unknown whether any agreement exists with the Town for them to be able to use this service in emergency situations.* *- Baptist Church in Jewett City has a PA system in its belltower that can be used to send out warnings to the limited area within earshot* *- Wolverine Radio began operating on Main Street two years ago. Emergency communications can be broadcast through that service.*

It was noted that the Fire Company regularly performs training exercises to prepare for events including Category 3 and 4 Hurricanes.

2. Flooding

2.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

2.2 - Capabilities

Capability	Changes
Community Rating System Participation	*None*
Bridge Replacements, Drainage, Maintenance	*- Both of the Bitgood Road Bridges were Replaced, built to 100-year storm flood capacity.* *- Edmund Road Bridge replaced to 100-yr storm flood capacity* *- 2 bridges slated to replacement in 2018 - Sheldon Road and Norman Road - 100 yr storm capacity* *- Sheldon Road Culvert Replacement (after 2010) - one 15ft culvert replaced with two 18ft culverts (@ Carroll Row)* *- Carroll Road Bridge Slated for removal, no rebuild [Carol Road?]*
Acquisitions, Elevations, Property Protection	
Other Completed Projects	
Avalonia Land Conservancy, Inc Land Trust	*Looking to buy land along the Griswold/Preson Line* *Took over the Island in Pachaug Pond recently*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

New bridge over Norman Road may address Norman Road Flooding, removing that previously vulnerable area

- Private Properties
    - Changes to properties (acquisitions, new constructions) in SFHA
    - Repetitive Loss Properties (notes, new RL properties, etc)
- Vulnerable Critical Facilities

2.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
	Prevention	
Continue to prohibit new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of storm water is the best option for reducing peak flows downstream	*Capability*	*Included within site plan requirements*
Review local Subdivision Regulations and evaluate incorporating further limitations on impermeable surfaces in floodprone areas	*Drop*	*There are no proposed developments within floodprone areas* *Developments proposed in floodprone areas are not approved by the Town* *This action is addressed by the above and is dropped*
Consider an ordinance placing responsibility for stream maintenance on the property owner with town enforcement	*Drop*	*A review of Town ordinances is currently underway, and flood and stream-maintenance ordinances will be reviewed as a part of this process.* *However, many landowners do not have the financial capacity to maintain streams on their own property, so placing responsibility on them will likely result in a decrease in maintenance. Therefore, this action is deemed unproductive and is dropped.* *[Replace action with one related to current ordinance review?]*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*Continual effort*
Pursue acquisition of floodprone property on Popple Bridge Rd	*Drop*	*- An easement has been placed on the floodprone property on Popple Bridge Road to alleviate flooding and allow the installation of improved drainage infrastructure. Easement was placed through eminent domain.*

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Pursue the acquisition of floodprone properties on Mill Street	*Drop*	*- Town is pursuing removal of Rubber Pond dam downstream from the floodprone Mill Street property. It is hoped that this action will relieve flooding issues and make other actions unnecessary*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*Town does not run Hazard-Related Public Education Workshops*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Carry Forward*	
Make necessary changes to floodplain regulations so that all insured residents are eligible for increased cost of compliance coverage	*Drop*	
Encourage residents to submit flood insurance claims following damage events	*Capability*	*Information packets are available to residents that contact the Town after an event*
Emergency Services		
Ensure that the EOP provides detailed instructions regarding the evacuation procedures within town	*Capability*	
Investigate locations and labor involvement for the pre-event stockpiling of sand bags for use in flood prone areas	*Capability*	*Bags and palates for transportation are stored at DPW, and deployed from that site.* *6 palates pre-loaded with bags.* *Bags are washed and reused after events*
Pursue mutual aid agreements with non-profits to provide volunteer labor for filling sand bags and other response activities	*Drop*	*Town will accept help from volunteers, but does not solicit*
Identify the locations of and pursue the establishment of Fire Department substations in areas not adequately served by the Departments	*Carry Forward*	*Have not felt this was necessary to pursue in the past, however the ISO is encouraging the Town to construct a substation near the intersection of routes 165 and 201. Town's ISO rating went from 10 to 8B in February, providing great cost-savings to residents. Town is interested in lowering that score again.* *NOTE: this action needs to be put in the wildfire section.*
Public Education and Awareness		
Conduct a "Natural Hazards Fair" so that interested parties can familiarize themselves with natural hazard mitigation options	*Drop*	
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	
Annually distribute a brochure outlining the risks of flood prone areas, mitigation strategies, and contacts	*Capability*	*Emergency Manager has brochures relevant to specific types of hazards, which he puts out at appropriate times of year. Locations for brochures at the Town Hall Lobby and the Fire House.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	
Continue to pursue funding for an information kiosk outside of Town Hall	*Drop*	*Part of the Main Street Master Plan was to construct an information kiosk outside Town Hall. State funding for the plan was insufficient, and the plan is not being further pursued. The kiosk was not built.*
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	*Capability*	*Addressed in regulations*
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Drop*	*Engineers building culverts look at upland floodplain area and 100-year storm precipitation.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	*Annually clean catch basins & culverts, upgrade if they are failing.*
Investigate funding and feasibility of mitigating frequent drainage problems	*Carry Forward*	*Investigated funding through HMGP, but did not receive sufficient money to address all problems*
Pursue the the receipt of funding under the HMGP to improve roadway drainage at Sheldon Road	*Complete*	

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Pursue the receipt of funding under the HMP to construct a retaining wall for the Volunteer Fire Department, Station 55	*Carry Forward*	*This building is a shelter, with the back wall located approximately 2 feet from the floodplain. Town personnel said that the floodplain extent was last calculated in the 1950s, and was miscalculated. They are not aware of whether the new FEMA maps updated the floodplain extent here. They believe that reassessment of the floodplain would place its edge closer to five feet from the edge of the building. Therefore, it may be advisable to reassess the floodplain extent prior to pursuit of this action*
If acquisition is not possible, pursue a drainage upgrades for the flood prone residences on Mill Street Popple Bridge Road	*Carry Forward*	*The drainage upgrade being pursued is the removal of the dam.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Wastewater Treatment Facility - floodwall was breached (circumvented, really) by floodwaters in 2010; it does not extend far enough toward Wedgewood Road to prevent flooding. FEMA did not fund an extension of the wall when the Town applied for funding. Town will continue to pursue extension of this wall.

3. Wind Damage from Hurricanes, Tropical Storms, and Other Events

3.1 - Setting/Historic Record

Event	Date	Impact
Sandy	10/29/2012	*Minor. Some trees down. Power outages.*
Microburst	*2013 or 2014 [appears to be June 2015]*	*Many trees down.*

3.2 - Capabilities

Capability	Notes/Changes
Tree Maintenance	*$5K annual budget. Have been reimbursed by FEMA a couple of times.*
Other Completed Projects	
Power Utility Operations	*Eversource - extensive trimming, especially along Rixtown Road. 37 miles of trimming.* *Also take entire trees when deemed appropriate.* *Trimming/response based on reported outages.* *Power outages are very common. Griswold experienced an outage on 1/25 during a nor'easter.*
Jewett City Power Utility	*Jewett City Department of Public Works has done extensive trimming. Power outages are not a problem in the borough.*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Work with State to place NOAA radios in commercial buildings w/large populations & educate managers in use	*Drop*	*NOAA radios located at P.W. Department. First Selectman emails out weather information. Distribution of NOAA radios not expected to improve communication.*
Ensure building codes relative to wind are properly enforced	*Capability*	
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	*Town explored this option, specifically for the Emergency Shelters and Fire Companies. The windows were determined to be sufficiently strong, and functional shutters unnecessary*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Performed by the Building Department*
Encourage commercial building owners to develop emergency response plans and ID mitigation opportunities	*Drop*	
Emergency Services		
ID a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*Town Transfer Station. State has also designated the field in front of Public Works as a brush disposal area.*
Survey all municipal buildings, particularly historic buildings to determine their ability to withstand wind loading	*Drop*	*Cost Prohibitive*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Complete*	*Town performs own chop/chip during storms. Also are members of 15-town incinerator agreement through SCCOG, and can utilize that service if necessary. This agreement includes borrowing equipment. The incinerator has an emergency plan in place.*
Prioritize wind-related retrofitting for the town's shelters over other critical facilities	*Drop*	*Wind-related retrofits are cost-prohibitive for the Town.*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*The time and money needed to perform any sort of effective educational program for children (which the Town feels would require consistent reinforcement) is not available*
Conduct an annual workshop so that interested parties can familiarize themselves with wind mitigation	*Drop*	
Work w/local homeowner associations & community groups to provide education re: wise landscaping & tree planting	*Drop*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Heavy snow over entire winter	*2015*	*Chicken Coop collapsed, other old farm houses collapsed. None of them Town-owned. FEMA funding granted to Town*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*Upgraded equipment. High output plows. Reliability has increased. All upgrades paid for in-house. Residents seem to be satisfied with response, generally.*
Snow Loading/Removal from Roofs	*After 2015 developed a new policy, focusing on removing snow from the backside of the Senior Center and from the roofs of the Dog Pound Kennels.*
Public Information	*Fire Department and Senior Center check on homeless people during cold weather.*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting town residents during cold weather and for mitigating icing and insulating pipes at residences	*Carry Forward*	
Identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Attendees noted a minor event in the last few years - minor rumbling, like a train going by. No other details. No damage.		

5.2 - Capabilities

Capability	Changes
Building Code	*None*
Zoning Ordinances, etc.	*None*

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	*Have extra supplies. Fire Companies (which are also emergency shelters) have extra food to feed public works employees during events. Unclear whether backup supplies are always on hand in case of a sudden emergency like an Earthquake*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Drop*	*Does not apply - no such areas in Town*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response
Routine Brush Fires		

6.2 - Capabilities

Capability	Changes
Warning/Communication/Monitoring	*Monitoring performed by Fire Service [locally? Civil Air Patrol?]*
Water Supply	*4 new dry hydrants installed in the last 5 years* - *Route 165* - *Glasgow Dam* - *Rixtown Road* - *Pachaug Lake @ Shooting Range*
Fire Department	*Mutual Aid Agreements with surrounding Towns* *DEEP often lends assistance because of large amount of State land in Town.*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town	*Capability*	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	
Identify the locations of and pursue the establishment of Fire Department substations in areas not adequately served by the Departments	*Carry Forward*	*Have not felt this was necessary to pursue in the past, however the ISO is encouraging the Town to construct a substation near the intersection of routes 165 and 201. Town's ISO rating went from 10 to 8B in February, providing great cost-savings to residents. Town is interested in lowering that score again.* *NOTE: this action was previously (mistakenly) in the Flood section.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams

Number	Name	Owner	Class	Status / Notes
5801	Glasgo Pond Dam	CT DEEP	B	*Currently undergoing rehabilitation. Headworks for overflow redone. New top put on dam.*
5803	Stone Hill Reservoir	Jewett City Water Company	B	
5804	Ashland Pond	CT DEEP	C	*May have been improved recently. Riprap has been added*
5805	Pachaug Pond	CT DEEP	C	*Work is currently underway to improve*
5807	Hopeville Pond Dam	CT DEEP	B	
5811	Aspinook Pond	Private (Commercial)	B	*Work was done to improve hydropower operations. Dam owned by Summit Hydropower*

- Capabilities

Capability	Changes
EOPs, Monitoring	*None*
Dam Removals	*None*
Other	*None*

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Capability*	*Emergency Manager monitors dams and EOP status.* *Town reports to DOT on state of Scour-critical bridges. Often, bridge and dam inspection performed in unison.* *NOTE: Town is attempting to get State to take over Carroll Row Dam. Previous owner passed away, leaving required repair work unfinished. There is no EOP for this dam.*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Drop*	*DEEP has its own requirements that have become stricter since the previous plan. The Town will call DEEP if there are issues.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Town is seeking to breach and remove two minor dams: - *Route 138 / Slater Avenue Dam on the Quinebaug* - *Downstream Dam on the Quinebaug (near Dam)*
Town is attempting to get State to take over Carroll Row Dam

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Promote inter-jurisdictional coordination for emergency response	*Capability*	*Fire Department and Public Works have mutual-aid agreements with surrounding towns*
Promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	*Emergency Manager Responsible* *3 local exercises/trainings are run per year* - *Snow, wind, etc. drills*
Evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	*Fire: adding new frequency - incorporating new Voluntown Tower, expected to eliminate "dead areas." Will work with Norman Rd Tower*
Promote regional transportation and evacuation planning through SCCOG	*Capability*	
Work with SCCOG to perform regional study of critical facility vulnerability to natural hazards	*Capability*	
Work with SCCOG to develop regional evacuation scenarios that include but build on Millstone plan	*Capability*	
Local Emergency Response & Public Information		
Review & update EOP at least once annually	*Capability*	
Maintain emergency response training & equipment. Upgrade equipment when possible.	*Capability*	
Have town officials attend FEMA-sponsored trainings at EMI	*Capability*	*Online trainings through Three Rivers [Three Rivers Community College?]*
Evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Disseminate public information about natural hazard effects into Government buildings	*Carry Forward*	*Replace action with more specific:* *Coordinate with Wolverine Radio to display relevant hazard information (on a seasonal or event-specific basis) on Wolverine Radio screens located in Town Hall and other locations around Town.*
Employ a town-wide Reverse 911 system such as the CT Alerts Everbridge System	*Carry Forward*	*[ctalert website indicates Griswold participates. Action is to implement local reverse-911 system]*
Prevention		
Integrate elements of HMP into the POCD & EOP updates	*Carry Forward*	*POCD and EOP are currently being updated*
Review building plans to ensure proper access for emergency vehicles	*Capability*	
Require the underground installation of utilities for all new development and pursue opportunities to put existing lines underground	*Capability*	
Expand street tree planting programs and maintenance. Recommend appropriate trees near overhead wires	*Capability*	
Enforce appropriate building code for new projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	
Natural Resource Protection & Open Space		
Protect watercourses, inland wetlands, steep slopes greater than 15%, and inland floodplains	*Capability*	
Require deduction of wetlands, watercourses, slopes greater than 20%, & floodplains from development area calcs	*Capability*	
Strive to ensure that any open space acquired be preserved in perpetuity	*Capability*	
Modify open space provisions in Subdivision Regs to require every residential subdivision make a provision for open space	*Capability*	*Technically, developers can pay a fee in lieu of setting aside open space. Town representatives are not aware of this ever having been done. This language could be tightened.*

Expand the open space set-aside requirement to all other types of residential development	*Drop*	*Town feels open space requirements are sufficient*
Seek to identify and preserve areas with high passive recreational potential as open space and as part of a waterfront pathway network	*Drop*	*Town is concerned about possible legal issues with regards to "taking" and does not want to officially pursue acquisitions.*

- Notes

Update Acknowledgement Page of Plan
Email GIS maps to Mario

Attendance

Name	Department and Role	Email
Mario Tristany	Town Planner	
Todd Babbitt	DPW	
John Connelly	Jewett City Warden	

Groton City
Data Collection Meeting

DATE: November 8, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Barbara Goodrich, City Planner
Carl Smith, Zoning Officer & Historic District Staff
Tom Davoren, Police Chief
Tim Umrysz, Public Works
Noah Slovin, CFM, Milone & MacBroom, Inc.

SUBJECT:

SCCOG Regional Hazard Mitigation Plan Update - Municipal Annex Data Collection Kickoff Meeting

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the City to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group worked through much of this worksheet together.

Update Worksheet:

1. Community Profile

1.1 - Land Use

Use	Percentage
NO NOTES	

1.2 - Top Employers

Employer	Number Employed
NO NOTES	

1.3– Potential Developments and Developments in Progress:

Name	Location	Changes
NO NOTES		

1.4 - Any changes to government structure

*__NO NOTES*_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
POCD	2008	*Currently Undergoing 10-year Update*
EOP	2016 (Annual)	*Currently Undergoing 5-year Update*
Harbor Management Plan	2007	*NO NOTES*
Zoning Regulations	July, 2011	*NO NOTES*
Subdivision Regulations	2/18/2005	*NO NOTES*
IWW Regulations	2007	*Updated to conform to requirements of Darcy Wither at CT DEEP*

1.6 - Critical Facilities

Facility	Changes
Fire Station (Broad Street)	*One of these was upgraded within the last 2 years, and a new generator installed in it*
Fire Station (Benham Road)	*One of these was upgraded within the last 2 years, and a new generator installed in it*
City Hall (EOC,PD, Groton Utilities, Public Works, Shelter)	*EOC moved to upstairs of Municipal Building to protect from basement flooding*
Water Pollution Control Authority	
Fitch High School (Shelter)	
Avery Heights (Elderly Housing	
Pfizer	
Electric Boat	
University of Connecticut (Avery Point)	

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact
NO NOTES		

2.2 - Capabilities

Capability	Changes
Community Rating System Participation	*NO COMMENTS*
Bridge Replacements, Drainage, Maintenance	*NO COMMENTS*
Regulations, Codes, Ordinances	*Updating Flood Regulations on December 1, 2016. These updates have been drafted and vetted by Diane Ifkovic, State Floodplain Manager*
Acquisitions, Elevations, Property Protection	*NO COMMENTS*
Warnings/Communication	*- There is interest in updating these systems.* *- The Everbridge System continues to be in place* *It has been updated so that it notifies citizens about parking bans prior to snowstorms* *- Millstone Siren System*
Completed Projects	*NO COMMENTS*
Coastal Resilience Planning	*NO COMMENTS*
Coastal Flood Infrastructure	*- New drainage line under Thames Street - it is somewhat helpful, but can still be overwhelmed.* *- PAF Retaomomg wall has been renovated and rebuilt* *- Bulkhead of the Costa Property has been renovated and rebuilt* *- Shore Avenue Tide Gates upgraded*
Other	*NO COMMENTS*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses

Thames Street and Eastern Point Road - flooding starts at Sacred Heart School and flows downhill
Shore Avenue floods during storms due to high tide/surge. Tidal gates have been upgraded, but are not able to mitigate high water.
Undersized drainage is a common issue

- Private Properties
    - Changes to properties (acquisitions, new constructions) in SFHA

Rumors that Pfizer may leave and sell their facility in Groton City, in Flood Zone.

    - Areas vulnerable or historically impacted

NO COMMENTS

    - Repetitive Loss Properties

NO COMMENTS

- Vulnerable Critical Facilities

EOC moved to upstairs of Municipal Building to protect from basement flooding

2.4 - Actions

Action	Capability	Status
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within City land use regulations	X	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	X	*Enforce current stormwater management from State* - *No runoff from new development* - *Engineer must check drainage plan*
Review local Subdivision Regulations and evaluate incorporating further limitations on impermeable surfaces in floodprone areas	-	There is no new development in the City, and is unlikely to be in the future - there is very limited space. City Planner feels this would not have a significant impact. DROP ACTION
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	X	Inspections performed regularly. Rarely occur in a situation where drainage improvements would be helpful (high tide or surge problems)
Consider establishing a recreational boating zoning classification to prevent water-dependent uses being replaced with residential uses	-	Considered DROP
Consider regulating development activities within potential storm surge areas as mapped by FEMA	-	This is unlikely to pass
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise		DROP
Compile a list of addresses of structures within the 1% annual chance floodplain, and track repair costs following disasters		Structures are dealt with and costs tracked on a case-by-case basis. City does not have staff to perform this task. DROP
Encourage the railroad company to regularly inspect, clear, and maintain its culverts and bridges in the vicinity of Thomas Road		DROP
Encourage the Town of Groton to complete or redo the drainage from the golf course down to Shore Avenue	X	Completed
Encourage the State to clean, repair, and correct, as needed, the drainage across Poquonnock Road from the former Trails Pond dam site	X	Electric Boat cleans. Regularly inspected.
Property Protection		
Incorporate information on the availability of flood	X	

Action	Capability	Status
insurance into all hazard-related public education workshops as appropriate		
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	X	
Consider providing technical assistance to owners of non-residential structures regarding flood proofing techniques		
If property owners become interested, consider elevation or acquisition of flood prone residential properties		
Consider applying one foot freeboard standards for structure elevations for renovations and new construction in coastal A and V zones	X	Is in the State Building Code (2009 and 2012) This Code is enforced
Encourage residents to submit flood insurance claims following damage events		
Emergency Services		
Identify alternate evacuation routes for the Jupiter Point, Avery Point, and Eastern Point areas other than Route 349		Mitchell Street is the evacuation route. Southern section of 349 (Eastern Point Road) gets flooded. Thomas Road is often flooded. Replace with Tyler Avenue. - Is anything needed to mark this as an evacuation route?
Ensure that the EOP provides current detailed instructions regarding the timing of evacuations from the southern part of the City		Currently being updated (5 year cycle). This will be incorporated.
Evaluate alternative evacuation methods for residents stranded after Route 349 begins to flood	X	Tyler Avenue
Investigate locations and labor involvement for the pre-event stockpiling of sand bags for use in flood prone areas		Responsibility of Highway Department
Pursue mutual aid agreements with non-profits to provide volunteer labor for filling sand bags and other response activities		Sandbags are not a primary flood control tool. Response activities are done in-house. This action is deemed unnecessary DROP
Implement a roadway-specific warning system to alert motorists to flooding dangers	X	This has been incorporated into the EOP
Public Education and Awareness		
Make information available outlining the risks of flood prone areas, mitigation strategies, and contacts at City Hall and on the City website		Check this
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards	X	This is done through both the Planning and Building Departments, especially during permitting process.
Natural Resource Protection		
Encourage owners of Shennecosset Beach to conduct beach nourishment and vegetation replacement to keep up with erosion	X	Hurricane Sandy washed away sediment that was present. The presence of the beach and vegetation was found to have helped reduce damage. Afterwards nourishment and vegetation

Action	Capability	Status
		planting was performed. Completed.
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new devleopments and at existing properties where appropriate	X	Within Building Permit process
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	X	Performed by Highway department
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	X	
Investigate funding and feasibility of mitigating frequent drainage problems	X	
Determine the cause of flooding and dampness in the basement of the Municipal Complex and install measures to prevent future occurrences	X	Items in storage have been placed on Pallets Items stored in basement have been changed to move the most flood-vulnerable items up. The EOC has been relocated upstairs
Evaluate the drainage on Bayberry Lane and make improvements if possible	X	Tidal problem - no improvements are possible State jurisdiction DROP
Upgrade stormwater collection and discharge systems to keep up with rising sea level	X	Performed on a case-by-case basis
Maintain existing hard structures along the coast in good condition	X	
Investigate funding sources and the feasibility of elevating portions of Shore Avenue	X	Funding for 5 seawall outlets - Elevated - New flap gates
Work with the State DOT to elevate Shennecossett Road and Route 349 in the vicinity of the Avery Point campus		DROP
Consider elevating Shennecossett Road immediately east of Avery Point above the 1% annual chance flood elevation		*NO COMMENT*
Perform more frequent cleaning of the drainage systems near Electric Boat		Electric Boat is responsible
Repair and clean the culverts near Shennecossett Beach		
Repair or replace all flapper valves as appropriate	X	Performed as needed Note Shore Avenue seawall improvements
Investigate and remediate the malfunctioning backwater valve near Shore Avenue	X	Not a malfunction - designed to prevent debris ingress, not a flood control mechanism. DROP
Ensure that the City's waste water treatment facility is protected from coastal flooding and storm surge, and make improvements if needed		

- Other Actions Completed since Previous Plan

NO COMMENTS

- New Recommendations / Actions of Interest

Working on upgrading the seawall along Shore Avenue. Engineering is complete.
Pine Island Road - Upgrading the bulkhead, drainage system. Elevating.
Complete upgrades of Shore Avenue Seawall and Tidal Gates

3. Hurricanes and Tropical Storms

3.1 - Setting/Historic Record

Event	Date	Impact
NO COMMENT		

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	Tree Warden in Highway department. "Steve" (Biekert)? Groton Utilities maintains trees ASPLUNDH maintains trees
Warnings/Communication	
Sheltering	
Completed Projects	
Coordination with Power Utility	Groton Utilities owned by City. Good coordination
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

NO COMMENTS

3.4 - Actions

Action	Capability	Status
Prevention		
Consider working with the State to locate NOAA weather radios in buildings with large populations and educate managers to use them		
Work with City marinas to ensure that personal watercraft can be removed in a timely manner or removed to sea prior to severe winds		
Develop a plan for notifying residents and business about approved areas for storing boats during high wind events		
Work with SCCOG to develop a regional marina management plan addressing wind damage, and encourage local marinas to develop plans		
Consider a City ordinance to establish how to notify property owners about dangerous trees, their responsibilities, and potential liabilities		
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources		
Make information on wind-resistant construction techniques available to all building permit applicants where applicable		

Action	Capability	Status
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities		
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse		
Consider surveying all town-owned buildings, particularly historic buildings to determine their ability to withstand wind loading		
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal		
Prioritize wind-related retrofitting for the town's shelters over other critical facilities		
Public Education and Awareness		
Post and maintain signs signifying evacuation routes from coastal areas		
Explore ways to perform public outreach to the community regarding wind hazards and continue to provide information at City Hall		
Natural Resource Protection		
Consider acquisition of coastal shorefront land at risk of flooding and convert to open space		

- Other Actions Completed since Previous Plan

Developed a process for harboring boats on land prior to event
Firehouse upgraded and given a new generator

- New Recommendations / Actions of Interest

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Tree Maintenance	
Snow Loading/Removal from Roofs	
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Capability	Status
Consider drafting a written plan for inspecting and prioritizing the removal of snow from City-owned structures		
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots		
Continue to provide information for protecting City residents during cold weather and for mitigating icing and insulating pipes at residences		
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas		
Encourage the Connecticut DOT to remove snow from State roads in the City in a timelier manner.		

- Other Actions Completed since Previous Plan

Parking Ban enforcement, informed through Everbridge

- New Recommendations / Actions of Interest

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Capability	Status
Ensure that City departments have adequate backup supplies and facilities for continued functionality following an earthquake		
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction		*There are not believed to be any slopes steep enough in the City.*

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Fire Department	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Capability	Status
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town		
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes		
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

7. Dam Failure

No Dams in the City of Groton

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Capability	Status Update
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response		
Continue to promote local and regional planning exercises that increase readiness to respond to disasters		
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available		
Continue to promote regional transportation planning through SCCOG		
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage		
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan		

Local Emergency Response & Public Information		
Continue to review and update the City EOP at least once annually		
Continue to maintain emergency response training and equipment and upgrade equipment when possible		
Encourage City officials to attend FEMA-sponsored training seminars	**X**	Zoning officer/Building Official and Assistant Building Official attended regional Floodplain Management seminar in Old Lyme
Continue to evaluate emergency shelters, update supplies, and check communication equipment		
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions		
Utilize the Everbridge system to telephone warnings into affected areas, and add DFIRM floodplain areas to the database		
Prevention		
Integrate additional elements of this HMP into the Plan of Conservation and Development during the next update		Currently being updated.
Continue reviewing building plans to ensure proper access for emergency vehicles		
Encourage underground installation of utilities for all new development and pursue opportunities to put existing lines underground		
Consider expanding street tree planting programs and maintainence while recommending appropriate trees near overhead wires		
Continue to enforce the appropriate building code for new building projects		
Natural Resource Protection & Open Space		
Work with the Town of Groton to create an open space corridor along Birch Plain Creek and add land to the existing park		Requires taking private property KEEP
Continue to protect watercourses, tidal and inland wetlands, steep slopes greater than 15%, and coastal and inland floodplains		
Consider requiring the deduction of wetlands, watercourses, steep slopes greater than 20%, and floodplains from development area calcs		
Seek to identify and preserve areas at risk of flooding as recreational open space		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

End of Meeting

Groton Town
Data Collection Meeting

1. Community Profile

1.3 - New developments within the last few years:

Name	Location	Changes

1.4 - Any changes to government structure

_____

_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
EOP	(2016)	
POCD	(2012-2013)	
Zoning	2011	
Subdivision	2006	
Inland WW Regs	2011	
Municipal Coastal Program		

1.6 - Critical Facilities

Facility Type	Changes
Fire	
Police	
Ambulance/Hospital	
Municipal	
EOC	
Shelters	
Water/Wastewater	
Historical	
Evacuation Routes	
Other	

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	
Completed Projects	
Other	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities

2.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within the local land use regulations.	**Capability**	This is a capability and can be removed from the list of actions.
Continually review regulations affecting coastal areas to ensure that siting of development within coastal flood hazard areas (A- and Vzones) is discouraged, and hazards to life and property are minimized.	**Capability**	This is a capability and can be removed from the list of actions.
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream.	**Capability**	This is a capability and can be removed from the list of actions.
Review local Zoning Regulations and evaluate the possibility of incorporating changes to place further limitations on areas of impermeable surfaces in new residential subdivision developments in flood prone areas. If warranted, make necessary changes.	**Complete**	A Zoning Regulation re-write was completed in 2016-2017

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Conduct an annual inspection of floodprone areas that are accessible to Town officials. Determine if potential flood damage is stormwater facility related and make recommendations as appropriate.	**Not Completed**	The Town does not have the resources for annual inspections. Instead, they monitor known problems and respond to complaints and address issues on a case by case basis.
Limit development activities within potential storm surge areas as mapped by FEMA.	**Capability**	This is a capability and can be removed from the list of actions.
Consider flexible yard requirements and regulatory incentives to allow for and encourage larger separations of buildings from coastal high hazard areas and encourage or require property owners to build as far back from eroding shorelines and vulnerable beach areas as possible.	**Partly Completed**	The Town developed a Municipal Coastal Program to advance resilience concepts, and it discusses setbacks. The next step will be to revisit this action.
Work with State and Federal agencies to ensure that flood protection regulations reflect current thinking and standards especially with regard to long-term rise in sea levels.	**Complete**	The Town developed a Municipal Coastal Program to advance resilience concepts and has adopted freeboard.
Utilize the recently released DFIRM to compile a list of addresses with structures within the 1% annual chance floodplain. Track the cost of repairs to these properties following major storm events through outreach or building permits to develop a database of information for potential future grant funding.	**Partly Completed**	The Town keeps track of repairs and improvements in the SFHA. However, the Town does not promote the use of grant funds for private property mitigation.
Consider a study to determine if improvements are necessary to control flooding on Birch Plain Creek near Poquonnock Road since the former Electric Boat Dam has been removed.	**Not Completed**	The Town has not had sufficient resources for this type of study.
<u>Property Protection</u>		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops.	**Not Completed**	The Town does not have the resources to do this.
Make available FEMA-provided flood insurance brochures at public accessible places such as the local government buildings. Encourage residents to purchase flood insurance if they are located within a FEMA SFHA.	**Capability**	This is a capability and can be removed from the list of actions.
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding floodproofing techniques such as wet and dry floodproofing.	**Not Completed**	This has not been necessary in the last five years.
When property owners become interested, pursue elevations or acquisitions of residential properties that suffer flood damage.	**Partly Complete**	Numerous property owners have elevated their structures. The Town does not promote the use of grant funds for private property mitigation.
Upon completion of the pending update to Groton's Municipal Coastal Program, consider strategic application of freeboard standards of one foot or greater when requiring structure elevations for renovations and new construction in coastal A and V zones.	**Complete**	Freeboard is required
Remind residents that their flood insurance rates will not increase if they make a claim since the insurance is federally subsidized and encourage them to submit claims following damage events.	**Not Completed**	The Town does not have the resources to do this, nor has it been necessary.

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Work with the fire districts to pursue floodproofing for the fire stations in flood hazard areas and hurricane surge zones.	**Partly Completed**	The Poquonnock Bridge fire house located in the SFHA has been retired from service and the fire district utilizes a building located outside the SFHA.
Emergency Services		
Develop a site-specific evacuation plan for residents of the Mystic River Homes senior living complex, as it is located in a flood zone.	**Not Completed**	This is no longer necessary because dry land access has been established.
Develop a protocol to address redevelopment of buildings severely damaged or destroyed after a major coastal storm.	**Not Completed**	This has not been necessary.
Ensure that the EOP provides up-to-date, detailed instructions regarding the timing of evacuations from the southern part of the Town, since these roads will be significantly flooded or washed out by a major hurricane.	**Not Completed**	The Town has found that its EOP is sufficient and this has not been necessary.
Investigate locations and necessary labor involvement for the pre-event stockpiling of sand bags for use in floodprone areas.	**Complete**	Supplies are maintained and the Town can access three bagging devices as well as labor for bagging.
Pursue mutual aid agreements with such organizations as the American Red Cross and the Boy Scouts of America to provide volunteer labor prior to or during flood events to fill sand bags and assist with other response activities.	**Complete**	Supplies are maintained and the Town can access three bagging devices as well as labor for bagging.
Incorporate the 1% annual chance and the 0.2% annual chance inland and coastal floodplains based on the recent DFIRM into the Reverse 9-1-1 system.	**Complete**	This has been done.
Implement a roadway-specific warning system to alert motorists to the dangers present during times of flooding. Warning may take the form of dedicated signage or traffic control lights.	**Complete**	Evacuation signs are affixed to staff gauges and are located at many intersections in the SFHAs.
Public Education and Awareness		
Consider having a local Natural Hazards Awareness Week each year. As part of this week, conduct an annual "Flood Fair" so that residents, business owners, insurance and real estate agents, and all interested parties can familiarize themselves with functions of a floodplain, the laws governing development in a floodplain and the associated hazards, mitigation alternatives, and precautions necessary for living in flood prone areas. Climate change and sea level rise concepts should be included. Invite local insurance agents and the NFIP representatives from FEMA's insurance contractors to educate the public on the program.	**Not Completed**	The Town does not have the resources to do this. However, the new POCD and MCP address climate change and sea level rise.
Visit schools (as is currently done under fire prevention) and educate children about the risks of floods (and other natural hazards) and how to prepare for them. Climate change and sea level rise concepts should be included.	**Not Completed**	The Town does not have the resources to do this. However, the new POCD and MCP address climate change and sea level rise.
Expand the annual public outreach projects to include a brochure which will outline the risks of flood prone areas and mitigation and preparedness strategies and contacts. The brochure would be handed out annually.	**Not Completed**	The Town does not have the resources to do this.
Encourage builders, developers, and architects to become familiar with the NFIP land use and building standards by attending annual workshops.	**Not Completed**	The Town does not have the resources to do this.
Natural Resource Protection		
Conduct beach nourishment and vegetation as needed to keep up with erosion.	**Not Completed; Carry Forward**	The Town has not had the resources to do this, but is interested in pursuing these actions.

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Acquire properties adjacent to tidal wetlands and set aside for advancement of tidal marshes.	**Partly Completed**	The Sparkle Lake area in the coastal SFHA was acquired in 2013 and is now Town-owned open space. This prevented the siting of a new school on the land. Other areas will be acquired as they become available.
Structural Projects		
Encourage the use of floodplain storage, diversions, berms, dikes, and other flood control methods in new developments and at existing properties where appropriate.	**Not Completed**	The Town's preference is to avoid new development in SFHAs.
Utilize recently available extreme rainfall data to determine existing sizing of culverts. Encourage bridge replacements and culvert replacements in areas found to be undersized.	**Not Completed; Carry Forward**	The Town has not had an opportunity to use this data yet, but plans to use it.
Continue to require that post- development rates of runoff to be no greater than pre-development conditions in most circumstances; utilize recently available extreme rainfall data as noted above when designing controls.	**Not Completed; Carry Forward**	The Town has not had an opportunity to use this data yet, but plans to use it.
Continue to perform catch basin and culvert surveys to perform maintenance and cleaning and to identify and prioritize structures in need of replacement.	**Capability**	This is a capability and can be removed from the list of actions.
Investigate funding sources and feasibility of improvements to mitigate frequent and repeated flooding problems. Improvements could include elevation of roads and replacement of storm drainage systems. Work with CT DOT to facilitate these actions if State roads are involved.	**Not Completed; Carry Forward**	The Town has not had the resources for this yet. The new MCP discusses this issue appropriately
Upgrade stormwater collection and discharge systems to keep up with rising sea level.	**Not Completed; Carry Forward**	The Town has not had the resources for this yet. The new MCP discusses this issue appropriately
Install appropriately designed flood/tide gates at locations such as Groton Long Point and Mumford Cove, with considerations for sea level rise built into the designed.	**Not Completed; Carry Forward**	The Town has not had the resources for this yet.
Maintain existing hard structures along the coast in good condition.	**Partly Completed; Carry Forward**	The Town has been allocating funds to repair a 130' bulkhead in Noank. The new MCP discusses this issue appropriately. These will be addressed on a case by case basis.
Encourage or require use of "non-structural" erosion control measures (such as vegetated slopes and elevated foundations) when and where appropriate.	**Not Completed; Carry Forward**	The Town has not had the resources to do this, but is interested in pursuing living shorelines and bioengineered erosion mitigation. The new MCP discusses this issue appropriately.
Strive to ensure that structural measures will not cause secondary or cumulative shoreline impacts.	**Not Completed**	The Town's preference is to avoid new development in coastal SFHAs.

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that the Groton WPCF is adequately protected from coastal flooding and storm surge, and perform improvements if necessary.	**Completed**	In connection with general upgrades, resiliency measures are being incorporated. Electrical panels and equipment are being removed from the basement, and flood gates are being installed.
Complete the ongoing engineering study of Groton Long Point Road Bridge and determine appropriate means of protecting this important mode of egress to keep up with rising sea level and withstand coastal storms.	**Not Completed; Carry Forward**	The Town has not had the resources to do this. The current tentative plan is to harden and upgrade the causeway and bridge without elevating it.
Evaluate potential roadway elevation and structural protections at Groton-New London Airport, as it lies in the coastal flood hazard area.	**Not Completed; Carry Forward**	The Town has not had the resources to do this, but is interested in pursuing these actions. The new MCP discusses this issue appropriately.
Work with Amtrak to prioritize bridge replacements at the Poquonnock Road and South Road underpasses to facilitate enhanced emergency transportation. Conduct drainage Improvements at the South Road and Poquonock Road underpasses to reduce flooding.	**Not Completed; Carry Forward**	The Town has not had the resources to do this, but is interested in pursuing these actions. The new MCP discusses this issue appropriately.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Note – The POCD and MCP were both updated subsequent to the 2012 HMP, and have incorporated many of the objectives and actions from the HMP. Although many of these actions were not completed, their incorporation into the POCD and MCP positions them for progress. Many of these actions have been carried forward and are re-phrased to be consistent with the POCD and MCP.

3. Hurricanes and Tropical Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	
Underground Utilities	
Warnings/Communication	
Sheltering	
Completed Projects	
Coordination with Power Utility	
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Work with the State to locate NOAA weather radios in commercial buildings with large population clusters	**Not Completed**	With advances in warning systems, this has not been necessary.
Work with marinas to ensure personal watercraft can be removed in a timely manner prior to a hurricane or tropical storm event	**Not Completed**	This has not been necessary.
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans	**Not Completed**	Check with SCCOG
Property Protection		
Promote use of functional shutters for older buildings, particularly at the Senior Center	**Not Completed**	This has not been necessary.
Make information on wind-resistant construction techniques available to all building permit applicants	**Capability**	This is a capability and can be removed from the list of actions.
Encourage commercial building owners or managers of large population clusters to develop response plans and mitigation opportunities	**Not Completed; Carry Forward**	The Town has not had the resources to do this, but is interested in pursuing these actions. The new MCP discusses this issue appropriately.
Upgrade shelters and critical facilities to resist stronger winds when possible	**Not Completed; Carry Forward**	The Town has not had the resources to do this.
Emergency Services		
Consider surveying all Town-owned buildings to determine ability to withstand wind load	**Not Completed**	The Town does not have the resources to do this.
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	**Not Completed**	This has not been necessary. Adequate space and procedures are in place.
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	**Not Completed**	The Town does not have the resources to do this.

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Visit schools & educate children about risks of wind events and how to prepare for them	**Not Completed**	The Town does not have the resources to do this.
Post and maintain signs signifying evacuation routes from coastal areas	**Complete**	Evacuation signs are affixed to staff gauges and are located at many intersections in the SFHAs.
Develop working relationships with local community organizations and encourage them to promote wise landscaping techniques	**Not Completed; Carry Forward**	The Town has not had the resources to do this.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Snow Loading/Removal from Roofs	
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	**Not Completed**	The Town has not found this necessary, as buildings are addressed case-by-case.
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	**Capability**	This is a capability and can be removed from the list of actions.
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	**Not Completed**	The Town does not have resources to do this.
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	**Capability**	This is a capability and can be removed from the list of actions.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure Town departments have adequate backup supplies & facilities for continued functionality following an earthquake	**Not Completed**	Groton does not have a backup EOC, but in general there are sufficient redundancies.
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	**Not Completed**	This has not been necessary. Adequate protections are believed in place, and there are few sites for new development in these areas.
Carefully guide development near the airport as it is located above extensive sand deposits susceptible to shaking or liquefaction	**Not Completed**	This has not been necessary. Adequate protections are believed in place, and there are few remaining sites for new development near the airport.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Equipment	
Open Burning Official	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, & areas at risk of wildfire in town	**Capability**	This is a capability and can be removed from the list of actions. In the last five years, Groton Utilities and Aquarion Water Company interconnected the Groton and Mystic systems, which has improved fire protection water availability. Aquarion is constructing a

		new tank, which will improve pressures.
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	**Capability**	This is a capability and can be removed from the list of actions.
Ensure provisions of Town regulations regarding fire protection facilities & infrastructure are being enforced	**Capability**	This is a capability and can be removed from the list of actions.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

7. Dam Failure

7.1 - Setting/Historic Record

Event (Scale)	Date	Impact

7.2 - Capabilities

- Dams in Town

Number	Name	Owner	Class
5902	Ledyard Reservoir	Groton Utilities	
5904	Poquonock Dam	Groton Utilities	
5905	Poheganut Reservoir	Groton Utilities	

- Capabilities

Capability	Changes
EOPs, Monitoring	
Dam Removals	
Other	

7.3 - Vulnerabilities and Risk

- State of Dams

Dam	Status
Ledyard Reservoir	
Poquonock Reservoir	
Poheganut Reservoir	
Morgan Pond Dam	

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure copies of EOPs for GU dams are on file at the Office of Emergency Management	Not Completed; Carry Forward	The Town is waiting to receive the new EAPs.
Work with GU to conduct a tabletop exercise that simulates potential dam failure	Not Completed; Carry Forward	The Town will pursue this after the new EAPs are ready.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	**Capability**	This is a capability and can be removed from the list of actions.
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	**Capability**	This is a capability and can be removed from the list of actions.
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	**Capability**	This is a capability and can be removed from the list of actions.
Continue to promote regional transportation planning through SCCOG	**Capability**	This is a capability and can be removed from the list of actions.
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	**Complete**	This was completed in 2017.
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	**Not Completed**	Check with SCCOG
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually	**Not Completed; Carry Forward**	In lieu of revising the EOP into the State's new format, the Town has notified the State that the EOP is sufficient and will revise it in the next few years.
Continue to maintain emergency response training and equipment and upgrade equipment when possible	**Capability**	This is a capability and can be removed from the list of actions.
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	**Capability**	This is a capability and can be removed from the list of actions. The EMD attended a course in 2016.
Continue to evaluate emergency shelters, update supplies, and check communication equipment	**Capability**	This is a capability and can be removed from the list of actions.
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	**Capability**	This is a capability and can be removed from the list of actions.
Utilize the CT Alerts Reverse 9-1-1 system during emergencies	**Capability**	This is a capability and can be removed from the list of actions.
Expand the availability of standby power in the Town's critical facilities particularly the Senior Center	**Not Completed; Carry Forward**	The Town has not had the resources for this, but it is a priority.
Prevention		
Integrate elements of this HMP and the Climate Change Project into the next PoCD and MCP updates	**Complete**	This was done.
Continue reviewing building plans to ensure proper access for emergency vehicles	**Capability**	This is a capability and can be removed from the list of actions.
Consider expanding street tree planting programs while recommending appropriate street-side trees and encouraging maintenance	**?**	**?**
Require the underground installation of utilities for all new development	**Capability**	This is a capability and

		can be removed from the list of actions.
Continue to enforce the appropriate building code for new building projects	**Capability**	This is a capability and can be removed from the list of actions.
Encourage residents to install and maintain lightning rods on their structures	**Not Complete**	This has not been necessary.
Natural Resource Protection & Open Space		
Work with the City of Groton to create an open space corridor along Birch Plain Creek	**Partly Completed; Carry Forward**	The Sparkle Lake Open Space (acquired 2013) is part of this area. Additional progress is desired.
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	**Capability**	This is a capability and can be removed from the list of actions.
Continue requiring the deduction of sensitive areas when determining residential density for new developments	**?**	**?**
Fund open space acquisitions so land can be purchased when it becomes available	**Complete; and Capability**	Examples include the Sparkle Lake Open Space (2013) and lands acquired by the Groton Open Space Association (GOSA acquired the 91-acre Candlewood Ridge in June 2013). This is a strong capability and can be removed from the list of actions.
Ensure that any open space acquired be preserved appropriately	**Capability**	This is a capability and can be removed from the list of actions.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

Pursue the acquisition of the Tilcon land, which is traversed by Fort Hill Brook.
Work with The Nature Conservancy to identify redevelopment options for the Fort Hill homes area, which is partly located in a SFHA.
Upgrade standby power for both shelters, enabling full capacity use of both shelters.
Pursue acquisition of a sufficient generator for the new middle school when it is constructed.

Lebanon
Data Collection Meeting

2017 SECCOG HMP Update - Lebanon Town Update Worksheet

PROJECT		ATTENDEES:
SCCOG Regional Hazard Mitigation Plan Update	**Jay Tuttle**	- Public Works Director, Highway Foreman
DATE: December 15, 2016	**Jason Nowosad**	- Building Official
MMI# 3570-09	**Phil Chester**	- Town Planner
	Betsy Petrie	- First Selectman
	Noah Slovin	- CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group worked through some this worksheet together. Because Lebanon's previous Hazard Mitigation Plan was adopted only a year ago (2015), meeting attendees felt most of the Town overview, capabilities, and actions would be the same in this update.

Meeting attendees requested a copy of the presentation, as well as the link to the surveymonkey survey, be emailed to them.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Potential Developments and Developments in Progress:

Name	Location	Use/Units/Size	Vulnerabilities	Notes
Senior Housing	*West Town Street*	*16 units*		*Ongoing development*
Solar Farm	*Franklin/Windham Line*	*4.9 MW* *25 acres*		*[(from 2015): Ecos Energy of MN. 43 acres. Former Orbuch Farm @ 1 Williams Crossing Road]*

1.4 - Any changes to government structure

Authorities	Role			Hazard Mitigated	Notes/Changes
	Advisory	Supervisory	Direct		
Selectmen/Flood & Erosion Control		X	X	All	
Building Department	X		X	All except drought	
Burning Official	X		X	Wildfire	
Conservation and Agriculture Comm	X			Flooding	
Emergency Management	X	X	X	All	
Fire Department			X	Wildfire	
Fire Marshall	X		X	Wildfire	
First Selectman		X		All	
Inland Wetlands Commission	X			Flooding	
Planning and Zoning Commission	X		X	Flooding	
Public Works Department	X	X	X	All except drought	
Town Engineer	X		X	All	
Town Planner	X		X	All	
Zoning Board of Appeals			X	Flooding	

1.5 - Plans and Regulations

Plan/Document Name	Year	Hazard-Relevant Sections	Recent Changes
Emergency Operations Plan	*Current*		
POCD	*2010*		
Code of Ordinances			*Undergoing State-required upgrade*
Zoning Regulations	*2013*	*Incorporated newest SFHA*	
Subdivision Regulations	*2013*		
Inland Wetland & Watercourses Regs	*2006*		

1.6 - Critical Facilities

Facility	Type	Changes
Volunteer fire department*/ Fire Safety Complex*	*EOC*	*23 Goshen Hill Road*
Police department		
Elementary school		
Middle school		
High school	*Shelter*	*Has a backup generator*
Industrial park off Route 207		
Hist Dist (Jon. Trumbull home, Jon. Trumbull Jr. home, town green, War Office, etc.)		
Elderly housing facility, Dr. Manning Dr.		
Senior center on West Town Street		
Water treatment Plant		
2 transformer stations		
Girl Scout camp off Clubhouse Road		
Eight high potential loss dams		
Pumping Stations		
Other Infrastructure		
Warnings/Emergency Communication (CT Alert)		
Shelters		
Department of Public Works		*New Garage in Planning Stage*

2. Flooding

2.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge/Culvert/Drainage Improvements	*Baker Hill (Columbia Side) and Kingsley Road (Lebanon Side) Bridge Replaced.* *$4 million Road and Bridge Project Upcoming - general road and bridge improvements in Town*
Drainage Maintenance	*Regularly clean swales and replace culverts as needed* *Purchased a small vacuum about 2 years ago (~2015) to remove leaves, etc., from drainage infrastructure*
Road Acquisitions, Elevations, Protection	*Bascom Road was redone with new drainage systems*
Regulations, Codes, Ordinances	
Property Acquisitions, Elevations, Protection	*Always working on setting aside open space - typically through easements, rather than acquisition. This is a constant, active, productive program.* *Purchased development rights along farmland*
Completed Projects	
Other	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities or Historic/Cultural Resources

2.4 - Actions

Action	**Progress** Completed Underway Carry Forward Drop	**Notes** What progress has been made? If dropping, why?
	<u>Prevention</u>	
Implement maintenance program to clear debris from storm water drainage areas	*Capability*	*Performed maintenance on all catchbasins over the course of the last year*
Develop sediment control to prevent clogged drainage systems; such as street sweeping, curb and gutter cleaning, paving dirt roads, and planting vegetation on bare ground	*Capability*	*Maintain dirt roads to prevent erosion into drainage systems.* *Do not pave dirt roads.*
Develop a municipal stormwater management plan	*Underway*	
Consider effects of proposed development on stormwater runoff	*Capability*	*Town staff do not have a lot of concern with regard to development and stormwater runoff. They watch some areas, and ensure stormwater drainage systems are adequately maintained. They find their efforts to be sufficient.*
Rent or contract for giant vac-all or similar equipment to assist Public Works in keeping up to date with the removal of silt and leaves from the	*Capability*	*This goes out to bid annually. Equipment is rented.*

town's waterways along all town roads		
Contract for vehicle-mounted catch basin cleaning equipment to assist Public Works in keeping up-to-date with the removal of silt and leaves from catch basins	*Complete*	*Purchased new equipment.* *Contract out only when necessary.* *Town was able to clean all catchbasins in past year, demonstrating capability to remain up-to-date.*
Inventory all culverts and catch basins for upgrading and prioritize, schedule, and provide funding for their upgrade	*Underway*	*This is a High Priority, ongoing action for the Town*
Property Protection		
Elevate structures above the 100-year flood level	*Drop*	*Town does not own any structures within the 1% annual-chance floodplain.*
Emergency Services		
Public Education and Awareness		
Educate public on risks of flooding, risks of building in hazard-prone areas, FEMA floodplain maps	*Capability*	*Sent out a mailer in 2012. Previous version of the HMP included action to send another educational mailer out in 2017 (every 5 years) - Town still plans to do this. Carry Forward.*
Make FEMA maps easily available to the public	*Complete*	*Complete, but also an ongoing effort and capability.* *Maps are available online through Town Website (SFHA overlaid on aerial photographs) as well as in the Town Hall from the Planner's office.*
Encourage individuals in flood-prone areas to purchase flood insurance	*Drop*	*Town does not feel it is necessary for them to encourage individuals to purchase flood insurance, as there are many other parties that do this.*
	UN-RESOLVED	➔ *Due to printing issue this action was not addressed in the meeting*
Natural Resource Protection		
Investigating the use of flood-prone areas as open spaces	*Capability*	*This is accomplished as part of the Town's aggressive open-space-easement and land preservation efforts.*
Consider conservation of open space by acquisition of repetitive loss structures	*Drop*	*Town staff are not aware of any repetitive loss structures in Town.*
Structural Projects		
Remove McGrath Lane #2 bridge crossing the Yantic River	*Carry Forward*	*There is a second access to this area, so bridge does not need to be repaired.* *Bridge can still be removed.*
Upgrade Chappell Road bridge crossing Susquetonscut Brook	*UN-RESOLVED*	➔ *Due to printing issue this action was not addressed in the meeting*
Upgrade bridge stability; eliminate or replace wooden deck on Randall Road bridge	*Carry Forward*	*Same status*
Encourage ConnDOT to improve Route 87 from Waterman Road to the Franklin town line where drainage problems form puddles of water and ice resulting in many serious motor vehicle accidents	*Carry Forward*	*Same status*
Encourage ConnDOT to replace culvert on Route 207 between North Street and Mack Road	*UN-RESOLVED*	➔ *Due to printing issue this action was not addressed in the meeting*
Develop a long-term plan to bury power lines in existing development	*DROP*	*This action was listed as dropped in the previous plan, and replaced with developing regulations to require power lines be buried in new developments (completed in 2006).*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

2015: Town purchased about 30 acres of property along the Ten Mile River [37 acres. Synagogue Road. Part will become new cemetery space.]

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	*This is a major concern to the Town*
Debris Cleanup Equipment	*2016: purchased Equipment-Mounted Blower to remove leaves from dirt roads. Works very Well.*
Completed Projects	
Coordination with Power Utility	
Distributing Preparedness Information	
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Prevention		
Implement tree hazard management program that encourages responsible planting practices		
Practice a tree trimming maintenance program		
Enforce and update building code standards for light frame construction, especially wind resistant roofs		
Encourage underground utility wires		
Property Protection		
Encourage upgrading of existing buildings to meet current building codes		
Emergency Services		
Provide emergency shelters		
Natural Resource Protection		
Re-landscape with native species	*Capability*	*In new Zoning Regulations*
Public Education and Awareness		
Educate the public through pamphlets and web-based information on the warning signs for a tornado, the importance of securing outdoor objects that could become projectiles, the kinds of buildings that are most vulnerable to damage from tornadoes or high winds (such as manufacture housing), structural alterations to protect against wind damage, when and where to seek shelter		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Snow Loading/Removal from Roofs	
Public Information Program	
Emergency Power	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Trees are a major concern

4.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Implement a tree trimming maintenance program	*Carry Forward*	*Currently Town responds to hazardous tree reports, but does not have a formalized tree maintenance program.* *Town does utilize "iTree" - a USDA Forest Service GIS-based tool to help quantify forest benefits and structure. [hazard mitigation application is unclear]*
Encouraging underground utility wires		
Provide emergency shelters before, during, and after the event		
Educate the public on the risks of hypothermia, the risks of carbon monoxide poisoning in motor vehicles and from portable heaters and power generators in homes, the risk of fires from portable heaters and candles, the importance of staying off the roads, landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce the risk of damage to structures		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Progress** Completed Underway Carry Forward Drop	**Notes** What progress has been made? If dropping, why?
Enforce effective building codes & local ordinances		
Encourage emergency facilities such as hospitals to be constructed to withstand seismic events		
Encourage a low-cost earthquake rider for homeowners and businesses		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Recent Significant Events	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Regulations	
Water Supply	
Maintenance of Dry Hydrants 7 Cisterns	
Fire Department	
Public Education Program	
Open Burning Program	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Educate the public on safe fire practices		
Use fire-resistant material when renovating, building, and retrofitting structures		
Move shrubs and other landscaping away from structures		
Periodically clear brush and dead grass from property		
Acquire land susceptible to wildfires to maintain it as open space.		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Explore feasibility of acquisition and operation of drones for wildfire monitoring purposes.
Purchase one to two drones for wildfire monitoring purposes.

7. Dam Failure

7.1 - Dams in Town

Name	Owner	Class	EAP	Notes/Status
Savin Lake Dam	CT DEEP	B		
Brewster Pond Dam	CT DEEP	B		
Red Cedar Lake Dam	CT DEEP	B		
Williams Pond Dam	Lebanon	B	N	*Town is aware of need to update this EAP*
Deep River Reservoir Dam	NPU	C	2015?	

7.2 - Capabilities

Capability	Changes
Periodic Dam Inspections	
EOP/EAP Maintenance	
Emergency Communications	
Public Information Program	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Progress** Completed Underway Carry Forward Drop	**Notes** What progress has been made? If dropping, why?
For municipally-owned dams, make sure EOPs/EAPs are in place and current, and implement recommendations resulting from state inspections		
For privately-owned dams, encourage dam owner to have an EOP/EAP in place and current, and implement recommendations resulting from inspections; monitor compliance as possible		
Develop EOP for Williams Pond Dam	*Carry Forward*	

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Regional Coordination		
Local Emergency Response & Public Information		
	Carry Forward	*Not yet complete*
		➔ *Due to printing issue this action was not addressed in the meeting*
		➔ *Due to printing issue this action was not addressed in the meeting*
Prevention		
Public Education and Awareness		
	Completed	*Information has been added to Town Website.* *Literature is available at the Town Hall and the Library*
	Capability	*5 year cycle determined.* *Materials mailed out in 2012. Will be mailed again in 2017.* *Town plans to continue mailings indefinitely.*
Natural Resource Protection & Open Space		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Town is looking to upgrade generators.
Town will develop EAPs for dams - *As part of this, interested in acquiring a response vehicle specifically for setting up road status signage in case of a dam failure (other applications as well)* - *There is a disagreement over what the Town already has. First Selectman believes Town already owns a trailer with signage.* - *Town will update EAP for Lake Williams Dam*
Planning & Zoning would like to pursue burial of power-lines in the Town Center only as a low priority, long-term action.

Ledyard
Data Collection Meeting

Ledyard Hazard Mitigation Plan Update for SCCOG Municipalities

DATE: December 12, 2016	**ATTENDEES**:	
PROJECT: SCCOG Regional Hazard Mitigation Plan Update	**Michael Finkelstein**	- Mayor, Ledyard
	Russell Shaw	- Ledyard Emergency Management Director
MMI# 3570-09	**Noah Slovin**	- CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He covered regulations requiring the City to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave the Mayor and Russel copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

Data Collection: Detailed Worksheet

1. Community Profile

1.3 – Potential Developments and Developments in Progress:

Russel suggested checking with the Planning department for more information

Name	Location	Use/Units/Size	Vulnerabilities	Notes
Baldwin Hill Industrial Park				*Development is still in process. Blasting has taken place in December 2016.*
Small Housing Developments	*Multiple around Town*	*A dozen acres 8-10 housing units*		*Talk to Planning Department for more information*

1.4 - Any changes to government structure

Switched from Resident State Trooper program to Local Independent Police Department

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes/Notes
POCD	revised 2005	
EOP	2006 w/annual updates	*Updated through 2013. Currently under revision for January 1st because of new State requirements*
Zoning Regulations	2010	*Changes to regulations are currently in progress*
Subdivision Regulations	Amended 2008	
Inland Wetlands and Watercourse	2008	
Road Ordinance	1988	*Implementing upgrades to the road ordinance has been on the agenda for discussion for over a year. Hopefully will be updated in the next five years.*
Storm water Runoff Ordinance	1995	

1.6 - Critical Facilities

Facility	Vulnerabilities	Changes
Police Department		*Newly independent police department has moved into the building next to the Town Hall. This building is also a back-up Emergency Operations Center. A new, larger generator has been installed at this building.*
Ledyard Fire Company		
Gales Ferry Volunteer Fire Company		
Town Hall and Annex		*Some minor upgrades have been made*
Public Works Garage		*Fuel tanks have been replaced with new above-ground tanks*
High School (EOC)		
Middle School		*Major renovation is currently in the works. Plans are currently in development for a major addition that will allow the school to expand, so that another school building across the street can be closed.* *[Clarification needed. Will this closure remove a vulnerability (eg move away from Thames)?]*
Highlands Wastewater Treatment Facility		*Installing a solar panel system.* *A major upgrade to modernize the facility's equipment is underway.*
Infrastructure		
Warnings/Emergency Communication		*Upgraded towers to use microwaves, limiting interference risks.* *Runs Everbridge System*
Shelters		*High School is the primary shelter.* *Town has also entered into a multi-jurisdictional sheltering agreement with Groton and Stonington.*

2. Flooding

2.1 - Setting/Historic Record

Events	Date	Impact
	2010	*Last significant flooding was 2010*

2.2 - Capabilities

Capability	Changes
Bridge/Culvert/Drainage Improvements	*Improvements made to Shewville Road at Wiffle Brook crossing [off of Williams Brook]* *Lantern Hill Road near Homestead Road at the North Stonington Town Line will be upgraded this year (2017)*
Drainage Maintenance	*Ongoing capability*
Road Acquisitions, Elevations, Protection	
Regulations, Codes, Ordinances	*Zoning codes are under revision, will be upgraded next year (2017)*
Property Acquisitions, Elevations, Protection	
Coastal Flood Controls	*No significant tidal issues in Town*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Area around Lantern Hill Road, Bush Pond, (Long Pond) near the Ledyard/North Stonington Town Line. - *There are 3 major dams around Long Pond/Bush Pond complex, with the largest being over 100 years old. The State performed a study of the potential effects of a 500-years storm on the dams here, and the Town is waiting on its report. The Town of Ledyard shares partial ownership of one and a half of the 3 dams.*
Mill Cove off of the Thames is somewhat vulnerable to tidal flooding, but there need to be 8-10 feet of rise before the road there gets flooded.

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities

2.4 - Actions

Russel suggests checking with Public Works Department for more information.

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within City land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate	*Drop*	*There are not many publically accessible floodprone areas in Town. The Lantern Hill study involved a thorough inspection of that are, which the Town deems to be sufficient for the time being.* *The Public Works Director regularly inspects dams and areas of beaver activity.* *Further activity than that currently performed deemed unnecessary*
Revise and/or update the Ordinance Regulating Management of Stormwater Runoff (Ordinance #44) with more current practices	*Carry Forward*	*This ordinance has not been updated. Meeting attendees suggest checking with the Inland Wetlands Commission on this.*
Property Protection		

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*This is not done at the local level. The City feels that FEMA's public advertisements and outreach methods are sufficient.*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Drop*	*Mortgage companies inform homeowners and buyers about Flood insurance. This is considered to be sufficient.*
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flood proofing measures	*Capability*	*There have not been any significant flooding in the last five years, so such assistance has not been necessary. If the scenario arises, the City can provide assistance.*
Encourage residents to submit flood insurance claims following damage events	*Capability*	*There have not been any significant flooding in the last five years, so such assistance has not been necessary. If the scenario arises, the City can encourage.*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Carry Forward*	*The City is concerned about issues with civilian volunteers, including a lack of training. Nevertheless, they would like to carry this action forward and explore their options.*
Public Education and Awareness		
Conduct a "Natural Hazards Fair" so that interested parties can familiarize themselves with natural hazard mitigation options	*Drop*	*City does not feel this would be a productive activity*
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*City does not feel this would be a productive activity*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*City has found that developers, etc., are all fully aware of NFIP standards, and does not feel more encouragement is necessary.*
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	*Capability*	*Old farmland along Haley Brook was purchased by Groton Open Space Association, and will now be permanently open space. [Avery Farm. 298 Acres. Groton-Ledyard border. December 2013]*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new devleopments and at existing properties where appropriate	*Capability*	*60% of new developments must be set aside as open space. Retention ponds are required at new developments.*
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Unresolved*	*Meeting attendees directed Noah to ask Steve at DPW*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	*Meeting attendees directed Noah to ask Steve at DPW*
Complete construction of Lantern Hill Road infrastructure improvements with North Stonington and MPTN	*Complete*	
Work with the non-residential owner on Baldwin Hill Road to reduce flooding at the Flat Brook crossing	*Complete*	*Redirected water course. Problem has been mitigated.*
Consider upgrade of culvert outlet on Lambtown Road Extension near Lamb and Haleys Brooks	*Complete*	*Mayor thinks this may have been done as part of [Avery Farm] open space acquisition. [Appears to be permanently closed to traffic. http://gosaonline.org/2014/02/forward-thinking-preserve-a-ledyard-farm-close-a-road-to-traffic-by-steve-fagin/]*
Continue pursuing State approval to complete replacement of the Shewville Road bridge at the Shewville Brook/Indiantown Brook	*Complete*	*Replaced in 2016*

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Pursue funding to replace/increase the capacity of the Town Farm Road bridge over Williams Brook	*Unresolved*	*Check with DPW director*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

  60% open space for new development over 2 lots
  - *Development at 800 Long Cove just created a lot of designated open space*

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

  In the area of Lantern Hill @ North Stonington Town Line: State approved, BIA in process to increase culvert size under the bridge and upgrade the bridge itself. Over Whitford Brook.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Events	Date	Impact
Hurricane Sandy	10/29/2012	

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance Tree Warden:	*Eversource does most of the maintenance in Town (near powerlines). City does some maintenance for what Eversource doesn't already cover.* *Director of Public Works is Tree Warden*
Debris Collection & Disposal	*City Transfer Station used, debris converted to mulch. 5-6 acres of space.*
Completed Projects	
Coordination with Power Utility	*Eversource is power utility. They have been doing aggressive trimming.* *Eversource is also building redundancy into the power distribution system to create resiliency.* *Eversource is expanding a sub-station.*
Underground Utilities	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Encourage ~~CL&P~~ *Eversource* to also cut down trees as opposed to just trimming trees near power lines	*Complete*	
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	
Make information on wind-resistant construction techniques available to all building permit applicants	*Drop*	*Unnecessary*
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	*Capability*	*Fire Marshall is good at encouraging building owners to develop all-hazard emergency response plans during building inspectors.*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Carry Forward*	*City Transfer station is designated for now.* *There have been conversations at the city level to designate additional or alternative debris collection areas, but there has been no resolution.*
Consider surveying all town-owned buildings, particularly historic buildings, to determine their ability to withstand wind loading	*Drop*	*Mayor believes this is covered by the Department of Public Works routine activities.* *Attendees suggested checking with DPW.*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Capability*	*The town has tree trimming companies on contract to help trim trees and collect debris.* *Mayor knew of at least one landowner with whom an agreement is in place.* *Attendees suggested following up with DPW.*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*City does not run educational activities for children.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Recent Significant Events	Date	Impact
Snow	*February 2013*	*Main problems are power out and blocked roads.*
Snow	*January 2015*	

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*City feels snow removal capability is strong*
Snow Loading/Removal from Roofs	*Public Works and Board of Education are responsible*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Old Police Department headquarters were at the end of a power circuit, so power outages were a problem. New location less vulnerable to outages, and has a larger backup generator.

4.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider posting snow plowing routes in Town Hall and on the town's website	*Drop*	*Plow routes change to frequently*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	*Capability*	*Building and Grounds department of Town Hall campus has plans for snow removal. Recently re-done campus (especially parking lot and installation of police department into one of the buildings) has led to new plans.*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Put on website*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Drop Complete*	*City does not have any public areas that are difficult to access during storms. Fire Departments have 4WD pickup trucks for long driveways.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	*City maintains supplies as part of hurricane/snowstorm preparations.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Drop*	*Attendees say that no dangerous areas have been identified in the City.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Recent Significant Events	Date	Impact/Size/Response
Minor brush fires occur each summer		
Minor brush fire	*2016*	*Rural area. Less than 5 acre.*
Underground fire	*Summer 2016*	*Over one acre. Ran for a long time because it was underground.*
[Brush Fire South of Whippoorwill Drive]	*[July 2016]*	*[10 acres, 14 departments responded, 6 hour fight]*
[Avery Hill Road Fire]	*[May 2015]*	*[7-8 acres. Neighboring stations responded]*

6.2 - Capabilities

Capability	Notes/Changes
Warnings/Monitoring	*Robust Mutual Aid Agreements*
Water Supply	*Portions of Town have hydrants, the rest have dry hydrants.*
Fire Department / Equipment (trucks, ranks, brush trucks, etc)	*Purchased two brush trucks.* *Surrounding communities have purchased UTVs, accessible through mutual aid agreements*
Fire Marshall	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate dry hydrants, fire ponds, and areas at risk of wildfire in the town if and when they develop	*Capability*	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

[Note: It appears Long Pond has multiple names and multiple dams. Some of this may need to be clarified]

Name	Owner	Class	EOP?	Status/Notes/Changes
Long Pond Dam	Private Association	B		
Morgan Pond Dam	City of Groton *Groton Utilities*	B		*Flows into lower reservoir - breach not a major concern*
Lantern Hill Pond	*MPTN*			*Attendees say failed in 2010, flooded lower road. Since then it has been completely restructured, along with the road*

7.2 - Capabilities

Capability	Changes
EOPs/Emergency Drills	
Dam Removal	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with CT DEEP and Lantern Hill Valley Association (Long Pond Dam) to insure issues are resolved and EOP is updated	*Carry Forward*	*DEEP paid for a study that was performed recently. City is waiting for the report to determine next steps. Carry Forward to Completion*
Continue to work with North Stonington and MPTN to complete repairs and improvements to the Lantern Hill Pond Dam	*Completed*	*Repaired after 2010 failure.*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Capability*	*Given on a case by case basis by the Town Engineer, who helps determine whether city needs to hire outside help.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the City EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage local officials to attend FEMA-sponsored training seminars at EMI	*Capability*	*Attend seminars online*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	
Pursue the American Red Cross-certification of Ledyard High School (primary shelter) and Ledyard Middle School (secondary Shelter)	*Carry Forward*	*Primary Shelter has been certified.* *Secondary Shelter - installing emergency generator, then pursuing certification.* *Additionally - drafted multi-jurisdictional sheltering agreement.* *Carry forward until Middle School Shelter generator is installed and certification secured.*
Resolve and utilize the Reverse 9-1-1 system to telephone warnings into affected areas, and add DFIRM floodplain areas to the database	*Capability*	*Everbridge*
Work closely with the town's Emergency Management Department with all emergency management and services decisions moving forward	*Complete*	*Created a Public Safety Committee that regularly meets to discuss emergency management decisions.*
Update the town's EOP and POCD annually	*Capability*	*Documents are Up to Date*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Drop*	*Built into application requirements*
Integrate additional elements of this HMP into the POCD during the 2013 update and beyond	***Unresolved***	*Attendees suggested Noah check with Planning staff.*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their buildings	*Drop*	

Advertise the sign up page for the CT Alert "Everbridge" Emergency Notification System	*Capability*	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Lantern Hill/Bush Pond/Long Pond Dams: based on results of weaknesses identified by DEEP in their report, make improvements.

- Notes

New Backup Emergency Operations Center in Police Department next to Town Hall.
Solar Panels installed on municipal buildings - *Exist on Town Hall* - *Will be installed at water treatment plant* - *Schools are investigating* - *Old Police Department had solar panels (building is currently unoccupied, still owned by town)*
Town GIS has flood zone layer, and is accessible through Town website.

Attendance

Name	Department and Role	Email
Michael Finkelstein	Mayor	
Russell Shaw	Emergency Management Director	

Lisbon
Data Collection Meeting

2017 SECCOG HMP Update - Lisbon Town Update Worksheet

DATE: November 30, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Thomas Sparkman - First Selectman, Lisbon, CT
Noah Slovin, CFM - Milone and MacBroom, Inc

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He discussed regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, the types of projects for which HMPs can be used to secure funding, and the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah and Thomas then worked through an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Location	Changes
Four Subdivisions in planning phase		
Two commercial developments in planning phase		*No longer being planned*
Barber Farm Road Development	*[Between Mell Rd and River Rd]*	*4 houses have been approved* *[32 lots, 1-5 acres each, available - http://www.barberfarmlisbon.com/]*

1.4 - Any changes to government structure

_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
POCD	2004	*Just updated and approved in March [adopted 3/15/16, effective 5/1/2016]*
EOP		*No change*
Subdivision Regulations	2011	
Inland Wetlands Regulations	5/1/2012	

1.6 - Critical Facilities

Facility	Changes
Lisbon Central Elementary School	
Public Works Garage	*Moved from near the school to the old State Garage @ 486 River Road/ Route 12* • *New public works truck for $120K purchased*
Town Hall	
Volunteer Fire Department (EOC)	
Public Safety Complex	*In design phase* *$4-5 million* *Awaiting approval by residents*

2. Flooding

2.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	*Every summer - inspect and repair culverts and catch basins* • *Summer 2016, repaired 4 catch basins, and 2 culverts*
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	*47 acres on Kendall Road* *98 Acres at 228 North Burnham Highway (includes historic house [Old Burnham Tavern. Purchased 2012-2013])*
Warnings/Communication	*Everbridge*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)
- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA
  - Repetitive Loss Properties (notes, new RL properties, etc)
- Vulnerable Critical Facilities

2.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within City land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate	*Capability*	
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Capability*	
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*As town receives brochures they display them on the kiosk in the Town Hall hallway*
Provide technical assistance to owners of non-residential structures regarding flood proofing techniques	*Capability*	*As town is asked, they provide. This is not a common request.*
Encourage residents to submit flood insurance claims following damage events	*Capability*	
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Drop*	*Town does not feel this is necessary*
Include structures within the 1% annual chance floodplain within the Reverse 9-1-1 contact database	*Capability*	
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*Thomas believes such educational programs are run by schools*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Capability*	*Building official does this.* *Town does not run workshops. Drop.*
Natural Resource Protection		

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Pursue the acquisition of additional open space in SFHAs	*Carry Forward*	*Town has acquired land, but none of it has been in the floodplain, to Thomas's knowledge*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
Structural Projects		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Capability*	*Town Engineer does this*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Upgrade culverts along Blissville Brook to reduce the chance that roads will overtop during severe storm events	*Carry Forward*	*2 culverts have been upgraded.* *More remain undersized.* *Carry forward to completion.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Repair Schoolhouse Road Bridge, if money can be secured. Deep approved a grant for this project, but it has not been pursued because it is not a high priority for the town.
Grant was secured to replace the bridge on Bundy Hill Road. It is currently in the planning phase with the Town engineer. Residents have approved this project.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Recent Significant Events	Date	Impact
Sandy		*Power out up to 2.5 weeks*

3.2 - Capabilities

Capability	Changes
Wind Loading	*Follow state building code*
Tree Maintenance	*Performed as needed*
Sheltering	*Red Cross operates shelter at the school*
Coordination with Power Utility	*Eversource. Implementing an enhanced tree-trimming program as we speak.* *Town has a good relationship with Eversource. They have liaison through customer relations.*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Property Protection		
Promote the use of functional shutters for older buildings	*Drop*	
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Through the building official*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Carry Forward*	*Every Spring, and as needed, Town brings brush to the Public Works Garage.* *There is not designated emergency debris storage location*
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	*Carry Forward*	
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Carry Forward*	
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Capability*	*Schools run hazard education programming*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*Satisfactory program*
Snow Loading/Removal from Roofs	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Drop*	*Roof collapses have not been a problem. No collapses during the snow-heavy winter of 2015. Town is not concerned about roof collapse, does not feel this study is necessary.*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	*Drop*	*Not necessary for this Town*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Posted on Town website*
Consider posting the snow plowing routes in local government buildings and on the Town's website	*Drop*	*Plow routes too variable*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*Hard-to-access areas are known. 3-areas: 2 privately owned trailer parks, 1 small community at the end of a mile-long private dirt road.* *Public Works is ready to assist with emergency access*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	*Through Zoning and Building*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Recent Significant Events	Date	Impact/Size/Response
Minor brush fires		

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*Sufficient water supply for firefighting* *Hydrants, ponds, dry hydrants*
Fire Department	*No Change*
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate public water supply hydrants, dry hydrants, and areas at risk of wildfire in the town	*Capability*	
Extend fire protection to future areas identified as being particularly at-risk, such as the Pleasant View Cove Road area	*Carry Forward*	*Pleasant View Cove - mile long private driveway*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	
Perform maintenance and repairs on the Town's dry hydrants such that fire flows from these sources are unimpeded	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

Name	Owner	Class	Notes
Aspinook Pond Dam	Private	B	
Lower Blissville Pond Dam	Town of Lisbon	B	*No Change*
Paper Mill Pond Dam	Private	B	
Scotland Dam	Private	C	
Taftville Dam #4	Private	C	
Tunnel *Hill* Dam	Private *Eversource*	B	
Versailles Pond Dam	Private	B	

7.2 - Capabilities

Capability	Changes
Other	

7.3 - Vulnerabilities and Risk

- State of Dams

Dam	Status

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Include structures within the dam failure inundation areas in the Reverse 9-1-1 contact database	*Carry Forward*	*Only Lower Blissville Pond Dam failure inundation area included.*
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Capability*	*Emergency Management has copies of EOPs*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Capability*	*Town is ready to provide assistance if approached by dam owners*
Create an EOP for Lower Blissville Pond Dam and submit it to DEEP	*Carry Forward*	*In process of revising EOP to conform with new DEEP requirements*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	*Carry Forward*	
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies	*Capability*	
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Capability*	
Integrate elements of this HMP into the Plan of Conservation and Development during the next update	*Carry Forward*	*Carry forward to next POCD update*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Require the underground installation of utilities for all new development	*Capability*	
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	*Town does not feel it is necessary to encourage this action. Landowners can make that decision.*
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Mohegan
Data Collection Meeting

2017 SECCOG HMP Update - Mohegan Update Worksheet

Meeting Agenda

HAZARD MITIGATION PLAN UPDATE FOR SCCOG COMMUNITIES

2017

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1. Purpose and Need for Hazard Mitigation Plan
   a. Disaster Mitigation Act of 2000
   b. Status of Regional Hazard Mitigation Plan (approved 10/19/12; expires 10/19/2017)

2. Update on Hazard Mitigation Grant Programs (PDM, HMGP)

3. What's New with Plan Updates and Approvals
   a. Include loss estimates for the hazards not evaluated by HAZUS
   b. Improved public involvement and outreach to neighboring towns
   c. Make plan maintenance more specific
   d. Incorporation of hazard mitigation plan into other town plans
   e. Assign specific timeframes to hazard mitigation actions

4. Project Scope
   a. Data collection, outreach
   b. Update vulnerability analysis and run HAZUS
   c. Revisit strategies and update plan
   d. DESPP/DEMHS and FEMA review and approval

5. Project Schedule

6. Review of Hazards and Events from 2012-2016

7. Data Collection Needs for Loss Estimates

8. Review of Table of Actions from Current Plan

9. Outreach and Public Involvement

10. Next Steps

Data Collection: Summary of Needs

Town Overview

- **Development** and redevelopment trends
- What are the **critical facilities**?
- **Shelters** and **evacuation routes**
- Standby **power** supplies
- Discussion of **recent storms**
- **Loss Estimates**
    - Public Assistance reimbursements needed (2012-2016)
    - Typical costs to recover from a severe thunderstorm
    - Typical costs to recover from a severe winter storm
    - Typical costs to address a wildfire or brush fire

Flooding

- Update on **areas** of flooding
- How are drainage and flooding **complaints** received and tracked?
- Have any bridges, culverts, or stormwater systems been **replaced** or **upgraded**?
- **Dams** and effects of dam failure

Wind

- Update on **areas** prone to wind damage or increased wind damage risk
- **Tree maintenance** and tree warden budget

Snow

- Update on snow and ice removal **routes** and **capabilities**
- Update on **areas** prone to icing or drifts in winter

Fire

- **Areas** prone to wildfires, fire department capabilities, coordination with nearby municipalities
- Areas without fire protection and use of dry hydrants and cisterns

Future Actions

- Review **prior** actions
- **New** mitigation actions?
- What one or two things can be done with **current** budgets?
- What one or two things would be done if funding was not a concern?

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Type	Location	Notes
Mohegan Sun	Commercial	Northern portion of reservation	Added Earth Tower Hotel
Residential	Residential	Southern portion of reservation, West of Ft Shantok	Added Sunny Hill Apts., residences on Broadview Av
Industrial	Industrial	NONE	
Government Center	Government	13 Crow Hill Road	

1.4 - Places of Distinction

Name	Type	Notes	Hazard Concerns
Fort Shantok	Historic Site	Preserved from development, National Register	
Sacred Areas		Located on Fee Lands outside of reservation	
Mohegan Church	Historic site	Church La., Uncasville	Fire, Wind Damage
Tantaquidgeon Museum	Historic site	Church La., Uncasville	Fire, Wind Damage

1.5 - Any changes to government structure

_____Added Detached Public Works GArage_____

_____

1.6 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
EOP	2016	Yearly update of Plan
Office of Land Management Documents	2017	Updated to reflect latest additions to the Reservation
Building Code	1996	Adopted CT Building codes in 1996, updated regularly
Fire Code	1996	Adopted CT Fire Code which is updated regularly
Environmental Protection Plan	2006	Updated in 2007 with addition of Spill Prevention Plan

1.7 - Critical Facilities

Facility	Notes/Changes
Public Safety Building (Police, Fire, EOC)	
Shelter	Ft Hill Residences
Community Center	
Daycare	
Public Works	New Garage added at Government Center
Infrastructure	New Earth Tower Hotel added
Backup Generators	28 Generators located at various facilities on Reservation
Emergency Communication	Upgraded radio system, increased off-site radio coverage

2. Flooding

2.1 - Setting/Historic Record

Recent Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge/Culvert Replacements/Improvements	
Drainage Improvements	New Oil/water separator and improved drainage system installed at Erath loading dock; ME 3500 retention chamber installed at Earth Tower Hotel
Drainage/Culvert/Bridge Maintenance Programs	
Regulations, Codes, Ordinances	EOP updated and submitted to state, HMP included in EOP
Acquisitions, Elevations, Property Protection	
Warnings/Communication	
Other Completed Projects	Additional hotel space completed
Other	Employee Gas Station brought onto Reservation

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to prohibit new development activities within SFHAs to the greatest extent possible within Tribal land use regulations	Capability	
Consider prohibiting development activities within potential storm surge areas as mapped by FEMA	Carry forward	such areas are generally coincident with FEMA SFHAs and as such are not developed.
Make available FEMA-provided flood insurance brochures and encourage tribal members to purchase insurance if they are in a SFHA	Drop	Less than ¼ acre is located within 100 year flood plain, area is not buildable
Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains	Capability	
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	Completed	
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	Capability	
Upgrade stormwater collection and discharge systems to keep up with rising sea level	Carry forward	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	None – minimal debris

3.2 - Capabilities

Capability	Changes
Tree Maintenance	No Changes
Coordination with Power Utility	No Changes
Underground Utilities	No Changes
Warnings/Communication	No Changes
Debris Management	Added two debris holding areas
Other	No Changes

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Promote the use of shutters for older properties to guard against window breakage which can result in structural failure	**Drop**	**Unnecessary on Reservation, older structure have been removed**
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	**Completed**	
Consider surveying all tribal buildings, particularly historic buildings to determine their ability to withstand wind loading	Carry Forward	
Visit Tribal schools and educate children about the risks of wind events and how to prepare for them	Drop	We have no schools on site

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
None		

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	No Changes, operating at capacity
Snow Loading/Removal from Roofs	No Changes – Monitor and mitigate
Other	No Changes

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Finalize the draft written plan for inspecting and prioritizing the removal of snow from Tribally-owned structures	Completed	
Make funding available to the Public Works Department each year for clearing snow from roofs as well as from roads and parking lots	Completed	
Provide information for protecting tribal residents during cold weather and for mitigating icing and insulating pipes at Tribal residences	Completed	
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	Drop	All areas have adequate, dependable access, dedicated snow removal procedures and equipment

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	Updated yearly
Zoning Ordinances, etc.	No Changes
Emergency Supplies	No Changes
Other	No Changes

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that Tribal departments have adequate backup supplies and facilities for continued functionality following a sudden earthquake	Completed	
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	Completed	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response
NONE		

6.2 - Capabilities

Capability	Changes
Monitoring	No Changes
Water Supply	No Changes
Fire Department	Refurbished ambulance, replaced old patient compartment with new, updated unit
Equipment	No Changes
Other	No Changes

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire on the Reservation	Carry Forward	
Extend public water supply and fire protection to future areas identified as being particularly at-risk	Completed	
Pursue other sources of firefighting water where adequate supplies do not exist, such as through the installation of dry hydrants	Carry Forward	all developed areas on the Reservation have public water service and fire hydrants provided by Norwich Public Utilities.
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	Capability	Fire Department program in place
Ensure that provisions of Tribal regulations regarding fire protection facilities and infrastructure are being enforced	Completed	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

Name	Owner	Class	Notes	Changes
Fort Shantok (Shantok Brook)	Mohegan Tribe	Low Hazard	12 ft high Rebuilt before 2012 Was believed to be in excellent condition	

7.2 - Capabilities

Capability	Changes
Dam Monitoring & Inspection	No Changes
Dam Removal Program	**N/A**
Alert Systems	**Security Patrols**

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to maintain the Fort Shantok Dam in excellent condition	**Completed**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	Completed	Mutual Aid agreements are in place
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	Completed	Participate in Region 4 Training and Exercise program
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	Carry Forward	
Continue to promote regional transportation planning through SCCOG	Capability	Plan to assist Region with Patron buses
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	Carry Forward	Working with Region 4 REPT
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	Carry Forward	
Work with the SCCOG to determine interest in Mohegan Sun Arena becoming a regional shelter location and pursue if appropriate	Drop	Our capability would be overstrained, plans in place to care for residents and stranded patrons
Local Emergency Response		
Continue to review and update the Tribal EOP at least once annually	Completed	
Add the HMP update as an annex to the Tribal EOP.	Completed	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	Completed	Trainig and upgrade schedule developed and in practice
Encourage tribal officials to attend FEMA-sponsored training seminars at EMI	Carry Forward	Training in progress
Continue to evaluate emergency shelters, update supplies, and check communication equipment	completed	Evaluation schedule and Comm check procedure in place
Continue to promote dissemination of public information regarding natural hazard effects into Tribal community and Government buildings	Carry Forward	
Consider implementing a Reverse 9-1-1 service for tribal residents	Carry Forward	Awaiting installation of NG9-1-1 system
Prevention		
Form a committee to review planning documents in the Office of Land Management and integrate appropriate elements of this HMP	Carry Forward	
Continue reviewing building plans to ensure proper access for emergency vehicles	Completed	Plans are reviewed by Public Safety Department as part of approval process
Continue to require the burying of utility lines where appropriate	Completed	
Continue to enforce the appropriate building code for new building projects	completed	
Encourage tribal residents and members to install and maintain lightning rods on their structures	Drop	No buildings on Reservation are privately owned

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

Notes

zAttendance

Name	Department and Role	Email

Montville
Data Collection Meeting

2017 SECCOG HMP Update - Town of Montville Data Collection Meeting

DATE: November 17, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Noah Slovin, CFM	- Milone and MacBroom, Inc
Ron McDaniel	- Mayor: rmcdaniel@montville-ct.org
Colleen Bezanson	- Assistant Planner: cbezanson@montville-ct.org
Marcia Vlaun	- Town Planner: mvlaun@montville-ct.org (not in attendance, provided notes)
Raymond Occhialini	- Fire Marshal / EMD: rocchialini@montville-ct.org
Leonard Bunnell	- Lieutenant, Montville Police Department

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group worked through much of this worksheet together.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

- Contact Colleen (cbezanson@montville-ct.org) for list

Name	Location	Changes
"The Village"-160 units/townhouses	Route 32 near St. Bernard Drive	
Fast Food Restaurant		*McDonalds. Constructed*
40 Lot Subdivision	Black Ash Road/Chesterfield Road	*Possibly referring to a small subdivision with only a dozen lots*
Various commercial projects	Route 32	*New infill occurring. Dollar General*
300 Acre Site- No development pending as of 2012, but developable	Between Route 32 and Thames River	
Haughton Cove		*Vulnerable to flooding*
B&D Auto - Lower Lot (?)		*Vulnerable to flooding*
Old DOT Building		*Distillery moving in* *Department of Labor moving in*
Near Chesterfield		*80,000 square foot soccer stadium* *80,000 square foot NASCAR track*

1.4 - Any changes to government structure

NONE

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
POCD	2010	*Sections have been updated*
EOP	*Current*	*Undergoing regular update*
Zoning/Subdivision Regulations	2011 *Current*	*Undergoing regular update* *Will incorporate new FEMA requirements AND new MS4 requirements*
Inland Wetlands and Watercourse Regulations	2011 *(2013?)*	

1.6 - Critical Facilities

Facility	Changes
Montville Fire company	
Mohegan Fire Company	
Oakdale Fire Company	
Chesterfield Fire Company	
Public Safety Building	
Town Hall (EOC)	
Montville High School	
Leonard J. ***Tyl*** Middle School	
Public Works Building	
Cook Drive Water Tank	
Montville (Pink Row) WPCF	*Upgraded entire building and installed new generator in 2015*
Killeen Road Substation	
Orchard Grove Specialty Care Center	
Haughton Cove Manor	
Independence Village Elderly Housing	
Freedom Village Elderly Housing	
Jensen's Hillcrest Mini Estates (40+)	
Water and Wastewater Infrastructure	
• *New East Lyme (East LINE?) Water Tank*	
• *Youth Services has been moved to Community Center*	
• *There is a regional shelter in East Lyme*	
• *Improvements have been made to communications towers. No new towers have been built.*	
• *$1 million from STEEP for transfer station upgrades - considering stormwater discharge. Ongoing.*	

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	**Changes**
Bridge Replacements, Drainage, Maintenance	
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	*Utilize Reverse 911 system of contact areas needing evacuation. Alerts posted to website, on Public Access TV, Facebook*
Completed Projects	*Montville Road has been opened up*
Other	

Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)
- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA
  - Repetitive Loss Properties (notes, new RL properties, etc)
- Vulnerable Critical Facilities

Fuel Tank Farm - stormwater is an issue
14 Bridge Street Brownfield - Brownfield Remediation has been approved. Stormwater will be considered.

2.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	**Capability**	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	**Drop**	*Detention or retention required. Case-by-case assessment of plans.*
Conduct an annual inspection of floodprone areas that are publically accessible and recommend drainage improvements as appropriate	**Capability**	
Specific language regarding sea level rise should be reviewed when updating planning documents	**Carry Forward**	*Incorporate into Plan of Conservation and Development update currently underway*
Work with State and Federal agencies to ensure flood protection regulations reflect current practices regarding sea level rise	**Capability**	*FEMA updates maps, State has changed some of its guidelines.*
Utilize the 2008 FEMA Hurricane Surge mapping to compile a list of addresses with structures within the Hurricane Surge Areas	**?**	
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	**?**	
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	**Capability**	
Provide technical assistance to owners of non-residential structures regarding flood proofing techniques	**?**	
Encourage residents to submit flood insurance claims following damage events especially Faria Marine Inst. & the Countryside Condominiums	**?**	

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Emergency Services		
Continuously monitor Chesterfield Fire Company and Montville Fire Company for any future floodproofing needs which may include relocation	**?**	
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	**?**	
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare	**Carry Forward**	*This was not prioritized during the previous plan's timeframe, but interest remains.* *One factor for consideration is how to work this information into existing curricula, or teachers will not have the time or flexibility to cover this.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	**Drop**	
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs		
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	**Capability**	
Structural Projects		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	**Capability**	*Projects are assessed on a case-by-case basis, and what rainfall data to use is determined for each project*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	**Capability**	*This is done on a regular basis, and is reclassified as a capability.* *A specific example of this practice can be seen at Montville Manor, where the drainage systems were recently mapped.*
Continue to pursue funding to conduct drainage improvements to Route 32 South at Jerome Avenue	**Carry Forward**	*Incomplete due to lack of funding. Rephrase as "conduct drainage improvements to route 32 south at Jerome ave"*
Complete the culvert replacement on Old Colchester Road near Fair Oaks with HMGP funding	**Carry Forward**	*This project is underway. A public hearing on the project is taking place in November*
Continue to pursue funding to replace the bridge on Pink Row near the Montville WPCF	**Drop**	*A number of projects that will impact Oxoboxo Brook are underway or being explored. These projects include a dam removal. Given the potential for these projects to mitigate flooding, as well as the uncommonness of flooding impacting Pink Row bridge, it is deemed unnecessary at this point to pursue bridge replacement.*
Pursue funding to improve drainage along Laurel Point Drive near Oxoboxo Lake	**Carry Forward**	*Incomplete due to lack of funding. Rephrase as "Improve drainage along Laurel Point Drive near Oxoboxo Lake."*
Pursue funding to improve drainage and investigate a connection with Route 163 road work to the section of Maple Ave. near Town Hall	**Drop**	*Municipal staff were not aware of a flooding problem at this location.*
Pursue funding to improve the drainage system on Fitch Hill Road near the intersection with Old Fitch Hill Road	**Carry Forward**	*Phase I of this project is complete.*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
		Funding for a portion of Phase II has been allocated. Additional funding is being pursued.
Work with the owner of Faria Marine Instruments to report all flood damage and consider pursuing funding for floodproofing	**Drop**	*This property has been purchased by a new owner, and will have a new use. A dam on the property has been sold to Picker Pond LLC, which is exploring removing the dam - this is expected to diminish flood risk.*
Work with the owners of Countryside Condominiums to report all flood damage and consider pursuing funding for floodproofing	**Carry Forward**	*The condos experience basement flooding. On Carolina Drive.*
Work with the owner of the Repetitive Loss Property on Lake Drive East to pursue funding for floodproofing	**Drop**	*No interest shown by property owner, and no damage has occurred recently*
Look for opportunities and subsequently pursue funding to upgrade storm water collection and discharge systems per sea level rise	**Drop**	*Municipal staff expect this will tie-into new MS4 requirements from the State, and other ongoing updates to regulations and upgrades of systems.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Lynch Hill Drainage Improvements
Replacement of culvert under Montville Road
Replacement of bridge at Route 163 and Meetinghouse Road
Replacement of bridge on Dairy Hill Road

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Public Works Department and the Water Pollution Control Authority are working together to map all of the storm drains and signage in the Town
Publicize CT Prepares App to help residents remain informed of disasters
Assess the sinking problem being experienced by Georgia Manor Condominiums to determine the cause of the problem and possible solutions
Fuel Tank Farm - stormwater is an issue
14 Bridge Street Brownfield - Brownfield Remediation has been approved. Stormwater will be considered.
$1 million from STEAP for transfer station upgrades - considering stormwater discharge. Ongoing.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	*Week long power outage*

3.2 - Capabilities

Capability	Changes
Wind Loading	*Updated CT Building Code*
Tree Maintenance	*Doubled budget between 2015 and 2016 - from $25K to $50K.* *Public Works Director is Tree Warden*
Warnings/Communication	
Sheltering	
Completed Projects	
Coordination with Power Utility	*CL&P. Very responsive and effective. They're great!* *Note: power goes back up on Route 32 Corridor First*
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Encourage CL&P to also cut down, rather than just trim, trees near their power lines	**Capability**	
Continue to perform appropriate tree maintenance to the greatest extent possible	**Capability**	*Doubled Budget*
Property Protection		
Improve communications to prevent a future long, extended outage such as the one experienced following Tropical Storm Irene	**Capability**	*Strong communications with CL&P*
Promote the use of functional shutters for older buildings in the town and investigate funding sources	**Drop**	
Make information on wind-resistant construction techniques available to all building permit applicants	**Capability**	
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	**Capability**	*Accomplished through SCCOG and the Chamber of Commerce*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	**Capability**	*DEEP-approved location included in EOP. Wood debris is ground and open to the public to take. Town must inform DEEP before each use.*
Consider surveying all town-owned buildings to determine their ability to withstand wind loading giving priority to the oldest buildings	**Drop**	*Not considered necessary*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	**Capability**	
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	**Carry Forward**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Winter Storm Nemo	2013	*Power outage - variable, up to one week*
2015 Storms	2015	*Montview Apartments roof collapse - significant relocation of residents @ Town expense.* *Barn roof collapse*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Snow Loading/Removal from Roofs	*Board of Education and Public Works coordinate a monitoring plan.* *Recently [October 29 and November 2) participated in Statewide [ice storm] Drill*
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Give priority to important and high traffic volume roadways with steep slopes when Town staff begins treatment of roads	**Capability**	
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	**Drop**	*Municipal emergency staff are in close coordination after significant snow events, and are familiar with vulnerable locations and prioritization needs. Snow removal from municipal structures has been effective, and a written plan is not considered necessary or helpful.*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	**Capability**	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	**Capability**	*Utilize Facebook to remind people about seasonal hazards*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	**Capability**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Plainfield Earthquake "swarm" Max 3.3	2015	*None*

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	**Capability**	
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	**Capability**	*Steep Slopes are regulated*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Date	Impact/Size/Response
Spring 2016	*10 Acres*
2014 (?)	*Power lines short-circuited when a large bird landed on the lines and provided a connection. Caused a small fire.*

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*East Lyme Fire Tower - provides new fire suppression capabilities to previously un-served area* *Mutual Aid agreement with New London County municipal fire departments - Tanker Task Force: shared water tankers respond to fires in areas without water service.*
Fire Department	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with water supply utilities to extend water mains into developed areas not currently served	**Capability**	*East Lyme Fire Tower - new fire suppression capabilities* *Continue to move forward with Town Water Supply Plan, which includes fire suppression plan.*
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town if/when they develop	**Capability**	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	**Capability**	
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced	**Capability**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town (January 21, 2016)

Number	Dam Name	Owner	Class	Size
8601	Congdon Pond Dam	Congdon Pond Hydro	B	Small
8602	Bogue Brook Reservoir Dam	City of New London	B	Small
8604	Picker Pond Dam	Picker Pond LLC	B	Small
8605	Trading Cove Pond Dam	Connecticut DOT	BB	Small
8606	Oxoboxo Lake Dam	West Rock LLC	C	Intermediate
8607	Wheeler Pond Dam	Theodore Wisniewski	B	Intermediate
8608	Gay Cemetery Pond Dam	WestRock Company	BB	Small
8609	Brodie Pond Dam	David A. Brodie	BB	
8610	Red Mill Pond	Castle Realty LLC	B	
8611	Schofield Pond Dam	Raymond, David &	BB	Small
8613	Rockland Pond	Rand-Whitney Realty	B	Small
8614	Mohegan Brook Dam	MTIC Acquisitions, Inc.	BB	
8615	Oakdale Pond Dam	Craig L. & Kathy Stelik	BB	
8616	Stony Brook Reservoir	City of Norwich	B	Intermediate
8622	Beckwith Pond Dam	City of New London	BB	
8638	Lake Konomoc Dike	City of New London	B	Small

7.2 - Capabilities

Capability	Changes
Other	

7.3 - Vulnerabilities and Risk

- State of Dams

Dam	Status

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with the CT DEEP Dam Safety Section and dam owners to ensure that all EOPs remain current and on file	**Capability**	*Call dam owners and invite them to pre-event planning meetings (for example, before a hurricane or predicted rain event occurs*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	**Capability**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	**Capability**	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	**Capability**	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	**Capability**	
Continue to promote regional transportation planning through SCCOG	**Capability**	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	**Capability**	
Local Emergency Response & Public Information		
Continue to review and update the town EOP at least once annually	**Capability**	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	**Capability**	
Encourage town officials to attend FEMA-sponsored training seminars at EMI	**Capability**	*Emergency Management Director attended Development Seminar - required for a grant.* *Mayor has taken a number of online seminars*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	**Capability**	
Continue to promote dissemination of public information regarding natural hazard effects into local government and community buildings	**Capability**	*Utilize Facebook to remind people about seasonal hazards*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	**Capability**	*Falls under site plan and development plan review process*
Integrate elements of this HMP into the next update of the Plan of Conservation and Development and beyond	**Carry Forward**	*POCD update currently underway*
Consider requiring underground installation of utilities for new development to the greatest extent/feasibility	**Capability**	*This is required*
Continue reviewing building plans to ensure proper access for emergency vehicles	**Capability**	
Continue to enforce the appropriate building code for new building projects	**Capability**	
Encourage residents to install and maintain lightning rods on their structures	**Capability**	*New Police Building had a lightning rod installed. Municipal buildings considered as examples to public.*
Continue to advertise the sign up page for the CT Alert "Everbridge" Emergency Notification System for reverse 9-1-1	**Capability**	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	**Capability**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions

Capital Improvements Plan Review:

	Item	Cost	Prior Approp	Town Aid	Grant/ Financing/FB	2016 -17	2017 -18	2018 -19	2019 -20	2020 -21
DPW	PW Garage Roof	800000	40000			40000				
	Transfer Station Upgrades	1000000			1000000					
	Replace medium plow trucks (2)	260000					125000			135000
	Replace Plow Trucks (2)	385000					190000			195000
	New all-season body for plow truck	16000				46000				
	Fitch Hill Road drainage improvements	620000	260000		360000					
Fire	Radio Repeater Replacement	50000					50000			
	Cook Drive Radio Tower	160000					160000			
	Radio Combiner	200000				200000				
	Chapel Hill Radio Tower	160000						160000		
	Cook Drive Generator Replacement	15000							15000	
	Oakdale Pumper M-42 (purchase 2017)	325000	215898				109102			
	Chesterfield Pumper M-32 (purchase 2018	693000					693000			
	Montville Pumper M-21 (purchase 2020)	761000						380500	380500	
	Turn Out Gear/SCBA Cylinders	160000					50000	50000		60000
P&Z	Old Colchester/Black Ash Road	669700	61302		596100	12298				
	Partial Renovations Fair Oaks	744250							744250	
	Architectural Drawings Fair Oaks	25000					25000			
	Total Renovation of Existing Fair Oaks	6162000								6162000
	Upgrades to Fair Oaks	143800		143800						
Police	Police Boat	80000	50000		30000					
	CSP Portable & Mobile Radios	204000	85000			119000				
	Cruisers	115746				33037				
P&Rec	Acquisition of Land	300000								300000
Board of Ed	Tyl: Fire Pump Replacement	37000					37000			
	Tyl: Roof (net of school construction)	1057250							1057250	
	Palmer: Roof Feplacement	82130								82130

MPTN
Data Collection Meeting

2017 SCCOG HMP Update - Mashantucket Pequot Tribal Nation Update Worksheet

DATE: March 6, 2017

PROJECT:

SCCOG Regional Hazard Mitigation Plan Update

MMI# 3570-09

ATTENDEES:

Rick Tougas	- Fire Chief
Jeff King	- Fire Inspector / Emergency Manager
Keith Gove	- Director, Public Works, Planning & Community Development
Mike Boland	- Director, Natural Resources Protecion & Regulatory Affairs
Dave Deskis	- Deputy Fire Chief
Noah Slovin	- Milone & MacBroom, Inc.

SUBJECT:
SCCOG Regional HMP Update - Municipal Annex Data Collection Kickoff Meeting
Mashantucket Pequot Tribal Nation

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Tribal Nation to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding.

During the presentation, Noah went into detail about the types of hazards and the categories of mitigation strategies and actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group then worked through much of this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Type	Location	Notes
Foxwoods	Commercial	Eastern portion of reservation	
~~MGM Grand~~	Commercial	Eastern portion of reservation	*Called "The Fox Tower"*
MP Museum & Research Center	Commercial/ Education		
Large Retail Outlet (Tanger Outlets?)	Retail	Between Foxwoods & ~~MGM Grand~~ *The Fox Tower*	*Tanger Outlets*
Sand & Gravel	Industrial	Fee Lands in North Stonington	*No longer exists*
Pequot Outpost	*Retail*	*Route 2 and Route 214*	*Gas Station/Convenience Store. Completed October 12 2012*

1.4 - Places of Distinction

Name	Type	Notes	Hazard Concerns
MP Burial Ground	Sacred Site	Fanning Road	
Other	Sacred Areas	Located on Fee Lands outside of reservation	
Cemetery	*Active Cemetery*	*Shewville Road*	
Burial Ground	*Historic Burial Ground*	*Near Post Office*	*Funding from Hurricane Sandy helped pay for a fence around historic burial ground*

1.5 - Any changes to government structure

In 2016, Planning & Community Development & DPW were consolidated/replaced a single Department of Public Works, Community Planning and Property Management (DPWCPPM). Responsible for:

- ***public works***
- ***planning***
- ***infrastructure management***
- ***landscaping***
- ***wastewater treatment***
- ***water service***

1.6 - Plans and Regulations

Name	Year	Relevant Changes	
Emergency Management Plan	Annual	Previously: HMP added as annex to EMP *- In-house, HMP split into sections by responsible department, added to that annex of EOP* *- The EOP is being transferred to the new State format, and reference Annexes will remain as reference information for each departments.* ~~**- Building Code Enforcement:** isolates damaged areas, disconnect utilities, coordinate utility restorations, assist damage assessment~~ - **Public Works, Community Planning**, and **Property Management:** compile strike & incident impact area data, repair	*- DPWCPPM is responsible for isolations of damaged areas, utility shutoff, etc. - not building code enforcement.* *- EOP "Emergency Mapping Book" put together - includes building blueprints, building and area evacuation routes, maps, info, etc. Allows continued emergency operations in case of power outage and loss of access to digital information.* *- Sections:* - *Guest Evacuation Plan, List of Area Hotels on other power Feeds* - *Emergency Response Address Map* - *Utility Address Map* - *Latitudes & Longitudes for Crucial Buildings with Securty Cameras* - *Traffic Low map of Casino Campus with Parking and Exits* - *Reservation Overall Map* - *Lake of Isles Map* - *Wildfire Mapping - Access Road mapping* - *Fire Hydrant Map of reservation* - *Generators and Coverages, Critical Gas Valves and Hydrants Map* - *Storm Structures Outfall Mapping* - *Sanitary Infrastructure* - *Gas Infrastructure* - *Water Infrastructure* - *Electric Infrastructure* - *Available Equipment*

Name	Year	Relevant Changes	
		damaged areas, coordinate regarding potable water, structural viability, and safe utility operation.	
Office of Planning & Community Development Documents		(Previously suggested opportunities for integration)	
Regulations			
Planning Documents			
Building Code	*2012*	*Updated to be aligned with 2012 international codes (IBC, IFC)*	

1.7 - Critical Facilities

Facility	Location	Notes/Changes
Public Safety Building	Route 214 & Pequot Trail	Police Fire Emergency Services Dispatch Animal Control EOC ~~Backup Shelter (ca 200)~~ *no longer a backup shelter* *Tribal Court* Generator *Replaced wooden shingles with 50-year asphalt roof*
Backup EOC	Eagle Park, North Stonington	*Project Dropped*
Mashantucket Pequot Community Center	Matt's Path	Government Center Senior Activities Primary Shelter (ca 100) - *Located in Gym* - *Not used during high-wind events due to concern over vulnerability of large-span roof to wind loads (specifically related to opening doors to the outside).* Generator & Co-Gen Connection - *Updated so that it is now able to power the entire facility. Previously only partial backup power* *Replaced wooden shingles with 50-year asphalt roof*
MPTN Co-Gen Plant	Muhshee Mahchaq	*Steam turbine added, giving an additional 3 MW of capacity.* *Eversource kicks off the Co-Gen plant during power outages, so it is not functional as a backup power source. During Sandy all three of the Reservation's connecting lines from Eversource were down, and power was out (only time this has happened). PW was thinking about starting up the Co-Gen plant during that event, but power came back on before it was necessary.* *In short: Reservation does NOT have the capacity to use Co-Gen plant in Island Mode*
MPTN Child Development Center	Ephraim's Path	~~Secondary Shelter (ca 100)~~ *No longer used as a shelter* No Generator - *MPTN is interested in installing a generator, but has not had funds*
Evacuation	Route 2 Route 214 Casinos Agreements with Hotels	

Facility	Location	Notes/Changes
Public Works	Pequot Trail	Fueling Station *Replaced wooden shingles with 50-year asphalt roof*
Infrastructure		
Backup Generators		18 at Casino 13 Portable
Emergency Communication		Radios Phones Email - *Pequot At Home - listserv with all tribe members* - *Government employee emails (many tribe members are govt employees.* Phone Battery Stock CT Alerts "Everbridge" Tribe Reverse 911 *Backup generators installed at cell towers to maintain service in outage* *Prior to every forcast storm, Fire Department and C.O.S. sends out "be prepared" flyers and emails to residents. Police go door to door if necessary.* *Tribe has list of impaired residents, and makes sure to check on them prior to storms. Provide with an extra week of medication.* *All emergency communication methods are "opt-in" only. Depends on residents.*
Emergency Preparation		*Training and exercises for emergency operations have been increased*
Water & Wastewater Plant		
Backup Shelter	*Ballrooms at Fox Tower*	*For use during hurricane, when MPCC gym is not used due to wind load concerns.*

2. Flooding

2.1 - Setting/Historic Record

Recent Event	Date	Impact
Minor flooding	*Occasional*	*Minor bank washouts* *Some flooding at Lot D*

2.2 - Capabilities

Capability	Changes
Bridge/Culvert Replacements/Improvements	*$600K culvert replacement on Shewville Road with Ledyard. About 3 years ago.* *Replacement of culvert downstream from Silica Mine Dam*
Drainage Improvements	
Drainage/Culvert/Bridge Maintenance Programs	*Bridge inspections performed by Bureau of Indian Affairs every couple years*
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	
Other Completed Projects	
Other	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)
- Vulnerable Critical Facilities

2.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to prohibit new development activities within SFHAs to the greatest extent possible within Tribal land use regulations	*Capability*	
Make available FEMA-provided flood insurance brochures and encourage tribal members to purchase insurance if they are in a SFHA	*Drop*	*Tribal staff says no tribal member homes in SFHA*
Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains	*Capability*	
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Carry Forward*	*Tribal staff are interested in utilizing this data but are not aware of accepted data sources, or how utilizing alternative data sources will conform to State/Fed requirements. [http://precip.eas.cornell.edu/]*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	*Inspections performed annually (rotating through basins & culverts)*
Consider resizing and upgrading the storm draining in the vicinity of the intersection of Route 214 and Trolley Line Boulevard	*Drop*	*With construction of Pequot Outpost on formerly impervious parking area, a retention basin was built, reducing water flow to location.* *Previous hazard was 4-6 inches of standing water in flash storms (4 inches in an hour). Water was short-lasting.* *Tribal staff consider Outpost basin to have addressed issue.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	*Power outage (first in years)*

3.2 - Capabilities

Capability	Changes
Tree Maintenance	*Factory Mutual Insurance (FM Global) report: guided hazardous tree removal efforts over last 5 years.* *Also removed tall pine trees near transformer*
Coordination with Power Utility	*Utilities: Eversource delivers power and gas to reservation,* - *MPTN distributes gas & electric within reservation* - *→ RH White contracted to distribute gas within reservation* - *Eversource fixes outages, reconnects lines* *Coordination has improved greatly. Eversource has hardened lines, resulting in fewer instances of the Co-Gen plant being shut off unnecessarily (due to squirrels, birds on lines, etc).*
Underground Utilities	*Tribal staff estimate 95-98% of utilities are underground. Only overhead wires are on Fanning Road & Coachman Pike - roads are Ledyard, though some properties are in reservation. Tribe plans to purchase all properties on those roads, and will replace utilities underground when that happens.*
Warnings/Communication	*Emails sent out. Door-to-door* *Before wind events, loose items at construction sites, for eg., are tied down by DPW.*
Debris Management	*"Stump Dump" designated. Collect and chip over time.*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider being slightly more aggressive with tree-trimming activities along critical access roads	*Capability*	
Promote the use of shutters for older properties to guard against window breakage which can result in structural failure	*Drop*	*Tribe maintains a Conex box loaded full of plywood, etc. It is ready to go in case of emergency to board up windows. Located at Silica Mine. This is deemed sufficient protection for windows. Action can be dropped.*
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*"Stump Dump"* *Temporary storage after an event.*
Consider surveying all tribal buildings, particularly historic buildings to determine their ability to withstand wind loading	*Drop*	*All tribal buildings are less than 25 years old. They are built to code and able to withstand high winds.* *Housing stock is older.* *Action deemed unnecessarily costly given building states.*
Visit Tribal schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*Prior to every forecast storm, Fire Department and C.O.S. sends out "be prepared" flyers and emails to residents.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Foxwoods: most of the ballast roofs replaced. Protects roof from wind AND prevents rock-throw of gravel on roof.

- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

Acquire backup generator for Child Development Center and convert to backup shelter.
Replace roofs as per recommendations of FM Global

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Major Snow	*2013/2014*	*Major ice dams on roofs. Tribe had to hire contractors to remove.*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*DPW is responsible*
Snow Loading/Removal from Roofs	*Contract out. Purchase orders in place every winter*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Finalize the draft written plan for applying ice melt to Reservation roofs	*Drop*	*Don't apply ice melt - deemed problematic (ice dams in winter of 2013). Prefer to remove snow. Hire contractors as needed.*
Make funding available to the Public Works Department each year for clearing snow from roofs as well as from roads and parking lots	*Capability*	
Provide information for protecting tribal residents during cold weather and for mitigating icing and insulating pipes at Tribal residences	*Capability*	*See warnings/communication* *Additionally, have firewood program - provide residents with fire places with fire wood if heat goes out.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*DPW and emergency responders go out together during storms.* *No areas that are particularly difficult to access, but there are many areas.* *Maintenance of egress is always a priority for property managers.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Emergency Supplies	*Tribe has 3 days-worth of food and water*
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that Tribal departments have adequate backup supplies and facilities for continued functionality following a sudden earthquake	*Capability*	*3 days-worth of food & water*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Carry Forward*	*There are roads located in swampy areas that are likely vulnerable to liquefaction and collapse during earthquake.* *There are homes in the southwest part of the reservation that may also be vulnerable.* *The fact that these areas are not great for construction is only limit on development.* *Determine appropriate action to address this and carry forward.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Monitoring	*Spray mulch piles regularly during dry weather to prevent fires.*
Water Supply	*Mostly hydrants.* *Installing dry hydrant at Silica Mine* *Groundwater monitoring wells regularly checked (reservation water is wellwater, this is important for maintaining water supply)*
Fire Department	
Equipment	*Grant for a brush truck applied for in 2016. If awarded should receive in 2017.*
Other	*BIA wildland fire program - cleanout deadfall. Tribe is in program, but has not performed deadfall cleanout.*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Capability Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire on the Reservation	*Capability*	
Extend public water supply and fire protection to future areas identified as being particularly at-risk	*Drop*	*Tribe has tankers, mutual aid agreements, and lot of backup water. Residential areas are all served by hydrants. Multiple booster stations ensure adequate flow.* *Extension of water supply not currently needed.*
Pursue other sources of firefighting water where adequate supplies do not exist, such as through the installation of dry hydrants	*Capability*	*Installing at Silica Mine*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	*Fire Department talks to students* *Permits are required for campfires*
Ensure that provisions of Tribal regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	*Stringently done*
Continue to provide funding to the Natural Resources Protection office to remove deadfall from Reservation forests	*Carry Forward*	*Tribe needs the money and the personnel to do this. PW does not have the capacity to take on this task.* *Carry forward as: assign a tribal department as responsible for deadfall removal, and budget removal activities.*
Consider the purchase of additional off-road firefighting equipment to provide additional response capability to the Reservation	*Complete*	*Submitted grant application for brush truck in 2016*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

NONE

7.2 - Capabilities

Capability	Changes
Dam Monitoring & Inspection	
Dam Removal Program	
Alert Systems	*Lake of Isles (largest dam): water level is lowered prior to storms.*

7.3 - Vulnerabilities and Risk

- Upstream Dams:
  - Lake of Isles Dam - *dam inspection report just completed.*
  - Silica Mine Dam*/Lantern Hills Dam*
- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Silica Dam: new spillway built with federal funds, dam improved (around 2012). New box culvert with larger capacity installed downstream of dam.

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to maintain Tribally-owned dams in excellent condition	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	*Capability*	
Local Emergency Response		
Continue to review and update the Tribal ~~EMP~~ *EOP* at least once annually	*Capability*	*Rewrite of base plan underway currently* *Annexes updated annually. May shift to every 2 years.*
Add the HMP update as an annex to the Tribal EMP.	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage tribal officials to attend FEMA-sponsored training seminars at EMI	*Capability*	
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Tribal community and Government buildings	*Capability*	
Prevention		
Form a committee to review documents in the Planning and Community Development office and integrate appropriate elements of this HMP	*Capability*	
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Continue to require the burying of utility lines where appropriate	*Capability*	
Continue to enforce the appropriate building code for new building projects and exceed code design when possible	*Capability*	
Encourage tribal residents and members to install and maintain lightning rods on their structures	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Emergency Operations trainings performed much more regularly than in the past

- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

NOTES:

- *Get updated map of Fee Lands (changed since previous HMP)*
- *During an emergency, PWCPPCC arranges to isolate damaged areas and to disconnect utilities…*
- *Send tribe shapefiles (requested)*

New London
Data Collection Meeting

Meeting 1: 11/8/2016

DATE: November 8, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

SUBJECT:

SCCOG Regional HMP Update - Municipal Annex Data Collection Kickoff Meeting

New London, CT

ATTENDEES:

Sybil Tetteh, City Planner
Brian Sear, Public Works Director
Tammy Daugherty, Development & Planning Director
Tom Bombria, Community Development Coordinator
Henry Kydd, Fire Chief
Noah Slovin, CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and explaining the purpose of this data-gathering meeting. He handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan.

Meeting attendees decided that it would be more efficient and effective to take the worksheets back to their respective offices, review them with their staffs, and reconvene at a different date to compile all of that information. A new meeting was scheduled for Monday, November 21, at 9 am at the Fire House.

End of Meeting

Notes, Michelle Johnson Scovish

Assistant Planner / Zoning & Wetlands Official

City of New London Town Update Worksheet

1. Community Profile

1.1 - Land Use

Getch/GIS?

1.2 - Top Employers

Employer	Number Employed
L + M Hospital	*Ned may have these numbers?*
Electric Boat	
CT College	
Mitchell College	
USCGA	
New London Board of Education	
City of New London	

1.3 – Status of Developments and Developments in Progress:

Name	Location	Changes
High Rise Building Renovation	Crystal Avenue	*Or Demolition*
Fort Trumbull Townhouses 99 townhouses	Fort Trumbull	
Shaw's Landing Units 80 units	Shaw's Landing	
Development 33 units	Georgetown Street	*Extension of site plan and IWC Permit*
Condominiums 50 units/condominiums	Bayonet Street behind mall	*Extension of site plan and IWC Permit*
Additional Downtown Re-development		
Parcel J		*+80 Units*
Garfield Avenue	*Garfield Avenue*	*+68 units (fit out/renovate old factory store)*
Mansfield Road	*Mansfield Road*	*+104 Units*

1.4 - Any changes to government structure

_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
Emergency Operations Plan	Assume 2016	*Check with Tammy*
POCD	September 27,2007	*Currently reviewing for 8/17/2017 adoption Comprehensive.*
Harbor Management Plan	1986	
Fort Trumbull Vision	2011	
Code of Ordinances	Focus on 1976 A8 & V8 zones	
Zoning Regulations	February, 2011	*Revised through 10/18/2016* *Floodplain regs updated 6/10/2011*
Subdivision Regulations	June, 2011	*104 (?)*
Inland Wetland and Watercourses Regs	June 2010	*Updated to address statutory charges 1/23/2012*
Arboricultural Standards and Specifications	*April 5, 2010*	

1.6 - Critical Facilities

Facility	Changes
Fire Headquarters (EOC)	
North Fire Station	
South Fire Station	
Police Department	
City Hall Annex *(/Startor[??])*	*Structural issues!*
Water Pollution Control Facility	
Martin Center	
New London High School	

Bernie Dover Jackson Middle School	
Lawrence and Memorial Hospital	
Beechwood Manor	
Camelot Nursing home	
Nutmeg Pavilion Health Care	
Bacon and Hinkley Home	
Briarcliff Manor	
Sunny Lodge (Cedar Grove Manor)	
City Hall	*2017 Historic Renovation Project*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	
Coastal Flood Control Measures	
Completed Projects	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Pequot Avenue → drainage capacity + proximity to Thames River
Bank Street (Lower) → Drainage Capacity + Lack of maintenance over # of years
Broad Street → Drainage Capacity + Lack of maintenance over # of years

Meeting 2: 11/21/2016

DATE: November 21, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

SUBJECT:

SCCOG Regional HMP Update - Municipal Annex Data Collection, Internal Municipal Staff Meeting, New London, CT

ATTENDEES:

Sybil Tetteh, City Planner
Tammy Daugherty, Development & Planning Director
Henry Kydd, Fire Chief
Noah Slovin, CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Meeting attendees worked through some of the Hazard Mitigation Plan update worksheets, attempting to answer questions and provide information necessary for the update.

Attendees noted that none of them had worked on the previous plan, and some of them did not work for the City at all at that point, and so they were not familiar with the previous plan. Therefore, noting changes was difficult.

None of the attendees have seen the existing Hazard Mitigation Plan or know where a copy is located. Noah will email copies of the local annex to meeting attendees.

Meeting attendees said that New London is understaffed, and municipal staff do not have time to address longer-term hazard mitigation initiatives. A full-time Hazard Mitigation officer is needed, or some other method of effectively distributing hazard mitigation duties. Stormwater management specifically was noted as being an important issue that is not addressed because the City does not have the staff to work on it, the grants to fund it, nor the staff to apply for grants.

Henry noted that the new Emergency Operations Center is equipped with tablets. During an emergency, staff are able to bring up a checklist relevant to their specific role and fill it out. This kind of clear layout is helpful.

Tammy suggested that finding a way to consolidate the many different emergency or hazard related plans covering New London would be helpful. This master plan could incorporate the HMP, the EOP, the Millstone evacuation plan, and long-term recovery planning. Plans could be cross-referenced. Noah wondered if a simply-laid-out, accessible HMP quick-sheet might be helpful.

Henry expressed that he has some concern about vulnerabilities related to the Millstone power plant and Electric Boat.

Municipal Employees decided to meet with all City Planners and relevant staff for a day-long workshop to work through updating a number of city planning documents. This will help integrate these different plans. Meeting is scheduled for December 27.

Sybil provided Noah with a table summarizing Housing Developments Approved in New London from November 2016. This table is included below.

Housing Developments Approved in New London, November 2016

Name/Location	# units; bdrm	Type	Developer	Status/Timetable
Hawthorne Drive	51; 2/3 bdrm	Townhouse/Condo	Forest Homes	51 built (complete)
Shaw's Landing / Bank St.	35 (phase I) 44 (phase II) 48 (phase III)	Condos	Oaktree Develop	35 - Phase I Built
147-143 Bank St	9; 2 bdrm 4 commercial	Rentals	Academy Group Properties	Complete
Bacon Bldg/State St	21; Eff., 1 bdrm	Rentals	Bill Cornish	Fire - Re-Construction Completion June 2016
Crystal Ave & Williams St	20; 2 bdrm	Twnhs/Condos	Ken Boyer	Built
Georgetown Road	31; 3 bdrm	Twnhs/Condos	New England Devel.	Apprvd to 2019. Have not broken ground.
Crocker House	84; studio, 1-2 bdrm	Rental	AME Develop	Completed
10 Huntington St & 42-52 Jay St	12; studios 9; 1-bed	Rental	The Connection Fund	PZC apprvd 9/3/2015 Construction Pending
Mansfield Road	104 units; studio, 1-2 bed	Rental	AR Building Company	Under construction
73 Washington St	28; studio & artist studio, 1-2 bdrm	Rental	73/86 Washington LLC	Completed
253 State St	2 apts & commercial space	Rental	Foti & Foley	Construction planning stage
State St	6 studio/1 bdrm	Rental	Caruso	Completed

End of Meeting

2017 SECCOG HMP Update

City of New London Town Update Worksheet

February 23, 2017
Attendees: Sybil Tetteh, City Planner
Tammy Daugherty
Henry Kydd, Fire Chief
Ned Hammond, Economic Coordinator
LJ Keating, Captain Police Department
Dave Denoia, High/Park Manager
Project: Hazard Mitigation Plan

Meeting started with an update to the worksheet. Please refer to the worksheet for full detail changes.

Community Profile (Please see attached)

1.

1.1 - Land Use

Use	Percentage
Developed (Residential, Commercial, Institutional)	
Open (conserved, vacant)	
Agriculture	
Other	

1.2 - Top Employers (Please see attached)

Employer	Number Employed
L+M Hospital	
Electric Boat	
City of New London	
CT College	

1.3 – Status of Developments and Developments in Progress: (Please see attached

Name	Location	Changes
High Rise Building Renovation	Crystal Avenue	Court ordered demolition
Fort Trumbull Townhouses 99 townhouses	Fort Trumbull	
Sha's Landing Units 80 units	Shaw's Landing	
Development 33 units	Georgetown Street	
Condominiums 50 units/condominiums	Bayonet Street behind mall	
Additional Downtown Re-development		
Other		

1.4 - Any changes to government structure

_____

_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
Emergency Operations Plan	Assume 2016 (updated annually)	
POCD	September 27,2007	Updating the POCD

~~Harbor Management Plan~~	~~1986~~	
Fort Trumbull Vision	2011	
Code of Ordinances	Focuses on A8 and V8 zones of 1976	
Zoning Regulations	February, 2011	
Subdivision Regulations	June, 2011	
Inland Wetland and Watercourses Regulations	June 2010	
Water infrastructure plan		
Stormwater Plan (Black & Beach		
Hurricane protection Levee – meet requirement for Army Corp		
Millstone – Local emergency Plan for Millstone		
Harbor Improvement Plan		

1.6 - Critical Facilities

Facility	Changes
Fire Headquarters (EOC)	Improvement to the FH (Flat screen tV installed in the conference room)
North Fire Station	
South Fire Station	
Police Department Headquarters	Has emergency Power
City Hall ~~Annex~~	Does not have emergency power
Water Pollution Control Facility	Improvement to the reservoir - fuel tanks removed
Martin Center / Senior Center	
New London High School	Not a shelter
Bernie Dover Jackson Middle School	Not a shelter
Lawrence and Memorial Hospital	
Beechwood Manor	
Camelot Nursing home	
Nutmeg Pavilion Health Care	
Bacon and Hinkley Home	
Briarcliff Manor	
Sunny Lodge (Cedar Grove Manor)	
Stanton Building	Has emergency Power (House the IT dept.)
Jennings Elementary	
Nathan Hale Elementary	
Winthrop Elementary	
Harbor Elementary	
Public Work Complex	

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	No change
Coastal Flood Control Measures	
Completed Projects	Purchased Regional sand bag machine

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Retaining wall on Pequot -

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities

Police Department, Fire House, and pump station Water Pollution Control Facilities

2.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	Carry Forward	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	Carry Forward	
Conduct an annual inspection of floodprone areas that are publically accessible and recommend drainage improvements as appropriate	Carry Forward	
Consider prohibiting development activities with potential storm surge areas as mapped by FEMA	Carry Forward	
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	Carry Forward	
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	Carry Forward	
Ensure that development at Fort Trumbull is resilient to flooding, hurricane surges, and sea level rise	Carry Forward	
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	Completed	
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	Completed	
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques	Completed	
Encourage residents to submit flood insurance claims following damage events	Completed	
Pursue elevation or acquisition of properties that suffer flood damage	Drop	No regulation in place by the City

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Apply freeboard standards of one foot or more for structure elevations for renovation or new construction in coastal A and V zones	complete	New London require 2’
Emergency Services		
Ensure that the EOP provides current, detailed instructions regarding the timing of evacuations	Completed	
Investigate locations and necessary labor involvement for the pre-event stockpiling of sandbags	Completed	
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	Completed	
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	Carry Forward	
Implement a roadway-specific warning system to alert motorists to dangers during flooding	Completed	
Public Education and Awareness		
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and floodproofing	Carry Forward	
Visit schools and educate children about the risks of flooding and how to prepare	Carry Forward	
Distribute an annual brochure regarding the risks of floodprone areas, mitigation strategies, and contacts	Carry Forward	
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	Carry Forward	
Natural Resource Protection		
Conduct beach nourishment and vegetation replacement along any affected beaches to keep up with erosion	Completed	
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	Completed	
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	Carry Forward	
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	Carry Forward	
Investigate funding sources and the feasibility of improvements to mitigate repeated flooding problems	Carry Forward	
Enact the recommendations of the Stuart Avenue Drainage Study	Completed	
Enact the recommendations of the Parkway South Drainage Study	Completed	
Pursue drainage improvements at Pequot Avenue near Green Harbor Beach	Carry Forward	
Pursue improvements to the Shaws Cove pumping system to allow greater flood control through stormwater pumping	Carry Forward	
Consider elevating portions of Pequot Avenue and other coastal roads to keep ahead of rising sea level and increased inundation	Drop	Feasibility
Upgrade stormwater collection and discharge systems to keep up with rising sea level	Carry Forward	
Maintain existing hard structures along the coast in good condition		Maintained as needed
Ensure that the City's wastewater treatment facility is adequately protected from coastal flooding and storm surge	Carry forward	Is protected against the 10 year floodplain but the 100 year floodplain.

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Sandy	2012	
Other /Irene	2011	
Heavy super storm	2010	
Storm Nemo and Charlotte	2013	

3.2 - Capabilities

Capability	Changes
Wind Loading	Trimming of Trees
Tree Maintenance	Working with Eversource to enhance tree trimming (ETT)
Warnings/Communication	UHF to 1800 MH system regional Digital system
Sheltering	No
Completed Projects	
Coordination with Power Utility	Tree effort communication (EOC)
Other/ Drainage capacity is a problem	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Historic tree still standing
Green harbor beach / High Tide

3.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Work with the State to locate NOAA weather radios in commercial buildings with large population clusters	Carry Forward	
Work with marinas to ensure personal watercraft can be removed in a timely manner prior to a hurricane or tropical storm event	completed	
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans	Carry Forward	
Property Protection		
Promote the use of functional shutters for older buildings	Drop	
Make information on wind-resistant construction techniques available to all building permit applicants	completed	
Encourage commercial building owners or managers of large population clusters to develop response plans and mitigation opportunities	Carry Forward	
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	completed	
Consider surveying all City-owned buildings to determine their ability to withstand wind loading	Carry Forward	
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	completed	
Prioritize wind-related retrofitting for the City's shelters over other critical facilities, or relocate shelters if necessary	completed	
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	Carry Forward	
Visit schools and educate children about the risks of wind events and	Carry	

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Work with the State to locate NOAA weather radios in commercial buildings with large population clusters	Carry Forward	
Work with marinas to ensure personal watercraft can be removed in a timely manner prior to a hurricane or tropical storm event	completed	
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans	Carry Forward	
how to prepare for them	Forward	
Post and maintain signs signifying evacuation routes from coastal areas	completed	
Develop working relationships with local community organizations and encourage them to promote wise landscaping techniques	completed	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms (Please see attached)

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Heavy super storm	2010	
Storm Nemo and Charlotte	2013	

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	new/ changed routes
Tree Maintenance	
Snow Loading/Removal from Roofs	Update operation & equipment
Other	New tracks/ pretreating roads

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

N/A

4.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Consider drafting a written plan for inspecting and prioritizing the removal of snow from City-owned structures	Complete	
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	Carry forward	
Provide information for protecting City residents during cold weather and for mitigating icing and insulating pipes at residences	Complete	
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	Carry forward	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that City departments have adequate backup supplies and facilities for continued functionality following an earthquake		
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

No changes

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Fire Department	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the city		
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes		
Ensure that provisions of City regulations regarding fire protection facilities and infrastructure are being enforced		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

No changes

7. Dam Failure

No dams in town

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	Completed	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	Completed	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	Completed	
Continue to promote regional transportation planning through SCCOG	Completed	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	Carry Forward	
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	Carry Forward	
Local Emergency Response & Public Information		
Continue to review and update the City EOP at least once annually	Completed	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	Carry Forward	
Encourage City officials to attend FEMA-sponsored training seminars at EMI	Completed	
Continue to evaluate emergency shelters, update supplies, and check communication equipment	Completed	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	Completed	
Utilize the CT Alerts Reverse 9-1-1 system during emergencies	Completed	
Prevention		
Integrate elements of this HMP into the next Plan of Conservation and Development update	Carry Forward	
Continue reviewing building plans to ensure proper access for emergency vehicles	Completed	
Promote industrial redevelopment in the Thames River area to located non-water dependent uses further inland and encourage public access	Completed	
Consider expanding street tree planting programs while recommending appropriate street-side trees and encouraging maintenance	Completed	
Require the underground installation of utilities for all new development	Carry Forward	
Continue to enforce the appropriate building code for new building projects	Completed	
Encourage residents to install and maintain lightning rods on their structures	**Drop**	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	Completed	

Consider requiring the deduction of sensitive areas when determining residential density for new developments	Completed	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

  Long term disturbance recovery ordinance

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

HOUSING DEVELOPMENTS APPROVED IN NEW LONDON
November 2016

Name/Location	# of units; bdrm	Type	Developer	Status/Timetable
Hawthorne Drive	51; 2/3 bdrms	Twnhs/Condos	Forest Homes	51 Built
Shaw's Landing/Bank St.	35 (Phase I) 44 (Phase II) 48 (Phase III)	Condos	Oaktree Develop.	35 – Phase I Built
147-153 Bank St.	9 2-bd residential; 4 commercial spaces	Rentals	Academy Group Properties	Complete
Bacon Bldg/State Street	21; Eff., l bdrm	Rentals	Bill Cornish	Fire – Re-Construction Completion May 2017
Crystal Ave. & Williams St.	20; 2 bdrms	Twnhs/Condos	Ken Boyer	Built
Georgetown Rd.	31; 3 bdrms	Twnhs/Condos	New England Devel.	Apprvd to 2019. Have not broken ground
Crocker House	84 studio, one/two bdrms	Rental	AME Develop.	Completed
10 Huntington St & 42-52 Jay St.	12 studios, 9 one bdrms	Rental	The Connection Fund	PZC apprvd 9/3/2015 Construction pending
Mansfield Road	104 units, studio, one/two bdrms	Rental	AR Building Company	Under construction
73 Washington Street	28 studio & artist studio, one and two bdrms	Rental	73/86 Washington LLC	Completed
253 State St.	2 apts. & commercial space	Rental	Foti & Foley	Construction planning stage
State Street	6 studio/1 bdrm	Rental	Caruso	Completed
State Street	4 one bedroom	Rental	AME Development	Completed
429-461 Bank Street New London Habour Towers	6000 s.f. office 39 residential 3000 s.f. retail	Condos	Anthony Silvestri	Completed
13 Washington Street	25 apartments + 2 commercial spaces 3 – efficiency $625 700sf 10 – 1bd $775 875-900sf 12 – 2bd $835 900-1275sf	Rental	Peter Levine	Completed

City of New London Major Employers

CITY OF NEW LONDON
OFFICE OF DEVELOPMENT & PLANNING
April, 2014-17

EMPLOYER	**NATURE OF BUSINESS**	**# OF FULL & PART-TIME EMPLOYEES**
General Dynamics – Electric Boat	Submarine Design & Build	3250***
Lawrence & Memorial Hospital	Hospital – Medical Center	2500
Connecticut College	Higher Education	909*
US Coast Guard Academy	Higher Education – Military & Civilian	Mil. 650 Civ. 250*
City of New London	Government only Education	244** 422**
The Day Publishing Company	Newspaper & Related Publishing	280
Cross Sound Ferry Services	Ferry Services	300*** 450 in summer season***
Mitchell College	Higher Education	124 FT* 85 PT*
Kindred Crossings Healthcare	Nursing & Convalescent Homes	217**
Sheffield Pharmaceuticals	Manufacturing	145 FT*** 50+/- PT***
Beechwood Rehab & Nursing Ctr.	Nursing & Convalescent Homes	105**
M J Sullivan Automotive Cntr.	Automotive Dealership	83**
Whaling City Ford	Automotive Dealership	63****

*Updated to 10/2013. **Updated to 4/2014. *** Updated 6-20-2016. ****Updated to 2-6-2017. Employment numbers are based on information provided by employers and are generally best estimates and subject to change. 2. AT&T was at 300 employees but since 2011 has reduced their numbers significantly. AT&T will not reveal their employment numbers at this time, probably due to negotiations with Frontier Communications which intends to purchase some AT&T services.

North Stonington
Data Collection Meeting

2017 SECCOG HMP Update - North Stonington Town Update Worksheet

DATE: November 30, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Shawn Murphy	- First Selectman
Stephen Holliday	- Highway Department
Gary Baron	- Emergency Management
Noah Slovin, CFM	- Milone and MacBroom, Inc

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the City to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. He and the Town staff worked through this worksheet together.

1.3 – Potential Developments and Developments in Progress:

Name	Location	Changes
Milltown Commons Mixed Use- 275 housing units/250,000 ft^2 commercial space		*This development did not occur, and is no longer proposed.*
Meadow Court 84 unit affordable housing	Off Route 2 next to Holly Green	*This development did not occur, and is no longer proposed.*
Emergency Services Building		*Will be built starting in 2017. Will include emergency generators*
School modification project	*Note: school campus borders a wetlands*	*Kicking of in 2017.* *Will include installation of emergency generators.* *Schools are critical facilities.*
Lake of Isles Development		*11 buildings* *Driveway to development is in an A zone, vulnerable to closure, isolating development. Single egress.*

1.4 - Any changes to government structure

NONE

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
POCD	2003, amended 2009	*[Updated through October 2013 – information provided by 12/1 email, after meeting]*
EOP	Jan 1, 2017	*Updated, finalized, waiting for Town to sign off on it. Will be in effect by January 1, 2017*
Zoning Regulations	May, 2011	*[Updated in March 2016 – information provided by 12/1 email, after meeting]*
Subdivision Regulations	July, 2009	*[Updated in March 2016 – information provided by 12/1 email, after meeting]*
Inland Wetlands and Watercourse Regulations	Last amended May 1999	*[Updated in March 2012 – information provided by 12/1 email, after meeting]*

1.6 - Critical Facilities

Facility	Changes
New Town Hall (EOC)	*EOC continues to be located in Town Hall, however there is a plan to construct a new Emergency Services Building, and the EOC will be relocated there upon completion. Expected completion is within 15 months [Around February 2018. See note below.]* *The roof of the Town Hall was fixed in late 2016 (fall), fixing an indoor leakage and flooding problem*
North Stonington Ambulance	*Will relocate to new Emergency Services building, across from current location.*
North Stonington Elementary School	*Has been updated. [Updates not specified]*
North Stonington Medical Clinic	
Old Town Hall	
Public Works Garage	
Volunteer Fire Department	*[Will be relocated to new Emergency Services building*
High School and Middle School	*New*
Communication Capabilities	*New devices purchased with improved range of frequencies [?]. New radios. Communication equipment has been brought up-to-date.* *EMD: Warnings from Region 4 or FEMA are forwarded to the IT department and the First Selectman, and posted on the Town Website*
Emergency Services Building	*[Planned completion is April 2018. To be located at 25 Rocky Hollow Road. Will contain EOC, Ambulance, and Volunteer Fire Department]*

2. Flooding

2.1 - Setting/Historic Record

Recent Events	Date	Impact
2010 flooding is still considered "the big one" - *Many "corrections" have been implemented since then* - *For example, the headwall in Sleepy Hollow has been improved*		*Town helped pull a restaurant out of the water*
Main issue is local basement flooding		

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	*- Route 184 and route 216 bridges have been rehabilitated by the State* *- The Town Hall Bridge replacement was finished in 2012. Drainage was improved on the roads approaching the bridge as part of that project. Additionally, the center post underneath the bridge was removed, so there is only a single large opening now - this has decreased the amount of debris clogging that occurs here.* *- Village Green Bridge has been reinforced* *- The Hewitt Farm property, including a Bridge/Dam, was purchased by the Town [in 2008]. Town personnel believe that in 2016 the Town finished rebuilding the dam and bridge overtop. [Online research shows the project tentatively completed May 2015. http://www.theday.com/article/20150514/NWS01/150519563]* *- http://www.theday.com/article/20150506/NWS01/150509480*
Regs, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	*Town utilizes Everbridge system. Town of Groton runs the dispatch for North Stonington.* *Town encourages residents to sign up for CTAlert and other state-level programs*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

  No new info

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

    The recreational area that includes Parke Pond Dam was purchased by a land trust.
    - *There has been consideration of installing a fish ladder at the site*
    - *Historic Society has installed some signage*
    - *The area purchased in a floodplain.*
    - *[Avalonia Land Conservancy Purchased. "Parke Memorial Preserve" - part of Donald R. Henne Memorial Preserve. 3.3 acres, purchased 2009, 16 Babcock Road, "Historical mill site and pond with dam."*

  - Repetitive Loss Properties (notes, new RL properties, etc)

2.4 - Actions

Action	Status Completed Capability Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within Town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	*Town staff claimed this is covered in Inland Wetland Regulations*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*Town-owned land is regularly inspected* *The Town tries to be proactive about drainage improvements, but out of necessity is often reactive, solving problems as they arise.*
Compile a list of addresses of structures within the 1% annual chance floodplain and track repair costs	*Carry Forward*	*Not yet completed*
Amend the publically available copies of the Zoning and Subdivision regulations to reflect recent NFIP amendments approved by the PZC	*Complete*	*As can be seen in the regulations, available online*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*The Town does not hold public education workshops. Staff think there may have been some after the 2010 floods*

Action	Status Completed Capability Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*Town staff believe this is true, but plan to check*
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques, esp. in North Stonington Village	*Drop*	*Structure owners do not approach Town for technical assistance, so Town does not feel this action is necessary. Town provides sandbags to non-residential structure owners through the highway department prior to storms.*
Encourage residents to submit flood insurance claims following damage	*Capability*	*Information posted on Town Website*
Pursue acquisition, elevation, or relocation of floodprone residential properties particularly in North Stonington Village	*Drop*	*Since improvement of the bridge [Town Hall Bridge], flow has improved, and flooding hazards diminished. Property owners in North Stonington Village are not interested in selling their properties, and additionally many of them are historic so structural options are limited, so improving the flow is a more desirable option. Purchasing, relocating, or elevating properties is not deemed necessary.*
<u>Emergency Services</u>		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Drop*	*Town maintains mutual aid agreements with ambulance companies and volunteer fire departments. Non-profit volunteer labor is not of interest to the Town.*
Include structures within the 1% annual chance floodplain within the "Everbridge" Reverse 9-1-1 contact database	*Complete*	
<u>Public Education and Awareness</u>		
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*Town runs an annual fire prevention education program with schools, but not a flood risk program. Town does not think this would be effective. Additionally, the parents of children who live in floodprone areas are already aware of the risk.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*Town does not run annual workshops. Builders, developers, and architects are incentivized to familiarize themselves with the NFIP through requirements of permit applications. Further encouragement unnecessary.*
Perform outreach to floodprone property owners regarding availability of competitive grant funding for mitigation projects	*Carry Forward*	*Town says if they are provided with that information, they will send it out via Town website & brochures at Town Hall*
<u>Natural Resource Protection</u>		
Pursue acquisition of additional municipal open space in SFHAs	*Drop*	*Town is concerned about loss of property tax revenue if property owners are bought out. The budget is very tight.*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
<u>Structural Projects</u>		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Carry Forward*	
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Replace the culvert at Lantern Hill Brook on Milltown Road as proposed	*Drop*	*This was attempted years ago, and ended is a big legal fight. The Town is no longer pursuing this project.*
Replace the culvert at Glade Brook on Pine Woods Road as proposed	*Carry Forward to Completion*	*Plans have been developed, but locally there is a fight over this project. Project is ongoing, but on hold until resolution of this disagreement.*
Work with the Connecticut Department of Transportation to upgrade culverts along Pendleton Hill Road (Route 49)	*Carry Forward*	*Project is ongoing - some culverts have been upgraded. There is talk of redoing the road.*
Consider methods of diverting excess water from the unnamed pond to reduce the frequency of flooding at Rocky Hollow Road	*Drop*	*There was an issue with groundwater coming to the surface and causing flooding in 2010, but there have been no problems since then. Stephen feels the only long term solution to this problem would be to pipe the water away, but since it is so rarely an issue it does not seem worth such an extensive, expensive project.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

The culvert under the Village Green is undersized. There are not many options for solving drainage problems without the Town acquiring properties in the area, which it does not wish to do. The Town may want to perform an assessment of options here.
A new Route 49 Bridge is expected in the next few years (State Jurisdiction)
Improve Drainage on Rocky Hollow Road near the Recreational Area
Improve drainage on Pinecrest Road in the Kingswood - Meadow Wood Subdivision
Perform other major drainage improvement projects as they arise
Pine Woods Road culvert replacement ("Above ^" [unclear what this refers to])

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Recent Events	Date	Impact
Sandy	*2012*	*Trees down, power out 8-9 days* - *People lost food because there was no power for refrigerators* - *North Stonington is at the end of the power distribution system, so it got power last. Residents complained that work was being done down in the population centers first because they have more money and the power companies care about them more. Really, they have to fix the center of the system before the edges.*

3.2 - Capabilities

Capability	Changes
Tree Maintenance	*Town owns a tree-truck. Run tree maintenance along roadways.* *They have a budget to hire outside contractors when necessary.* *They've performed some major trimming over the last 5 years.*
Sheltering	*Multi-town sheltering agreement signed in 2016. Included Stonington*
Completed Projects	*None*
Coordination with Utility	*Eversource. They have a liaison. Coordination has been good. Eversource also performs tree maintenance - along their lines.*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

No Notes

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Property Protection		
Promote the use of functional shutters for older buildings	*Drop*	*Window blowouts is not an issue in Town, staff do not see installation of shutters to be necessary*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Building inspector ensures this information is available. Town implements newest State Building Code, & inspector enforces.*
Encourage building designs that meet the ASCE-suggested wind design speed of 160 mph in the East Green Falls Road area	*Drop*	*Building official enforces the requirements in the newest State Building Code. This has been sufficient up to this point.*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*Two locations designated: the Town-owned transfer station, and the Grange Grounds/Fairgrounds*
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	*Drop*	*There has been no indication that Town buildings are not capable of withstanding wind loading.*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Complete*	*Agreement through SCARRA program*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*Town staff do not feel this would be an effective way to educate the public about wind hazards.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Recent Events	Date	Impact
	2013	
	2015	

4.2 - Capabilities

Overall, Town staff feel they are in good shape with regards to capabilities for mitigating winter storm hazards.

Capability	Changes
Snow Removal from Roads	*Good program for maintaining local roads. They have the equipment and manpower they need. It's the State roads that don't seem to get cleared in a timely manner.*
Snow Loading/Removal from Roofs	*Public roofs are taken care of by the Town. Schools maintain their own roofs successfully*
Other	*Snow removal budget has been consistently reduced*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Fire and ambulance can have difficulty accessing areas off of back roads. These are often private roads, or just very long driveways.

4.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Drop / Capability*	*Town staff have identified vulnerable roofs, and are able to keep an eye on them during snow events. They know what they have, and do not feel conducting a formal study is necessary*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	*Complete*	*A written plan of prioritization has been written [check this]*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	*Funding is allocated consistently on an annual basis. However, funding has been greatly reduced over the last 5 years.*
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Posted on Town Website*
Consider posting the snow plowing routes in local government buildings and on the Town's website	*Drop*	*Plow routes are variable storm to storm, moment to moment. Posting routes in government buildings does not make sense, and the Town wouldn't be able to ensure they stuck to those routes.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*DPW will dispatch a plow with emergency vehicles when calls come in from such areas.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Recent Events	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

No Change

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Complete*	*Schools have been upgraded, and once the Emergency Services facility is complete it, too, will have adequate backup.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	*Incorporated into Town Zoning ordinances*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Recent Events	Location	Impact/Size/Response
- an overheated generator started a fire	*Route 184*	
	Wyasset Horse Barn	
Illegal burns, cigarettes *Several Brush Fires*	*Lantern Hill, especially*	*Minor, regularly occurring.* *Some property damage has occurred, no loss of life*

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*No Changes*
Fire Department	*Through a grant, recently acquired new equipment:* *- Helmets, rakes, suites, hose, a new drone* *New Town budget includes purchaseing a new Brush Truck* *- RAFL: UTV with 50 Gallon Capacity local generator pump, wounded transport*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

[Lantern Hill appears to be a vulnerable area]

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire protection and areas at risk of wildfire in the town	*Capability*	
Extend fire protection to future at-risk areas through public water systems or the installation of dry hydrants	*Carry Forward*	*Town does not feel it is necessary to extend public water systems for the purpose of fire suppression.* *Town is considering adding a water Tower to give the existing public water system the pressure necessary to fight fires.* *Town is interested in installation of dry hydrants*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	*Fire Department goes to schools to run educational programs.* *FD posts information on Town website.* *FD has $3000 a year for outreach.* *National fire safety organizations donate outreach material and information*
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	*Should read "State" regulations, more than Town regulations* *Town has a Fire Marshall enforcing State regulations.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

Town provided a table of High or Significant Hazard Dams. Some corrections to that list were made and are included here.

Name	Waterbody	Owner	Class	Notes
Billing Lake Dam	*Billings Lake*	*DEEP*	*BB*	
Blue Lake Dam	*Anderson Pond*	*Private/Local*	*BB*	
Spaulding Pond Dam		*Private/Local*	*BB*	
Wyassup Lake Dam	*Wyassup Lake*	*Private/Local*	*B*	*Dam has been greatly improved and updated in last 5 years*
Assekonk Swamp Pond		*Private/Local*	*BB*	
Lake of Isles		*Private/Local*	*BB*	
Bush Pond Dam		*Private/Local*	*B*	
Gallup Pond Dam		*Private/Local*	*B*	
Clark's Falls Dam		*Private/Local*	*B*	
Shunnuk River / Park Pond Dam		*Local / Town of North Stonington*	*BB*	

7.2 - Capabilities

Capability	Changes
Other	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Carry Forward*	*Town wishes to carry forward the action of maintaining local copies of EOPs*
Continue to maintain Town-owned dams in good condition	*Capability*	
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Drop*	*Dam owners work directly with DEEP under recent changes to State dam management protocol. No longer necessary for Town to provide direct assistence*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually	*Capability*	*Currently undergoing update*
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	*Fire Department and EMD do this*
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	*Carry Forward*	*EMD takes ICS courses as required by FEMA* *Grant-writing courses in Colchester have been attended by Town personnel* *Town wishes to send staff to additional seminars*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	
Encourage residents to submit contact information to the CT Alerts "Everbridge" Reverse 9-1-1 system and utilize it during emergencies	*Capability*	
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Drop*	*Not considered necessary given permitting process*
Integrate elements of this HMP into the Plan of Conservation and Development during the next update	*Carry Forward*	
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	*Commercial driveway ordinances require such review*
Require the underground installation of utilities for all new development	*Drop*	*Not performed, not considered cost-effective. Aggressive tree maintenance and power restoration efforts are preferred.*
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	*It is not clear to Town staff that lightning rods help very much. [http://lightningsafety.com/nlsi_lhm/InstallRods.html]*
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

On Wed, Nov 30, 2016 at 2:46 PM -0500, "Shawn Murphy" <smurphy@northstoningtonct.gov> wrote:

Noah,

Thank you for meeting with us this morning to discuss our HMP update. I promised you the following information on our current plans and regulations:

POCD	October 2013
EOP	January 2017
Zoning Regulations	March 2016
Subdivision Regulations	March 2016
IW&W Regulations	March 2012

Also, the location for NS Ambulance and NS Volunteer Fire Company is anticipated to change in April 2018 to 25 Rocky Hollow Road.

Please let me know if you will need any further information.

Regards,

Shawn

Shawn P. Murphy

First Selectman

Town of North Stonington

40 Main Street

North Stonington, CT 06359

Phone: 860 535-2877 x12

Fax: 860 535-4554

smurphy@northstoningtonct.gov

Norwich
Data Collection Meeting

2017 SECCOG HMP Update - City of Norwich Update Worksheet

DATE: November 30, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Ryan Thompson	- Director, Public Works
Deanna Rhodes	- City Planner
Gene Arters	- Emergency Management Director
Noah Slovin	- CFM, Milone & MacBroom, Inc.

SUBJECT:

SCCOG Regional HMP Update - Municipal Annex Data Collection Kickoff Meeting
Norwich, CT

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the City to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

- Meeting attendees wanted to know how much money is available from the federal government for mitigation activities through their grant programs.
    - - Noah did not know the answer to that question, but said he'd look into it.
- Meeting attendees expressed concern that this update process was not being well advertised to the public, limiting public involvement

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group then worked through much of this worksheet together.

Community Profile

1.3 – Status of Developments and Developments in Progress:

Deanna volunteered to get more information about development in Town to Noah at a later date.

Name	Location	Changes
Subdivisions	Hanson Road	
Apartments/Condos	Taftville near Shetucket River	*Mostly complete, facing some permitting issues. More trees were cleared than initially agreed on, possibly posing a runoff/sediment/landslide hazard. There is also a disagreement about the need for a retaining wall.*
Ponemah Mills	*Shetucket River at Shetucket Falls Dam*	*Redevelopment of historic mill into residential use. In SFHA*
Businesses on Boswell Avenue	*Boswell Avenue*	*Dollar General is going in here. Will have a large detention basin. Businesses at this slight flood badly.*

1.4 - Any changes to government structure

NONE

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
POCD	2002	*Updated through 2013*
EOP	2016	*Current. Currently being promulgated.*
Zoning Regulations	July 2011	*Updated in 2015. New regulations don't comply with FEMA requirements and need to be updated. This new update is in process. Deanna predicts fixing this will cost the city around $10,000, and is wondering if there is money available through grants for this kind of work.*
Inland Wetlands and Watercourse Regulations	June 1, 2010	*Deanna will double check the date of this*
Harbor Management Program	2012	*Ongoing updates currently*
Waterfront Vision		*Drop - this plan is not utilized anymore*

1.6 - Critical Facilities

Facility	Changes
Emergency Services	
Municipal Facilities	
Health Care Facilities and Senior Living	
Norwich Public Schools	
Alternate Public Schools	*Example: Integrated Day Charter School*
Private Schools	
Solar Farms	
Yantic Fire Department	*Flooded by Yantic River. Town went out for grant and found that Fire Station qualified. Grant would fund relocation of fire department. Building is historic, limiting possible measures.*
Warning/Communication	*Everbridge system has been implemented*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact
1982 Flood was largest		
Yantic Flooding by Norwich Tire Caused by a Microburst	*2013 or 2014*	*Closed West Town Street under 395. Carried out a Swift Water Rescue.*

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	*Canada Bridge (Sherman Street Bridge) - rehabilitation in design phase. Will raise bridge by 1.5 feet. Raise section of Asylum Street 1.5 to 2 feet.*
Regulations, Codes, Ordinances	*Zoning update required, as noted previously*
Acquisitions, Elevations, Property Protection	*City owns many empty structures, is at capacity re: maintenance, monitoring. Not interested in acquiring more structures.*
Warnings/Communication	*-Everbridge system.* *-Public Information and Education Programs carried out by City.* *-Norwich Commons mitigation: Weather alerts sent to EM are forwarded to store owners. Deployable floodgates have been installed. Supplemented with Sandbags from the City* *-Training videos are available on City Website*
Completed Projects	*Rehabilitation Assessment Reports on the Spaulding Pond Dams*
Coastal Flood Controls	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

FEMA maps so a floodway through the downtown area. Deanna and Gene disagree - there is underground piping that moves water through the system, and this was not accounted for in the FEMA mapping. Deanna and Gene went to a FEMA meeting and presented this site and two other sites (including a development on West Town Street near Rt 395, along the Yantic River) for reassessment by FEMA.
Areas along the Yantic, Shetucket, and Thames.
Downtown area in the SFHA

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

Nutmeg Companies moved from old headquarters in floodprone area (hq since 1988) to new location at 1 Ohio Avenue (out of floodprone area) in June 2015
Changes in MS4 requirements from the State require retaining water on site to improve downstream water quality. Will this retention exacerbate flood hazards at those sites?
Dollar General was moved out of the Floodway (still in the SFHA)
Foundry 66 - newly refurbished office space in Downtown Area, vulnerable to flooding
Ponemah Mills - has been empty, once refurbished will represent new residential building that is vulnerable

  - Repetitive Loss Properties (notes, new RL properties, etc)

NONE

- Vulnerable Critical Facilities

Yantic Fire Department. Critical Facility, vulnerable to flooding, and historic site. Bridge downstream is also historic. There are plans for rehabilitating that bridge.

2.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within Town land use regulations	*Capability*	
Consider requiring new buildings in floodprone areas to be protected to the highest recorded flood level regardless of SFHA	*Drop*	*Municipal staff feel this action is unreasonable and unaffordable, and that the public would not buy into it*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	
Review local Zoning Regulations and evaluate incorporating further limitations on impermeable surfaces in floodprone areas	*Capability*	*This is being required under updated MS4 guidelines*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate. Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	*Capability*	*Catch basins and drainage systems are regularly checked. Improvements are made as needed.*
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	*Carry Forward*	*A list of addresses of structures within the SFHA was just compiled.* *Repair costs are beginning to be tracked* *Carry forward until municipal staff feel it has been completed.*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Carry Forward*	*Flood insurance information is provided, but education and distribution of this information could be improved.* *This action may need to be altered.*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques	*Drop*	*The city directs non-residential structure owners to consult with an engineer. Providing technical assistance is not a capability of Municipal personnel*
Pursue acquisition of floodprone residential properties - RLPs should be prioritized - and convert to open space	*Drop*	*Norwich already owns many properties, and cannot afford to acquire more. They are, generally, attempting to "shed" properties, rather than acquire more.* *The City is interested in replacing this action with the following:* *"Convert previously residential structures owned by the City into open space, prioritizing those that are floodprone."* *"Use grant funding to acquire floodprone private residential properties that pose significant health and safety risks from owners that approach the City."*
Pursue acquisition of Nutmeg Company, Inc. and other commercial floodprone properties and convert to open space	*Capability* *Carry Forward*	*Nutmeg Company Inc. has relocated, and previous property has been acquired by the City.* *City wishes to carry forward "pursue acquisition of commercial floodprone properties and convert to open space, if funding is available."*
Encourage residents to submit flood insurance claims following damage events	*Drop*	*City facilitates flood insurance claims and provides guidance, but does not feel it is appropriate to actively encourage submittal of claims.*
Acquire grant funding to floodproof the Yantic Fire Engine Co. No. 1 building and complete floodproofing project	*Carry Forward*	*Historic Building, so floodproofing measures cannot be applied. Relocating the department and abandoning the building is possible, but City does not wish to give it up. Carry forward as "determine effective and acceptable flood mitigation options for the Yantic Fire Engine Co. No. 1 Building"*
Emergency Services		
Investigate locations and labor involvement for the pre-event stockpiling of sand bags for use in floodprone areas	*Capability*	*4,000 bags are pre-filled and ready to go.* *20,000 bags are empty and ready to be filled.* *REPT grant used to purchase an automated sand bagger that can rapidly fill bags as needed.*
Pursue mutual aid agreements with non-profits to provide volunteer labor for filling sand bags and other response activities	*Capability*	*Emergency Manager maintains a call list of organizations that can be contacted for assistance. This list was recently used to recruit volunteers to help direct traffic during a parade.*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Implement a roadway-specific warning system to alert motorists to flooding dangers	*Drop*	*Town has physical barriers and the ability to send warnings to specific areas using the Everbridge system. These systems are deemed sufficient, and this action unnecessary.*
Public Education and Awareness		
Conduct a "Flood Fair" so that interested parties can familiarize themselves with flood mitigation	*Drop*	*City has many public education programs that address all hazards. A Flood Fair is not deemed necessary.*
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*FEMA provides some educational material for children, such as coloring books. There are also many other public education programs run by the City, including training videos on the City website. This action is not deemed necessary.*
Annually distribute a brochure outlining the risks of floodprone areas, mitigation strategies, and contacts	*Carry Forward*	*City is interested in distributing a brochure, but does not want to commit to an annual brochure.*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Capability*	*City does not hold annual workshops. Completes this action on a case-by-case basis as developers, etc., approach City about new construction.*
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	*Carry Forward*	*City actively creates open space on properties already acquired. City is not interested in acquiring new properties at this point in time. Carry forward as "Pursue the creation of additional open space on City-owned properties, prioritizing those within SFHAs."*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	*Capability*	
Continue to evaluate culvert sizing as time and funding allows in order to prioritize replacements	*Capability*	
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Capability*	
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Investigate funding and feasibility of mitigating frequent drainage problems	*Capability*	
Consider removing the silt buildup from the vicinity of the Canada Bridge on Sherman Street	*Carry Forward*	*Part of Canada Bridge replacement project. Carry forward until completion.*
Upgrade stormwater collection and discharge systems to keep up with rising sea level	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Investigate feasibility and utility of removing the dam downstream of the Canada Bridge (note: this action is referenced in the Dam Hazard section)
Assist NPU with completion of their sewer separation project.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/25/2012	*Minimal impact in Norwich*

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	*Very robust program.* *2 Tree Wardens in the Public Works department.* *Contract with Linden Tree for Tree Maintenance, removal.* *City owns a bucket truck and has its own tree crew.*
Warnings/Communication	
Sheltering	
Completed Projects	
Coordination with Power Utility	*NPU. Very good coordination. EOC is at NPU Administrative & Operations Center building, 2nd floor (16 South Golden Street).*
Underground Utilities	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Work with the State to locate NOAA weather radios in commercial buildings with large populations and educate managers to use them	*Capability*	*1 in every school and other locations with large populations (Dodd Stadium, Norwich Marina).* *Theft issue - radios keep having to be replaced*
Work with City marinas to ensure that personal watercraft can be removed in a timely manner or removed to sea prior to severe winds	*Capability*	*Marina is receptive, and does a good job of this*
Work with SCCOG to develop a regional marina management plan addressing wind damage, & encourage local marinas to develop plans	*Carry Forward*	*Will work with SCCOG when approached*
Property Protection		
Promote the use of functional shutters for older buildings in the City, and investigate funding sources	*Drop*	*Loss of windows from wind has not been an issue in the City* *Historical Society would not want shutters installed on historic structures (aesthetics)*
Make information on wind-resistant construction techniques available to all building permit applicants	*Carry Forward*	*Information distribution could be improved. This information is likely readily available.*
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities		*Unaddressed*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Capability*	*City Transfer Station*
Consider surveying all City-owned buildings, particularly historic buildings to determine their ability to withstand wind loading	*Capability*	*City has a report summarizing this information for all operational city buildings. Does not include city-acquired abandoned buildings.*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Drop*	*City does not feel this is necessary*
Prioritize wind-related retrofitting for the City's shelters over other critical facilities.	*Capability*	*The three primary shelters of the City have been assessed and rated to withstand a Category 3 Hurricane.*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Capability*	*Emergency Manager does this when he performs his all-hazard educational programs*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Conduct an annual workshop so that interested parties can familiarize themselves with wind mitigation	*Drop*	
Work with local homeowners associations and community groups to provide education regarding wise landscaping and proper tree planting	*Drop*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
36-inches in one day	*January 2015*	

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*Good*
Tree Maintenance	*Good*
Snow Loading/Removal from Roofs	*Good*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Reid and Hughes Building: large building downtown in bad shape - flat roof, deteriorated. City in discussions with the Historic Commission to take it down, but it the meantime it is a serious hazard.

4.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the city	*Drop*	*City employees know which buildings are vulnerable. Study is not necessary.*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from City-owned structures	*Capability*	*City has a priority program for snow removal and clearance. Starts with Police, then Fire, then City Hall, etc.*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting City residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Human Services has information.* *United Way and TBCCA, which run the home heating fuel program, also provide information.*
Consider posting the snow plowing routes in local government buildings and on the City's website	*Drop*	*Not useful because routes will change for each storm.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*Plow goes out with emergency vehicles.* *Parking bans help keep roads clear.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code Zoning Ordinances, etc.	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that City departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (structural, natural resource, property protection, emergency service, prevention, education, incomplete projects)

6. Wildfires

City personnel directed Noah to talk to NPU, which handles water supply and may have more information about capabilities

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*NPU handles*
Fire Department	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the City		
Extend public water supply & fire protection to future areas identified as being particularly at-risk	*No Extensions*	*Extension to Ponemah during rehab*
Pursue other sources of firefighting water where adequate supplies do not exist, such as through the installation of dry hydrants		
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes		
Ensure provisions of City regulations regarding fire protection facilities and infrastructure are being enforced		
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the City		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (structural, natural resource, property protection, emergency service, prevention, education, incomplete projects)

7. Dam Failure

City personnel directed Noah to talk to Mark Decker or Eric McDermot at NPU to collect information about NPU-owned dams

7.1 - Dams in Town

Name	Owner	Class	Notes
Bog Meadow Reservoir Dam	Norwich Public Utilities	B	
Deep River Reservoir Dam	Norwich Public Utilities	C	
Fairview Reservoir Dam	Norwich Public Utilities	C	
Fitchville Pond Dam	Private (Commercial)	C	
Greeneville Dam	Norwich Public Utilities	C	
Scotland Dam	Private (Commercial)	C	
Spaulding Pond Dam Site #1	City of Norwich	C	*Just went through assessment, City has reports. 50 year old dam.*
Spaulding Pond Site #2 Dam	City of Norwich	C	""
Taftville Dam #4 (Taftville Pond	Private (Commercial)	C	
Taftville Reservoir #1	Norwich Public Utilities	B	
Taftville Reservoir #3	Norwich Public Utilities	B	
Upper Falls Dam on Yantic	*City of Norwich*	*Minor*	*City wants to remove, potentially*

7.2 - Capabilities

Capability	Changes
EOP's/Emergency Drills	*Just updated EOPs - Rehabilitation assessment for Spaulding pond dams*
Dam Removal	*Looking into removal of Upper Falls Dam*

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to maintain City-owned and NPU dams in good to excellent condition	*Capability*	
Include dam failure inundation areas in the Reverse 9-1-1 contact database	*Capability*	
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Capability*	
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance		
Remove the Upper Falls dam on the Yantic River to eliminate backwater flooding at Sherman Street	*Carry Forward*	*Carry forward as "investigate removal." It's not clear that it would be worthwhile.*
Encourage NPU to remove Taftville Reservoir #3 dam	*Drop*	*NPU's jurisdiction*
Investigate means to remove other outdated industrial-age dams on major rivers	*Drop*	*Upper Falls is the only one they are aware of*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Carry Forward*	*Change to "Improve participation in…" Exercises are run, but there is not enough attendance for them to be useful*
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Carry Forward*	*Capabilities have been evaluated, but upgrades have not been implemented, for the most part, due to budget constraints.* *A backup EOC has been set up in the City Hall office of the Emergency Manager*
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the City EOP at least once annually	*Capability*	*Live document, updated as needed*
Continue to implement comprehensive plans to maintain and upgrade water service infrastructure		*NPU's authority*
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage City officials to attend FEMA-sponsored training seminars at EMI	*Capability*	
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	
Utilize the Reverse 9-1-1 system to telephone warnings into affected areas, and add DFIRM floodplain areas to the database	*Capability*	*Everbridge system*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience		*Unresolved*
Integrate additional elements of this HMP into the Plan of Conservation and Development during the next update	*Carry Forward*	*Next update in 2023*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Require the underground installation of utilities for all new development and pursue opportunities to put existing lines underground	*Drop*	*Not cost-effective, despite higher resilience. City expects this would cost $300K-400K*
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	*Job of Individual Home Insurance Company*
Natural Resource Protection & Open Space		
Identify rock outcrops and steep slopes with additional natural resource potential and prioritize for conservation efforts	*Carry Forward*	*Have not yet performed this task, but want to. New City Planner.*
Continue to support linear park and trail systems in the 1% annual chance floodplain, and expand the Heritage Riverfront Walkway	*Capability*	*This is underway.* *Yantic Falls is included in this.*

Seek additional funding for open space from Federal/State programs and encourage private donations	*Drop*	*City is not interested in purchasing more properties with structures, but will consider acquiring open space if funding is made available.*
Improve public access to coastal areas and expand river walkways	*Carry Forward*	
Consider additional regulations and design standards for development of properties with slopes greater than 15%	*Carry Forward*	*Remove "Consider"*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
  Installed backup EOC at City Hall office of Emergency Manager
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)
  Upgrade Radio System

Preston
Data Collection Meeting

Preston Hazard Mitigation Plan Update for SCCOG Municipalities

DATE: December 12, 2016
PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:
Bob Congdon - First Selectman, Preston
Noah Slovin - CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He covered regulations requiring the City to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave the Mayor and Russel copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

Data Collection: Detailed Worksheet

1. Community Profile

1.3 – New Developments and Developments in Progress:

Name	Location	Use/Units/Size	Vulnerabilities (if any)	Notes
125 Room Hotel	Route 2 near Foxwoods			*Completed*
Norwich State Hospital Redevelopment	Adjacent to Thames River			*Memo of understanding has been signed with the Mohegan Tribe* *$200-700 million* *February 14 [?]*

1.4 - Any changes to government structure

*NONE*_____

1.5 - Plans and Regulations

Bob told Noah he would look into the updated years of these documents

Plan/Document Name	Year	Relevant Changes/Notes
EOP		*Town has an EOP. Year unknown.*
POCD	2002	*Has been updated since 2002*
Zoning Regulations	June 2008	*Have been updated since 2008*
Inland Wetlands and Watercourse	September 2010	
Subdivision Regulations	January 2005	
Coastal Area Management Plan	1981	

1.6 - Critical Facilities/Capabilities

Facility	Vulnerabilities	Changes
Lincoln Park Elderly Housing		
Poquetanuck Fire House		
Preston City Fire Station (EOC)		
Preston Plains School		*Shelter*
Preston Veterans Memorial School		
Public Works Garage		
Town Hall		
Pumping Stations		*One at Norwich State Hospital Site*
Other Infrastructure		
Warnings/Emergency Communication		*Everbridge has been Implemented*
Shelters		*Preston Plains School*
Open Space		*In last 4 years:* - *125 acres purchased: section of "Blue Trail"* - *30 acres purchased around Amos Lake*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge/Culvert/Drainage Improvements	*No Changes*
Drainage Maintenance	*No Changes*
Road Acquisitions, Elevations, Protection	*No Changes*
Regulations, Codes, Ordinances	*No Changes*
Property Acquisitions, Elevations, Protection	*No Changes*
Coastal Flood Controls	*No Changes*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

  Route 2A: severe high-tide and hurricane surge risk

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA
  - Repetitive Loss Properties (notes, new RL properties, etc)
- Vulnerable Critical Facilities

2.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within Town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	*[Carry Forward]*	*Route 2A is the only place at risk. Ongoing work in that area is accounting for SLR.*
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	*Capability*	*One new address added since previous plan, due to new maps from FEMA.*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*Town does not run public education workshops on hazards.*

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Completed*	*Town sent a letter out to every address within the SFHA.* *[Carry forward as: determine appropriate frequency and set-up mechanism for regular mailings]*
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques	*Capability*	*Can be done after events*
Encourage residents to submit flood insurance claims following damage events	*Capability*	*Can be done after event*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Drop*	*Emergency Service Mutual Aid Agreements with surrounding Towns.* *No interest in volunteer labor.*
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	*Completed*	*Incorporated into Everbridge System*
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare	*[Carry Forward]*	*Bob said to check with the schools about whether they run any such education internally. The Town does not do this.* *Bob noted the possibility of running such educational programs through the Youth Services Committee*
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Capability*	
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	*Carry Forward*	*Have not been any acquisitions of SFHA open space.* *Subdivisions require 10% be set aside as open space.*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	*Bob noted that this is definitely done*
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	*Capability*	*Part of development proposal requirements*
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Drop*	*Projects must ensure that the downstream drainage will be able to handle runoff, but this analysis is done on a case-by-case basis.* *Drainage sizing changes are performed reactively, not proactively.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Determine and enact the best flood mitigation method for Shewville Brook at Matthewson Mill Road	*Drop*	*Flooding at Matthewson Mill Road was determined to be cause by beavers. Beaver activity in this location is continually monitored. When they are not blocking drainage, there are not problems.*
Encourage the State to upgrade culverts along Route 2A.	*Carry Forward*	*Over the next 2 years the State will upgrade culverts here.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	*Not a significant event in Preston*

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance Tree Warden	*Town has a tree warden*
Debris Collection & Disposal	*Town provides for people to deliver debris to the Public Works Garage.* *Town does not collect debris*
Completed Projects	
Coordination with Power Utility	*Connecticut Light & Power performs tree trimming, and does a good job. Bob feels the Town is in good shape in this regard. CL&P has a liaison and they and the Town coordinate regularly.*
Underground Utilities	*Very few areas with underground utilities*
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Property Protection		
Promote the use of functional shutters for older buildings	*Drop*	*Town does not feel this action addresses any problem that has been experienced.*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Town makes this information available and enforces wind-resistant building techniques.*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*Location is the DPW garage.* *This has been sufficient for all debris-creating events.*
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	*Drop*	*Town buildings have withstood high wind events without displaying any vulnerabilities.*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Drop*	*Town is able to manage debris without such agreements with landowners or companies.*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*Town does not think wind hazard education for children would be helpful*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
		Significant tree damage, road closure, and power outage during recent FEMA-declared winter storm disasters. - *Mitigation actions have improved capabilities since then*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*Public Works responsible* *Town also has 2 private companies on contract for larger events*
Snow Loading/Removal from Roofs	*Snow load on roofs has not been an issue in Preston.* *There are not many flat roofs in Town. Schools check their roofs and contact the Town when removal is needed. Occasionally the Town will assist residents.*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Drop*	*Town does not think this is necessary given the small number of buildings with flat roofs.*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	*Drop*	*Town staff is already aware of snow removal needs for Town-owned structures. A written plan is not expected to improve capabilities in this regard.*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Some information is provided through the Local Town Newsletter, distributed quarterly.*
Consider posting the snow plowing routes in local government buildings and on the Town's website	*Drop*	
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*Bob does not think the Town has any particularly difficult to access areas.* *Plows are sent out ahead of ambulances and School Buses when necessary.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Undetermined*	*Town does not maintain backup supplies for the purposes of allowing continued functionality following an earthquake.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction		*Zoning regulations preventing development in dangerous areas are from the perspective of flooding hazards, not earthquake hazards.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Preston does not face many wildland fire issues. There are no large tracts of forest or big State forests in Town that would be particularly vulnerable to significant fires.

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Notes/Changes
Warnings / Monitoring	*Everbridge*
Water Supply	*Water holes [dry hydrants] are located all over Town. There are two areas served by public water supply with hydrants*
Fire Department / Equipment (trucks, tanks, brush trucks, etc)	*Town has brush trucks and brushfire fighting equipment.* *Mutual aid agreements give the Town access to equipment of neighbors*
Fire Marshall	*One full time fire marshall. 2 full-time firefighting personnel.*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to evaluate public water supply hydrants, dry hydrants, and areas at risk of wildfire in the town	*Capability*	*Good status.* *I.S.O. evaluated Town, gave a high fire safety rating. This benefited fire insurance holders by lowering rates.*
Extend fire protection to future areas identified as being particularly at-risk	*Carry Forward*	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

Dam Name	Owner	Class	EOP?	Status/Notes/Changes
Aspinook Pond Dam	Private (Commercial)	B		
Greeneville Dam	Norwich Public Utilities	C		
Taftville Dam #4 (Taftville Pond)	Private (Commercial)	C		
Tunnel Dam	Private (Commercial)	B		
Norwich Hospital Site Dam	*Preston*	*Low*		*Recently Inspected per State Statutes*

7.2 - Capabilities

Capability	Changes
EOP's/Emergency Drills	
Dam Removal	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to maintain Norwich Hospital Pond Dam in good to excellent condition	*Capability*	
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Completed*	
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Capability*	*According to Bob, there are no minor dams in Town that pose any real risk*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Capability Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Completed*	
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	*Completed*	
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	*Capability*	*Bob has attended seminars, along with the Emergency Director (fire marshal)*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies	*Capability*	*Town encourages enrollment in local Everbridge system as well.*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience		*Bob said to check this with Town Planner*
Integrate elements of this HMP into the Plan of Conservation and Development during the next update		*POCD was just updated. Bob believes this action was completed.*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Require the underground installation of utilities for all new development	*Drop*	*Town determines utility needs on a case by case basis.* *For developments larger than 2 lots, utilities are required to be installed underground. With this caveat, this action is a capability.*
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	

Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Norwich Hospital Redevelopment - Town is studying all aspects of Emergency management, response, etc.
- *For example, they're addressing the hypothetical: if they build a 15 story hotel, will Town be able to respond (do not currently have equipment to reach 15 stories high)*
- *Environmental remediation for the site is underway*
- *95% of the buildings have been torn down*

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

- Notes

4-5 years ago a major summer rain caused damage, led to replacement of some bridges and culverts

Zoning regulations are being updated

Town will acquire land as possible and as land is made available for acquisition

Town will continue to install Solar Panels on municipal buildings

Town is exploring the possibility of installing a microgrid

Town would consider or has performed the following actions:
- *Replace bridges and culverts*
- *Install stormwater systems*
- *Remove hazardous materials from properties*
- *Modify zoning*
- *Implement low Impact development*
- *Minimize impervious cover*
- *Acquire or preserve floodplain land*
- *Acquire or preserve other lands*
- *Build local capacities to respond*
- *Install emergency power generators*
- *Install solar panels on municipal buildings*
- *Install microgrid system*
- *Upgrade emergency notification*
- *Newsletters*
- *Community meetings*
- *Web site with flood risk maps*
- *Leverage state and FEMA education programs*

Attendance

Name	Department and Role	Email

Salem
Data Collection Meeting

Salem Hazard Mitigation Plan Update Kickoff Meeting

DATE: January 26, 2016
PROJECT: SCCOG Regional Hazard Mitigation Plan Update (MMI# 3570-09)

ATTENDEES:
Don Bourdeau - Public Works Director, Fire Marshall, EMD
Noah Slovin - CFM, Milone & MacBroom, Inc.

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He covered regulations requiring the Town and Borough to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave Don a copy of an HMP Update worksheet that provided a comprehensive list of the information needed to update the Plan. The two of them worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Location	Changes
Salem Multi Purpose Path	*[behind Salem School and Town Hall, Music Vale Rd to Round Hill Rd. 7 stream/wetland crossings. Along Eightmile River]*	*Underway [opening planned for spring 2017. Along Eightmile River, Wild and Scenic River - riparian corridor overlay zone created for protection, special permits required and acquired from DEEP & USACE]*
Mixed Use Building *[Harris Brook Commons]*	24 Hartford Road *[Off Route 85, next to Harris Brook]*	*Completed [Pharmacy, Apartments, Businesses]*
Medical Office Building	Center Street off Route 82 *[Adjacent to Harris Brook Commons]*	*Completed*
Route 82/85 Roundabout		*Completed*

1.4 - Any changes to government structure

_____*None*_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
EOP		*Currently updating to new State Template*
POCD	2012	
Zoning/Subdivision Regulations	2011	
Inland Wetlands and Watercourse Regulations	2009	

1.6 - Critical Facilities

Facility	Changes
Gardner Lake Volunteer Fire Company	
Salem Volunteer Fire Company	*Town is exploring making this a backup/alternate Emergency Operations Center*
Town Hall (EOC)	
Public Works Garage	
Elementary School	*Underwent a $16.2 million renovation 2 years ago [2014?]. Primary Shelter.*
New Public Works Storage Area (and other agencies)	*Next to Town Hall. Land acquired recently*
Regional Shelter	*Set up through SCCOG*
Emergency Communication	*Through Everbridge* *Switched to QV Dispatch out of Danielson (near Putnam) - the old dispatch closed down. QV is bigger, has more capabilities.*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	*No Change*
Regulations, Codes, Ordinances	*No Change*
Acquisitions, Elevations, Property Protection	*No Change*
Warnings/Communication	*QV Dispatch*
Completed Projects	*No Change*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Route 85 before the roundabout
Off of Darling Road

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Capability*	*Required by zoning regulations*
Conduct an annual inspection of floodprone areas that are publically accessible and recommend drainage improvements as appropriate	*Capability*	*DPW responds to complaints and regularly performs drive-by inspections of floodprone areas. DPW director notes that complaints usually stem from beaver issues.*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Complete / Capability*	*When new FEMA maps were published, Town held a public hearing to give information. They expect to continue practice for future changes.*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*Located in Town Hall*
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flooding measures	*Capability*	*Building Official*
Encourage residents to submit flood insurance claims following damage events	*Capability*	*After disasters occur, Town encourages residents to submit claims.*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Complete*	*Member of New London County Fire Cheifs Association*
Public Education and Awareness		
Conduct a "Natural Hazards Fair" and consider working different "Hazard Weeks" into the town's public education program	*Drop*	

Action	Status	Notes What Happened? If dropping/ incomplete, why?
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	
Natural Resource Protection		
Pursue the acquisition of additional municipal open space in SFHAs	*Drop*	*Salem Land Trust purchases significant amounts of land in Town to set aside as open space - much of which is wetlands and other floodprone land. Not necessary for Town to supplement these efforts.*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Capability*	
Structural Projects		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Carry Forward*	*When looking at problem areas, Town engineers look at the upstream watershed area and calculate flow from a 25-year storm event.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Work with the CT DOT to elevate the bridge and/or increase the culvert capacity for the Harris Brook corridor at the Route 82/85 crossing	*Carry Forward*	*Nothing has changed at this site, but Town does work closely with CT DOT to increase capacities.*
Pursue funding to install floodproofing measures, including elevations acquisitions, and/or flood walls behind the Salem Town Center strip mall	*Carry Forward*	*There has not been any significant flooding in this area, or in Town generally, since the previous plan, so this action has not been a priority. Carry forward.*
Pursue funding to elevate the bridges and/or increase the culvert capacity of Witch Meadow Road off Route 85	*Carry Forward*	*This culvert has not presented a problem in the last five years. Carry forward until funding is available. Continues to be low priority.*
Pursue funding to elevate the bridges and/or increase the culvert capacity of the intersection of Darling Road and White Birch Road	*Carry Forward*	*These culverts/bridges have not presented a problem in the last five years. Carry forward until funding is available, low priority.*
Work with the CT DOT to either elevate the existing bridge and/or increase culvert capacity of Route 82 at the E. Branch Eightmile River	*Underway*	*DOT is currently working on this project*
Pursue funding to elevate Rattlesnake Ledge Road near Whittlesey Swamp where beavers have historically contributed to flooding	*Carry Forward*	*Town has a big beaver problem*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

  Put hazard information on the website
  Put hazard-related flyers, etc., in Library

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	

3.2 - Capabilities

Capability	Changes
Wind Loading	*Wind Loading requirements have been updated by the State in the new Building Code. Town enforces State building Code.*
Tree Maintenance	*Town does all tree maintenance not related to power lines.*
Warnings/Communication	*Eversource*
Debris Management	*Salem Community Park in designated debris area*
Completed Projects	
Coordination with Power Utility	*Eversource - has been much better post-Sandy. They perform a great deal of tree trimming, and have been building redundancy into power distribution systems.*
Underground Utilities	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Encourage ~~CL&P~~ *Eversource* to also cut down trees as opposed to just trimming trees near their power lines	*Capability*	*Eversource is doing a good job, no interference necessary. Eversource also helps with roadside trimming when it's near powerlines. Good relationship.*
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	
Property Protection		
Improve communications to prevent a future long, extended outage such as the one experienced following Tropical Storm Irene	*Complete*	*Eversource liaison stationed at Emergency Operations Center during events to improve communication.*
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*Building Official Responsible*
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	*Carry Forward*	
Emergency Services		
Identify a location for a brush disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*Salem Community Park*
Consider surveying all town-owned buildings to determine their ability to withstand wind loading giving priority to the oldest buildings	*Drop*	*This is a cost-prohibitive action. Drop. Replace with: Survey Emergency Operations Center and Primary Emergency Shelter to determine wind loading capacities.*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Capability*	*Companies go out of their way to reach out to the Town after storm events to offer services, other agreements are unnecessary SCRRRA (Southeastern Connecticut Regional Resources Recovery Authority) Member.*
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them	*Carry Forward*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Winter - Heavy Snow	*2015*	*Snow Removal from School, other roofs, was necessary*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*Good*
Tree Maintenance	*Good*
Snow Loading/Removal from Roofs	*No written plans. Good.*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	*Carry Forward*	
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Posted on Town Website*
Consider posting snow plow routes in Town Hall and on the town's web site so residents and businesses better understand procedures	*Drop*	
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

  Public Works, Schools, and Emergency Services all have radios in vehicles that they can use to communicate with one another. This is not a new action within the last 5 years.

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	*none*
Zoning Ordinances, etc.	*None*

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Drop*	*Town does not feel that the cost of constant maintenance of backup supplies in case of a sudden earthquake event is proportional to the risk of such an event occurring.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Drop*	*Not Applicable, no such areas in Town.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Historically, there have been wildfires in the area. But none in recent years (aside from minor brush fires)

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	*None*
Water Supply	*None*
Fire Department	*None*
Equipment	*None*

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town if/when they develop	*Capability*	
Pursue funding to purchase a new tanker truck which is figured to cost the town approximately $490,000	*Complete*	*Purchase approved in 2016. Truck is currently being delivered.*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Drop*	*Responsibility for this action has been taken on by DEEP*

7.1 - Dams in Town

Number	Name	Owner	Class

7.2 - Capabilities

Capability	Changes

7.3 - Vulnerabilities and Risk

- State of Dams

Dam
Town purchased land at Salem Community Park. A minor dam is located on the site. No danger posed, no actions planned.

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	*Run trainings locally. Recently ran a HazMat drill [this is an example showing frequency of local emergency response drills. HazMat does not fall under the purview of this HMP]*
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Capability*	
Local Emergency Response & Public Information		
Continue to review and update the town EOP at least once annually	*Capability*	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage town officials to attend FEMA-sponsored training seminars at EMI	*Capability*	*School staff as well as Emergency Service personnel take training seminars online.*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Identify a replacement EOC as the Town Hall has become outdated	*Carry Forward*	*- Town working to develop a backup EOC at Fire Department.* *- Town interested in identifying replacement for Town Hall EOC as well. Carry forward* *NOTE: two actions listed here.*
Pursue American Red Cross-certification of the Elementary School and Gardner Lake Fire Company	*Capability*	*Ongoing maintenance of certification*
Repair the link to the Gardner Lake Volunteer Fire Company on the town's web site	*Complete*	
Continue to promote dissemination of public information regarding natural hazard effects into local government and community buildings	*Capability*	
Enroll Salem in the CT Alert Emergency Notification System, then encourage residents and businesses to register on the State web site	*Complete*	*Everbridge (new in last 5 years)*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Drop*	
Integrate elements of this HMP into the Plan of Conservation and Development into the 2012 update and beyond	*Capability*	
Consider requiring underground installation of utilities for new development to the greatest extent/feasibility	*Drop*	*Town recommends underground utilities, but does not require them. There have not been any new developments in last 5 years. This is not a major concern for the Town and is not considered a necessary action. Drop.*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	

Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (natural resource/property protection, emergency response, prevention, education. Include incomplete projects.)

Attendance

Name	Department and Role	Email
Don Bourdeau	PW Director, Fire Marshall, EMD, Director of Facilities	

Sprague
Data Collection Meeting

2017 SECCOG HMP Update - Town of Sprague Data Collection Meeting

DATE: November 17, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Noah Slovin, CFM	- Milone and MacBroom, Inc
Cathy Osten	- First Selectman

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and summarizing the Hazard Mitigation Plan Update process. He discussed regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, the types of projects for which HMPs can be used to secure funding, and the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. He and Cathy worked through this worksheet together. One challenge the First Selectwoman stressed is that the Town is very limited with regard to staffing, making pursuing grants and projects very difficult.

Normal text below was in the original worksheet. Text in *italics* was added during the data collection meeting. Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Status of Developments and Developments in Progress:

Name	Location	Changes
Noah's Way Subdivision, 17 incomplete units	Noah's Way	*3 lots left. 1 has house, 2 are vacant. All other lots lived-in.*
Active Adult Community	Riverside Drive	*Ongoing dispute between P&Z and owner. Owner wants to double the size of the development, P&Z feels this is inappropriate, and that plan does not adequately address drainage concerns.*
Baltic Mills Property		*Put in for a BF grant. Phase 1, 2, and 3 are done. In a flood risk area.*
Former Packaging Mill *(Carustar Property)*	*8-9 acres*	*Owners are not selling. Property remains empty. In a flood risk area.*
Former Paper Mill (formerly Fusion property)	*486 acres*	*Going through foreclosure process. In a flood risk area.*
No New Development		

1.4 - Any changes to government structure

There is an emergency management team consisting of 6-8 people, activated during emergencies:
3 Public Works employees (2 part-timers), 1 part-time emergency manager who also works at Electric Boat

1.5 - Plans and Regulations

All plans are current

Plan/Document Name	Year	Relevant Changes
EOP		
Emergency Response Plan for Sayles School		
Local Emergency Medical Services Plan		
POCD	2007	*Money has been allocated for update*
Subdivision Regulations	2011	
Zoning Regulations	2011	
Inland Wetlands and Watercourses	2009	
Ordinance Regulating Addition of New Streets	1991	
Forest Management Plan		*For all Town Owned open space*

1.6 - Critical Facilities

All municipal buildings have generators except for the transfer station and the grist mill. A grant has been submitted to purchase and install generators.

Facility	Changes
Baltic Fire Department (EOD)	
Town Hall	*Sandbags are available*
Public Works Garage	
Sayles Elementary School (Shelter)	
Shetucket Village (senior living)	*Elderly and disabled residents*
Hanover Nursery School	*In a private home*
Daycare (private home)	
Hanover Road Sewer Pumping Station	*Totally Rebuilt, generator installed*
Water Filtration Plant	*Lots of upgrades to water system required*
Sewer Treatment Plant	*45 Years old, still runs.*
Sewer Pumping Stations	*1- Baltic* *2- [?]* *3&4 - Versailles* *All 4 pumping station rebuilt in last 3-4 years* *Pipes upgraded in Versailles and Baltic* *Pipe upgrades needed in Hanover*
Water Supply Wells	
Gristmill (Community Center across from Town Hall)	*Vulnerable to River, brook. Sandbags available.*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact
Last large flooding event	*2010*	

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	*200 more catch basins* *1 Town Bridge (washed out years ago) replaced* *1 Street rebuilt* *2 Streets in process of being rebuilt*
Regulations, Codes, Ordinances	*Zone: 700 foot buffer around Shetucket, limits development*
Acquisitions, Elevations, Property Protection	*(DEEP Open Space and Watershed Land Acquisition) Grant used to purchase 100 acres*
Warnings/Communication	*First Selectman indicated that the Town does not have a mass public warning system [Town does participate in CTAlert System]* *Have a list of 40 to 50 people who are elderly/disabled/need to be checked on prior to, during, and after hazard events. During power outages the fire department stops by their homes.*

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

  Town Hall, Community Center/Library are in Shetucket flood zone

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

    NONE

  - Repetitive Loss Properties (notes, new RL properties, etc)

    NO NOTES

- Vulnerable Critical Facilities

2.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Continue to prohibit new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Drop*	*No new developments*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Drop*	*Unnecessary*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*Information publicized on Town website and through Newsletter* **- First selectman is unhappy with FEMA maps - she feels they are inaccurate, and don't take into account true elevations. Properties are mapped inside hazard zones that are higher than BFE.*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Make necessary changes to floodplain regulations so that all insured residents are eligible for increased cost of compliance coverage	*Drop*	*First Selectman indicated that the town does not have the staffing capacity to accomplish this. [Check regulations to determine if this is already completed]*
Encourage residents to submit flood insurance claims following damage events	*Capability*	*There have not been any damaging flood events in the past 5 years*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities		
Public Education and Awareness		
Conduct a "Natural Hazards Fair" so that interested parties can familiarize themselves with natural hazard mitigation options	*Drop*	*No interest*
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	*Town does not have staffing capacity to accomplish this. There is one school.*
Annually distribute a brochure outlining the risks of floodprone areas, mitigation strategies, and contacts		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*Construction does not occur within flood zone. This action is unnecessary.*
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs	Capability	*Town is consistently pursuing acquisition of open space. In last 5 years purchase 100 acres, some of which was in the Flood Zone.* *Taken down 4 buildings that were deemed to be dangerous - acquired by foreclosure.* - *2: converted to open space* - *2: converted to parking lots* *Located along water edge, but no history of flooding*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	Capability	*Under the jurisdiction of the Wetlands Officer*
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Drop*	*All road improvements (50 of 53 [?]) add additional drainage and upsize if deemed necessary on a case-by-case basis. This is considered sufficient to address drainage needs.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Drop*	*Unnecessary. Municipal staff are familiar with drainage system and problems, and do not require a formal survey to be conducted.*
Investigate funding and feasibility of mitigating frequent drainage problems	*[?]*	*[not resolved]*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Taken down 4 buildings that were deemed to be dangerous - acquired by foreclosure.
- *2: converted to open space*
- *2: converted to parking lots*

Located along water edge, but no history of flooding

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	*Many trees down*

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	*Eversource performs tree maintenance along their lines.* *Tree Warden - local arborist appointed by Board of Selectmen - performs tree maintenance along Town ROW, roads.* *First Selectman: "more trees to take down than resources to take them down"*
Warnings/Communication	
Sheltering	
Completed Projects	*Purchased 1 new woodchipper, bringing total to 2. Improved debris management.*
Coordination with Power Utility	*Eversource - good coordination*
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Prevention		
Encourage *Eversource* to also cut down trees as opposed to just trimming trees near power lines	*Capability*	
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Drop*	
Make information on wind-resistant construction techniques available to all building permit applicants		
Encourage commercial building owners to develop emergency response plans and identify mitigation opportunities	*Drop*	*3 commercial properties in Town: Cumberland Farms, Baltic Convenience, MS Chambers. Small businesses that do not ERPs.*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Capability*	*Debris disposal capabilities are considered strong. 1 new chipper purchased in last 5 years.*
Consider surveying all town-owned buildings, particularly historic buildings, to determine their ability to withstand wind loading		
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal		
Prioritize wind-related retrofitting for the town's shelters over other critical facilities		
Public Education and Awareness		
Visit schools and educate children about the risks of wind events and how to prepare for them		
Conduct an annual workshop so that interested parties can familiarize themselves with wind mitigation		
Work with local homeowners associations and community groups to provide education regarding wise landscaping and proper tree planting		

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Nemo		*Minor Power Outages*
2015		*No significant impact*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Tree Maintenance	
Snow Loading/Removal from Roofs	
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Drop*	
Consider drafting a written plan for inspecting and prioritizing the removal of snow from town-owned structures	*Drop*	
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	***Capability***	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	***Capability***	*Located at the Town Clerk's area in the Town Hall.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	***Capability***	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake		*Purview of the Building Enforcement Officer*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction		*Purview of the Building Enforcement Officer*
Consider conducting an assessment of buildings in town in respect to their susceptibility to earthquakes		*Purview of the Building Enforcement Officer*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Taken down 4 buildings that were deemed to be dangerous - acquired by foreclosure. - *2: converted to open space* - *2: converted to parking lots* *Located along water edge, but no history of flooding*

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response
Power Line sparked a fire		*No impacts - was extinguished quickly without causing any damage.*

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Fire Department	
Equipment	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the town	Capability	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	Capability	
Ensure that provisions of town regulations regarding fire protection facilities and infrastructure are being enforced	Capability	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies		
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance		

7.1 - Dams in Town

Num	Name	Owner	Class	Notes
13301	Baltic Reservoir (West)	Town of Sprague	B	*Completely rehabilitated in past 5 years*
13302	Hanover Reservoir Dam	*Previously Ray Armstrong Acquired by Sprague*	C	*Acquired by Town. Study underway to determine best course of action moving forward. Town would like to remove.*
13303	Paper Mill Pond	*Currently owned by Fusion* (formerly C/O Cascades USA, Inc.?)	B	*Undergoing foreclosure*
13304	Versailles Pond	*Currently owned by Fusion* (formerly C/O Cascades USA, Inc.?)	B	*Undergoing foreclosure*
13306	Harrington Apartments Dam	*(formerly Noela & Samantha Harrington)*	B	*New owners, names unknown off top of head. Dam is in fine condition*
13312	Baltic Reservoir (East)	Town of Sprague	B	*Needs to be repaired. Town is waiting for CT DEEP to provide guidance.*

7.2 - Capabilities

Capability	Changes
Inspections	
EOP's	*Town has developed EOPs for Baltic Reservoir East and West. Recently acquired Hanover Reservoir Dam and will develop EOP.*
Other	

7.3 - Vulnerabilities and Risk

- State of Dams

Dam	Status
New open space property acquired by Town has a small dam on it.	*Town is working on removal.*

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Complete study to determine best course of action regarding Hanover Reservoir dam, including the possibility of dredging the reservoir or removing the dam. [NOTE: this may be completed by the time this plan is adopted]
Perform the action determined to be the best course by that study.

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	**Capability**	*Public Works departments in 5 surrounding towns have capability to all collaborate.*
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	**Capability**	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	**Capability**	
Continue to promote regional transportation planning through SCCOG	**Capability**	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	**Capability**	
Work with the SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan	**Capability**	
Local Emergency Response & Public Information		
Continue to review and update the City EOP at least once annually	**Capability**	
Continue to maintain emergency response training and equipment and upgrade equipment when possible	**Capability**	
Encourage City officials to attend FEMA-sponsored training seminars at EMI	**Capability**	*As trainings or specific issues arise, officials attend*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	**Capability**	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	**Capability**	*Newsletter. Flood maps are available at the Town Hall.*
Resolve and utilize the Reverse 9-1-1 system to telephone warnings into affected areas, and add DFIRM floodplain areas to the database	**Carry Forward**	*Not yet accomplished. School is able to communicate with parents.*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	**Drop**	
Integrate additional elements of this HMP into the Plan of Conservation and Development during the next update	**Carry Forward**	
Continue reviewing building plans to ensure proper access for emergency vehicles	**Capability**	
Continue to require the underground installation of utilities for all new development where possible	**Capability**	
Continue to enforce the appropriate building code for new building projects	**Capability**	
Encourage residents to install and maintain lightning rods on their structures	**Drop**	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	**Capability**	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Baltic: low impact design road construction underway - Upper High Road, 1st, 2nd, 3rd, Maple, and Elm complete. River Rd underway.
Former Skeet Range at Mukluk Preserve - EPA has rehabilitated, lead abatement. $16 million project, almost complete.

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Note: Town is not aware of Community Rating System
Complete Low Impact Design reconstruction of River Road
Hanover Reservoir - Complete study determining if dredging is necessary [NOTE: may already be complete by time plan is adopted]

Stonington Borough
Data Collection Meeting

2017 SECCOG HMP Update

Stonington Borough Update Worksheet

1. Community Profile

1.1 - Land Use

Use	Percentage
Developed (Residential, Commercial, Institutional)	
Open (conserved, vacant)	
Agriculture	
Other	

1.2 - Top Employers

Employer	Number Employed

1.3 – Potential Developments and Developments in Progress:

Name	Location	Changes
None	Various	Contractors continue to renovate buildings and homes

1.4 - Any changes to government structure

_____

_____

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
EOP	Assume 2016	The Borough is included in the Town's EOP, and will continue to be included when the Town EOP is revised

POCD	2012	
Harbor Management Plan	May 3, 2000	
Zoning Regulations	July, 2011	

1.6 - Critical Facilities

Facility	Changes
Fire Station (EOC)	The Borough's EOC is the Town's EOC, so this should be corrected. The fire station in the Borough is not an EOC. However, the Borough runs emergency operations out of the fire station as needed, in addition to participating with the primary EOC.
Borough Hall and Public Works	
Water Pollution Control Authority	
Viaduct/bridge over Amtrak	This is the only access/egress for the Borough, and it should be considered a critical facility.
Eversource substation	Should be considered a critical facility.

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact
Sandy	October 2012	Wall Street was directly flooded. The warden's house was surrounded by water and the basement flooded. Orchard Street was flooded, and areas below the viaduct were flooded.

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	A contractor clears drainage systems
Community Ratings System	The Borough is in the program and passed the most recent review
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	Reverse 911 is used. The Borough also has an email blast system.
Completed Projects	
Coastal Flood Controls	
Other	The Borough is participating in the coastal resilience plan.

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses

- Private Properties
    - Changes to properties (acquisitions, new constructions) in SFHA

- Areas vulnerable or historically impacted

- Repetitive Loss Properties

- Vulnerable Critical Facilities

2.4 - Actions

Action	Capability	Status
Prevention		
Continue to prohibit new development activities within SFHAs to the greatest extent possible within Borough land use regulations		
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.		
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise		
Compile a list of addresses of structures within the 1% annual chance floodplain, and track repair costs following disasters		
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops		
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA		
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques		
If property owners become interested, pursue elevation or acquisition of floodprone residential properties		
Apply freeboard standards of one foot when requiring structure elevations for renovations and new construction in coastal A and V zones		
Encourage residents to submit flood insurance claims following damage events		

Action	Capability	Status
Emergency Services		
Ensure that the EOP provides current detailed instructions regarding the timing of evacuations from the southern part of the borough		
Pursue mutual aid agreements with non-profits to provide volunteer labor for filling sand bags and other response activities		
Public Education and Awareness		
Annually distribute a brochure outlining the risks of floodprone areas, mitigation strategies, and contacts		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops		
Structural Projects		
Encourage the use of berms and seawalls at existing properties where appropriate		
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized		
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning		
Upgrade stormwater collection and discharge systems to keep up with rising sea level		
Maintain existing hard structures along the coast in good condition		
Ensure that the Borough's waste water treatment facility is protected from coastal flooding and storm surge and make improvements if needed		The Borough cannot do this directly, as the Town owns the facility. The action should be modified to reflect that the Borough will work with the town. See the revised action in the Town's list.
Work with the State to ensure that the breakwaters to Stonington Harbor are maintained in good condition		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

Actions will come from the coastal resilience plan.
If funding was not a limitation, a seawall around the Borough would be desired for flood protection.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Sandy	October 2012	The wind from Sandy was not as bad as the wind from Irene in 2011. The power outage was about a week. People used the fire station for warming and charging.

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	In 2014, Eversource conducted an evaluation with the Borough's tree commissioner (one of the burgesses) and conducted some clearing. The Borough also does its own clearing.
Warnings/Communication	
Sheltering	
Completed Projects	
Coordination with Power Utility	In 2014, Eversource conducted an evaluation with the Borough's tree commissioner (one of the burgesses) and conducted some clearing. The Borough also does its own clearing.
Other	There are no cost effective opportunities to move utilities below-grade. The warden was involved with a cost estimate conducted several years ago, and they found that it could cost $30 million to place all Borough power lines below grade.

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Capability	Status
Prevention		
Work with borough marinas to ensure that personal watercraft can be removed in a timely manner or removed to sea prior to severe winds		
Work with SCCOG to develop a regional marina management plan addressing wind damage, and encourage local marinas to develop plans		
Property Protection		
Promote the use of functional shutters for older buildings		

Action	Capability	Status
Prevention		
Work with borough marinas to ensure that personal watercraft can be removed in a timely manner or removed to sea prior to severe winds		
Work with SCCOG to develop a regional marina management plan addressing wind damage, and encourage local marinas to develop plans		
in the borough, and investigate funding sources		
Make information on wind-resistant construction techniques available to all building permit applicants		
Emergency Services		
Consider surveying all Borough-owned buildings, particularly historic buildings to determine their ability to withstand wind loading		
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal		
Public Education and Awareness		
Post and maintain signs signifying evacuation routes from coastal areas		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

4. Winter Storms

4.1 - Setting/Historic Record

Event (Scale)	Date	Impact
Winter storms	2015	Snow buildup was excessive. Contractors were secured to move it, and DEEP permission was gained to allow disposal in marine waters.

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	The Borough has a street department of two people. They clear from their garage to the fire house first, then the other streets.
Tree Maintenance	As noted above: In 2014, Eversource conducted an evaluation with the Borough's tree commissioner (one of the burgesses) and conducted some clearing. The Borough also does its own clearing.
Snow Loading/Removal from Roofs	The Borough has only two municipal buildings, and they don't need special attention.
Other	

4.3 – Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 – Actions

Action	Capability	Status
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Borough-owned structures		Not completed; This is not needed, as the Borough owns only two structures. Remove this action.
Continue making funding available to the Highway Department each year for clearing snow from roads and parking lots	Yes	Remove from list. This is a capability.
Provide information for protecting borough residents during cold weather and for mitigating icing and insulating pipes at residences		
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

5. Earthquakes

5.1 – Setting/Historic Record

Event (Scale)	Date	Impact

5.2 – Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 – Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 – Actions

Action	Capability	Status
Ensure that Borough departments have adequate backup supplies and facilities for continued functionality following an earthquake		Not completed; This is not needed, as the Borough owns only two structures, and shares the Town's EOC. Remove this action.

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

6. Wildfires

6.1 – Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 – Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	
Fire Department	
Other	

6.3 – Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 – Actions

Action	Capability	Status
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the borough	Yes	Remove from list. This is a capability.
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	Yes	Remove from list. This is a capability.
Consider the purchase of a fire boat and the installation of dry hydrants near Stonington Harbor		This was not completed because it was found unnecessary. Dry hydrants are not needed because there are sufficient numbers of public water system hydrants. A fire boat is not needed for the Borough; there is one in Mystic if needed.
Ensure that provisions of Borough regulations regarding fire protection facilities and infrastructure are being enforced	Yes	Remove from list. This is a capability.

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

7. Dam Failure

7.1 – Dams in Town

Number	Name	Owner	Class
13705	Island Road Pond Dam	-	Unclassified

7.2 – Capabilities

Capability	Changes
Inspections	
EOP's	
Other	

7.3 – Vulnerabilities and Risk

- State of Dams

Dam	Status

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 – Actions

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

8. All Hazards

8.4 – Actions Applicable to All Hazards

Action	Capability	Status Update
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	Yes	Remove from list. This is a capability.
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	Yes	Remove from list. This is a capability.
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	Yes	Remove from list. This is a capability.
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage		Lack of funding impeded this action. A grant was obtained, and this is scheduled for 2017.
Local Emergency Response & Public Information		
Continue to review and update the Borough EOP at least once annually		
Continue to maintain emergency response training and equipment and upgrade equipment when possible		
Encourage Borough officials to attend FEMA-sponsored training seminars at EMI		
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions		
Utilize the Reverse 9-1-1 system to telephone warnings into potentially affected areas		
Identify and install an additional means of egress out of the borough across the railroad		The Borough has attempted to advance this action, but ongoing discussions with Amtrak have not helped resolve this issue. Modify the action to "Investigate feasibility of creating new egress from the Borough."
Prevention		
Integrate additional elements of this HMP into the Plan of Conservation and Development during the next update		
Continue reviewing building plans to ensure proper access for emergency vehicles		
Require the underground installation of utilities for all new development and pursue opportunities to put existing lines underground		
Continue to enforce the appropriate building code for new building projects		
Encourage residents to install and maintain lightning rods on their structures		
Continue to regulate development in protected and sensitive areas including coastal areas and floodplains		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

The Borough Hall does not have a generator. Obtaining a generator should be a new action.

DATE: November 9, 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Keith Brynes, AICP, Town Planner
Scott Deledda, P.E., Town Engineer
David Murphy, P.E., CFM, Milone & MacBroom, Inc.

SUBJECT:

SCCOG Regional Hazard Mitigation Plan Update
Municipal Annex Data Collection Meeting and Review of Prior Hazard Mitigation Actions

Welcome and Introductions

David Murphy opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, David went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

David then handed out copies of an HMP Update worksheet that provided a comprehensive list of the information that is needed to update the Plan. The group worked through much of this worksheet together, including a detailed review of the prior hazard mitigation actions, strategies, and recommendations.

General discussion topics included the following:

<u>Development Trends</u>

- The thread mill redevelopment in Pawcatuck is almost complete; apartment contracts are being signed. The project includes 50 units located in an A zone.
- A new Mystic Seaport building is under construction. This is in an AE zone.
- Old buildings at the Coogan Farm Nature Center (Rt 27 in Mystic) have been converted to classrooms.
- West Marine has constructed a new building.
- Various businesses are expanding.

<u>Critical Facilities</u>

- These are largely the same.
- Stonington Ambulance was renovated in 2016
- Mystic Middle School may not be a shelter; check if it should be on the list.
- Mystic Water Pollution Control Authority has undergone significant renovations for operational and water quality reasons, but some resilience measures were taken such as elevating the generator. That said, the town did not require complete NFIP adherence; some variances were given.

Flooding

- Complaints have increased related to high tide flooding in Mystic.
- Dams were removed recently (Hyde Park dam and White Rock dam).
- The following are coming up on the Capital Improvement Plan:
    - North Stonington Road bridge replacement (damaged in 2010 flood)
    - Meadow Avenue drainage project
    - Stillman Avenue bridge
    - Pawcatuck flood protection system improvements
    - Toll subdivision drainage projects

Review of Mitigation Action List

- Presented below.

1. Community Profile

1.1 - Land Use

1.2 - Top Employers

1.3 – Potential Developments and Developments in Progress:

Name	Location	Changes
Granview Farms-7 of 26 homes built		Constructed
Mystic Senior Living	Clara Drive	Constructed
64 Townhouse Units	Mary Hall Road	No progress
Old Mystic Estates-60 Homes	Pequot Trail	Almost complete – this is the Toll Brothers project
Volkswagon Dealership + Several small commercial developments		Not built
Affordable Housing Units	Route 1 near South Broad Street	Phase I almost complete, but not occupied
Target and Lowes	I-95 Exit 92 Interchange	No progress
Thread Mill Redevelopment – 50 units	Pawcatuck	These apartments are almost complete. Contracts are being signed. This is likely a FEMA A zone, but it's a redevelopment project.
New building at Mystic Seaport	Mystic	Complete; located in a coastal flood zone
Coogan Farm Nature Center	Rt 27, Mystic	Old buildings were converted to educational buildings
West Marine		New building
Various businesses		Various businesses are expanding

1.4 - Any changes to government structure

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
EOP	Assume 2016 (updated annually)	A new edition has been developed using the DEMHS template.
POCD	2004 with 2007 Open Space Amendments	2015 POCD should be used
Stonington Harbor	May 3, 2000	

Plan/Document Name	Year	Relevant Changes
Management Plan		
Pawcatuck River Management Plan	Draft as of October 14, 2010	
Mystic Harbor Management Plan	1995	
Subdivision Regulations	June 2004	Amended through 2016
Zoning Regulations	July, 2011	Amended through 2016
Inland Wetlands and Watercourse Regulations	July, 2004	

1.6 - Critical Facilities

Facility	Changes
Police Department (EOC)	Same/keep on list
Town Hall (Backup EOC)	Same/keep on list
Mystic Fire Department	Same/keep on list
Old Mystic Fire Department	Same/keep on list
Pawcatuck Fire Department	Same/keep on list
Quiambaug Fire Department	Same/keep on list
Stonington Borough Fire Department	Same/keep on list
Wequetequock Fire Department	Same/keep on list
Stonington Ambulance	Building was renovated in 2016
Public Works Garage	Same/keep on list
Stonington High School	Same/keep on list (still a shelter)
Mystic Middle School	Might not be a shelter; check why this is a critical facility
Deans Mill Water Treatment Plant (Aquarion)	Same/keep on list
Pawcatuck Water Pollution Control Facility	Same/keep on list
Mystic Water Pollution Control Authority	Same/keep on list. Note that significant renovations were completed for operational and water quality reasons, but some resilience measures were taken such as elevating the generator. That said, the town did not require complete NFIP adherence; some variances were given.
Borough Water Pollution control Authority	Same/keep on list
Stone Ridge	Same/keep on list
Brookside Village	Same/keep on list
Stonington Arms	Same/keep on list
Edythe K. Richmond Elderly Housing (Town)	Same/keep on list

Avalon Health Center	Same/keep on list
Pendleton Health and Rehabilitation	Same/keep on list
Apple Rehabilitation	Same/keep on list

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact
Sandy	October 2012	Flooding occurred
High tide flooding	None	Complaints about high tide flooding are becoming more frequent, especially in the Mystic area.

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	The town has a capital improvement plan. Coming up: • North Stonington Road bridge replacement (repair of damage) • Meadow Avenue drainage project • Stillman Ave bridge replacement (structural/age issues) • Pawcatuck flood protection system improvements
Community Ratings System	The town is working on getting reinstated to the CRS program.
Regulations, Codes, Ordinances	Same capabilities as previous; check to see if freeboard is there.
Acquisitions, Elevations, Property Protection	The town is trying to acquire a waterfront home to convert the parcel to a small park. This is not “for” flood mitigation, but it would be an outcome.
Warnings/Communication	Same capabilities as previous
Completed Projects	During completion of the Toll Brothers “Old Mystic Estates” project, the town required the developer to make detention and drainage improvements that benefited downstream properties, taking care of longstanding nuisance flood problems.
Coastal Flood Controls	Pawcatuck flood protection system improvements: the town is trying to secure funding to conduct an evaluation of the flood protection system and determine if if can be accredited, and how that may occur.

Coastal Resilience Planning	Town and Borough are working on a plan with completion by mid-2017.
Other	Generally, same capabilities as previous

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses
- Private Properties
    - Changes to properties (acquisitions, new constructions) in SFHA
    - Areas vulnerable or historically impacted
    - Repetitive Loss Properties
- Vulnerable Critical Facilities

2.4 - Actions

Action	Capability	Status
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within Town land use regulations	Yes	Remove from list. This is a capability.
Consider requiring buildings located in floodprone areas to be protected to the highest recorded flood level regardless of SFHA status		Because the highest recorded flood level is lower than the BFE, this is not feasible. Remove this action. The town will use freeboard requirements instead, as it's considered to be more consistent with FEMA maps plus a safety factor.
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	Yes	Remove from list. This is a capability.
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.		Due to funding and logistical barriers, this is not complete. The town will be tracking drainage-related flooding problems more effectively through the revised and expanded municipal separate storm sewer (MS4) program. Make this into a new action.
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise		Complete. The freeboard requirement is used, and the town will apply the Federal Flood Risk Management Standard (FFRMS) when its implementation is complete.
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs		Partly complete. The Building Department does this. The Engineering Department has requested that the tracking system be improved to make sorting and queries easier. Make this into a new action.
Continue to maintain good standing with the Community Rating System and consider additional achievements		The town was moved to a Class 10 CRS community and is actively working to re-enter the program.

Action	Capability	Status
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	Yes	Remove from list. This is a capability. The flood newsletter also mentions this.
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	Yes	Remove from list. This is a capability. The flood newsletter also mentions this.
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques	Yes	Remove from list. This is a capability. The Engineering Department has worked with several nonresidential property owners. The flood newsletter also mentions this.
Encourage residents to submit flood insurance claims following damage events		Not complete, as the town has found this is occurring. Remove from list.
Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties and the Lords Point area		Partly complete, as some properties have been elevated or reconstructed in the last five years. Keep this action but remove "Lords Point Area."
Consider floodproofing measures for fire departments susceptible to flooding and storm surge		Underway with the regional critical facilities assessment. The assessment will be complete in May 2017.
Consider floodproofing measures for wastewater treatment plants susceptible to flooding and storm surge		Partly complete. Significant renovations were completed at the Mystic facility for operational and water quality reasons, but some resilience measures were taken such as elevating the generator. More progress is desired, and the coastal resilience plan will help inform the next steps. Change action to "Allocate funding to make the wastewater treatment plans more resilient in accordance with recommendations of the coastal resilience plan."
Ensure that sewer pumping stations have a method for connecting emergency power and are adequately floodproofed		Not completed. Funding needs to be obtained. Check with Doug Nettleton (WPCA) about this.
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities		*Don't know – need to check with EMD*
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database		*Don't know – need to check with EMD*
Consider establishing a second mode of egress for the Bishops Cove neighborhood		This has been considered, but lack of resources and funding has impeded any progress. Change to "Determine the feasibility and cost of establishing a second mode of egress for the Bishops Cove neighborhood."
Public Education and Awareness		
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and floodproofing		There has been a lack of progress for any of these, but (1) re-entry into the CRS and (2) the public education components of the new and

Action	Capability	Status
Visit schools and educate children about the risks of flooding and how to prepare		expanded MS4 program will spur these actions. Keep these, but combine them into a concise action for the updated HMP.
Work with homeowners associations to develop a floodproofing workshop		
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops		
Natural Resource Protection		
Pursue the acquisition of additional open space in SFHAs including along the coast		Aquarion Water Company acquired 75 acres of land adjacent to Deans Mill Reservoir. Other acquisitions may have occurred over the last few years.
Pursue the acquisition and demolition of floodprone properties with conversion to open space, prioritizing repetitive loss properties		Partly complete. The town is trying to acquire a waterfront home to convert the parcel to a small park. This is not "for" flood mitigation, but it would be an outcome. Carry forward this action.
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	Yes	Remove from list. This is a capability.
Conduct beach nourishment and vegetation replacement along any affected beaches to keep up with erosion		Check with Mary Ellen M. from Mystic Aquarium. She may have spearheaded a vegetation project. Other than that, the coastal resilience plan will recommend projects. Change action to "Conduct a beach nourishment or green infrastructure shoreline project in accordance with recommendations of the coastal resilience plan."
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	Yes	Remove from list. This is a capability. For example, during completion of the Toll Brothers "Old Mystic Estates" project, the town required the developer to make detention and drainage improvements that benefited a larger area, taking care of longstanding nuisance flood problems.
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized		This is a new capability, as it was just done for the first time on a school redevelopment project. However, the methodology has not been fully incorporated into procedures. Modify into a new action.
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	Yes	Remove from list. This is a capability. The expanded MS4 program will help enhance this.
Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation		Lack of resources and funding has impeded any progress. Change to "Determine the feasibility and cost of elevating specific roads in accordance with the recommendations of the coastal resilience plan."

Action	Capability	Status
Maintain existing hard structures along the coast in good condition, particularly near Stonington Harbor		Partly complete. The Stonington Harbor breakwater adjacent to the borough was evaluated with grant funding. Lack of resources and funding has impeded additional progress. Change to "Address coastal structures in accordance with the recommendations of the coastal resilience plan."
Maintain the causeways and bridges to inhabited islands in good condition and pursue elevation		Lack of resources and funding has impeded progress. Change to "Address causeways and bridges to islands in accordance with the recommendations of the coastal resilience plan."
Continue to maintain the Pawcatuck levee system per USACE specifications		Partly complete. The flood protection system is maintained. Additional progress is desired. The town is securing funding to conduct an evaluation of the flood protection system and determine if it can be accredited, and how that may occur. Change action to "Complete evaluation of the flood protection system and determine if it can be accredited, and how that may occur, to ensure that risks are reduced on the Pawcatuck side of the levee."
Consider investigating the scale and cost of a large-scale diking project to protect Mystic from flooding		Some progress is being made, as this is a primary concern in the coastal resilience plan. Change action to "Asses the feasibility of a large-scale diking project to protect Mystic from flooding, or pursue other options as advised by the coastal resilience plan."

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

Refer to revised actions above.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	
Warnings/Communication	
Sheltering	
Completed Projects	
Underground Utilities	This is not a townwide requirement; it's case by case.
Coordination with Power Utility	
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Capability	Status
Prevention		
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans		
Consider working with CL&P to obtain funding to place utilities underground in coastal areas		
Property Protection		
Promote the use of functional shutters for older buildings		
Make information on wind-resistant construction techniques available to all building permit applicants		
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse		
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading		
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal		
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures		
Visit schools and educate children about the risks of wind events and how to prepare for them		

- Other Actions Completed since Previous Plan

- New Recommendations / Actions of Interest

4. Winter Storms

4.1 - Setting/Historic Record

4.2 - Capabilities

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Capability	Status
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town		Underway with the regional critical facilities assessment. The assessment will be complete in May 2017. Subsequent to the study, other town buildings could be evaluated.
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures		Delete. This protocol is not written.
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	**Yes**	Capability
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	**Yes**	Capability
Consider posting the snow plowing routes in local government buildings and on the Town's website		Delete. This will not be on the web site.
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	**Yes**	Capability

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

5. Earthquakes

5.1 - Setting/Historic Record

5.2 - Capabilities

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	Capability	Status
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	**Yes**	Capability
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	**Yes**	Capability

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

6. Wildfires

6.1 - Setting/Historic Record

6.2 - Capabilities

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	Capability	Status
Continue to evaluate public water supply hydrants, dry hydrants, and areas at risk of wildfire in the town	**Yes**	Capability. Also, note that a new interconnection between Aquarion and Groton Utilities has provided critical redundancy to the public water system in Mystic and southern Stonington.
Encourage the extension of public water supply for fire protection to areas identified as being particularly at-risk	**Yes**	Capability. Also, note that a new interconnection between Aquarion and Groton Utilities has provided critical redundancy to the public water system in Mystic and southern Stonington.
Pursue additional sources of firefighting water where adequate supplies do not exist such as through the use of fire ponds	**Yes**	Capability
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	**Yes**	Capability
Ensure that provisions of Town regulations regarding fire protection facilities and	**Yes**	Capability

infrastructure are being enforced		

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

7. Dam Failure

7.1 - Dams in Town

Number	Name	Owner	Class
	Dean's Reservoir Dam	Aquarion Water Compnany	C
	Long Pond Dam	Private	B
	Mystic Reservoir Dam	Aquarion Water Company	C
	Silvias Pond Lower Dam	Private	C

7.2 - Capabilities

7.3 - Vulnerabilities and Risk

- State of Dams

Dam	Status
Hyde Park Dam	Removed recently
White Rock Dam	Removed recently

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	Capability	Status
Include dam failure inundation areas in the Reverse 9-1-1 contact database		Not yet complete.
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies		Underway. Aquarion has provided new EAPs for its two dams.
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance		Delete. The Town does not have the resources for this.

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Capability	Status
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	**Yes**	Capability
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	**Yes**	Capability
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	**Yes**	Capability
Continue to promote regional transportation planning through SCCOG	**Yes**	Capability
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage		Underway with the regional critical facilities assessment. The assessment will be complete in May 2017.
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually	**Yes**	The EOP is being modified per the new DEMHS template.
Continue to maintain emergency response training and equipment and upgrade equipment when possible	**Yes**	Capability
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	**Yes**	Capability
Continue to evaluate emergency shelters, update supplies, and check communication equipment	**Yes**	Capability
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	**Yes**	Capability
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies	**Yes**	Capability
Support Stonington Ambulance's efforts to construct a new ambulance facility		Completed in 2016.
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience		Delete; the town does not have resources for this.
Integrate elements of this HMP into the Plan of Conservation and Development during the next update		Complete. Significant discussions about flooding, coastal hazards, sea level rise, and resiliency were incorporated into the 2015 POCD.
Continue reviewing building plans to ensure proper access for emergency vehicles	**Yes**	Capability
Require the underground installation of utilities for all new development	**Yes**	Capability (this is case-by-case)
Continue to enforce the appropriate building code for new building projects	**Yes**	Capability

Encourage residents to install and maintain lightning rods on their structures		Delete; the town does not have resources for this.

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

Stonington Town Data Collection Meeting

Waterford
Data Collection
Meeting

2017 SECCOG HMP Update - Waterford Data Collection Meeting

DATE: November 23 2016

PROJECT: SCCOG Regional Hazard Mitigation Plan Update
MMI# 3570-09

ATTENDEES:

Noah Slovin, CFM	- Milone and MacBroom, Inc
David Matheson	- Assistant Director Public Works
Tom Lane	- Zoning Enforcement Officer
Maureen Fitzgerald	- Environmental Planner
David Burton	- Police Lieutenant
Tali Soto	- Utility Commission Director
Mark Wytewicz	- Planner
Abby Piersall	- Planning Director

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. During the presentation, Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then handed out copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The group then worked through much of this worksheet together.

- One question brought forward by meeting attendees was whether dropping actions or strategies from this update would affect the Town's ability to secure funding, or make them less competitive for funding.
    - Noah explained that the plan update will reflect which actions are completed, which are ongoing and can be considered "capabilities," which were not completed but will be carried forward into the new plan, and which were not completed and no longer make sense for the town to pursue. For each action that was not completed, whether it will be carried forward or dropped, an acceptable explanation needs to be given. If that is done, it should not have a negative impact on the town's standing within the NFIP.

Normal text below was in the original worksheet. Text in *italics* was added during the data collection meeting. Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

Community Profile

1.3 – Potential Developments and Developments in Progress:

Name	Location	Changes
Lawrence Memorial Cancer Center	Parkway South	*Completed*
Student Housing	O'Neil Theater	*Completed*
88 Rental Units	Route 1 Theater	*Currently under construction*
Charter Oak Bank office/bank	Industrial Drive	*Completed*
Katherine Court- 14 Lots	Catherine Court	*10 units. Construction ongoing.*
Waterford Station	South of Waterford Commons	*Not yet started. Permits have been renewed.*
Possible development	Airport	*No development yet. Plan is up for auction.*
Gravel Operations could lead to reservoir	Miller's Pond	*Town is not pursuing this development*
Thames Landing Condos	Thames Landing	*Construction ongoing*
4 Lots on Harrison's Landing	Harrison's Landing	*Municipal staff are not familiar with this development. There is no new construction in this area - land is vacant.*
Miner La***n***e Condos- 45 Units		*Permit is still current. No construction*
Sawyer's Cove Subdivision [Oswegatchie Subdivision (Sawyer's Cove LLC)]	*[Oswegatchie and Shawandassee Roads]*	*[Cluster subdivision, 11 houses, 5 acre portion of larger plot. Approved by P&Z. 23 acres of plot will transfer to Waterford Land Trust as open space. http://www.theday.com/article/20160125/NWS01/160129396]*
MacKenzie Farm [Seaview Estates at MacKenzie Farm]	*Rope Ferry Road near East Lyme*	*[14 lots. 18 acres. >8 acres open space. No construction but lots for sale as of January 2016. http://www.theday.com/article/20160129/BIZ04/160129145]*
Gloucester Road Surgery		*[no further information found]*
ALDIs	*Downtown Waterford*	*[Demolition of Family Bowl bowling alley, replacement with ALDIs. http://patch.com/connecticut/waterford/waterford-family-bowl-planned-be-replaced-aldi-grocery-store-0]*
Mago Point	*Mago Point – [Niantic bay]*	*General update to zoning in this area to encourage commercial/residential development.*

1.4 - Any changes to government structure

NONE

1.5 - Plans and Regulations

Plan/Document Name	Year	Relevant Changes
EOP	*Unknown*	*Municipal staff are not familiar with this document*
POCD	January 1, 2012	*2015 amendment*
Subdivision Regulations	Amended through July 13, 1990	*Regulations are undergoing review, with adoption of updates expected in early 2017.* *Stormwater management regulations will be updated in the new version to be consistent with new State MS4 requirements (draft required April 2017)*
Zoning Regulations	Amended through November 15, 2011	*Amended through October 15, 2016.* *Floodplain regulations amended twice since previous HMP.* - *Freeboard requirements increased [amount not specified]* - *Building value clarified for substantial improvement definition* - *Stormwater regulations updated*
Inland Wetlands & Watercourse Regulations	Amended August 2005	*Amended since previous HMP.* *Revised through June 1, 2011*

1.6 - Critical Facilities

Facility	Changes
Emergency Services	*Use regional task force model in local EOC. Town has 5 Task Forces addressing different aspects of emergency management during an event.*
Municipal & Regional Facilities	*Regional distribution center. See below.*
Shelters	*Regional distribution center (with East Lyme, Montville, New London) at Municipal Complex - water, blankets.* *Can also use Community Center.*

Elderly Housing & Health Services	
New Infrastructure and facilities	
- *Salt shed*	*1 new shed*
- *Pumping stations*	*1 new @ Harrison's Landing* *28 total*
- *Radio towers*	*New generators purchased (through 1033 program, National Defense Authorization Act of Fiscal Year 1997)* *5 total (for all 5 towers)* - *Not yet hooked-up*
- *Water Towers*	*3 new towers - increased firefighting capacity*

2. Flooding

2.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	*10/29/2012*	*2 barrier beach breaches* *Seawall @ seaside started failing - there is a sewer line behind the wall* *Shoreline barrier problem* *Mango Point Flooding* *Miner Lane Flooded* *Numerous roads closed*

2.2 - Capabilities

Capability	Changes
Bridge Replacements, Drainage, Maintenance	
Community Rating System	*Not a lot of support for trying to join the CRS*
Regulations, Codes, Ordinances	
Acquisitions, Elevations, Property Protection	
Warnings/Communication	*Everbridge. Geospatial.*
Completed Projects	
Coastal Flood Controls	
Coastal Resilience Planning	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses (buildings, intersections, areas, etc.)

Beaver dams are starting to become a problem - at one location beavers are building dams <u>inside</u> a double-culvert. Very difficult to manage.
Twin box culvert on Cross Road - State inspected, found to be 3 ft high & half full of sediment. Town can't clean them out.

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

No Change

  - Repetitive Loss Properties (notes, new RL properties, etc)

No Change

- Vulnerable Critical Facilities

No Change

2.4 Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
<u>Prevention</u>		
Continue to regulate new development activities within SFHAs to the greatest extent possible within Town land use regulations	*Capability*	
Petition FEMA to prepare Zone AE mapping for Hunts Brook	*Carry Forward*	*FEMA is currently working through RiskMAP process. This will address mapping issue. (?)*
Continue managing activities in coastal areas in recognition of potential coastal flooding	*Capability*	
Consider potential need for a gradual phasing in of new policies related to SLR	*Carry Forward*	*Kleinfelder has completed an initial review, and is putting together a set of recommendations*
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Drop*	*Town has changed focus to no net increase in runoff, and requires that of new developments. (~ask about this~?)*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*Town is continuously inspecting floodprone areas and improving drainage when possible.*
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	*Capability*	*Addressed by coastal resilience project (Kleinfelder contracted) and new, upgraded zoning.*
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	*Capability*	*Town has a list of addresses.* *Repair costs tracked as applications are submitted.*
Incorporate the results of the Coastal Resilience project into the next HMP update	*Completed*	***Note where this occurs in plan, if possible*** *The Nature Conservancy's CR project in Town*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Review future sewer installation plans specifically for potential flooding issues	*Capability*	
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Drop*	*Sea Level Rise education workshops have been held. FIRM have not been included.* *"If we have them we'll do it"*
Pursue enrollment in the Community Rating System	*Carry Forward*	*Currently there is not popular support for pursuing CRS enrollment, but that may change in the future, and municipal staff are interested*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*Online through the website, at kiosk in Town Hall, maps are available.*
Provide technical assistance to owners of structures regarding floodproofing techniques	*Capability*	
Encourage residents to submit flood insurance claims following damage events	*Capability*	
Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties	*Drop*	*Repetitive Loss has not been a significant problem in Town since the previous HMP, so this action has not been relevant. If RL becomes more significant in the future, the Town will pursue elevations.* *It is also noted that substantial improvement definitions will require elevations of RL properties by law, making this action unnecessary to include in this plan.*
Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones	*Completed*	*Incorporated into updated zoning regulations*
Ensure that sewer pumping stations have a method for connecting emergency power and are adequately floodproofed	*Carry Forward*	*Wright Pierce was contracted to evaluate pumping stations in October 2016. New FEMA flood maps and Kleinfelder sea-level-rise analysis was incorporated into this evaluation.* *Action is in progress, carry forward to completion [http://www.waterfordct.org/planning-zoning-commission/news/climate-resilience]*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Drop*	*CERT was used in the past, but it was found that volunteers were being trained and taking classes, but wouldn't show up after a disaster. It became a liability. The Town utilizes regional Emergency Support Functions of Region 4 (state initiative). Other volunteers not wanted.*
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	*Carry Forward*	*Exists within institutional memory, but not incorporated into database.*
Public Education and Awareness		
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and floodproofing	*Drop*	*Municipal staff do not feel this would be effective. Additionally, recent storm events (Hurricane Sandy) served to increase awareness.*
Visit schools and educate children about the risks of flooding and how to prepare	*Drop*	
Work with homeowners associations to develop a floodproofing workshop	*Drop*	*Municipal staff do not feel this would be effective. Replace with: send out annual flood-hazard mailer to homeowners.*
Encourage builders, developers, engineers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Drop*	*Town does not hold workshops*
Natural Resource Protection		
Pursue the acquisition and demolition of floodprone properties with conversion to open space, prioritizing repetitive loss properties	*Carry Forward*	*This has not occurred at this point, but the Town is interested in this action.* *Town purchased Bingham Beach in 2014 - upper tideland, including beach, dune, and floodplain. $200K, 2.5 acre. No demolition.* *[http://www.theday.com/article/20141007/NWS01/310079921]*

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Complete*	*Town purchased Bingham Beach in 2014 - upper tideland, including beach, dune, and floodplain. $200K, 2.5 acre. No demolition. [http://www.theday.com/article/20141007/NWS01/310079921] More progress is desired, but Town has demonstrated consistent progress on this action.*
Conduct beach nourishment and vegetation replacement along any affected beaches to keep up with erosion	*Capability*	*Performed at Waterford Beach with volunteer labor with match $ from TNC.*
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	*Capability*	
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Drop*	*Town does not require this. Designers utilize this data as they plan projects. This is deemed sufficient by the Town, and formally requiring it deemed unnecessary.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	
Upgrade stormwater collection and discharge systems to keep up with rising sea level	*Carry Forward*	*Part of Coastal Resilience efforts in town have included assessments of the effects of sea level rise. The need to upgrade stormwater infrastructure has been noted in TNC reports and meetings, and is recognized by the Town. [Coastal resilience related projects have helped secure public buy-in into stormwater infrastructure improvements (https://www.conservationgateway.org/ConservationPractices/Marine/crr/library/Documents/2014_Waterford_Report_FINAL_LoRes.pdf), and prioritize locations in need of upgrades(https://www.conservationgateway.org/ConservationPractices/Marine/crr/library/Documents/Eastern%20Connecticut%20Risk%20and%20Vulnerability%20Assessment%20Workshop%20Final%20Report.pdf)]*
Maintain existing hard structures along the coast in good condition	*Capability*	*Regular maintenance*
Replace culverts along Gardiners Wood Road and elevate sections of the road	*Carry Forward*	*Included in Capital Improvements Plan*
Encourage CT DOT to replace a culvert and/or elevate Route 156 at Gardiners Wood Road	*Drop*	*State Jurisdiction*
Encourage CT DOT to replace culverts and/or elevate Route 213 as needed	*Drop*	*State Jurisdiction*
Replace culvert and/or elevate a section of Braman Road	*Carry Forward*	
Replace culverts and/or elevate sections of Oil Mill Road at Oil Mill Brook	*Carry Forward*	*In design phase. Expected to be completed summer 2017*
Replace culvert and/or elevate sections of Niles Hill Road at Fenger Brook	*Drop*	*Municipal Staff are not aware of flooding problems at this location*
Encourage CT DOT to replace the culvert and/or elevate a section of the Boston Post Road at Jordan Brook	*Complete*	*Under Construction. State Jurisdiction.*
Raise and improve hydraulics of the secondary access to Millstone Station	*Carry Forward*	*Project is on hold until ownership issues are resolved.*
Replace the Jordan Cove Road bridge	*Carry Forward*	*Project goes to bid December 2016. Construction expected in 2017.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

NONE

- New Actions (structural, natural resource, property protection, emergency services, prevention, education, incomplete)

Acquire emergency evacuation vehicle with high passenger capacity that can handle driving through 3 feet of saltwater.
Post/send out seasonal hazard information via Town website, social media, and electronic builboards

(ALL HAZARDS)

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Event	Date	Impact
Hurricane Sandy	10/29/2012	*No Power for 5 - 7 days* *Clear & Make Safe protocol with Eversource* *Municipal Complex was open - shelter, distribution center*

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	*Have a tree warden*
Warnings/Communication	
Sheltering	*Regional distribution center (with East Lyme, Montville, New London) at Municipal Complex - water, blankets.* *Can also use Community Center.*
Completed Projects	
Coordination with Power Utility	*Eversource liaison stationed at EOC during events, help ID critical areas. Positive coordination experience.*

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Prevention		
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans	*Carry Forward*	*If SCCOG pursues this action, Town will assist*
Consider working with CL&P to obtain funding to place utilities underground	*Drop*	*Required in new developments.* *Not pursuing in old development - it is not cost effective, and is less expensive to manage trees and power lines.*
Property Protection		
Promote the use of functional shutters for older buildings	*Capability*	*Promoted during renovation activities*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*Location identified: Landfill. SCRRRA is contracted to grind debris, returned to Town as mulch.* *Backup locations are designated in case landfill is at capacity*
~~Consider~~ surveying all Town-owned buildings to determine their ability to withstand wind loading	*Carry Forward*	*Perform as part of ongoing building maintenance*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Drop*	*Town has adequate debris collection capabilities, does not need to develop additional agreements.*
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	*Drop*	*Social media is considered to be a more effective and less expensive method for education.*
Visit schools and educate children about the risks of wind events and how to prepare for them	*Drop*	*Social media is considered to be a more effective and less expensive method for education.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

4. Winter Storms

4.1 - Setting/Historic Record

Event	Date	Impact
Alfred	*2013*	*Too much snow for the Town to handle - they had to hire contractors with larger vehicles. Town has one vehicle that can handle large snow events.*

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	*New Salt Shed - bigger stockpile of Salt.* *Local contractors designated from the 2013 storm - can activate more easily*
Snow Loading/Removal from Roofs	*Ongoing (what does this mean?)*
Warnings/Communication	*Community Center/Senior Center maintains a "vulnerable populations list" populated voluntarily by Town residents. Allows for outreach and checks.*

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Drop*	*Replace with: Prioritize snow removal from municipal buildings*
~~Consider~~ drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	*Carry Forward*	
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Carry Forward*	*Water & Sewer can send information through utility bills about protecting pipes.* *Town acts during cold weather - emergency heating oil plan; 211 information on website*
Consider posting the snow plowing routes in local government buildings and on the Town's website	*Drop*	*Town does not want to publicize static information when things may change.* *Dispatch maintains a list of blocked roads as people call in with that information.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)
- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Event (Scale)	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	*Slopes are regulated*
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	Capability	
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	Capability	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Location	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Water Supply	*Quaker Hill Area - new mid-pressure zone.* *Two booster stations retrofitted and rehabilitated*
Fire Department	
Fire Prevention and Control Measures	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

6.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Continue to evaluate public water supply hydrants and areas at risk of wildfire in the town	*Capability*	
Encourage the extension of public water supply for fire protection to areas identified as being particularly at-risk	*Drop*	*Public water supply is considered to be sufficient for firefighting purposes.*
Continue pursuing additional sources of firefighting water where adequate supplies do not exist through the use of dry hydrants and cisterns	*Capability*	
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Explore forest management for large, Town-owned forest lands

7. Dam Failure

7.1 - Dams in Town

Number	Name	Owner	Class
	Lake Konomoc Dams	City of New London	C
	Brandagee Lake Dam	City of New London	B
	Millers Pond	Schacht, Sanders and Saunders	B

7.2 - Capabilities

Capability	Changes
Voluntary lowering of Miller's Pond before rainfall	
Other	

7.3 - Vulnerabilities and Risk

- State of Dams

Dam	Status

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Status** Completed Carry Forward Drop	**Notes** What Happened? If dropping/ incomplete, why?
Include dam failure inundation areas in the Reverse 9-1-1 contact database	*Carry Forward*	
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Carry Forward*	*Millers Pond does not have an EOP*
Monitor conditions of the Route 156 CT DOT dam to determine whether it is a potential hazard	*Capability*	*The spillway was cleared just recently*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Capability*	*State just performed major outreach effort to notify dam owners about resources available. Town maintains an inventory of minor dams, and provides assistance on a case-by-case basis.*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Status Completed Carry Forward Drop	Notes What Happened? If dropping/ incomplete, why?
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	
Continue to promote regional transportation planning through SCCOG	*Capability*	
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Complete*	*[SCCOG has solicited proposals from contractors as of 12/1/2016]*
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan	*Carry Forward*	*Carried out evacuation exercise. SCCOG is assessing exercise results to determine whether evacuation plan is practically feasible*
Local Emergency Response & Public Information		
Acquire and install evacuation signs in coastal flood hazard areas	*Carry Forward*	
Continue to make evacuation routes in the Gardiners Wood Road area more resilient through elevation, culvert upgrades, etc.	*Carry Forward*	*In Capital Improvement Plan* *[re-word to remove "continue"]*
Encourage the State to perform improvements to reduce the frequency of flooding at Route 156 (Jordan Brook) and at Route 156 / Route 213	*Drop*	*State Jurisdiction*
Consider installing an emergency egress between Laurel Crest Drive and Miner Lane.	*Carry Forward*	*Municipal staff like this idea but feel that constructing a new road for egress is unlikely. They want to continue to review this possibility and evaluate other evacuation options.*
Continue to review and update the Town EOP at least once annually	*Carry Forward*	*Staff also want to ensure relevant personnel know where the EOP is kept, and are able to access it.* *[re-word to remove "continue" and to include staff comments]*
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	*Capability*	
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies	*Capability*	
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Drop*	*Unnecessary, covered by Plan Review process*
Integrate elements of this HMP into the Plan of Conservation and Development during the next update	*Completed*	*Performed.* *Remove from plan but add again during next update (2022) when next POCD update will fall within HMP planning horizon*

Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	
Continue to enforce the appropriate building code for new building projects	*Capability*	
Encourage residents to install and maintain lightning rods on their structures	*Drop*	
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Contacts

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Windham
Data Collection Meeting

2017 SECCOG HMP Update - Windham Town Update Worksheet

PROJECT		ATTENDEES:
SCCOG Regional Hazard Mitigation Plan Update	**Mike Licata**	- Emergency Management Director
DATE: December 15, 2016	**Noah Slovin**	- CFM, Milone & MacBroom, Inc.
MMI# 3570-09		

Welcome and Introductions

Noah Slovin opened the meeting by introducing himself and presenting a slide show that summarized the Hazard Mitigation Plan Update process. This presentation covered regulations requiring the Town to maintain a Hazard Mitigation Plan, the basics of the concepts of Hazards and Hazard Mitigation, and the types of projects for which HMPs can be used to secure funding. Noah went into some detail about the types of Hazards and the categories of Mitigation Strategies and Actions that the Plan will address.

Noah then gave Mike copies of an HMP Update worksheet that provides a comprehensive list of the information that is needed to update the Plan. The two of them worked through this worksheet together.

Normal text below (example) was in the original worksheet. Text in *italics* was added during the data collection meeting (*example*). Italics text within brackets (*[example]*) was added after the meeting based on further research, in order to clarify comments.

1. Community Profile

1.3 – Potential Developments and Developments in Progress:

Little development on new land (requiring clearing) in Town. Most development is demolition/rebuilt, and renovations

1.4 - Any changes to government structure

Authorities	Role			Hazard Mitigated	Notes/Changes
	Advisory	Supervisory	Direct		
Building Department	X		X	All except drought	
Code Enforcement and Zoning Office	X		X	Flooding	
Conservation, Open Space, and Agriculture Commission	X			Flooding, Drought	
Fire Department			X	Wildfire	
Fire Marshal / Emergency Management Director	X	X	X	All	*Under supervision of Town Manager*
Inland Wetlands & Watercourses Commission			X	Flooding	
Mayor / Town Council	X	X	X	All	
Planning	X		X	Flooding	
Planning and Zoning Commission	X		X	Flooding	
Public Works Department	X	X	X	All except drought	
Town Engineer	X	X	X	Flooding	
Water Commission / Windham Water Works	X	X		Wildfire	
Zoning Board of Appeals			X	Flooding	

1.5 - Plans and Regulations

Plan/Document Name	Year	Hazard-Relevant Sections	Recent Changes
Emergency Operations Plan	Current		*Currently being revised to change some of the language, but no content change.* *Will be switching to new State format between 2017 and 2019 - this will be an additional round of revision.*
POCD		➔ *Mike was not sure about this. Indicated that we would have to look into that*	
Code of Ordinances			
Zoning Regulations			
Subdivision Regulations			
Inland Wetland & Watercourses Regs			

1.6 - Critical Facilities

Facility	Type	Changes
Volunteer Fire department; Windham Center		
Volunteer department; South Windham		
Volunteer department; North Windham		
Career department; Bank Street in Willimantic		
Hazardous material site off Route 6		
Hazardous material site #1 off Route 32		
Hazardous material site #2 off Route 32		
Wal*Mart off Route 6 (propane concern)		
BJs off Route 32 (propane concern)		
Police Department; Meadow Street in Willimantic		
Police Department; Eastern Connecticut State U. campus		
1 Pre-Kindergarten School		

Facility	Type	Changes
7 Elementary Schools *Sweeney School*		
1 Middle School		
1 High School		*Shelter. Two cogenerators*
1 High School Education Program		
1 Technical High School		*Shelter. Diesel generator*
1 Secondary Arts Magnet School		
1 Charter High School (Opening on Main Street in August, 2014)		
Hospital; Mansfield Ave		
Airport; off Boston Post Road (Route 6) on Airport Road		
Historic Structures: former American Thread Company, Jillson House Museum, Windham Textile & History Museum, Town Hall, historic homes dispersed throughout town		
Eastern Connecticut State University Campus		
Quinebaug Valley Community College, Willimantic branch		
Club Road convalescent home		
North Road convalescent home		
Valley Street convalescent home		
5 elderly and special needs housing areas		
15 apartment buildings housing large populations		
5 strip malls: 3 across from Wal*Mart off Route 6, 1 on Rt 32, 1 in the BJs plaza off West Main Street		
Telephone facility: SBC switch station, High St next to town hall		
2 manufactured home parks off Route 6 and a number of additional manufactured homes dispersed through town		
7 high potential loss dams		
Pumping Stations		
Other Infrastructure		
Warnings/Emergency Communication (CodeRED)		
Shelters	- *Will be completing a Microgrid project in early 2017 to create an off-grid island for Sweeney School and Middle School. They have cogenerators and solar panels.* - *High School has two cogenerators* - *Trade School has a diesel generator*	

2. Flooding

2.1 - Setting/Historic Record

Recent Significant Events	Impact
2010 Flooding	*No real problems in Town.*
No serious flood issues recently, although it sometimes looks like it's getting close.	

2.2 - Capabilities

Capability	Changes
Bridge/Culvert/Drainage Improvements	
Drainage Maintenance	
Scour Bridge Monitoring	
Road Acquisitions, Elevations, Protection	
Regulations, Codes, Ordinances	
Property Acquisitions, Elevations, Protection	
Completed Projects	
Other	

2.3 - Vulnerabilities and Risk

- Vulnerable areas along watercourses

Plains Road Bridge over Shetucket - status: *Bridge was resurfaced in 2015/2016. Mike assumes that process included some check of bridge stability, and did not hear of any problems. Bridge continues to be used, and seems fine.*
Tyler Square - status: *This is a small shopping center that experiences parking lot flooding. Property managers and leasers are aware of the problem, and have emergency plans in place. Property has a pump to remove water, a good drainage system, and a flood warning system that gives tenants time to move cars and prepare for floods.*
There is a vulnerable railroad bridge, but the Town does not have any jurisdiction over it.

- Private Properties
  - Changes to properties (acquisitions, new constructions) in SFHA

  - Repetitive Loss Properties (notes, new RL properties, etc)

- Vulnerable Critical Facilities or Historic/Cultural Resources

2.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Prevention		
Implement maintenance program to clear debris from storm water drainage areas		
Develop sediment control to prevent clogged drainage systems, such as street sweeping, curb and gutter cleaning, paving dirt roads, and planting vegetation on bare ground		
Develop a municipal stormwater management plan		
Consider effects of proposed development on stormwater runoff		
Property Protection		
Elevate structures above the 100-year flood level		
Emergency Services		

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Public Education and Awareness		
Educate the public on risks of flooding, risks of building in hazard-prone areas, FEMA floodplain maps		
Make FEMA maps easily available to the public		
Encourage individuals in flood-prone areas to purchase flood insurance		
Natural Resource Protection		
Investigate the use of flood-prone areas as open spaces		
Consider conservation of open space by acquisition of repetitive loss structures		
Structural Projects		
Upgrade stone box culvert on Old Brooklyn Turnpike		
Improve low lying Bridge St. bridge crossing the Willimantic River; this bridge is an important rerouting structure which floods numerous times a year. Study whether to upgrade or blast and dredge	*Underway*	*Carry Forward*
Upgrade dry wells on Lovers Lane to larger capacity, upgrade drainage system, and improve roads	*Underway*	*Mike feels upgrading drainage and dry wells will have limited effect, and road elevation is necessary*

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Push forward silt removal program
Acquire vacuum truck for removing silt and debris from catch basins and culverts. Applied for budget in past, but was cut due to limited funding. Currently such cleaning is contracted out.

3. Wind Damage Related to Hurricanes, Tropical Storms, Tornadoes, and Winter Storms

3.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

3.2 - Capabilities

Capability	Changes
Wind Loading	
Tree Maintenance	
Debris Management	
Debris Cleanup Equipment	
Completed Projects	
Coordination with Power Utility	*Eversource*
Distributing Preparedness Information	
Other	

3.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

3.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Prevention		
Implement a tree hazard management program to encourage responsible planting practices and minimize future storm damage to buildings, utilities, and streets		
Practice a tree trimming maintenance program		
Encourage underground utility wires		
Property Protection		
Encourage upgrading of existing buildings to meet current building codes		
Enforce and update building code standards for light frame construction, especially wind resistant roofs		
Emergency Services		
Provide emergency shelters		
Natural Resource Protection		
Re-landscape with native species		
Public Education and Awareness		
Be aware of, and educate public through pamphlets and web-based information on warning signs for a tornado, importance of securing outdoor objects that could become projectiles, what kinds of buildings are most vulnerable to damage from tornadoes or high winds (such as manufacture housing), structural alterations to protect against wind damage, when and where to seek shelter		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions

Windham is a Millstone Evacuation Plan Host Community (host evacuees of communities farther south), making them eligible for $25,000 for various hazard mitigation efforts. Mike plans to use some of this money to install roller doors on the EOC windows.

4. Winter Storms

4.1 - Setting/Historic Record

The city (Willimantic) has not lost power since Mike has been working as Emergency Manager (2006)

4.2 - Capabilities

Capability	Changes
Snow Removal from Roads	
Snow Loading/Removal from Roofs	
Backup Power	
Public Information Program	
Other	

4.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

4.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Educating the public on the risks of hypothermia, the risks of carbon monoxide poisoning in motor vehicles and from portable heaters and power generators in homes, the risk of fires from portable heaters and candles, the importance of staying off the roads, landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce the risk of damage to structures		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

Public Works installed a brand-new generator (2016?)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

5. Earthquakes

5.1 - Setting/Historic Record

Recent Significant Events	Date	Impact

5.2 - Capabilities

Capability	Changes
Building Code	
Zoning Ordinances, etc.	
Other	

5.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

5.4 - Actions

Action	**Progress** Completed Underway Carry Forward Drop	**Notes** What progress has been made? If dropping, why?
Enforcing effective building codes and local ordinances		
Encouraging emergency facilities such as hospitals to be constructed to withstand seismic events		
Encouraging a low-cost earthquake rider for homeowners and businesses		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

6. Wildfires

6.1 - Setting/Historic Record

Recent Significant Events	Date	Impact/Size/Response

6.2 - Capabilities

Capability	Changes
Warnings/Communication/Monitoring	
Regulations	
Water Supply	
Maintenance of Dry Hydrants 7 Cisterns	
Fire Department	
Public Education Program	
Open Burning Program	
Other	

6.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

Illegal burning is an issue - Mike gets many complaints

6.4 - Actions

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Educate the public on safe fire practices		
Use fire-resistant material when renovating, building, and retrofitting structures		
Moving shrubs and other landscaping away from structures		
Periodically clearing brush and dead grass from property		
Acquiring land susceptible to wildfires to maintain it as open space		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

7. Dam Failure

7.1 - Dams in Town

Name	Owner	Class	EAP	Notes/Status
Hosmer Reservoir Dam	Windham	B		
Potash Pond Dam	Private	B		
Frog Pond Dam	Private	B		
Beaver Brook Pond Dam	Private	B		
Diehl Pond Dam	Private	B		
Bibbins Pond Dam	CT DEEP	BB		
Lake Marie Dam	Private	BB		
Bug Pond Dam	Private	C		
Scotland Dam	Private	C		*Having trouble getting the dam owner to develop an EAP. Mike plans to coordinate with Eversource on this, however the downstream hazard area is not within the Town of Windham, so this is not a top priority.*
Mansfield Hollow Dam	Private	C		11 ft of boundary
Willimantic Reservoir Dam	Private	C		11 ft of boundary

7.2 - Capabilities

Capability	Changes
Periodic Dam Inspections	*Mike is interested in carrying out periodic dam inspections, and hopes to do some this Spring or Summer (2017)*
EOP/EAP Maintenance	
Emergency Communications	
Public Information Program	

7.3 - Vulnerabilities and Risk

- State of previous vulnerabilities; Historic Structures; Critical Facilities; New Vulnerabilities:

7.4 - Actions

Action	**Progress** Completed Underway Carry Forward Drop	**Notes** What progress has been made? If dropping, why?
For municipally-owned dams, make sure that EOPs/EAPs are in place and current, and implement recommendations resulting from state inspections		*Work with Eversource to secure EAP for Scotland Dam*
For privately-owned dams, encourage each dam owner to have an EOP/EAP in place and current, and implement recommendations resulting from inspections; monitor compliance as possible		

- Other Actions Completed since Previous Plan
- New Recommendations / Actions of Interest

Carry out dam inspections (Mike/EMD) in spring/summer of 2017

8. All Hazards

8.4 - Actions Applicable to All Hazards

Action	Progress Completed Underway Carry Forward Drop	Notes What progress has been made? If dropping, why?
Regional Coordination		
Local Emergency Response & Public Information		
Upgrade or acquire generators at critical facilities, prioritizing: Public Works (critical need), Water Works, the Police/Fire Complex, and all Windham Public Schools		
Install Roller Doors to protect windows in TOWN EOC from damage		
Continue to improve and upgrade communication system between the EOC and other service providers, including Eastern Connecticut State University		
Prevention		
Encourage all buildings to be improved to meet current building codes. (Changes in building codes apply only to new constructions and renovations)		
Public Education and Awareness		
Use a multitude of communication methods - social media, town web site, government & local media channels, radio stations - to inform and update town residents on what to prepare for before, during and after an emergency event	*Carry Forward*	*Mike expressed interest in providing more educational materials and links on the Town website.*
Provide pamphlets and literature on natural disasters and preparedness at the Town Hall and Library	*Underway*	*Mike has acquired boxes of pamphlets and materials in both English and Spanish. These are currently available in the Town Hall. Library is undergoing major renovations - when that is complete, pamphlets and literature will be sited there as well.*
Educate the public about disaster preparedness and the benefits of mitigation measures.		
Natural Resource Protection & Open Space		

- Other Actions Completed (any action completed that may diminish risk. Does not have to intentionally addressed risk.)

- New Actions (can include structural projects, natural resource protection, specific property protection, strengthening of emergency services/response, hazard prevention, education. Can include projects currently underway but incomplete)

Emergency Operations Center Communication System upgrade - underway
- *New base and equipment purchased.*
- *Base and equipment need to be installed*
- *ECSU and PD will be able to communicate directly with EOC when complete*
- *New Radio tower is up on hospital, allowing direct communication with EOC (EOC can send advanced warning about incoming patients, etc.*

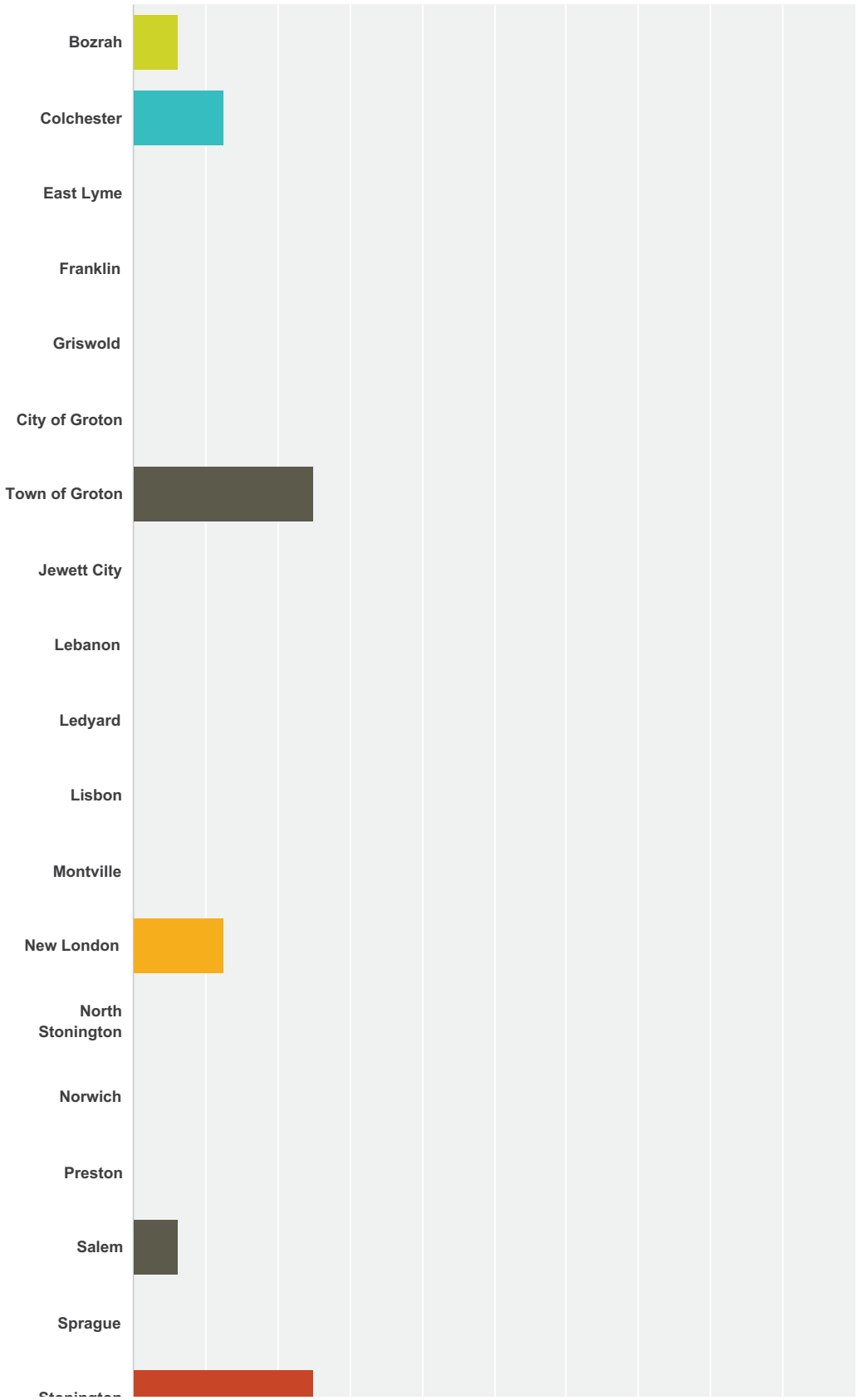
Notes

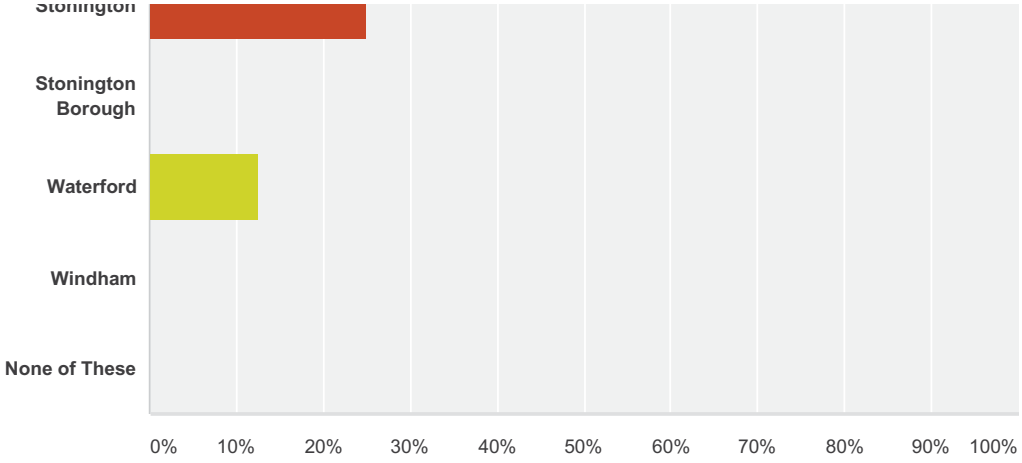
Everbridge warning system implemented. Backup method is driving on streets making announcements over PA systems. Eastern Connecticut State University (ECSU) has its own system.

Public Survey Results

Q1 In which community do you live or own property?

Answered: 16 Skipped: 0





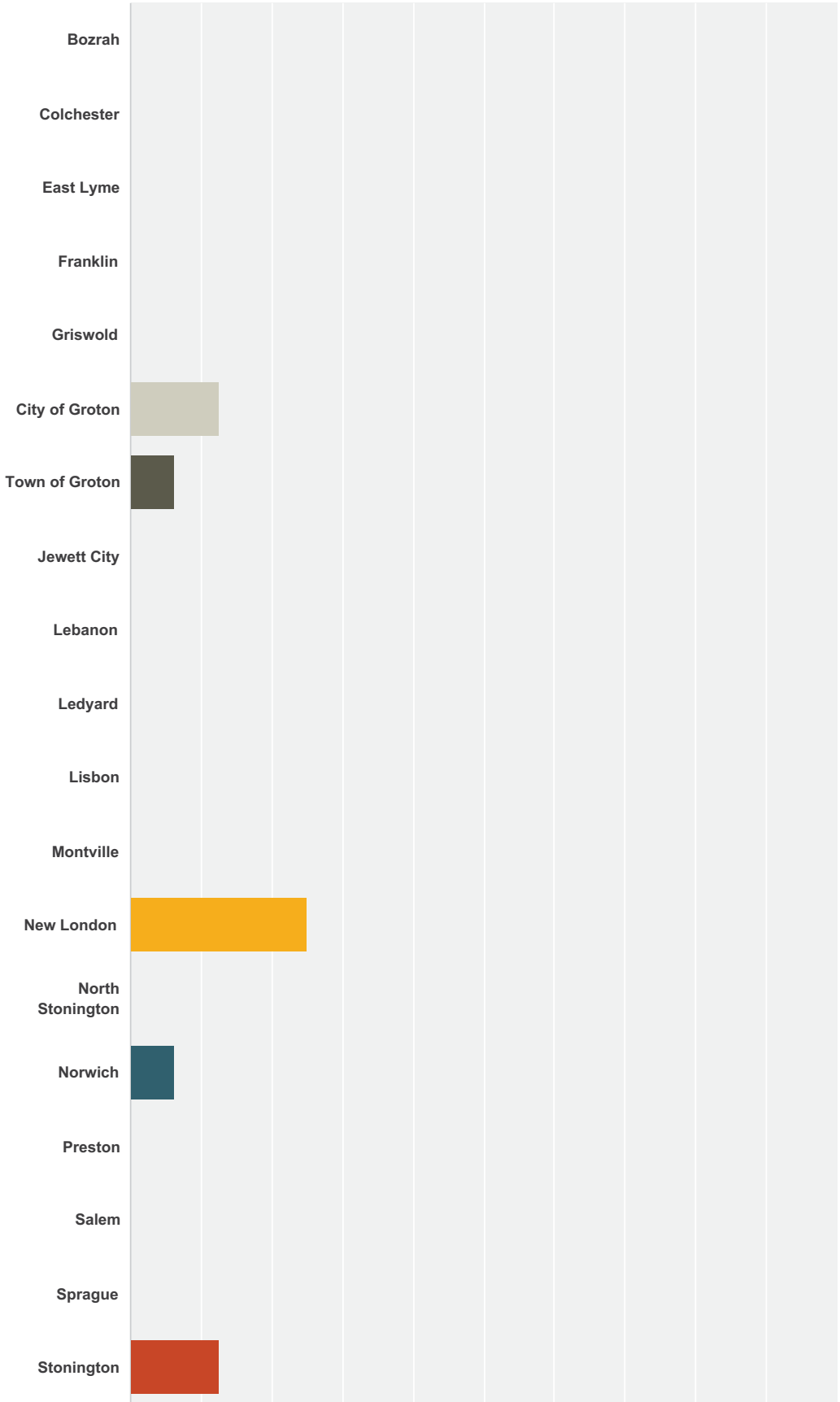
Answer Choices	Responses	
Bozrah	**6.25%**	1
Colchester	**12.50%**	2
East Lyme	**0.00%**	0
Franklin	**0.00%**	0
Griswold	**0.00%**	0
City of Groton	**0.00%**	0
Town of Groton	**25.00%**	4
Jewett City	**0.00%**	0
Lebanon	**0.00%**	0
Ledyard	**0.00%**	0
Lisbon	**0.00%**	0
Montville	**0.00%**	0
New London	**12.50%**	2
North Stonington	**0.00%**	0
Norwich	**0.00%**	0
Preston	**0.00%**	0
Salem	**6.25%**	1
Sprague	**0.00%**	0
Stonington	**25.00%**	4
Stonington Borough	**0.00%**	0
Waterford	**12.50%**	2
Windham	**0.00%**	0
None of These	**0.00%**	0

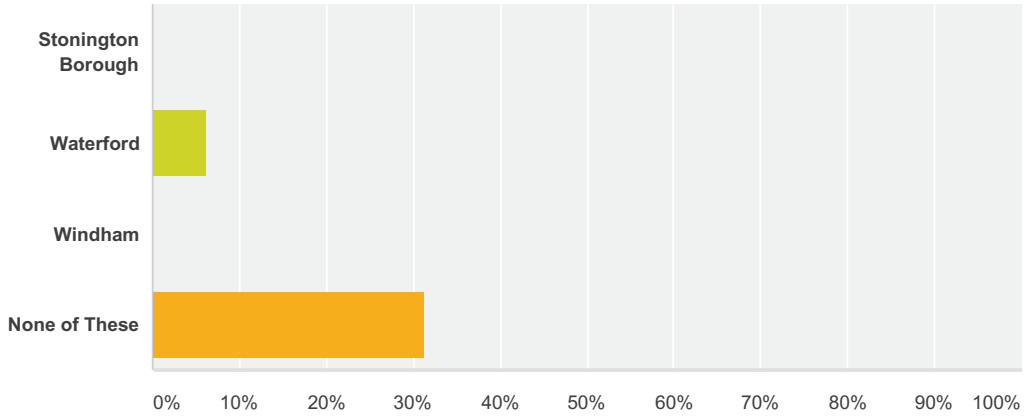
Total	16

#	None of These	Date
	There are no responses.	

Q2 In which community do you work?

Answered: 16 Skipped: 0





Answer Choices	Responses	
Bozrah	**0.00%**	0
Colchester	**0.00%**	0
East Lyme	**0.00%**	0
Franklin	**0.00%**	0
Griswold	**0.00%**	0
City of Groton	**12.50%**	2
Town of Groton	**6.25%**	1
Jewett City	**0.00%**	0
Lebanon	**0.00%**	0
Ledyard	**0.00%**	0
Lisbon	**0.00%**	0
Montville	**0.00%**	0
New London	**25.00%**	4
North Stonington	**0.00%**	0
Norwich	**6.25%**	1
Preston	**0.00%**	0
Salem	**0.00%**	0
Sprague	**0.00%**	0
Stonington	**12.50%**	2
Stonington Borough	**0.00%**	0
Waterford	**6.25%**	1
Windham	**0.00%**	0
None of These	**31.25%**	5
Total		**16**

#	None of These	Date
1	Hartford, CT	12/7/2016 7:52 AM
2	Retired	12/1/2016 4:47 AM
3	Retired	11/9/2016 6:54 AM
4	Glastonbury, CT `	11/8/2016 9:25 AM
5	Mashantucket	11/6/2016 3:31 PM

Q3 Please enter your street of residence or place of business, or both.

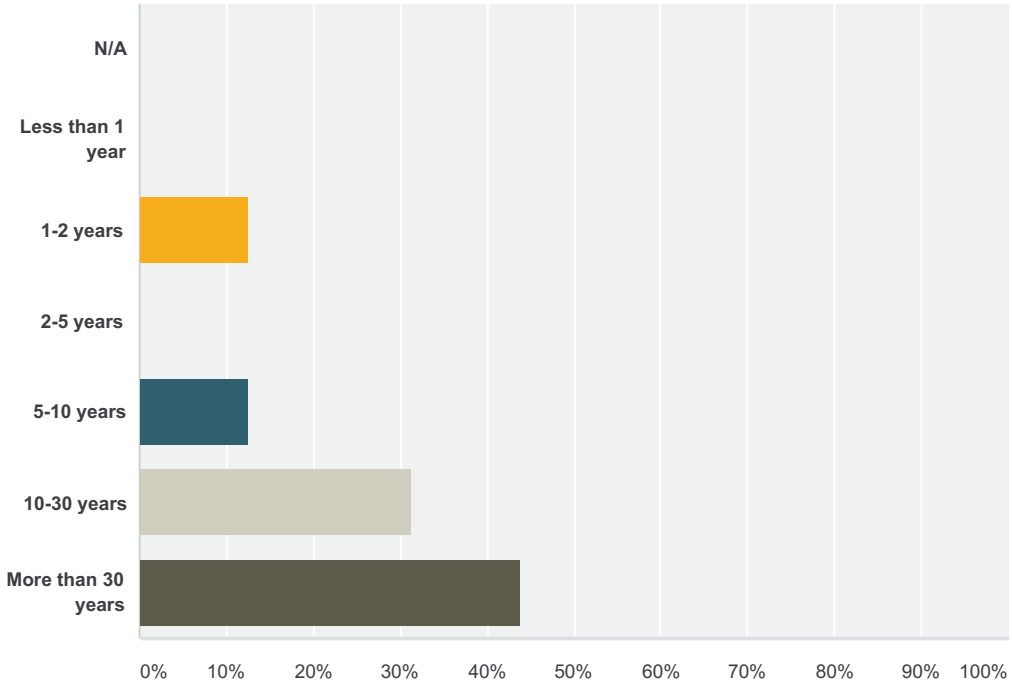
Answered: 16 Skipped: 0

Answer Choices	Responses	
Residence (Street Name, Town/City)	**100.00%**	16
Place of Business (Street Name, Town/City)	**62.50%**	10

#	Residence (Street Name, Town/City)	Date
1	810 1/2 Pequot Avenue, New London, CT	1/10/2017 3:37 AM
2	237 west shore avenue	12/7/2016 7:52 AM
3	58 Riverside Drive, Pawcatuck	12/1/2016 4:47 AM
4	Carli Blvd, Colchester	11/30/2016 6:12 AM
5	371 Brook st	11/21/2016 7:28 AM
6	71 Courtland Dr	11/15/2016 12:53 PM
7	Scotch Cap Rd , Quaker Hill CT	11/9/2016 6:54 AM
8	Fawn Run Salem	11/8/2016 9:25 AM
9	Garden St, Pawcatuck	11/7/2016 8:45 AM
10	New London Rd, Colchester	11/6/2016 3:31 PM
11	10 Josan dr waterford ct	11/6/2016 11:32 AM
12	Garden St, Pawcatuck	11/6/2016 7:16 AM
13	Fitchville Rd Bozrah Ct	11/6/2016 5:51 AM
14	Meadowbrook Lane, Mystic	11/6/2016 1:30 AM
15	81 Tipping Rock Rd. Stonington, 84 Boardwalk, Groton LP	11/4/2016 10:22 PM
16	Gardner Ave., New London	11/4/2016 6:23 AM
#	**Place of Business (Street Name, Town/City)**	**Date**
1	150 Bank Streetm New London, CT	1/10/2017 3:37 AM
2	Groton	12/7/2016 7:52 AM
3	Broad St, New London	11/30/2016 6:12 AM
4	112 Greenmanville Ave	11/15/2016 12:53 PM
5	na	11/9/2016 6:54 AM
6	State ST, New London	11/7/2016 8:45 AM
7	State St, New London	11/6/2016 7:16 AM
8	Subase Groton	11/6/2016 5:51 AM
9	Eastern Point Road, Groton	11/6/2016 1:30 AM
10	W Town Street, Norwich	11/4/2016 6:23 AM

Q4 For how many years have you lived or worked in southeastern Connecticut?

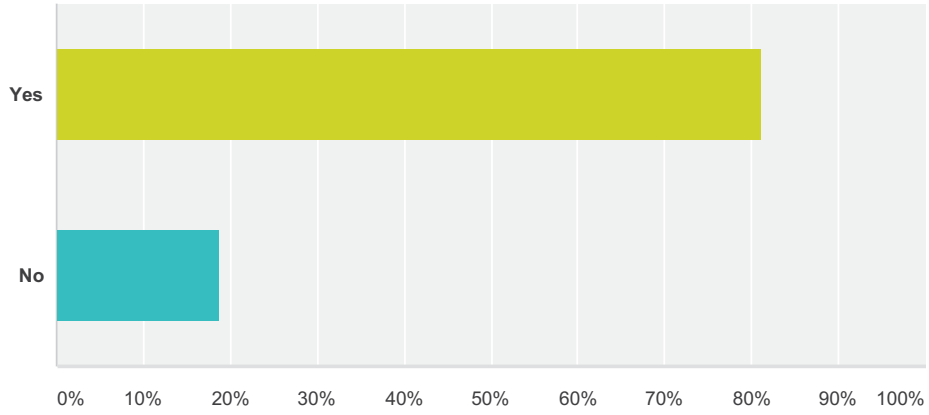
Answered: 16 Skipped: 0



Answer Choices	Responses	
N/A	0.00%	0
Less than 1 year	0.00%	0
1-2 years	12.50%	2
2-5 years	0.00%	0
5-10 years	12.50%	2
10-30 years	31.25%	5
More than 30 years	43.75%	7
Total		16

Q5 Were you aware that the communities listed above have a Hazard Mitigation Plan?

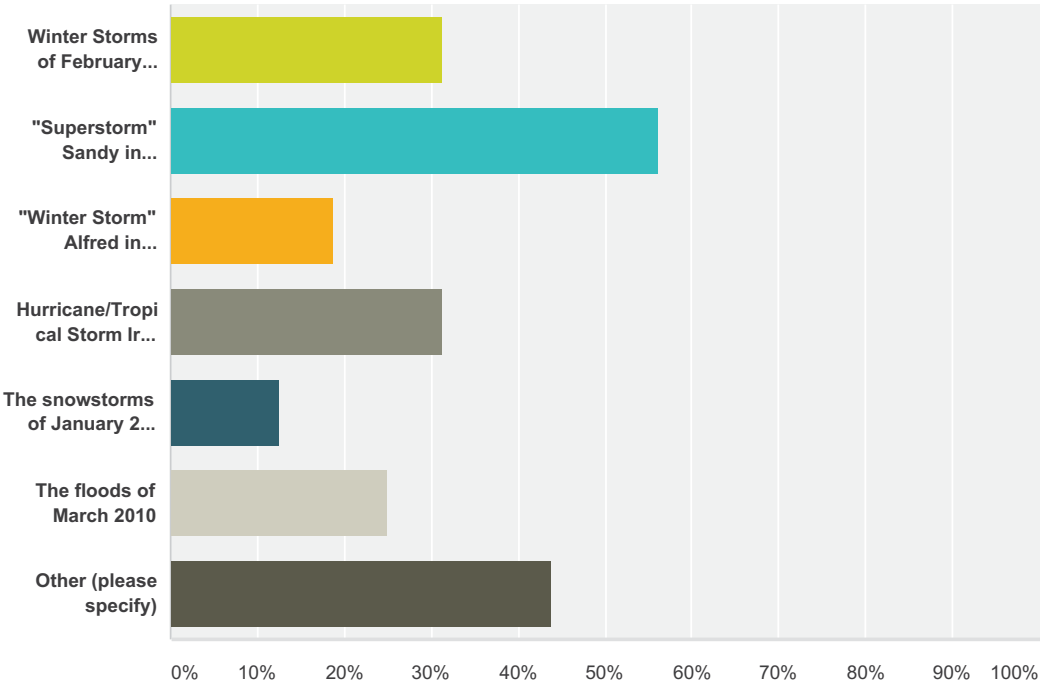
Answered: 16 Skipped: 0



Answer Choices	Responses	
Yes	**81.25%**	13
No	**18.75%**	3
Total		**16**

Q6 If your awareness of natural hazards has increased in recent years, which events have contributed to this awareness?

Answered: 16 Skipped: 0

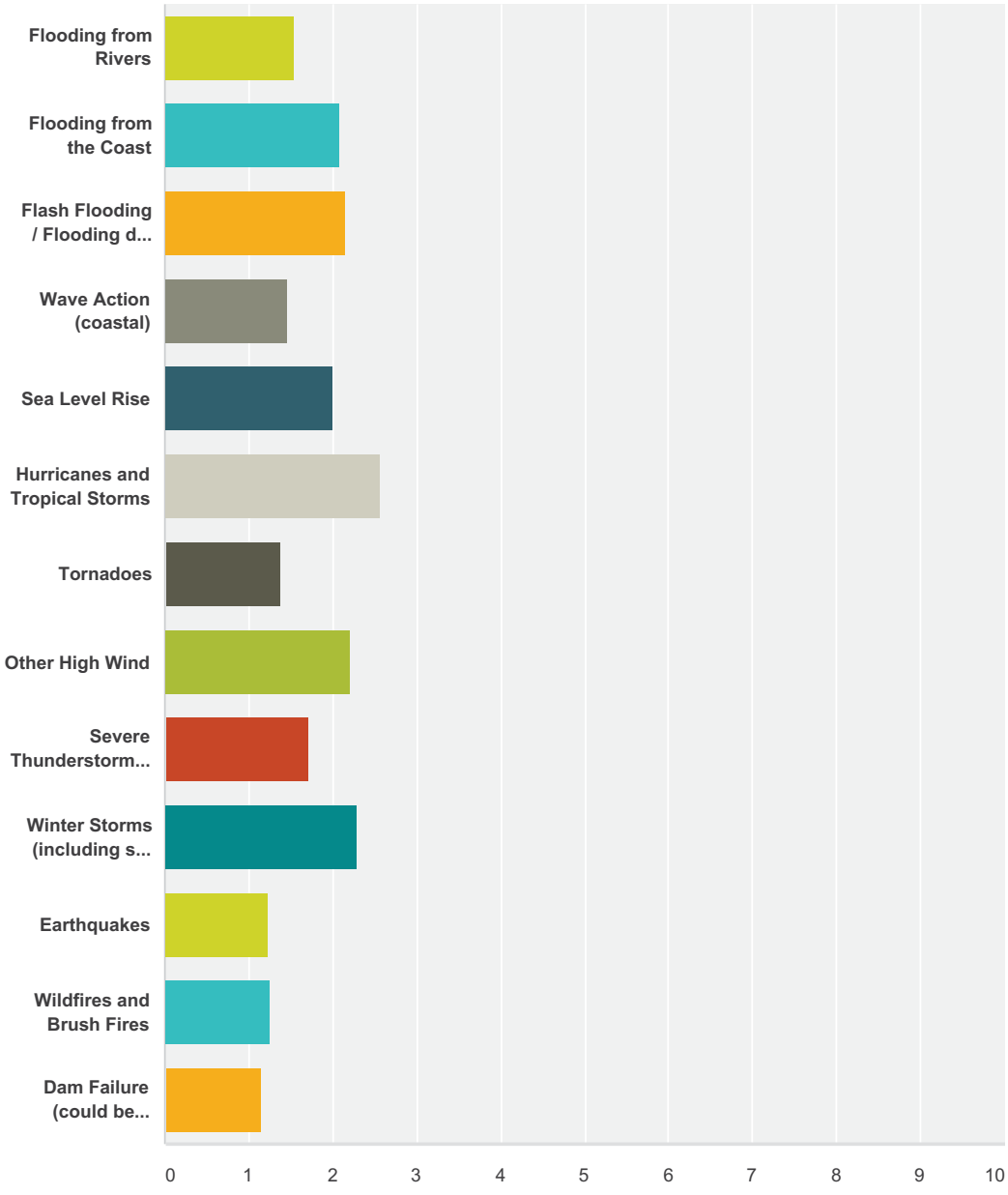


Answer Choices	Responses	
Winter Storms of February 2013 and January 2015	31.25%	5
"Superstorm" Sandy in October 2012	56.25%	9
"Winter Storm" Alfred in October 2011	18.75%	3
Hurricane/Tropical Storm Irene in August 2011	31.25%	5
The snowstorms of January 2011 that caused buildings to collapse in several southeastern Connecticut Towns	12.50%	2
The floods of March 2010	25.00%	4
Other (please specify)	43.75%	7
Total Respondents: 16		

#	Other (please specify)	Date
1	Hurricane Gloria	11/21/2016 7:28 AM
2	All of the above	11/15/2016 12:53 PM
3	Ever vigilant, these are nothing new.	11/9/2016 6:54 AM
4	Has not increased	11/7/2016 8:45 AM
5	Not aware of increase locally	11/6/2016 7:16 AM
6	Dealing with events from 1978, the difference is the people not the storms	11/6/2016 5:51 AM
7	Sea level rising	11/6/2016 1:30 AM

Q7 Please rate each of the following hazards on a scale of 1 (no concern) to 3 (high concern) indicating the level of threat each presents to your home or the functions of your business.

Answered: 14 Skipped: 2



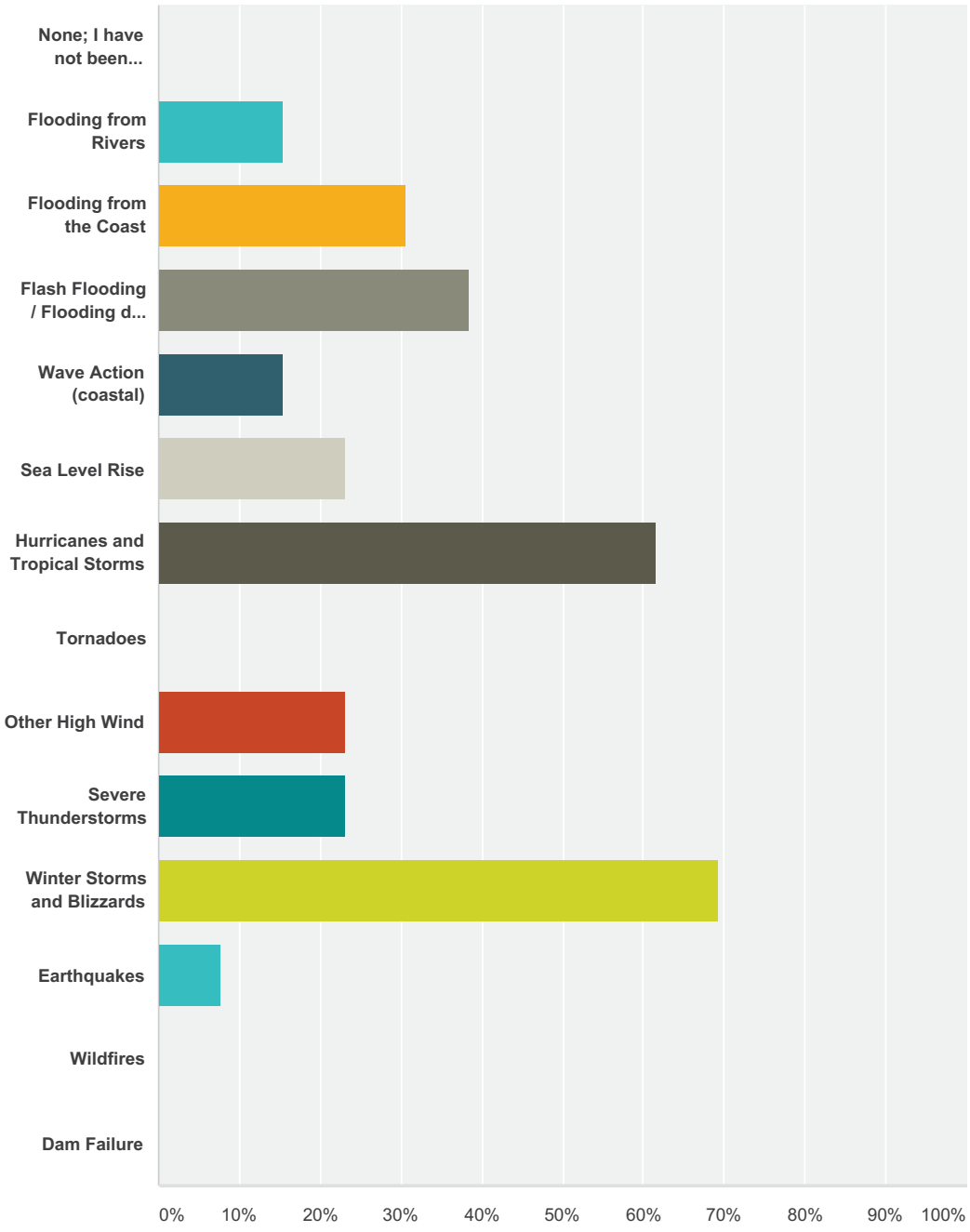
	Low Threat	Moderate Threat	High Threat	N/A	Total	Weighted Average
Flooding from Rivers	**61.54%** 8	**23.08%** 3	**15.38%** 2	**0.00%** 0	13	1.54
Flooding from the Coast	**28.57%** 4	**28.57%** 4	**35.71%** 5	**7.14%** 1	14	2.08

Flash Flooding / Flooding due to Poor Drainage	**14.29%** 2	**50.00%** 7	**28.57%** 4	**7.14%** 1	14	2.15
Wave Action (coastal)	**64.29%** 9	**14.29%** 2	**14.29%** 2	**7.14%** 1	14	1.46
Sea Level Rise	**28.57%** 4	**42.86%** 6	**28.57%** 4	**0.00%** 0	14	2.00
Hurricanes and Tropical Storms	**0.00%** 0	**42.86%** 6	**57.14%** 8	**0.00%** 0	14	2.57
Tornadoes	**64.29%** 9	**21.43%** 3	**7.14%** 1	**7.14%** 1	14	1.38
Other High Wind	**14.29%** 2	**50.00%** 7	**35.71%** 5	**0.00%** 0	14	2.21
Severe Thunderstorms (including hail, lightning, or downbursts)	**35.71%** 5	**57.14%** 8	**7.14%** 1	**0.00%** 0	14	1.71
Winter Storms (including snow or ice) and Blizzards	**21.43%** 3	**28.57%** 4	**50.00%** 7	**0.00%** 0	14	2.29
Earthquakes	**78.57%** 11	**7.14%** 1	**7.14%** 1	**7.14%** 1	14	1.23
Wildfires and Brush Fires	**64.29%** 9	**21.43%** 3	**0.00%** 0	**14.29%** 2	14	1.25
Dam Failure (could be caused by other hazards)	**85.71%** 12	**0.00%** 0	**7.14%** 1	**7.14%** 1	14	1.15

#	Other (please specify)	Date
1	Drought	11/6/2016 1:35 AM

Q8 Which hazards have impacted you, your home, or your place of business?

Answered: 13 Skipped: 3



Answer Choices	Responses	
None; I have not been impacted	**0.00%**	0
Flooding from Rivers	**15.38%**	2
Flooding from the Coast	**30.77%**	4
Flash Flooding / Flooding due to Poor Drainage	**38.46%**	5

Wave Action (coastal)	**15.38%**	2
Sea Level Rise	**23.08%**	3
Hurricanes and Tropical Storms	**61.54%**	8
Tornadoes	**0.00%**	0
Other High Wind	**23.08%**	3
Severe Thunderstorms	**23.08%**	3
Winter Storms and Blizzards	**69.23%**	9
Earthquakes	**7.69%**	1
Wildfires	**0.00%**	0
Dam Failure	**0.00%**	0
Total Respondents: 13		

#	Other (please specify)	Date
1	Winter storms takes out the electric power.	11/9/2016 7:01 AM
2	Severe rainstorm 3/31/2010	11/7/2016 9:03 AM

Q9 Are any specific areas of your community vulnerable to any of the above hazards? If so, please list them by location. Please use street intersections or landmarks to describe locations.

Answered: 11 Skipped: 5

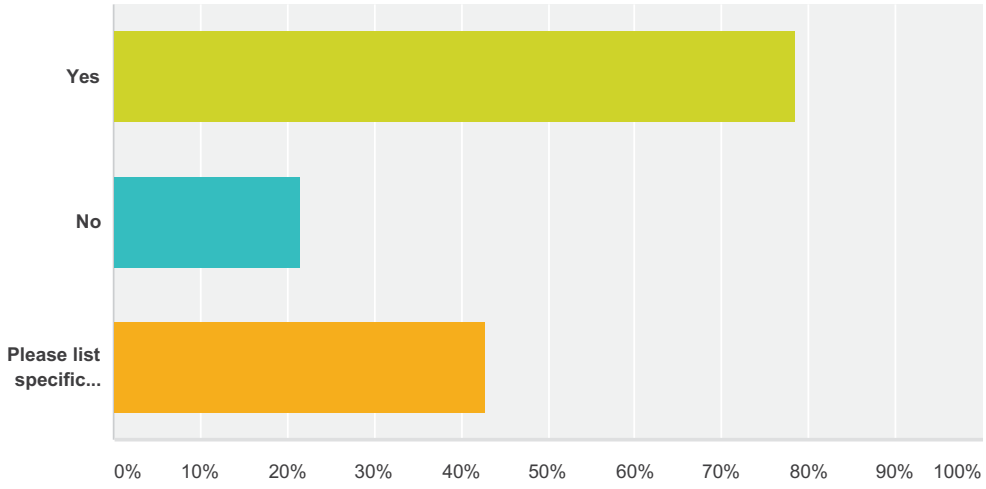
Answer Choices	Responses	
Location 1	**90.91%**	10
Location 2	**72.73%**	8
Location 3	**54.55%**	6
Location 4	**27.27%**	3
Additional Locations	**27.27%**	3

#	Location 1	Date
1	Bridge entering Groton Long Point	12/7/2016 7:58 AM
2	undersize/broken culvert 62 Riverside Dr Pawcatuck	12/1/2016 4:56 AM
3	Winter storms and Tropical Storms - Carli Blvd and Fran Lane	11/30/2016 6:23 AM
4	Old Norwich Rd at Hunts Brook, flooding	11/9/2016 7:01 AM
5	Stillman Avenue Bridge	11/7/2016 9:03 AM
6	Mago Point	11/6/2016 11:35 AM
7	Dam Break possible. Possibly soon Yantic River, fitchville Dam	11/6/2016 6:07 AM
8	Downtown Mystic	11/6/2016 1:35 AM
9	GLP	11/4/2016 10:27 PM
10	Bank St New London near Walgreens	11/4/2016 6:25 AM
#	**Location 2**	**Date**
1	Wall along East Shore Road Groton Long Point	12/7/2016 7:58 AM
2	Winter storms and Tropical Storms - Broad St and Connecticut Ave	11/30/2016 6:23 AM
3	Bloomingdale Rd at Hunts Brook, Flooding	11/9/2016 7:01 AM
4	Davis Farm, Osbrook Point Rd, Pawcatuck (saltwater flooding)	11/7/2016 9:03 AM
5	Jordan Village Dam	11/6/2016 11:35 AM
6	Above will effect all of the river area to the Thames river	11/6/2016 6:07 AM
7	Mason's Island	11/6/2016 1:35 AM
8	Stonington Borough	11/4/2016 10:27 PM
#	**Location 3**	**Date**
1	Revetment wall along Island Circle Groton Long Point	12/7/2016 7:58 AM
2	Flash Flooding - - Broad St and Connecticut Ave	11/30/2016 6:23 AM
3	Calvary Church, 27-33 Church St, Stonington	11/7/2016 9:03 AM
4	Flooding NorwichTown threat, higher do to EPA /Deep restrictions in maintaining river flow	11/6/2016 6:07 AM
5	Stonington borough	11/6/2016 1:35 AM

6	Noank peninsula	11/4/2016 10:27 PM
#	**Location 4**	**Date**
1	Sand erosion along beach front Groton Long Point	12/7/2016 7:58 AM
2	Amtrak (entire length) & Station (2 Roosevelt Avenue, Mystic)	11/7/2016 9:03 AM
3	Downtown Mystic	11/4/2016 10:27 PM
#	**Additional Locations**	**Date**
1	all coastal areas	11/21/2016 7:31 AM
2	Downtown Old Mystic (11-63 Main St, Old Mystic)	11/7/2016 9:03 AM
3	Coastal areas in SE CT	11/4/2016 10:27 PM

Q10 Utility companies have been under pressure to harden overhead utility lines and manage vegetation since the wind and snow events of 2011. Have you noticed increased maintenance in your community?

Answered: 14 Skipped: 2

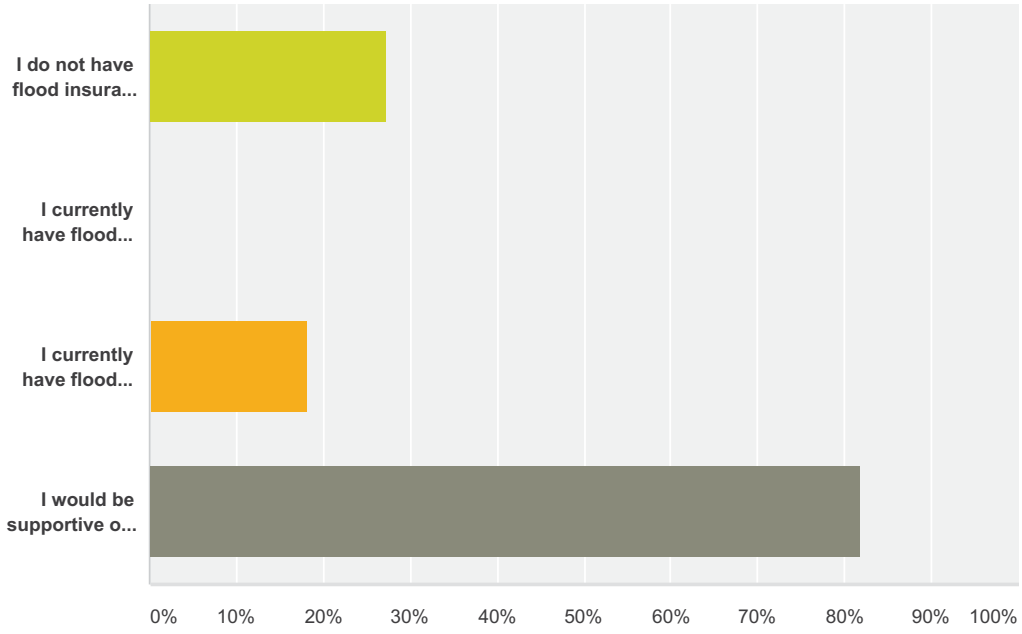


Answer Choices	Responses	
Yes	**78.57%**	11
No	**21.43%**	3
Please list specific examples of utility maintenance below:	**42.86%**	6
Total Respondents: 14		

#	Please list specific examples of utility maintenance below:	Date
1	Over -- grotesque -- pruning of trees along Pequot Avenue.	1/10/2017 3:41 AM
2	Trimming branches	11/15/2016 1:02 PM
3	Trimmed tree limbs near lines	11/6/2016 3:35 PM
4	Cut back trees from lines in majority of 152	11/6/2016 11:35 AM
5	Cutting back, replacent of poles and wire	11/6/2016 6:07 AM
6	Tree trimming	11/6/2016 1:35 AM

Q11 Floods are one of the most persistent and costly natural disasters in Connecticut. Changes are underway that will increase flood insurance premiums nationwide for many policy holders and for most new policies as actual flood risks are considered. What are your thoughts about flood insurance? You may check as many boxes as you wish.

Answered: 11 Skipped: 5

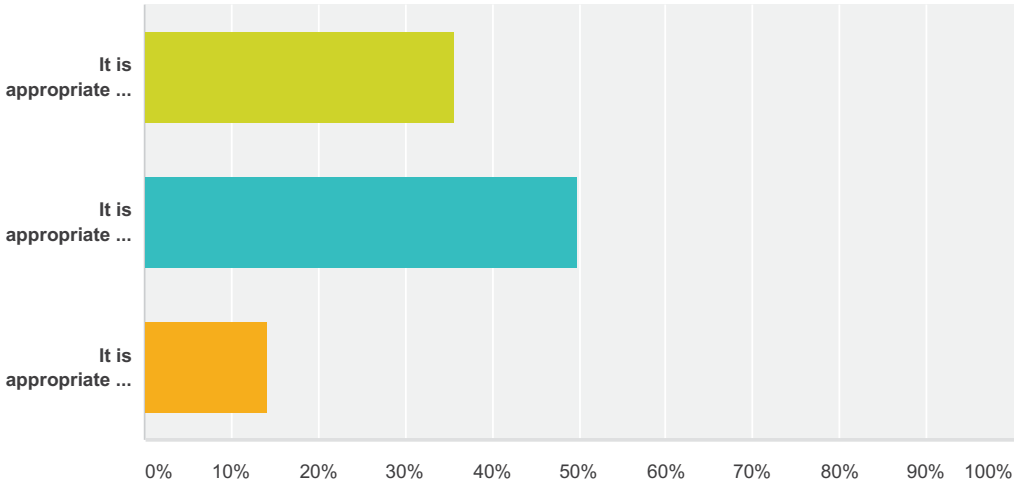


Answer Choices	Responses	
I do not have flood insurance and have no opinions about it	27.27%	3
I currently have flood insurance and am not concerned about changes in the premiums	0.00%	0
I currently have flood insurance and will be looking for ways to reduce my premiums	18.18%	2
I would be supportive of looking for ways to reduce the cost of flood insurance policies for all policyholders	81.82%	9
Total Respondents: 11		

#	Other (please specify)	Date
1	If you live in an area that floods in about every storm, the government should not have help fund your repairs. If your insurance does not pay to fix it, time to move from the known hazard zone.	11/6/2016 6:07 AM
2	Flood insurance program is a joke... I had it but as soon as I paid off my mortgage I dropped it. It is more cost effective for me to self-insure	11/6/2016 1:35 AM
3	I don't have flood insurance but approve of the recent efforts to gradually rise the price of it to reflect risk	11/4/2016 6:25 AM

Q12 Which of the following statements about planning for future sea level change do you most agree with?

Answered: 14 Skipped: 2

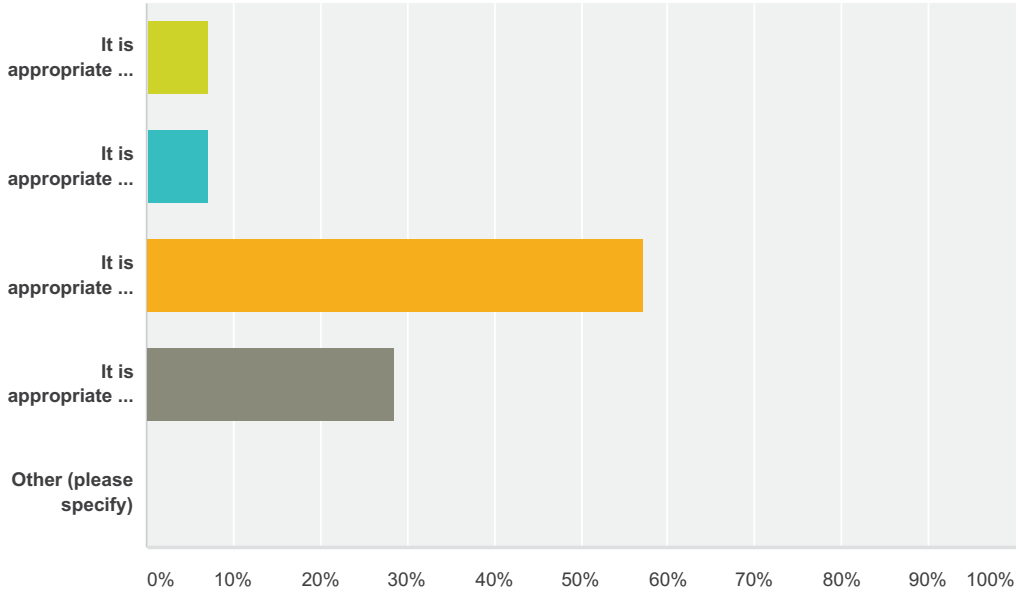


Answer Choices	Responses	
It is appropriate to plan for sea level rise to continue at the current rate, with less than a foot of rise by 2100.	**35.71%**	5
It is appropriate to plan for sea level rise to accelerate, with more than one foot of rise by 2100.	**50.00%**	7
It is appropriate to plan for sea level rise to accelerate dramatically, with several feet of rise by 2100.	**14.29%**	2
Total		**14**

#	Do you live or work near the coast? (yes/no)	Date
1	yes	1/10/2017 3:41 AM
2	yes	12/7/2016 7:58 AM
3	Yes	12/1/2016 4:56 AM
4	yes	11/21/2016 7:31 AM
5	Yes	11/15/2016 1:02 PM
6	yes	11/9/2016 7:01 AM
7	No	11/7/2016 9:03 AM
8	Yes	11/6/2016 6:07 AM
9	Yes	11/6/2016 1:35 AM
10	Yes	11/4/2016 10:27 PM
11	yes	11/4/2016 6:25 AM

Q13 Scientists expect rain and storm events may increase in this area due to Climate Change (click here to learn more). Which of the following statements about planning for future Climate Change do you most agree with?t

Answered: 14 Skipped: 2

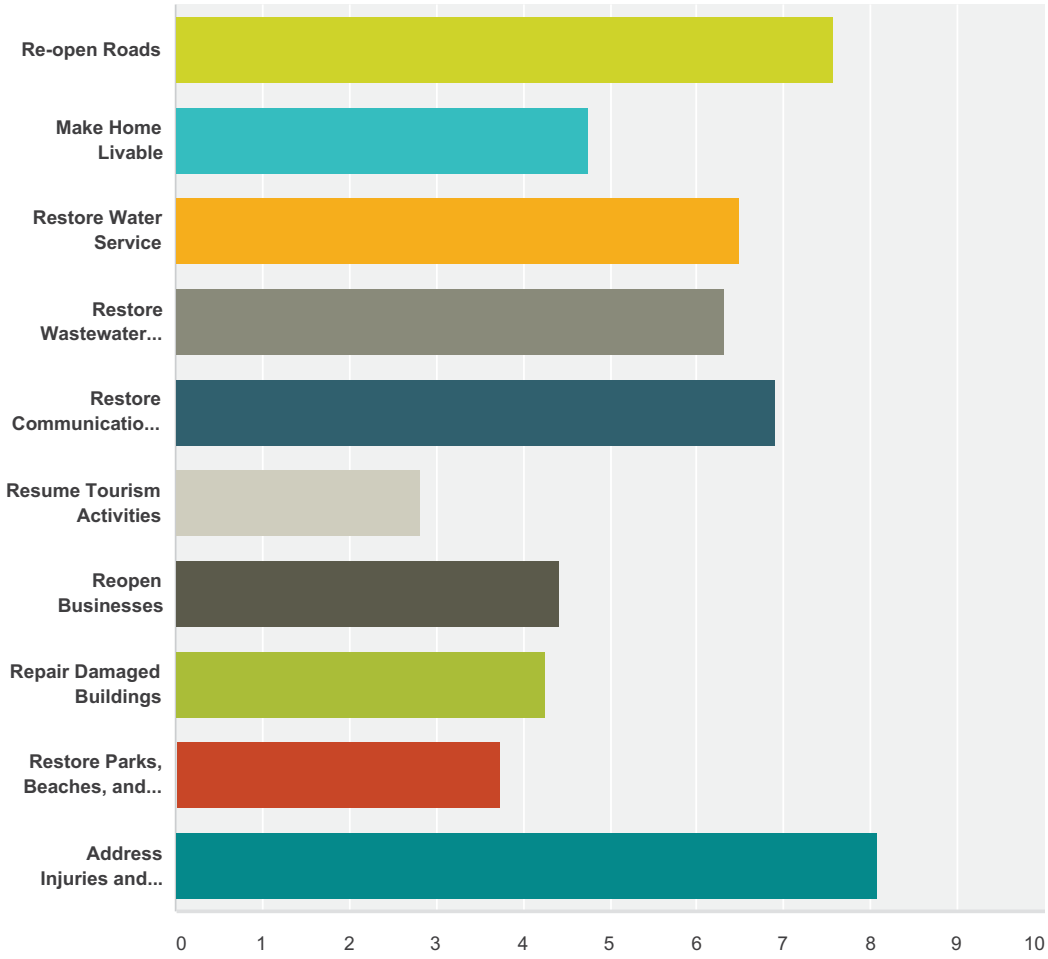


Answer Choices	Responses	
It is appropriate to plan for storm events to occur more frequently.	7.14%	1
It is appropriate to plan for storm events to become more severe.	7.14%	1
It is appropriate to plan for storm events to become more severe and more frequent.	57.14%	8
It is appropriate to plan for storm events to occur at a similar frequency and severity as in the past.	28.57%	4
Other (please specify)	0.00%	0
Total		14

#	Other (please specify)	Date
	There are no responses.	

Q14 Please rank the following activities, intended to restore daily life after a hazard event, from most important to you (1) to least important to you (9):

Answered: 12 Skipped: 4

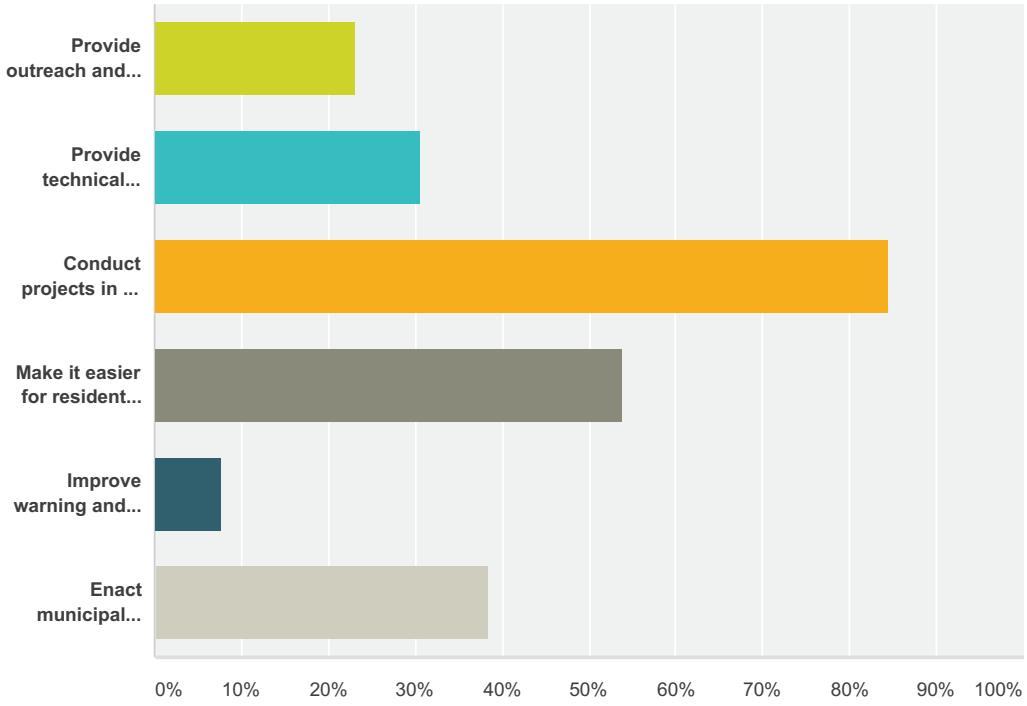


	1	2	3	4	5	6	7	8	9	10	Total	Score
Re-open Roads	16.67% 2	16.67% 2	25.00% 3	16.67% 2	8.33% 1	8.33% 1	8.33% 1	0.00% 0	0.00% 0	0.00% 0	12	7.58
Make Home Livable	0.00% 0	8.33% 1	0.00% 0	0.00% 0	16.67% 2	25.00% 3	33.33% 4	8.33% 1	8.33% 1	0.00% 0	12	4.75
Restore Water Service	0.00% 0	8.33% 1	33.33% 4	16.67% 2	8.33% 1	16.67% 2	8.33% 1	8.33% 1	0.00% 0	0.00% 0	12	6.50
Restore Wastewater Collection and Disposal (Sewer or Septic System)	0.00% 0	8.33% 1	8.33% 1	16.67% 2	58.33% 7	0.00% 0	0.00% 0	8.33% 1	0.00% 0	0.00% 0	12	6.33
Restore Communication (Telephones, Cell Phones, Internet)	8.33% 1	25.00% 3	16.67% 2	16.67% 2	0.00% 0	16.67% 2	8.33% 1	0.00% 0	8.33% 1	0.00% 0	12	6.92

Resume Tourism Activities	**18.18%** 2	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	**18.18%** 2	**63.64%** 7	11	2.82
Reopen Businesses	**0.00%** 0	**0.00%** 0	**8.33%** 1	**16.67%** 2	**8.33%** 1	**0.00%** 0	**16.67%** 2	**41.67%** 5	**8.33%** 1	**0.00%** 0	12	4.42
Repair Damaged Buildings	**0.00%** 0	**0.00%** 0	**8.33%** 1	**8.33%** 1	**0.00%** 0	**16.67%** 2	**25.00%** 3	**33.33%** 4	**8.33%** 1	**0.00%** 0	12	4.25
Restore Parks, Beaches, and other Natural Resources	**0.00%** 0	**18.18%** 2	**0.00%** 0	**0.00%** 0	**0.00%** 0	**18.18%** 2	**0.00%** 0	**0.00%** 0	**54.55%** 6	**9.09%** 1	11	3.73
Address Injuries and Casualties	**58.33%** 7	**16.67%** 2	**0.00%** 0	**8.33%** 1	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	**0.00%** 0	**16.67%** 2	12	8.08

Q15 What are the most important things that your municipal government and leaders can do to help residents and businesses be prepared for a disaster, and become more resilient over time?

Answered: 13 Skipped: 3

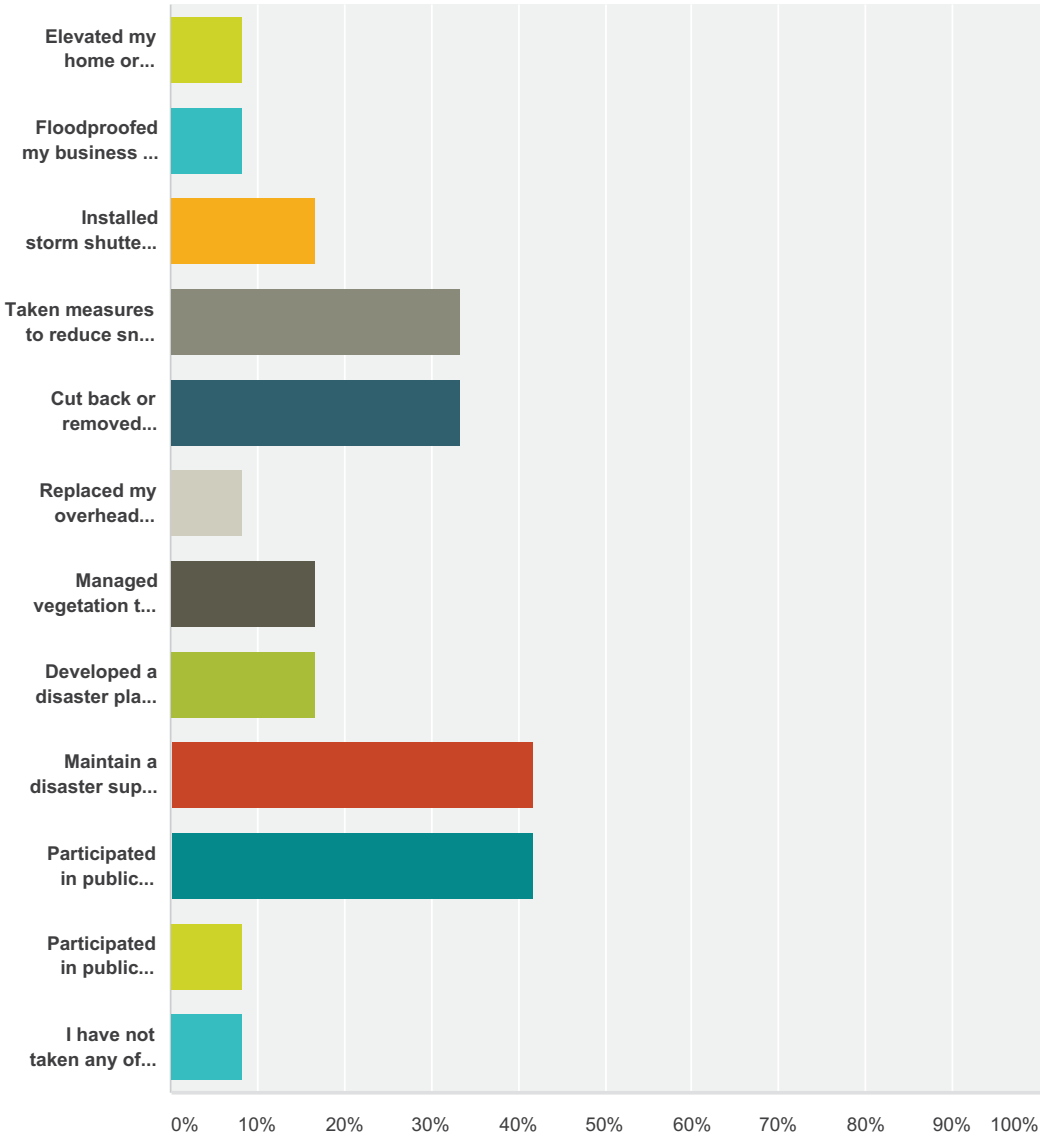


Answer Choices	Responses
Provide outreach and education to residents, businesses, and organizations to help them understand risks and be prepared	23.08% 3
Provide technical assistance to residents, businesses, and organizations to help them reduce losses from hazards and disasters	30.77% 4
Conduct projects in the community, such as drainage and flood control projects, to mitigate for hazards and minimize impacts from disasters	84.62% 11
Make it easier for residents, businesses, and organizations to take their own actions to mitigate for hazards and become more resilient to disasters	53.85% 7
Improve warning and response systems to improve disaster management	7.69% 1
Enact municipal regulations, codes, and ordinances - such as zoning regulations and building codes - designed to protect residents and businesses from natural hazards and disasters	38.46% 5
Total Respondents: 13	

#	Other (please specify)	Date
1	We may be out of service for 1-2 months including fuel and energy.	12/1/2016 5:35 AM
2	Living in this area just about everyone forgets about past history. Today's residents are needy and will demand help vs years ago they did not wait and started clean up by themselves. Even your planing forgets this	11/6/2016 6:18 AM

Q16 Have you taken any actions to reduce the risk or vulnerability to your family, home, or business? If so, please indicate below.

Answered: 12 Skipped: 4



Answer Choices	Responses	
Elevated my home or business to reduce flood damage	8.33%	1
Floodproofed my business to reduce flood damage	8.33%	1
Installed storm shutters or structural/roof braces to reduce wind damage	16.67%	2
Taken measures to reduce snow build-up on roofs	33.33%	4
Cut back or removed vegetation from my overhead utility lines or roof	33.33%	4

Replaced my overhead utility lines with underground lines	**8.33%**	1
Managed vegetation to reduce risk of wildfire reaching my home or business	**16.67%**	2
Developed a disaster plan for my family, home, or business	**16.67%**	2
Maintain a disaster supply kit for my family, home, or business	**41.67%**	5
Participated in public meetings to discuss the Plan of Conservation and Development or open space plans	**41.67%**	5
Participated in public meetings to discuss and approve changes to zoning or subdivision regulations	**8.33%**	1
I have not taken any of these actions	**8.33%**	1
Total Respondents: 12		

#	Other (please specify)	Date
1	No preparation is perfect, but be flexible.	11/9/2016 7:09 AM
2	Volunteered for climate change task force / volunteer w/ local land trust	11/6/2016 1:42 AM
3	replaced old roof	11/4/2016 6:27 AM

Q17 If you could choose one action that could be taken in your community to reduce risks to hazards and the disasters associated with these hazards, what would it be?

Answered: 11 Skipped: 5

#	Responses	Date
1	Streamline processes (including grants) for work to protect properties from hazards	1/10/2017 3:46 AM
2	Protect roads from post flooding damage. Allow for flooding which is inevitable but allow for unimpeded run off.	12/7/2016 8:05 AM
3	I expect the power to be off for an extended period of time. Will possibly need convenient food and water. Means of communication and transport after flooding.	12/1/2016 5:35 AM
4	encourage more volunteerism for emergency services	11/21/2016 7:34 AM
5	Define some community supply stockpile for food, water and basic shelter. Don't rely on retail supply chains.	11/9/2016 7:09 AM
6	Set aside the future coastal floodplain as open space area	11/7/2016 9:12 AM
7	Preparation	11/6/2016 3:40 PM
8	Improve infastructure to prevent erosion and support drainage	11/6/2016 11:38 AM
9	Clean out all waterways, rivers and ponds a priority. Better repairing of dams	11/6/2016 6:18 AM
10	To hear what the elected officials (selectmen / board of finance) are planning to do regarding sea level rise and how it will be paid for	11/6/2016 1:42 AM
11	don't know	11/4/2016 6:27 AM

Q18 Please provide any additional comments or questions to be addressed as these communities update their hazard mitigation plan.

Answered: 6 Skipped: 10

#	Responses	Date
1	Where does the current plan reside?	12/7/2016 8:05 AM
2	Recommend supplemental local power systems (solar?) for battery operated devices. This could be standardized and purchased in bulk. Need a standard communications system detailing what is open, closed, impassible, food/water location. Website? AM/FM radio with local transmitter?	12/1/2016 5:35 AM
3	Please coordinate with Stonington's Coastal Resiliency Plan, currently underway (http://www.stonington-ct.gov/home/news/stonington-resiliency-plan)	11/7/2016 9:12 AM
4	All communities need to take a closer look at the public safety side of hazards and have plans to increase efficiency and staffing during and after disasters	11/6/2016 11:38 AM
5	Make the plan real and realistic. Know your true resources, in a major event, for the first hrs or days the community you will be alone.	11/6/2016 6:18 AM
6	Sea level rise needs to be addressed regionally and not just at the town level.	11/6/2016 1:42 AM

Q19 If you wish to be notified of the progress in updating the Hazard Mitigation Plan, or provided a question you would like answered, please provide your name and email address.

Answered: 10 Skipped: 6

Answer Choices	Responses	
Name	90.00%	9
Email Address	90.00%	9

#	Name	Date
1	Susan Tamulevich	1/10/2017 3:46 AM
2	charles a primiano	12/7/2016 8:05 AM
3	Bernard Chalecki	12/1/2016 5:35 AM
4	Carol Zeilman	11/15/2016 1:09 PM
5	Homeowner	11/9/2016 7:09 AM
6	Ben Baldwin	11/7/2016 9:12 AM
7	Jacob Reagan	11/6/2016 11:38 AM
8	Robert Ladd	11/6/2016 6:18 AM
9	Amanda	11/4/2016 6:27 AM
#	**Email Address**	**Date**
1	nlmaritimedirector@gmail.com	1/10/2017 3:46 AM
2	twonafsh@aol.com	12/7/2016 8:05 AM
3	bchalecki@gmail.com	12/1/2016 5:35 AM
4	czeilman@comcast.net	11/15/2016 1:09 PM
5	nlday@sbcglobal.net	11/9/2016 7:09 AM
6	bhbaldwin@hotmail.com	11/7/2016 9:12 AM
7	Jakescs@msn.com	11/6/2016 11:38 AM
8	143 Fitchville Rd Bozrah Ct	11/6/2016 6:18 AM
9	rnewton06355@gmail.com	11/6/2016 1:42 AM

APPENDIX C

PROJECT WORKSHEET FOR EVALUATION OF RECOMMENDATIONS

Mitigation Action Progress Report Form

Progress Report Period	From Date:	To Date:
Action/Project Title		
Responsible Agency		
Contact Name		
Contact Phone/Email		
Project Status	❑ Project completed ❑ Project canceled ❑ Project on schedule ❑ Anticipated completion date:_____ ❑ Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

_____

_____

2. What obstacles, problems, or delays did the project encounter?

_____

_____

3. If uncompleted, is the project still relevant? Should the project be changed or revised?

_____

_____

4. Other comments

_____

_____

APPENDIX D

HAZUS-MH OUTPUT

HAZUS
Earthquake Results

Hazus-MH: Earthquake Global Risk Report

Region Name: SCCOG

Earthquake Scenario: East Haddam 6.4

Print Date: April 06, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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Transportation and Utility Lifeline Inventory	
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General Description of the Region

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

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 616.74 square miles and contains 66 census tracts. There are over 110 thousand households in the region which has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 (millions of dollars). Approximately 91.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 11,073 and 1,879 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 103 thousand buildings in the region which have an aggregate total replacement value of 36,944 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 82% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 69 hazardous material sites, 0 military installations and 1 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 12,952.00 (millions of dollars). This inventory includes over 668 kilometers of highways, 347 bridges, 22,643 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

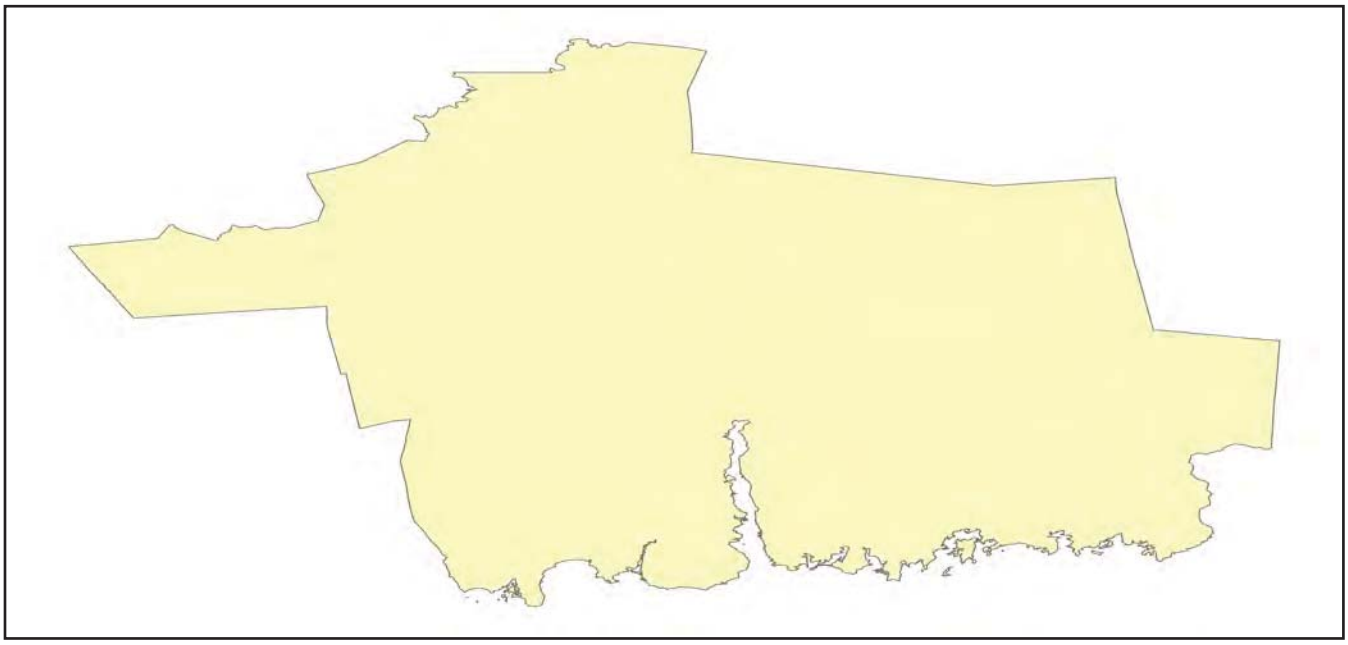
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	347	6,531.80
	Segments	276	3,902.60
	Tunnels	0	0.00
		Subtotal	**10,434.50**
Railways	Bridges	6	0.40
	Facilities	4	10.70
	Segments	76	249.30
	Tunnels	0	0.00
		Subtotal	**260.30**
Light Rail	Bridges	0	0.00
	Facilities	1	2.70
	Segments	6	133.70
	Tunnels	0	0.00
		Subtotal	**136.30**
Bus	Facilities	5	6.30
		Subtotal	**6.30**
Ferry	Facilities	2	2.70
		Subtotal	**2.70**
Port	Facilities	30	59.90
		Subtotal	**59.90**
Airport	Facilities	2	21.30
	Runways	4	151.90
		Subtotal	**173.20**
		Total	**11,073.10**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	226.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**226.40**
Waste Water	Distribution Lines	NA	135.90
	Facilities	12	919.10
	Pipelines	0	0.00
		Subtotal	**1,054.90**
Natural Gas	Distribution Lines	NA	90.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**90.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	4	506.00
		Subtotal	**506.00**
Communication	Facilities	15	1.70
		Subtotal	**1.70**
		Total	**1,879.70**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	East Haddam 6.4
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.40
Latitude of Epicenter	41.50
Earthquake Magnitude	6.40
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Building Damage

Building Damage

Hazus estimates that about 26,667 buildings will be at least moderately damaged. This is over 26.00 % of the buildings in the region. There are an estimated 4,186 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

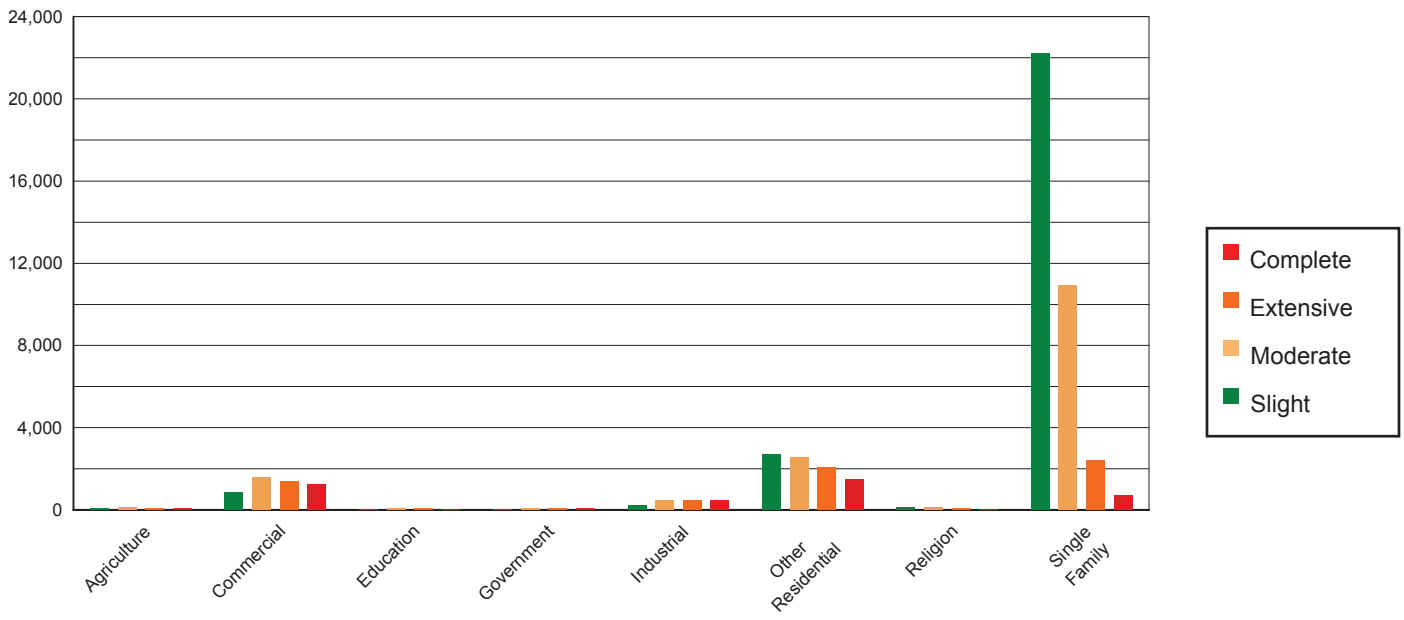


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	61	0.12	66	0.25	120	0.76	96	1.45	94	2.24
Commercial	908	1.79	833	3.18	1,571	9.91	1,397	21.10	1,246	29.77
Education	42	0.08	37	0.14	74	0.47	69	1.05	55	1.32
Government	35	0.07	33	0.13	76	0.48	81	1.22	73	1.74
Industrial	240	0.47	209	0.80	450	2.84	464	7.00	460	11.00
Other Residential	4,868	9.61	2,699	10.30	2,544	16.04	2,043	30.86	1,515	36.19
Religion	187	0.37	106	0.40	106	0.67	74	1.12	52	1.24
Single Family	44,291	87.48	22,214	84.80	10,919	68.85	2,398	36.21	691	16.51
Total	**50,632**		**26,196**		**15,859**		**6,622**		**4,186**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	47,312	93.44	23606	90.11	11,398	71.87	2,291	34.60	417	9.96
Steel	356	0.70	370	1.41	1,119	7.06	1,374	20.74	1,345	32.12
Concrete	82	0.16	84	0.32	271	1.71	334	5.04	290	6.94
Precast	44	0.09	29	0.11	79	0.50	98	1.48	89	2.13
RM	389	0.77	179	0.68	407	2.56	408	6.16	252	6.02
URM	2,082	4.11	1528	5.83	1,754	11.06	1,027	15.51	859	20.51
MH	368	0.73	401	1.53	832	5.25	1,091	16.47	934	22.32
Total	**50,632**		**26,196**		**15,859**		**6,622**		**4,186**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 499 hospital beds available for use. On the day of the earthquake, the model estimates that only 122 hospital beds (25.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 47.00% of the beds will be back in service. By 30 days, 75.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	3	2	0	0
Schools	132	76	7	6
EOCs	9	5	1	0
PoliceStations	26	12	3	1
FireStations	49	22	4	2

Transportation Lifeline Damage

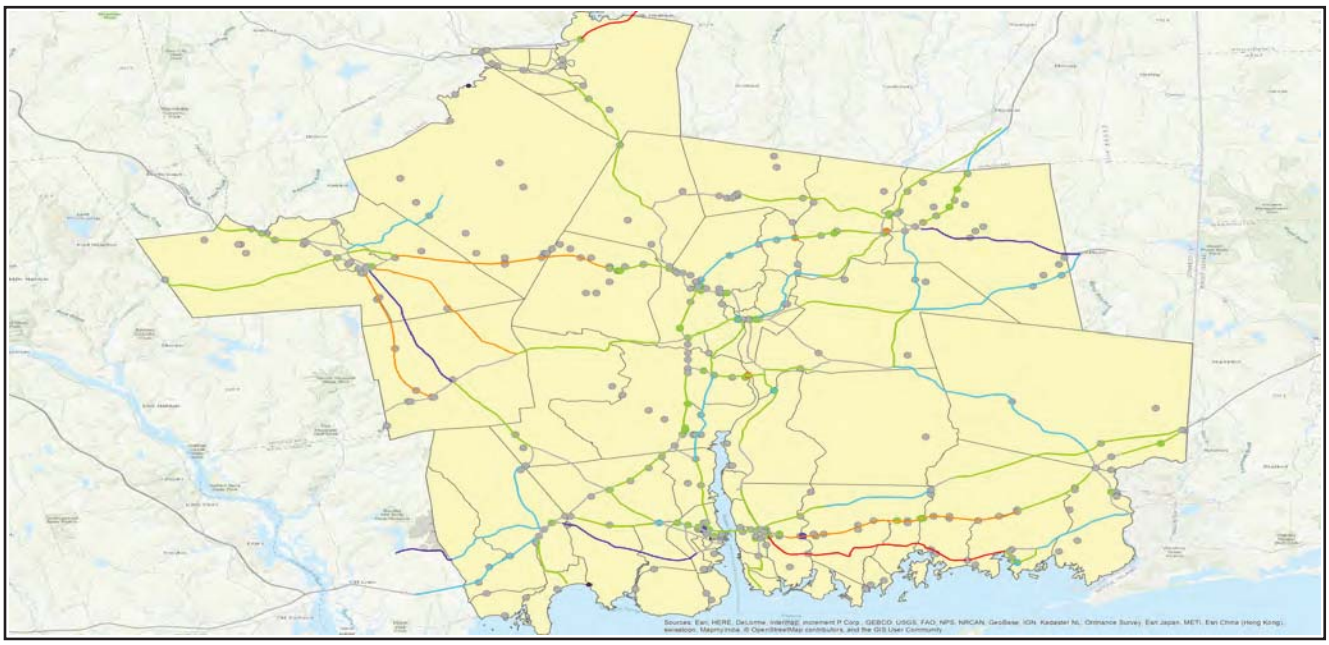


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	276	0	0	276	276
	Bridges	347	122	16	228	284
	Tunnels	0	0	0	0	0
Railways	Segments	76	0	0	76	76
	Bridges	6	0	0	6	6
	Tunnels	0	0	0	0	0
	Facilities	4	0	0	4	4
Light Rail	Segments	6	0	0	6	6
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	1	0	0	1	1
Bus	Facilities	5	1	0	4	4
Ferry	Facilities	2	0	0	2	2
Port	Facilities	30	0	0	30	30
Airport	Facilities	2	0	0	2	2
	Runways	4	0	0	4	4

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	12	2	0	2	12
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	4	2	0	0	4
Communication	15	7	0	15	15

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	11,322	3053	763
Waste Water	6,793	2188	547
Natural Gas	4,529	628	157
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	110,756	32,651	29,235	22,757	0	0
Electric Power		29,186	18,011	7,754	1,799	38

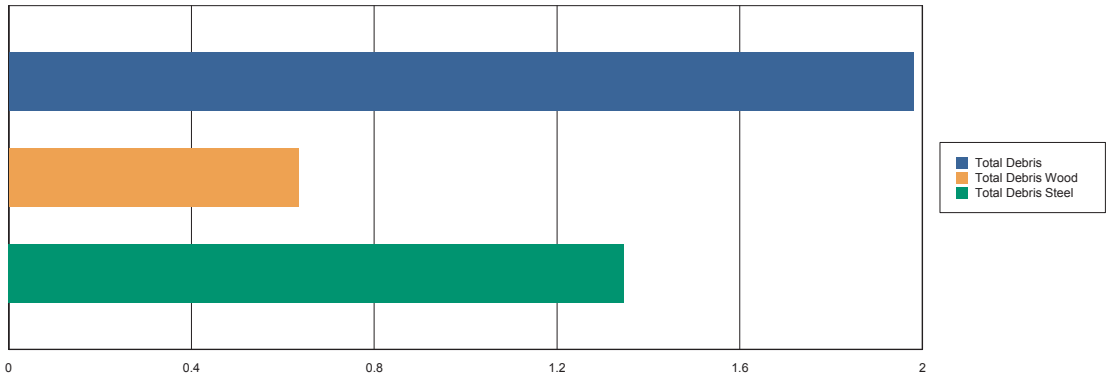
Induced Earthquake Damage

Debris Generation

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

The model estimates that a total of 1.98 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 32.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 79,240 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



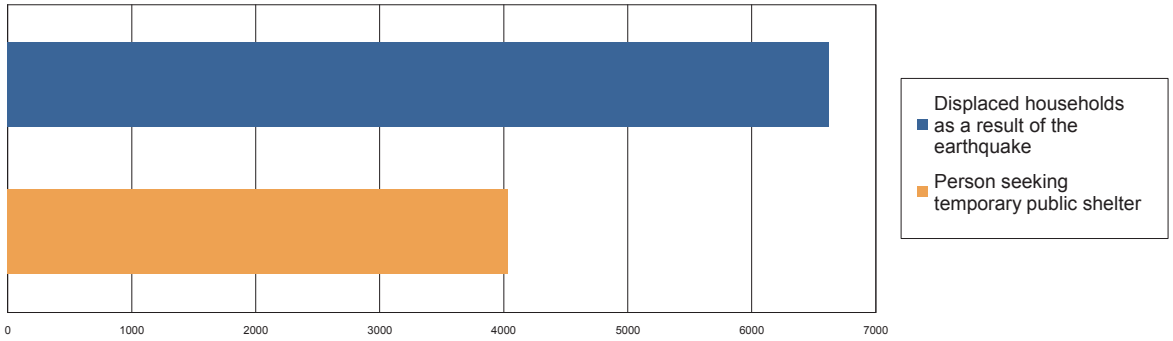
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.63	1.35	1.98	79,240 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 6,620 households to be displaced due to the earthquake. Of these, 4,033 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
6,620	4,033

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	41	12	2	3
	Commuting	0	0	1	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	66	20	3	6
	Other-Residential	888	251	38	75
	Single Family	354	75	9	18
	Total	**1,350**	**358**	**53**	**103**
2 PM	Commercial	2,322	669	101	197
	Commuting	2	3	5	1
	Educational	1,083	324	53	103
	Hotels	0	0	0	0
	Industrial	492	145	23	44
	Other-Residential	171	48	7	14
	Single Family	67	15	2	3
	Total	**4,137**	**1,205**	**191**	**363**
5 PM	Commercial	1,655	477	73	140
	Commuting	42	58	96	19
	Educational	123	36	6	11
	Hotels	0	0	0	0
	Industrial	307	91	14	28
	Other-Residential	345	98	15	29
	Single Family	141	31	4	7
	Total	**2,612**	**790**	**208**	**233**

Economic Loss

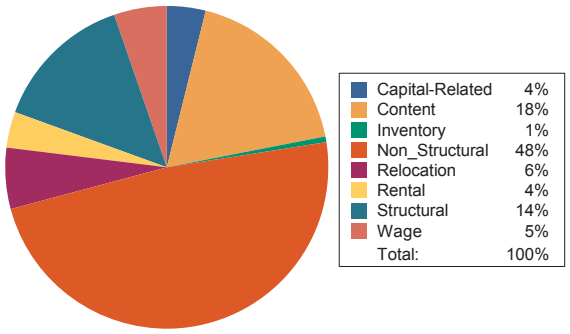
The total economic loss estimated for the earthquake is 8,547.13 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 7,474.06 (millions of dollars); 19 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 44 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

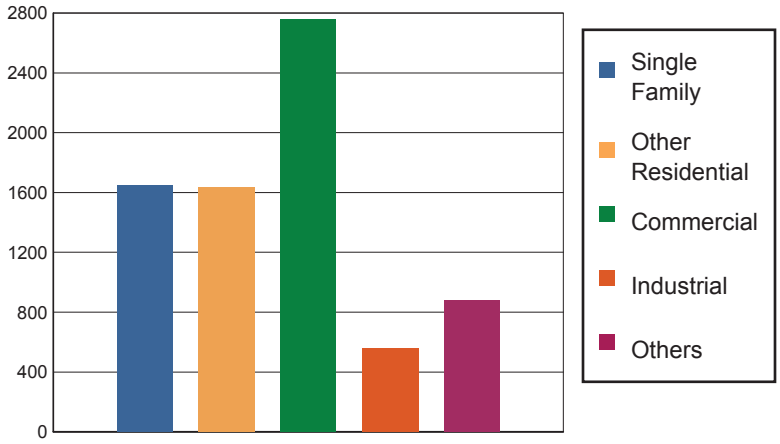


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	70.45	288.28	10.38	33.21	402.33
	Capital-Related	0.00	30.03	254.72	6.34	7.57	298.66
	Rental	31.79	111.11	107.14	3.22	12.66	265.92
	Relocation	111.60	56.06	171.63	16.59	95.12	451.00
	Subtotal	**143.39**	**267.65**	**821.78**	**36.54**	**148.56**	**1,417.91**
Capital Stock Losses							
	Structural	206.91	237.02	376.44	78.55	161.16	1,060.07
	Non_Structural	961.46	928.66	1,071.36	260.82	381.60	3,603.91
	Content	335.10	200.43	475.79	156.16	183.10	1,350.58
	Inventory	0.00	0.00	11.25	24.96	5.38	41.59
	Subtotal	**1,503.48**	**1,366.11**	**1,934.85**	**520.48**	**731.23**	**6,056.15**
	Total	**1,646.86**	**1,633.76**	**2,756.63**	**557.02**	**879.79**	**7,474.06**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	3,902.65	$0.00	0.00
	Bridges	6,531.81	$854.39	13.08
	Tunnels	0.00	$0.00	0.00
	Subtotal	**10,434**	**854.40**	
Railways	Segments	249.25	$0.00	0.00
	Bridges	0.40	$0.00	1.22
	Tunnels	0.00	$0.00	0.00
	Facilities	10.65	$2.28	21.42
	Subtotal	**260**	**2.30**	
Light Rail	Segments	133.65	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	2.66	$0.55	20.67
	Subtotal	**136**	**0.60**	
Bus	Facilities	6.27	$1.96	31.31
	Subtotal	**6**	**2.00**	
Ferry	Facilities	2.66	$0.55	20.75
	Subtotal	**3**	**0.60**	
Port	Facilities	59.91	$12.66	21.13
	Subtotal	**60**	**12.70**	
Airport	Facilities	21.30	$3.81	17.88
	Runways	151.86	$0.00	0.00
	Subtotal	**173**	**3.80**	
	Total	**11,073.10**	**876.20**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	226.40	$13.74	6.07
	Subtotal	**226.44**	**$13.74**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	919.10	$96.27	10.47
	Distribution Lines	135.90	$9.85	7.25
	Subtotal	**1,054.94**	**$106.11**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	90.60	$2.82	3.12
	Subtotal	**90.58**	**$2.82**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	506.00	$73.89	14.60
	Subtotal	**506.00**	**$73.89**	
Communication	Facilities	1.70	$0.29	16.71
	Subtotal	**1.73**	**$0.29**	
	Total	**1,879.68**	**$196.85**	

Appendix A: County Listing for the Region

New London,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	261,443	26,302	8,030	34,332
	Windham	25,268	1,887	723	2,611
Total State		**286,711**	**28,189**	**8,753**	**36,943**
Total Region		**286,711**	**28,189**	**8,753**	**36,943**

Hazus-MH: Earthquake Global Risk Report

Region Name: SCOG

Earthquake Scenario: Haddam 5.7

Print Date: June 21, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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Appendix A: County Listing for the Region

Appendix B: Regional Population and Building Value Data

General Description of the Region

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

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 616.74 square miles and contains 66 census tracts. There are over 110 thousand households in the region which has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 (millions of dollars). Approximately 91.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 11,073 and 1,879 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 103 thousand buildings in the region which have an aggregate total replacement value of 36,944 (millions of dollars). Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 82% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 69 hazardous material sites, 0 military installations and 1 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 12,952.00 (millions of dollars). This inventory includes over 668 kilometers of highways, 347 bridges, 22,643 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

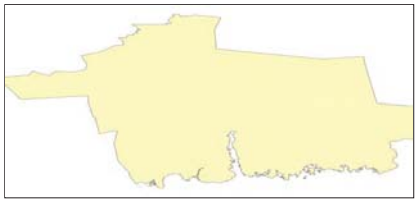
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	347	6,531.80
	Segments	276	3,902.60
	Tunnels	0	0.00
	Subtotal		**10,434.50**
Railways	Bridges	6	0.40
	Facilities	4	10.70
	Segments	76	249.30
	Tunnels	0	0.00
	Subtotal		**260.30**
Light Rail	Bridges	0	0.00
	Facilities	1	2.70
	Segments	6	133.70
	Tunnels	0	0.00
	Subtotal		**136.30**
Bus	Facilities	5	6.30
	Subtotal		**6.30**
Ferry	Facilities	2	2.70
	Subtotal		**2.70**
Port	Facilities	30	59.90
	Subtotal		**59.90**
Airport	Facilities	2	21.30
	Runways	4	151.90
	Subtotal		**173.20**
	Total		**11,073.10**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	226.40
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		**226.40**
Waste Water	Distribution Lines	NA	135.90
	Facilities	12	919.10
	Pipelines	0	0.00
	Subtotal		**1,054.90**
Natural Gas	Distribution Lines	NA	90.60
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		**90.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		**0.00**
Electrical Power	Facilities	4	506.00
	Subtotal		**506.00**
Communication	Facilities	15	1.70
	Subtotal		**1.70**
	Total		**1,879.70**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Haddam 5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.55
Latitude of Epicenter	41.47
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Building Damage

Building Damage

Hazus estimates that about 4,792 buildings will be at least moderately damaged. This is over 5.00 % of the buildings in the region. There are an estimated 142 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

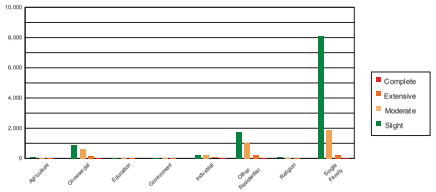


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	313	0.36	69	0.61	41	1.05	12	1.59	2	1.75
Commercial	4,262	4.87	866	7.74	612	15.65	174	23.61	41	28.38
Education	203	0.23	40	0.35	28	0.70	6	0.86	1	0.87
Government	210	0.24	44	0.39	34	0.86	9	1.22	2	1.36
Industrial	1,276	1.46	256	2.29	207	5.30	65	8.87	18	12.37
Other Residential	10,607	12.12	1,756	15.51	1,046	26.75	231	31.29	49	34.53
Religion	414	0.47	64	0.57	37	0.93	9	1.22	1	1.04
Single Family	70,225	80.25	8,120	72.54	1,907	48.76	231	31.34	28	19.70
Total	**87,509**		**11,194**		**3,912**		**737**		**143**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	74,742	85.41	8392	74.97	1,738	44.42	143	19.43	7	4.69
Steel	3,132	3.58	649	5.80	571	14.59	167	22.69	45	31.37
Concrete	747	0.85	149	1.33	127	3.25	30	4.08	7	4.91
Precast	238	0.27	40	0.36	43	1.09	17	2.31	2	1.63
RM	1,322	1.51	143	1.28	126	3.23	40	5.40	3	2.37
URM	5,068	5.79	1167	10.42	751	19.20	217	29.41	47	33.01
MH	2,261	2.58	654	5.85	556	14.22	123	16.67	31	22.02
Total	**87,509**		**11,194**		**3,912**		**737**		**143**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 499 hospital beds available for use. On the day of the earthquake, the model estimates that only 335 hospital beds (67.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 84.00% of the beds will be back in service. By 30 days, 96.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	3	0	0	3
Schools	132	0	0	126
EOCs	9	0	0	8
PoliceStations	26	0	0	23
FireStations	49	0	0	47

Transportation Lifeline Damage



Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	276	0	0	276	276
	Bridges	347	3	0	346	346
	Tunnels	0	0	0	0	0
Railways	Segments	76	0	0	76	76
	Bridges	6	0	0	6	6
	Tunnels	0	0	0	0	0
	Facilities	4	0	0	4	4
Light Rail	Segments	6	0	0	6	6
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	1	0	0	1	1
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	2	0	0	2	2
Port	Facilities	30	0	0	30	30
Airport	Facilities	2	0	0	2	2
	Runways	4	0	0	4	4

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	12	0	0	12	12
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	4	0	0	4	4
Communication	15	0	0	15	15

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	11,322	333	83
Waste Water	6,793	239	60
Natural Gas	4,529	68	17
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	110,756	34	0	0	0	0
Electric Power		2,060	1,042	285	35	3

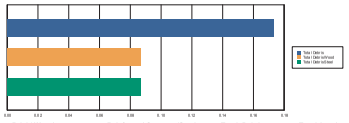
Induced Earthquake Damage

Debris Generation

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

The model estimates that a total of 0.17 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 50.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truck-loads, it will require 6,920 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



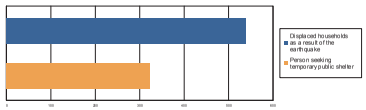
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.09	0.09	0.17	6,920 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 539 households to be displaced due to the earthquake. Of these, 322 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

Displaced Households / Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
539	322

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	3	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	4	1	0	0
	Other-Residential	59	11	1	2
	Single Family	39	5	0	1
	Total	**104**	**17**	**2**	**3**
2 PM	Commercial	152	32	4	8
	Commuting	0	0	0	0
	Educational	69	15	2	4
	Hotels	0	0	0	0
	Industrial	31	7	1	2
	Other-Residential	11	2	0	0
	Single Family	7	1	0	0
	Total	**270**	**57**	**8**	**14**
5 PM	Commercial	108	23	3	6
	Commuting	2	3	5	1
	Educational	6	1	0	0
	Hotels	0	0	0	0
	Industrial	19	4	1	1
	Other-Residential	23	4	0	1
	Single Family	15	2	0	0
	Total	**174**	**37**	**9**	**9**

Economic Loss

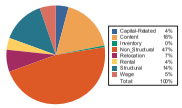
The total economic loss estimated for the earthquake is 872.52 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 762.31 (millions of dollars); 21% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 54 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

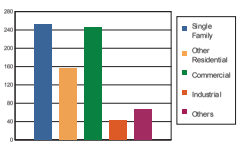


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	5.16	31.33	1.02	3.27	40.77
	Capital-Related	0.00	2.20	27.44	0.61	0.59	30.84
	Rental	4.27	11.90	13.23	0.37	1.14	30.91
	Relocation	14.53	7.68	20.52	2.24	8.87	53.84
	Subtotal	**18.80**	**26.93**	**92.52**	**4.24**	**13.87**	**156.36**
Capital Stock Losses							
	Structural	30.34	23.31	33.87	6.97	12.63	107.13
	Non_Structural	149.25	85.22	80.35	18.40	25.87	359.09
	Content	53.92	20.51	37.58	11.12	13.60	136.73
	Inventory	0.00	0.00	0.84	1.80	0.35	3.00
	Subtotal	**233.51**	**129.04**	**152.64**	**38.30**	**52.45**	**605.95**
	Total	**252.31**	**155.98**	**245.17**	**42.54**	**66.32**	**762.31**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	3,902.65	$0.00	0.00
	Bridges	6,531.81	$69.14	1.06
	Tunnels	0.00	$0.00	0.00
	Subtotal	**10,434**	**69.10**	
Railways	Segments	249.25	$0.00	0.00
	Bridges	0.40	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	10.65	$0.77	7.26
	Subtotal	**260**	**0.80**	
Light Rail	Segments	133.65	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	2.66	$0.20	7.63
	Subtotal	**136**	**0.20**	
Bus	Facilities	6.27	$0.63	10.13
	Subtotal	**6**	**0.60**	
Ferry	Facilities	2.66	$0.20	7.63
	Subtotal	**3**	**0.20**	
Port	Facilities	59.91	$4.59	7.66
	Subtotal	**60**	**4.60**	
Airport	Facilities	21.30	$1.34	6.29
	Runways	151.86	$0.00	0.00
	Subtotal	**173**	**1.30**	
	Total	**11,073.10**	**76.90**	

Table 13: Utility System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	226.40	$1.50	0.66
	Subtotal	**226.44**	**$1.50**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	919.10	$16.49	1.79
	Distribution Lines	135.90	$1.07	0.79
	Subtotal	**1,054.94**	**$17.57**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	90.60	$0.31	0.34
	Subtotal	**90.58**	**$0.31**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	506.00	$13.90	2.75
	Subtotal	**506.00**	**$13.90**	
Communication	Facilities	1.70	$0.05	2.96
	Subtotal	**1.73**	**$0.05**	
	Total	**1,879.68**	**$33.32**	

Appendix A: County Listing for the Region

New London,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	261,443	26,302	8,030	34,332
	Windham	25,268	1,887	723	2,611
Total State		**286,711**	**28,189**	**8,753**	**36,943**
Total Region		**286,711**	**28,189**	**8,753**	**36,943**

Hazus-MH: Earthquake Global Risk Report

Region Name: SCCOG

Earthquake Scenario: Portland 5.7

Print Date: May 10, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 616.74 square miles and contains 66 census tracts. There are over 110 thousand households in the region which has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 (millions of dollars). Approximately 91.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 11,073 and 1,879 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 103 thousand buildings in the region which have an aggregate total replacement value of 36,944 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 82% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 69 hazardous material sites, 0 military installations and 1 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 12,952.00 (millions of dollars). This inventory includes over 668 kilometers of highways, 347 bridges, 22,643 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

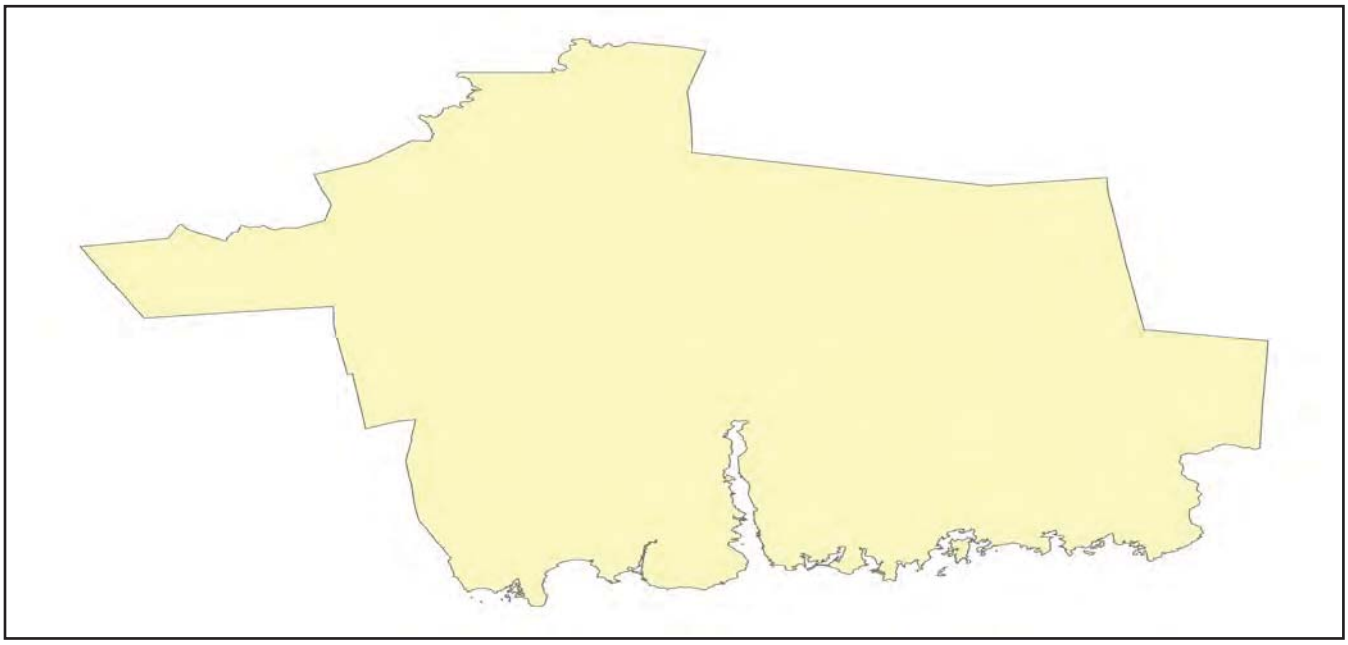
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	347	6,531.80
	Segments	276	3,902.60
	Tunnels	0	0.00
		Subtotal	**10,434.50**
Railways	Bridges	6	0.40
	Facilities	4	10.70
	Segments	76	249.30
	Tunnels	0	0.00
		Subtotal	**260.30**
Light Rail	Bridges	0	0.00
	Facilities	1	2.70
	Segments	6	133.70
	Tunnels	0	0.00
		Subtotal	**136.30**
Bus	Facilities	5	6.30
		Subtotal	**6.30**
Ferry	Facilities	2	2.70
		Subtotal	**2.70**
Port	Facilities	30	59.90
		Subtotal	**59.90**
Airport	Facilities	2	21.30
	Runways	4	151.90
		Subtotal	**173.20**
		Total	**11,073.10**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	226.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**226.40**
Waste Water	Distribution Lines	NA	135.90
	Facilities	12	919.10
	Pipelines	0	0.00
		Subtotal	**1,054.90**
Natural Gas	Distribution Lines	NA	90.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**90.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	4	506.00
		Subtotal	**506.00**
Communication	Facilities	15	1.70
		Subtotal	**1.70**
		Total	**1,879.70**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Portland 5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.60
Latitude of Epicenter	41.60
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Building Damage

Building Damage

Hazus estimates that about 3,511 buildings will be at least moderately damaged. This is over 3.00 % of the buildings in the region. There are an estimated 94 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

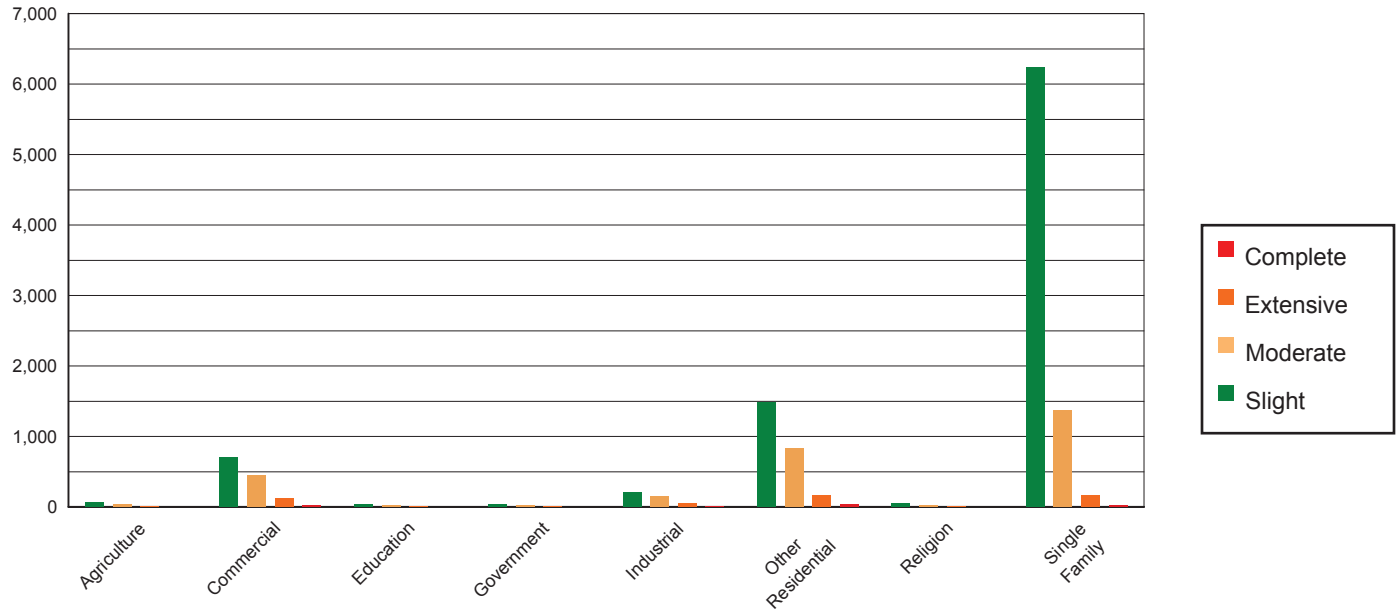


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	334	0.37	60	0.68	33	1.14	9	1.70	2	1.76
Commercial	4,662	5.11	706	8.00	444	15.26	117	22.89	26	27.94
Education	224	0.25	31	0.35	19	0.64	4	0.74	1	0.75
Government	233	0.26	35	0.40	23	0.80	5	1.06	1	1.19
Industrial	1,399	1.54	213	2.41	153	5.27	45	8.80	12	12.52
Other Residential	11,148	12.23	1,487	16.85	838	28.85	163	31.78	33	34.81
Religion	438	0.48	52	0.59	27	0.94	6	1.21	1	1.00
Single Family	72,723	79.77	6,239	70.71	1,369	47.10	163	31.82	19	20.03
Total	**91,161**		**8,823**		**2,906**		**511**		**94**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	77,313	84.81	6398	72.52	1,211	41.67	96	18.76	4	4.28
Steel	3,502	3.84	525	5.95	399	13.73	108	21.11	29	30.64
Concrete	828	0.91	120	1.36	88	3.04	19	3.78	5	4.83
Precast	259	0.28	34	0.39	33	1.15	12	2.35	1	1.48
RM	1,386	1.52	119	1.35	97	3.35	28	5.56	2	2.22
URM	5,416	5.94	1021	11.58	615	21.16	164	32.16	33	34.99
MH	2,456	2.69	604	6.85	462	15.90	83	16.28	20	21.57
Total	**91,161**		**8,823**		**2,906**		**511**		**94**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 499 hospital beds available for use. On the day of the earthquake, the model estimates that only 349 hospital beds (70.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 86.00% of the beds will be back in service. By 30 days, 97.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	3	0	0	3
Schools	132	0	0	127
EOCs	9	0	0	8
PoliceStations	26	0	0	24
FireStations	49	0	0	49

Transportation Lifeline Damage

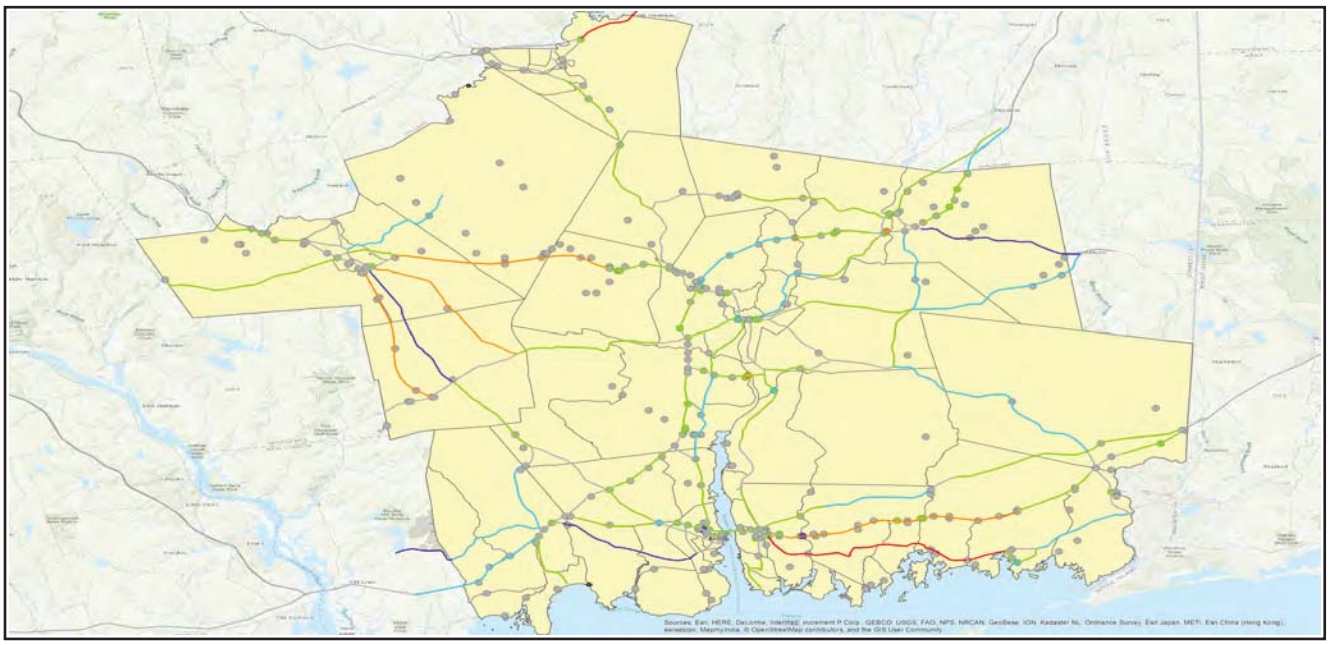


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	276	0	0	276	276
	Bridges	347	5	0	344	346
	Tunnels	0	0	0	0	0
Railways	Segments	76	0	0	76	76
	Bridges	6	0	0	6	6
	Tunnels	0	0	0	0	0
	Facilities	4	0	0	4	4
Light Rail	Segments	6	0	0	6	6
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	1	0	0	1	1
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	2	0	0	2	2
Port	Facilities	30	0	0	30	30
Airport	Facilities	2	0	0	2	2
	Runways	4	0	0	4	4

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	12	0	0	12	12
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	4	0	0	4	4
Communication	15	0	0	15	15

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	11,322	244	61
Waste Water	6,793	175	44
Natural Gas	4,529	50	13
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	110,756	0	0	0	0	0
Electric Power		1,940	913	223	23	3

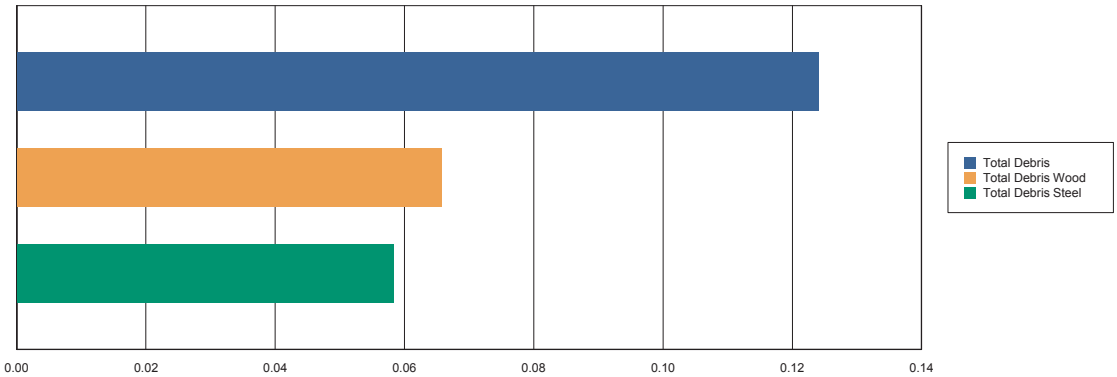
Induced Earthquake Damage

Debris Generation

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

The model estimates that a total of 0.12 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 53.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 4,960 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



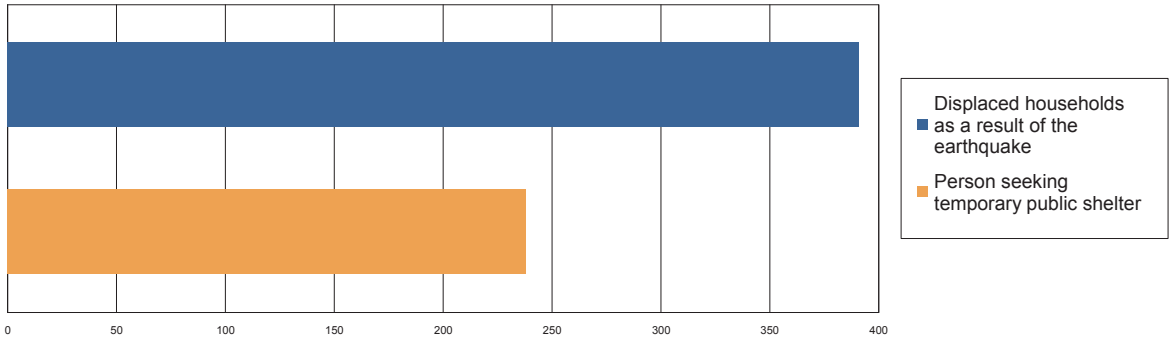
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.07	0.06	0.12	4,960 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 391 households to be displaced due to the earthquake. Of these, 238 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
391	238

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	2	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	3	1	0	0
	Other-Residential	43	7	1	2
	Single Family	28	4	0	1
	Total	**76**	**12**	**1**	**2**
2 PM	Commercial	106	22	3	5
	Commuting	0	0	0	0
	Educational	49	11	1	3
	Hotels	0	0	0	0
	Industrial	20	4	1	1
	Other-Residential	8	1	0	0
	Single Family	5	1	0	0
	Total	**189**	**39**	**5**	**9**
5 PM	Commercial	75	16	2	4
	Commuting	2	2	3	1
	Educational	5	1	0	0
	Hotels	0	0	0	0
	Industrial	13	3	0	1
	Other-Residential	17	3	0	1
	Single Family	11	1	0	0
	Total	**122**	**26**	**6**	**6**

Economic Loss

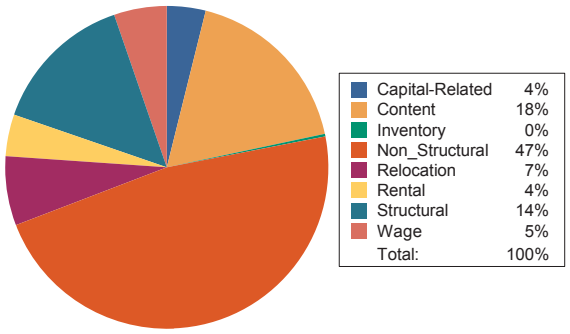
The total economic loss estimated for the earthquake is 602.54 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 528.55 (millions of dollars); 20 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 54 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

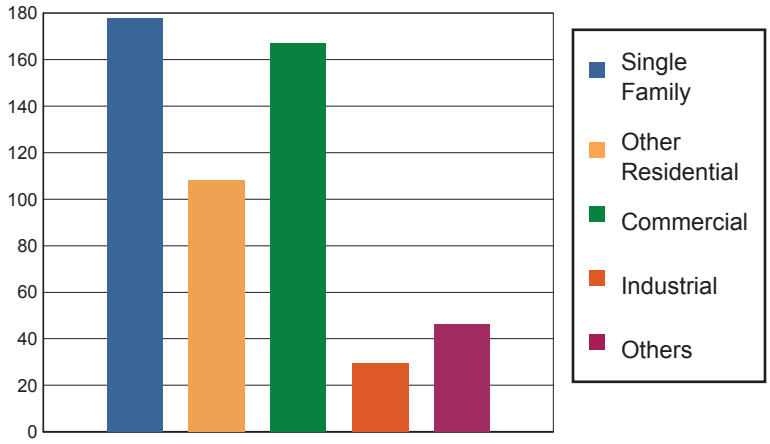


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	3.02	21.54	0.70	2.22	27.48
	Capital-Related	0.00	1.29	18.92	0.42	0.40	21.03
	Rental	3.06	8.43	9.20	0.26	0.75	21.70
	Relocation	10.34	5.70	13.94	1.57	5.89	37.44
	Subtotal	**13.41**	**18.44**	**63.60**	**2.95**	**9.26**	**107.65**
Capital Stock Losses							
	Structural	22.12	16.72	23.15	4.79	9.62	76.41
	Non_Structural	105.65	59.13	54.47	12.71	17.54	249.50
	Content	36.78	13.79	25.34	7.66	9.30	92.87
	Inventory	0.00	0.00	0.58	1.23	0.31	2.13
	Subtotal	**164.56**	**89.63**	**103.55**	**26.39**	**36.77**	**420.91**
	Total	**177.96**	**108.07**	**167.15**	**29.34**	**46.02**	**528.55**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	3,902.65	$0.00	0.00
	Bridges	6,531.81	$47.58	0.73
	Tunnels	0.00	$0.00	0.00
	Subtotal	**10,434**	**47.60**	
Railways	Segments	249.25	$0.00	0.00
	Bridges	0.40	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	10.65	$0.64	6.04
	Subtotal	**260**	**0.60**	
Light Rail	Segments	133.65	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	2.66	$0.12	4.58
	Subtotal	**136**	**0.10**	
Bus	Facilities	6.27	$0.62	9.91
	Subtotal	**6**	**0.60**	
Ferry	Facilities	2.66	$0.12	4.59
	Subtotal	**3**	**0.10**	
Port	Facilities	59.91	$2.81	4.69
	Subtotal	**60**	**2.80**	
Airport	Facilities	21.30	$1.29	6.04
	Runways	151.86	$0.00	0.00
	Subtotal	**173**	**1.30**	
	Total	**11,073.10**	**53.20**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	226.40	$1.10	0.48
	Subtotal	**226.44**	**$1.10**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	919.10	$10.53	1.15
	Distribution Lines	135.90	$0.79	0.58
	Subtotal	**1,054.94**	**$11.31**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	90.60	$0.23	0.25
	Subtotal	**90.58**	**$0.23**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	506.00	$8.13	1.61
	Subtotal	**506.00**	**$8.13**	
Communication	Facilities	1.70	$0.04	2.13
	Subtotal	**1.73**	**$0.04**	
	Total	**1,879.68**	**$20.80**	

Appendix A: County Listing for the Region

New London,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	261,443	26,302	8,030	34,332
	Windham	25,268	1,887	723	2,611
Total State		**286,711**	**28,189**	**8,753**	**36,943**
Total Region		**286,711**	**28,189**	**8,753**	**36,943**

Hazus-MH: Earthquake Global Risk Report

Region Name: SCCOG

Earthquake Scenario: Stamford 5.7

Print Date: May 10, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 616.74 square miles and contains 66 census tracts. There are over 110 thousand households in the region which has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 (millions of dollars). Approximately 91.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 11,073 and 1,879 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 103 thousand buildings in the region which have an aggregate total replacement value of 36,944 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 82% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 69 hazardous material sites, 0 military installations and 1 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 12,952.00 (millions of dollars). This inventory includes over 668 kilometers of highways, 347 bridges, 22,643 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

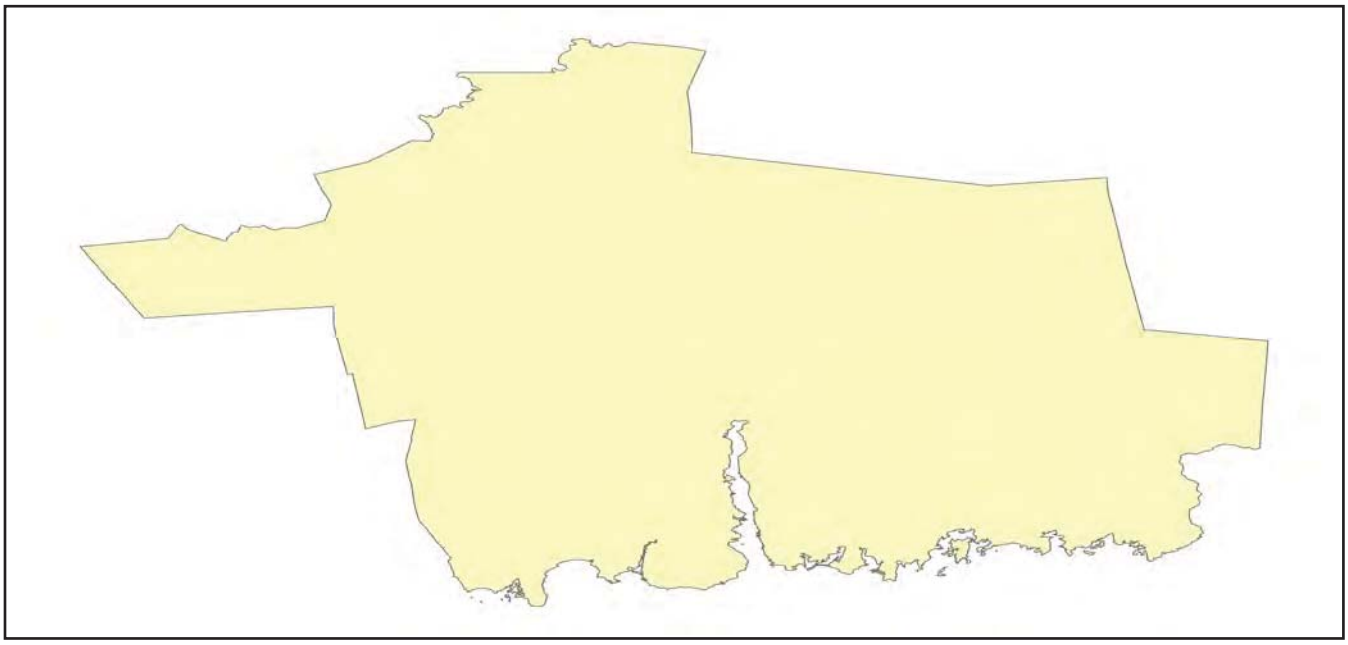
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	347	6,531.80
	Segments	276	3,902.60
	Tunnels	0	0.00
		Subtotal	**10,434.50**
Railways	Bridges	6	0.40
	Facilities	4	10.70
	Segments	76	249.30
	Tunnels	0	0.00
		Subtotal	**260.30**
Light Rail	Bridges	0	0.00
	Facilities	1	2.70
	Segments	6	133.70
	Tunnels	0	0.00
		Subtotal	**136.30**
Bus	Facilities	5	6.30
		Subtotal	**6.30**
Ferry	Facilities	2	2.70
		Subtotal	**2.70**
Port	Facilities	30	59.90
		Subtotal	**59.90**
Airport	Facilities	2	21.30
	Runways	4	151.90
		Subtotal	**173.20**
		Total	**11,073.10**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	226.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**226.40**
Waste Water	Distribution Lines	NA	135.90
	Facilities	12	919.10
	Pipelines	0	0.00
		Subtotal	**1,054.90**
Natural Gas	Distribution Lines	NA	90.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**90.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	4	506.00
		Subtotal	**506.00**
Communication	Facilities	15	1.70
		Subtotal	**1.70**
		Total	**1,879.70**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Stamford 5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-73.60
Latitude of Epicenter	41.15
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Building Damage

Building Damage

Hazus estimates that about 437 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 2 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

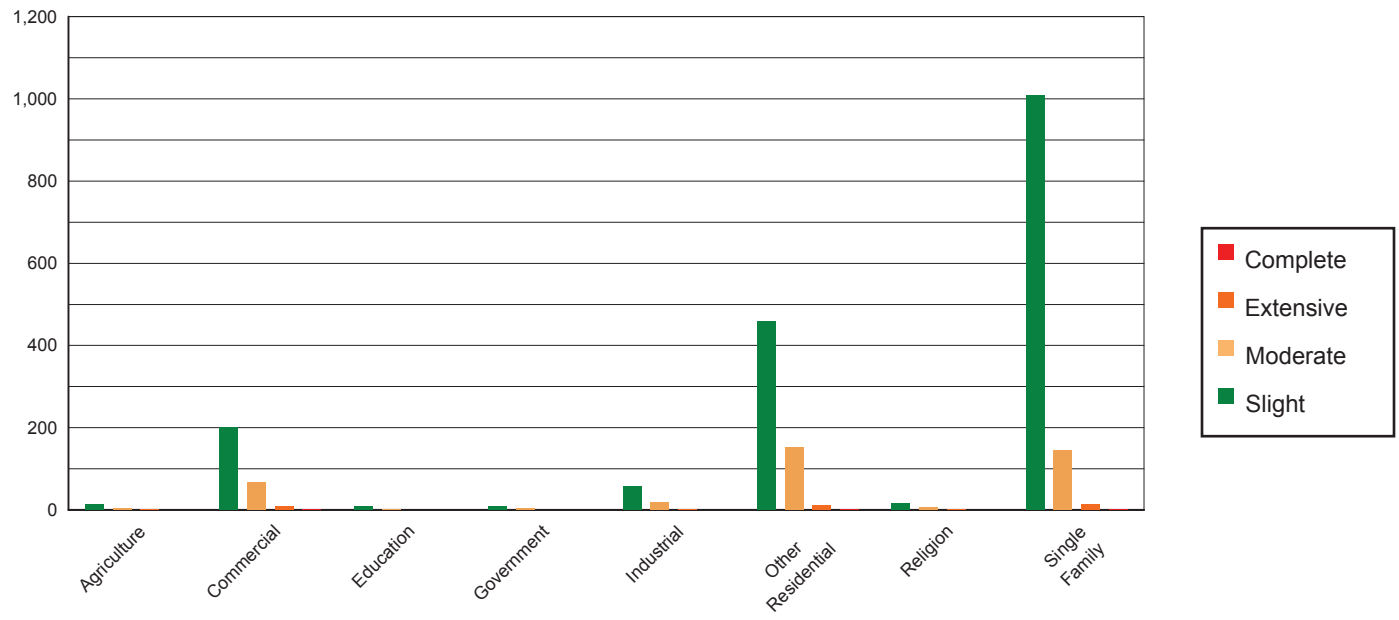


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	419	0.41	14	0.78	4	0.96	0	1.32	0	0.80
Commercial	5,679	5.61	201	11.33	66	16.54	8	22.89	1	19.19
Education	266	0.26	9	0.50	3	0.71	0	0.92	0	0.96
Government	285	0.28	9	0.53	3	0.74	0	0.90	0	0.75
Industrial	1,743	1.72	57	3.24	19	4.74	2	6.04	0	4.35
Other Residential	13,046	12.88	458	25.84	153	38.39	11	30.22	1	28.78
Religion	502	0.50	16	0.92	6	1.49	1	2.28	0	2.52
Single Family	79,344	78.34	1,009	56.87	145	36.43	13	35.44	1	42.64
Total	**101,284**		**1,774**		**399**		**36**		**3**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	84,011	82.95	931	52.47	79	19.89	2	4.34	0	0.00
Steel	4,394	4.34	128	7.20	38	9.63	3	9.25	0	3.09
Concrete	1,025	1.01	28	1.59	8	1.88	0	0.99	0	0.00
Precast	317	0.31	13	0.76	8	2.01	1	3.71	0	0.01
RM	1,573	1.55	39	2.22	19	4.71	2	6.59	0	0.00
URM	6,648	6.56	407	22.96	166	41.63	25	70.51	3	96.90
MH	3,316	3.27	227	12.80	81	20.26	2	4.61	0	0.00
Total	**101,284**		**1,774**		**399**		**36**		**3**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 499 hospital beds available for use. On the day of the earthquake, the model estimates that only 447 hospital beds (90.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 96.00% of the beds will be back in service. By 30 days, 99.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	3	0	0	3
Schools	132	0	0	132
EOCs	9	0	0	9
PoliceStations	26	0	0	26
FireStations	49	0	0	49

Transportation Lifeline Damage

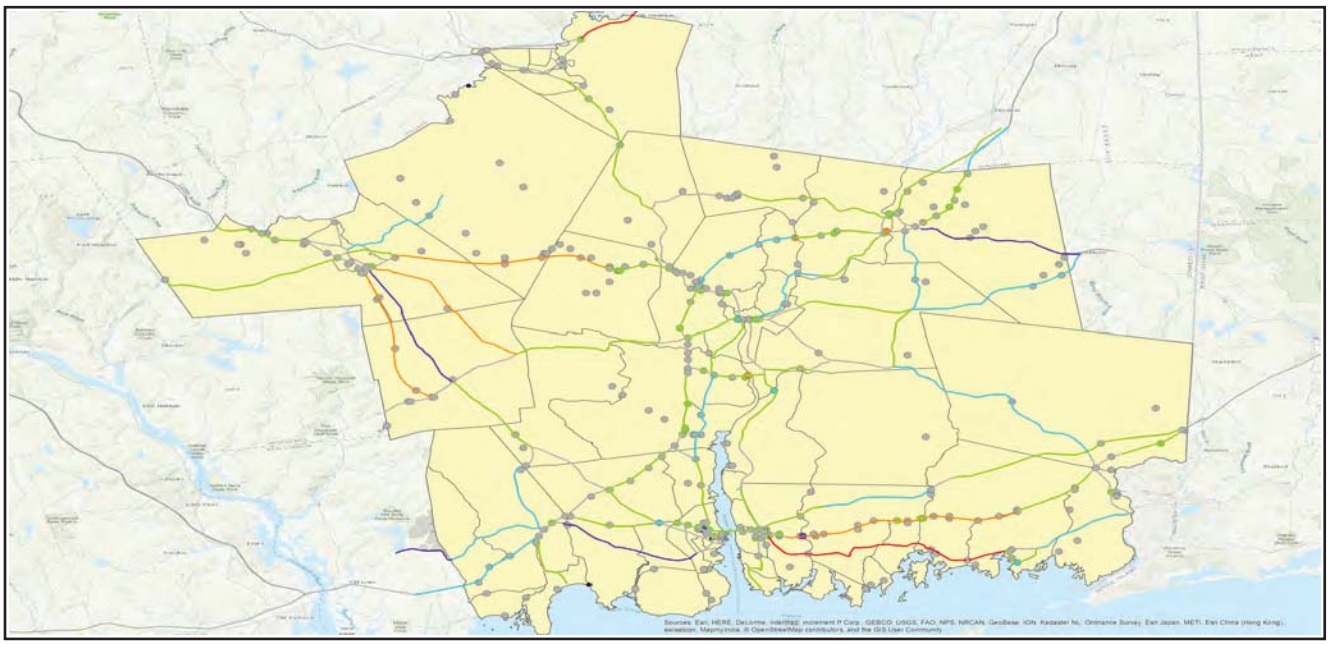


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	276	0	0	276	276
	Bridges	347	0	0	347	347
	Tunnels	0	0	0	0	0
Railways	Segments	76	0	0	76	76
	Bridges	6	0	0	6	6
	Tunnels	0	0	0	0	0
	Facilities	4	0	0	4	4
Light Rail	Segments	6	0	0	6	6
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	1	0	0	1	1
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	2	0	0	2	2
Port	Facilities	30	0	0	30	30
Airport	Facilities	2	0	0	2	2
	Runways	4	0	0	4	4

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	12	0	0	12	12
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	4	0	0	4	4
Communication	15	0	0	15	15

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	11,322	45	11
Waste Water	6,793	32	8
Natural Gas	4,529	9	2
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	110,756	0	0	0	0	0
Electric Power		0	0	0	0	0

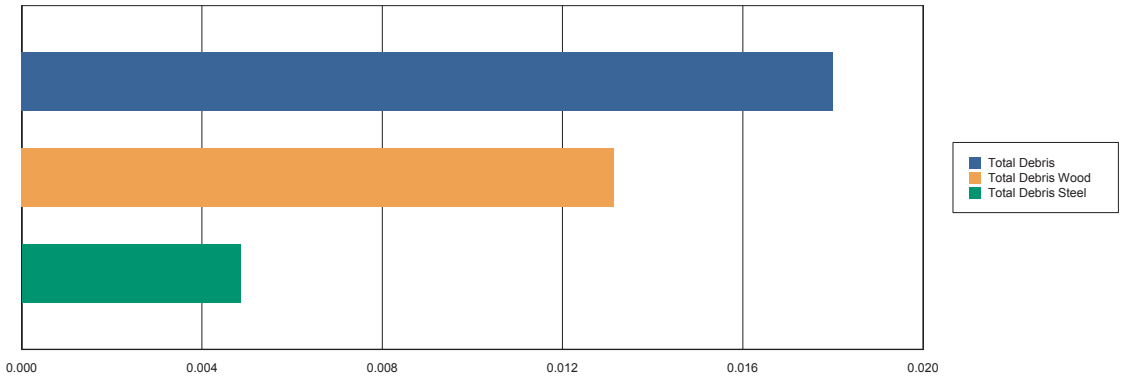
Induced Earthquake Damage

Debris Generation

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

The model estimates that a total of 0.02 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 73.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 720 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



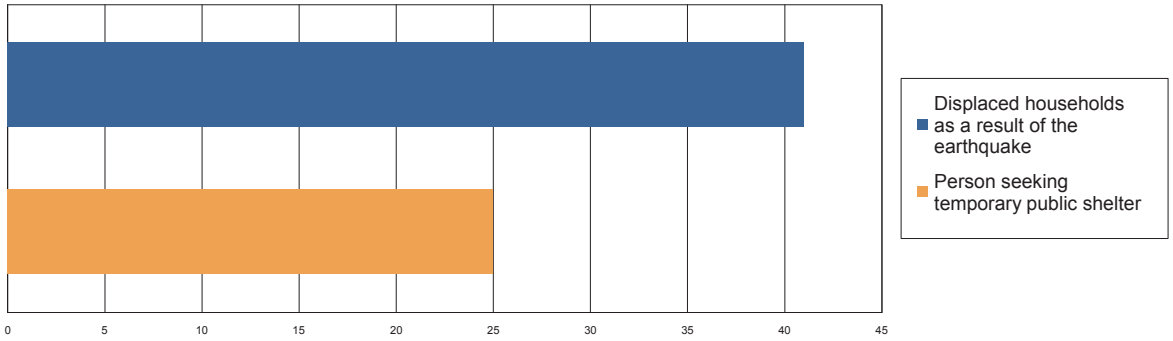
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.01	0.00	0.02	720 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 41 households to be displaced due to the earthquake. Of these, 25 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
41	25

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	6	1	0	0
	Single Family	3	0	0	0
	Total	**9**	**1**	**0**	**0**
2 PM	Commercial	8	1	0	0
	Commuting	0	0	0	0
	Educational	3	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	1	0	0	0
	Single Family	1	0	0	0
	Total	**15**	**2**	**0**	**0**
5 PM	Commercial	6	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	2	0	0	0
	Single Family	1	0	0	0
	Total	**11**	**1**	**0**	**0**

Economic Loss

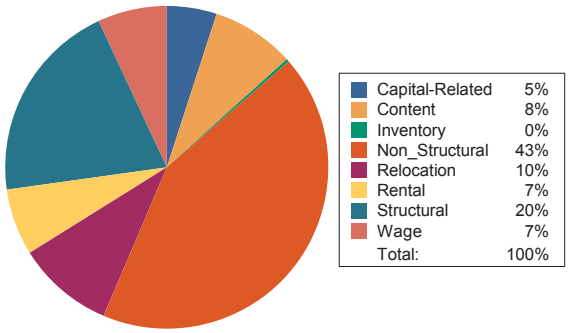
The total economic loss estimated for the earthquake is 49.38 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 45.76 (millions of dollars); 28 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 54 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

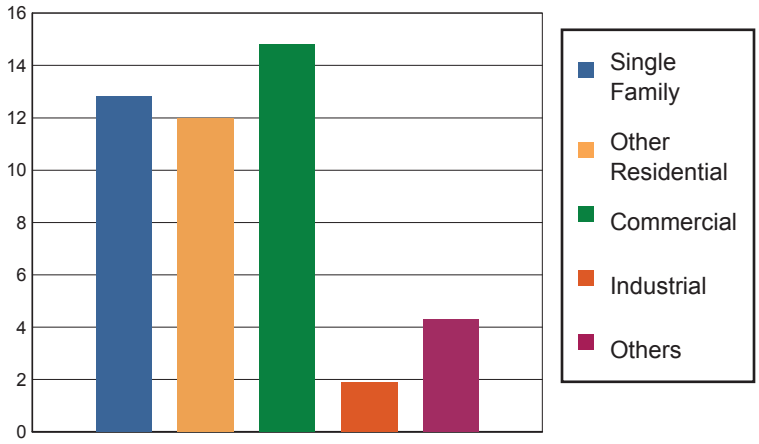


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.40	2.37	0.07	0.34	3.18
	Capital-Related	0.00	0.17	2.04	0.04	0.06	2.32
	Rental	0.31	1.38	1.21	0.03	0.10	3.02
	Relocation	1.00	0.91	1.62	0.16	0.77	4.45
	Subtotal	**1.31**	**2.86**	**7.24**	**0.30**	**1.27**	**12.97**
Capital Stock Losses							
	Structural	2.50	2.68	2.59	0.50	1.06	9.34
	Non_Structural	7.84	5.76	3.81	0.67	1.49	19.57
	Content	1.15	0.69	1.13	0.35	0.46	3.79
	Inventory	0.00	0.00	0.02	0.06	0.01	0.09
	Subtotal	**11.50**	**9.13**	**7.56**	**1.58**	**3.03**	**32.79**
	Total	**12.81**	**11.98**	**14.79**	**1.88**	**4.30**	**45.76**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	3,902.65	$0.00	0.00
	Bridges	6,531.81	$2.41	0.04
	Tunnels	0.00	$0.00	0.00
	Subtotal	**10,434**	**2.40**	
Railways	Segments	249.25	$0.00	0.00
	Bridges	0.40	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	10.65	$0.05	0.48
	Subtotal	**260**	**0.10**	
Light Rail	Segments	133.65	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	2.66	$0.01	0.54
	Subtotal	**136**	**0.00**	
Bus	Facilities	6.27	$0.03	0.51
	Subtotal	**6**	**0.00**	
Ferry	Facilities	2.66	$0.01	0.54
	Subtotal	**3**	**0.00**	
Port	Facilities	59.91	$0.32	0.54
	Subtotal	**60**	**0.30**	
Airport	Facilities	21.30	$0.10	0.46
	Runways	151.86	$0.00	0.00
	Subtotal	**173**	**0.10**	
	Total	**11,073.10**	**2.90**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	226.40	$0.20	0.09
	Subtotal	**226.44**	**$0.20**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	919.10	$0.18	0.02
	Distribution Lines	135.90	$0.15	0.11
	Subtotal	**1,054.94**	**$0.32**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	90.60	$0.04	0.05
	Subtotal	**90.58**	**$0.04**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	506.00	$0.11	0.02
	Subtotal	**506.00**	**$0.11**	
Communication	Facilities	1.70	$0.00	0.02
	Subtotal	**1.73**	**$0.00**	
	Total	**1,879.68**	**$0.68**	

Appendix A: County Listing for the Region

New London,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	261,443	26,302	8,030	34,332
	Windham	25,268	1,887	723	2,611
Total State		**286,711**	**28,189**	**8,753**	**36,943**
Total Region		**286,711**	**28,189**	**8,753**	**36,943**

HAZUS
Flood Results

Hazus-MH: Flood Global Risk Report

Region Name: Bozrah2

Flood Scenario: 100

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 20 square miles and contains 130 census blocks. The region contains over 1 thousand households and has a total population of 2,627 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,141 buildings in the region with a total building replacement value (excluding contents) of 474 million dollars (2010 dollars). Approximately 87.29% of the buildings (and 60.02% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,141 buildings in the region which have an aggregate total replacement value of 474 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	284,647	60.0%
Commercial	44,239	9.3%
Industrial	18,445	3.9%
Agricultural	115,800	24.4%
Religion	3,973	0.8%
Government	779	0.2%
Education	6,390	1.3%
Total	**474,273**	**100.0%**

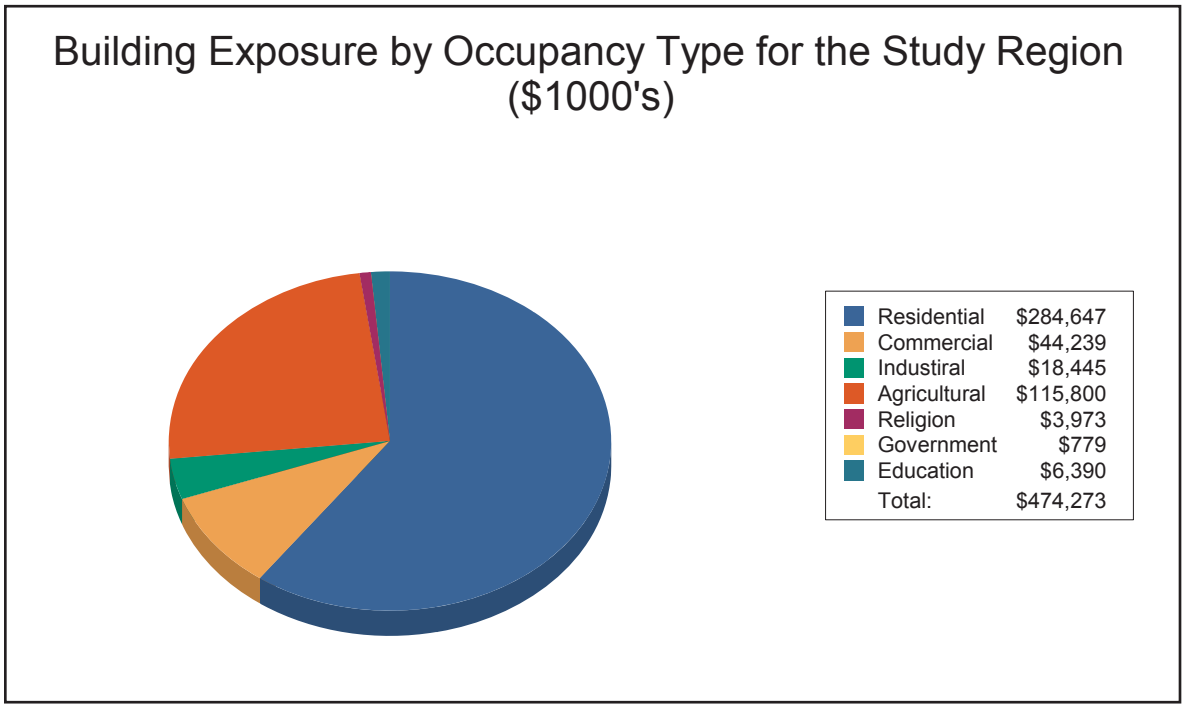
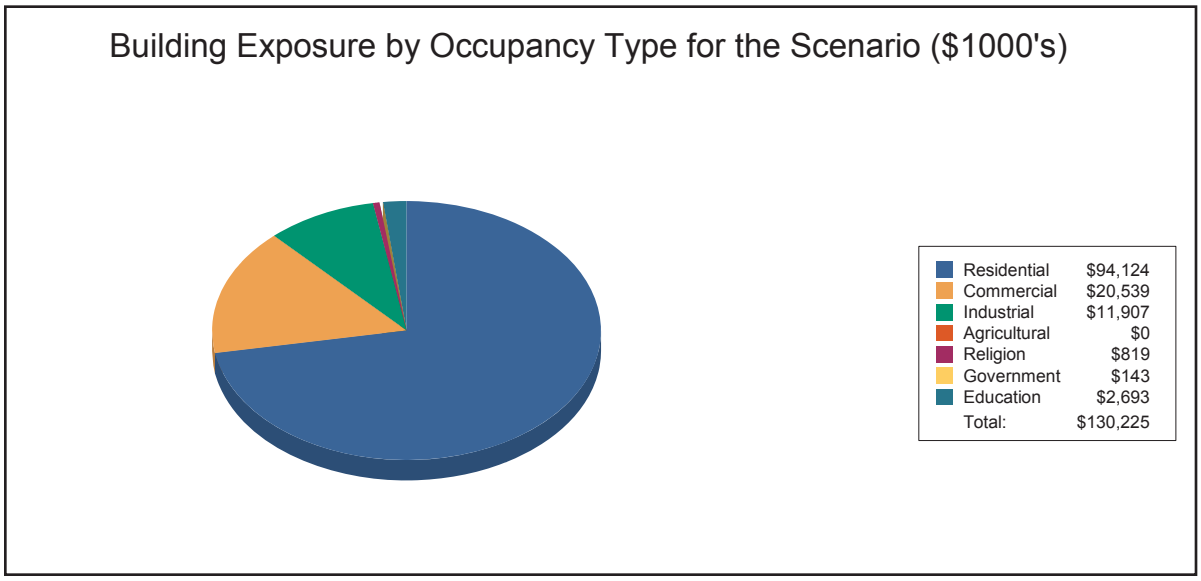


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	94,124	72.3%
Commercial	20,539	15.8%
Industrial	11,907	9.1%
Agricultural	0	0.0%
Religion	819	0.6%
Government	143	0.1%
Education	2,693	2.1%
Total	**130,225**	**100.0%**



Essential Facility Inventory

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

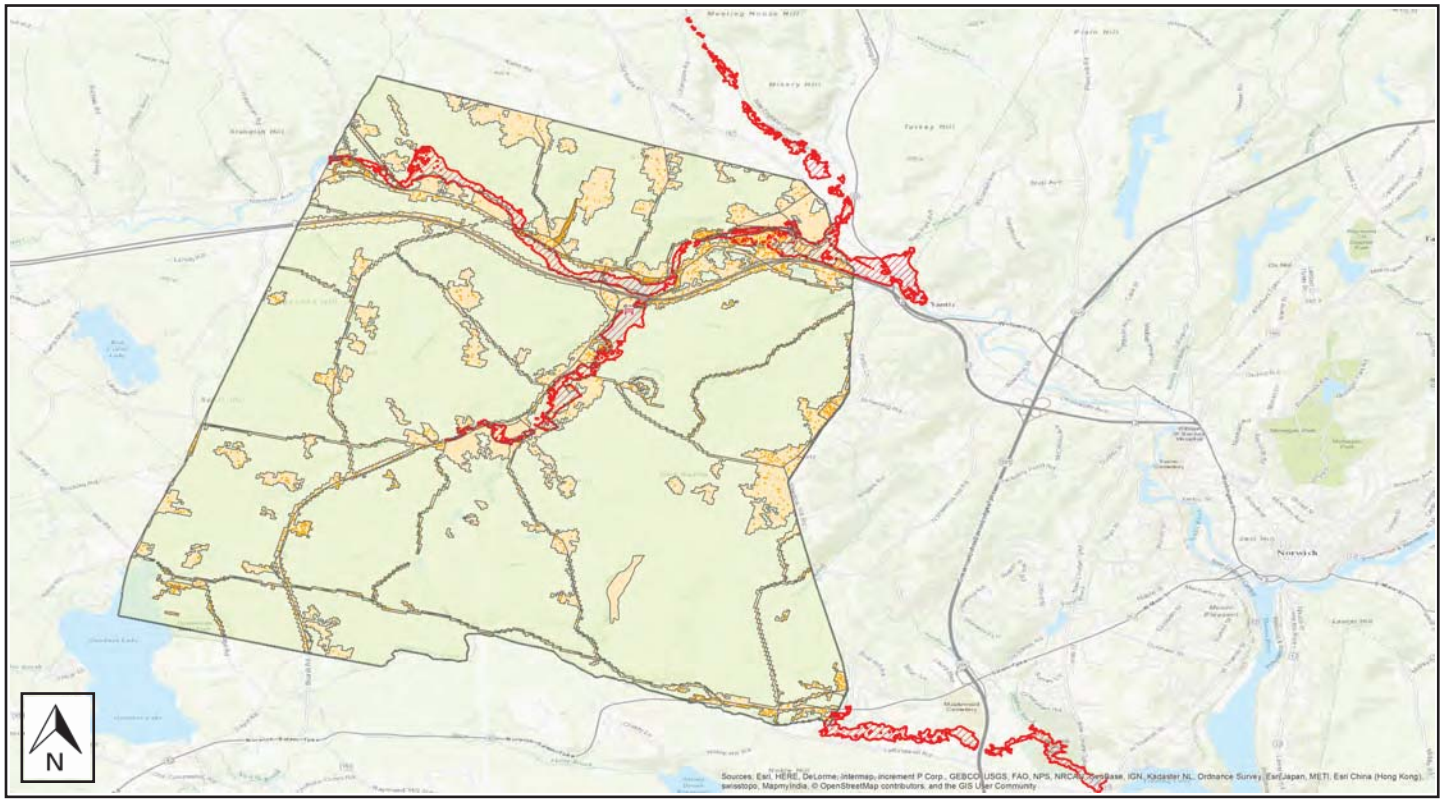
Flood Scenario Parameters

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

Study Region Name:	Bozrah2
Scenario Name:	100
Return Period Analyzed:	Mix0
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 3 buildings will be at least moderately damaged. This is over 91% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

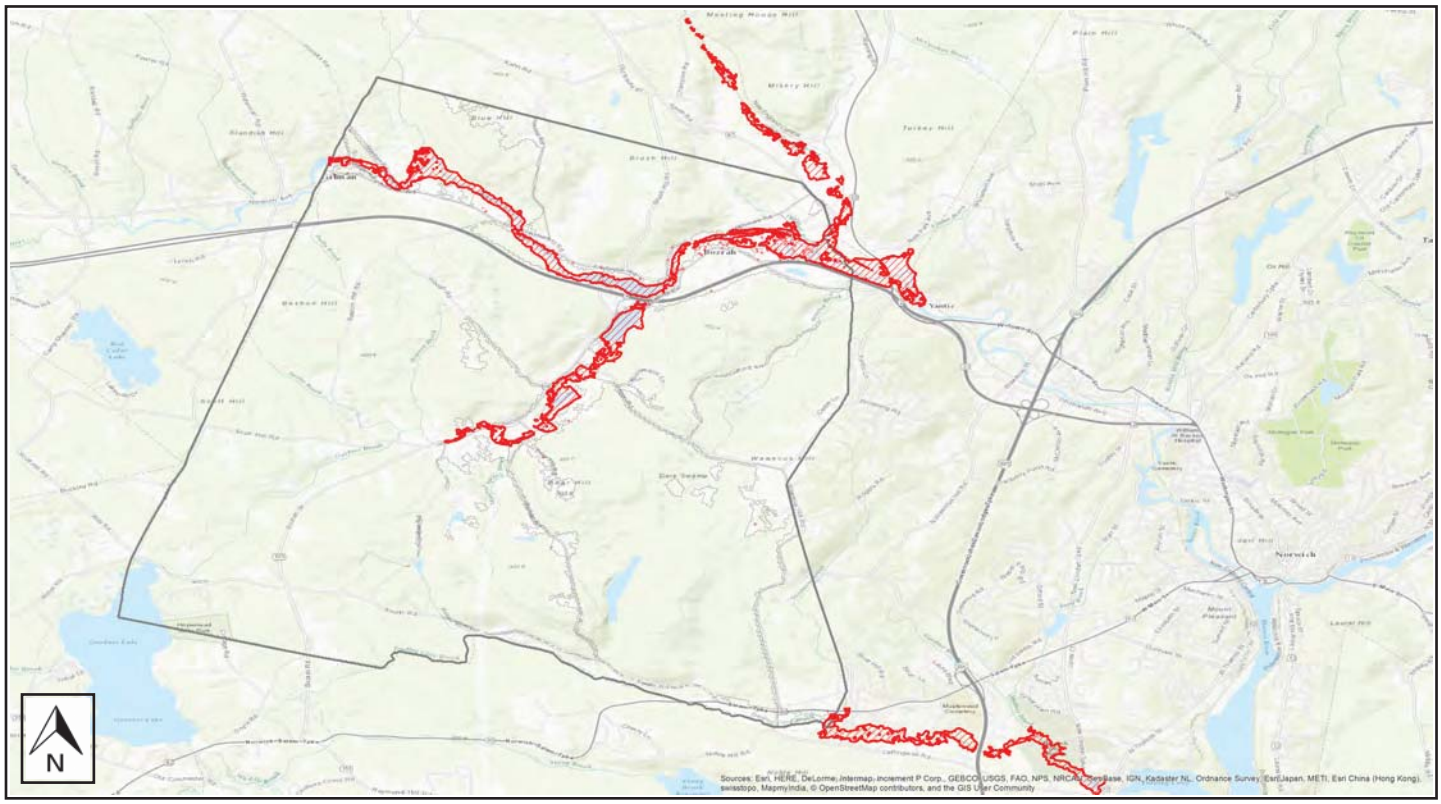


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	7	70.00	2	20.00	1	10.00	0	0.00	0	0.00	0	0.00
Total	**7**		**2**		**1**		**0**		**0**		**0**	

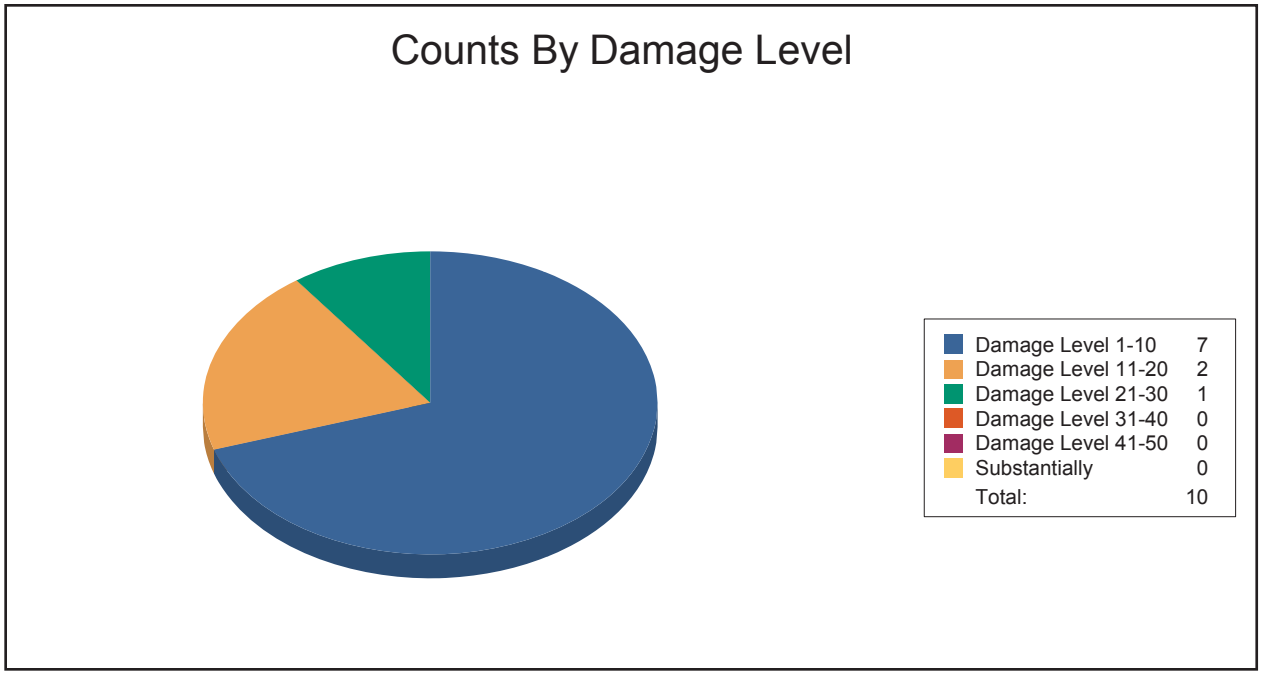


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	7	70	2	20	1	10	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

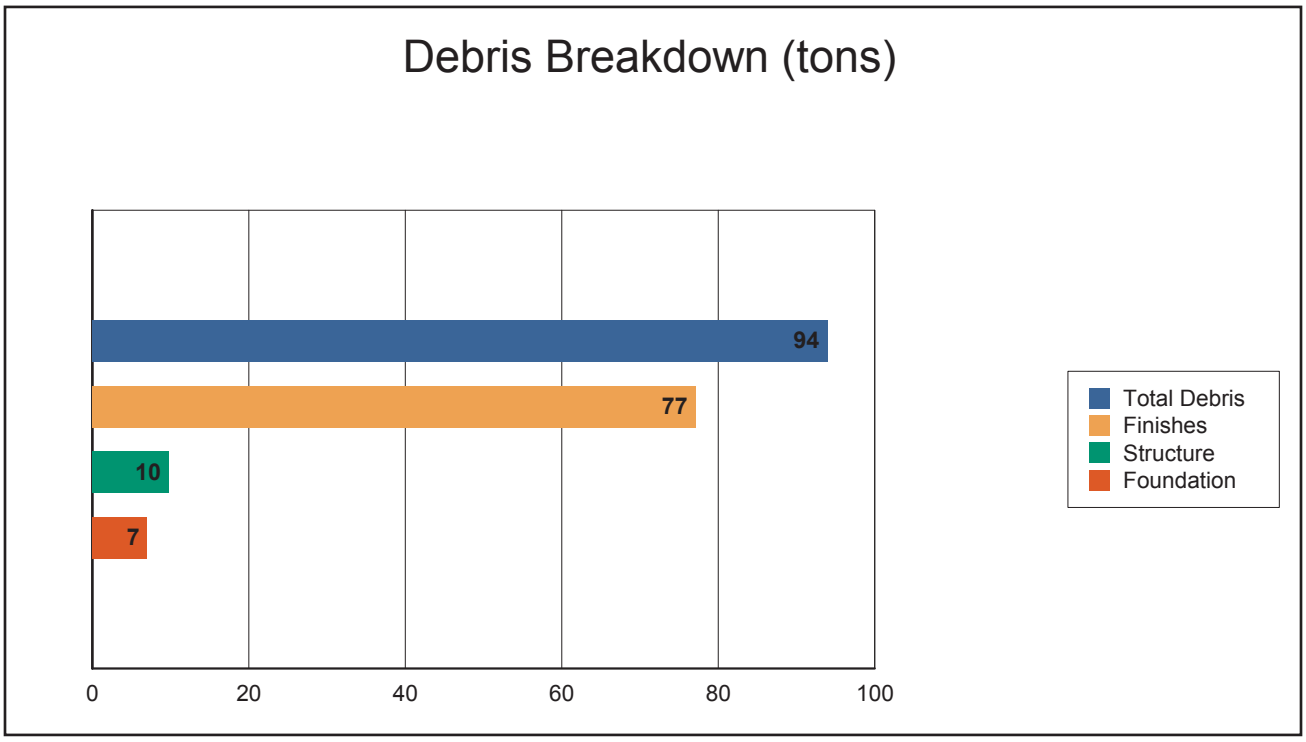
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

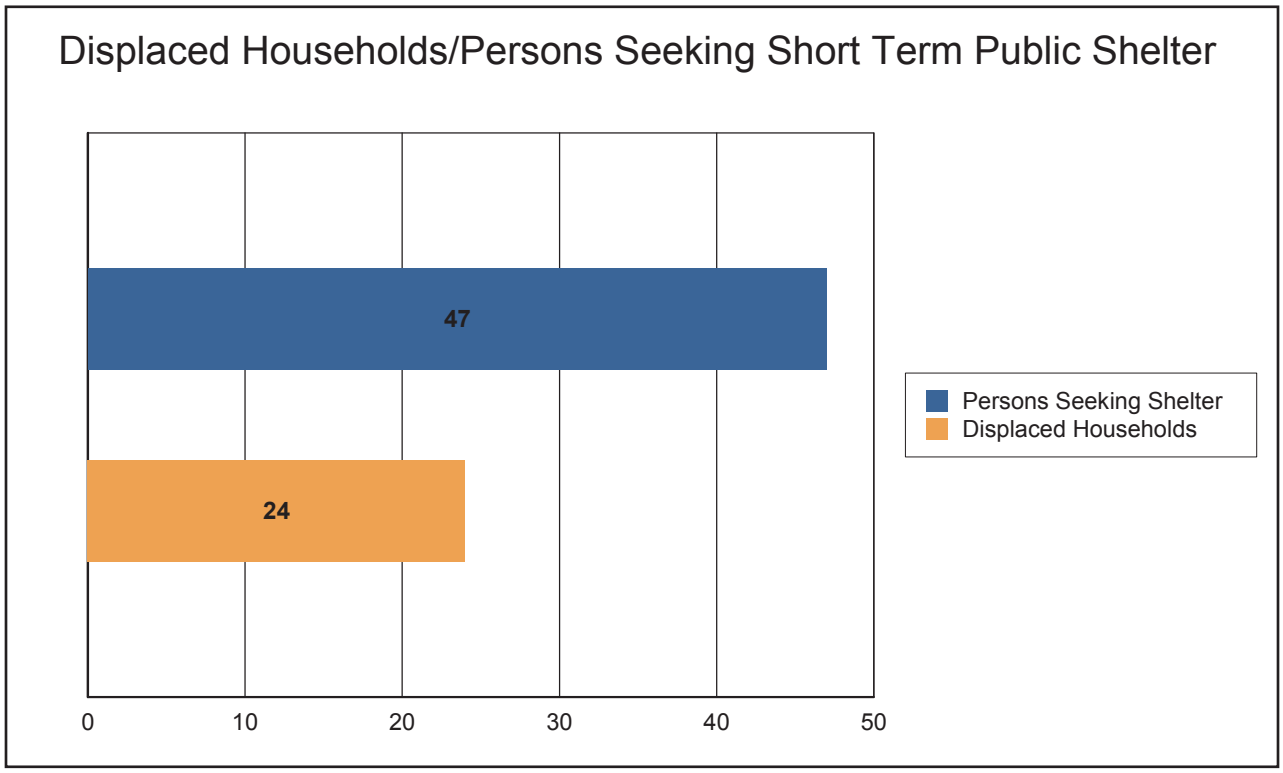


The model estimates that a total of 94 tons of debris will be generated. Of the total amount, Finishes comprises 82% of the total, Structure comprises 10% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 4 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 24 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 47 people (out of a total population of 2,627) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 4.16 million dollars, which represents 3.20 % of the total replacement value of the scenario buildings.

Building-Related Losses

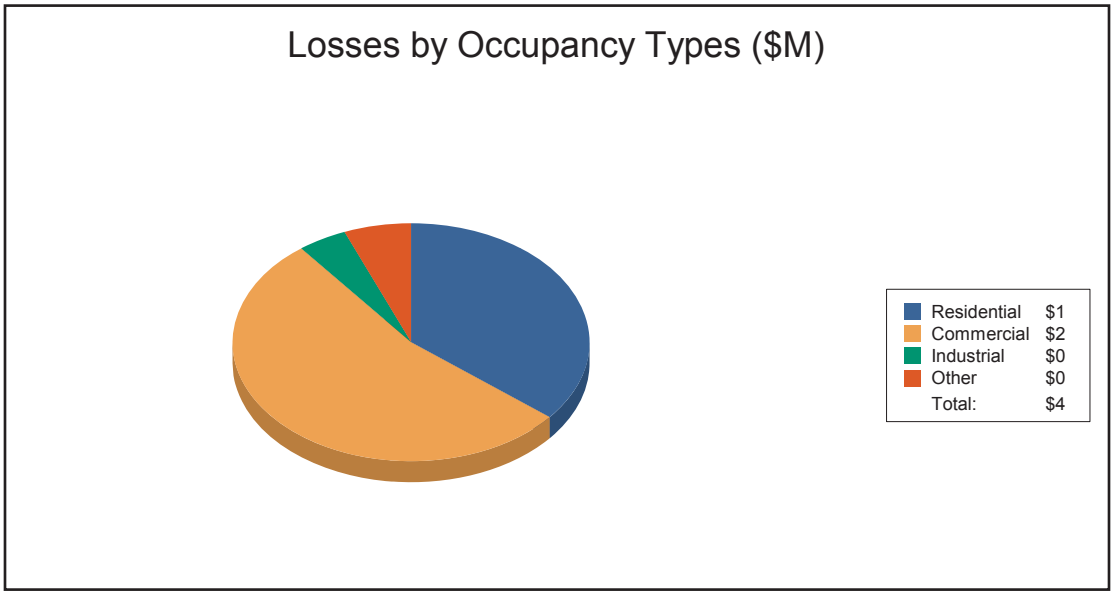
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 4.15 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 35.90% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.03	0.50	0.07	0.03	1.63
	Content	0.46	1.68	0.11	0.22	2.47
	Inventory	0.00	0.04	0.01	0.00	0.05
	Subtotal	**1.49**	**2.22**	**0.19**	**0.25**	**4.15**
Business Interruption						
	Income	0.00	0.01	0.00	0.00	0.01
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.01	0.00	0.00	0.01
	Subtotal	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**1.49**	**2.23**	**0.19**	**0.25**	**4.16**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,627	284,647	189,626	474,273
Total	**2,627**	**284,647**	**189,626**	**474,273**
Total Study Region	**2,627**	**284,647**	**189,626**	**474,273**

Hazus-MH: Flood Global Risk Report

Region Name: Colchester

Flood Scenario: Colchester 100 Year

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 50 square miles and contains 338 census blocks. The region contains over 6 thousand households and has a total population of 16,068 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 5,906 buildings in the region with a total building replacement value (excluding contents) of 1,920 million dollars (2010 dollars). Approximately 92.21% of the buildings (and 83.55% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 5,906 buildings in the region which have an aggregate total replacement value of 1,920 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,603,948	83.5%
Commercial	227,710	11.9%
Industrial	44,840	2.3%
Agricultural	4,629	0.2%
Religion	15,089	0.8%
Government	8,285	0.4%
Education	15,305	0.8%
Total	**1,919,. 06**	**100%w**

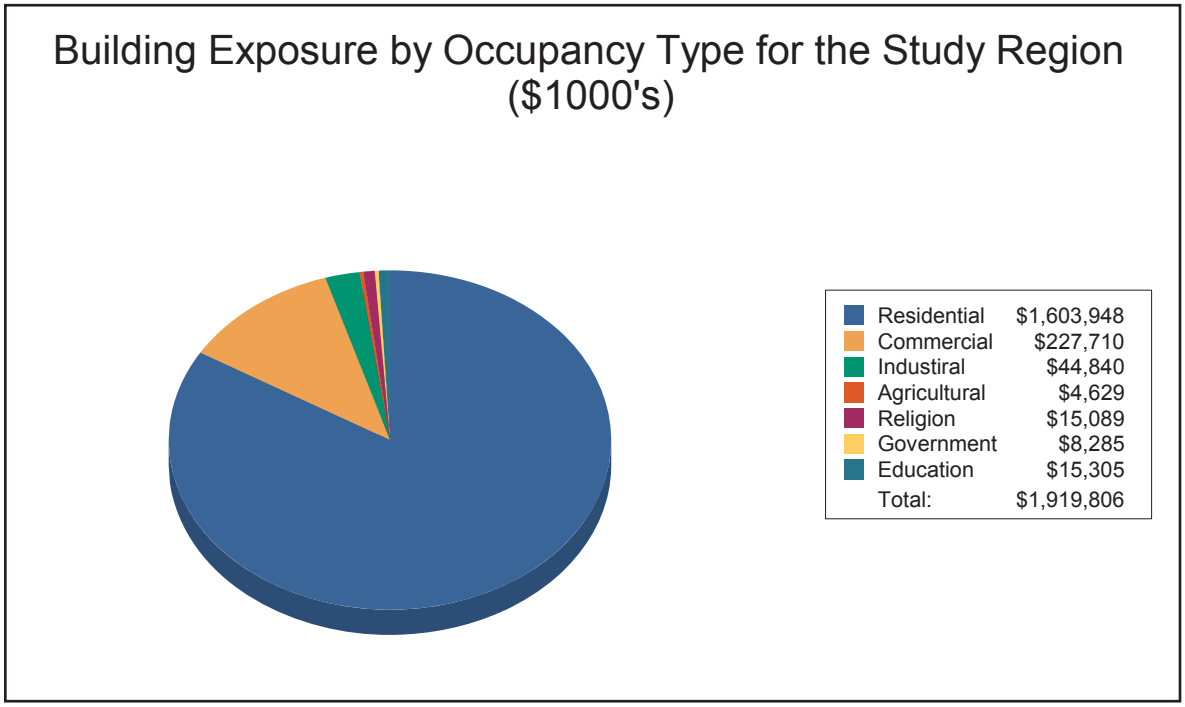
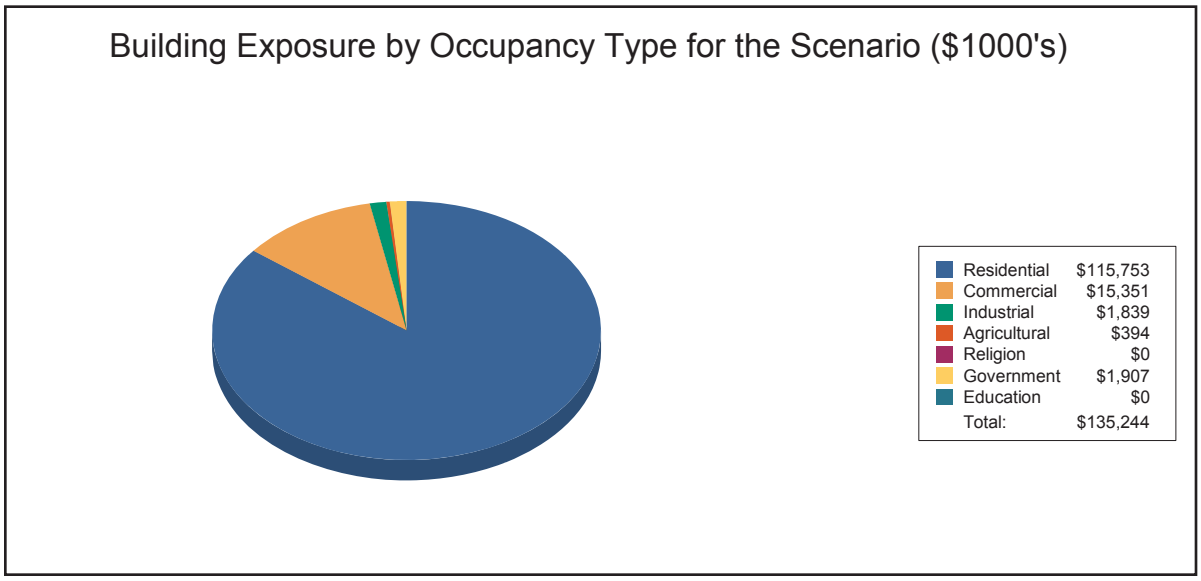


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	115,753	85.6%
Commercial	15,351	11.4%
Industrial	1,839	1.4%
Agricultural	394	0.3%
Religion	0	0.0%
Government	1,907	1.4%
Education	0	0.0%
Total	**135,244**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 5 schools, no fire stations, 2 police stations and 1 emergency operation center.

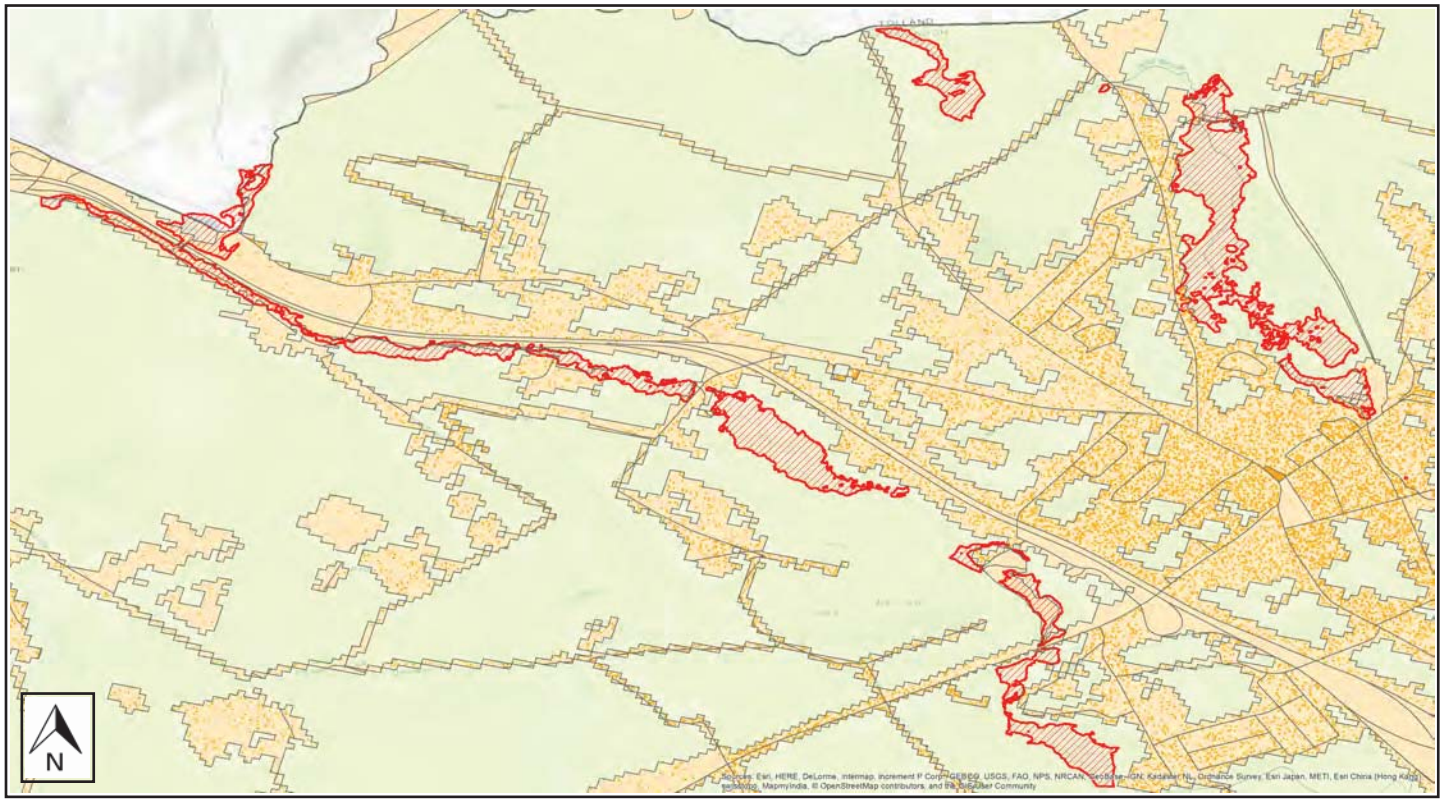
Flood Scenario Parameters

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

Study Region Name:	Colchester
Scenario Name:	Colchester 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

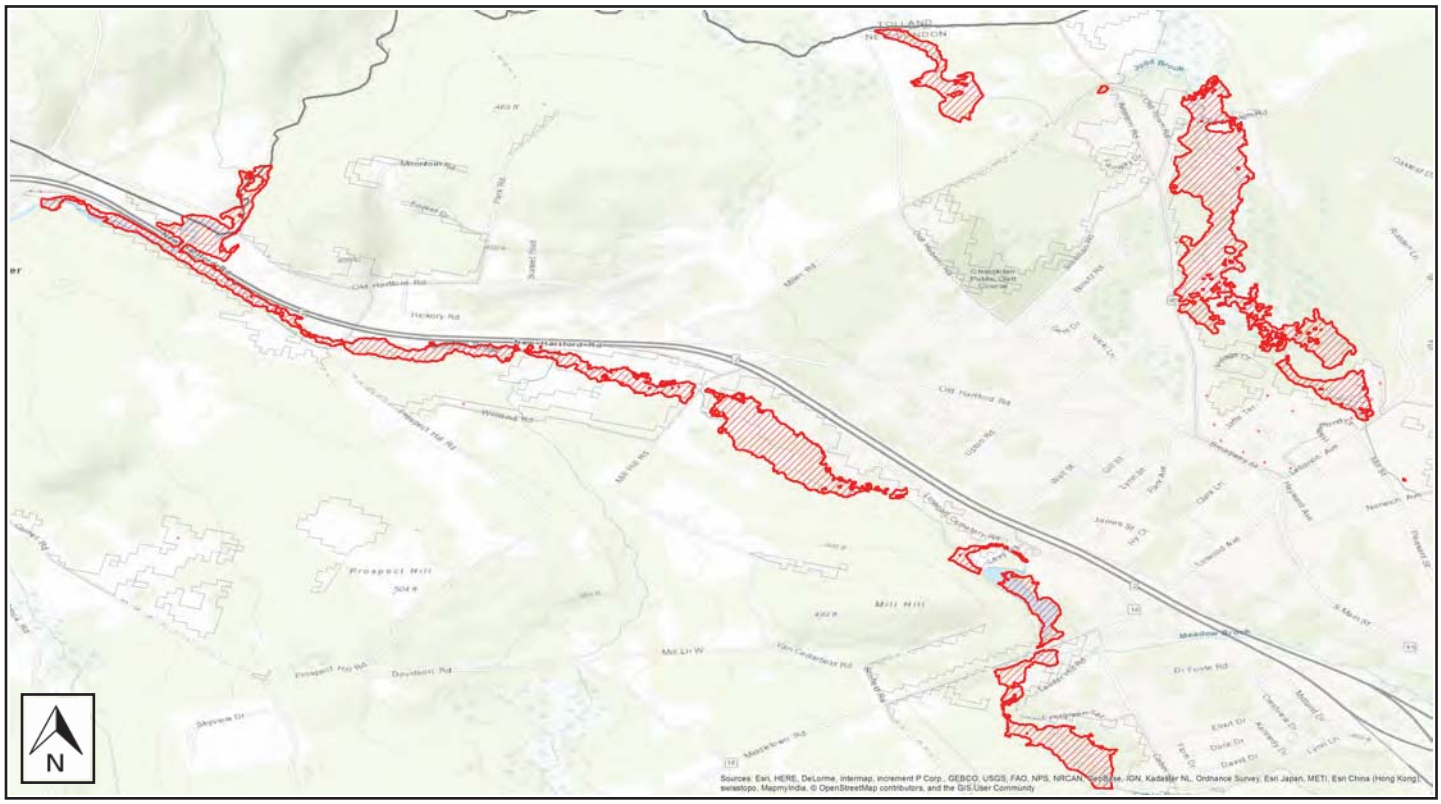


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

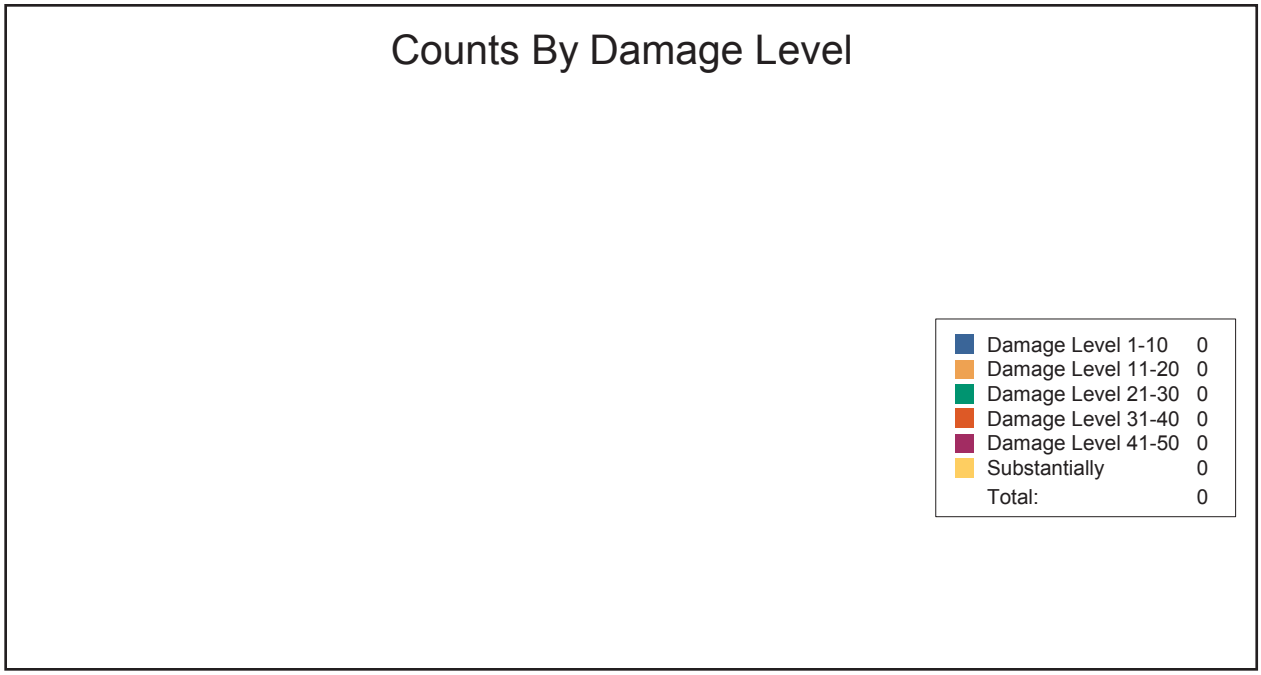


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	5	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

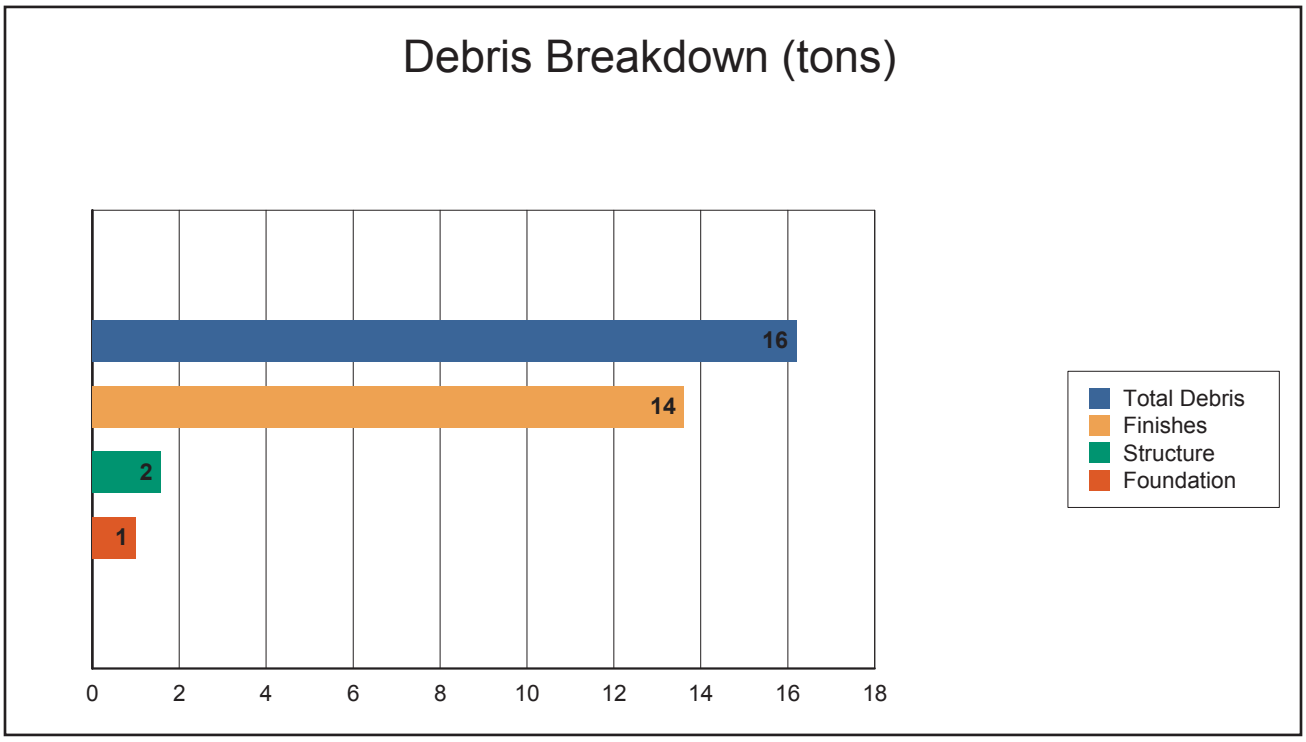
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

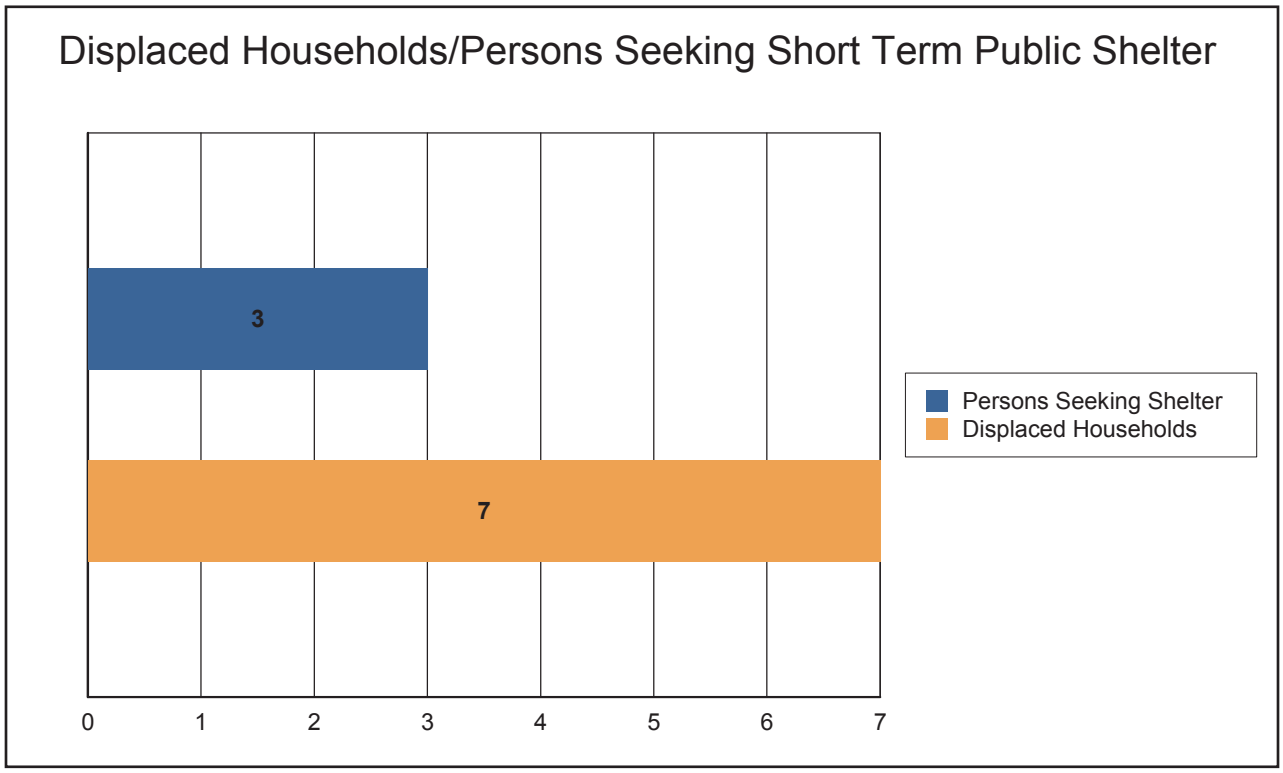


The model estimates that a total of 16 tons of debris will be generated. Of the total amount, Finishes comprises 84% of the total, Structure comprises 10% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 1 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 7 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3 people (out of a total population of 16,068) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.46 million dollars, which represents 0.34 % of the total replacement value of the scenario buildings.

Building-Related Losses

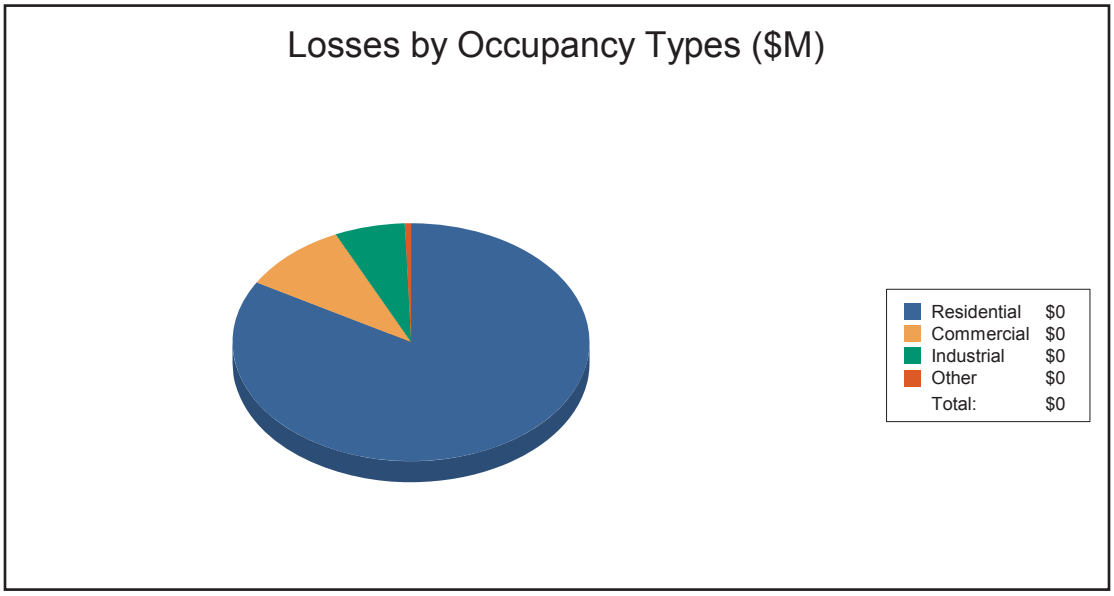
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.46 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 83.37% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.21	0.01	0.01	0.00	0.23
	Content	0.17	0.04	0.02	0.00	0.23
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.38**	**0.04**	**0.03**	**0.00**	**0.46**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.38**	**0.04**	**0.03**	**0.00**	**0.46**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	16,068	1,603,948	315,858	1,919,806
Total	**16,06.**	**1,603,94.**	**315,. 5.**	**1,919,. 06**
Total Study Region	**16,06.**	**1,603,94.**	**315,. 5.**	**1,919,. 06**

Hazus-MH: Flood Global Risk Report

Region Name: EastLyme

Flood Scenario: East Lyme 100 Year

Print Date: Friday, June 16, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 35 square miles and contains 540 census blocks. The region contains over 7 thousand households and has a total population of 19,159 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 8,120 buildings in the region with a total building replacement value (excluding contents) of 2,625 million dollars (2010 dollars). Approximately 93.09% of the buildings (and 83.61% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 8,120 buildings in the region which have an aggregate total replacement value of 2,625 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,194,425	83.6%
Commercial	294,691	11.2%
Industrial	82,396	3.1%
Agricultural	5,152	0.2%
Religion	14,173	0.5%
Government	19,668	0.7%
Education	14,153	0.5%
Total	**2,624,65.**	**100%w**

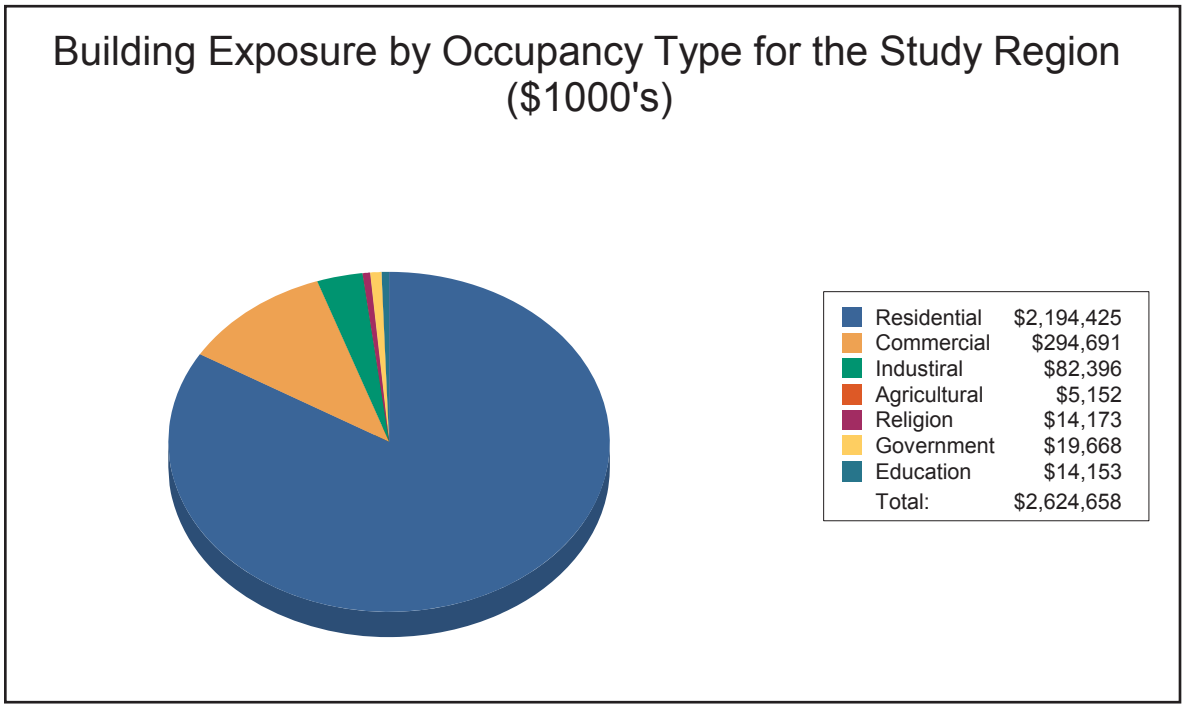
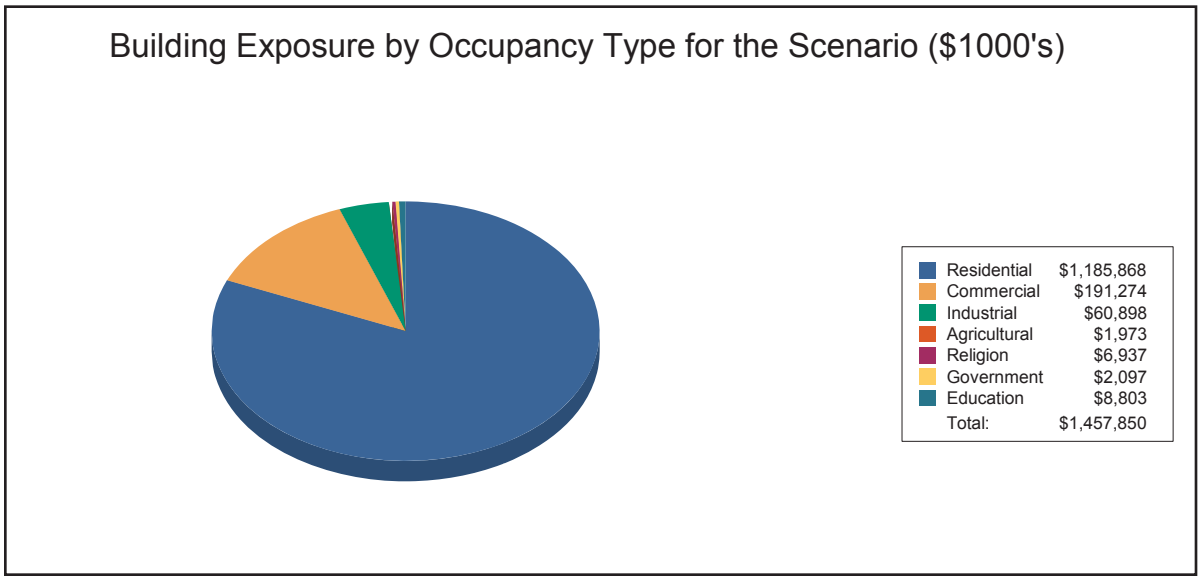


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,185,868	81.3%
Commercial	191,274	13.1%
Industrial	60,898	4.2%
Agricultural	1,973	0.1%
Religion	6,937	0.5%
Government	2,097	0.1%
Education	8,803	0.6%
Total	**1,457,. 50**	**100%w**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 7 schools, no fire stations, 2 police stations and 2 emergency operation center.

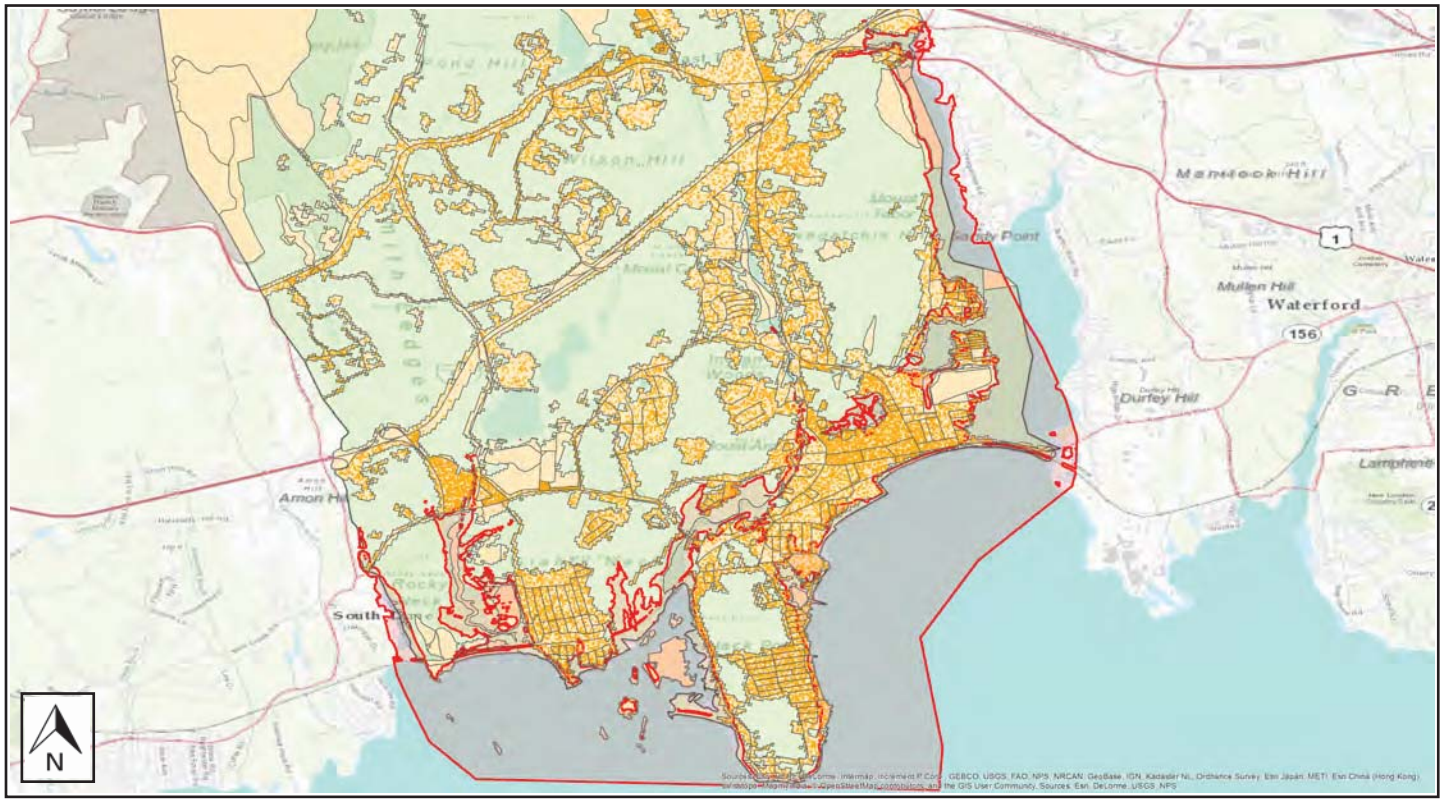
Flood Scenario Parameters

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

Study Region Name:	EastLyme
Scenario Name:	East Lyme 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 125 buildings will be at least moderately damaged. This is over 47% of the total number of buildings in the scenario. There are an estimated 16 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

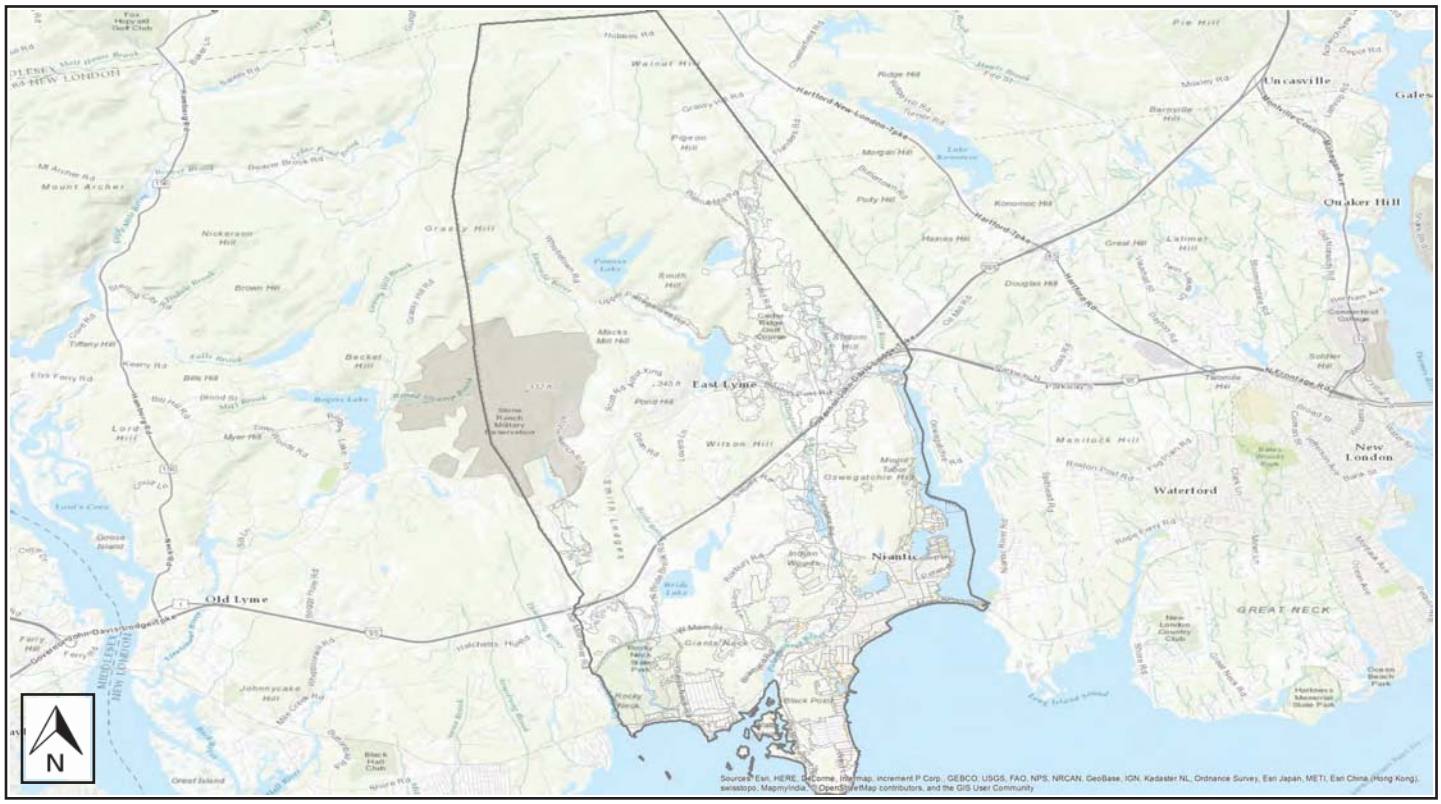


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	7	5.30	65	49.24	30	22.73	10	7.58	4	3.03	16	12.12
Total	**7**		**65**		**30**		**10**		**4**		**16**	

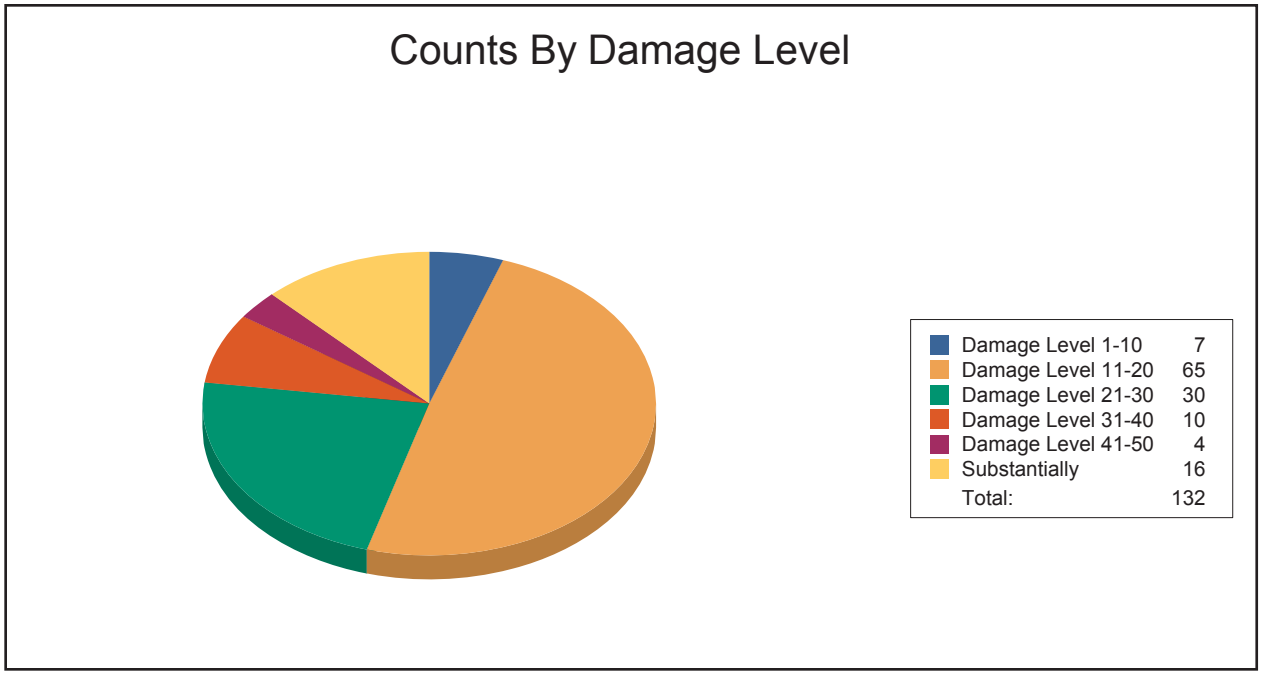


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	7	5	65	49	30	23	10	8	4	3	16	12

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	7	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

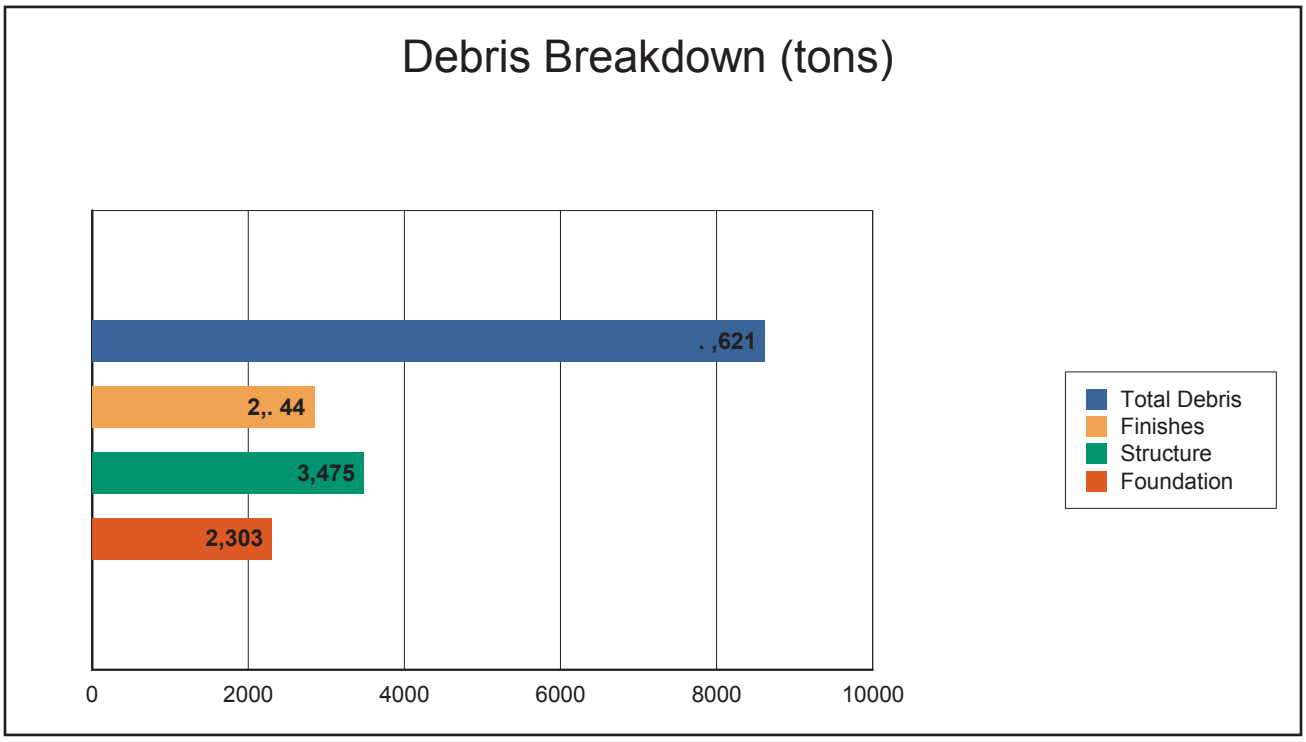
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

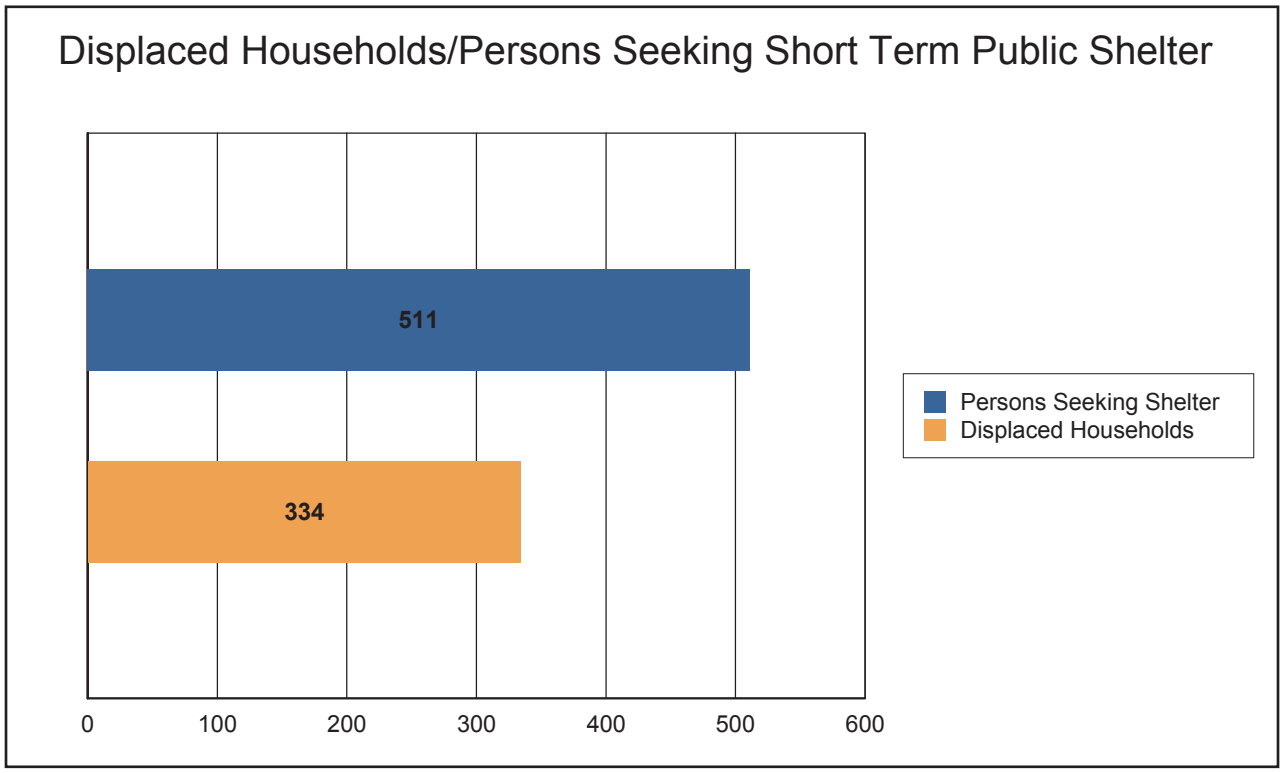


The model estimates that a total of 8,621 tons of debris will be generated. Of the total amount, Finishes comprises 33% of the total, Structure comprises 40% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 345 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 334 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 511 people (out of a total population of 19,159) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 66.35 million dollars, which represents 4.55 % of the total replacement value of the scenario buildings.

Building-Related Losses

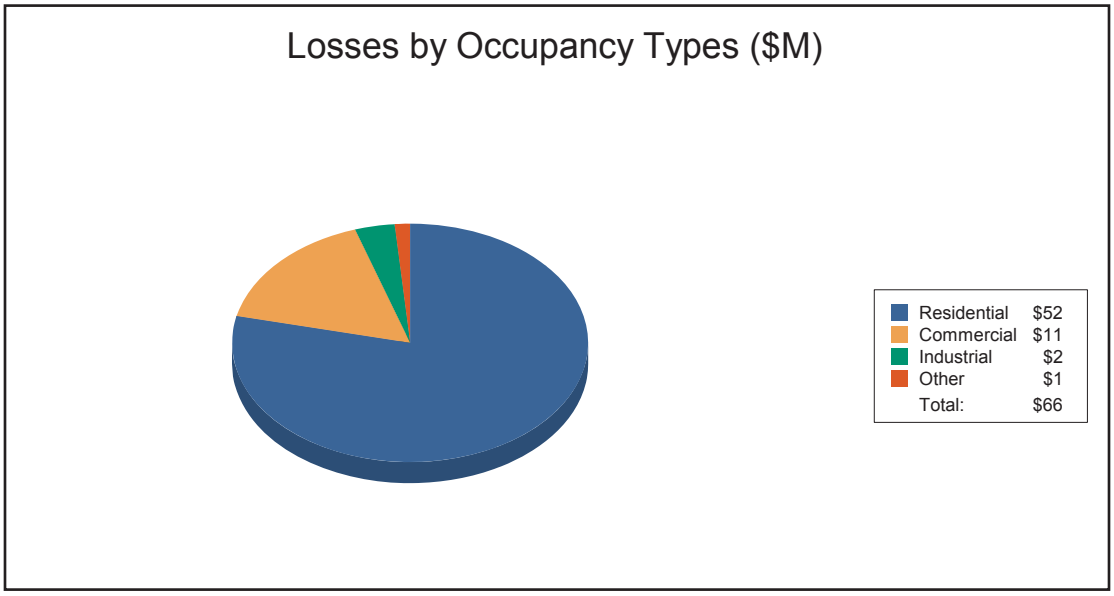
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 66.25 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 78.49% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	28.50	2.93	0.67	0.11	32.21
	Content	23.55	7.87	1.61	0.76	33.79
	Inventory	0.00	0.05	0.20	0.00	0.25
	Subtotal	**52.05**	**10.85**	**2.48**	**0.87**	**66.25**
Business Interruption						
	Income	0.00	0.03	0.00	0.00	0.03
	Relocation	0.03	0.00	0.00	0.00	0.03
	Rental Income	0.00	0.00	0.00	0.00	0.01
	Wage	0.00	0.03	0.00	0.01	0.03
	Subtotal	**0.04**	**0.06**	**0.00**	**0.01**	**0.10**
ALL	**Total**	**52.10**	**10.91**	**2.48**	**0.88**	**66.35**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	19,159	2,194,425	430,233	2,624,658
Total	**19,159**	**2,194,425**	**430,233**	**2,624,65.**
Total Study Region	**19,159**	**2,194,425**	**430,233**	**2,624,65.**

Hazus-MH: Flood Global Risk Report

Region Name: EastLyme

Flood Scenario: East Lyme Riverine

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 35 square miles and contains 540 census blocks. The region contains over 7 thousand households and has a total population of 19,159 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 8,120 buildings in the region with a total building replacement value (excluding contents) of 2,625 million dollars (2010 dollars). Approximately 93.09% of the buildings (and 83.61% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 8,120 buildings in the region which have an aggregate total replacement value of 2,625 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,194,425	83.6%
Commercial	294,691	11.2%
Industrial	82,396	3.1%
Agricultural	5,152	0.2%
Religion	14,173	0.5%
Government	19,668	0.7%
Education	14,153	0.5%
Total	**2,624,65.**	**100%w**

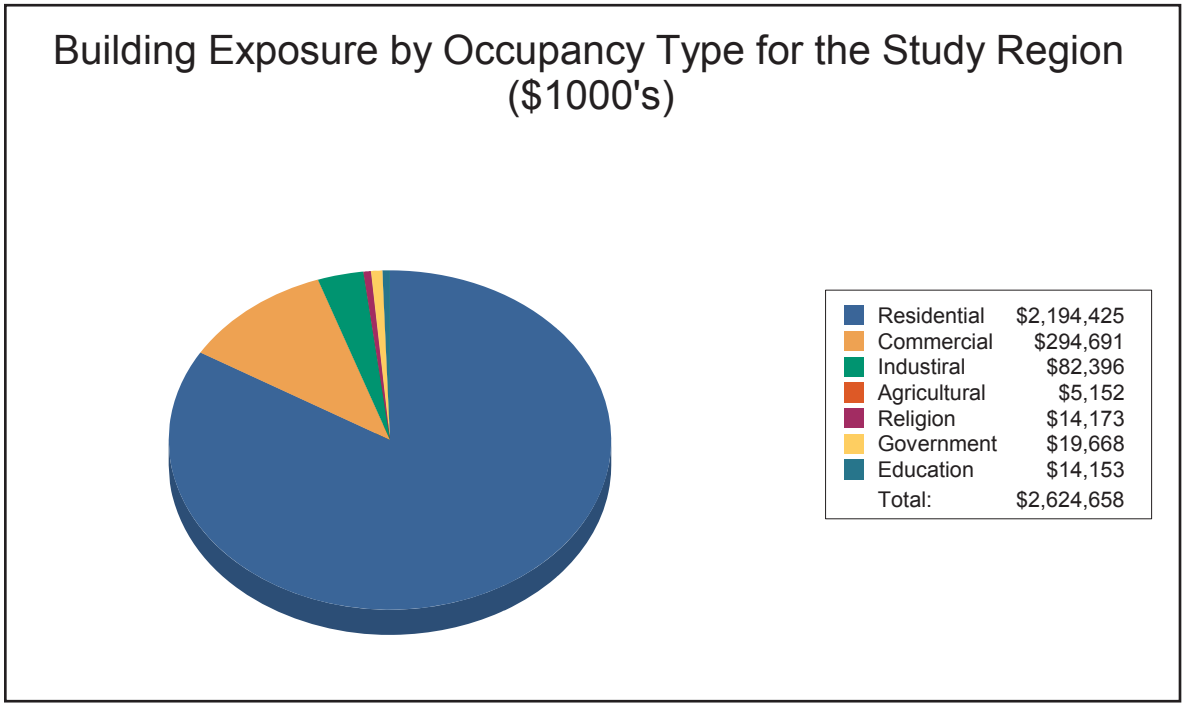
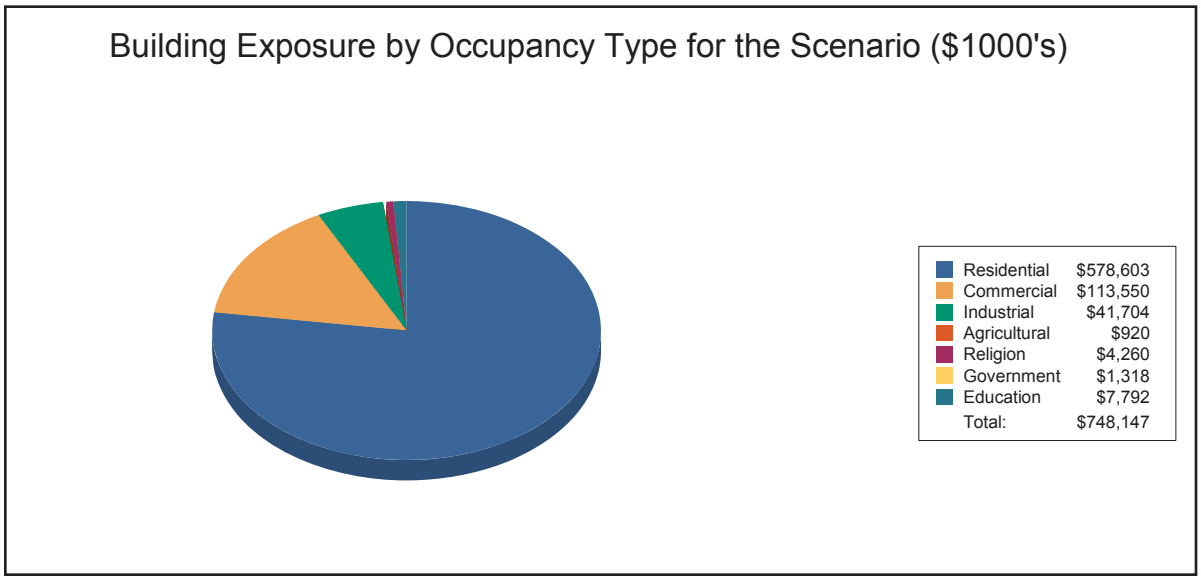


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	578,603	77.3%
Commercial	113,550	15.2%
Industrial	41,704	5.6%
Agricultural	920	0.1%
Religion	4,260	0.6%
Government	1,318	0.2%
Education	7,792	1.0%
Total	**74. ,147**	**100%w**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 7 schools, no fire stations, 2 police stations and 2 emergency operation center.

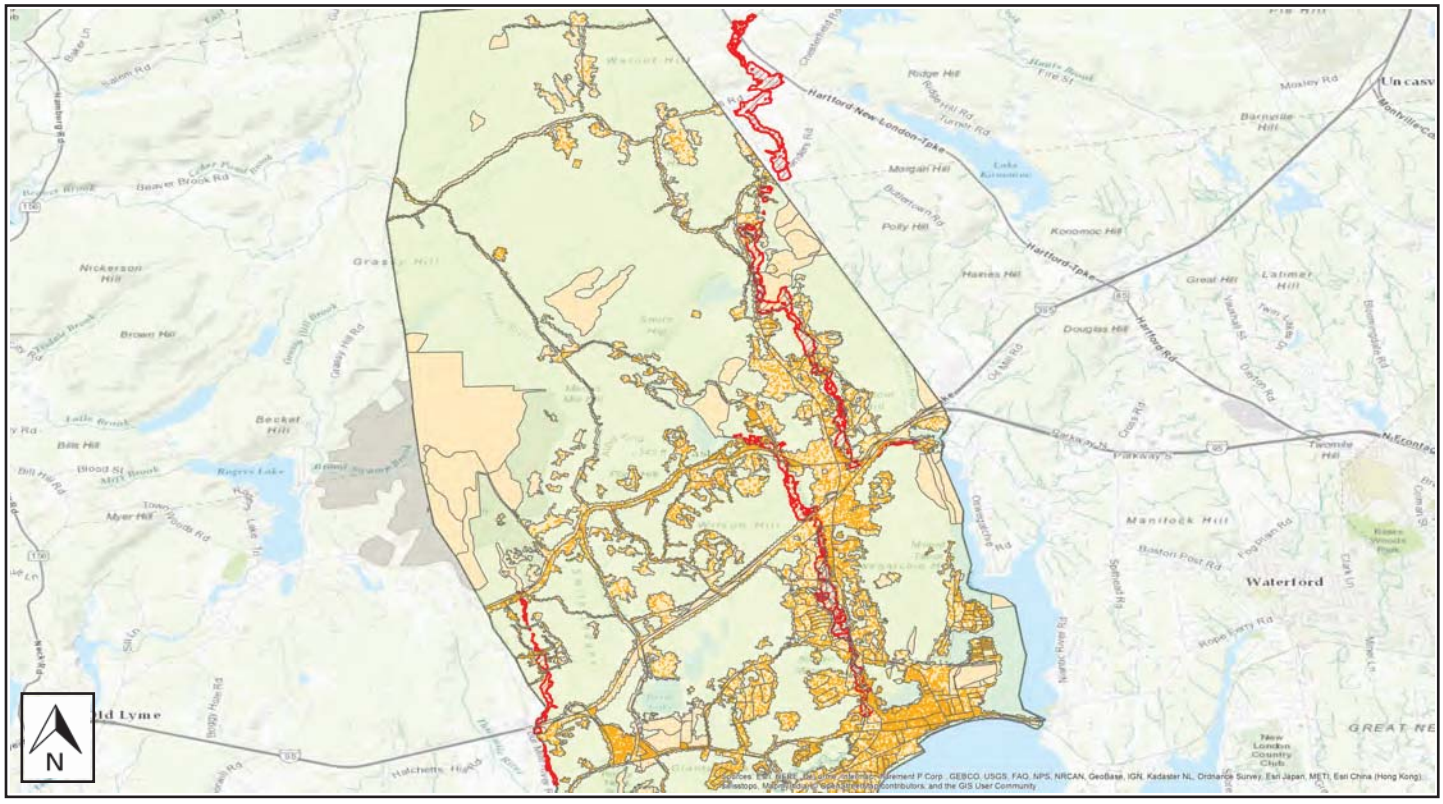
Flood Scenario Parameters

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

Study Region Name:	EastLyme
Scenario Name:	East Lyme Riverine
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 5 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

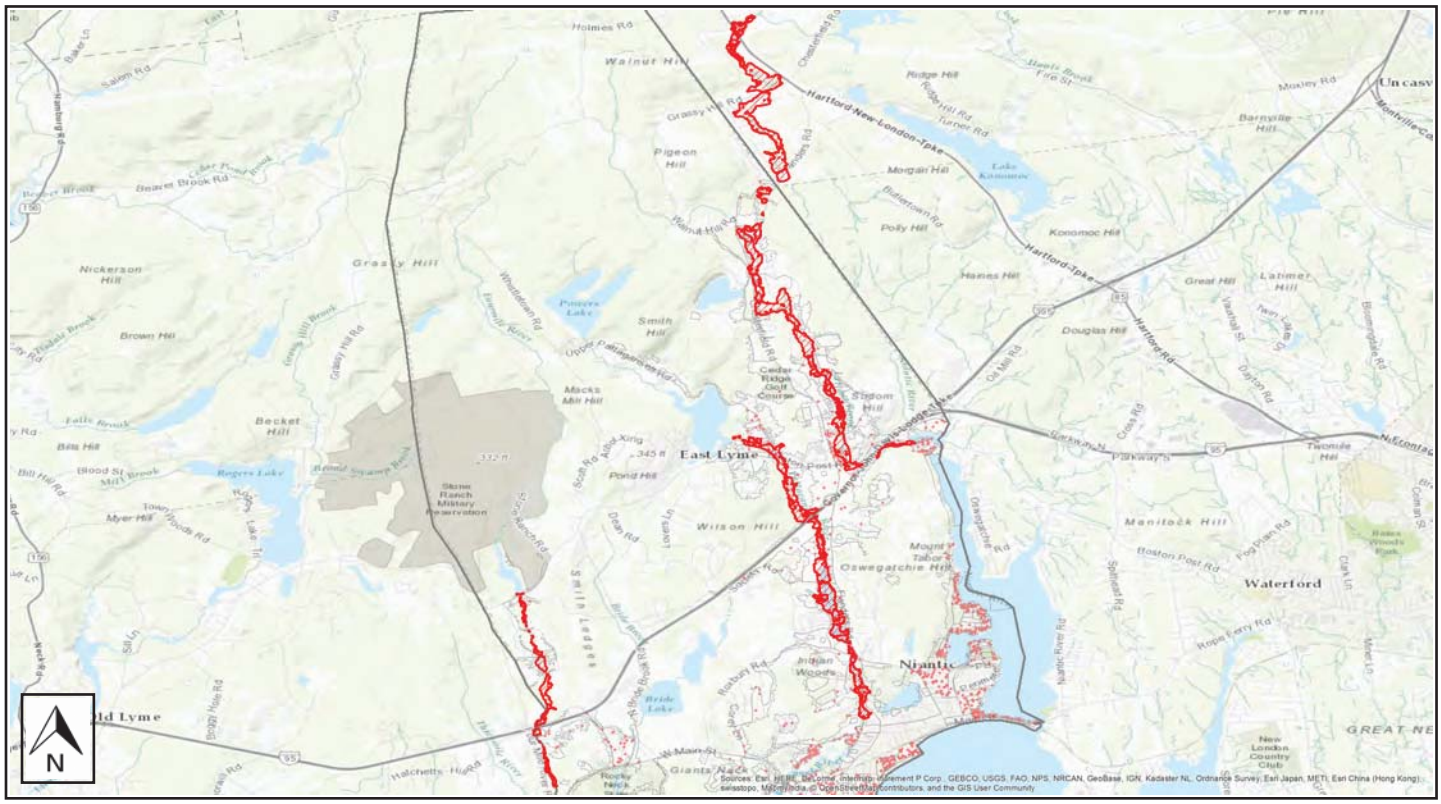


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	7	58.33	5	41.67	0	0.00	0	0.00	0	0.00	0	0.00
Total	**7**		**5**		**0**		**0**		**0**		**0**	

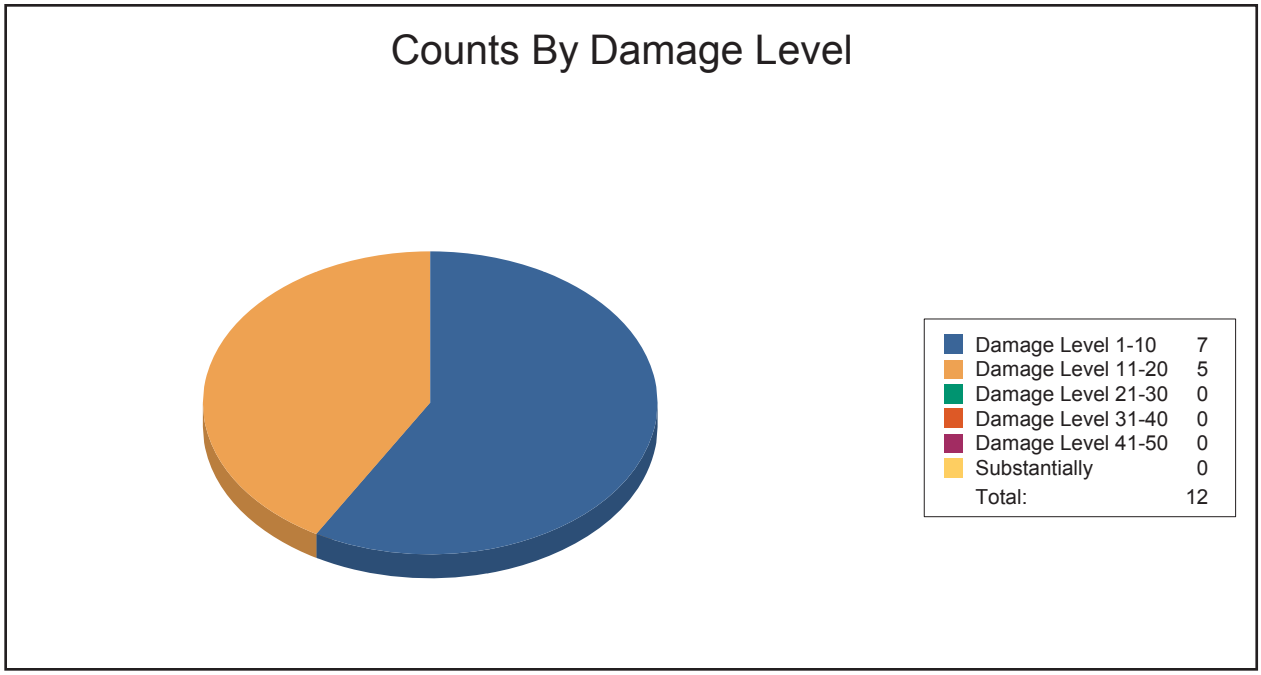


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	7	58	5	42	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	7	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

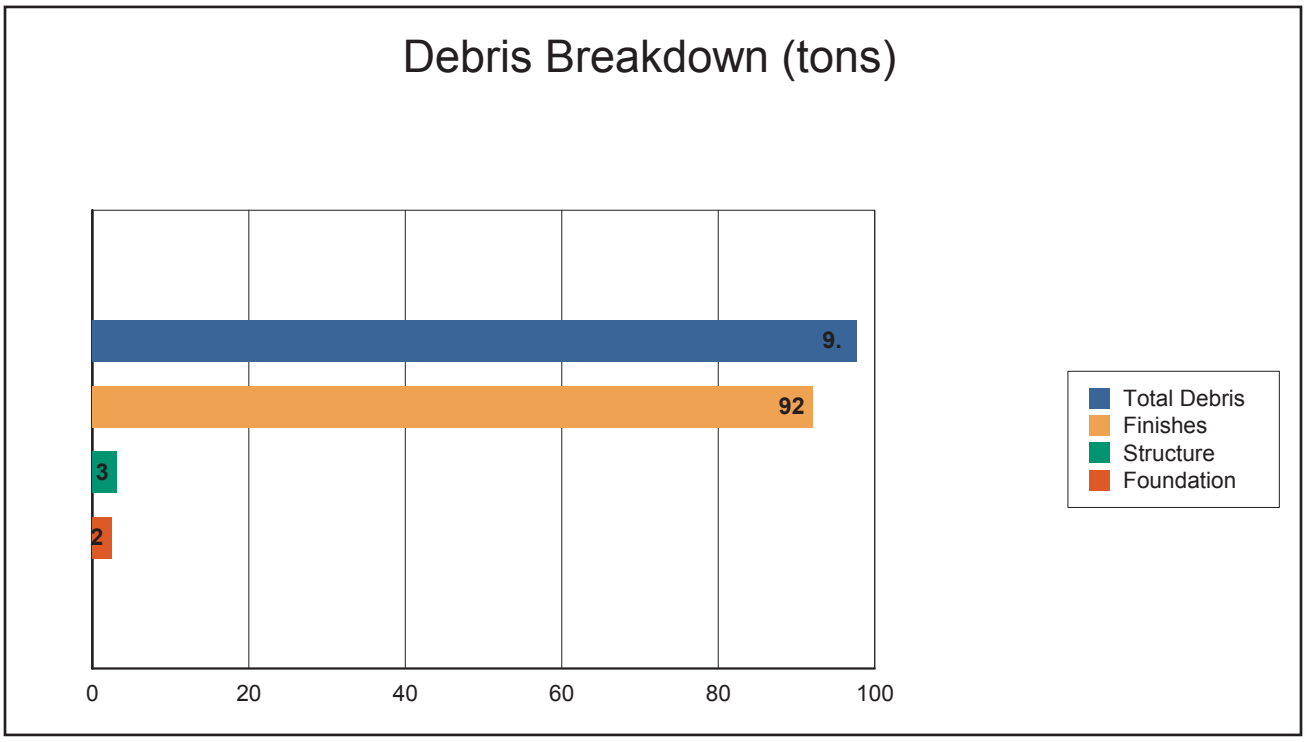
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

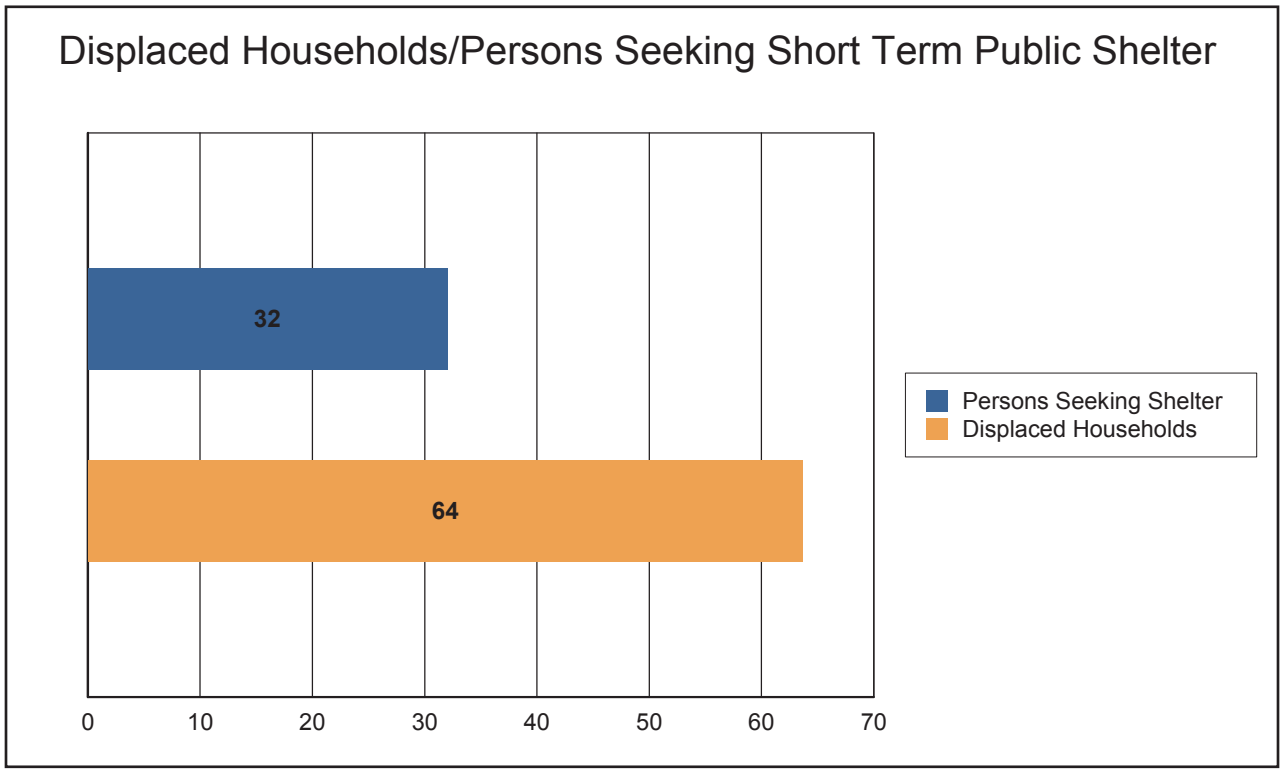


The model estimates that a total of 98 tons of debris will be generated. Of the total amount, Finishes comprises 94% of the total, Structure comprises 3% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 4 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 64 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 32 people (out of a total population of 19,159) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 6.15 million dollars, which represents 0.82 % of the total replacement value of the scenario buildings.

Building-Related Losses

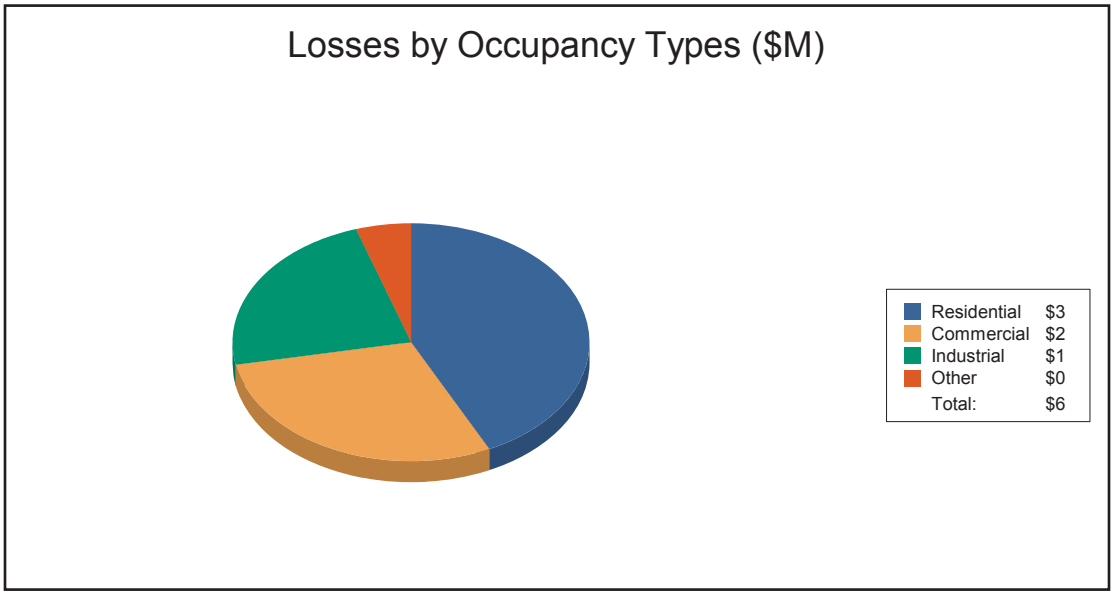
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 6.15 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 42.84% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.86	0.36	0.30	0.04	2.56
	Content	0.78	1.42	0.99	0.27	3.45
	Inventory	0.00	0.01	0.12	0.00	0.13
	Subtotal	**2.64**	**1.80**	**1.41**	**0.31**	**6.15**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**2.64**	**1.80**	**1.41**	**0.31**	**6.15**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	19,159	2,194,425	430,233	2,624,658
Total	**19,159**	**2,194,425**	**430,233**	**2,624,65.**
Total Study Region	**19,159**	**2,194,425**	**430,233**	**2,624,65.**

Hazus-MH: Flood Global Risk Report

Region Name: Franklin

Flood Scenario: Franklin 100 Year

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 20 square miles and contains 74 census blocks. The region contains over 1 thousand households and has a total population of 1,922 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 892 buildings in the region with a total building replacement value (excluding contents) of 323 million dollars (2010 dollars). Approximately 84.98% of the buildings (and 61.04% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 892 buildings in the region which have an aggregate total replacement value of 323 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	197,194	61.0%
Commercial	51,361	15.9%
Industrial	20,117	6.2%
Agricultural	49,135	15.2%
Religion	2,923	0.9%
Government	540	0.2%
Education	1,808	0.6%
Total	**323,07.**	**100%w**

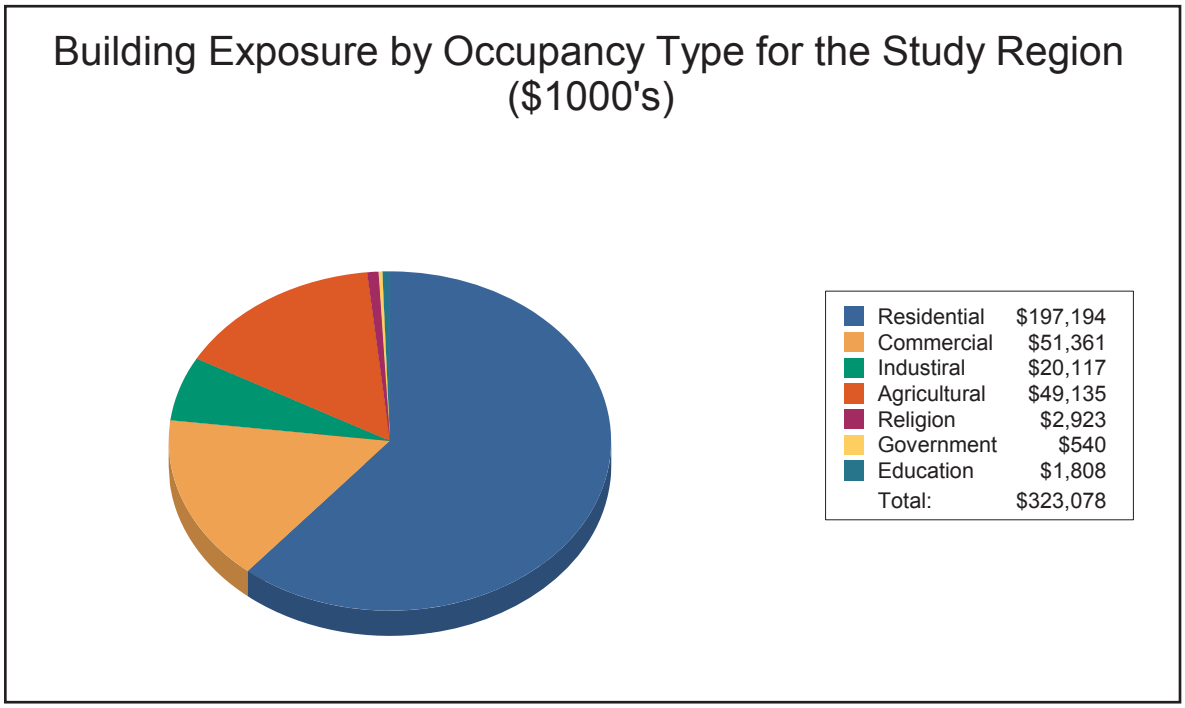
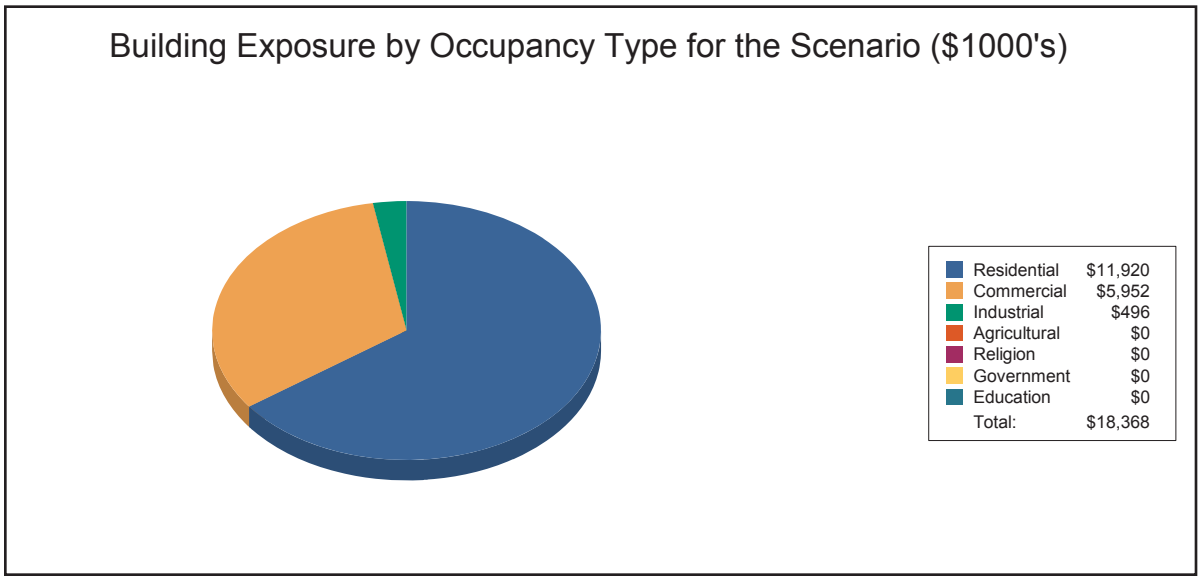


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	11,920	64.9%
Commercial	5,952	32.4%
Industrial	496	2.7%
Agricultural	0	0.0%
Religion	0	0.0%
Government	0	0.0%
Education	0	0.0%
Total	**1. ,36.**	**100%w**



Essential Facility Inventory

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

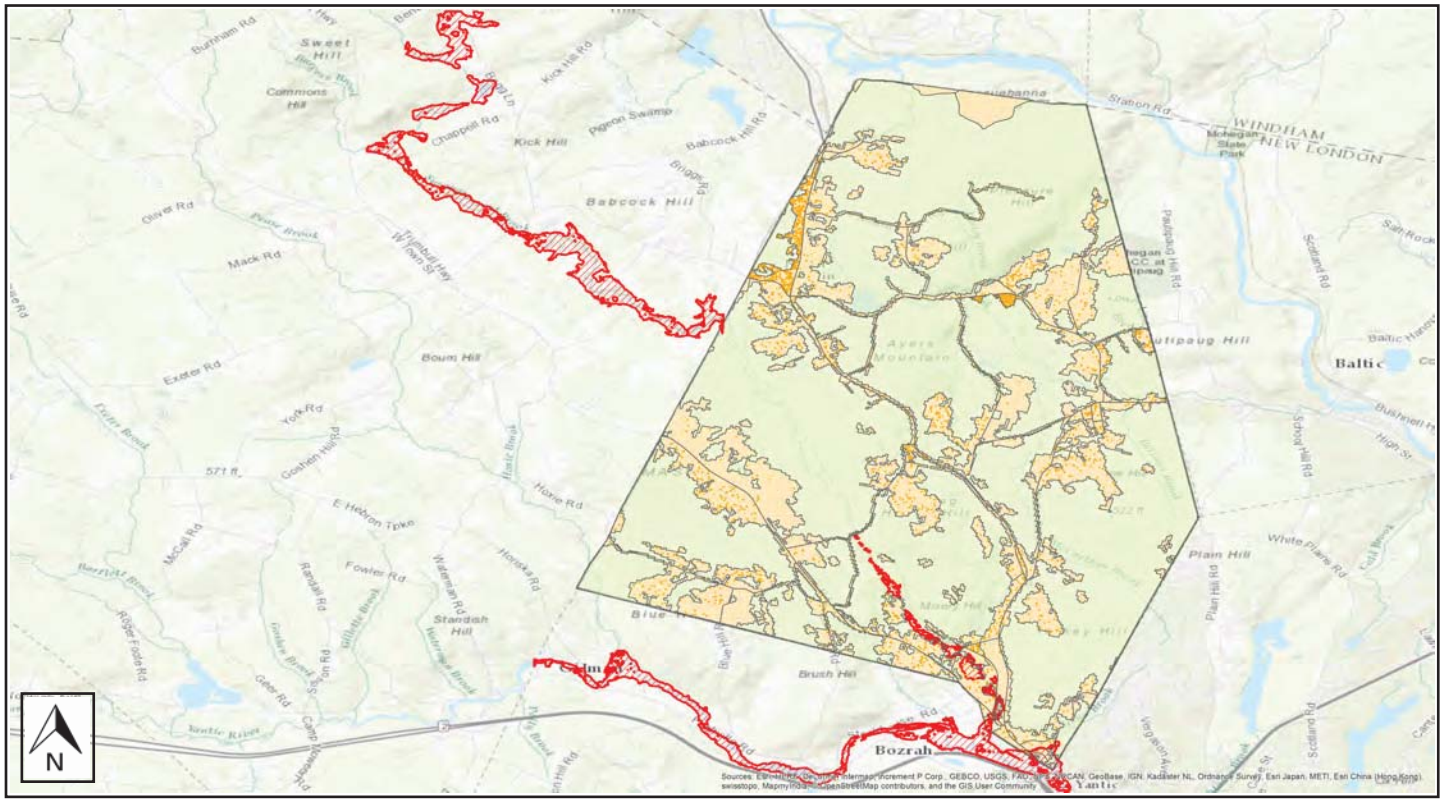
Flood Scenario Parameters

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

Study Region Name:	Franklin
Scenario Name:	Franklin 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

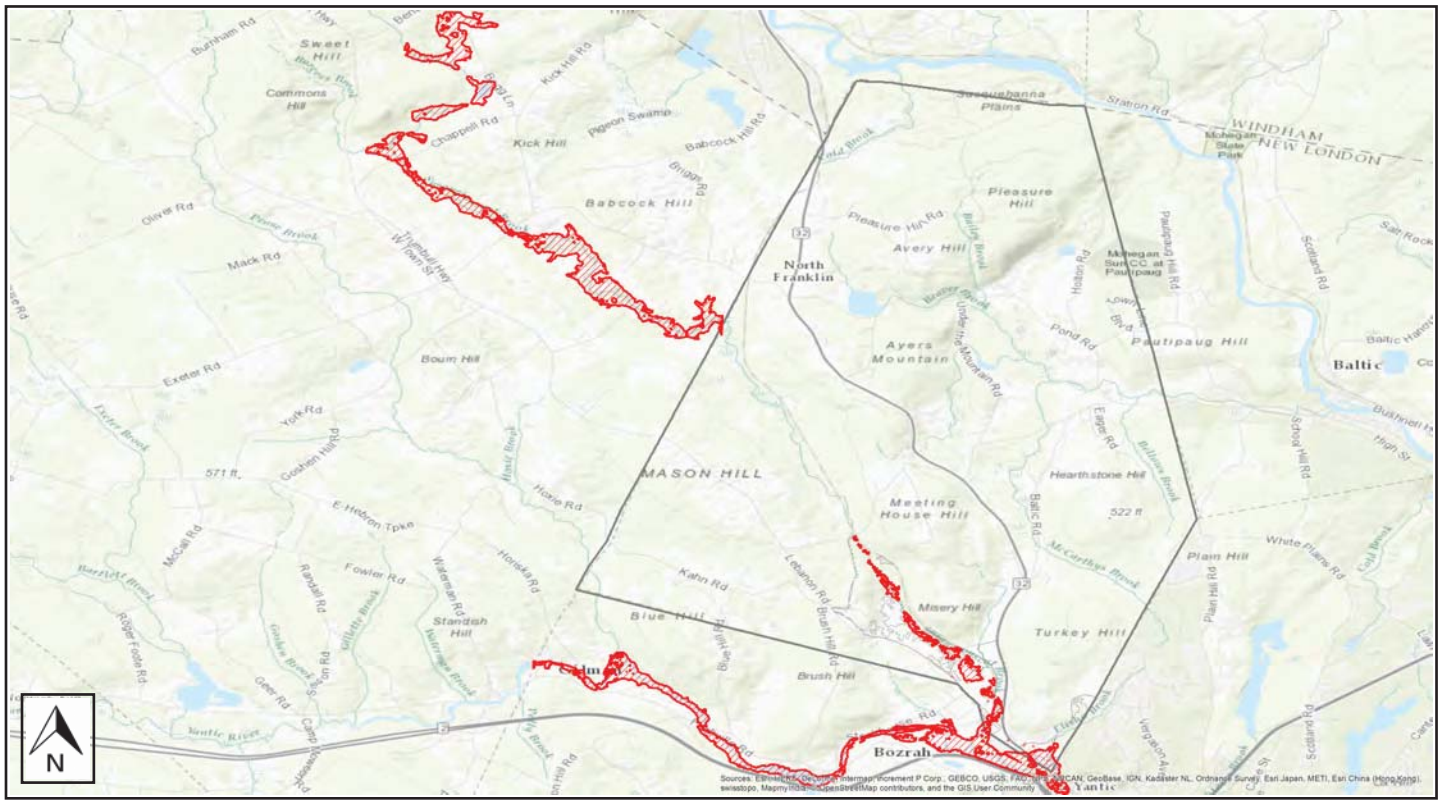


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

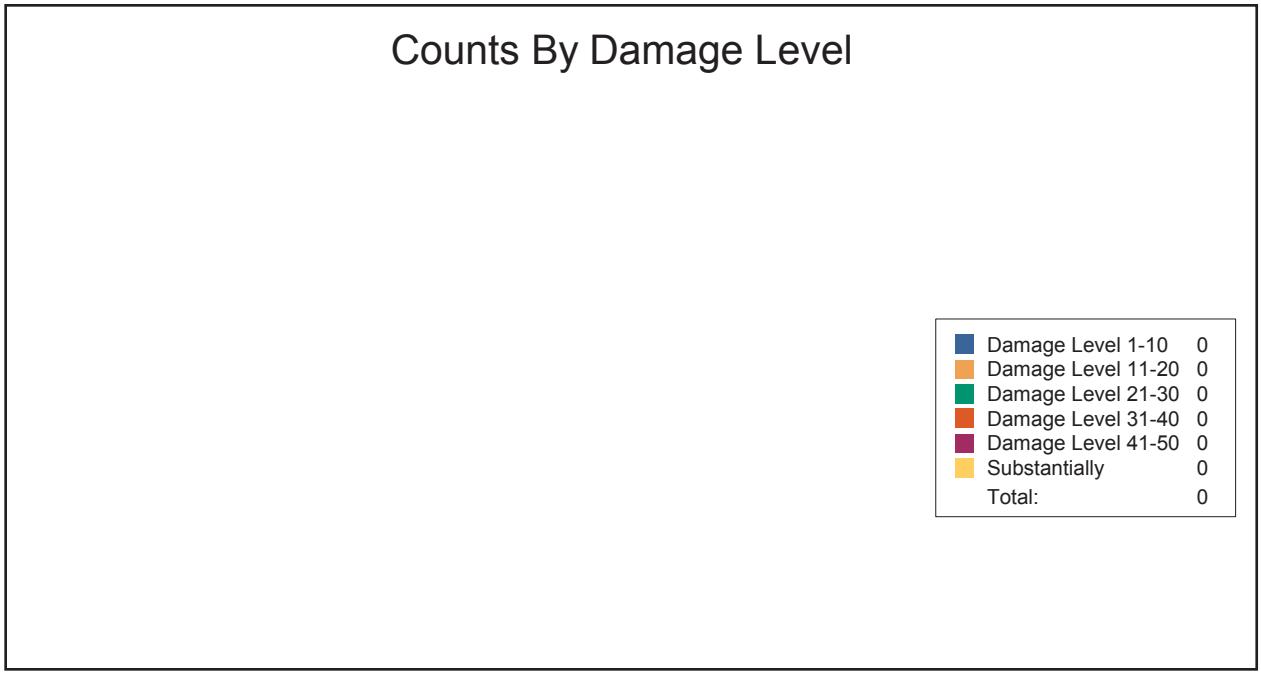


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

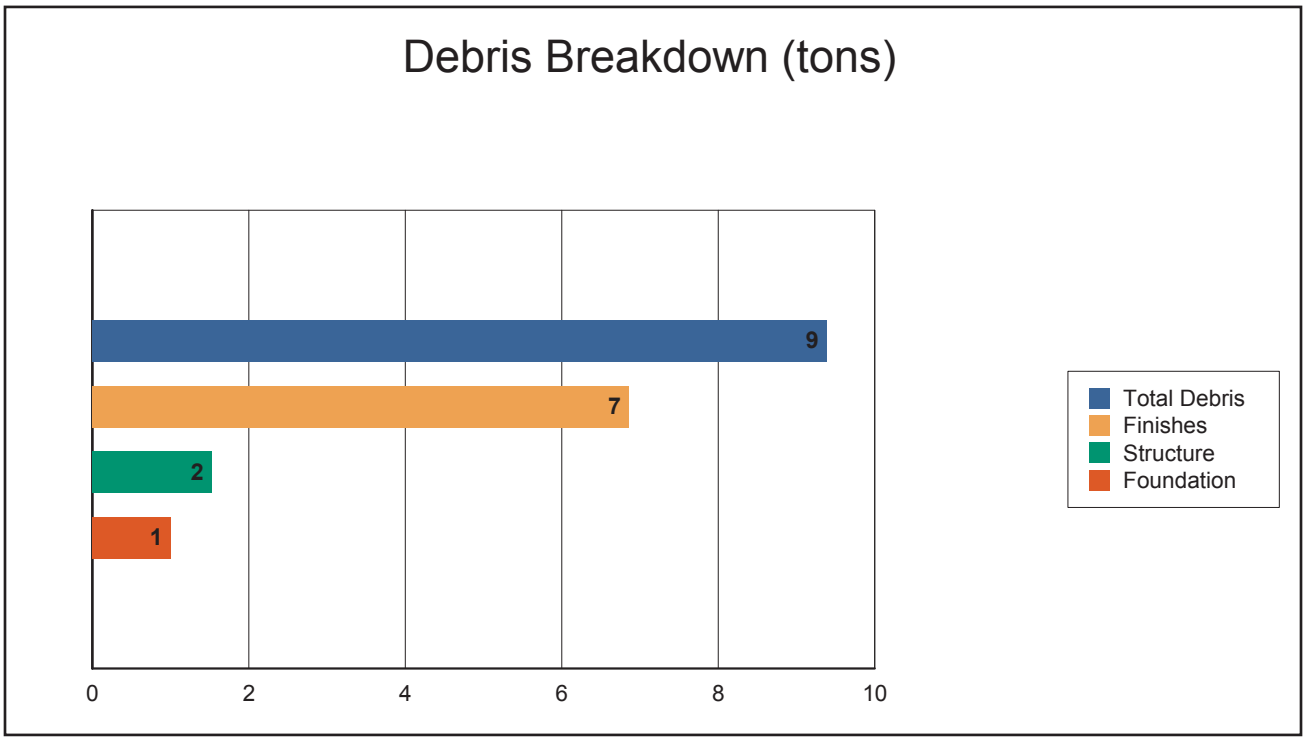
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

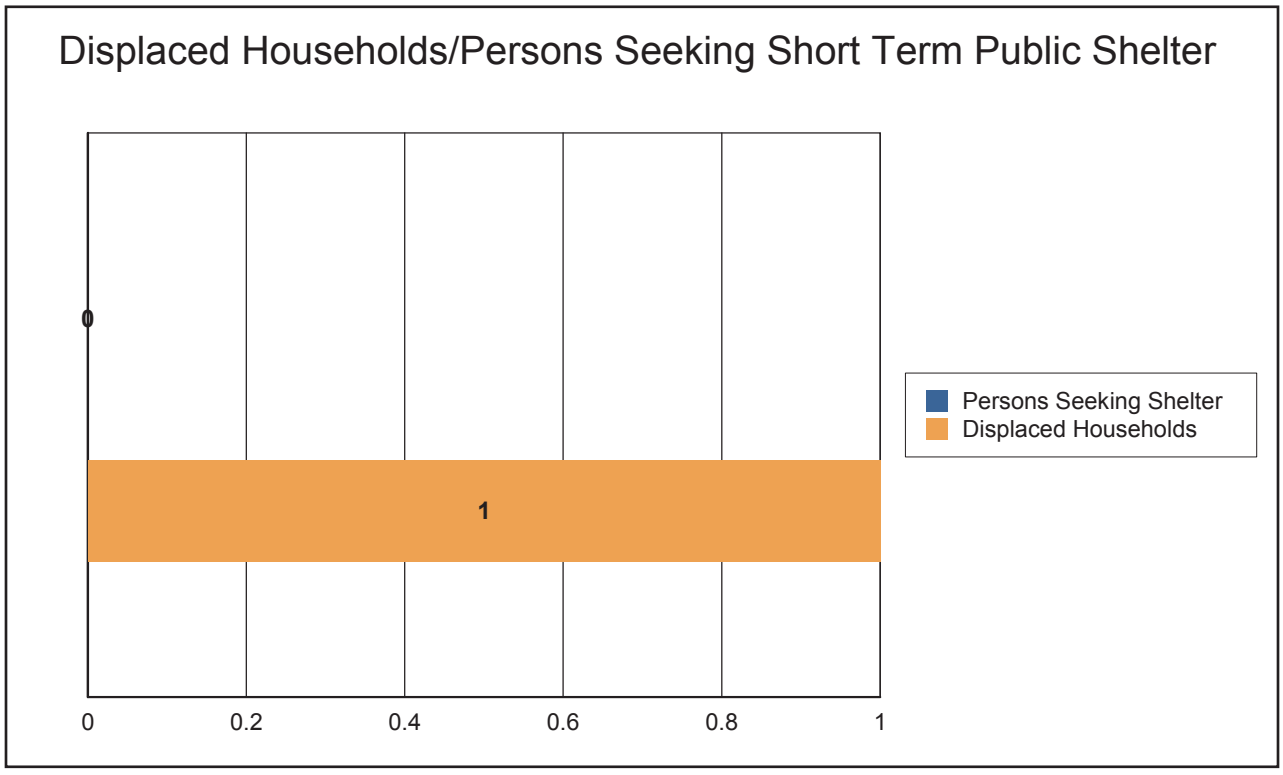


The model estimates that a total of 9 tons of debris will be generated. Of the total amount, Finishes comprises 73% of the total, Structure comprises 16% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 1,922) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.49 million dollars, which represents 2.68 % of the total replacement value of the scenario buildings.

Building-Related Losses

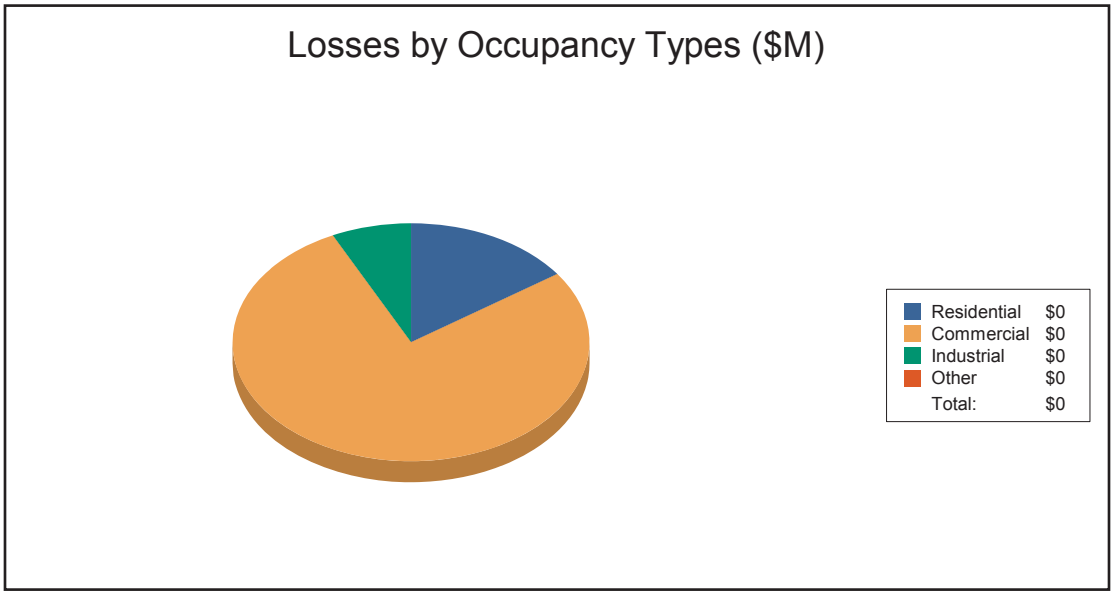
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.49 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 15.24% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.06	0.09	0.02	0.00	0.16
	Content	0.02	0.28	0.02	0.00	0.32
	Inventory	0.00	0.01	0.00	0.00	0.01
	Subtotal	**0%2.**	**0%3.**	**0%24**	**0%20**	**0%49**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0%20**	**0%20**	**0%20**	**0%20**	**0%20**
ALL	**Total**	**0%2.**	**0%3.**	**0%24**	**0%20**	**0%49**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	1,922	197,194	125,884	323,078
Total	**1,922**	**197,194**	**125,. . 4**	**323,07.**
Total Study Region	**1,922**	**197,194**	**125,. . 4**	**323,07.**

Hazus-MH: Flood Global Risk Report

Region Name: GriswoldComplete

Flood Scenario: Griswold Pachaug 1 Percent Annual Chanc

Print Date: Friday, June 16, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 37 square miles and contains 323 census blocks. The region contains over 5 thousand households and has a total population of 11,951 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 4,371 buildings in the region with a total building replacement value (excluding contents) of 1,340 million dollars (2010 dollars). Approximately 92.34% of the buildings (and 79.64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 4,371 buildings in the region which have an aggregate total replacement value of 1,340 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,067,241	79.6%
Commercial	148,843	11.1%
Industrial	92,494	6.9%
Agricultural	3,213	0.2%
Religion	9,134	0.7%
Government	5,981	0.4%
Education	13,141	1.0%
Total	**1,340,047**	**100.0%**

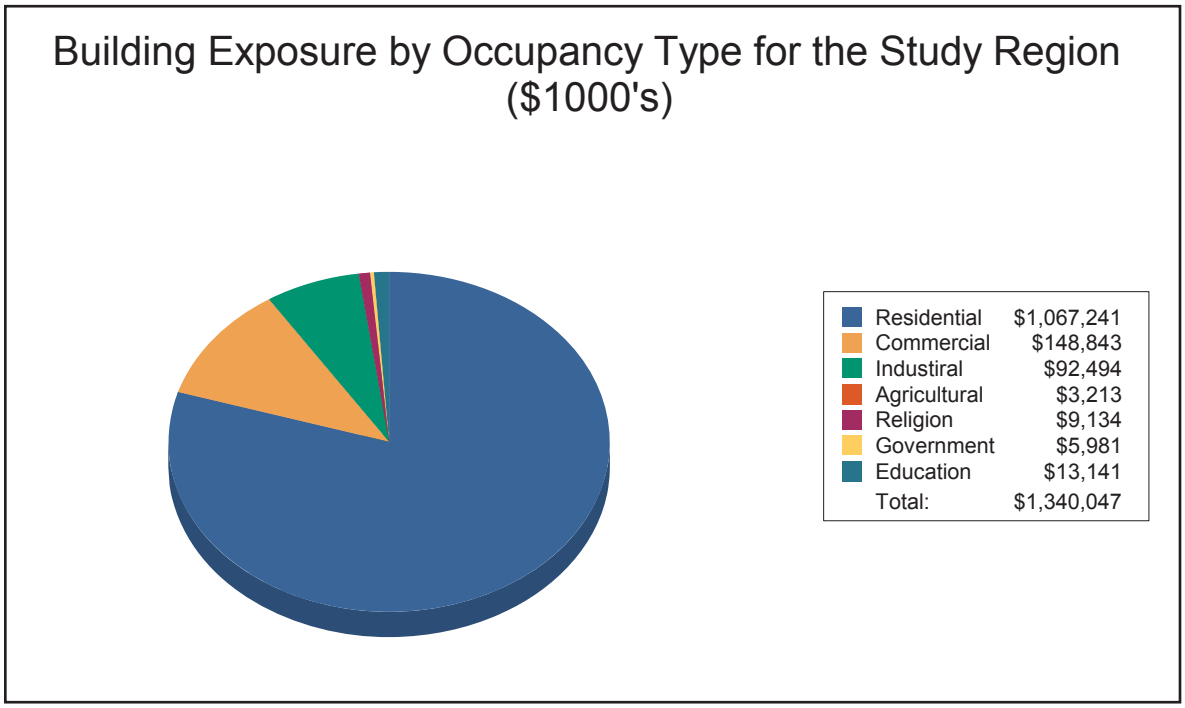
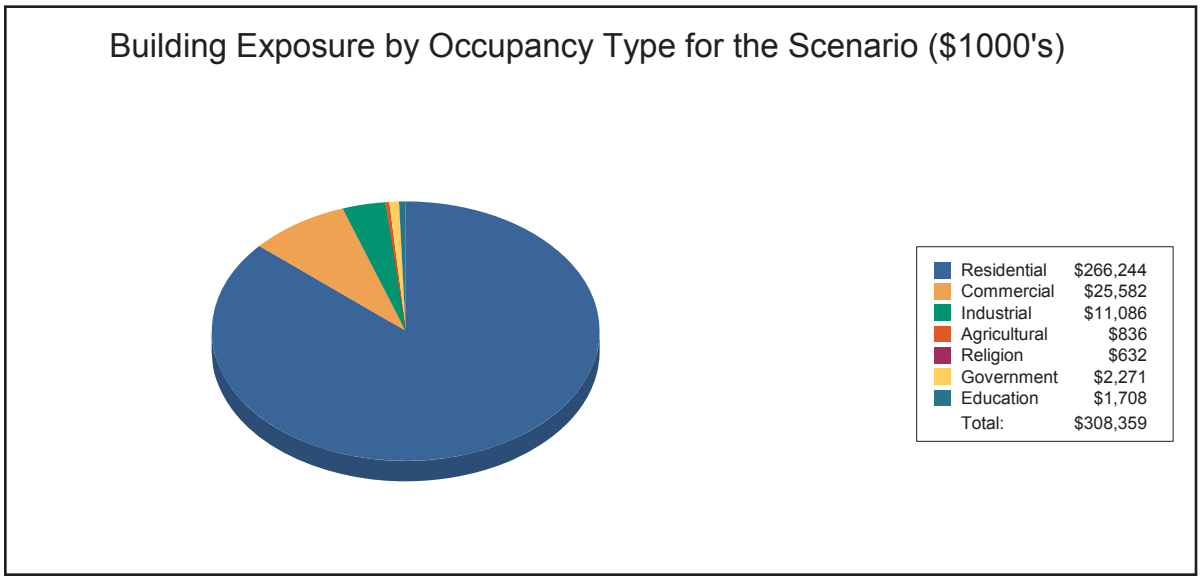


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	266,244	86.3%
Commercial	25,582	8.3%
Industrial	11,086	3.6%
Agricultural	836	0.3%
Religion	632	0.2%
Government	2,271	0.7%
Education	1,708	0.6%
Total	**308,359**	**100.0%**



Essential Facility Inventory

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

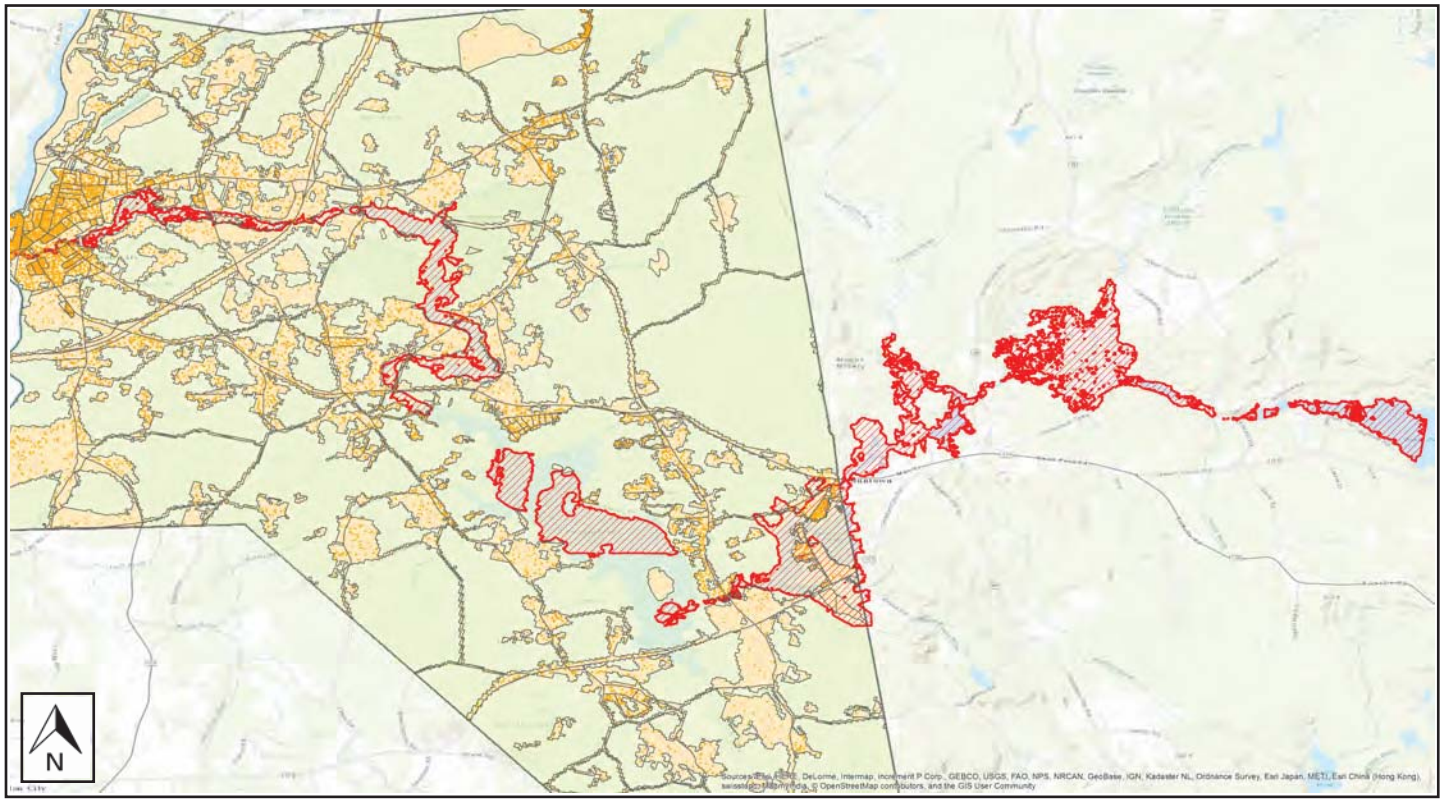
Flood Scenario Parameters

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

Study Region Name:	GriswoldComplete
Scenario Name:	Griswold Pachaug 1 Percent Annual Chanc
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 59 buildings will be at least moderately damaged. This is over 13% of the total number of buildings in the scenario. There are an estimated 38 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

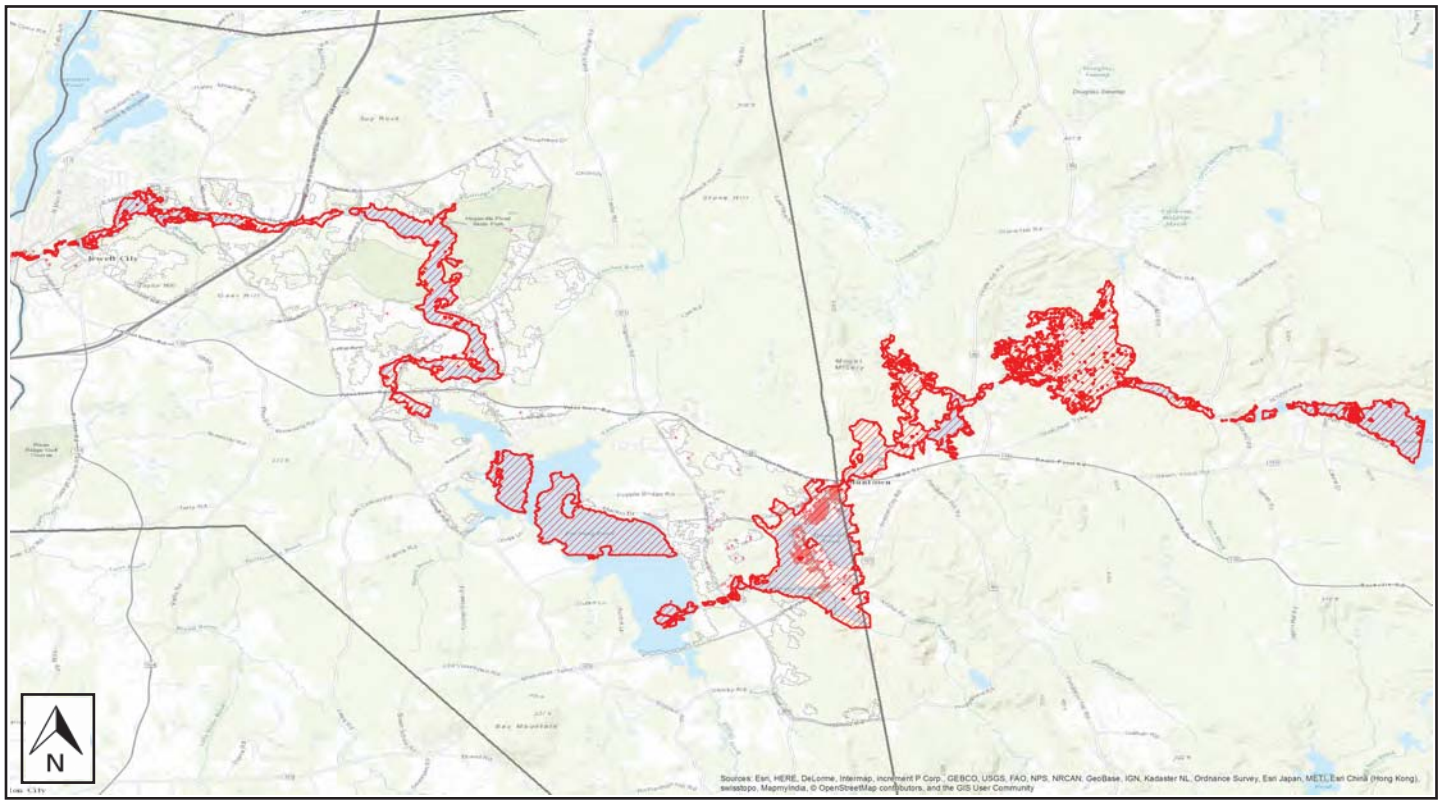


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	1.67	1	1.67	6	10.00	9	15.00	5	8.33	38	63.33
Total	**1**		**1**		**6**		**9**		**5**		**3ᴎ**	

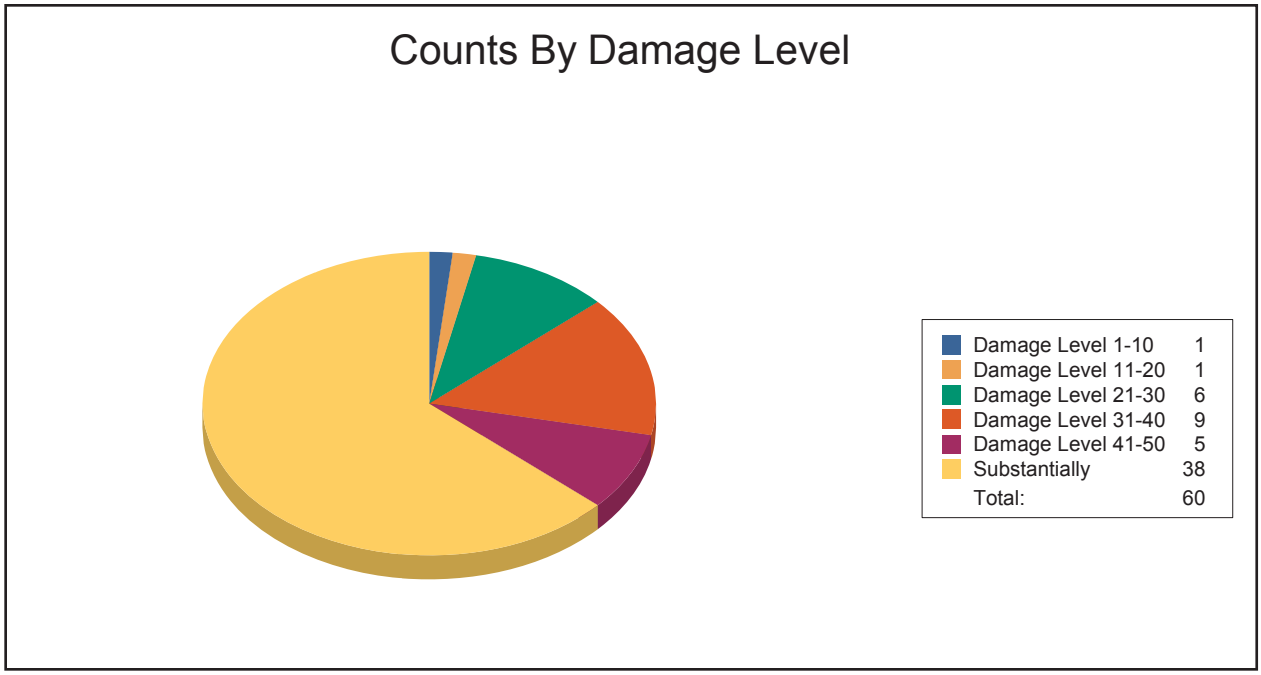


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	10	100
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	1	2	1	2	6	12	9	18	5	10	28	56

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	4	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

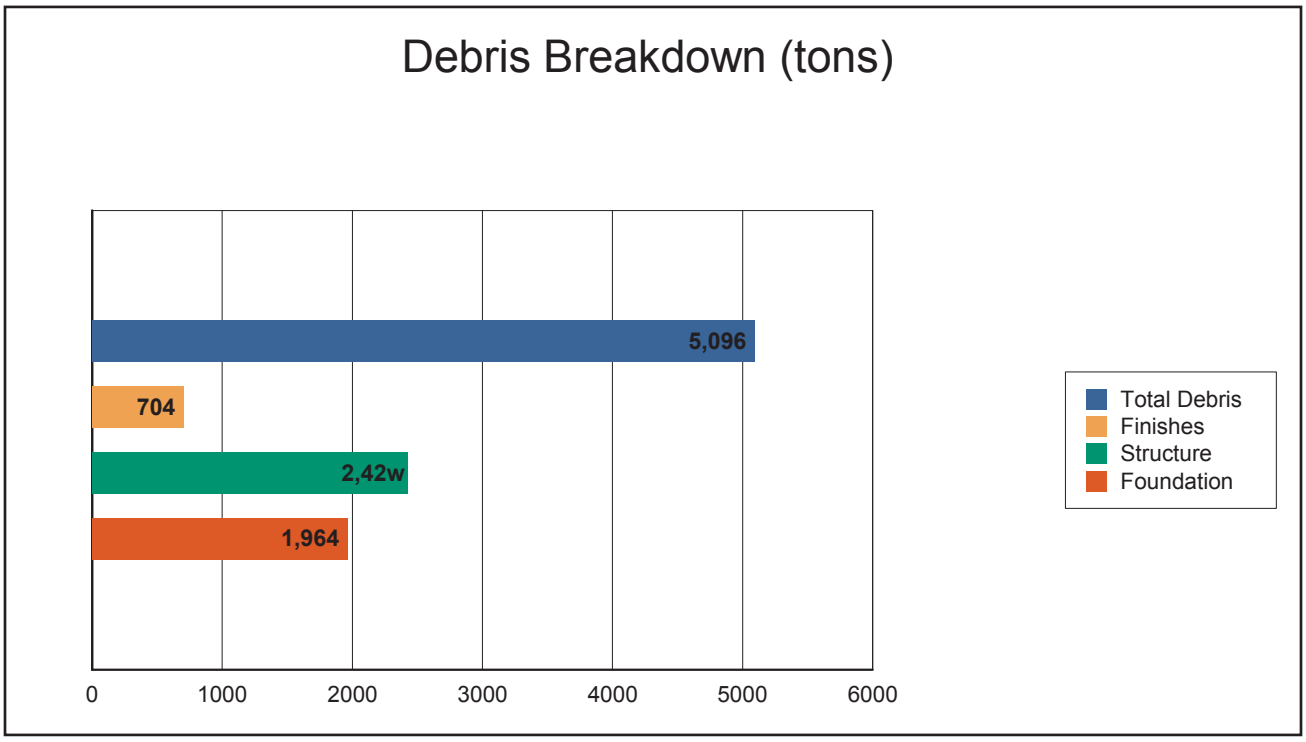
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

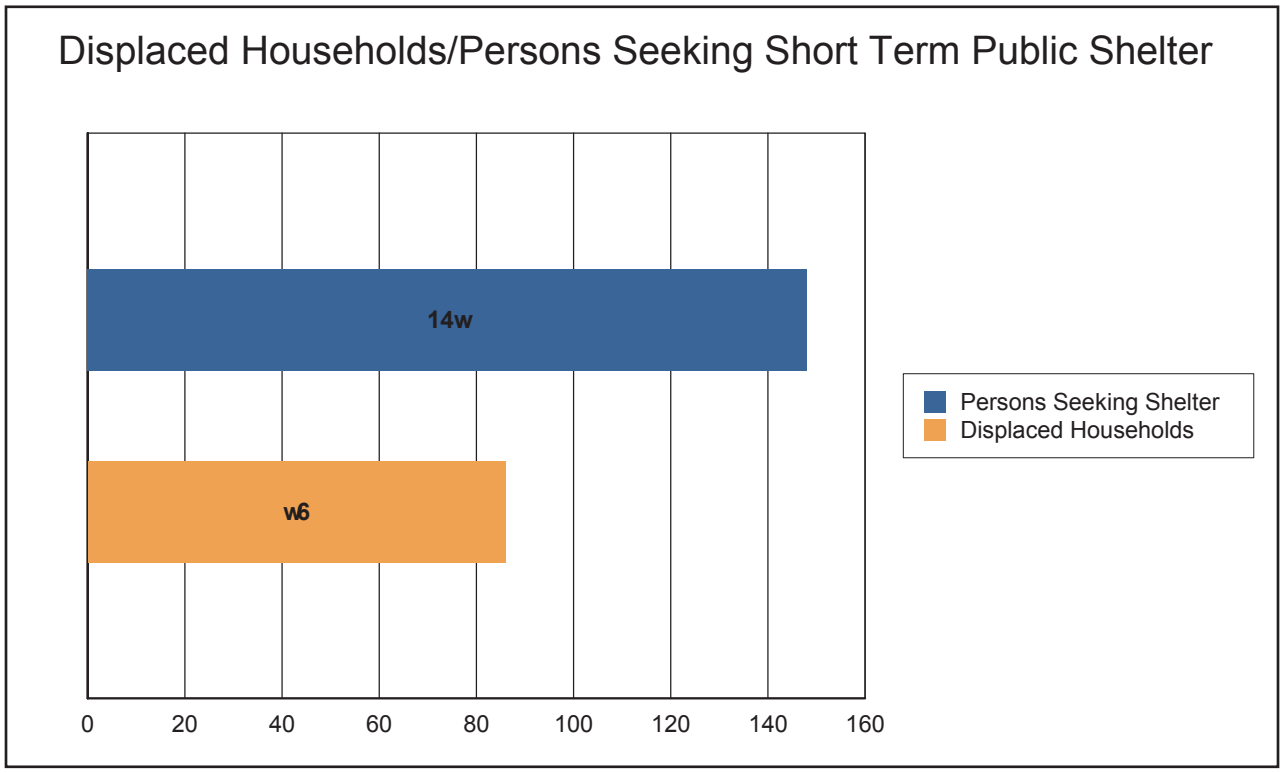


The model estimates that a total of 5,096 tons of debris will be generated. Of the total amount, Finishes comprises 14% of the total, Structure comprises 48% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 204 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 86 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 148 people (out of a total population of 11,951) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 36.65 million dollars, which represents 11.88 % of the total replacement value of the scenario buildings.

Building-Related Losses

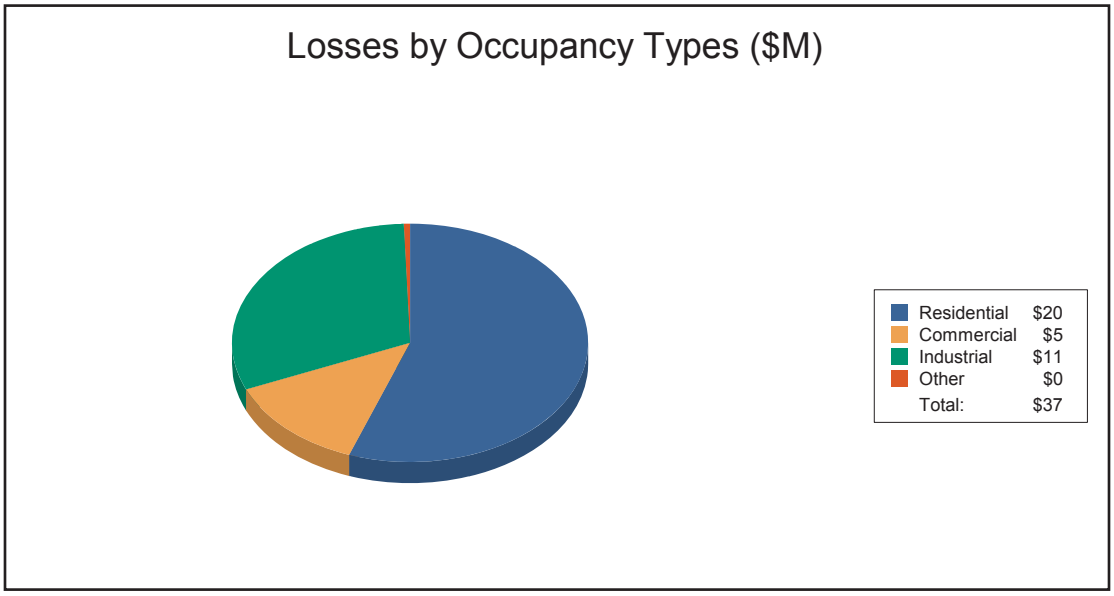
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 36.62 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 55.54% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	14.31	1.90	3.60	0.03	19.85
	Content	6.03	2.82	7.08	0.18	16.12
	Inventory	0.00	0.05	0.61	0.00	0.66
	Subtotal	**20.34**	**4.7w**	**11.30**	**0.21**	**36.62**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.01	0.00	0.00	0.00	0.01
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.01	0.00	0.00	0.01
	Subtotal	**0.02**	**0.01**	**0.00**	**0.00**	**0.03**
ALL	**Total**	**20.35**	**4.7w**	**11.30**	**0.22**	**36.65**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	11,951	1,067,241	272,806	1,340,047
Total	**11,951**	**1,067,241**	**272,w06**	**1,340,047**
Total Study Region	**11,951**	**1,067,241**	**272,w06**	**1,340,047**

Hazus-MH: Flood Global Risk Report

Region Name: GriswoldComplete

Flood Scenario: Griswold Quinebaug 1 Percent Annual Cha

Print Date: Friday, June 16, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 37 square miles and contains 323 census blocks. The region contains over 5 thousand households and has a total population of 11,951 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 4,371 buildings in the region with a total building replacement value (excluding contents) of 1,340 million dollars (2010 dollars). Approximately 92.34% of the buildings (and 79.64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 4,371 buildings in the region which have an aggregate total replacement value of 1,340 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,067,241	79.6%
Commercial	148,843	11.1%
Industrial	92,494	6.9%
Agricultural	3,213	0.2%
Religion	9,134	0.7%
Government	5,981	0.4%
Education	13,141	1.0%
Total	**1,340,047**	**100.0%**

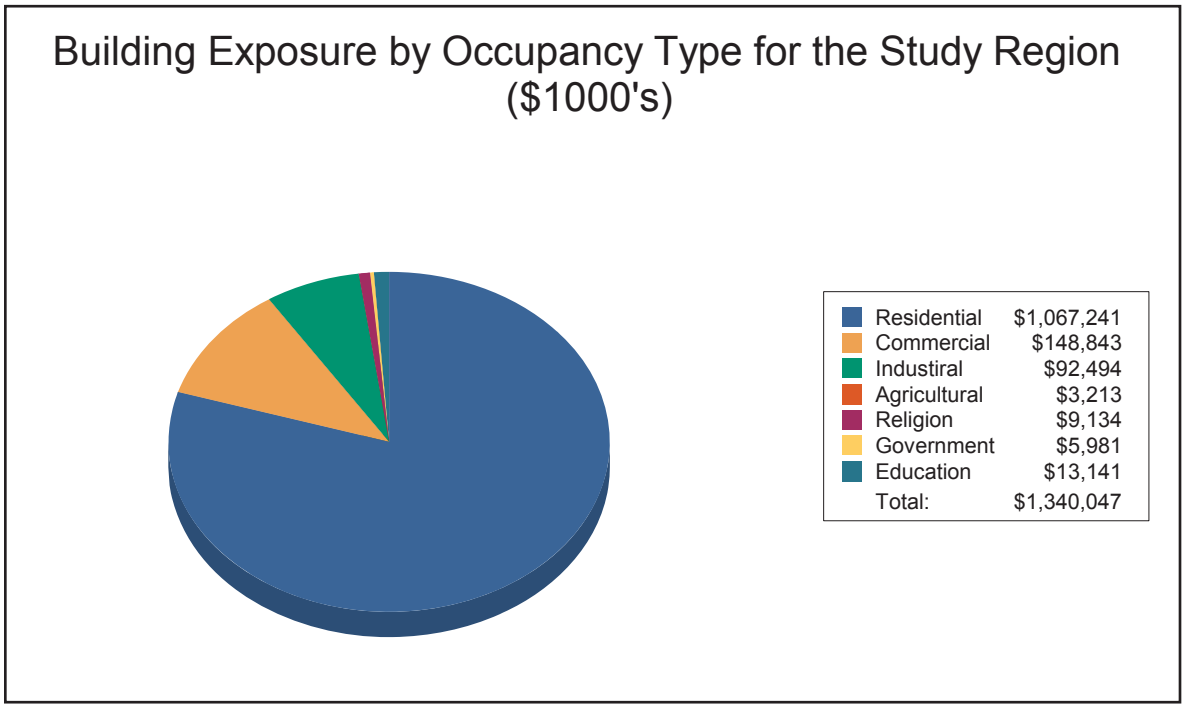
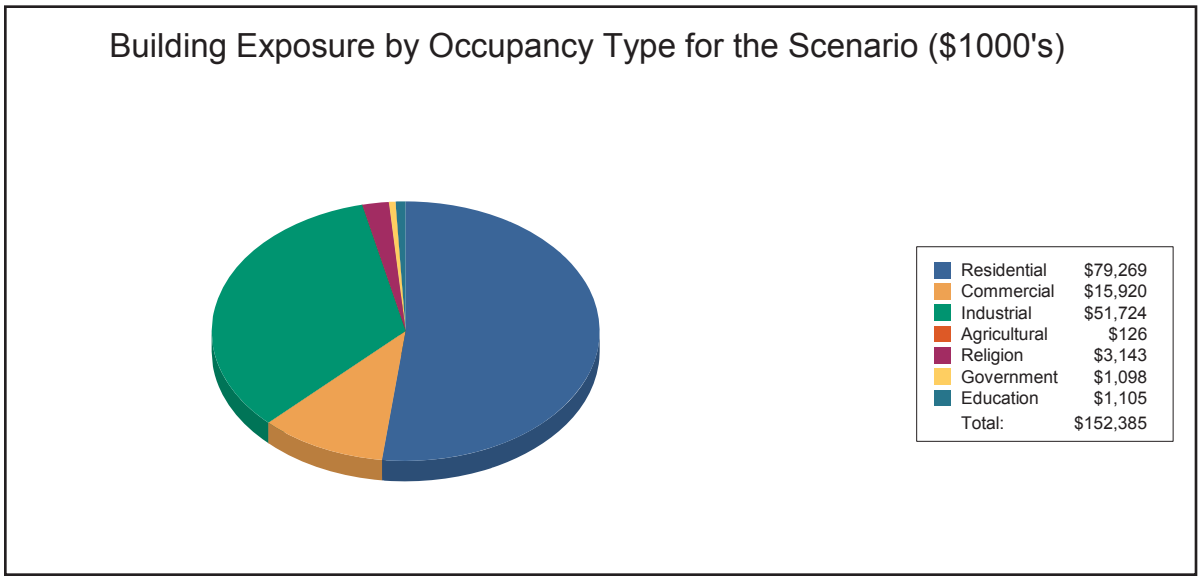


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	79,269	52.0%
Commercial	15,920	10.4%
Industrial	51,724	33.9%
Agricultural	126	0.1%
Religion	3,143	2.1%
Government	1,098	0.7%
Education	1,105	0.7%
Total	**152,385**	**100.0%**



Essential Facility Inventory

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

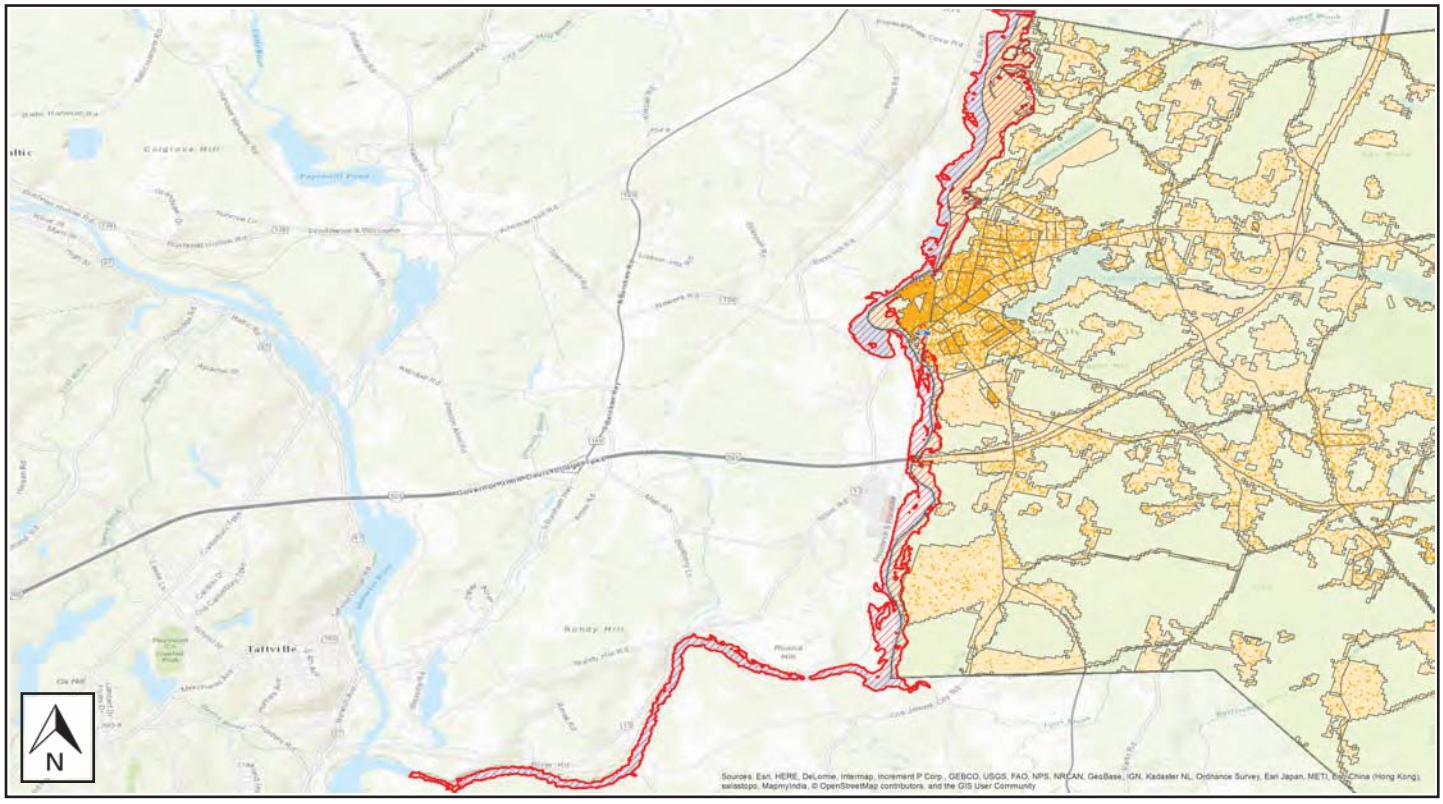
Flood Scenario Parameters

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

Study Region Name:	GriswoldComplete
Scenario Name:	Griswold Quinebaug 1 Percent Annual Cha
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

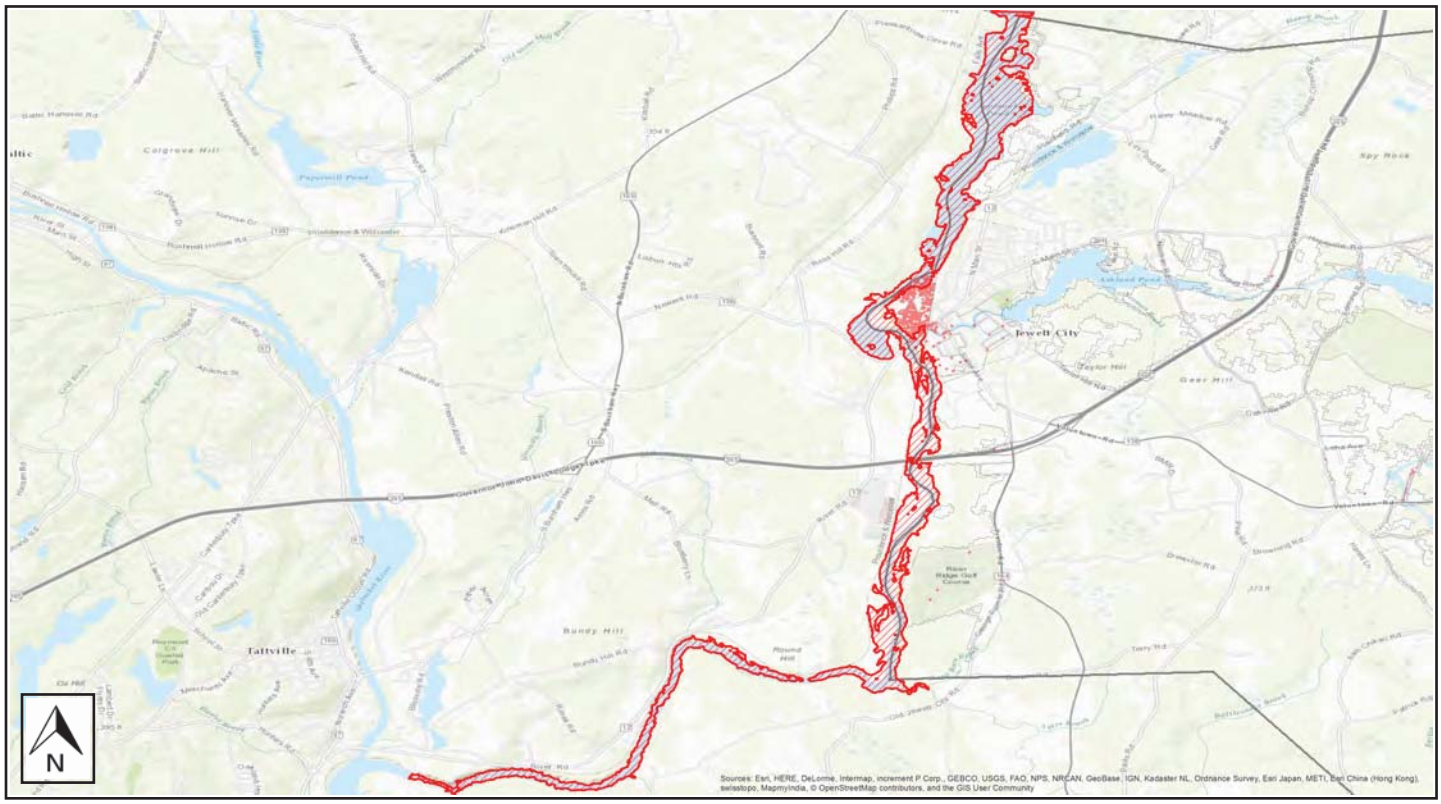


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

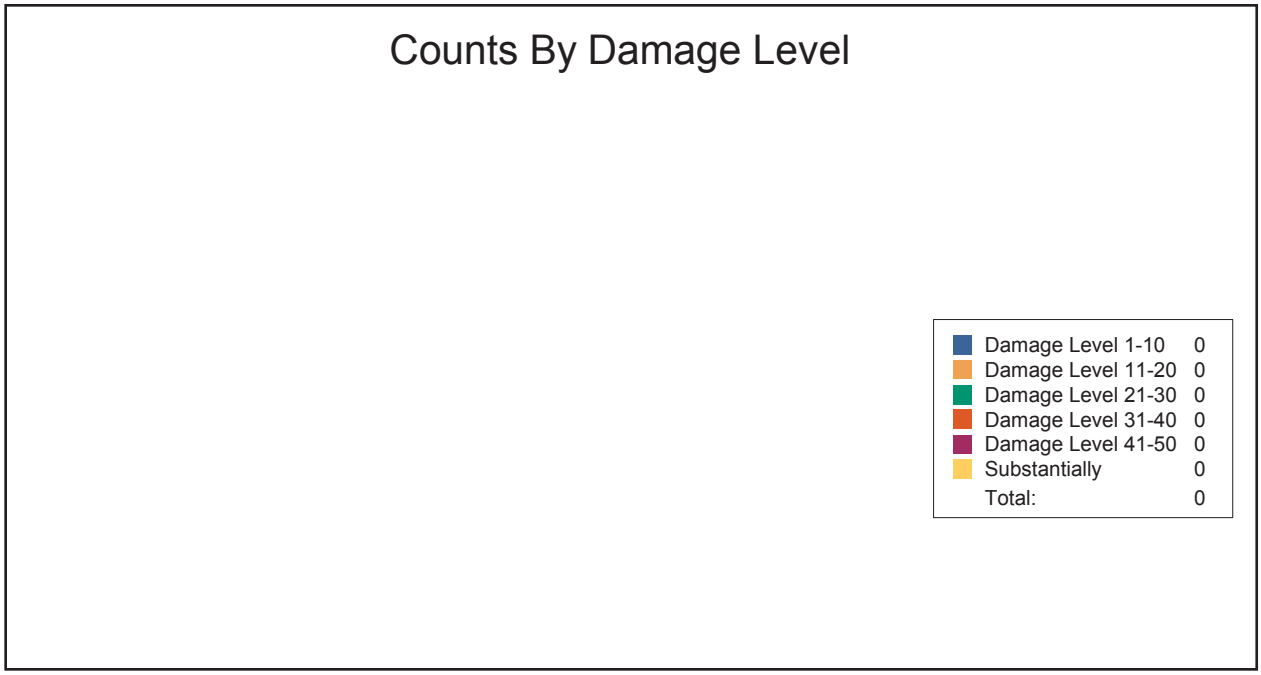


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	2	1	0	1
Schools	4	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

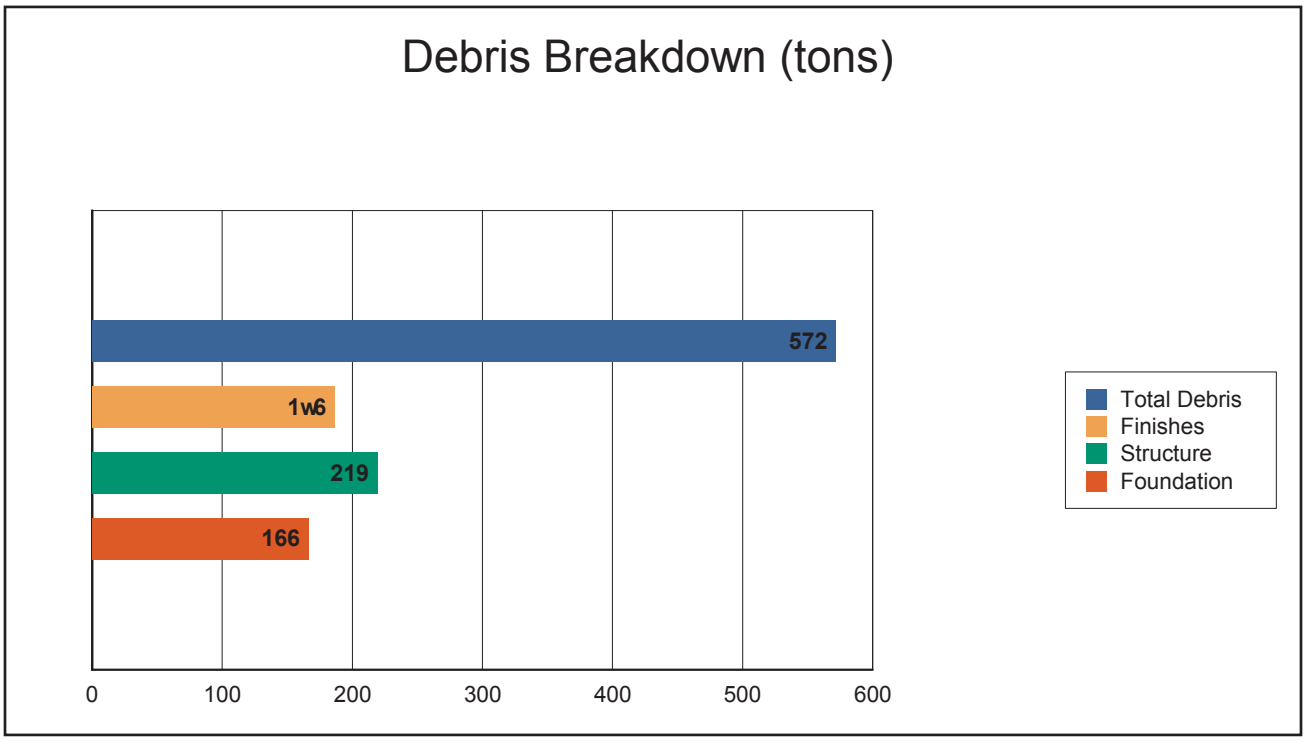
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

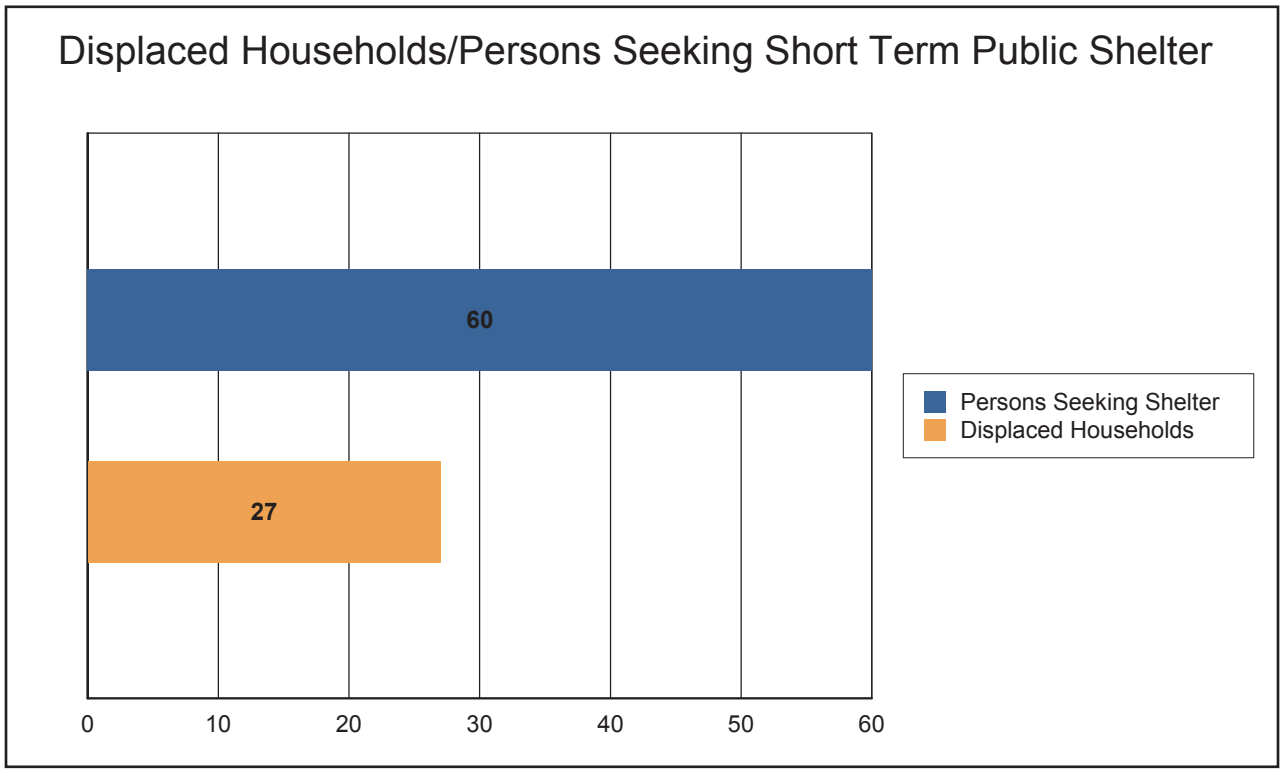


The model estimates that a total of 572 tons of debris will be generated. Of the total amount, Finishes comprises 33% of the total, Structure comprises 38% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 23 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 27 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 60 people (out of a total population of 11,951) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 14.69 million dollars, which represents 9.64 % of the total replacement value of the scenario buildings.

Building-Related Losses

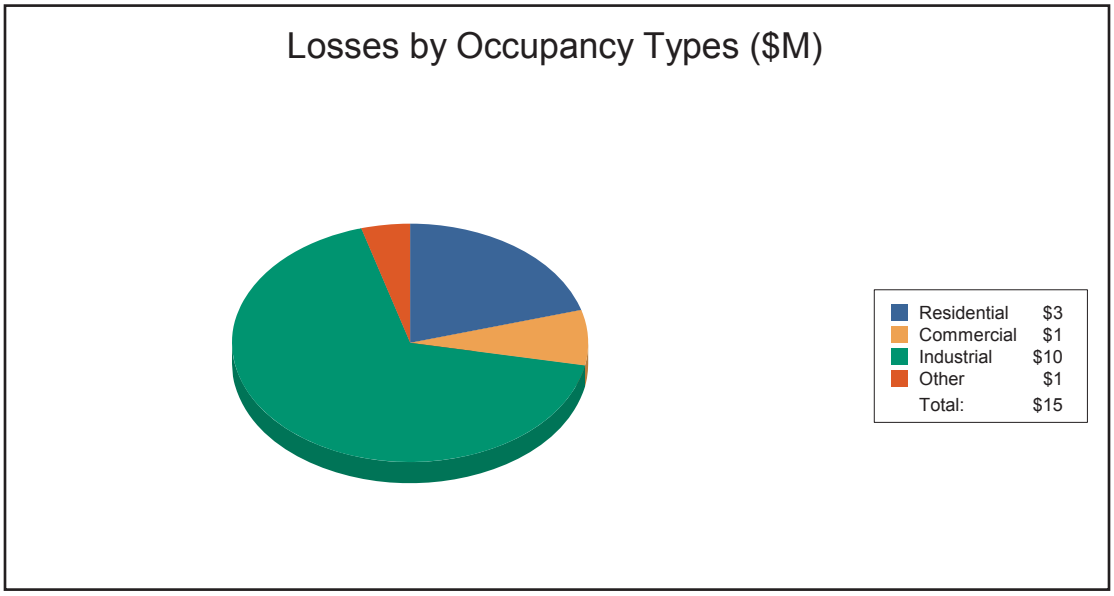
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 14.67 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 20.67% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.91	0.27	3.16	0.10	5.44
	Content	1.13	0.81	6.28	0.55	8.77
	Inventory	0.00	0.01	0.45	0.00	0.46
	Subtotal	**3.04**	**1.10**	**9.89**	**0.64**	**14.67**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.01	0.01
	Subtotal	**0.00**	**0.00**	**0.01**	**0.01**	**0.02**
ALL	**Total**	**3.04**	**1.10**	**9.90**	**0.65**	**14.69**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	11,951	1,067,241	272,806	1,340,047
Total	**11,951**	**1,067,241**	**272,w06**	**1,340,047**
Total Study Region	**11,951**	**1,067,241**	**272,w06**	**1,340,047**

Hazus-MH: Flood Global Risk Report

Region Name: GrotonCity

Flood Scenario: Groton City 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 3 square miles and contains 138 census blocks. The region contains over 4 thousand households and has a total population of 10,389 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 2,626 buildings in the region with a total building replacement value (excluding contents) of 1,288 million dollars (2010 dollars). Approximately 90.56% of the buildings (and 78.55% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 2,626 buildings in the region which have an aggregate total replacement value of 1,288 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,011,758	78.6%
Commercial	150,280	11.7%
Industrial	92,576	7.2%
Agricultural	563	0.0%
Religion	15,337	1.2%
Government	7,792	0.6%
Education	9,666	0.8%
Total	**1,2. 7,972**	**100%w**

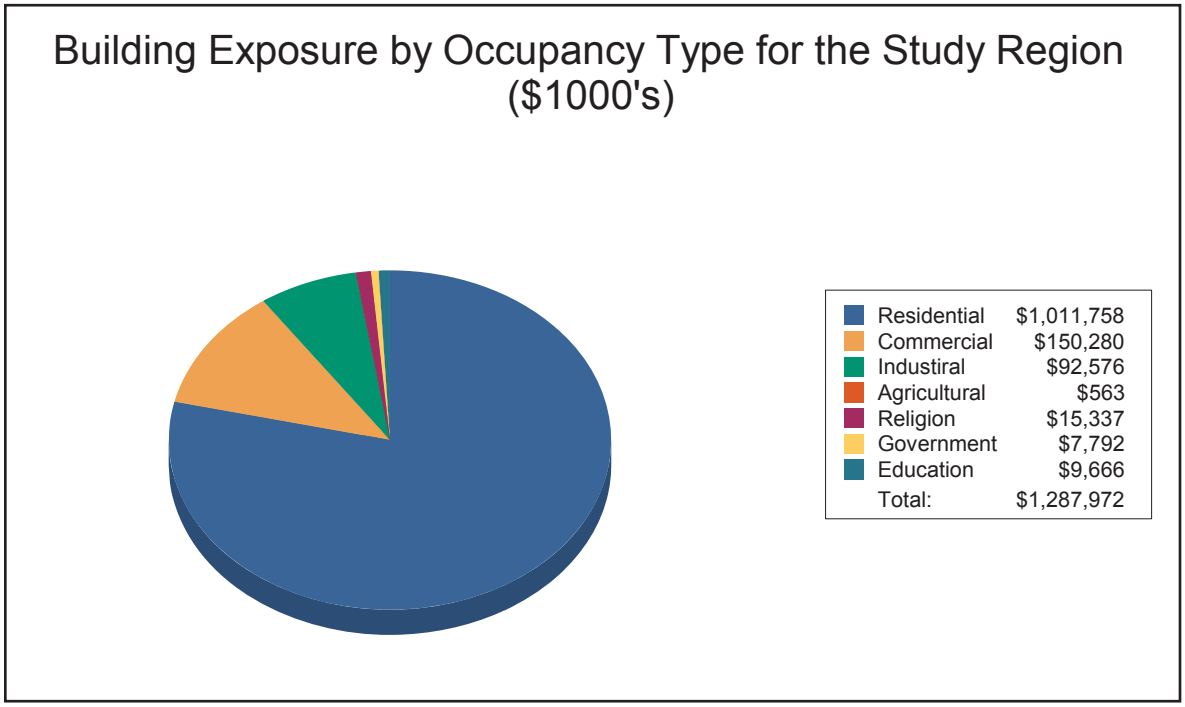
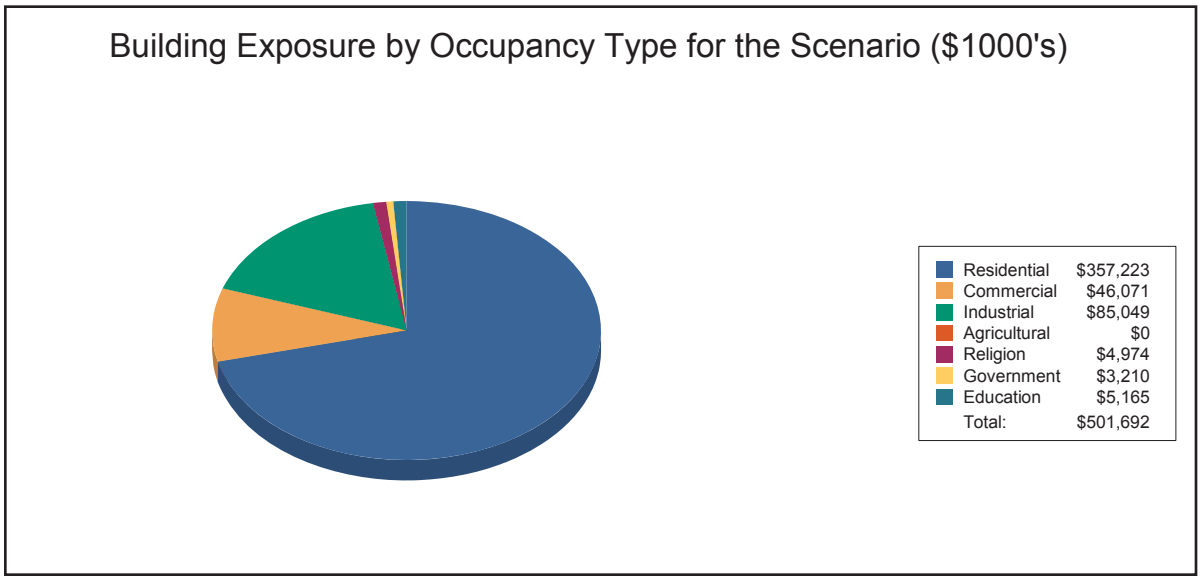


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	357,223	71.2%
Commercial	46,071	9.2%
Industrial	85,049	17.0%
Agricultural	0	0.0%
Religion	4,974	1.0%
Government	3,210	0.6%
Education	5,165	1.0%
Total	**501,692**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 5 schools, 2 fire stations, 2 police stations and no emergency operation centers.

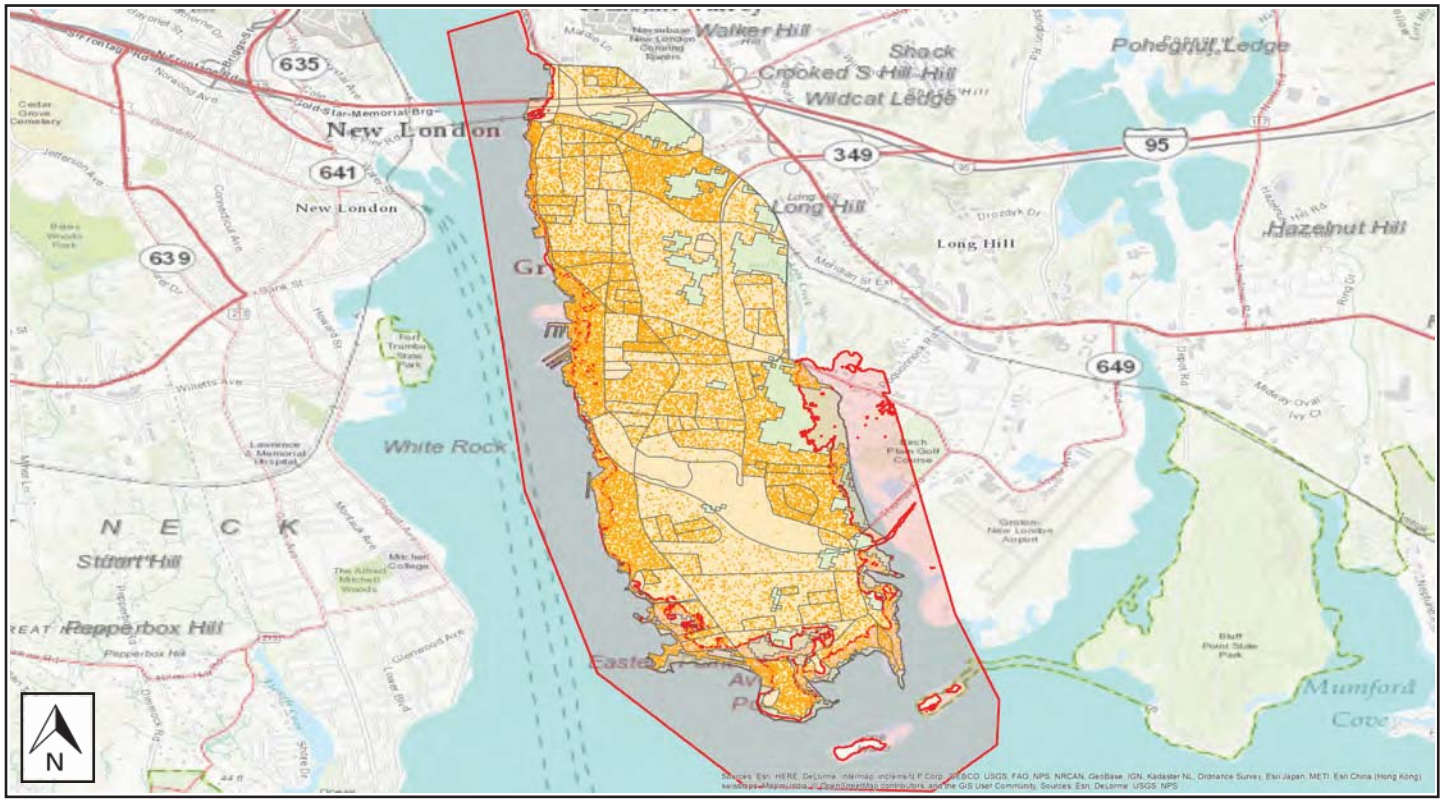
Flood Scenario Parameters

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

Study Region Name:	GrotonCity
Scenario Name:	Groton City 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 62 buildings will be at least moderately damaged. This is over 57% of the total number of buildings in the scenario. There are an estimated 9 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

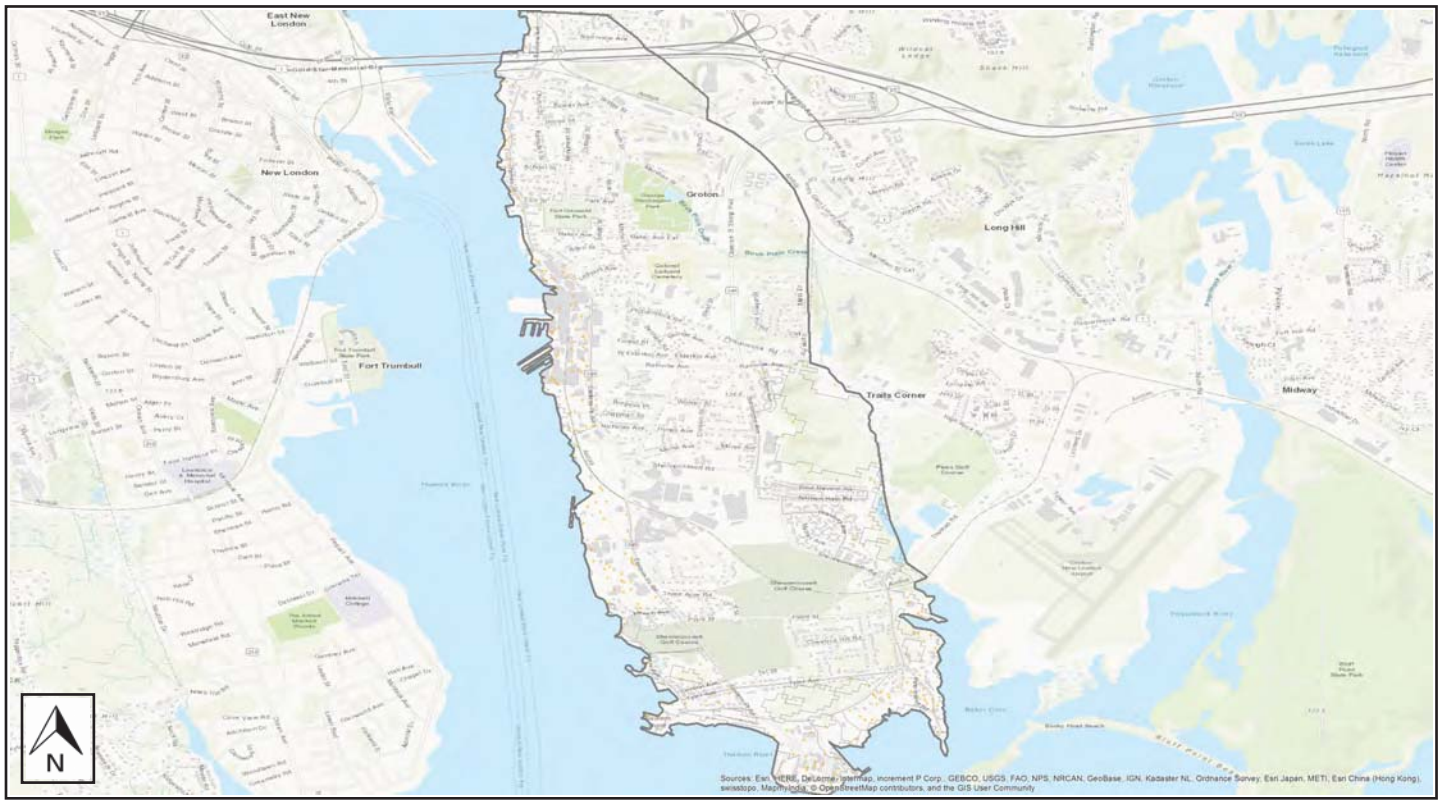


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	1.59	35	55.56	16	25.40	2	3.17	0	0.00	9	14.29
Total	**1**		**35**		**16**		**2**		**0**		**9**	

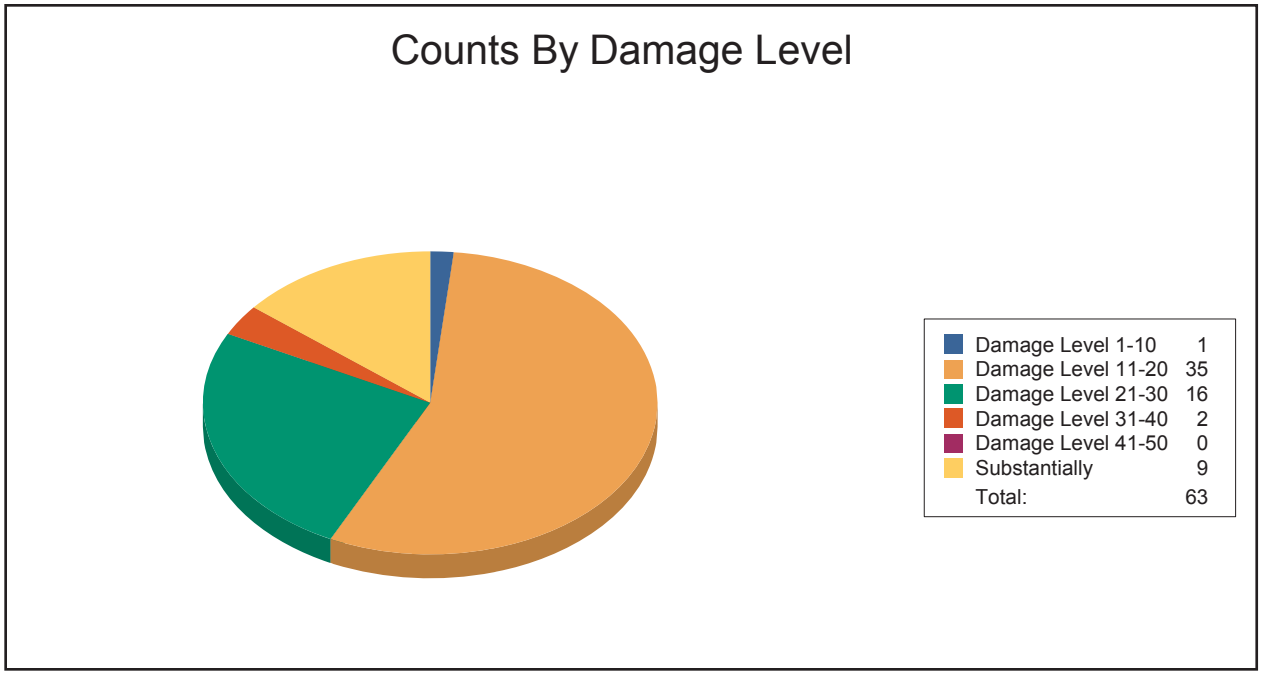


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	1	100	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	2	100	0	0	0	0	0	0	0	0
Steel	0	0	1	100	0	0	0	0	0	0	0	0
Wood	0	0	31	53	16	28	2	3	0	0	9	16

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	5	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

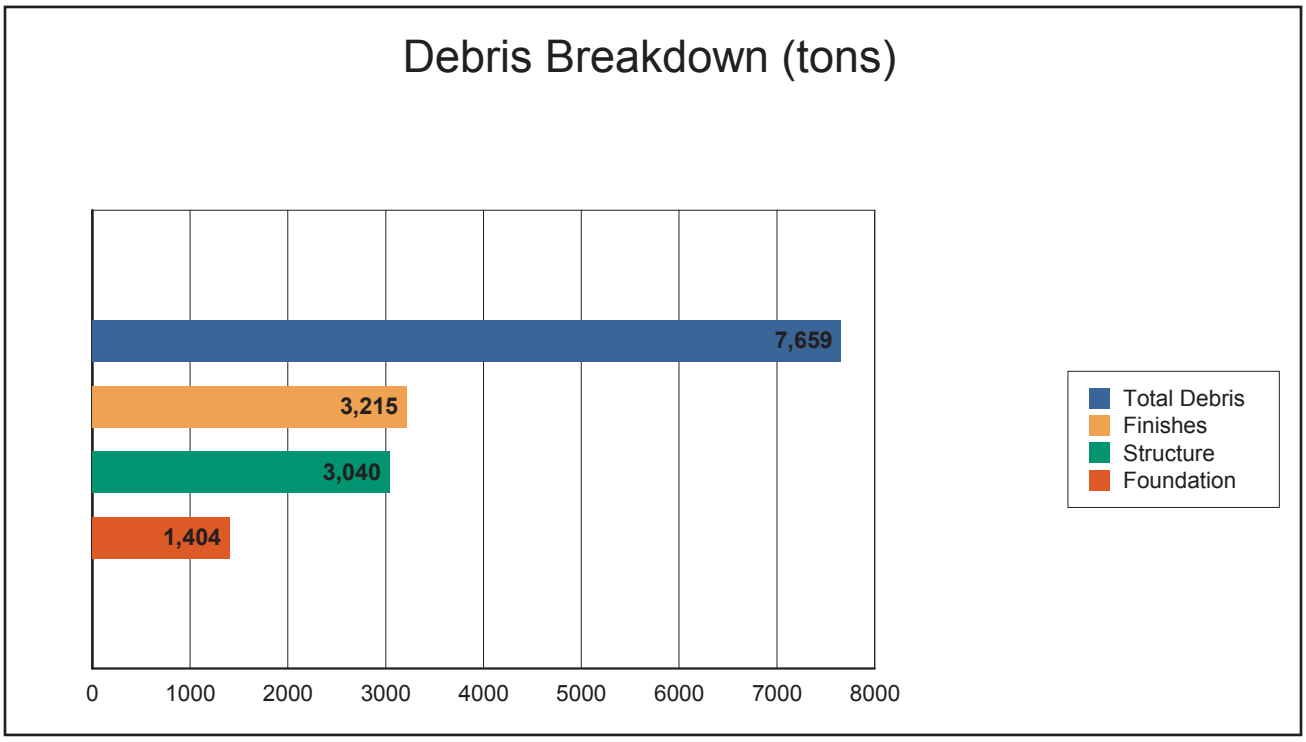
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

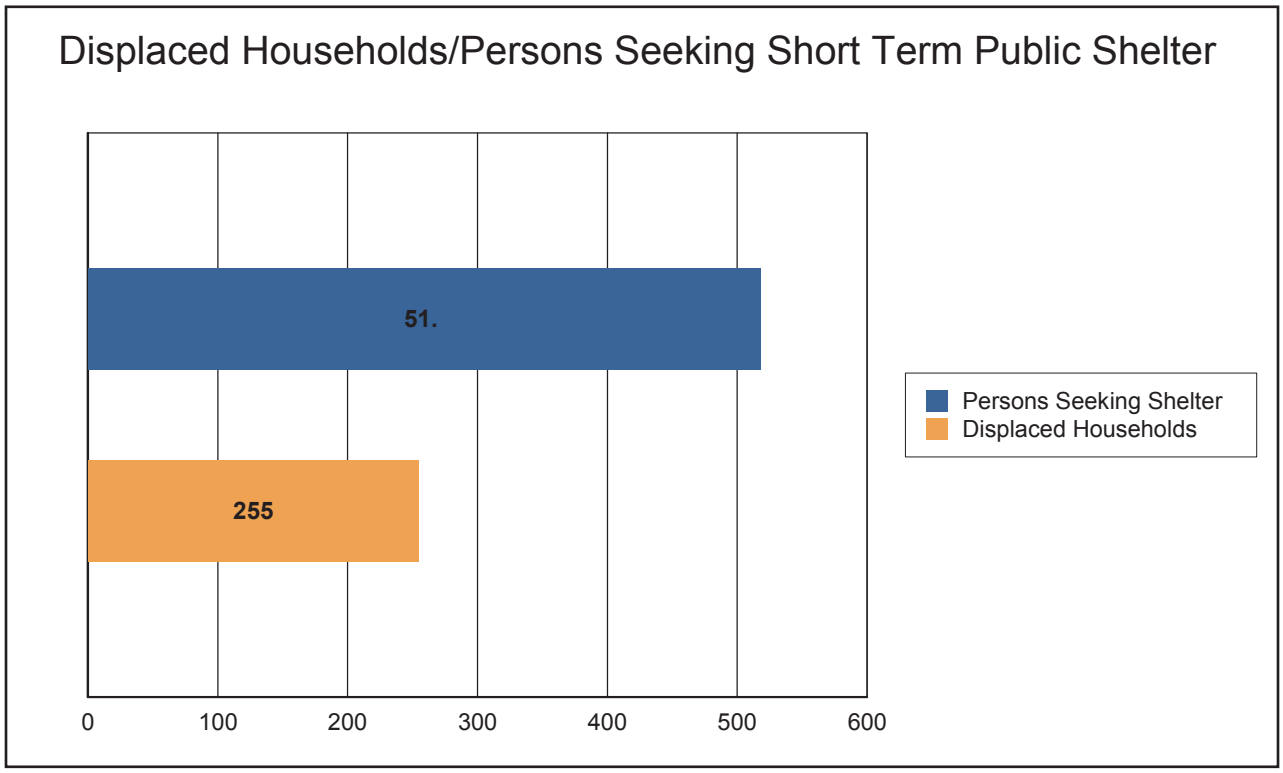


The model estimates that a total of 7,659 tons of debris will be generated. Of the total amount, Finishes comprises 42% of the total, Structure comprises 40% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 306 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 255 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 518 people (out of a total population of 10,389) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 75.22 million dollars, which represents 14.99 % of the total replacement value of the scenario buildings.

Building-Related Losses

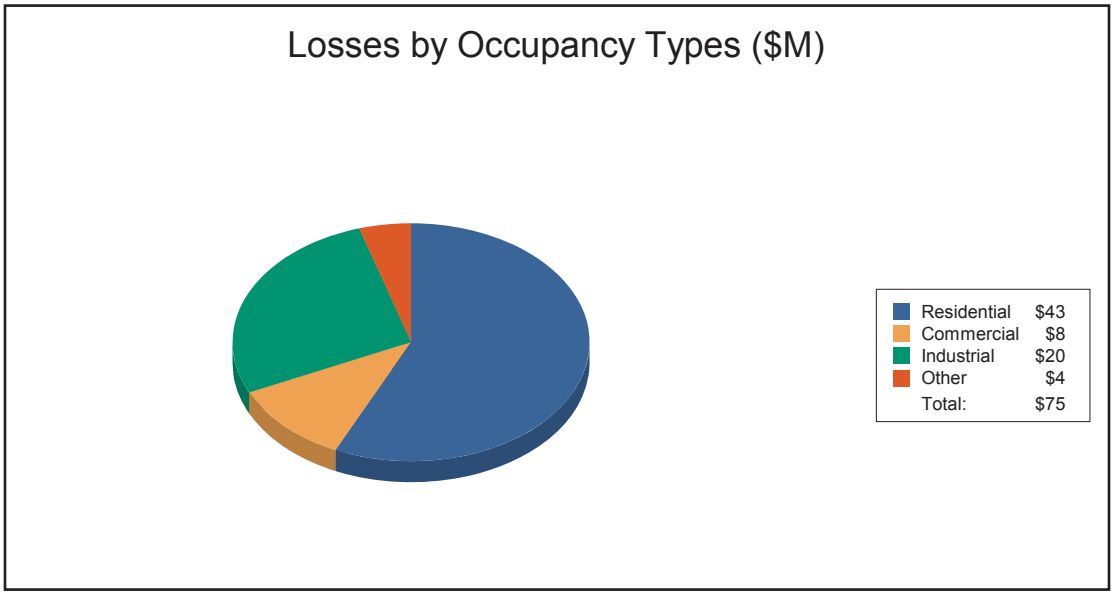
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 75.01 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 56.85% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	17.61	2.88	4.07	0.44	25.00
	Content	25.09	5.49	14.56	3.02	48.15
	Inventory	0.00	0.05	1.82	0.00	1.87
	Subtotal	**42.70**	**8.41**	**20.44**	**3.46**	**75.01**
Business Interruption						
	Income	0.00	0.04	0.01	0.01	0.05
	Relocation	0.02	0.00	0.01	0.00	0.03
	Rental Income	0.04	0.00	0.00	0.00	0.04
	Wage	0.01	0.02	0.01	0.06	0.09
	Subtotal	**0.07**	**0.06**	**0.02**	**0.06**	**0.21**
ALL	**Total**	**42.76**	**8.47**	**20.47**	**3.52**	**75.22**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	10,389	1,011,758	276,214	1,287,972
Total	**10,3. 9**	**1,011,75.**	**276,214**	**1,2. 7,972**
Total Study Region	**10,3. 9**	**1,011,75.**	**276,214**	**1,2. 7,972**

Hazus-MH: Flood Global Risk Report

Region Name: GrotonTownof

Flood Scenario: Groton Coast 100 Year

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 29 square miles and contains 621 census blocks. The region contains over 12 thousand households and has a total population of 29,726 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 10,531 buildings in the region with a total building replacement value (excluding contents) of 4,069 million dollars (2010 dollars). Approximately 92.17% of the buildings (and 81.97% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 10,531 buildings in the region which have an aggregate total replacement value of 4,069 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,335,451	82.0%
Commercial	474,426	11.7%
Industrial	77,183	1.9%
Agricultural	4,988	0.1%
Religion	45,958	1.1%
Government	97,077	2.4%
Education	34,048	0.8%
Total	**4,069,131**	**100.0%**

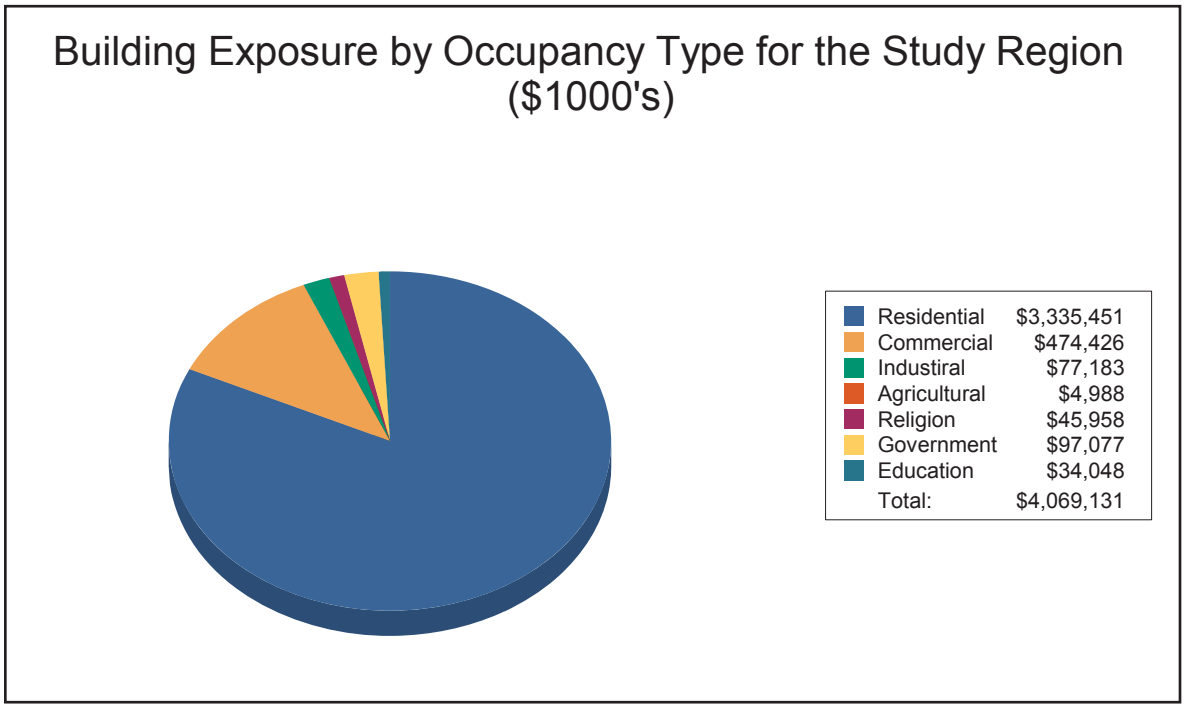
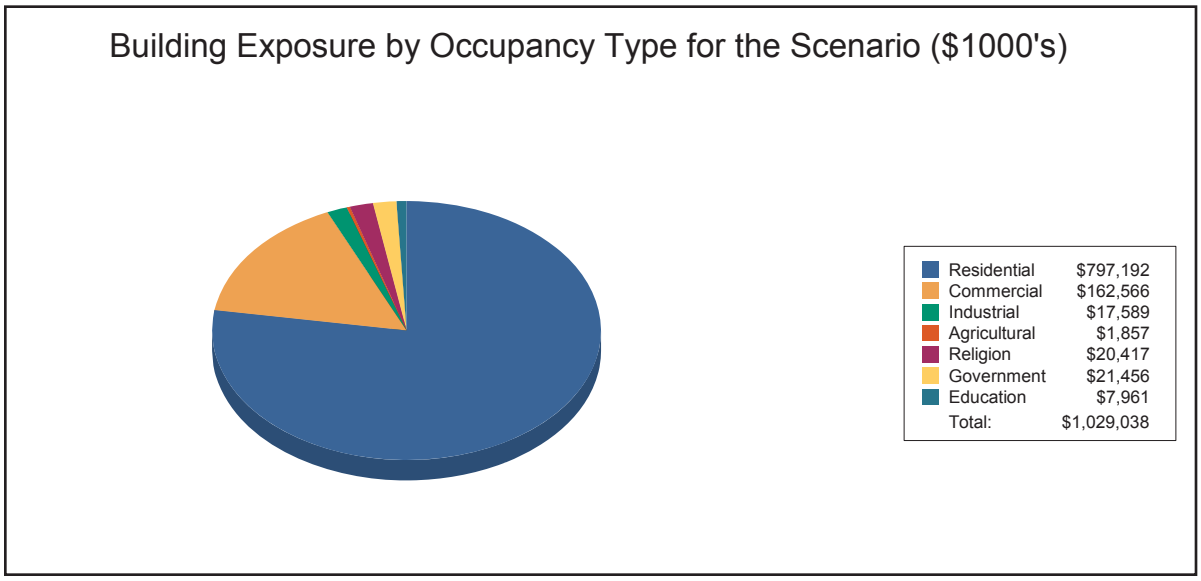


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	797,192	77.5%
Commercial	162,566	15.8%
Industrial	17,589	1.7%
Agricultural	1,857	0.2%
Religion	20,417	2.0%
Government	21,456	2.1%
Education	7,961	0.8%
Total	**1,029,03w**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 12 schools, 7 fire stations, 2 police stations and 1 emergency operation center.

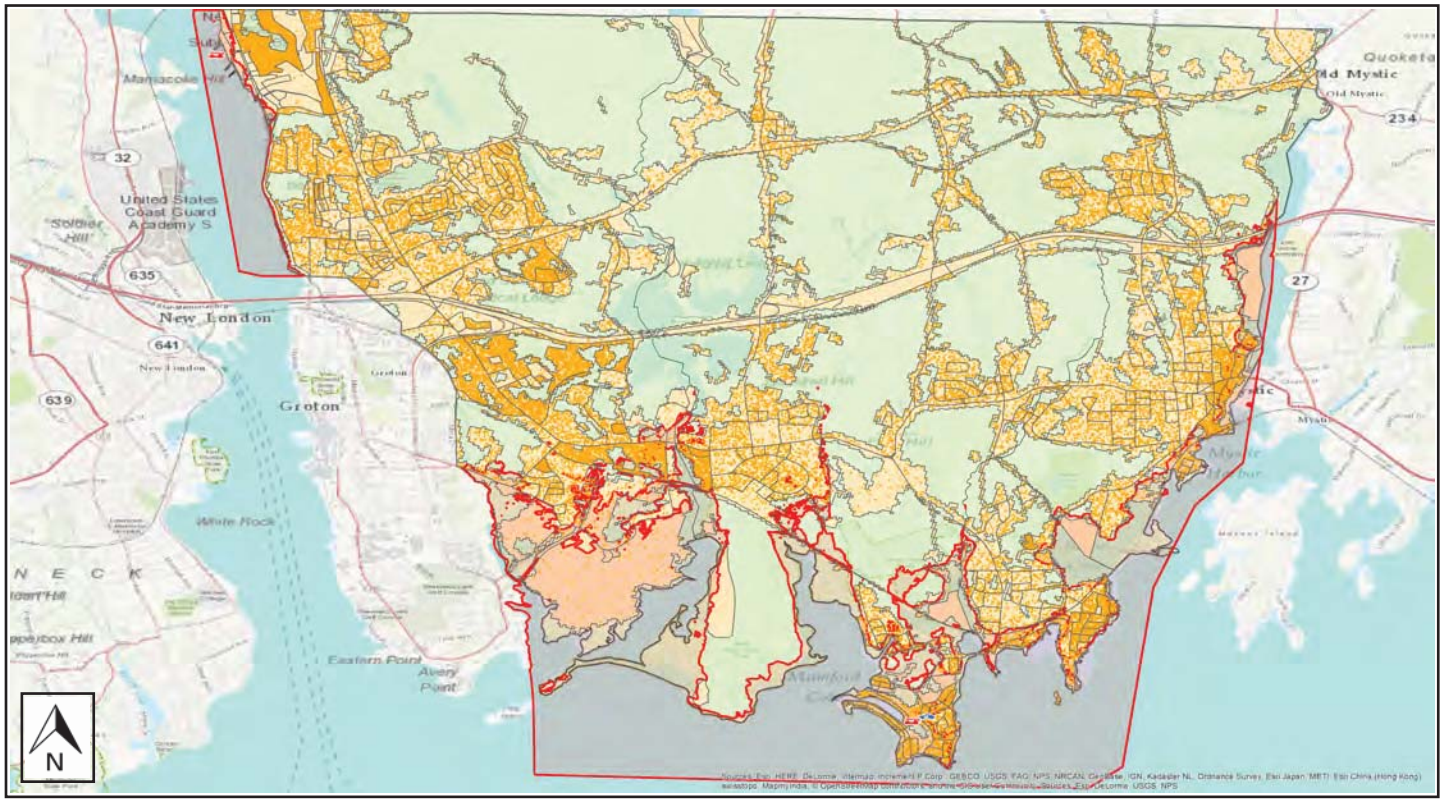
Flood Scenario Parameters

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

Study Region Name:	GrotonTownof
Scenario Name:	Groton Coast 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 414 buildings will be at least moderately damaged. This is over 53% of the total number of buildings in the scenario. There are an estimated 61 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

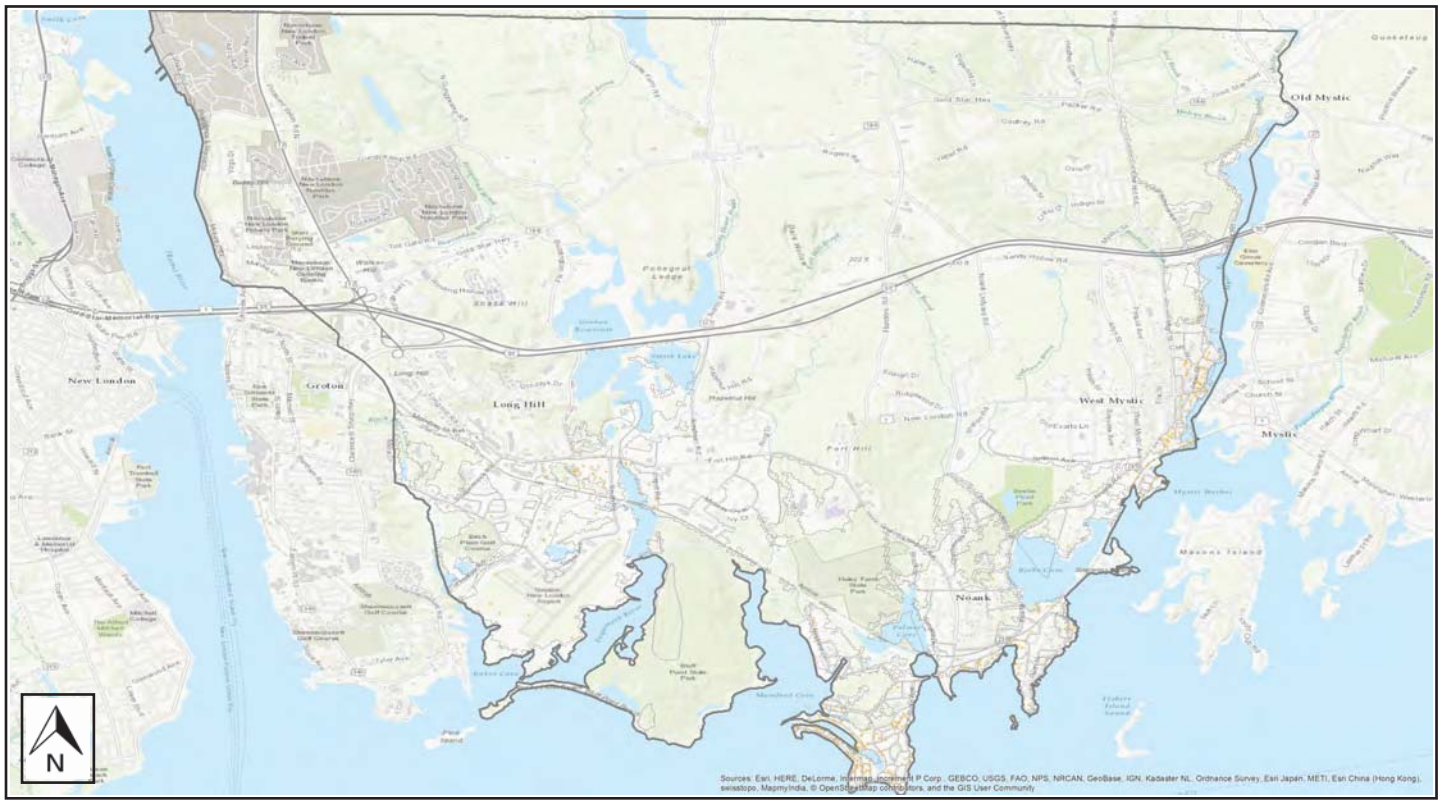


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	159	38.50	127	30.75	45	10.90	21	5.08	61	14.77
Total	**0**		**159**		**12w**		**45**		**21**		**61**	

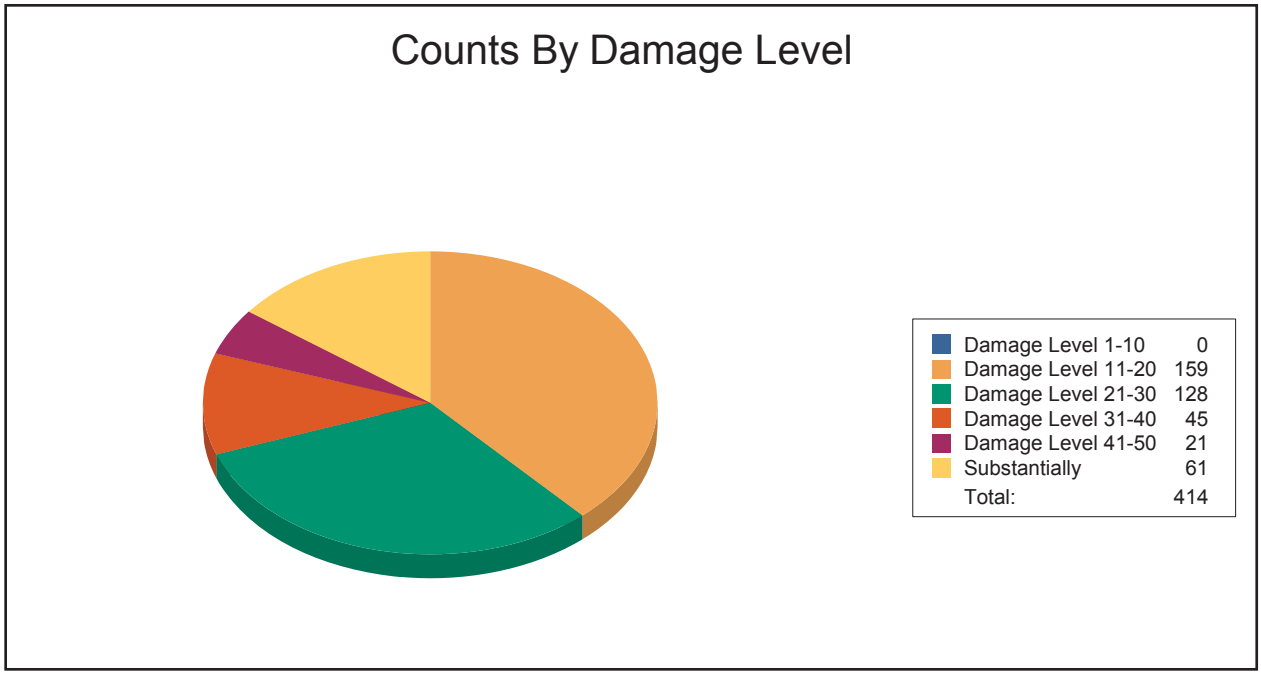


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	2	100
Masonry	0	0	2	67	1	33	0	0	0	0	0	0
Steel	0	0	0	0	1	100	0	0	0	0	0	0
Wood	0	0	157	38	126	31	45	11	21	5	59	14

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	7	2	0	2
Hospitals	0	0	0	0
Police Stations	2	1	0	1
Schools	12	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

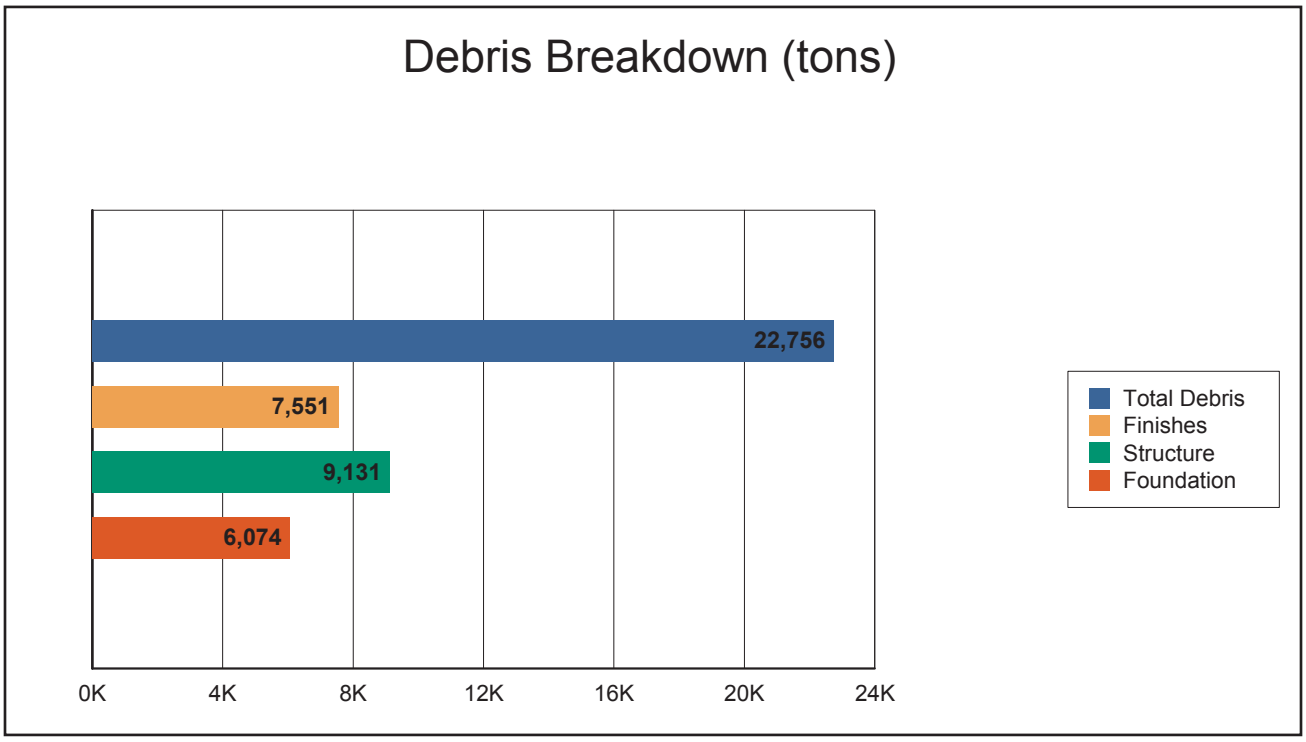
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

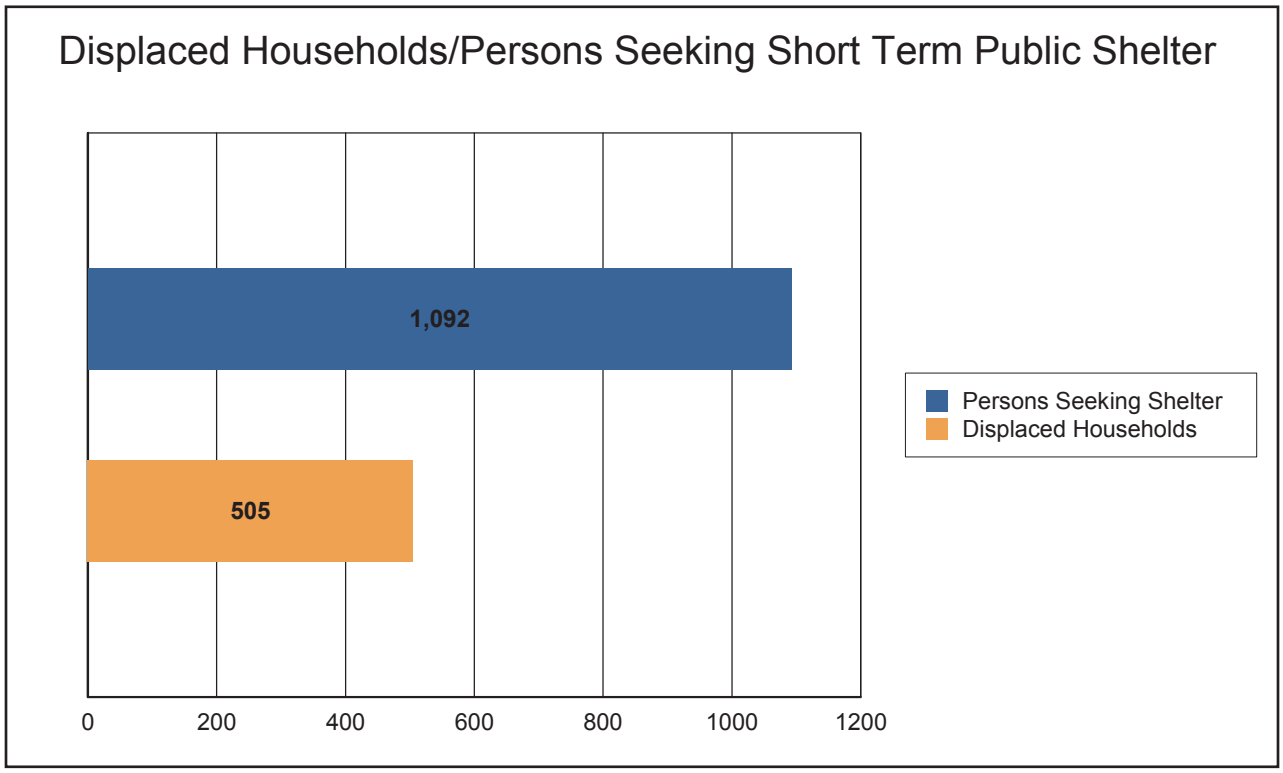


The model estimates that a total of 22,756 tons of debris will be generated. Of the total amount, Finishes comprises 33% of the total, Structure comprises 40% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 910 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 505 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,092 people (out of a total population of 29,726) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 195.36 million dollars, which represents 18.99 % of the total replacement value of the scenario buildings.

Building-Related Losses

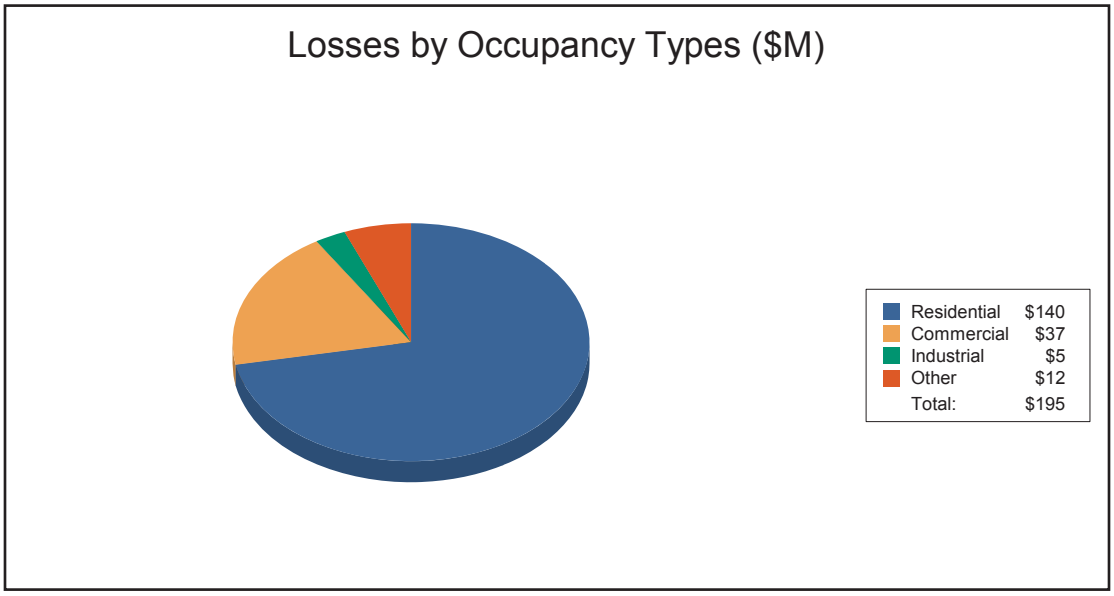
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 194.71 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 71.88% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	73.99	10.82	1.75	1.65	88.20
	Content	66.26	26.01	3.28	10.11	105.66
	Inventory	0.00	0.41	0.42	0.01	0.85
	Subtotal	**140.25**	**37.23**	**5.45**	**11.77**	**194.71**
Business Interruption						
	Income	0.01	0.14	0.00	0.01	0.16
	Relocation	0.11	0.02	0.00	0.01	0.13
	Rental Income	0.03	0.01	0.00	0.00	0.04
	Wage	0.03	0.09	0.00	0.21	0.33
	Subtotal	**0.1w**	**0.25**	**0.00**	**0.23**	**0.65**
ALL	**Total**	**140.43**	**37.4w**	**5.45**	**12.00**	**195.36**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	29,726	3,335,451	733,680	4,069,131
Total	**29,726**	**3,335,451**	**733,6w0**	**4,069,131**
Total Study Region	**29,726**	**3,335,451**	**733,6w0**	**4,069,131**

Hazus-MH: Flood Global Risk Report

Region Name: GrotonTownInland

Flood Scenario: Groton Town Riverine 100 Year

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 29 square miles and contains 621 census blocks. The region contains over 12 thousand households and has a total population of 29,726 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 10,531 buildings in the region with a total building replacement value (excluding contents) of 4,069 million dollars (2010 dollars). Approximately 92.17% of the buildings (and 81.97% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 10,531 buildings in the region which have an aggregate total replacement value of 4,069 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,335,451	82.0%
Commercial	474,426	11.7%
Industrial	77,183	1.9%
Agricultural	4,988	0.1%
Religion	45,958	1.1%
Government	97,077	2.4%
Education	34,048	0.8%
Total	**4,069,131**	**100.0%**

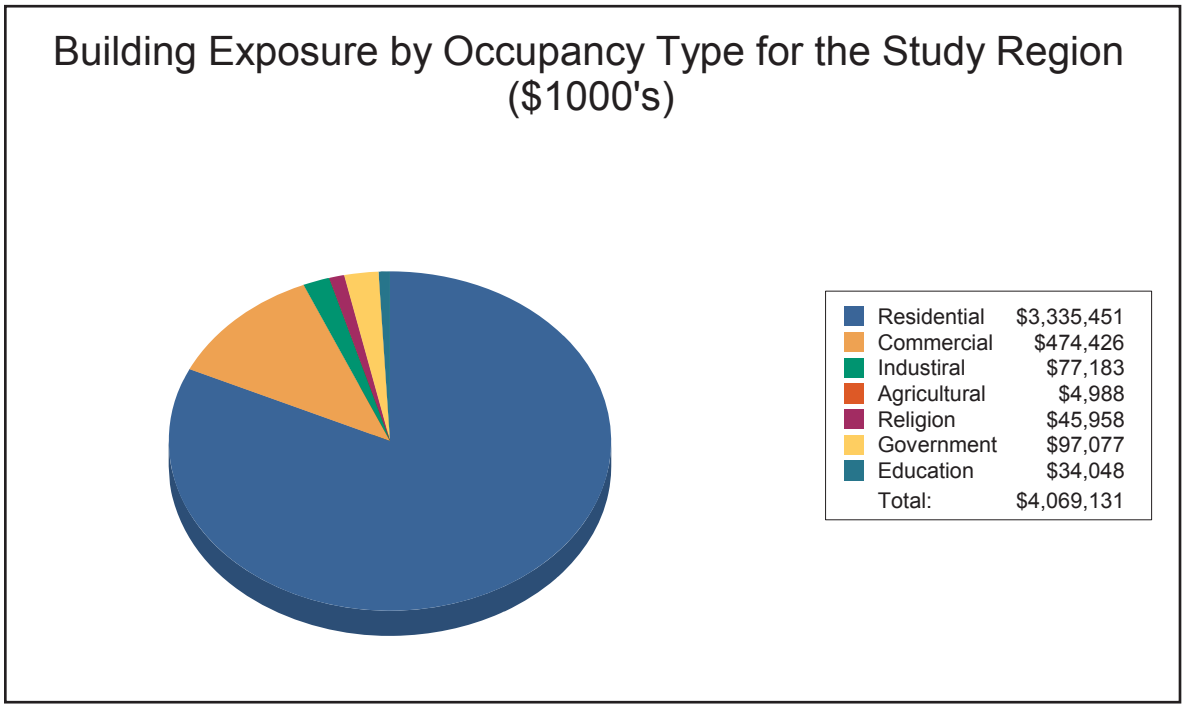
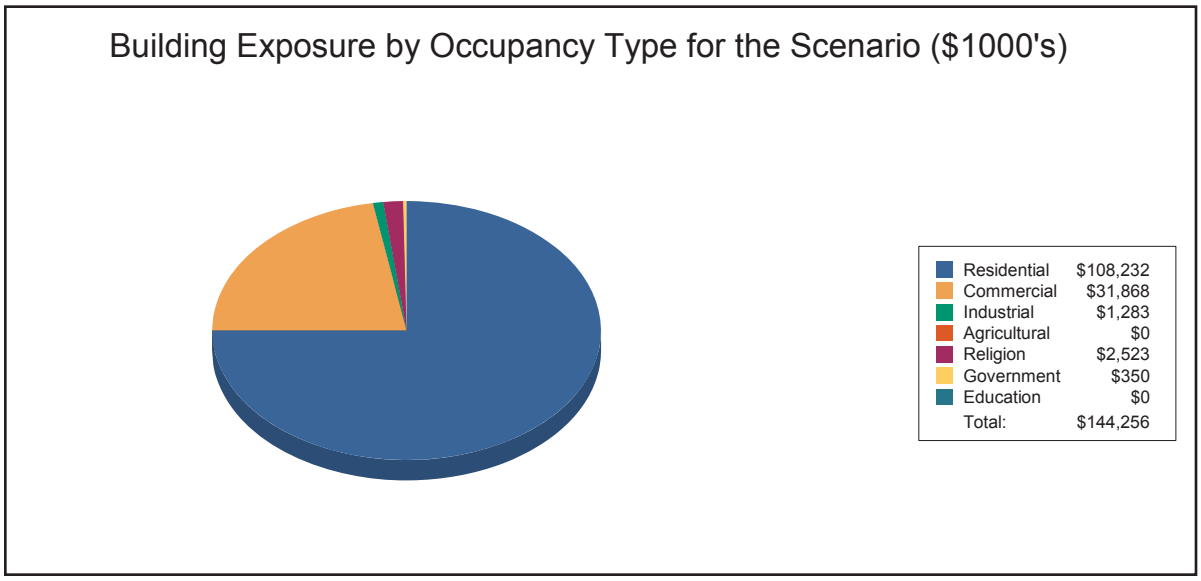


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	108,232	75.0%
Commercial	31,868	22.1%
Industrial	1,283	0.9%
Agricultural	0	0.0%
Religion	2,523	1.7%
Government	350	0.2%
Education	0	0.0%
Total	**144,256**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 12 schools, 7 fire stations, 2 police stations and 1 emergency operation center.

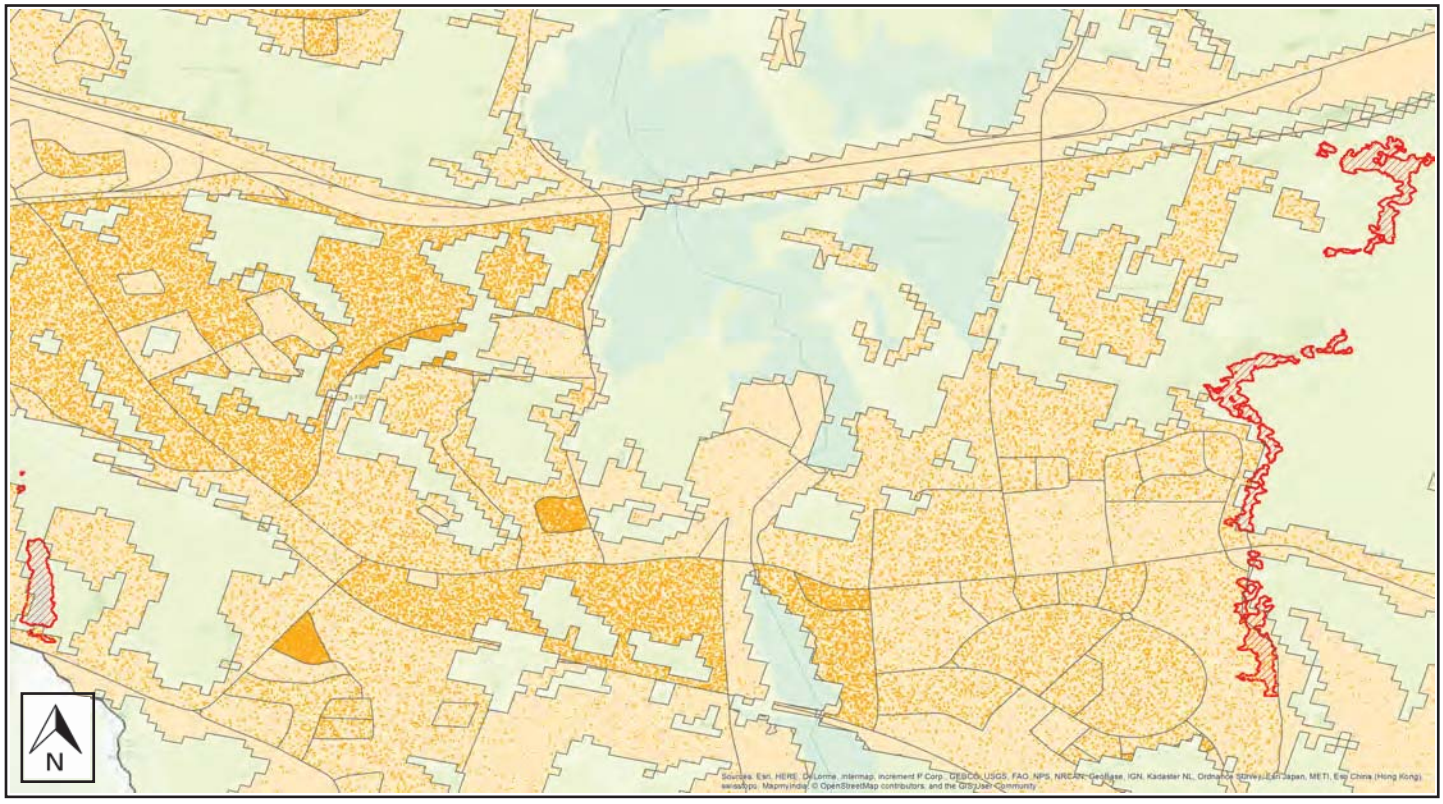
Flood Scenario Parameters

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

Study Region Name:	GrotonTownInland
Scenario Name:	Groton Town Riverine 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 67% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

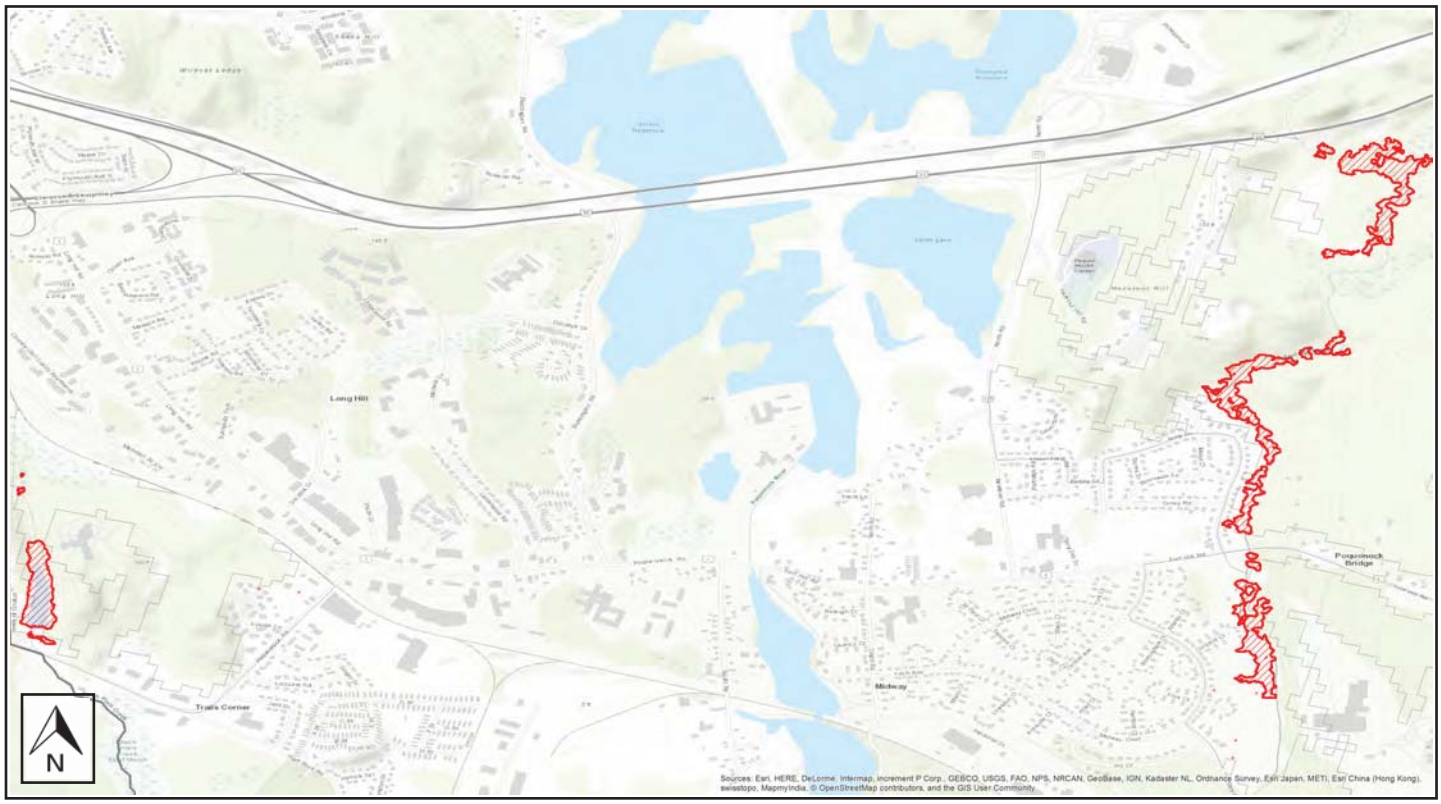


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**2**		**0**		**0**		**0**		**0**		**0**	

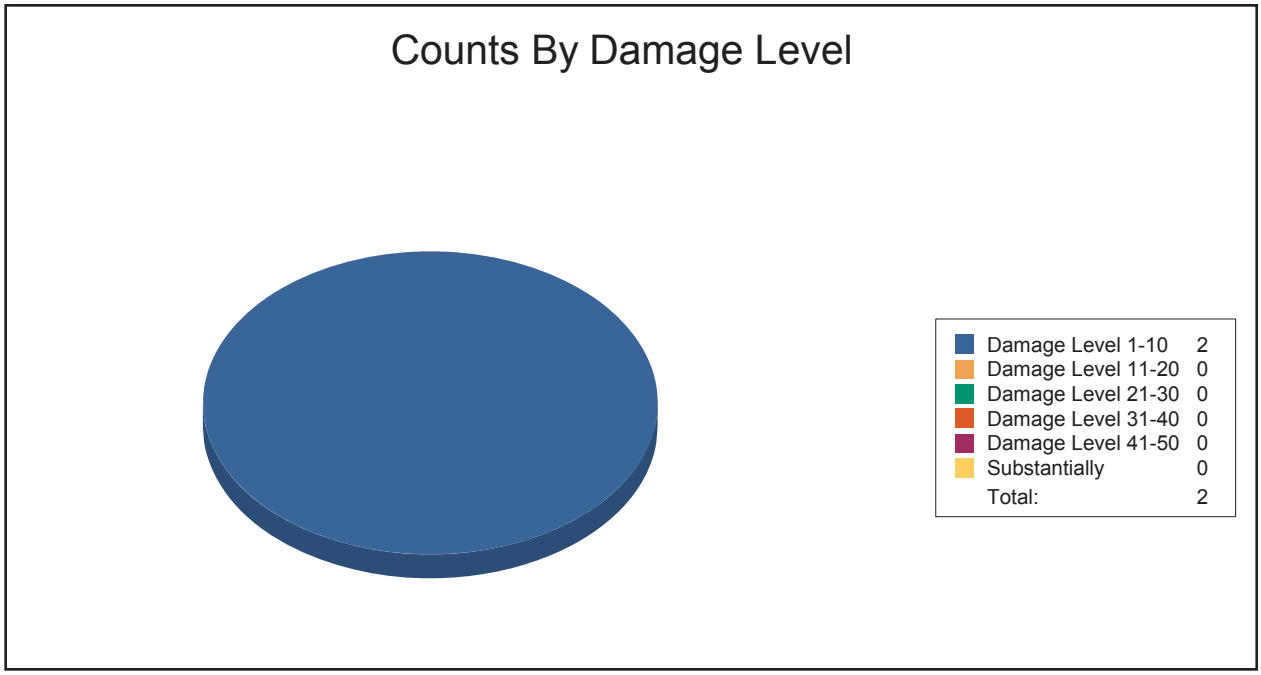


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	2	100	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	7	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	12	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

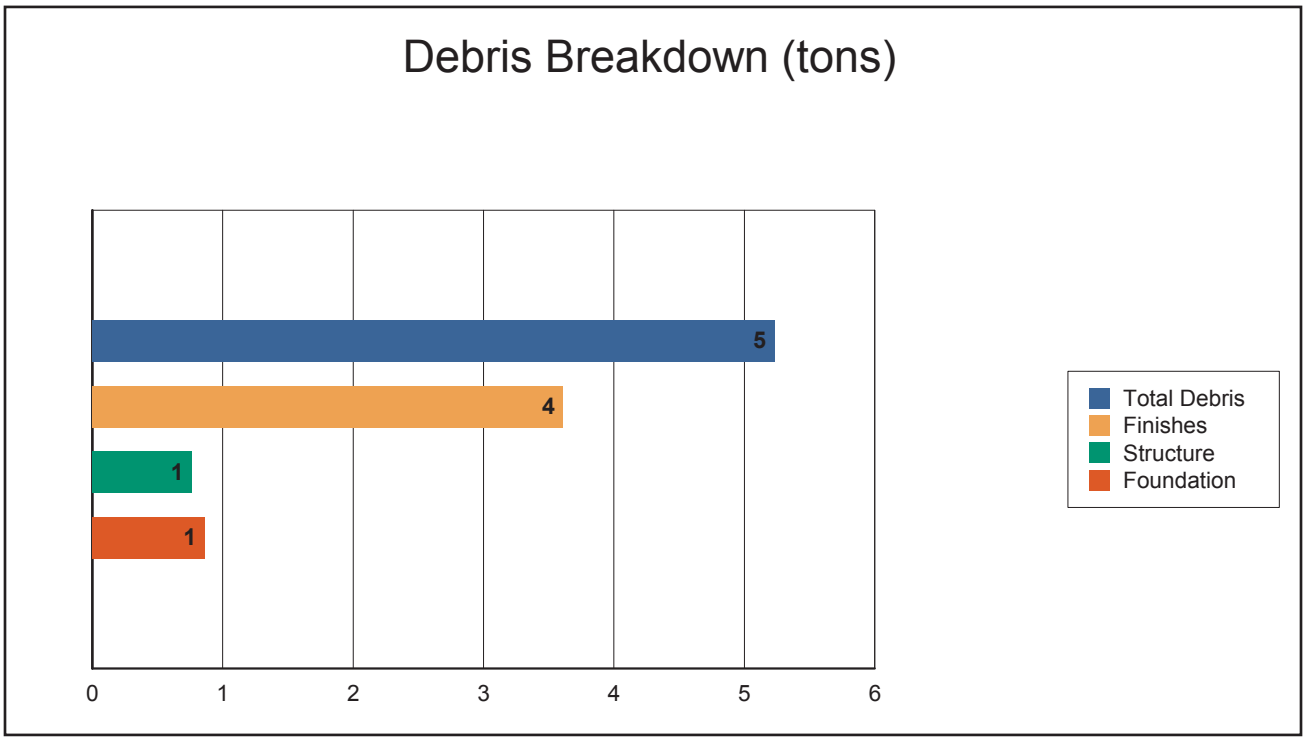
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

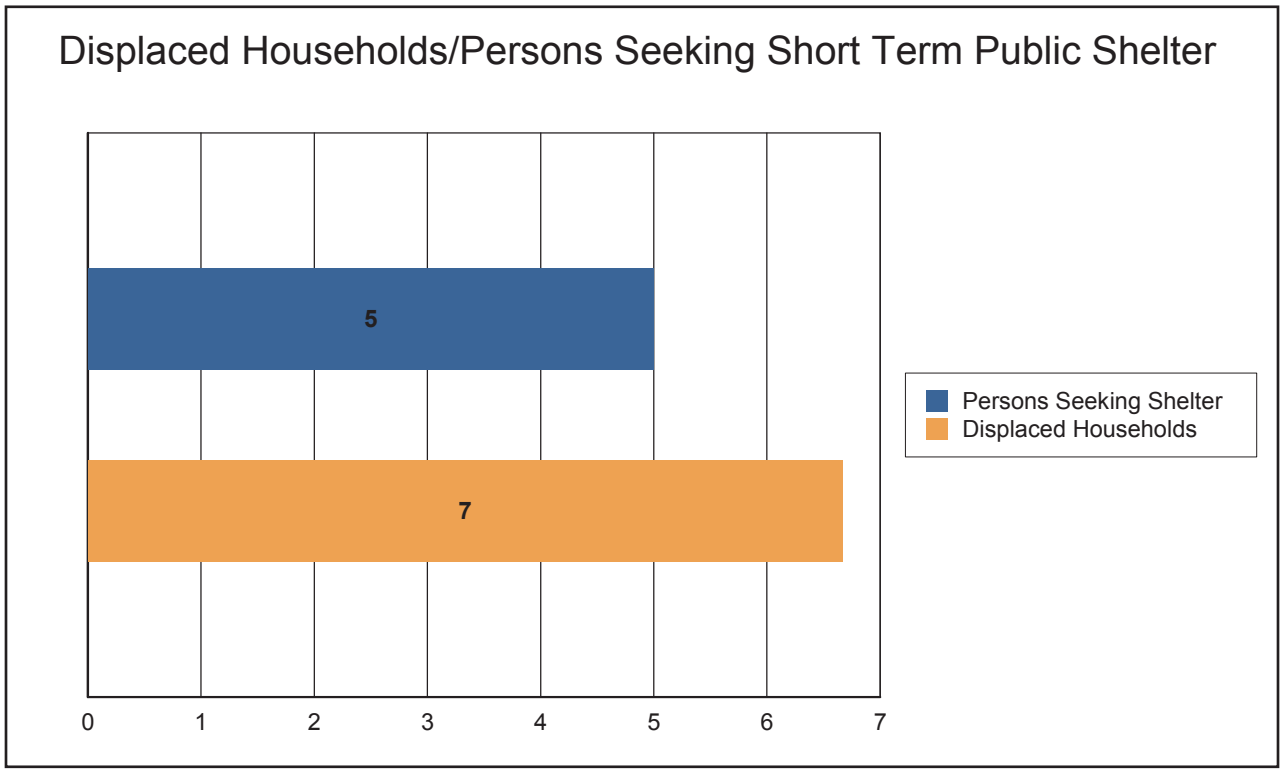


The model estimates that a total of 5 tons of debris will be generated. Of the total amount, Finishes comprises 69% of the total, Structure comprises 15% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 7 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 5 people (out of a total population of 29,726) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.12 million dollars, which represents 0.08 % of the total replacement value of the scenario buildings.

Building-Related Losses

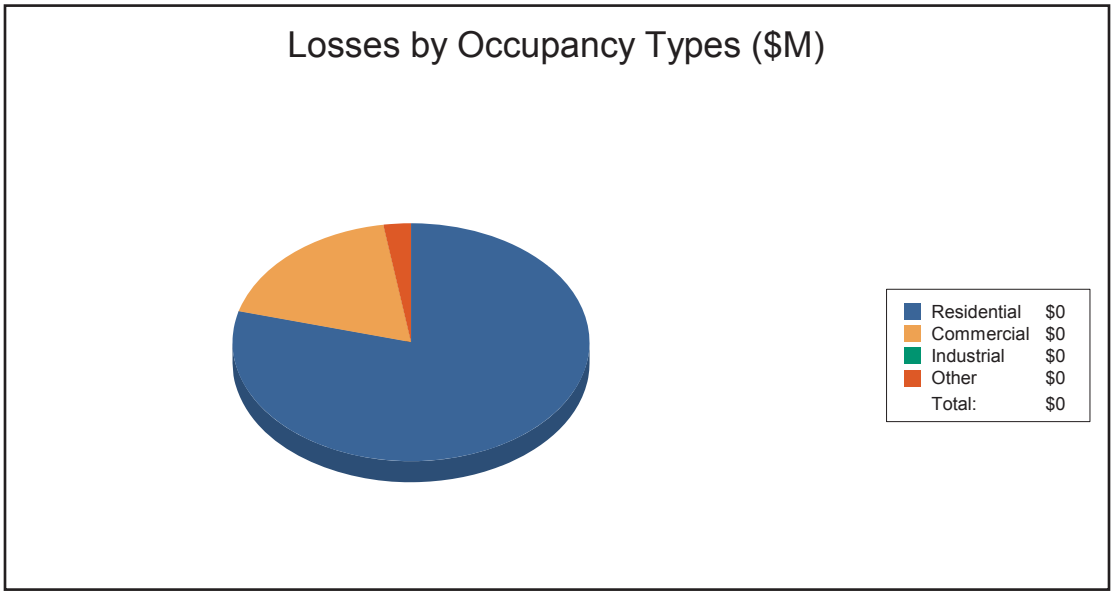
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.12 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 79.13% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.06	0.00	0.00	0.00	0.07
	Content	0.03	0.02	0.00	0.00	0.05
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.09**	**0.02**	**0.00**	**0.00**	**0.12**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.09**	**0.02**	**0.00**	**0.00**	**0.12**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	29,726	3,335,451	733,680	4,069,131
Total	**29,726**	**3,335,451**	**733,680**	**4,069,131**
Total Study Region	**29,726**	**3,335,451**	**733,680**	**4,069,131**

Hazus-MH: Flood Global Risk Report

Region Name: GrotonTownInland

Flood Scenario: GrotonRiverine2

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 29 square miles and contains 621 census blocks. The region contains over 12 thousand households and has a total population of 29,726 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 10,531 buildings in the region with a total building replacement value (excluding contents) of 4,069 million dollars (2010 dollars). Approximately 92.17% of the buildings (and 81.97% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 10,531 buildings in the region which have an aggregate total replacement value of 4,069 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,335,451	82.0%
Commercial	474,426	11.7%
Industrial	77,183	1.9%
Agricultural	4,988	0.1%
Religion	45,958	1.1%
Government	97,077	2.4%
Education	34,048	0.8%
Total	**4,069,131**	**100.0%**

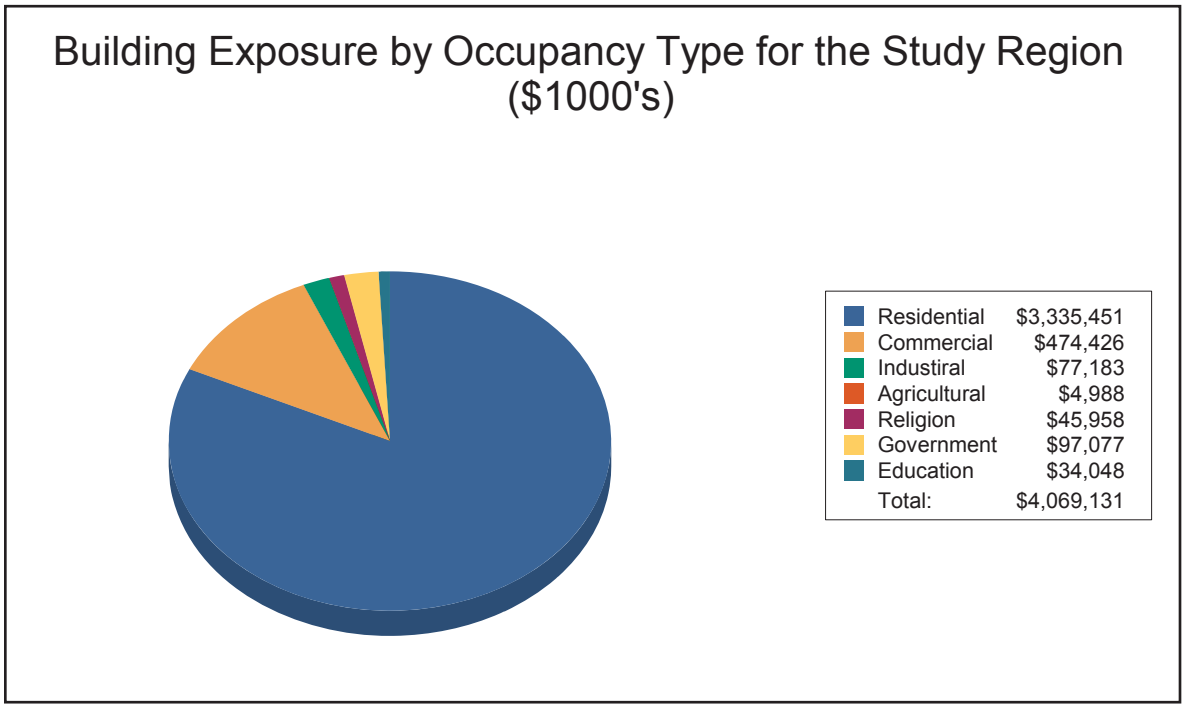
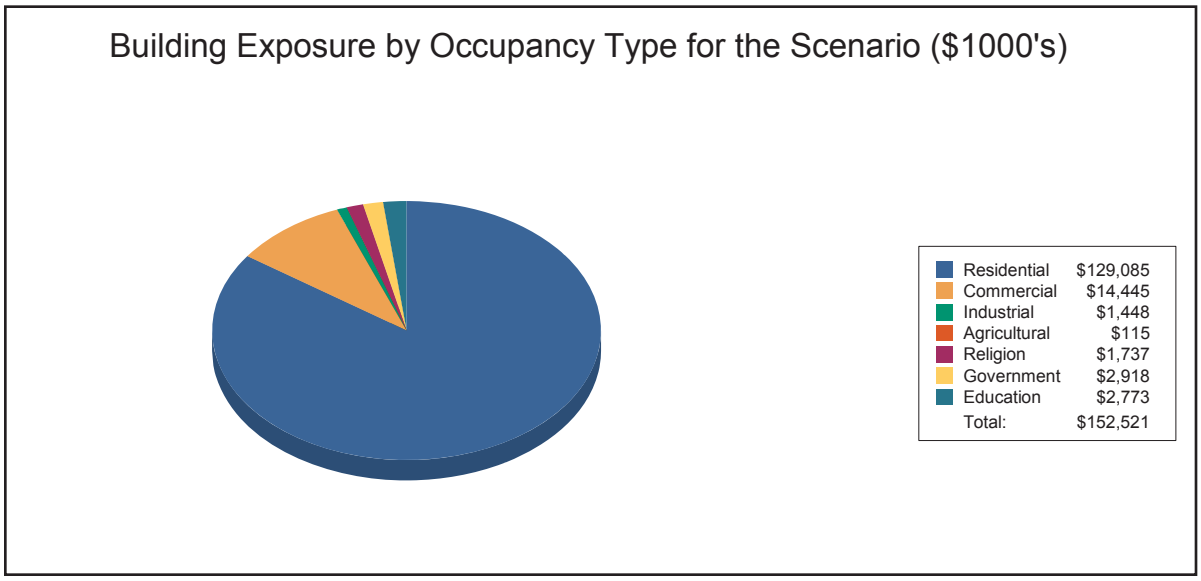


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	129,085	84.6%
Commercial	14,445	9.5%
Industrial	1,448	0.9%
Agricultural	115	0.1%
Religion	1,737	1.1%
Government	2,918	1.9%
Education	2,773	1.8%
Total	**152,521**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 12 schools, 7 fire stations, 2 police stations and 1 emergency operation center.

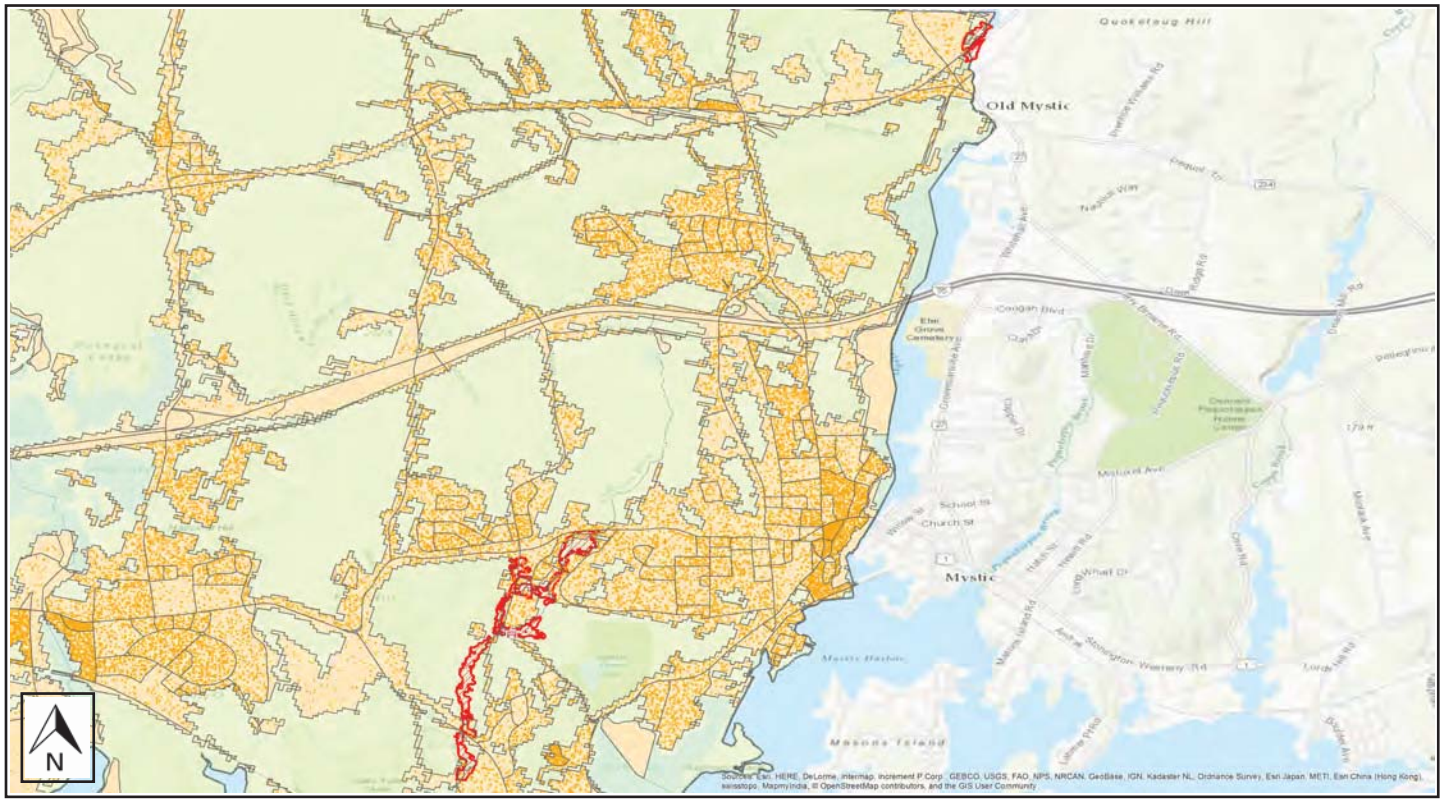
Flood Scenario Parameters

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

Study Region Name:	GrotonTownInland
Scenario Name:	GrotonRiverine2
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 1 building will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

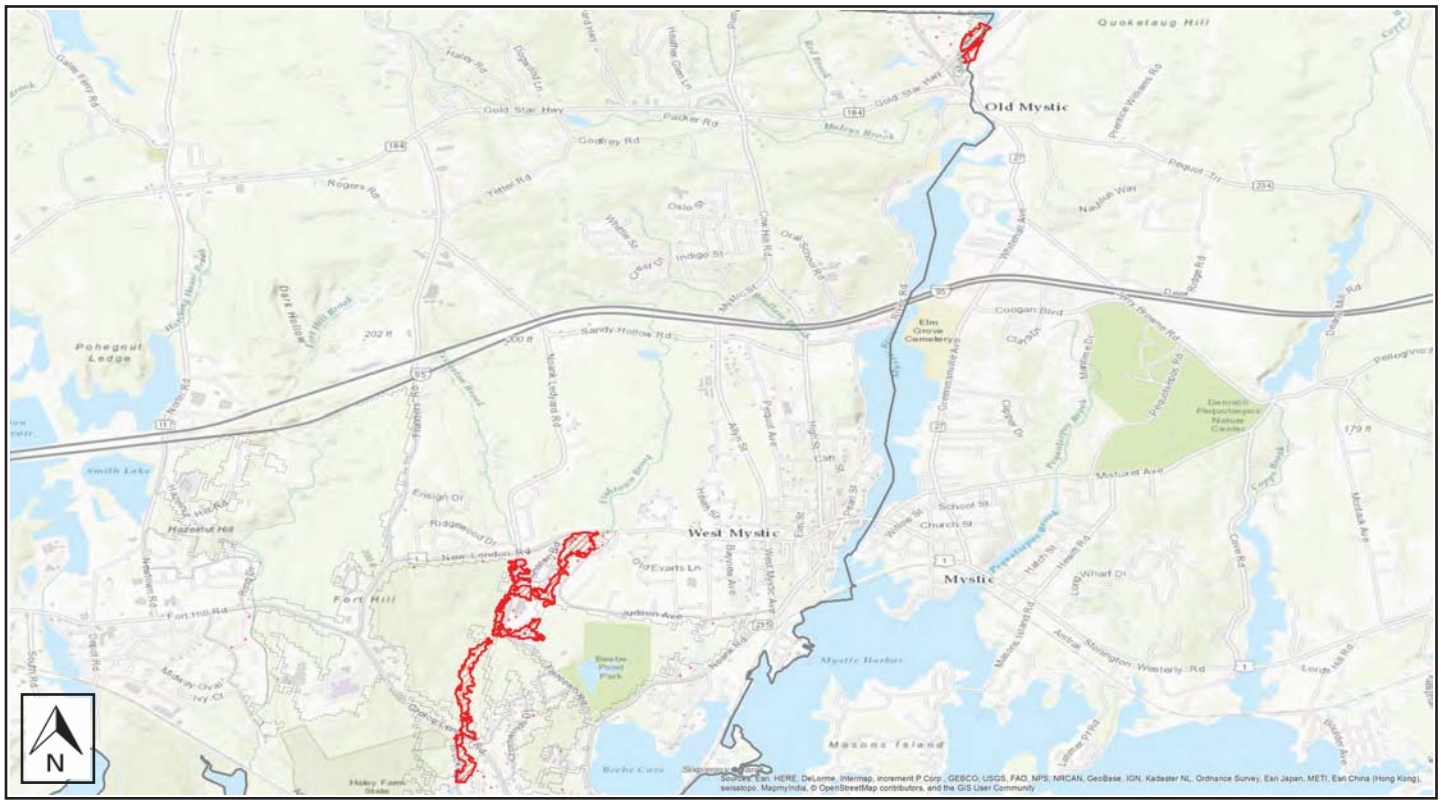


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	50.00	1	50.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**1**		**1**		**0**		**0**		**0**		**0**	

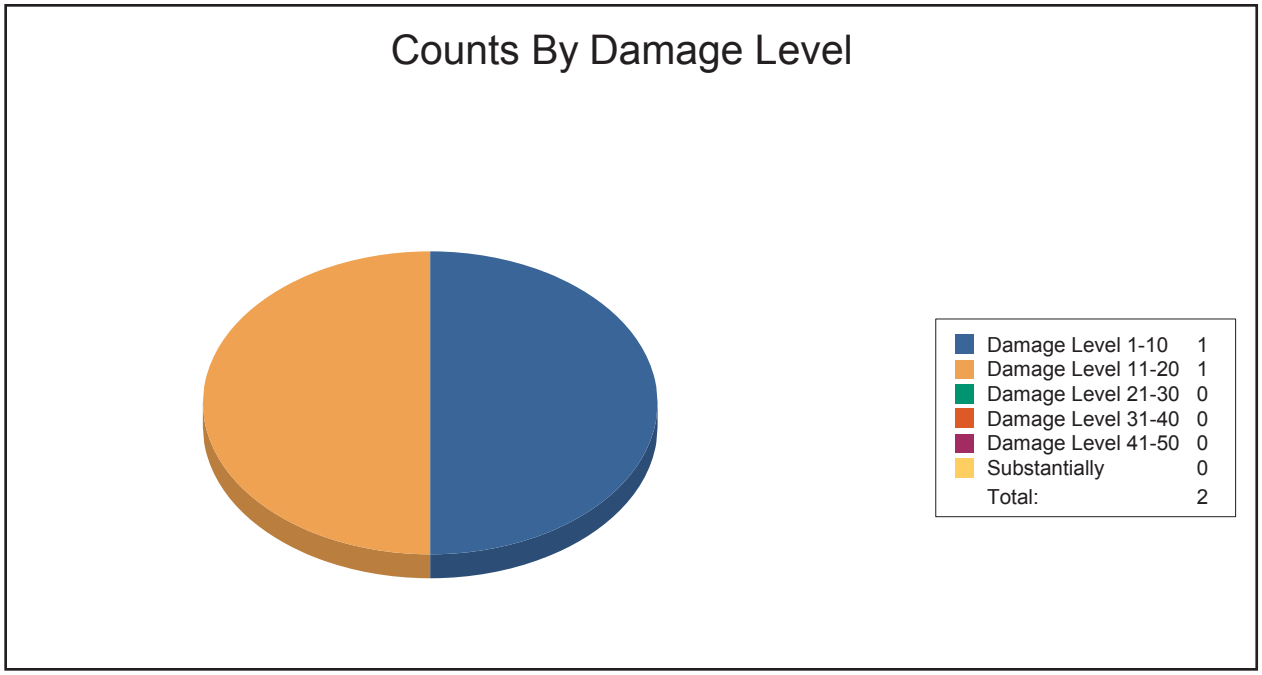


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	1	50	1	50	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	7	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	12	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

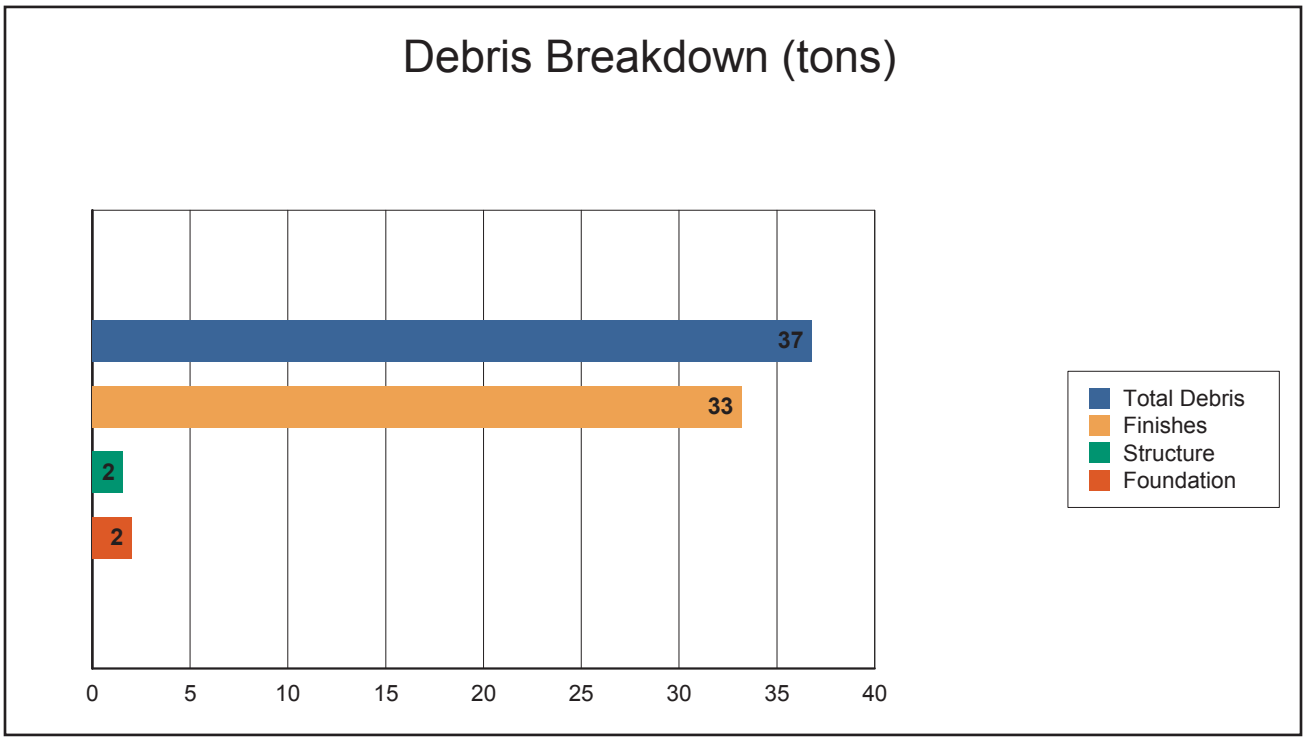
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

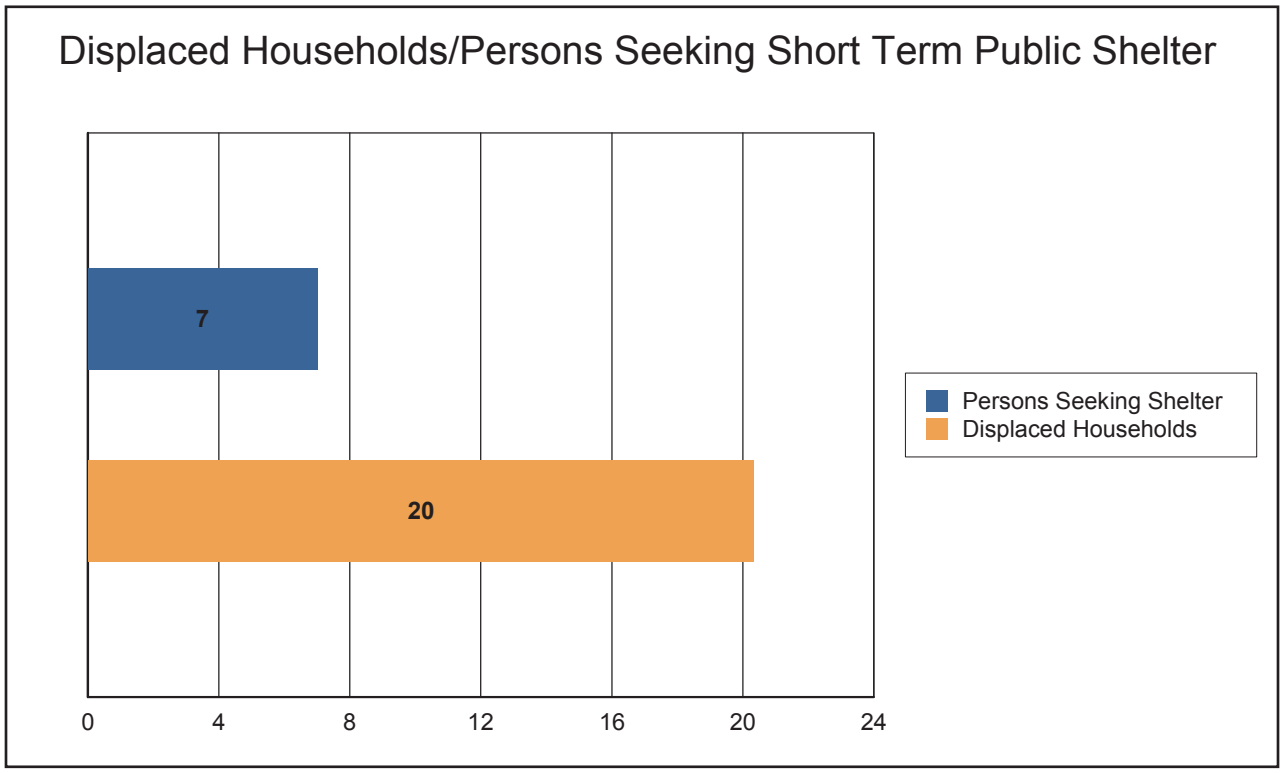


The model estimates that a total of 37 tons of debris will be generated. Of the total amount, Finishes comprises 90% of the total, Structure comprises 4% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 1 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 20 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 7 people (out of a total population of 29,726) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1.21 million dollars, which represents 0.79 % of the total replacement value of the scenario buildings.

Building-Related Losses

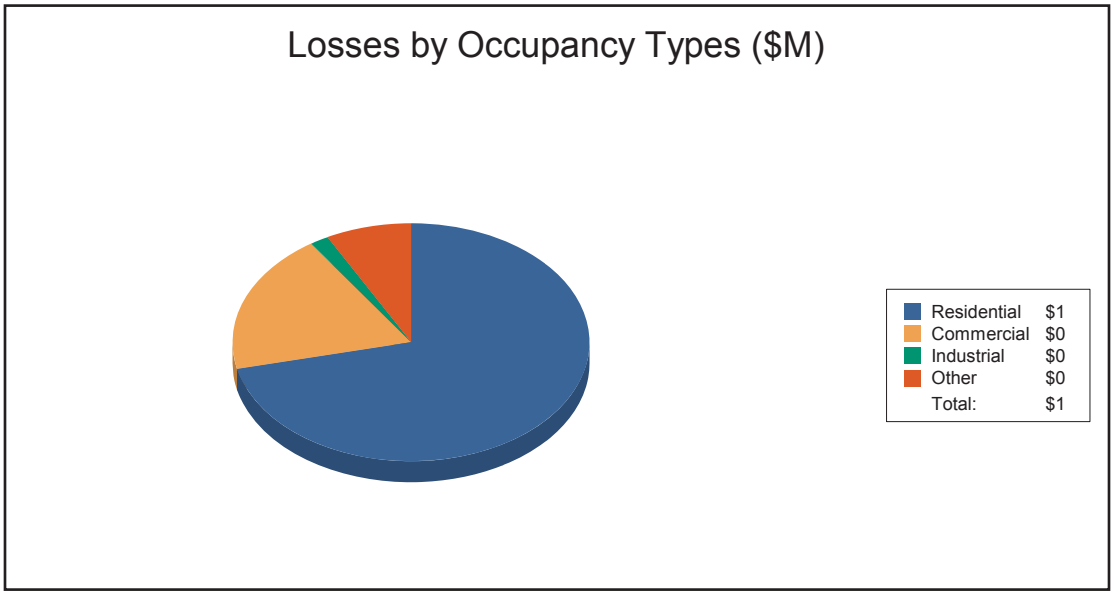
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 1.19 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 71.31% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.61	0.04	0.01	0.01	0.66
	Content	0.25	0.19	0.01	0.07	0.53
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.86**	**0.23**	**0.02**	**0.08**	**1.19**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.02	0.02
	Subtotal	**0.00**	**0.00**	**0.00**	**0.02**	**0.02**
ALL	**Total**	**0.86**	**0.23**	**0.02**	**0.10**	**1.21**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	29,726	3,335,451	733,680	4,069,131
Total	**29,726**	**3,335,451**	**733,680**	**4,069,131**
Total Study Region	**29,726**	**3,335,451**	**733,680**	**4,069,131**

Hazus-MH: Flood Global Risk Report

Region Name: JewettCity

Flood Scenario: Jewett City Pachaug

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 1 square miles and contains 58 census blocks. The region contains over 1 thousand households and has a total population of 3,487 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 906 buildings in the region with a total building replacement value (excluding contents) of 384 million dollars (2010 dollars). Approximately 87.86% of the buildings (and 66.03% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 906 buildings in the region which have an aggregate total replacement value of 384 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	253,265	66.0%
Commercial	54,859	14.3%
Industrial	59,290	15.5%
Agricultural	328	0.1%
Religion	3,503	0.9%
Government	5,393	1.4%
Education	6,932	1.8%
Total	**3, 3.570**	**100%w**

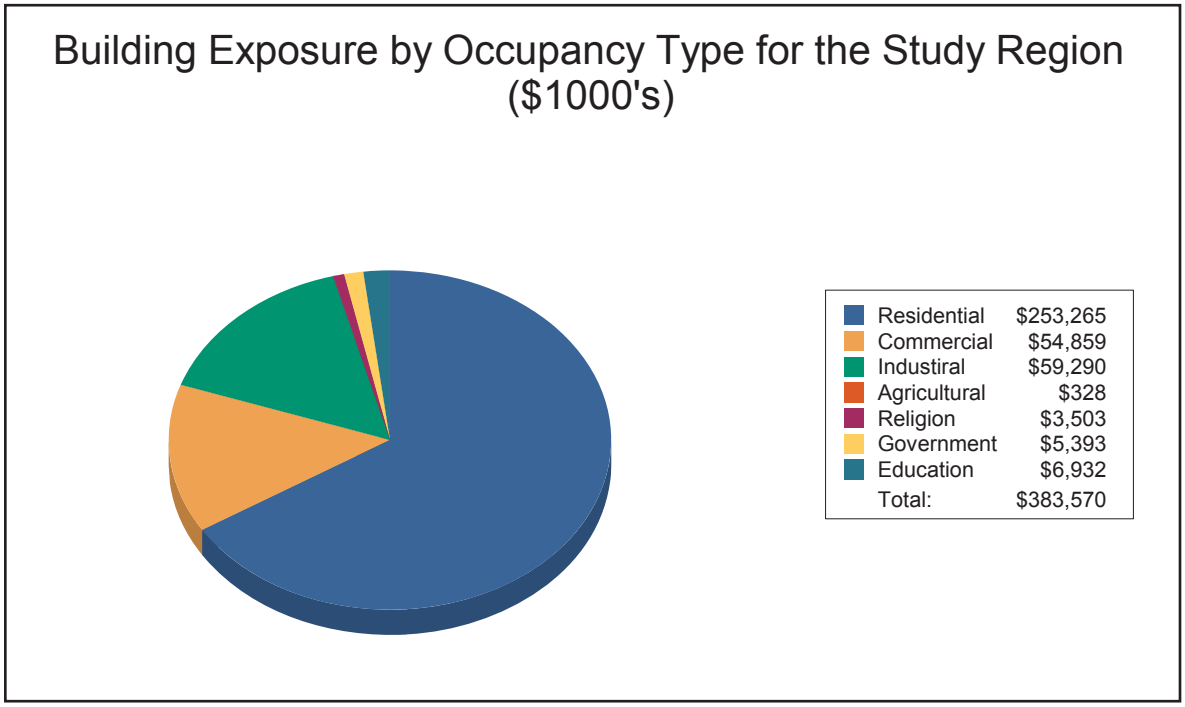
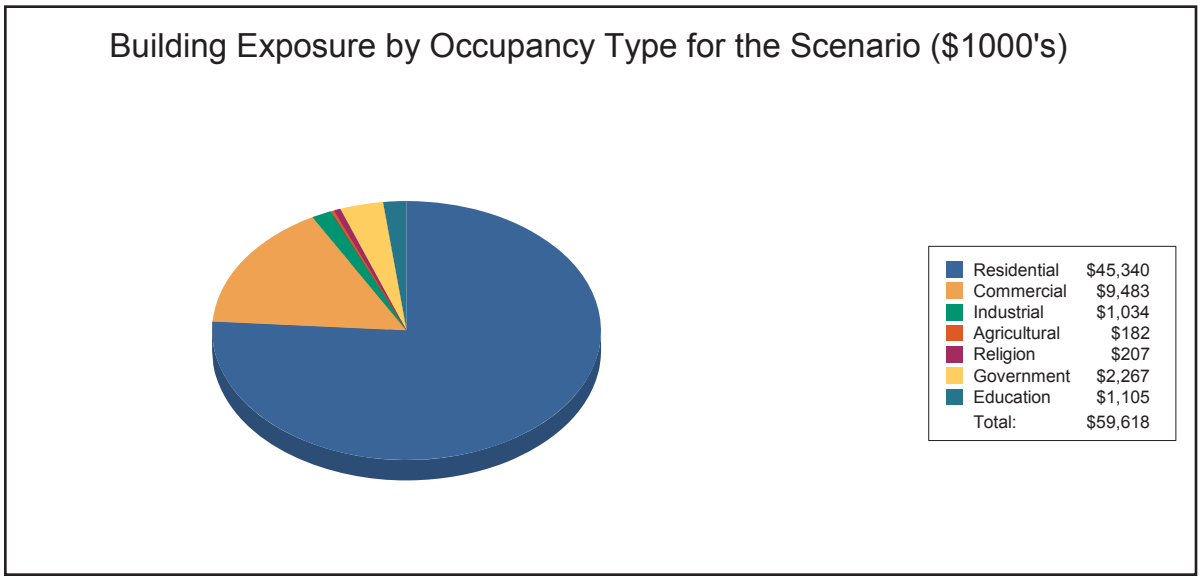


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	45,340	76.1%
Commercial	9,483	15.9%
Industrial	1,034	1.7%
Agricultural	182	0.3%
Religion	207	0.3%
Government	2,267	3.8%
Education	1,105	1.9%
Total	**59.61,**	**100%w**



Essential Facility Inventory

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

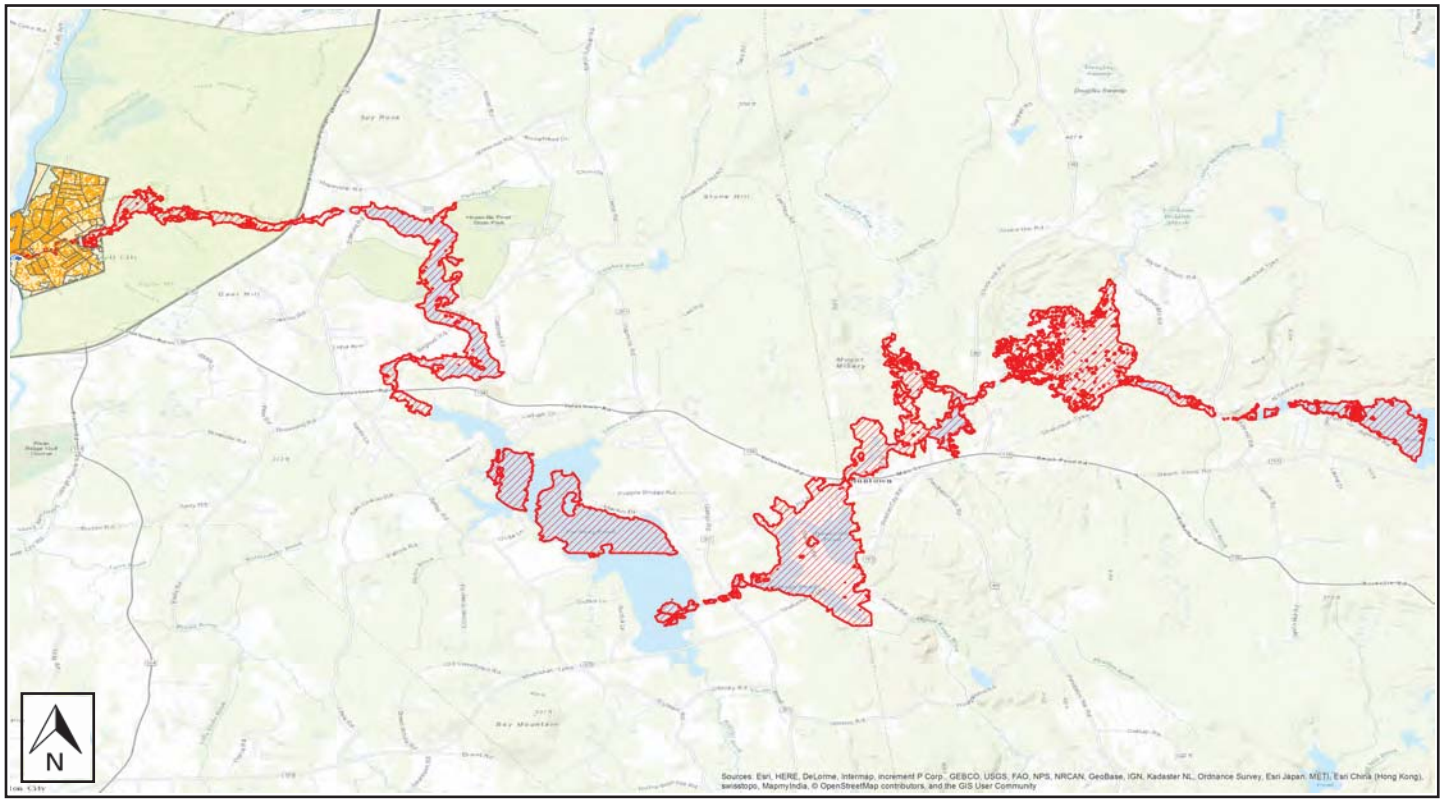
Flood Scenario Parameters

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

Study Region Name:	JewettCity
Scenario Name:	Jewett City Pachaug
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent. as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

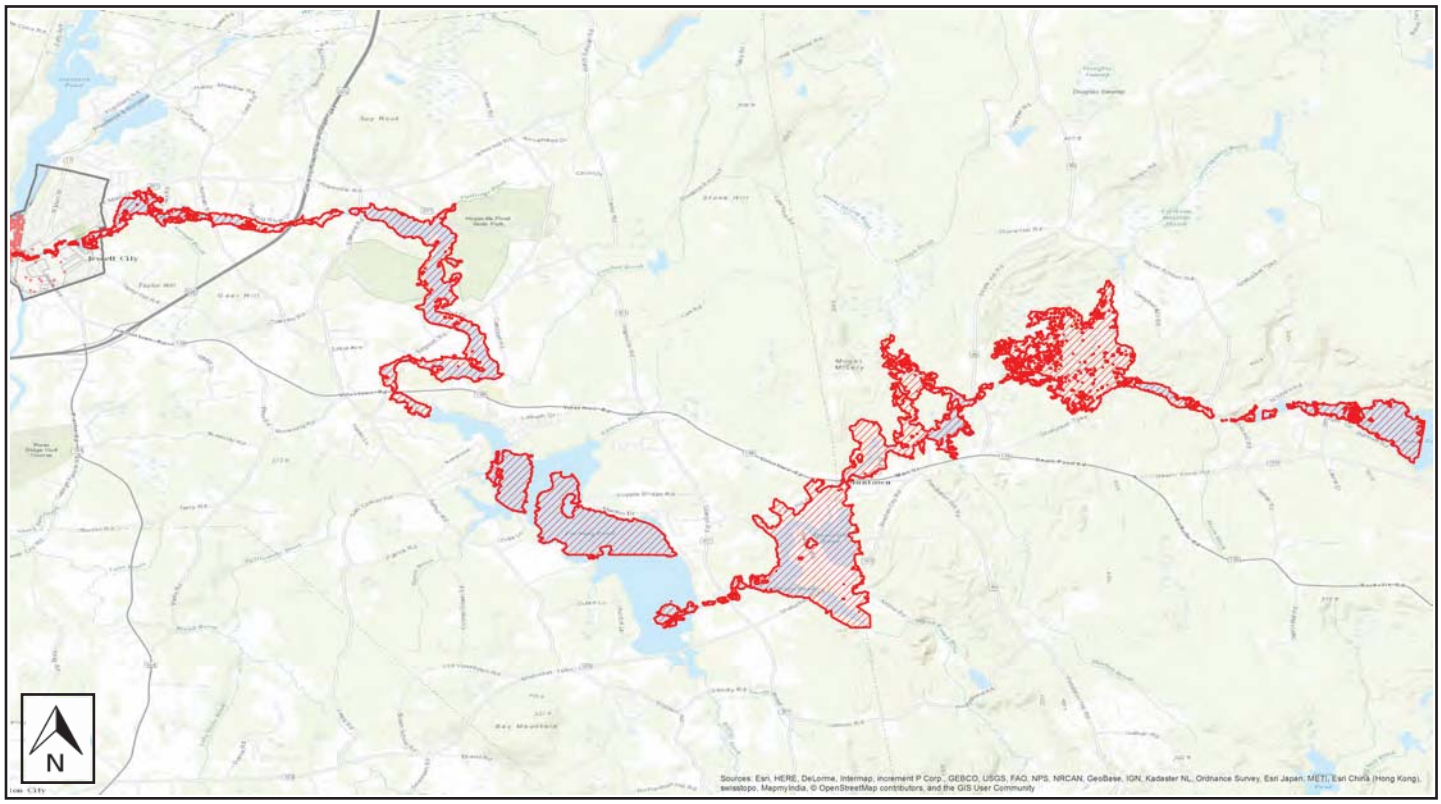


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

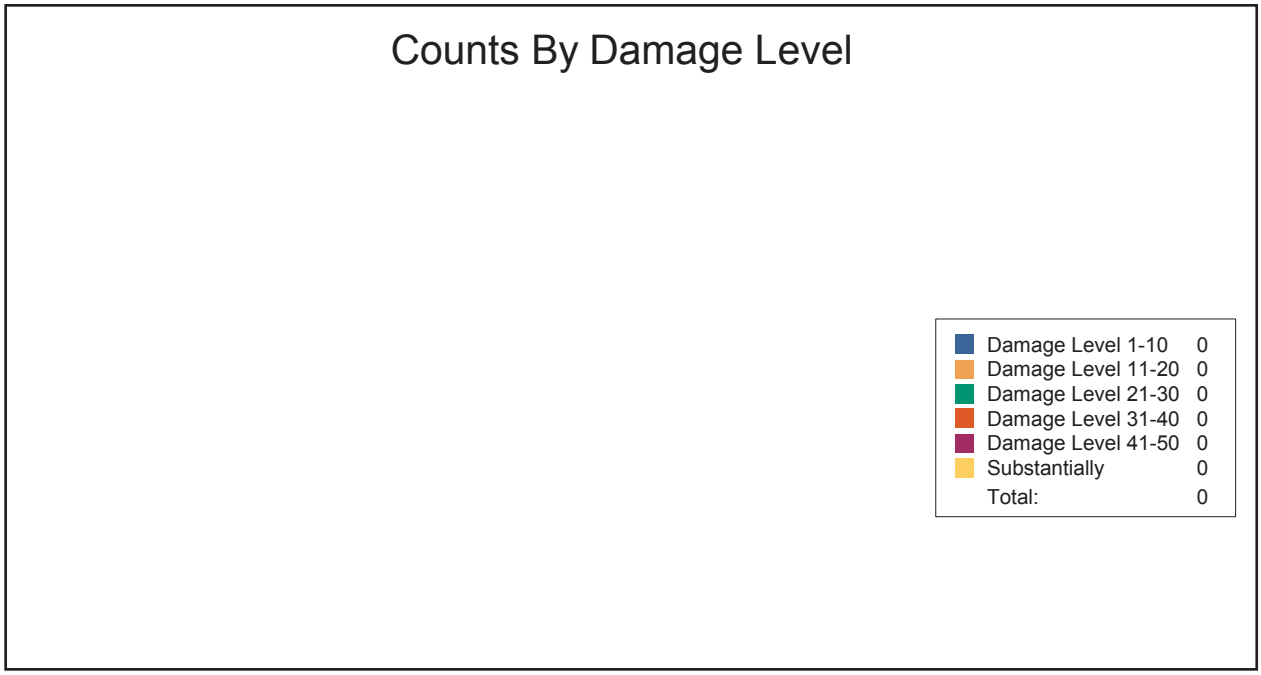


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	4	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

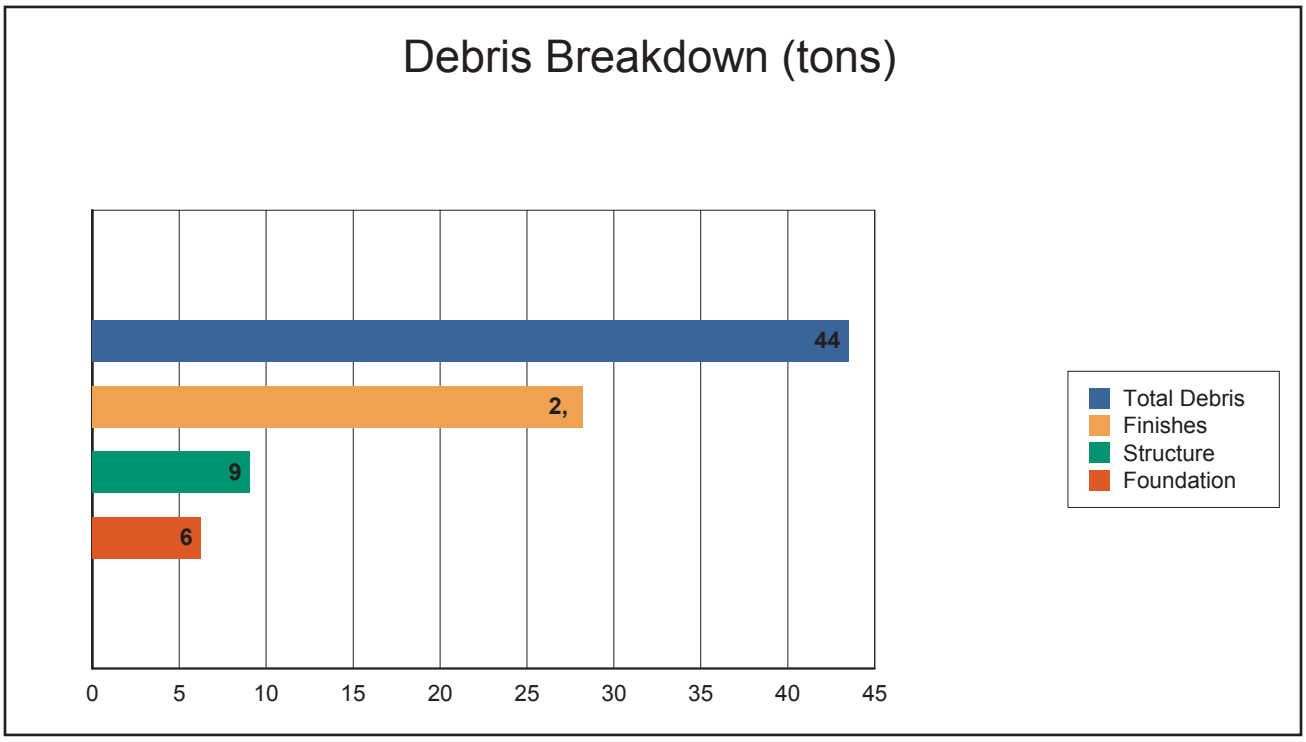
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

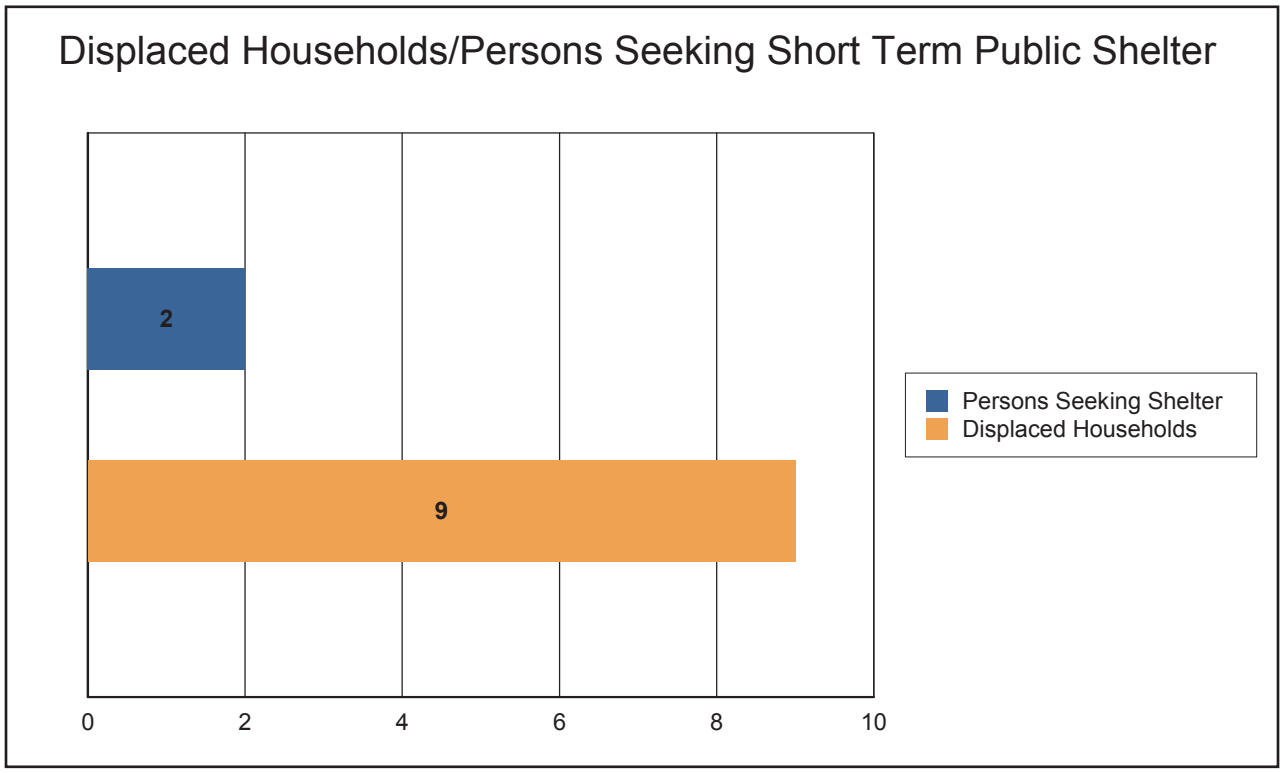


The model estimates that a total of 44 tons of debris will be generated. Of the total amount, Finishes comprises 65% of the total, Structure comprises 21% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 2 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 9 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2 people (out of a total population of 3,487) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1.13 million dollars, which represents 1.89 % of the total replacement value of the scenario buildings.

Building-Related Losses

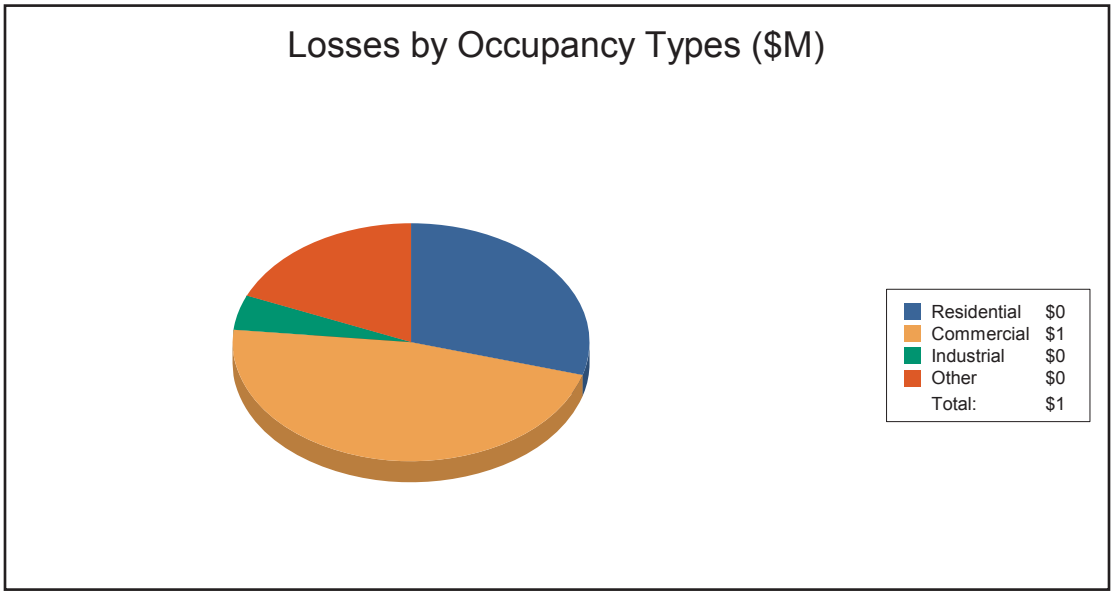
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 1.12 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 29.48% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.19	0.12	0.02	0.03	0.36
	Content	0.14	0.42	0.03	0.18	0.76
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.33**	**0.53**	**0.05**	**0.21**	**1.12**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.33**	**0.53**	**0.05**	**0.21**	**1.13**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	3,487	253,265	130,305	383,570
Total	**3.4, 7**	**253.265**	**130.305**	**3, 3.570**
Total Study Region	**3.4, 7**	**253.265**	**130.305**	**3, 3.570**

Hazus-MH: Flood Global Risk Report

Region Name: JewettCity

Flood Scenario: Jewett City 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 1 square miles and contains 58 census blocks. The region contains over 1 thousand households and has a total population of 3,487 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 906 buildings in the region with a total building replacement value (excluding contents) of 384 million dollars (2010 dollars). Approximately 87.86% of the buildings (and 66.03% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 906 buildings in the region which have an aggregate total replacement value of 384 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	253,265	66.0%
Commercial	54,859	14.3%
Industrial	59,290	15.5%
Agricultural	328	0.1%
Religion	3,503	0.9%
Government	5,393	1.4%
Education	6,932	1.8%
Total	**3, 3.570**	**100%w**

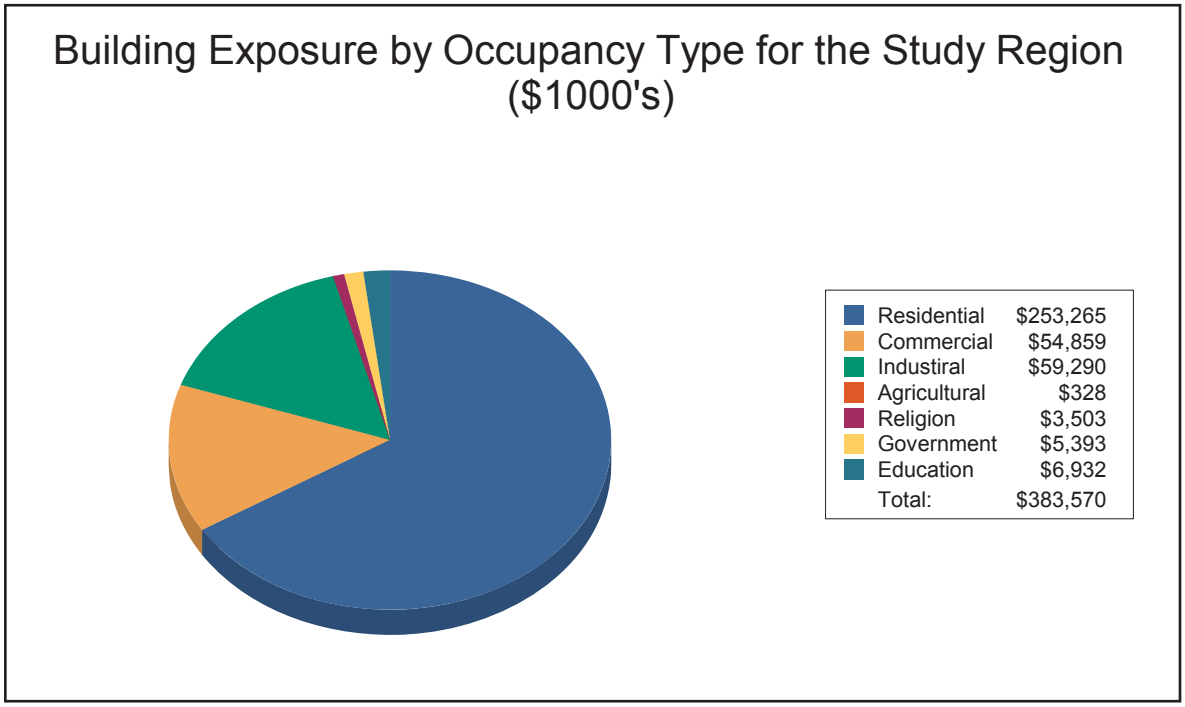
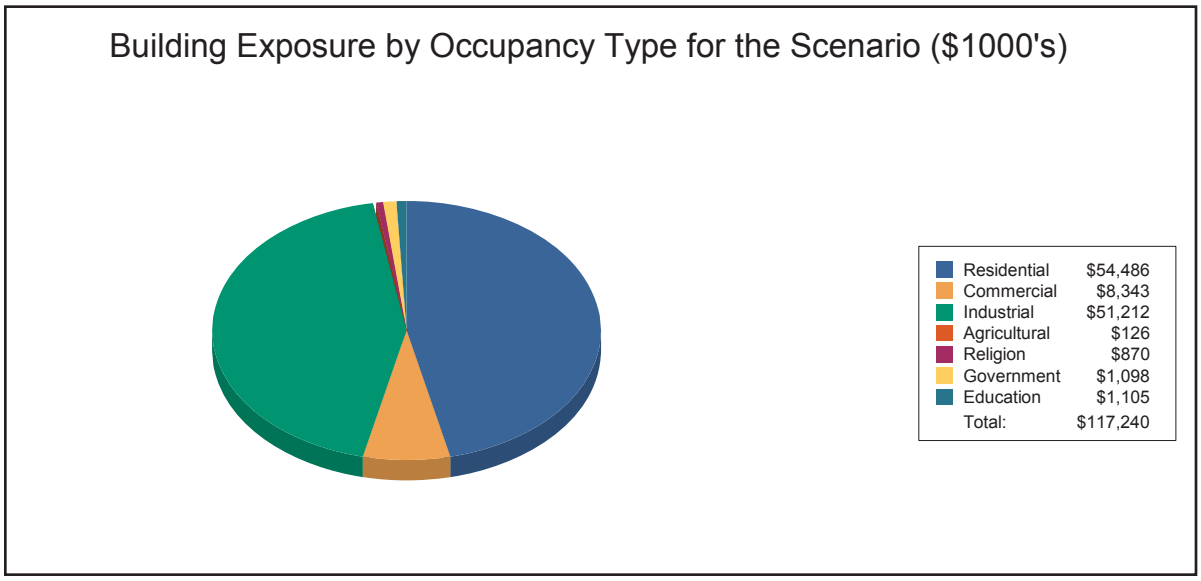


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	54,486	46.5%
Commercial	8,343	7.1%
Industrial	51,212	43.7%
Agricultural	126	0.1%
Religion	870	0.7%
Government	1,098	0.9%
Education	1,105	0.9%
Total	**117.240**	**100%**



Essential Facility Inventory

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

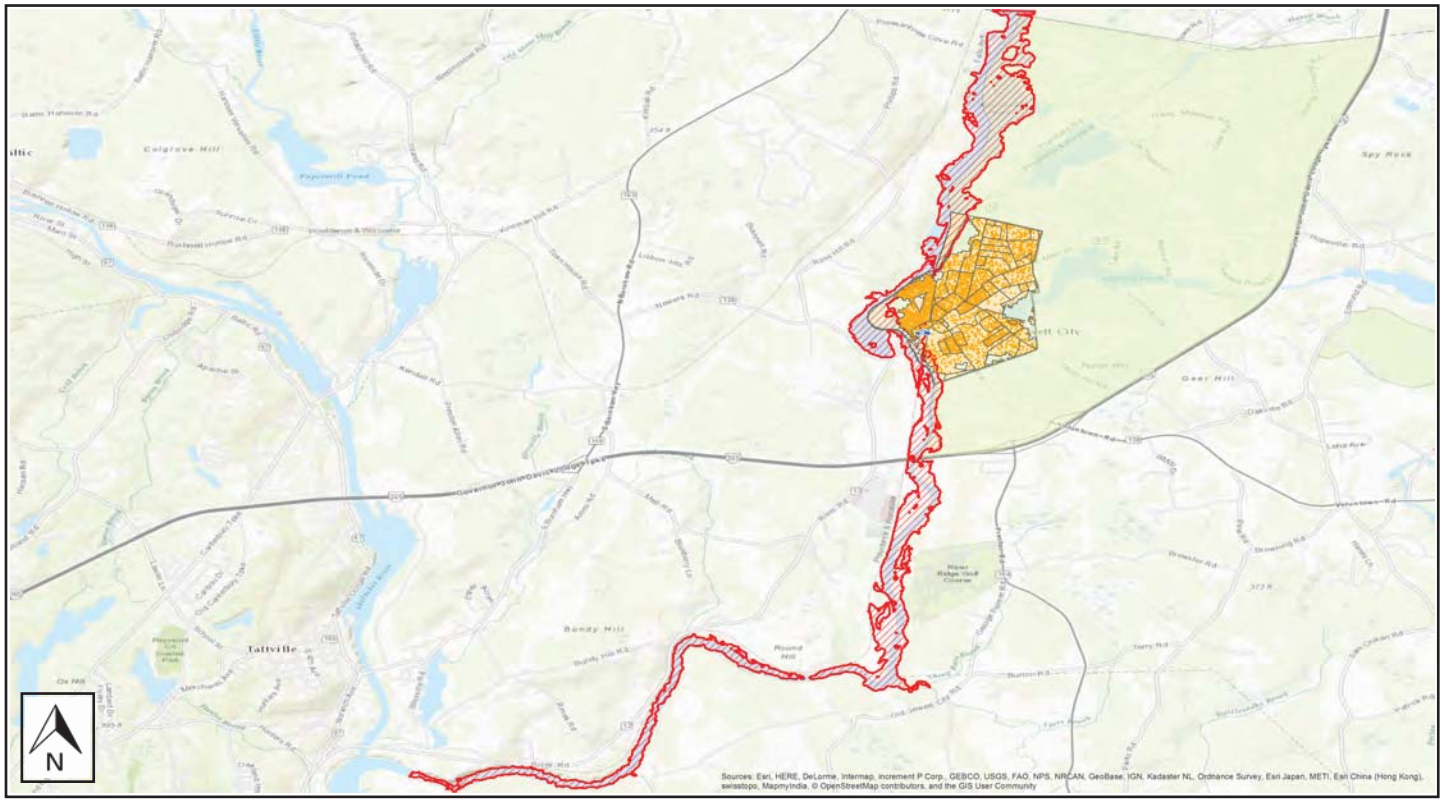
Flood Scenario Parameters

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

Study Region Name:	JewettCity
Scenario Name:	Jewett City 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent. as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

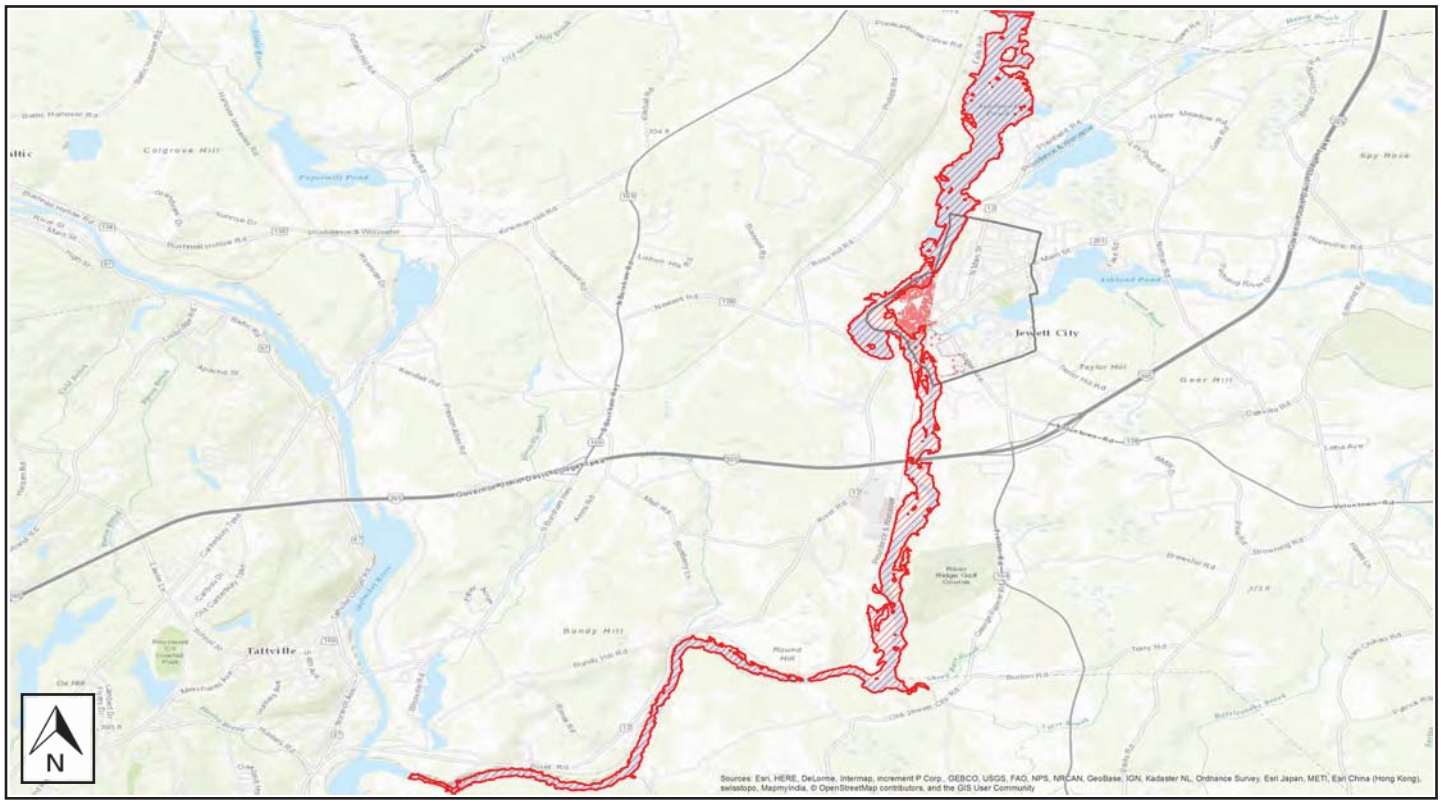


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

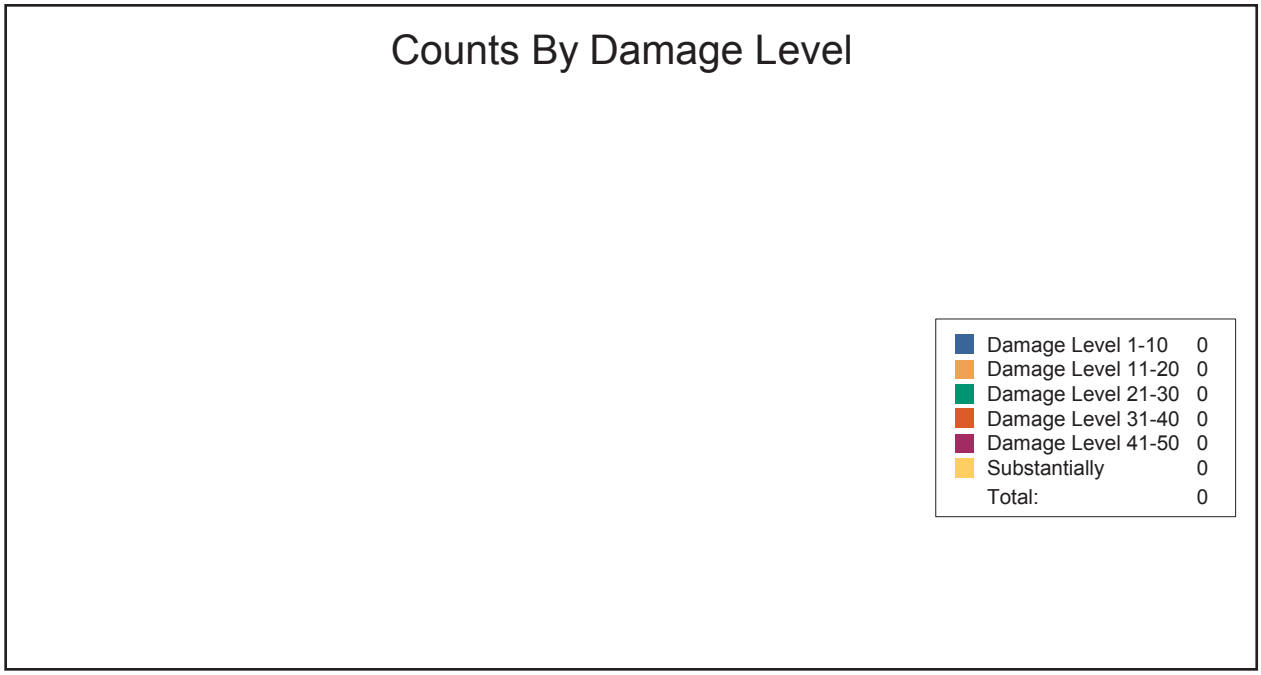


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	2	1	0	1
Schools	4	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

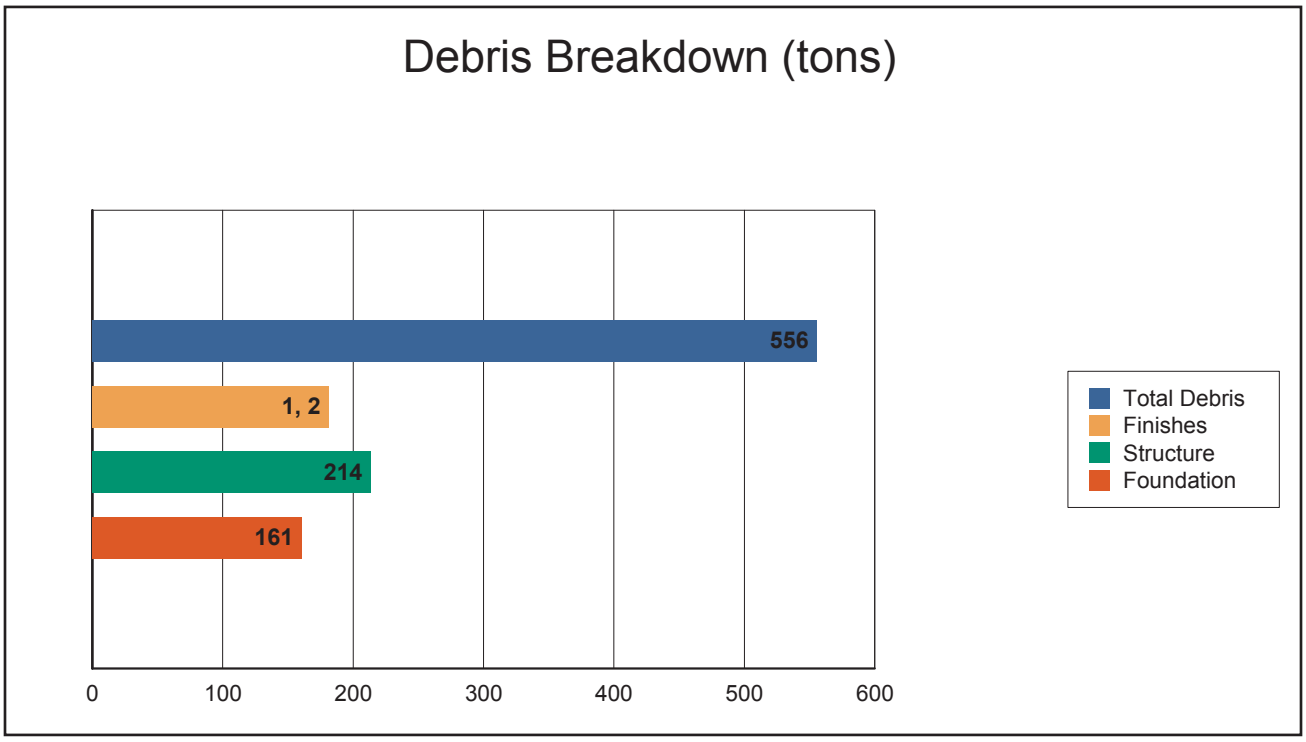
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

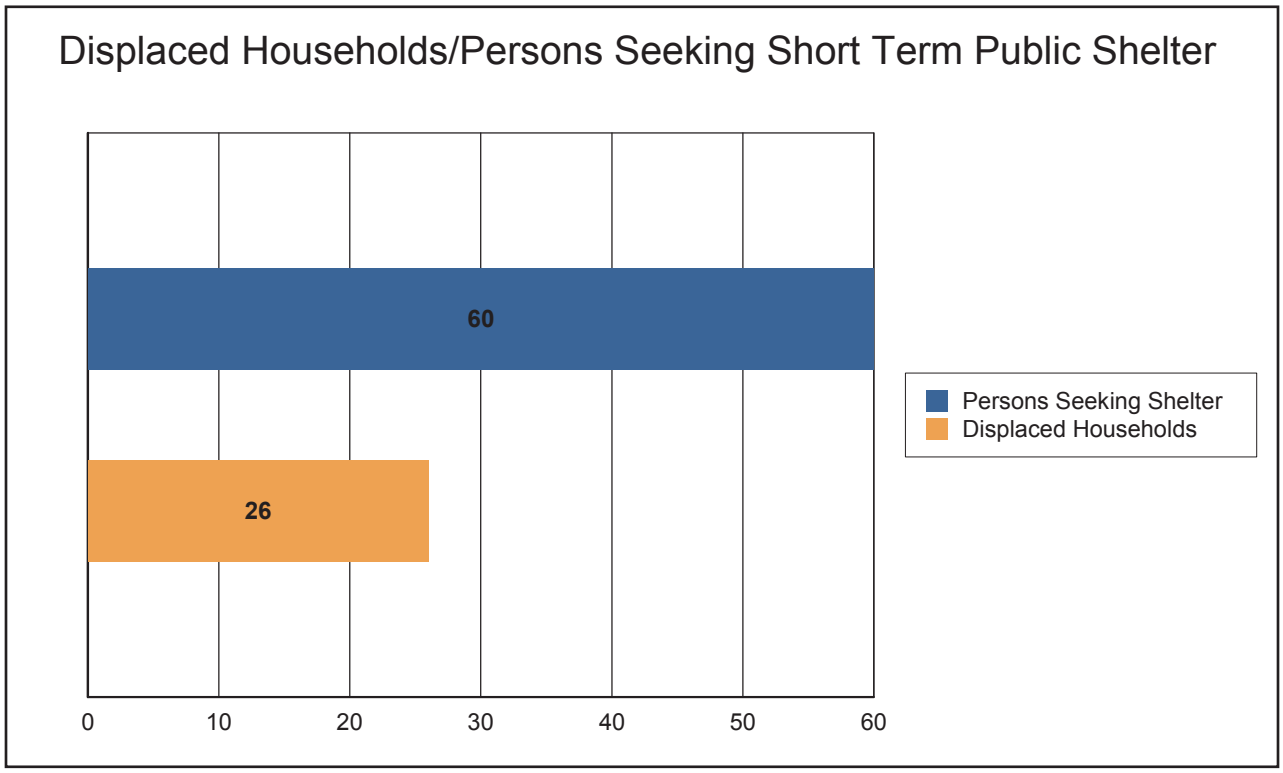


The model estimates that a total of 556 tons of debris will be generated. Of the total amount, Finishes comprises 33% of the total, Structure comprises 38% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 22 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 26 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 60 people (out of a total population of 3,487) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 14.40 million dollars, which represents 12.28 % of the total replacement value of the scenario buildings.

Building-Related Losses

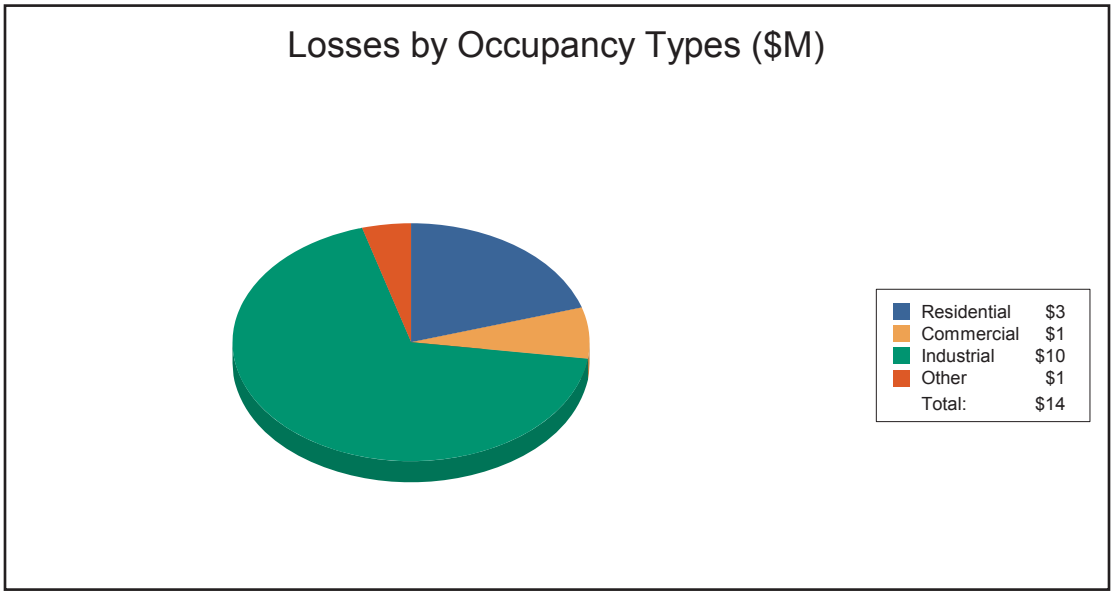
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 14.38 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 20.21% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.83	0.26	3.14	0.09	5.32
	Content	1.08	0.75	6.25	0.52	8.60
	Inventory	0.00	0.01	0.45	0.00	0.46
	Subtotal	**2.91**	**1.02**	**9.84**	**0.62**	**14.38**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.01	0.01
	Subtotal	**0.00**	**0.00**	**0.01**	**0.01**	**0.02**
ALL	**Total**	**2.91**	**1.02**	**9.85**	**0.63**	**14.40**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	3,487	253,265	130,305	383,570
Total	**3.4, 7**	**253.265**	**130.305**	**3, 3.570**
Total Study Region	**3.4, 7**	**253.265**	**130.305**	**3, 3.570**

Hazus-MH: Flood Global Risk Report

Region Name: Lebanon

Flood Scenario: Lebanon 100 Year

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 55 square miles and contains 246 census blocks. The region contains over 3 thousand households and has a total population of 7,308 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 3,259 buildings in the region with a total building replacement value (excluding contents) of 1,030 million dollars (2010 dollars). Approximately 92.05% of the buildings (and 81.06% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 3,259 buildings in the region which have an aggregate total replacement value of 1,030 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	835,303	81.1%
Commercial	61,591	6.0%
Industrial	34,540	3.4%
Agricultural	67,312	6.5%
Religion	6,211	0.6%
Government	7,917	0.8%
Education	17,569	1.7%
Total	**1,030,443**	**100.0%**

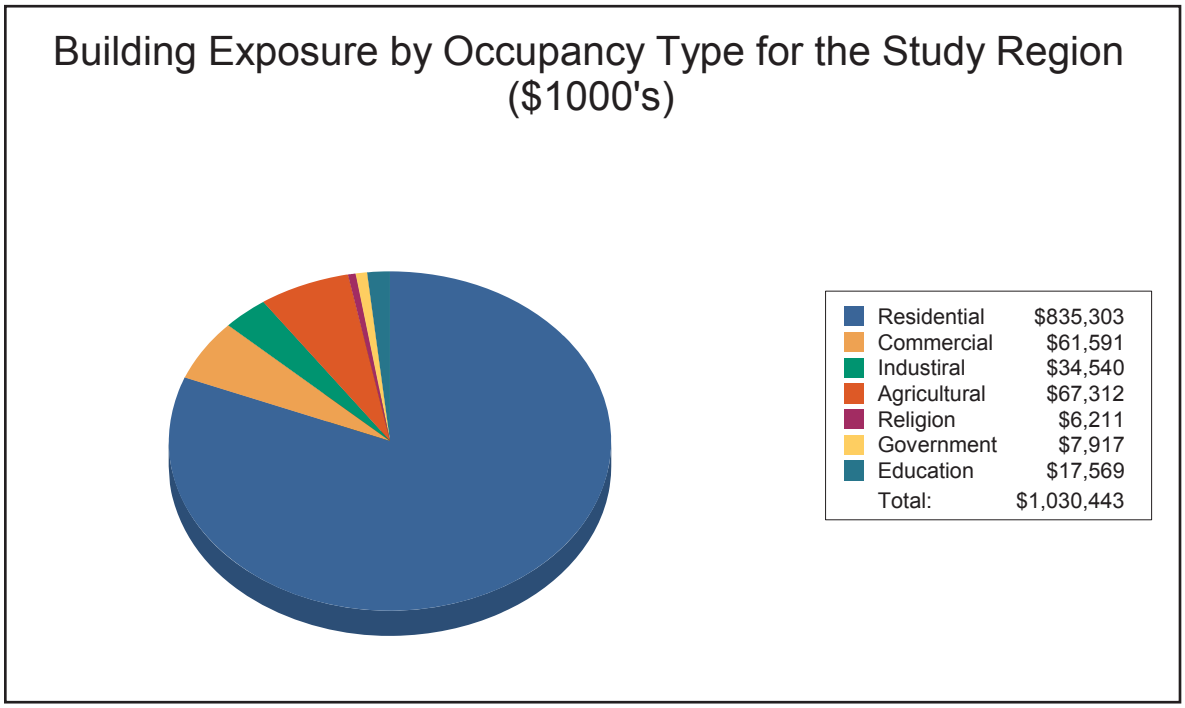
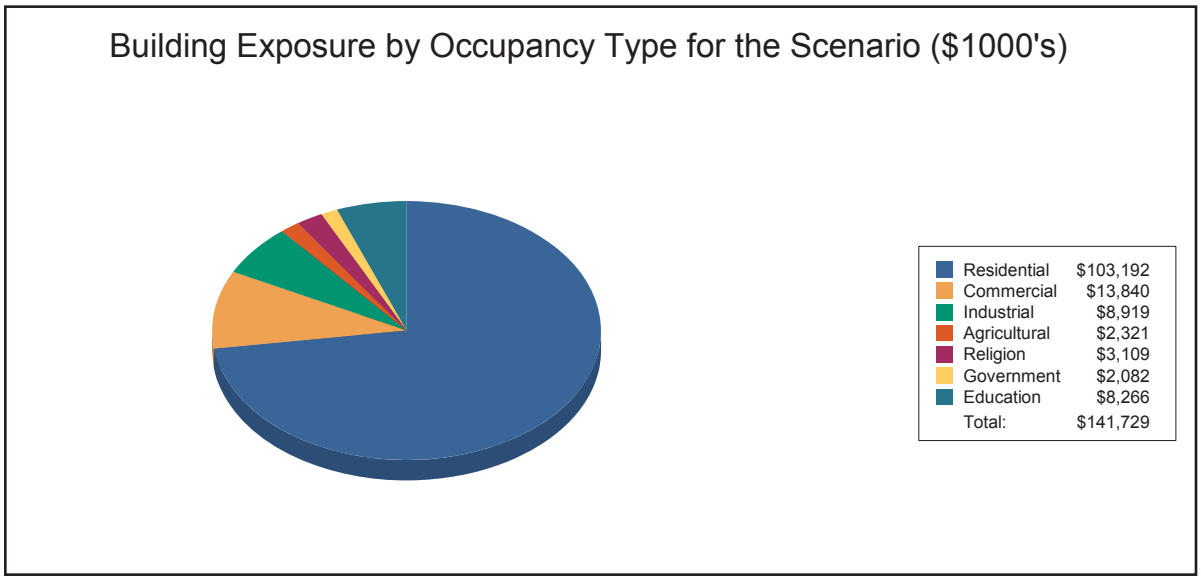


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	103,192	72.8%
Commercial	13,840	9.8%
Industrial	8,919	6.3%
Agricultural	2,321	1.6%
Religion	3,109	2.2%
Government	2,082	1.5%
Education	8,266	5.8%
Total	**141,729**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 3 schools, 1 fire station, 1 police station and no emergency operation centers.

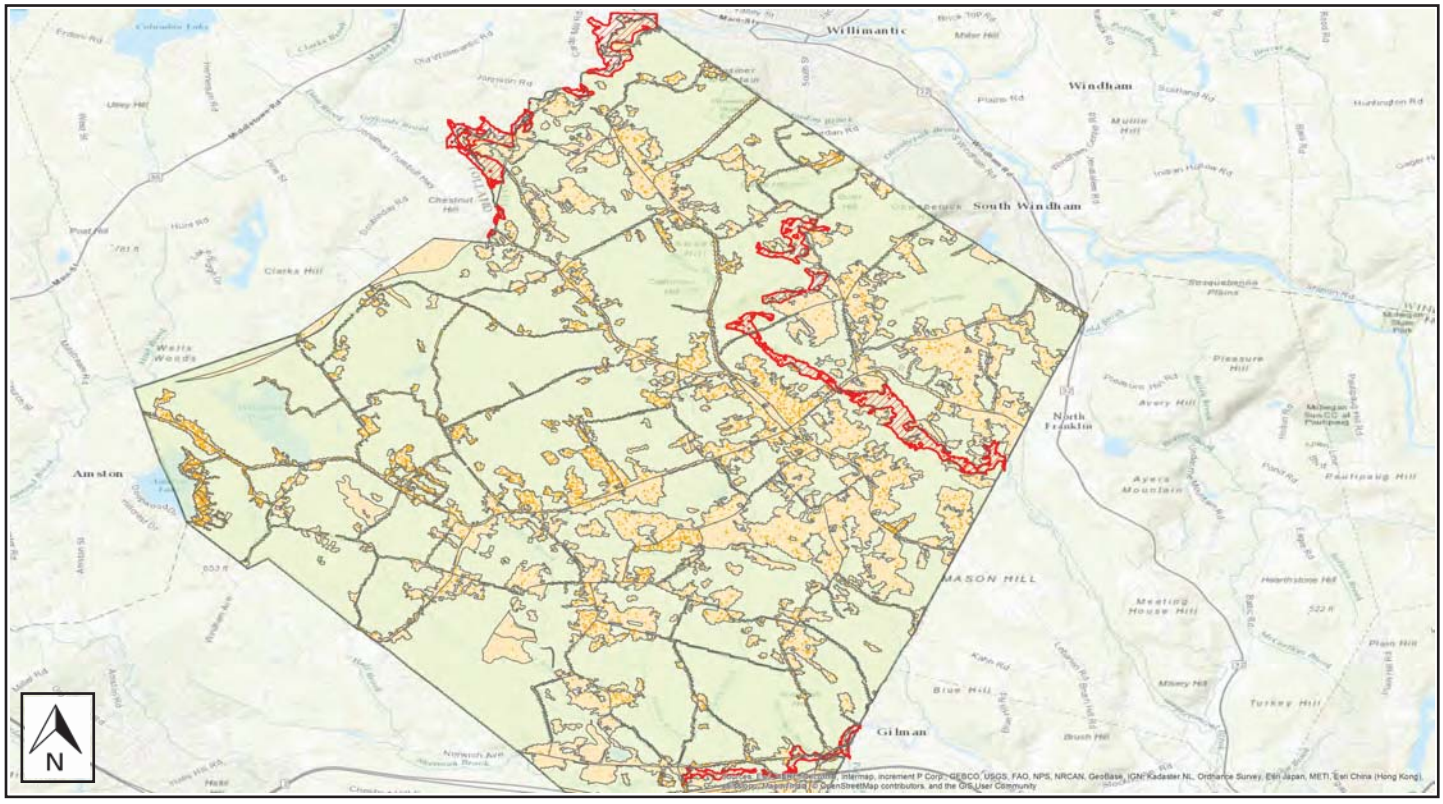
Flood Scenario Parameters

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

Study Region Name:	Lebanon
Scenario Name:	Lebanon 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

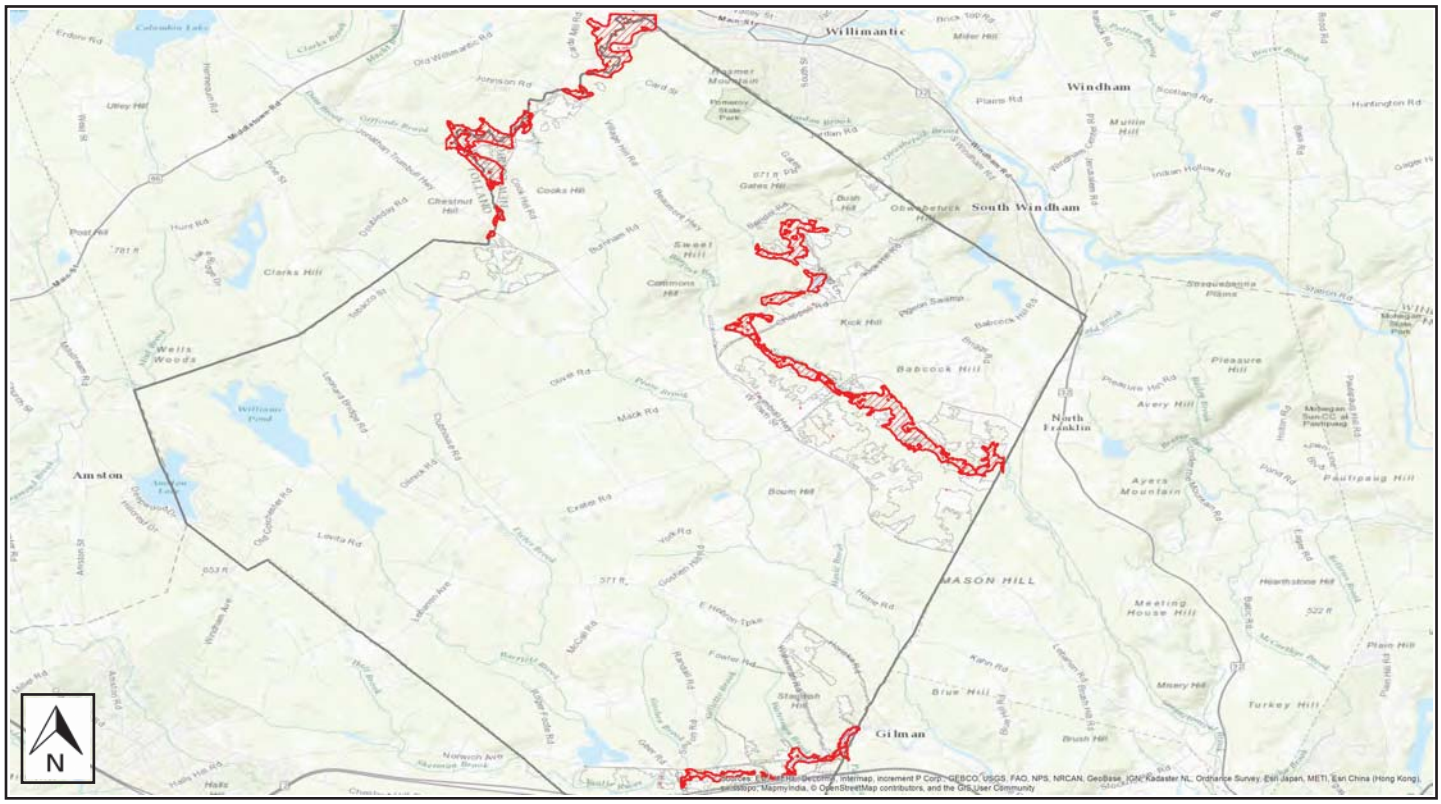


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

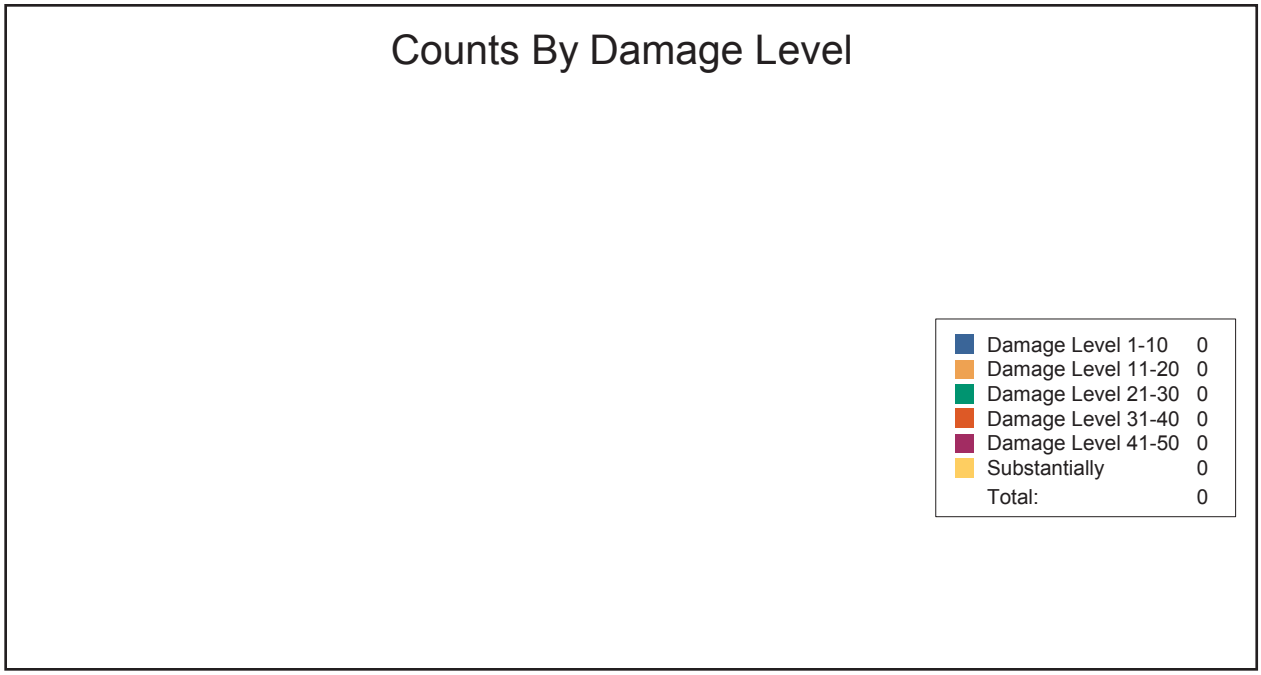


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	3	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

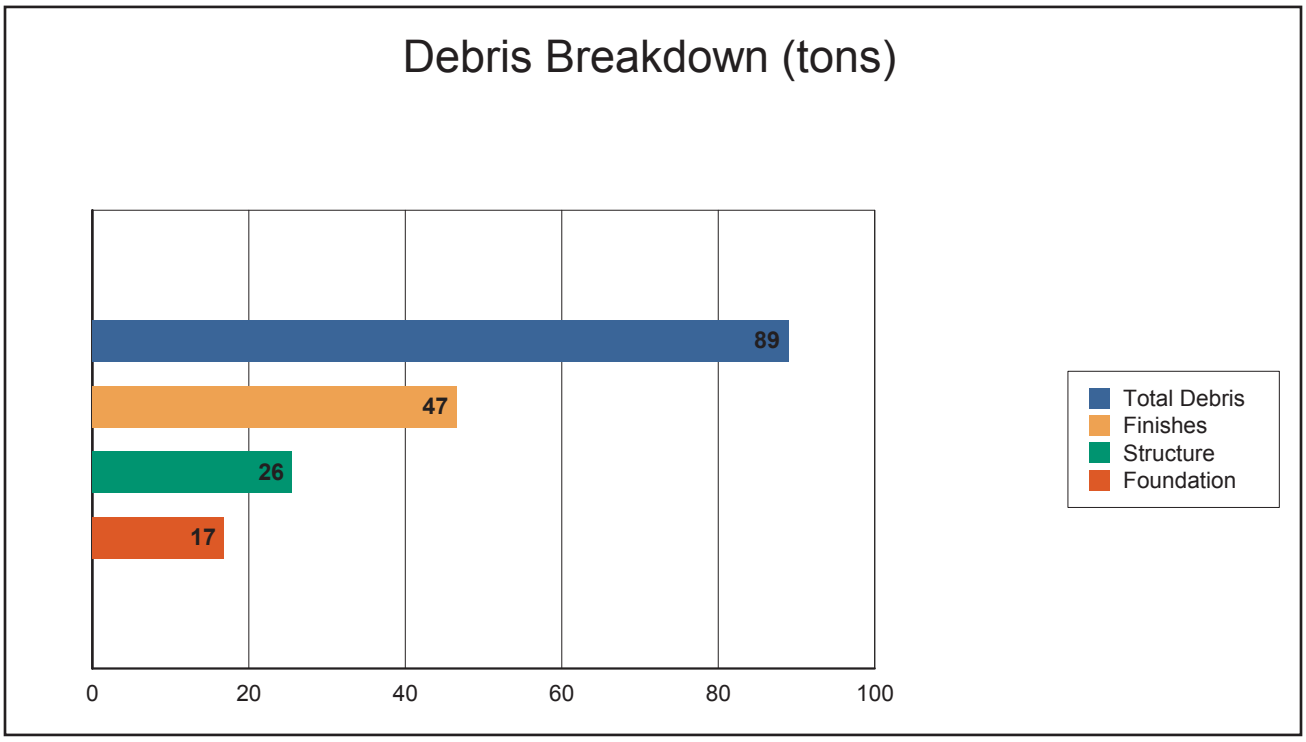
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

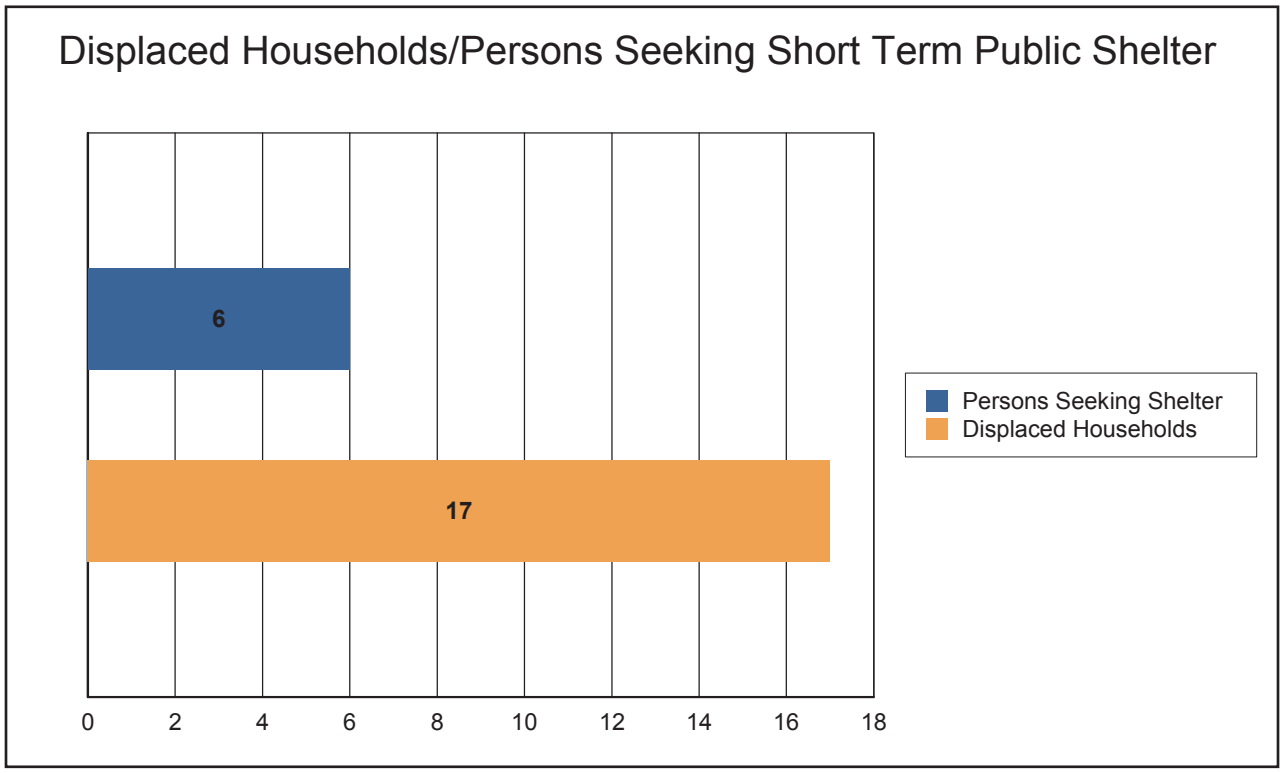


The model estimates that a total of 89 tons of debris will be generated. Of the total amount, Finishes comprises 52% of the total, Structure comprises 29% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 4 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 17 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 6 people (out of a total population of 7,308) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1.58 million dollars, which represents 1.11 % of the total replacement value of the scenario buildings.

Building-Related Losses

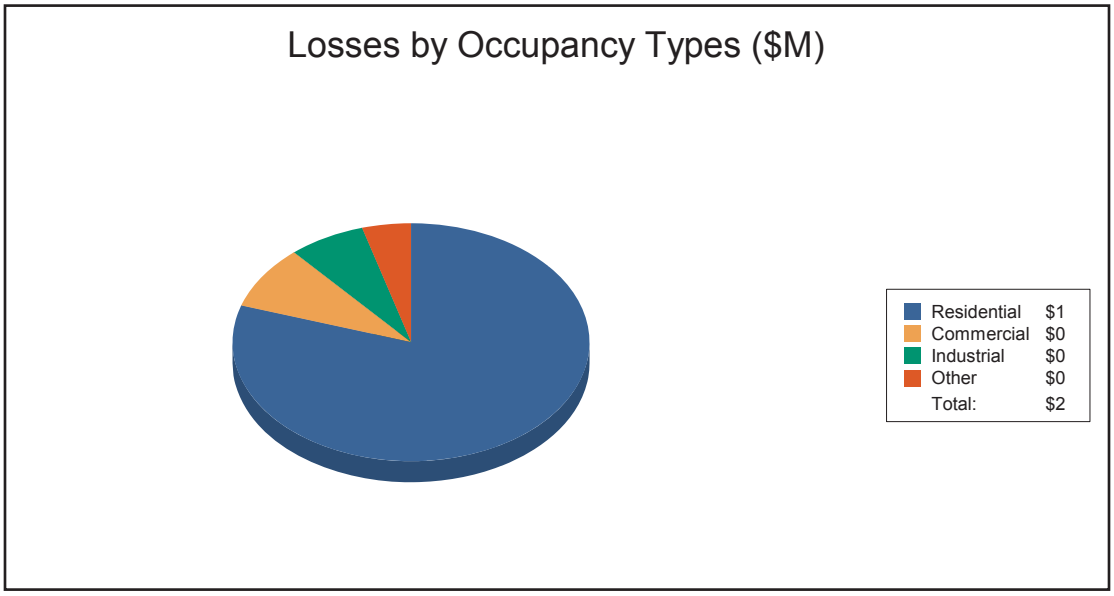
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 1.58 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 80.06% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.81	0.03	0.04	0.01	0.88
	Content	0.45	0.11	0.06	0.07	0.69
	Inventory	0.00	0.00	0.01	0.00	0.01
	Subtotal	**1.26**	**0.13**	**0.11**	**0.07**	**1.58**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**1.26**	**0.13**	**0.11**	**0.07**	**1.58**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	7,308	835,303	195,140	1,030,443
Total	**7,308**	**835,303**	**195,140**	**1,030,443**
Total Study Region	**7,308**	**835,303**	**195,140**	**1,030,443**

Hazus-MH: Flood Global Risk Report

Region Name: Ledyard

Flood Scenario: Ledyard 100 year 3

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 40 square miles and contains 379 census blocks. The region contains over 6 thousand households and has a total population of 15,051 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 5,956 buildings in the region with a total building replacement value (excluding contents) of 1,821 million dollars (2010 dollars). Approximately 93.57% of the buildings (and 86.28% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 5,956 buildings in the region which have an aggregate total replacement value of 1,821 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,570,938	86.3%
Commercial	164,322	9.0%
Industrial	24,328	1.3%
Agricultural	6,510	0.4%
Religion	23,691	1.3%
Government	8,384	0.5%
Education	22,545	1.2%
Total	**1,. 20,71.**	**100%w**

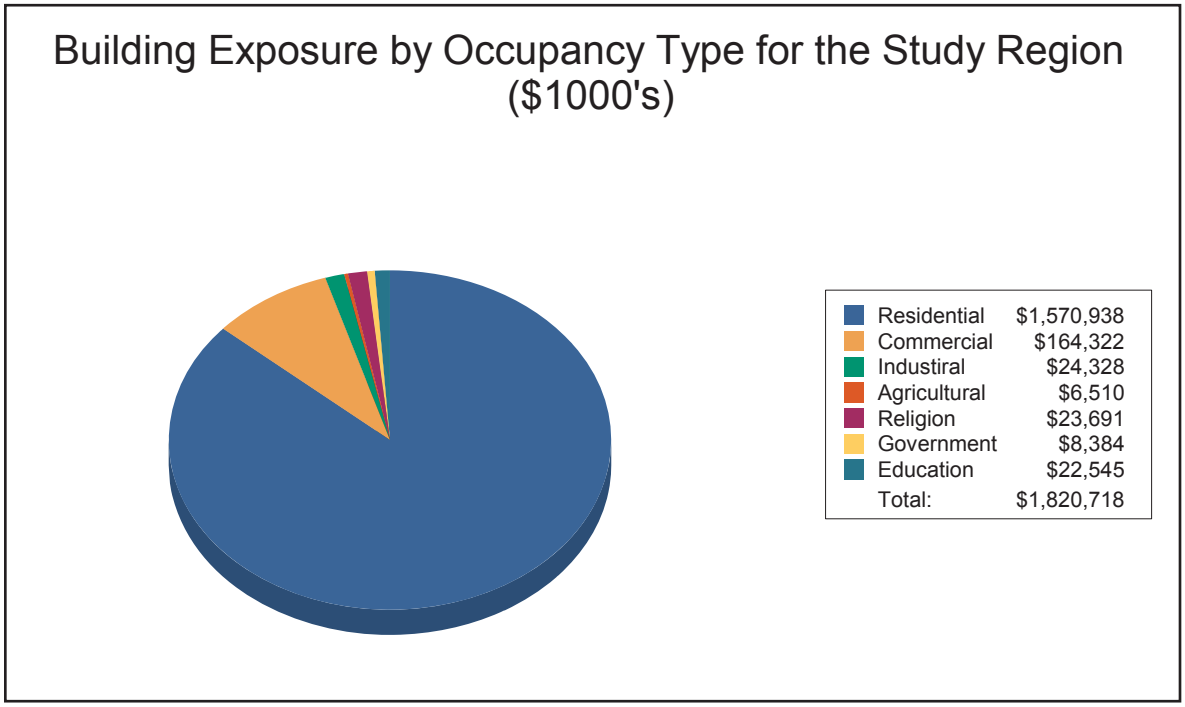
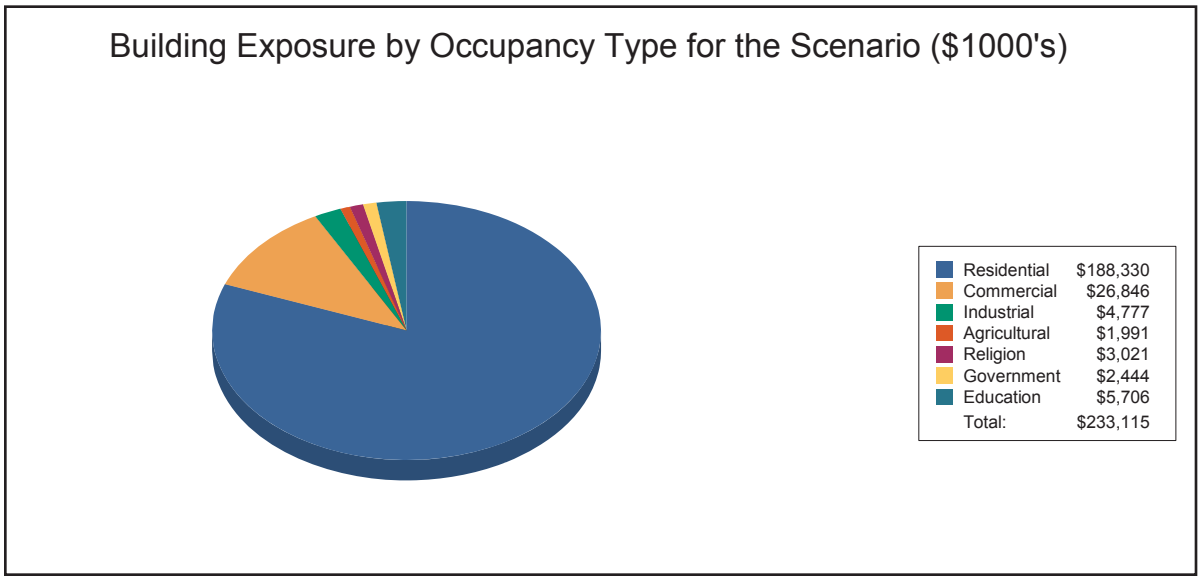


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	188,330	80.8%
Commercial	26,846	11.5%
Industrial	4,777	2.0%
Agricultural	1,991	0.9%
Religion	3,021	1.3%
Government	2,444	1.0%
Education	5,706	2.4%
Total	**233,115**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 7 schools, 4 fire stations, 1 police station and no emergency operation centers.

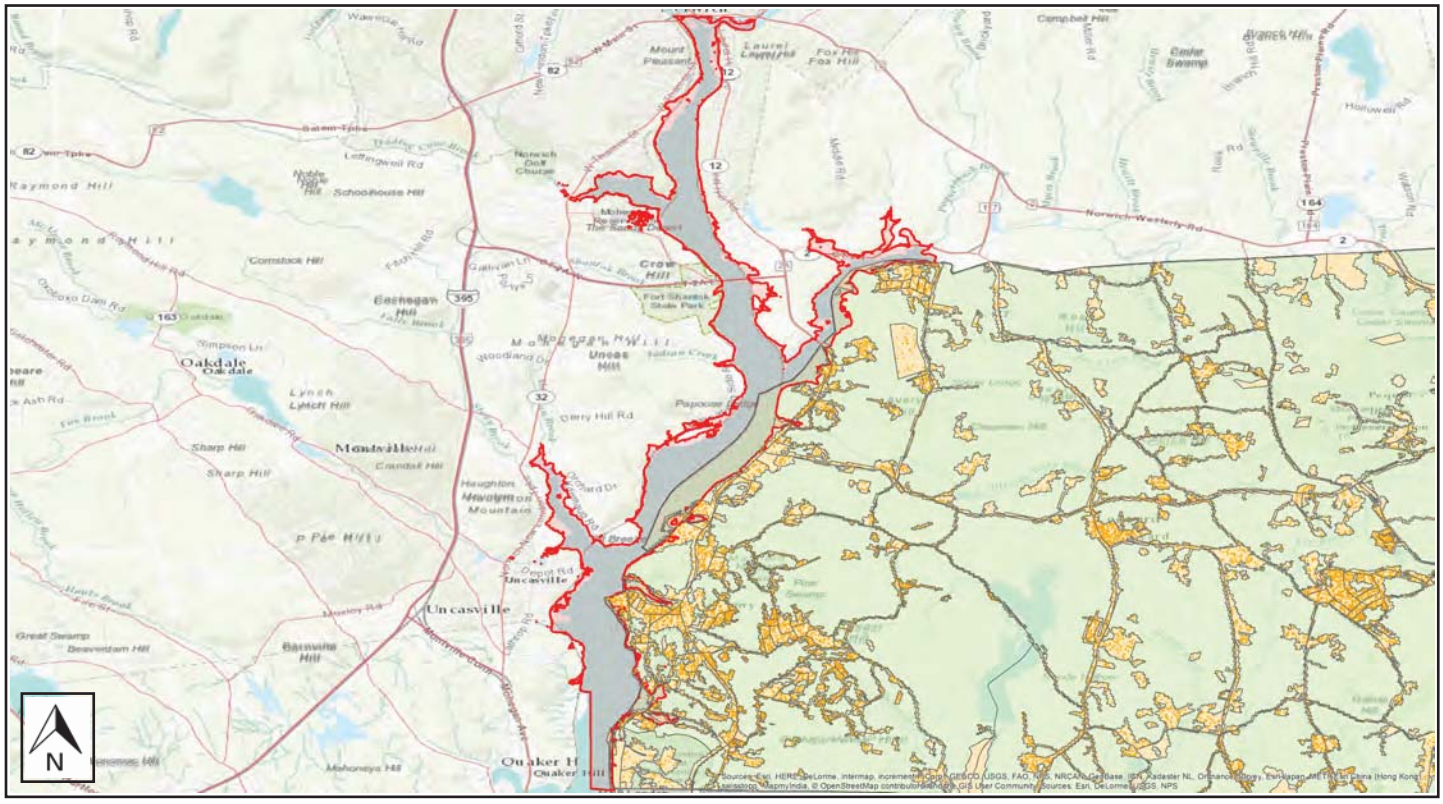
Flood Scenario Parameters

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

Study Region Name:	Ledyard
Scenario Name:	Ledyard 100 year 3
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 4 buildings will be at least moderately damaged. This is over 50% of the total number of buildings in the scenario. There are an estimated 1 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

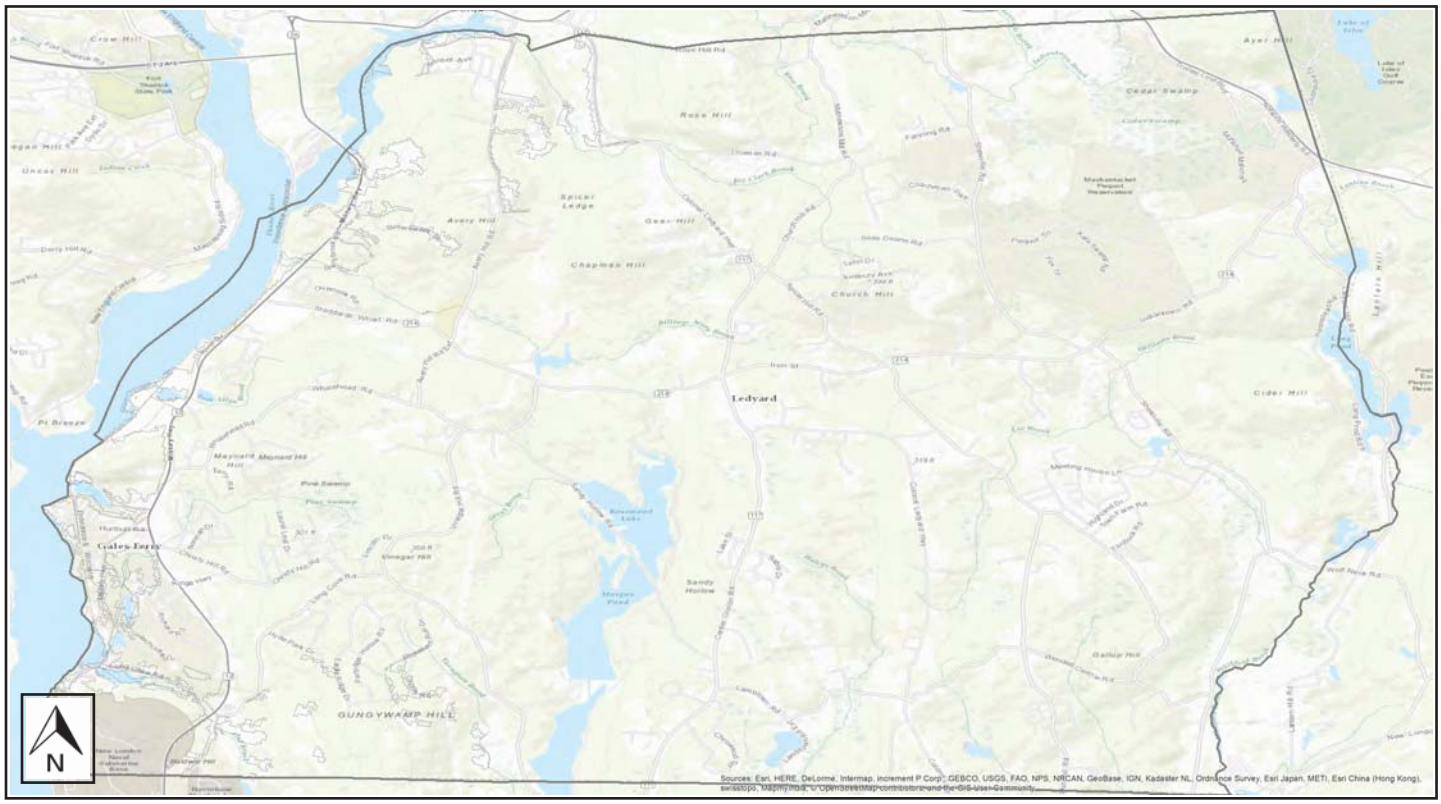


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	2	50.00	1	25.00	0	0.00	1	25.00
Total	**0**		**0**		**2**		**1**		**0**		**1**	

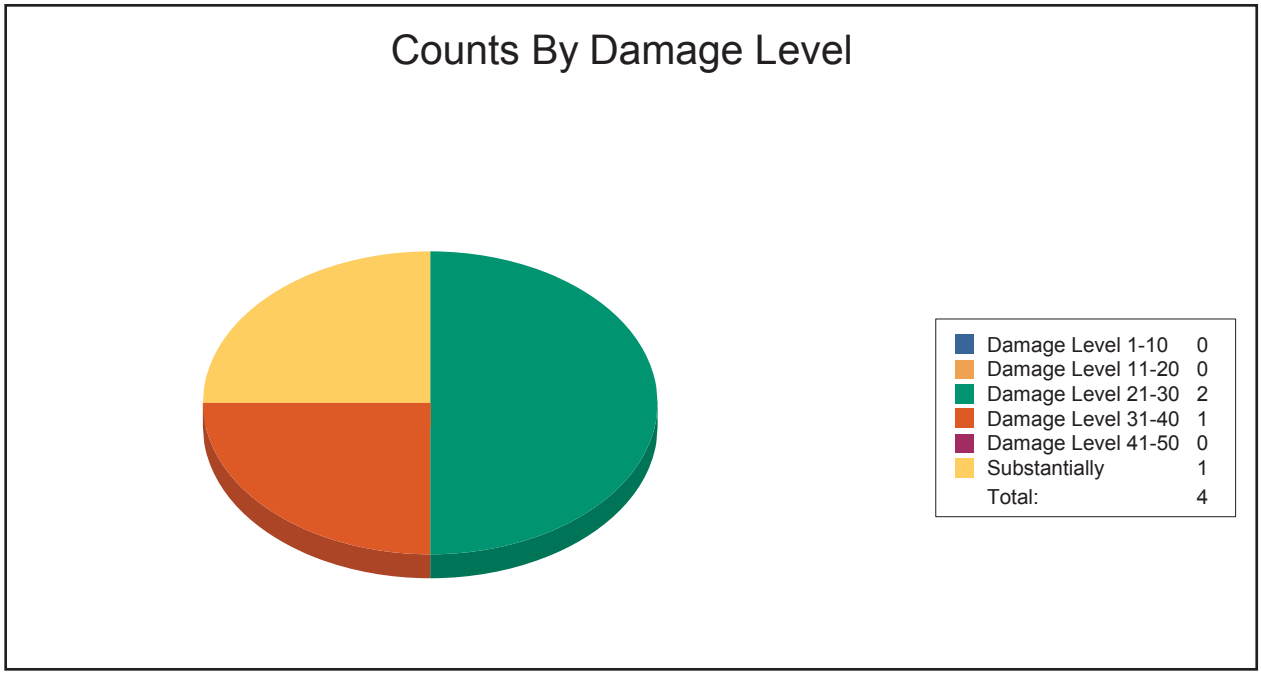


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	2	50	1	25	0	0	1	25

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	7	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

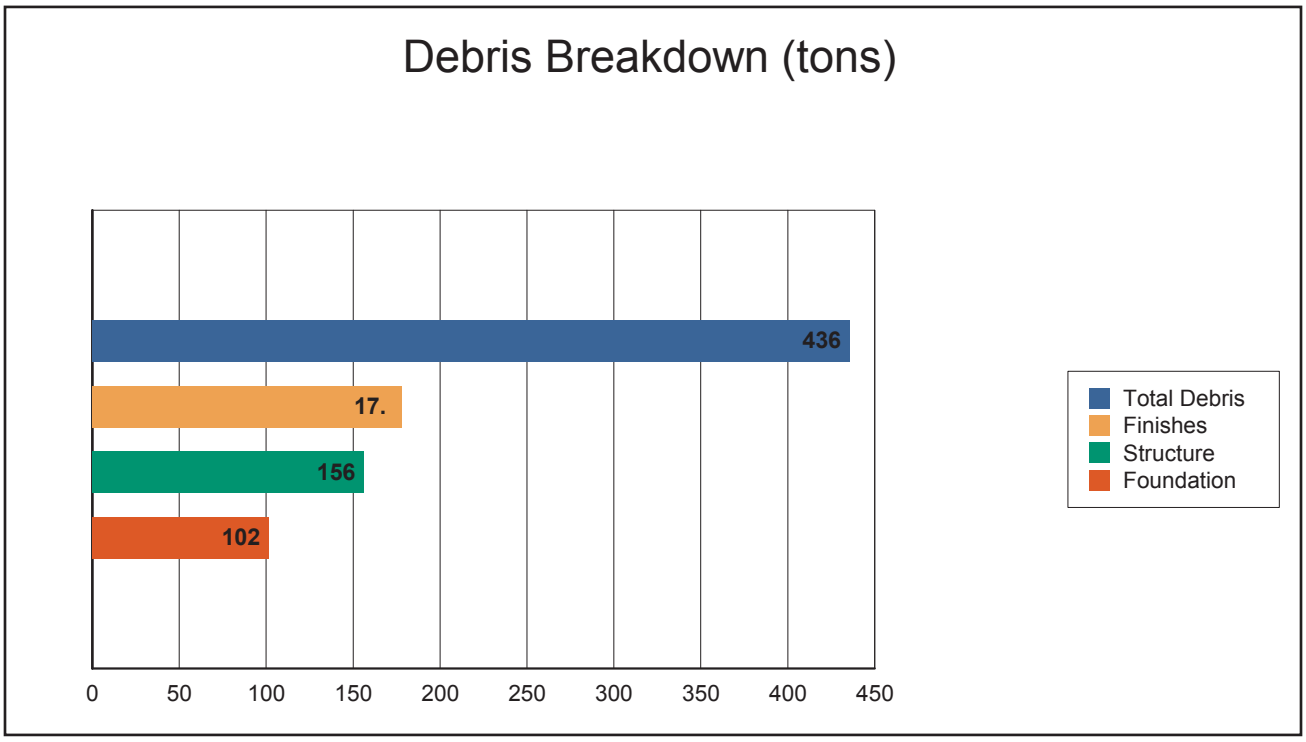
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

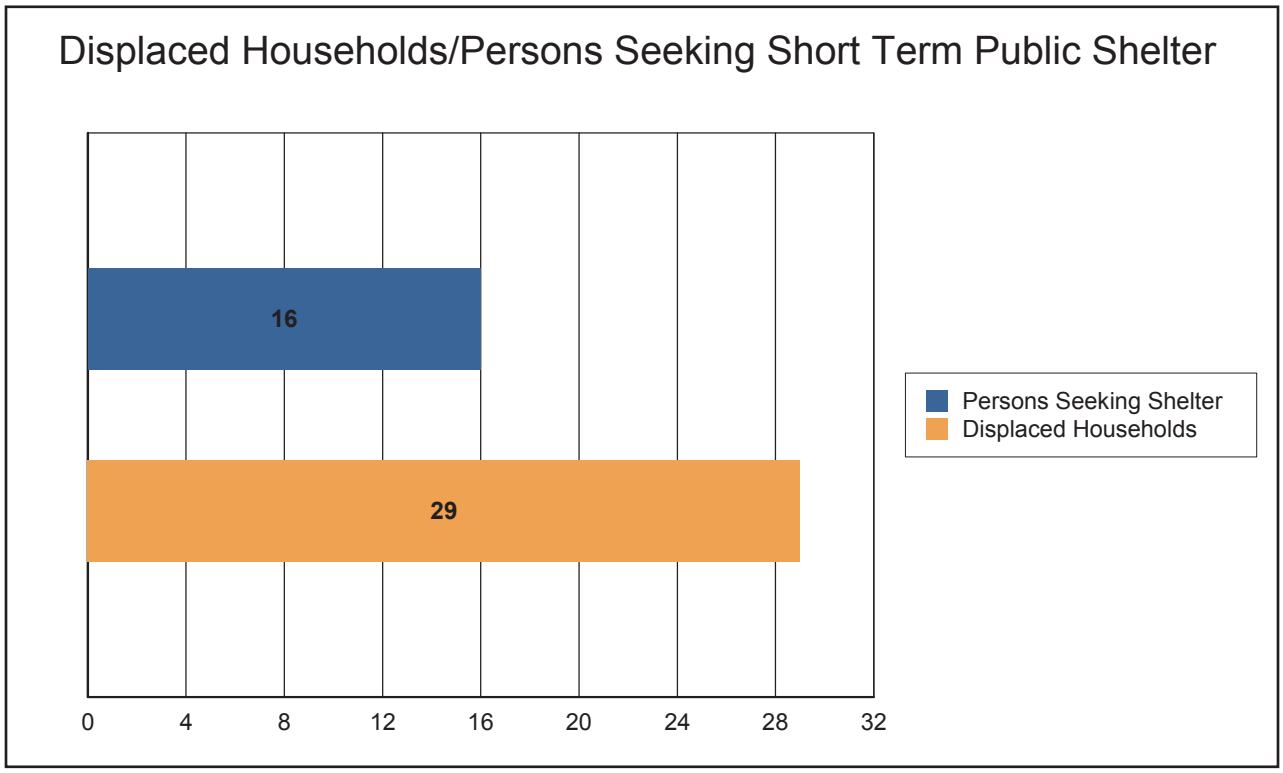


The model estimates that a total of 436 tons of debris will be generated. Of the total amount, Finishes comprises 41% of the total, Structure comprises 36% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 17 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 29 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 16 people (out of a total population of 15,051) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 6.46 million dollars, which represents 2.77 % of the total replacement value of the scenario buildings.

Building-Related Losses

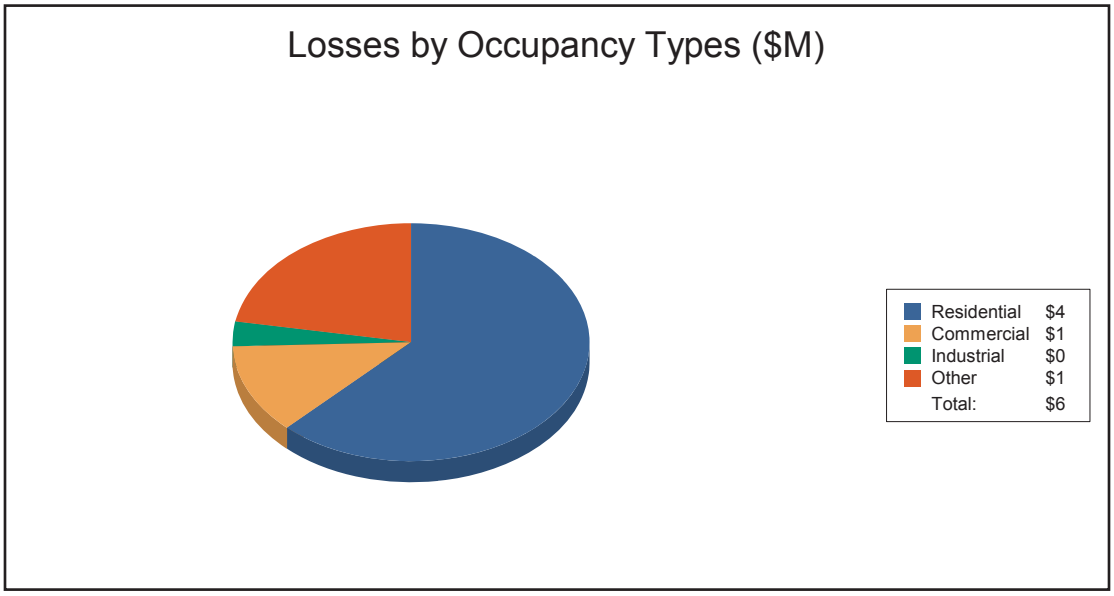
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 6.42 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 62.20% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.55	0.21	0.08	0.22	3.05
	Content	1.47	0.59	0.11	1.18	3.35
	Inventory	0.00	0.00	0.02	0.00	0.02
	Subtotal	**4.02**	**0.79**	**0.21**	**1.40**	**6.42**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.04	0.04
	Subtotal	**0.00**	**0.00**	**0.00**	**0.04**	**0.05**
ALL	**Total**	**4.02**	**0.79**	**0.21**	**1.44**	**6.46**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	15,051	1,570,938	249,780	1,820,718
Total	**15,051**	**1,570,93.**	**249,7. 0**	**1,. 20,71.**
Total Study Region	**15,051**	**1,570,93.**	**249,7. 0**	**1,. 20,71.**

Hazus-MH: Flood Global Risk Report

Region Name: Ledyard

Flood Scenario: Ledyard - Whitford Brook FP

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 40 square miles and contains 379 census blocks. The region contains over 6 thousand households and has a total population of 15,051 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 5,956 buildings in the region with a total building replacement value (excluding contents) of 1,821 million dollars (2010 dollars). Approximately 93.57% of the buildings (and 86.28% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 5,956 buildings in the region which have an aggregate total replacement value of 1,821 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,570,938	86.3%
Commercial	164,322	9.0%
Industrial	24,328	1.3%
Agricultural	6,510	0.4%
Religion	23,691	1.3%
Government	8,384	0.5%
Education	22,545	1.2%
Total	**1,. 20,71.**	**100%w**

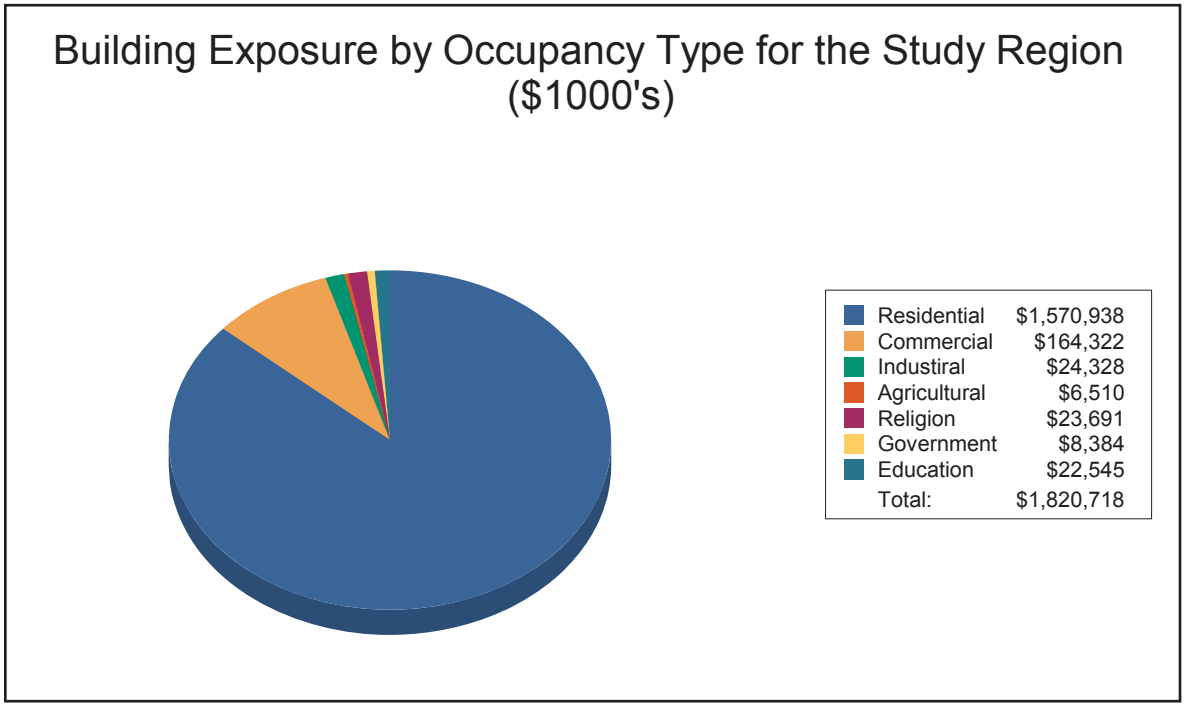
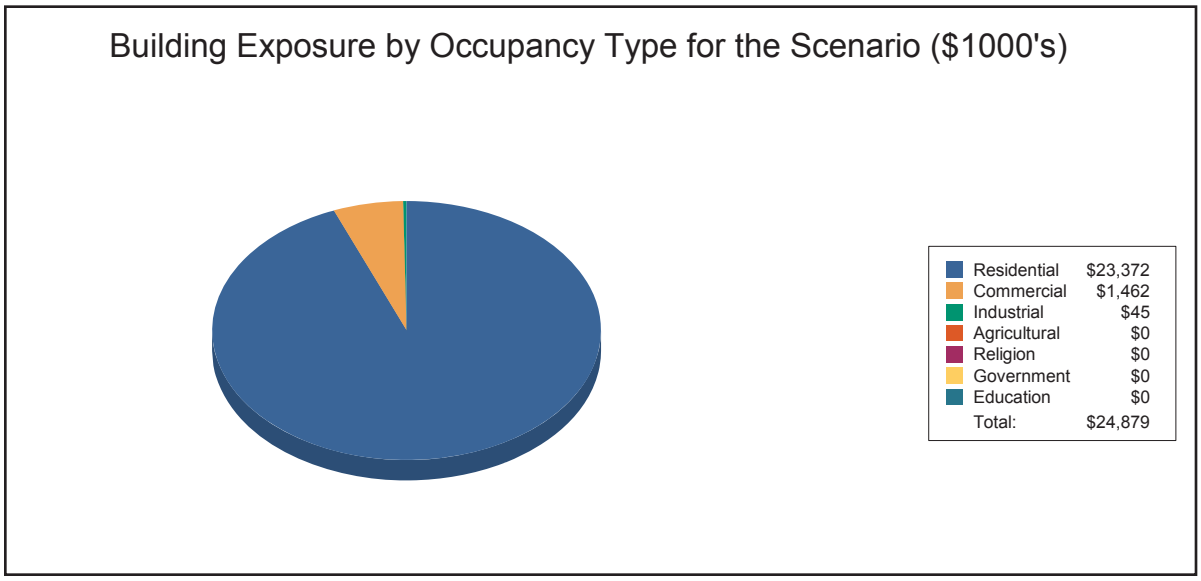


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	23,372	93.9%
Commercial	1,462	5.9%
Industrial	45	0.2%
Agricultural	0	0.0%
Religion	0	0.0%
Government	0	0.0%
Education	0	0.0%
Total	**24,. 79**	**100%w**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 7 schools, 4 fire stations, 1 police station and no emergency operation centers.

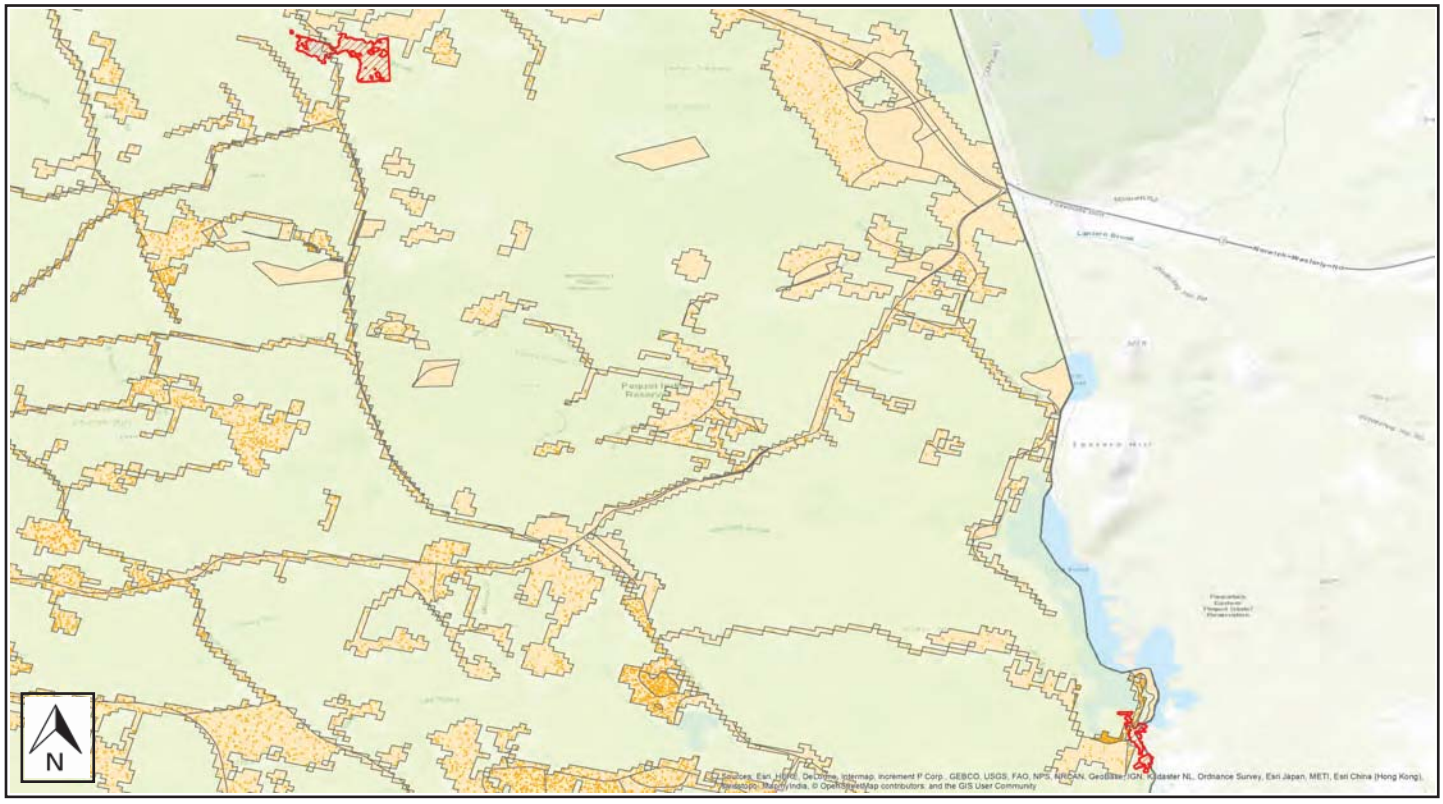
Flood Scenario Parameters

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

Study Region Name:	Ledyard
Scenario Name:	Ledyard - Whitford Brook FP
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

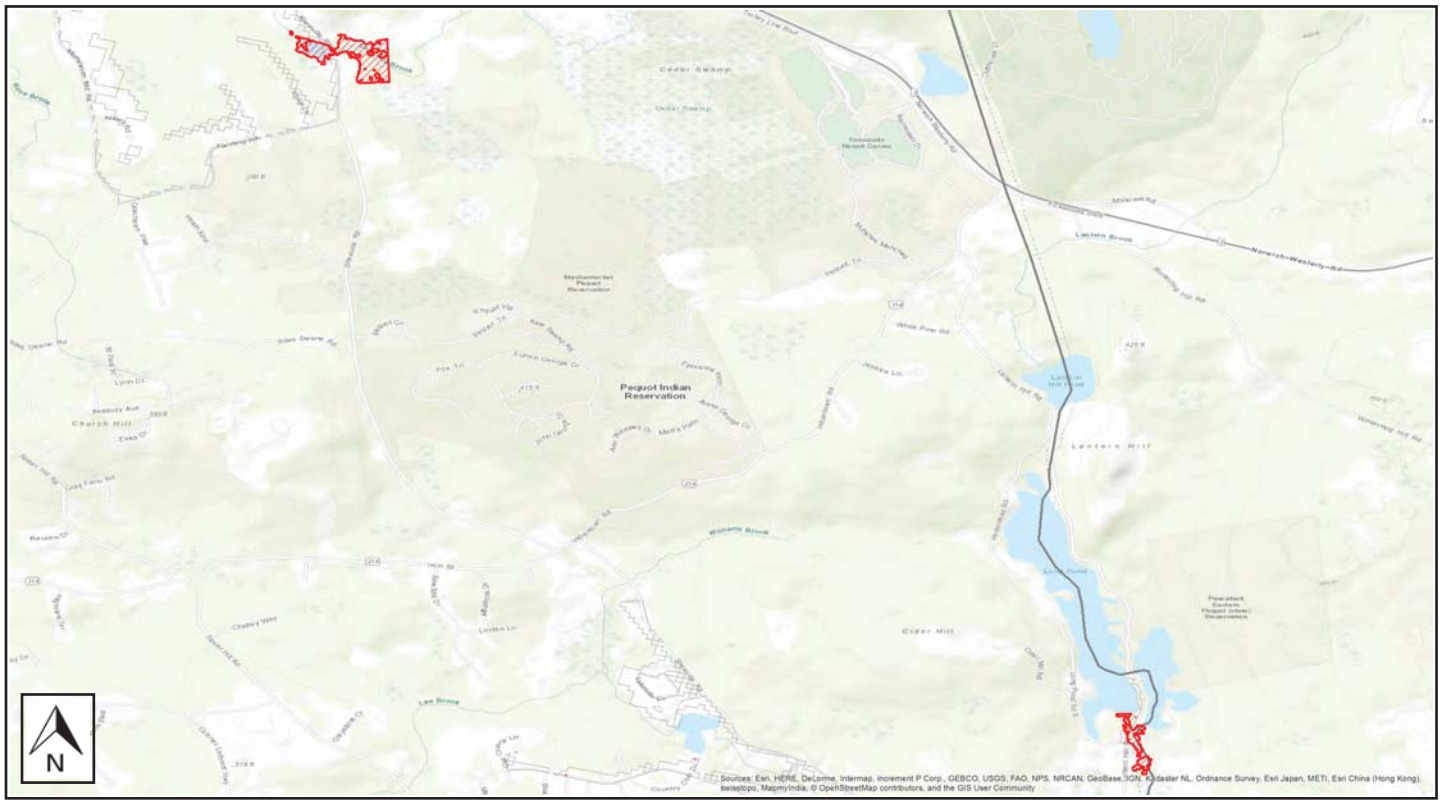


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

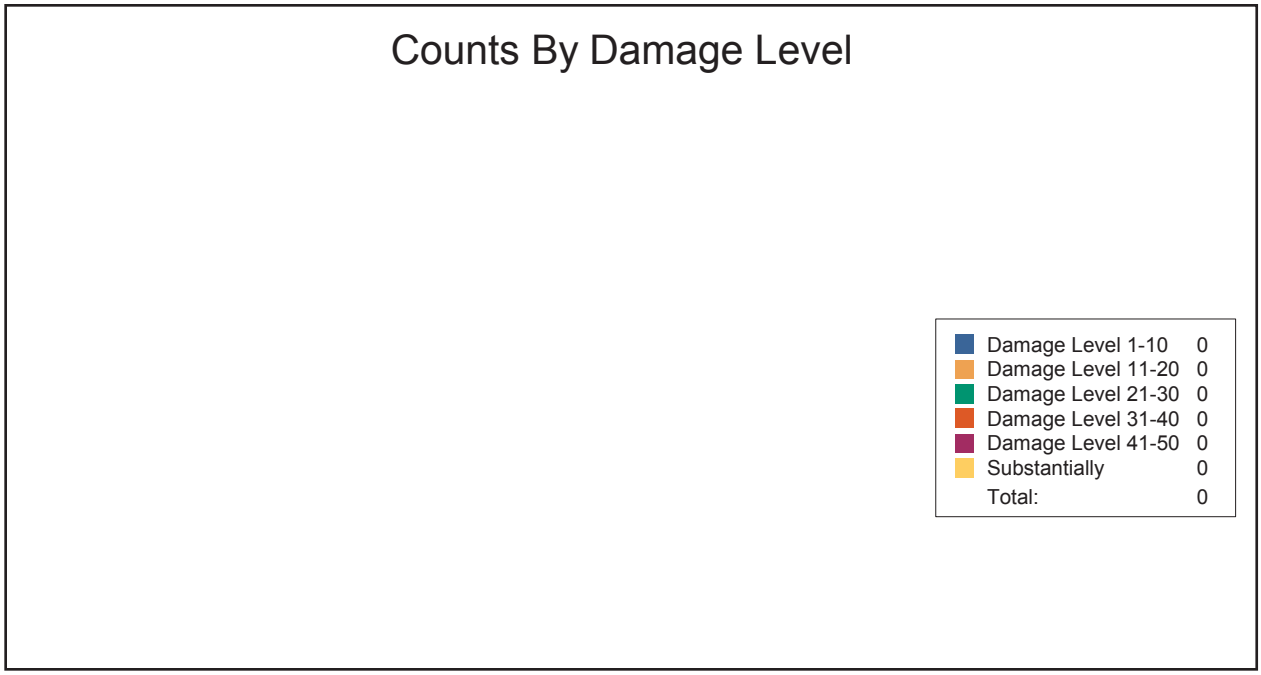


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	7	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

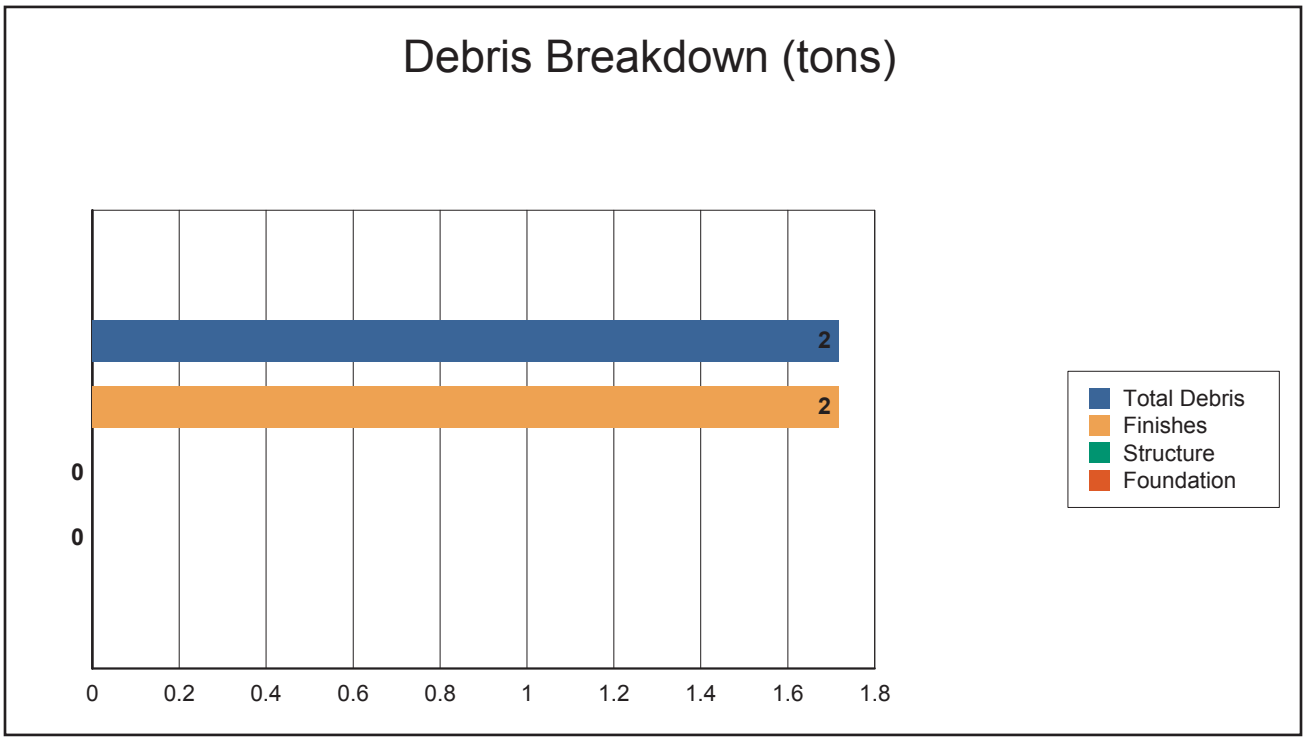
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

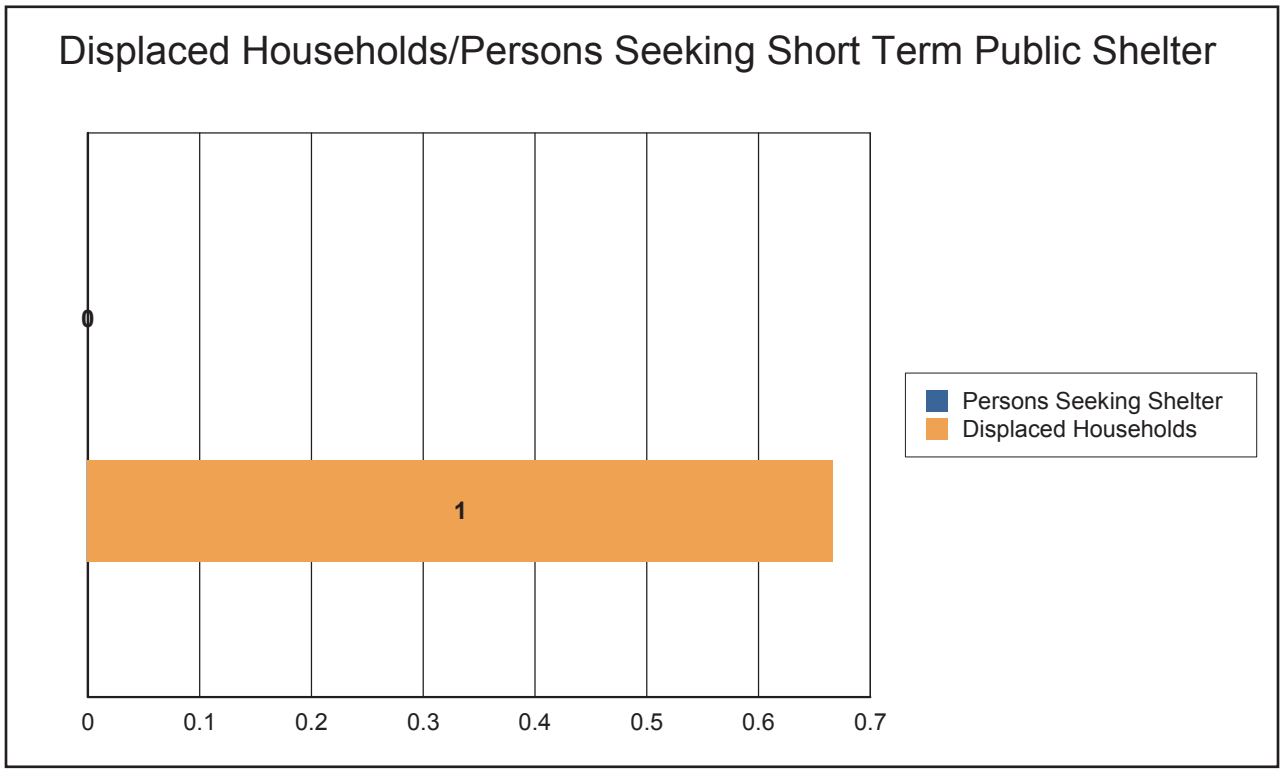


The model estimates that a total of 2 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 15,051) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.04 million dollars, which represents 0.15 % of the total replacement value of the scenario buildings.

Building-Related Losses

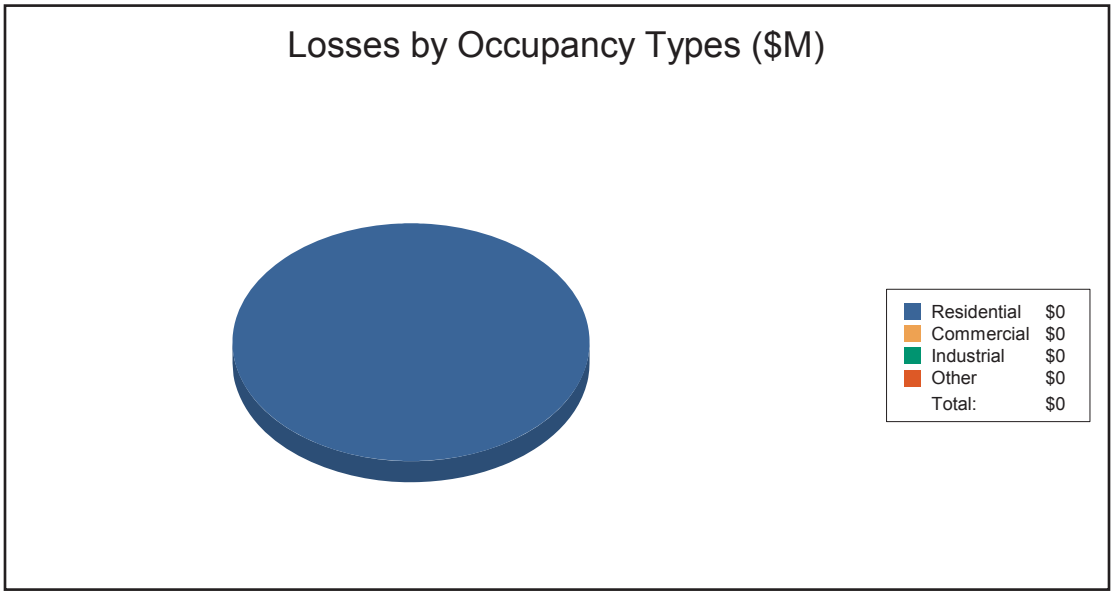
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.04 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 100.00% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.03	0.00	0.00	0.00	0.03
	Content	0.01	0.00	0.00	0.00	0.01
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.04**	**0.00**	**0.00**	**0.00**	**0.04**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.04**	**0.00**	**0.00**	**0.00**	**0.04**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	15,051	1,570,938	249,780	1,820,718
Total	**15,051**	**1,570,93.**	**249,7. 0**	**1,. 20,71.**
Total Study Region	**15,051**	**1,570,93.**	**249,7. 0**	**1,. 20,71.**

Hazus-MH: Flood Global Risk Report

Region Name: Ledyard

Flood Scenario: Ledyard Shewville FP

Print Date: Thursday, June 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 40 square miles and contains 379 census blocks. The region contains over 6 thousand households and has a total population of 15,051 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 5,956 buildings in the region with a total building replacement value (excluding contents) of 1,821 million dollars (2010 dollars). Approximately 93.57% of the buildings (and 86.28% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 5,956 buildings in the region which have an aggregate total replacement value of 1,821 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,570,938	86.3%
Commercial	164,322	9.0%
Industrial	24,328	1.3%
Agricultural	6,510	0.4%
Religion	23,691	1.3%
Government	8,384	0.5%
Education	22,545	1.2%
Total	**1,. 20,71.**	**100%w**

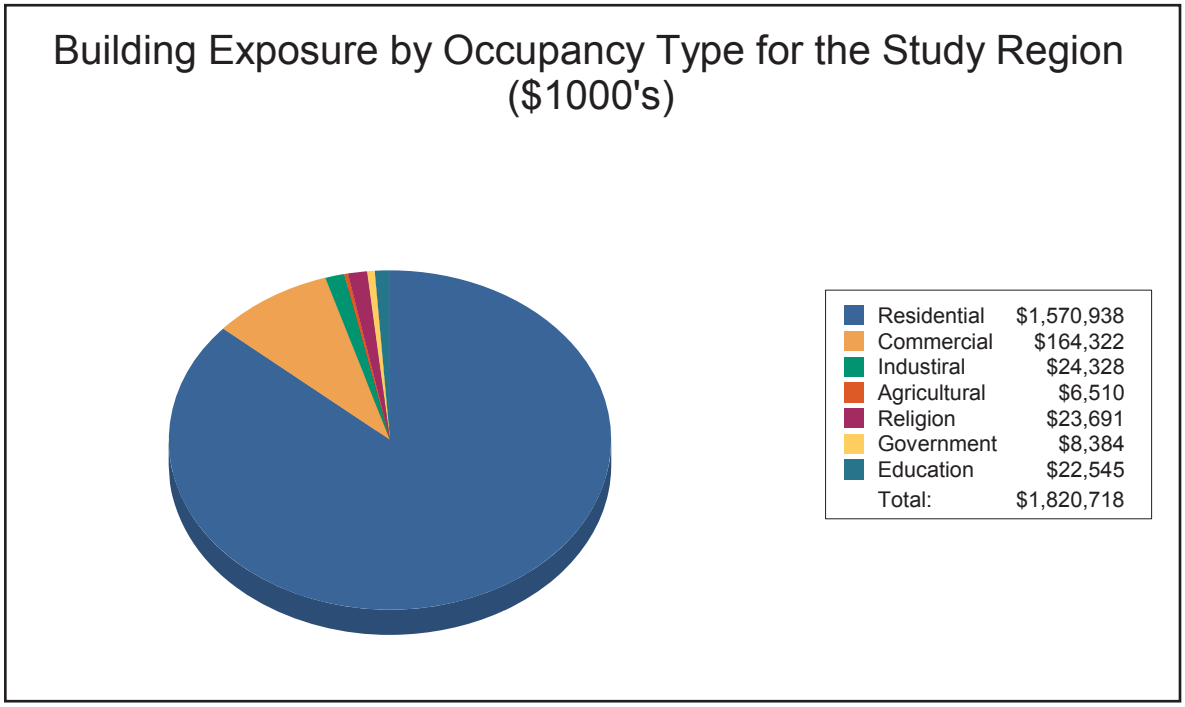
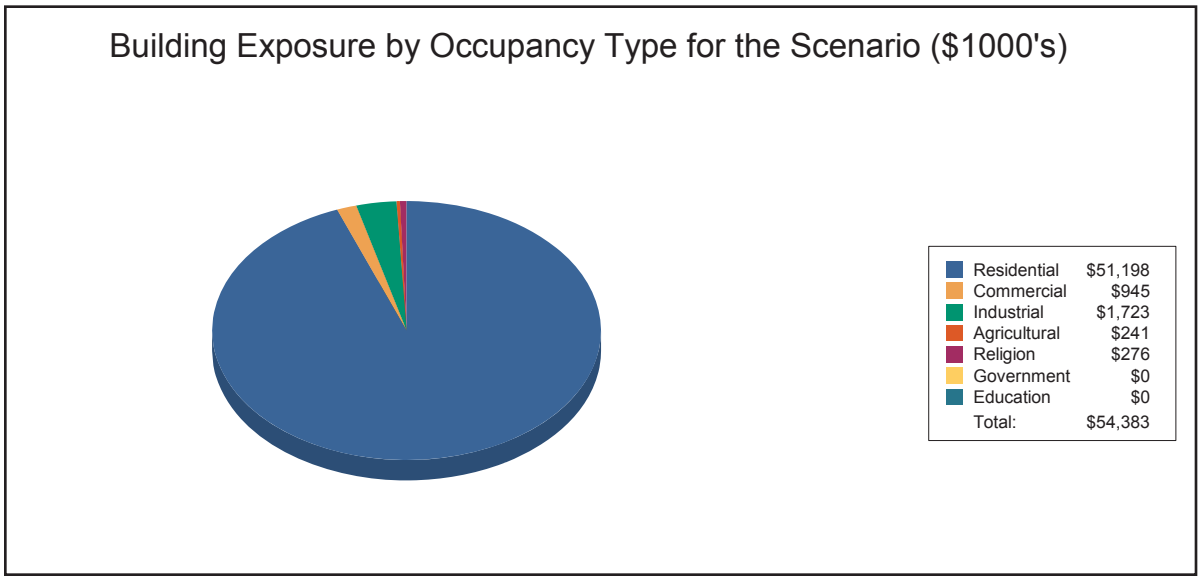


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	51,198	94.1%
Commercial	945	1.7%
Industrial	1,723	3.2%
Agricultural	241	0.4%
Religion	276	0.5%
Government	0	0.0%
Education	0	0.0%
Total	**54,3. 3**	**100%w**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 7 schools, 4 fire stations, 1 police station and no emergency operation centers.

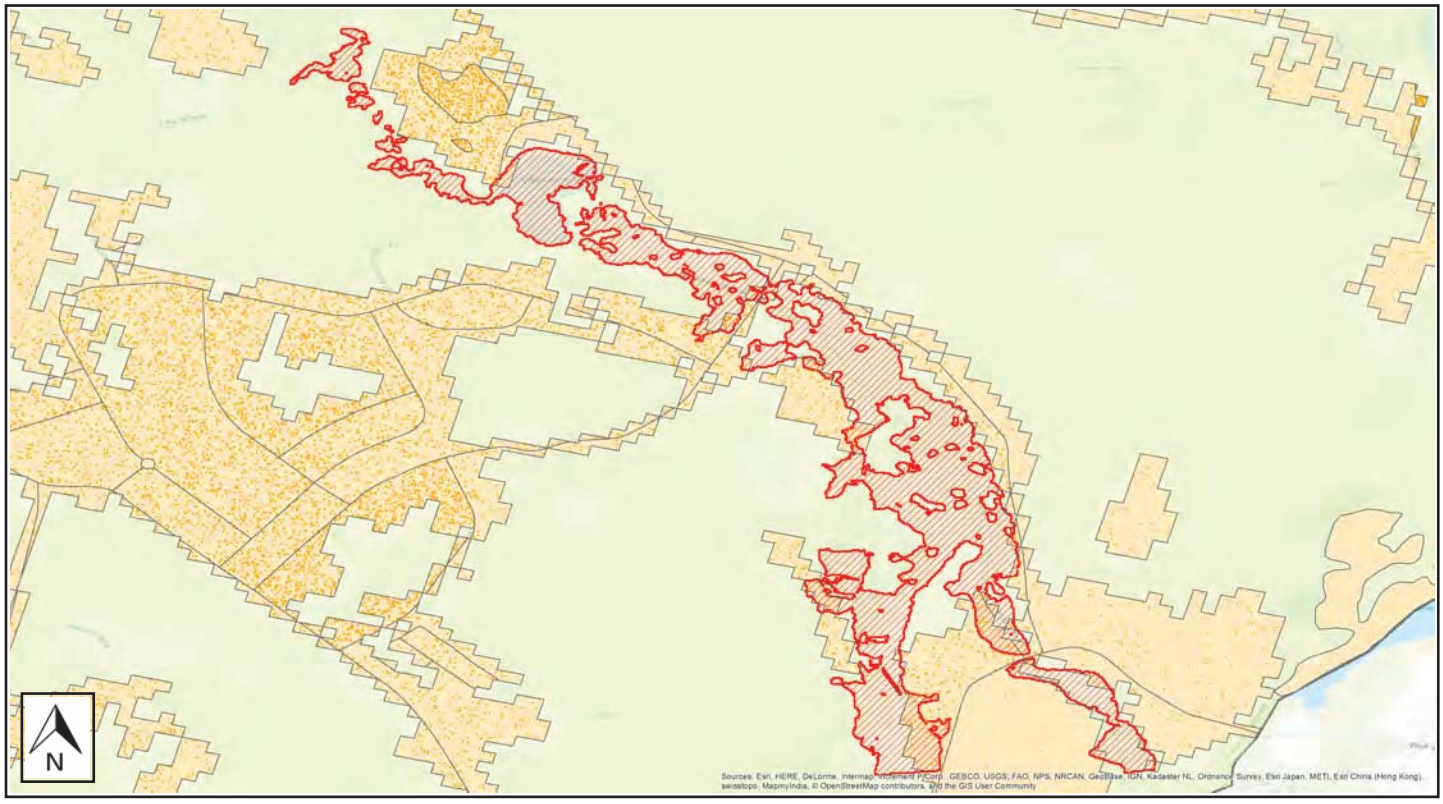
Flood Scenario Parameters

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

Study Region Name:	Ledyard
Scenario Name:	Ledyard Shewville FP
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 1 building will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map



Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2	66.67	1	33.33	0	0.00	0	0.00	0	0.00	0	0.00
Total	**2**		**1**		**0**		**0**		**0**		**0**	

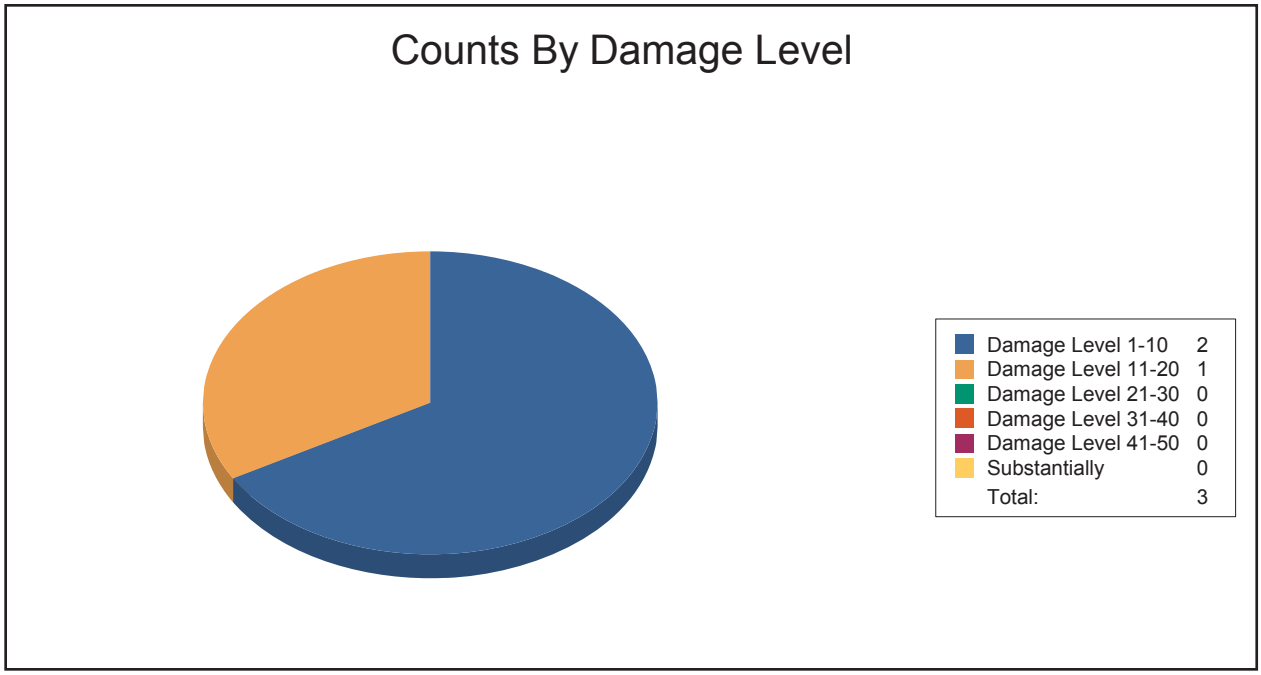


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	2	67	1	33	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	7	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

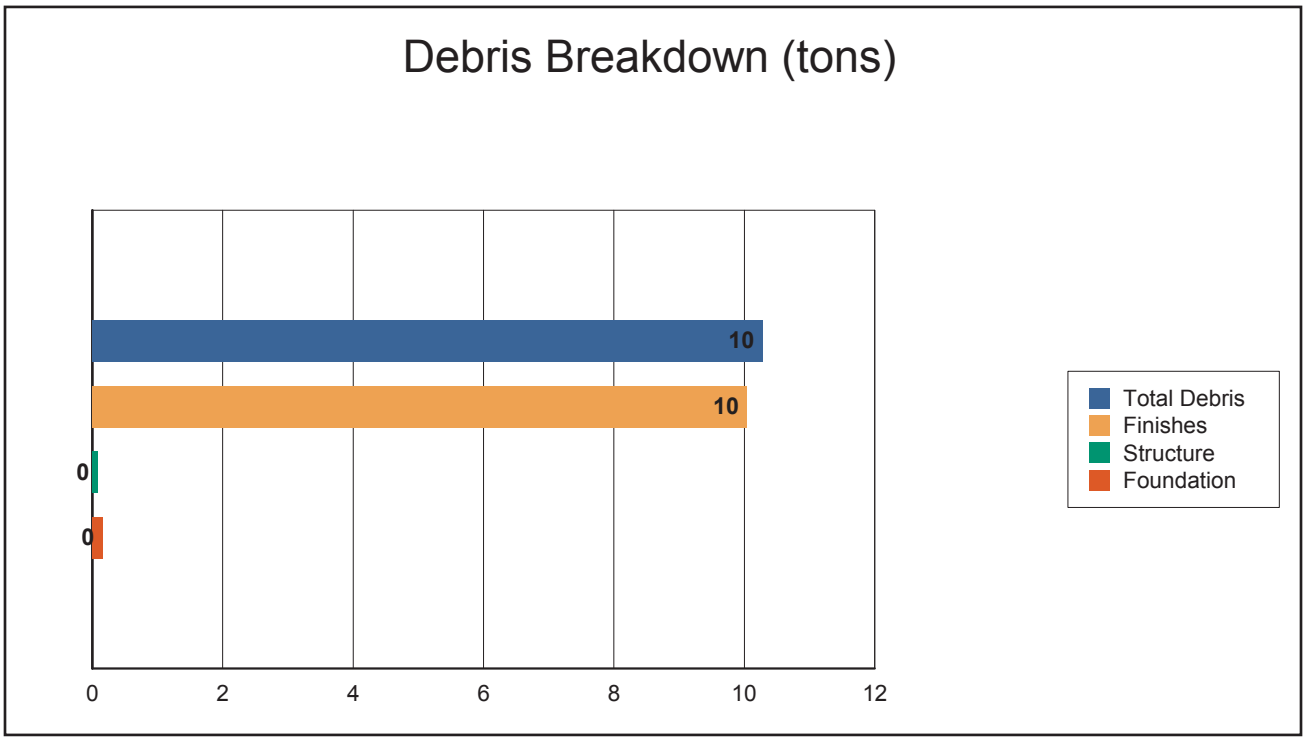
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

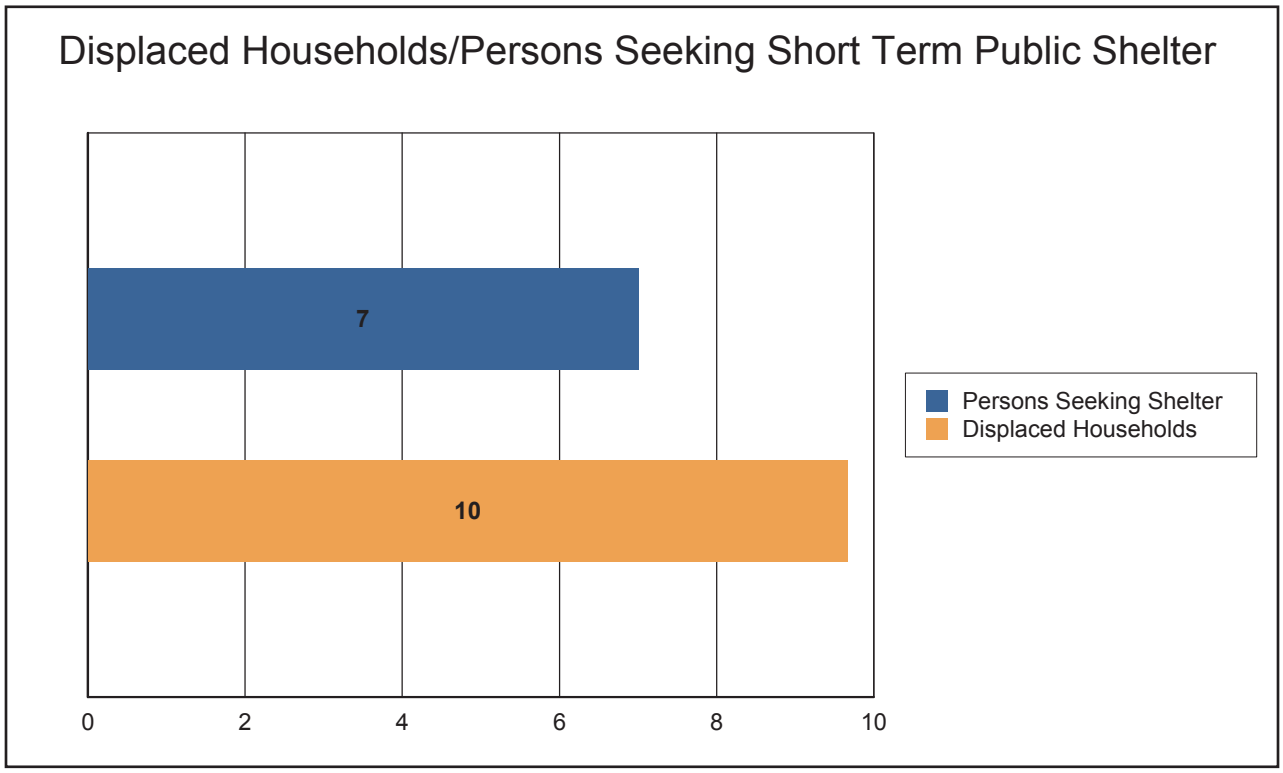


The model estimates that a total of 10 tons of debris will be generated. Of the total amount, Finishes comprises 98% of the total, Structure comprises 1% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 10 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 7 people (out of a total population of 15,051) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.34 million dollars, which represents 0.62 % of the total replacement value of the scenario buildings.

Building-Related Losses

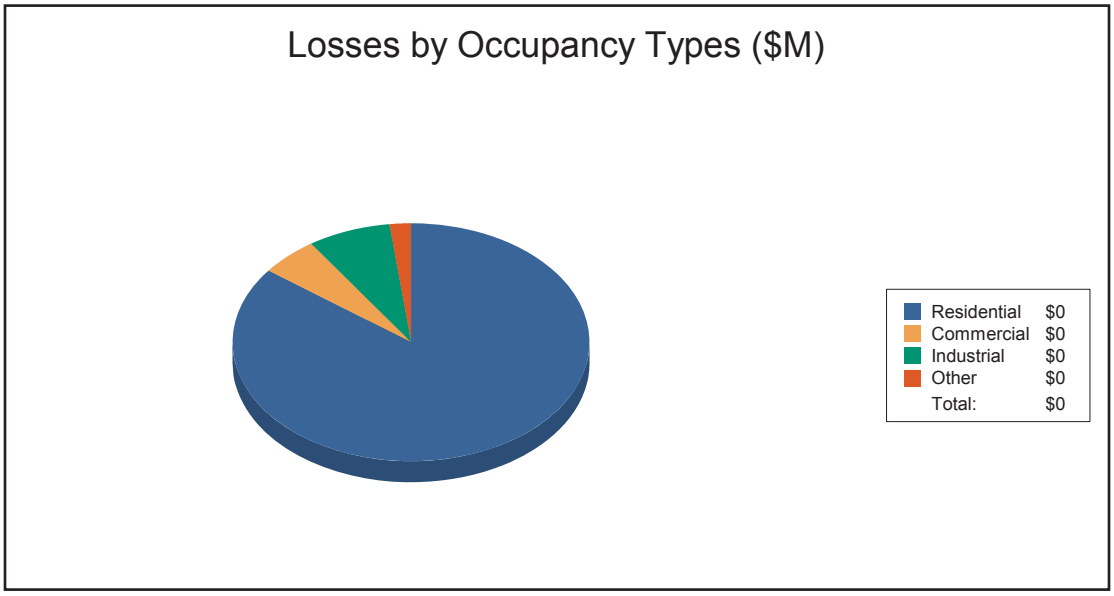
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.34 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 85.16% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.20	0.01	0.01	0.00	0.22
	Content	0.09	0.01	0.02	0.01	0.12
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.29**	**0.02**	**0.03**	**0.01**	**0.34**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.29**	**0.02**	**0.03**	**0.01**	**0.34**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	15,051	1,570,938	249,780	1,820,718
Total	**15,051**	**1,570,93.**	**249,7. 0**	**1,. 20,71.**
Total Study Region	**15,051**	**1,570,93.**	**249,7. 0**	**1,. 20,71.**

Hazus-MH: Flood Global Risk Report

Region Name: Lisbon

Flood Scenario: Lisbon 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 17 square miles and contains 116 census blocks. The region contains over 2 thousand households and has a total population of 4,338 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,775 buildings in the region with a total building replacement value (excluding contents) of 502 million dollars (2010 dollars). Approximately 92.56% of the buildings (and 77.45% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,775 buildings in the region which have an aggregate total replacement value of 502 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	389,106	77.4%
Commercial	62,370	12.4%
Industrial	39,107	7.8%
Agricultural	1,581	0.3%
Religion	642	0.1%
Government	3,322	0.7%
Education	6,287	1.3%
Total	**502,415**	**100.0%**

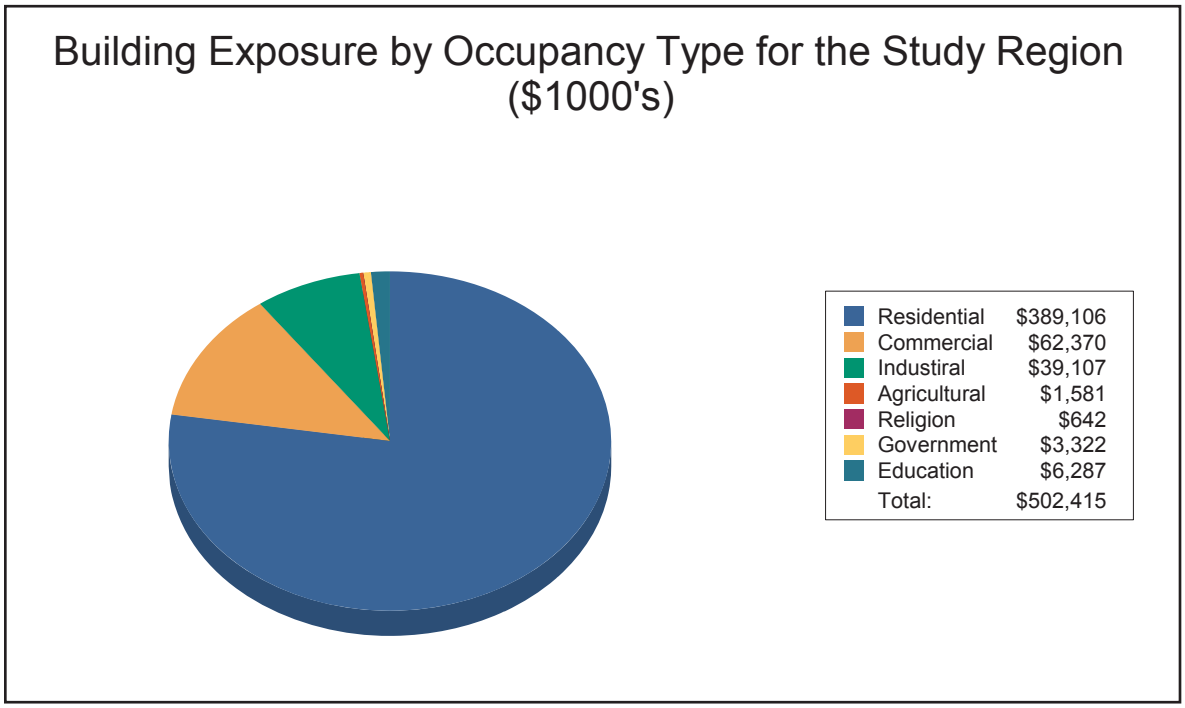
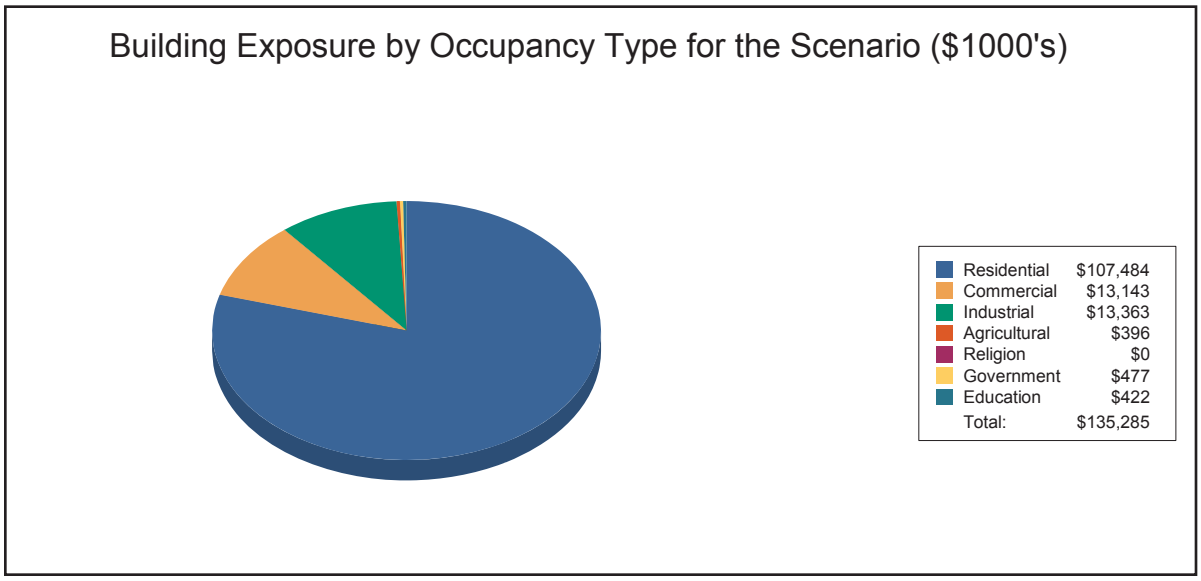


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	107,484	79.5%
Commercial	13,143	9.7%
Industrial	13,363	9.9%
Agricultural	396	0.3%
Religion	0	0.0%
Government	477	0.4%
Education	422	0.3%
Total	**135,285**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, 1 fire station, 1 police station and 1 emergency operation center.

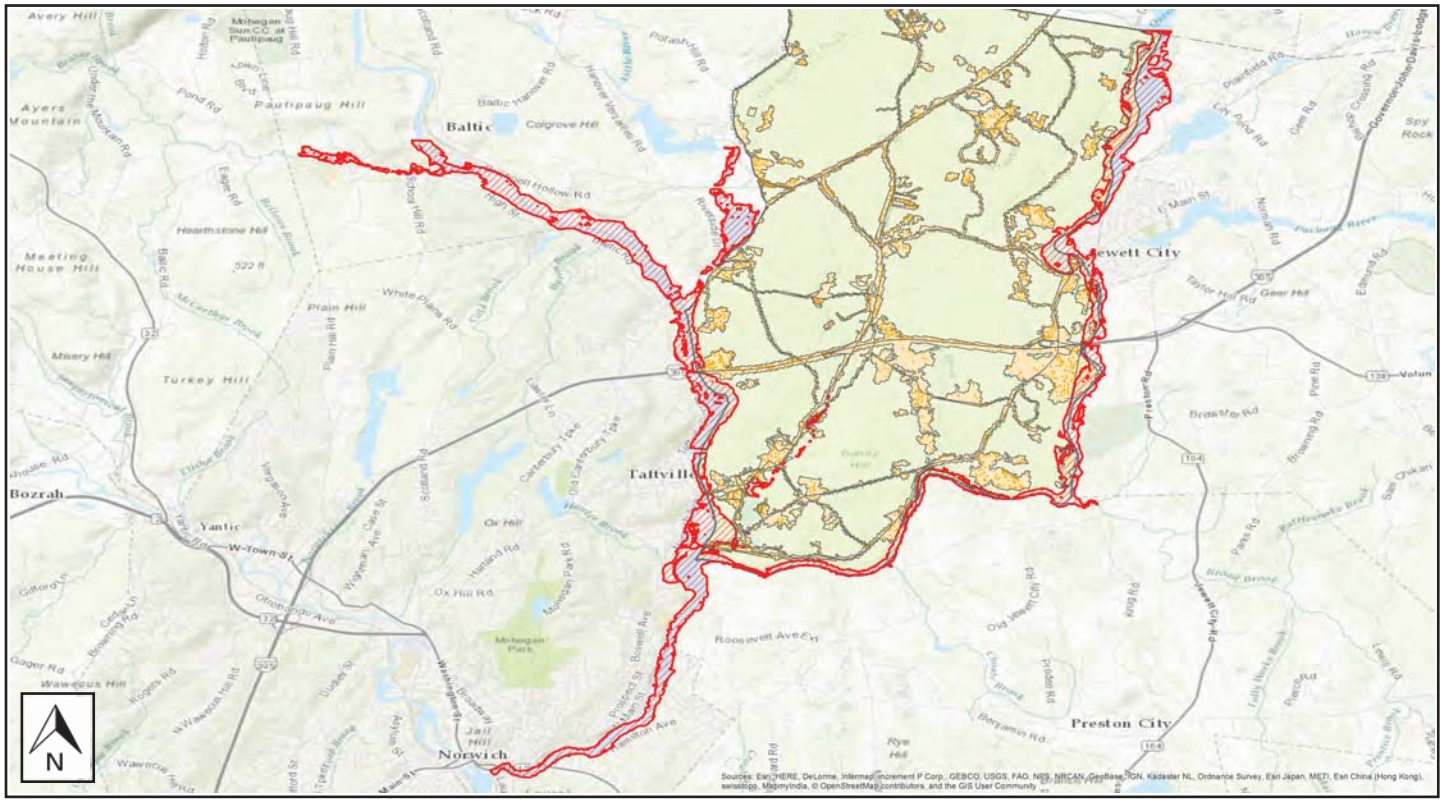
Flood Scenario Parameters

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

Study Region Name:	Lisbon
Scenario Name:	Lisbon 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map



Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**1**		**0**		**0**		**0**		**0**		**0**	

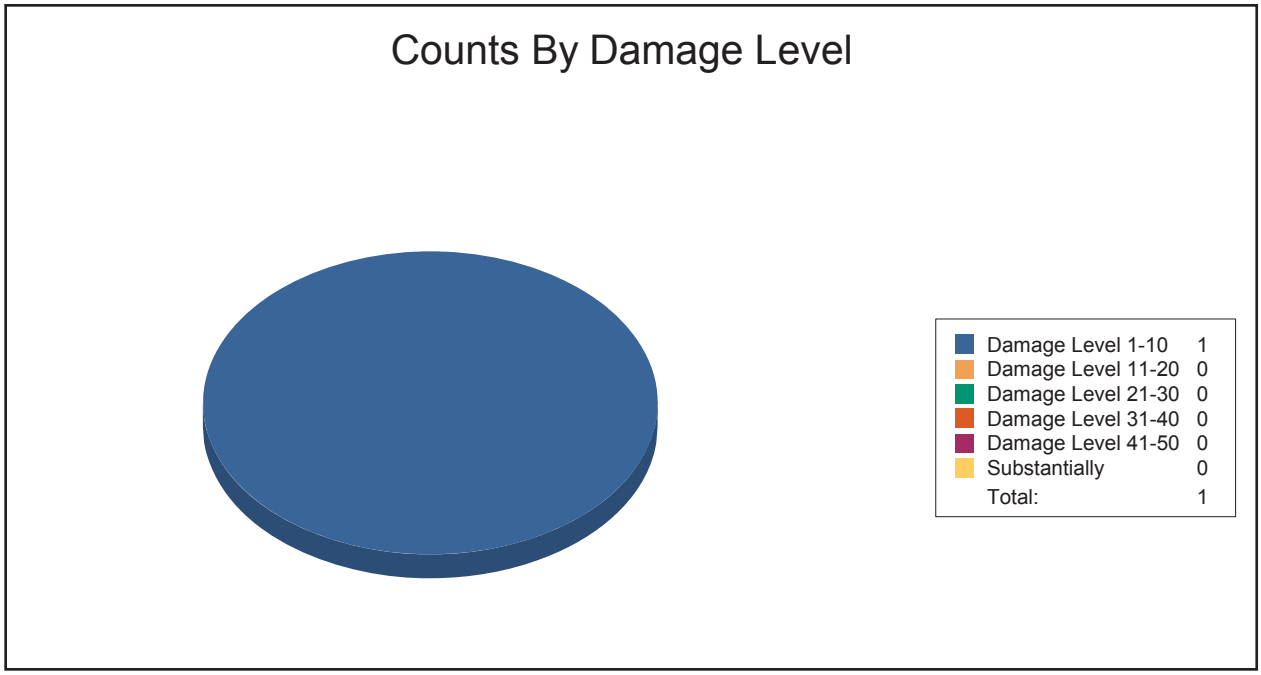


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	1	100	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

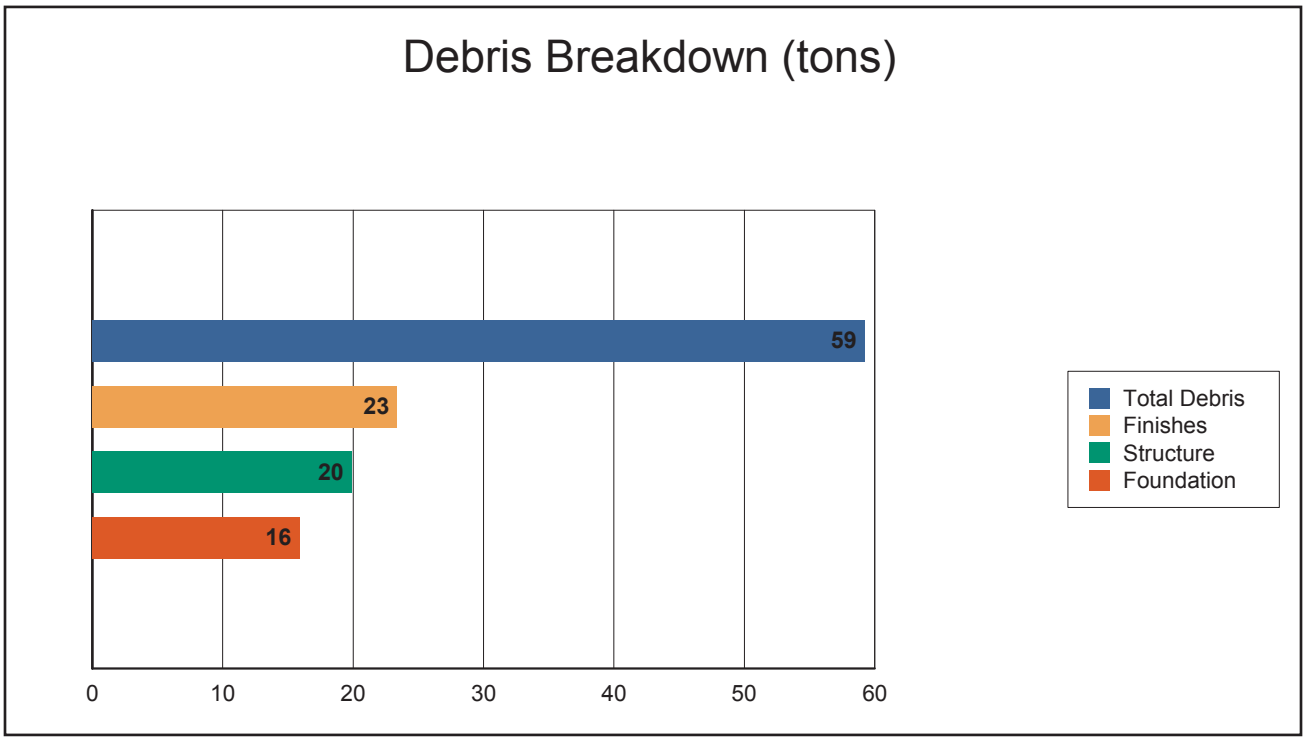
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

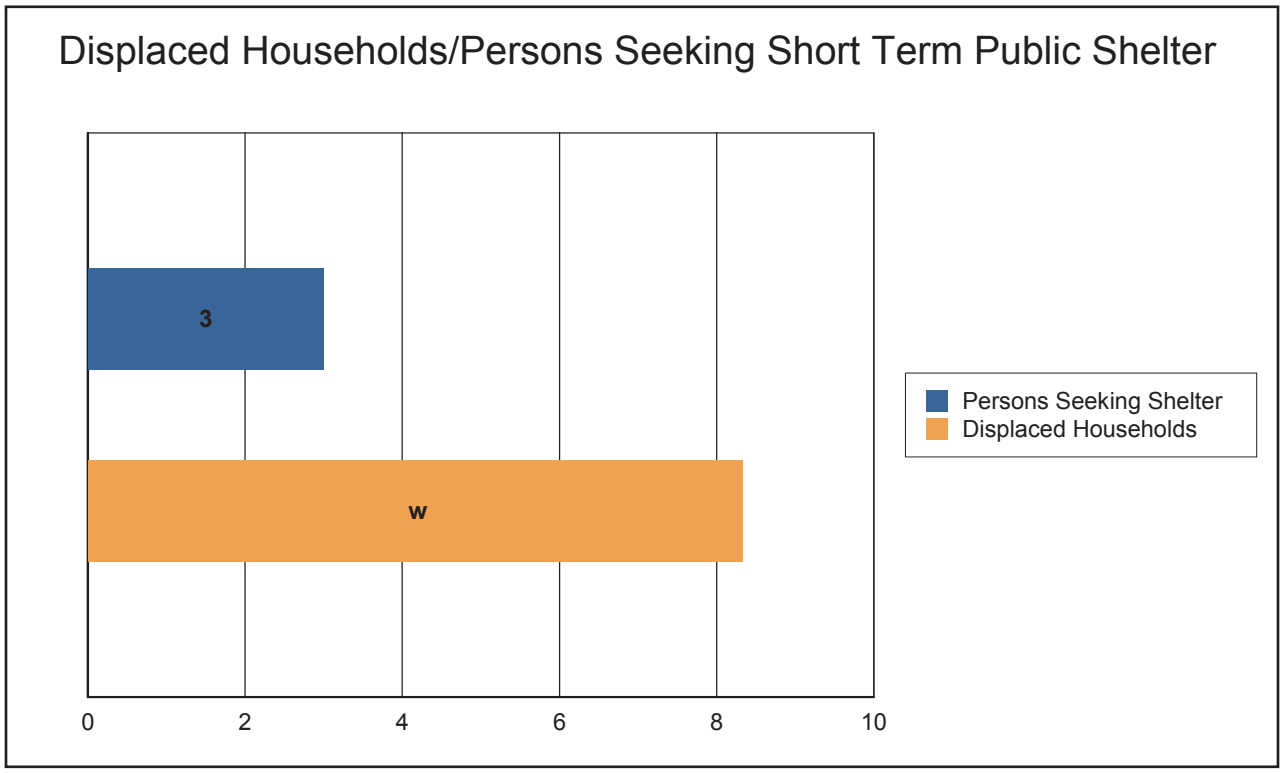


The model estimates that a total of 59 tons of debris will be generated. Of the total amount, Finishes comprises 40% of the total, Structure comprises 34% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 2 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 8 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3 people (out of a total population of 4,338) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.70 million dollars, which represents 0.52 % of the total replacement value of the scenario buildings.

Building-Related Losses

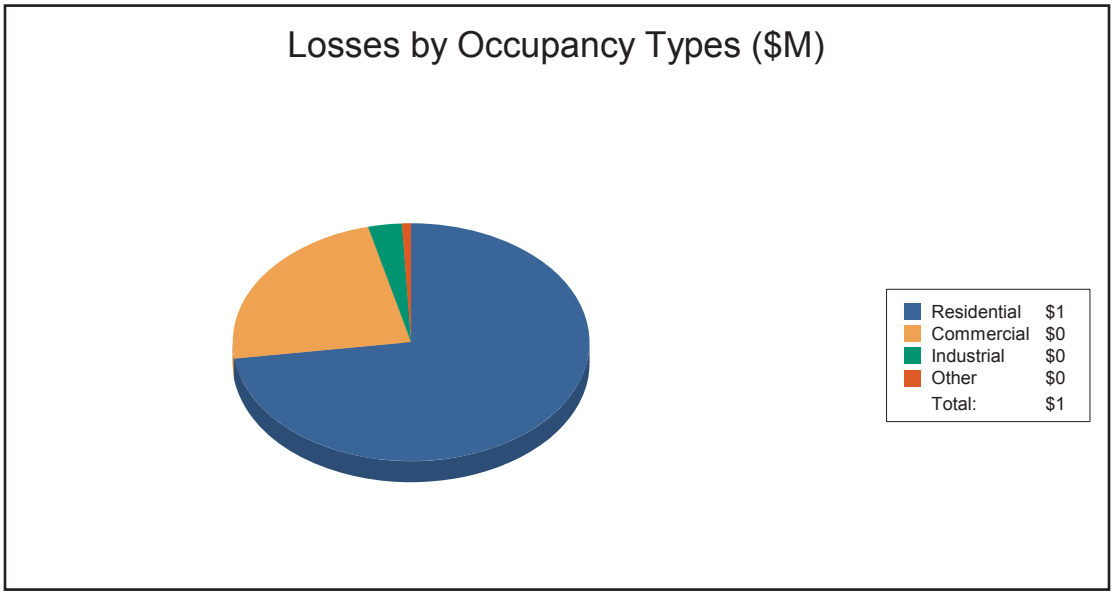
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.70 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 72.71% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.36	0.03	0.01	0.00	0.40
	Content	0.15	0.13	0.02	0.01	0.30
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.51**	**0.16**	**0.02**	**0.01**	**0.70**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.51**	**0.16**	**0.02**	**0.01**	**0.70**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	4,338	389,106	113,309	502,415
Total	**4,33w**	**3w9,106**	**113,309**	**502,415**
Total Study Region	**4,33w**	**3w9,106**	**113,309**	**502,415**

Hazus-MH: Flood Global Risk Report

Region Name: Mohegan

Flood Scenario: Mohegan 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 2 square miles and contains 39 census blocks. The region contains over 0 thousand households and has a total population of 786 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 333 buildings in the region with a total building replacement value (excluding contents) of 82 million dollars (2010 dollars). Approximately 93.39% of the buildings (and 82.51% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 333 buildings in the region which have an aggregate total replacement value of 82 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	67,757	82.5%
Commercial	13,253	16.1%
Industrial	967	1.2%
Agricultural	134	0.2%
Religion	0	0.0%
Government	0	0.0%
Education	6	0.0%
Total	**, 2.117**	**100%w**

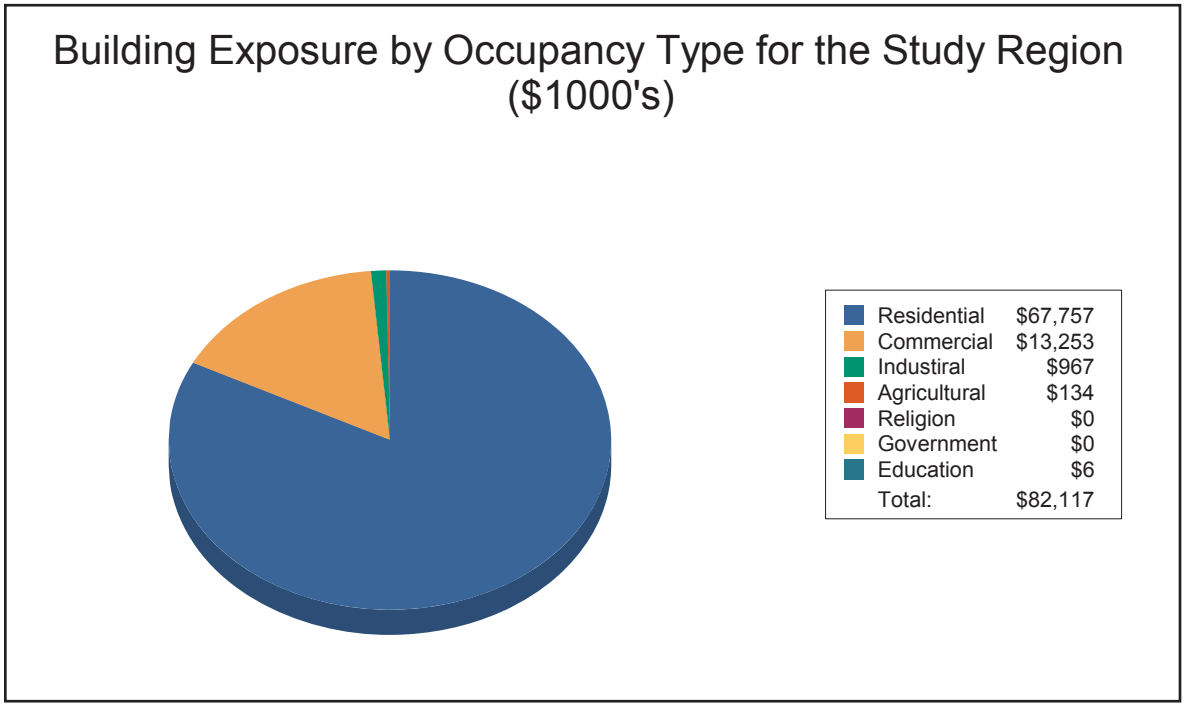
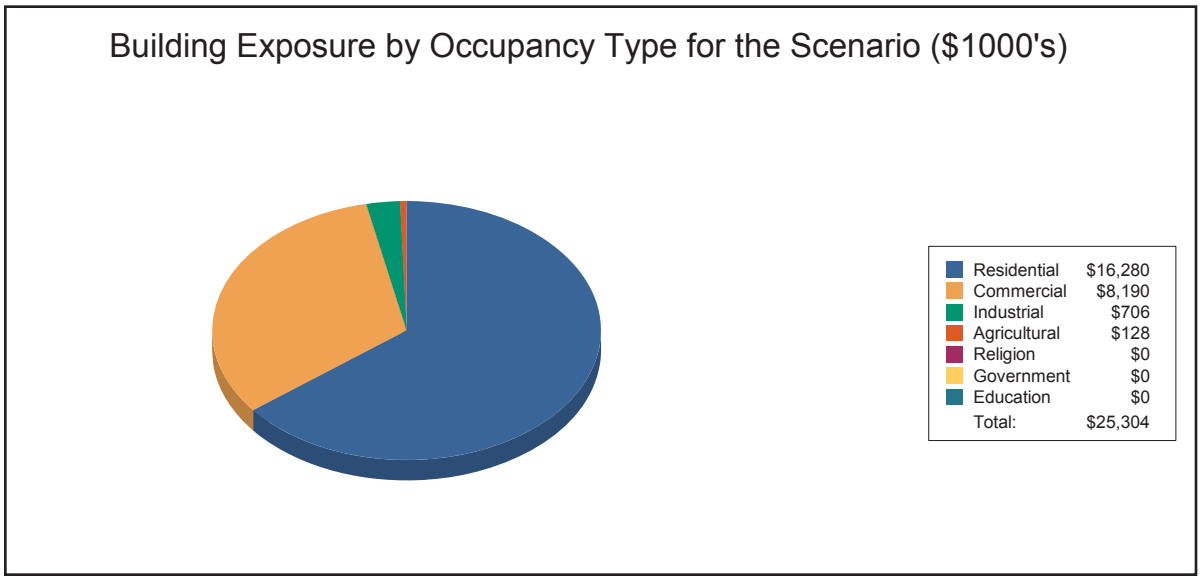


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	16,280	64.3%
Commercial	8,190	32.4%
Industrial	706	2.8%
Agricultural	128	0.5%
Religion	0	0.0%
Government	0	0.0%
Education	0	0.0%
Total	**25.304**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 3 schools, 4 fire stations, 4 police stations and no emergency operation centers.

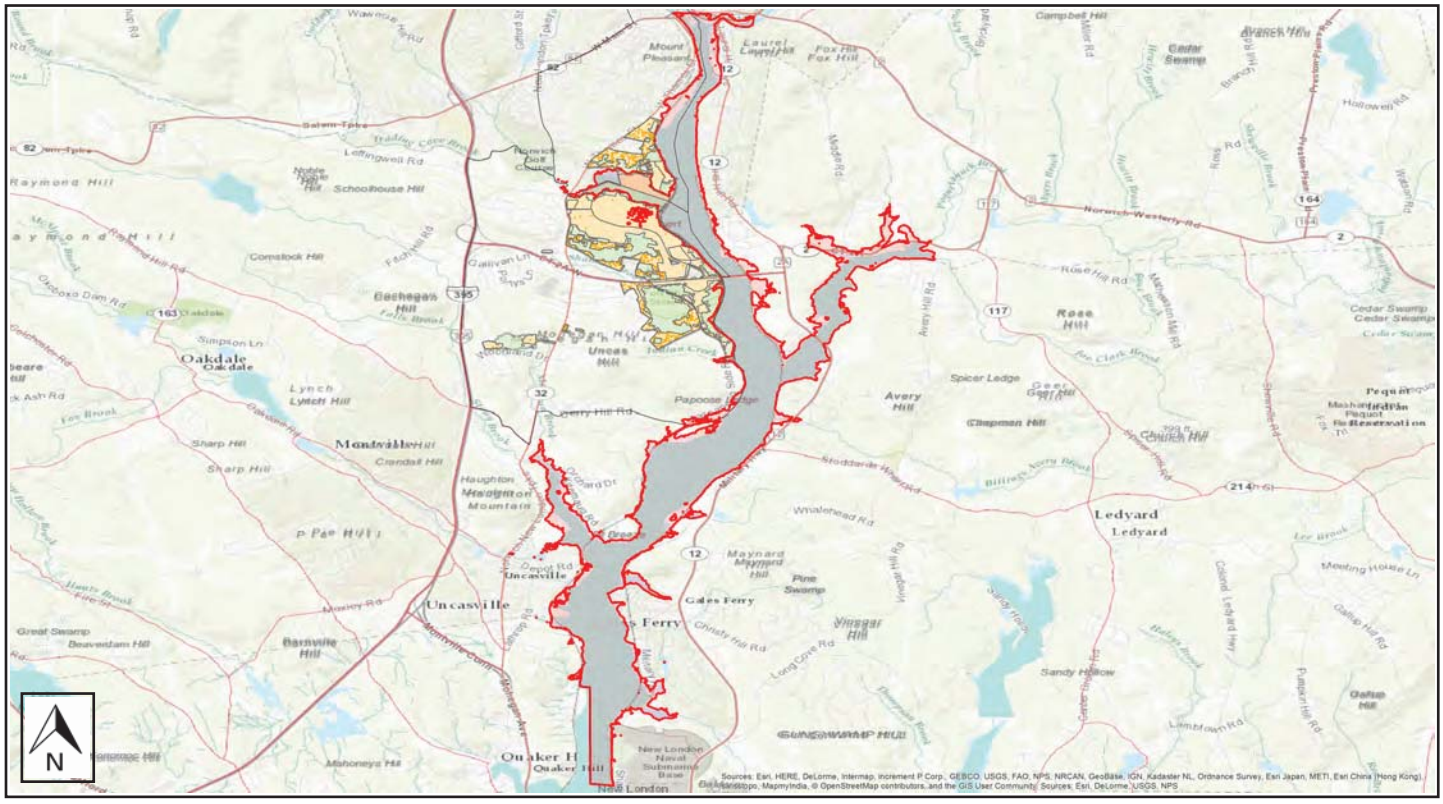
Flood Scenario Parameters

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

Study Region Name:	Mohegan
Scenario Name:	Mohegan 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent. as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map



Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

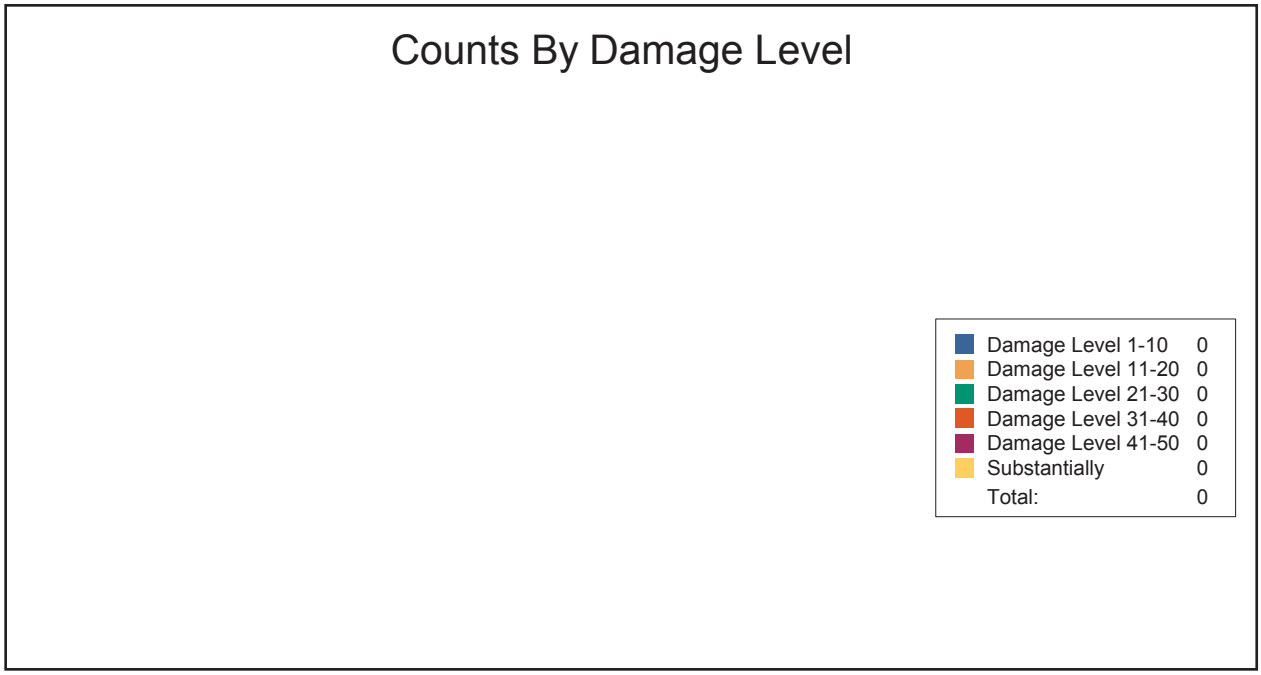


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	4	0	0	0
Schools	3	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

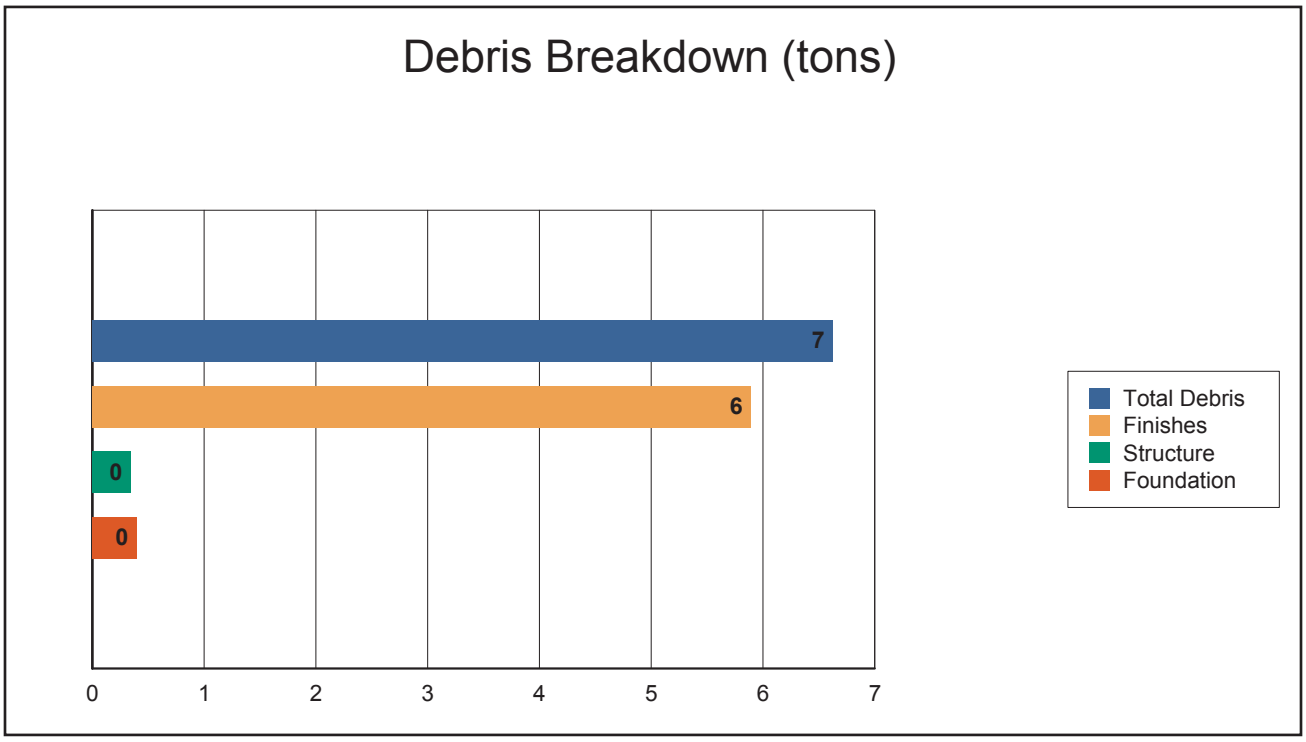
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

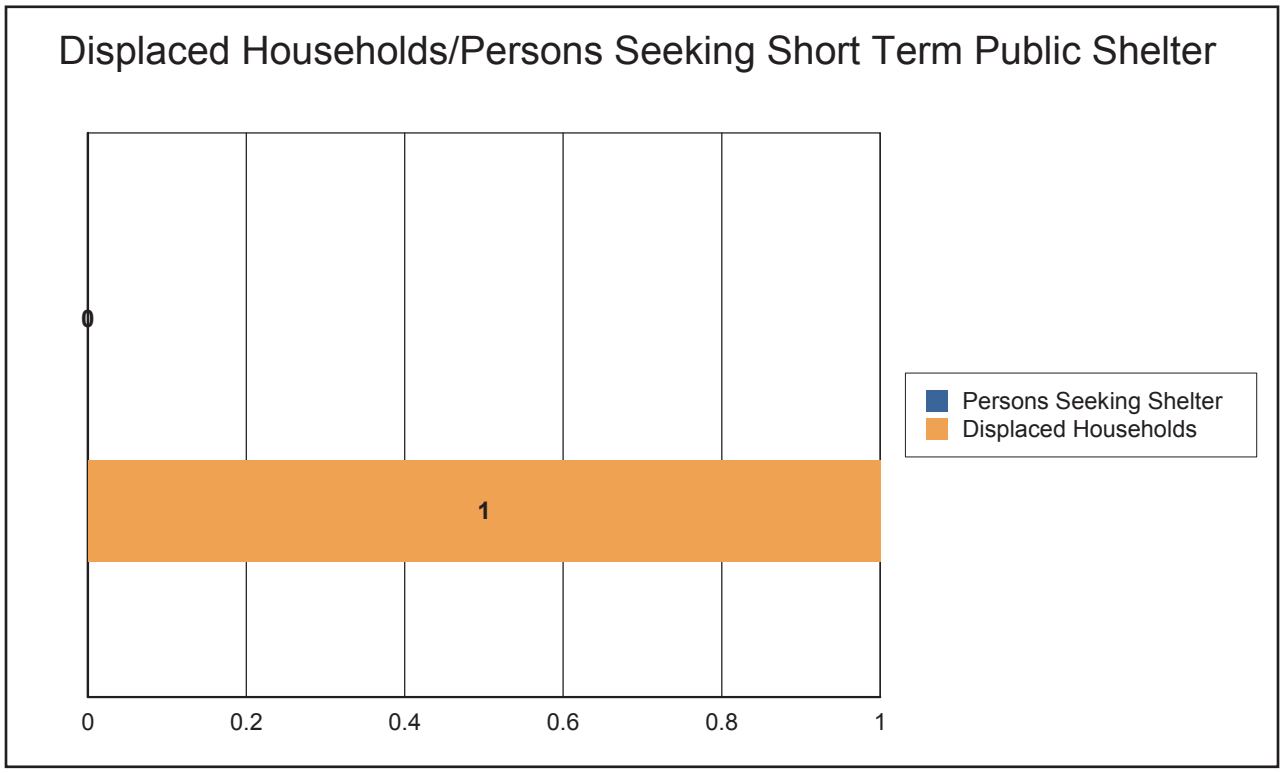


The model estimates that a total of 7 tons of debris will be generated. Of the total amount, Finishes comprises 89% of the total, Structure comprises 5% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 786) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.17 million dollars, which represents 0.67 % of the total replacement value of the scenario buildings.

Building-Related Losses

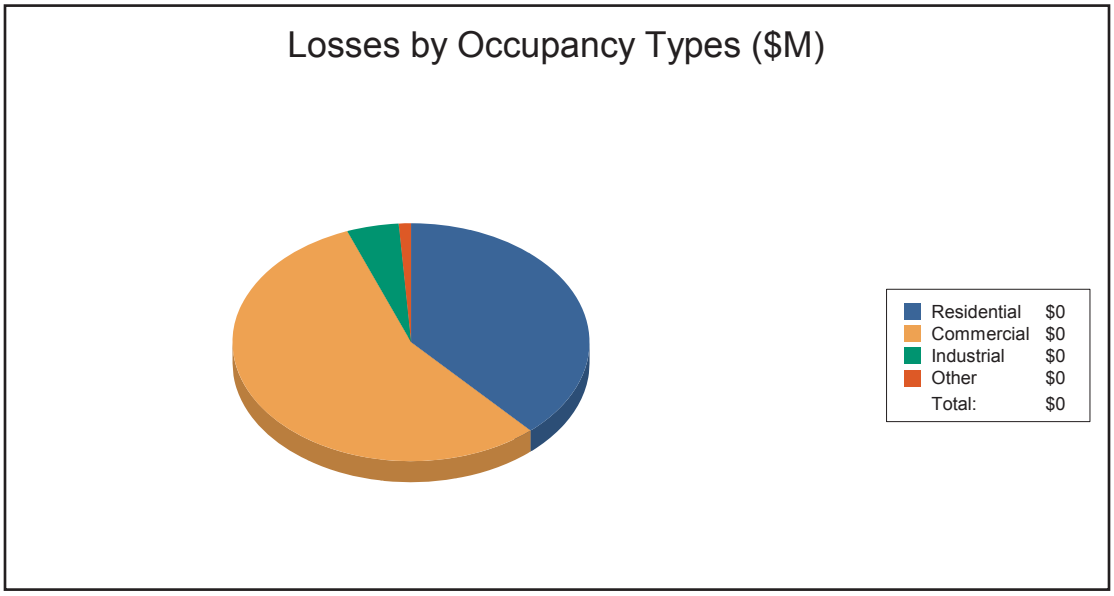
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.17 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 38.24% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.04	0.02	0.00	0.00	0.07
	Content	0.02	0.08	0.01	0.00	0.11
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.07**	**0.10**	**0.01**	**0.00**	**0.17**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.07**	**0.10**	**0.01**	**0.00**	**0.17**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	786	67,757	14,360	82,117
Total	**7, 6**	**67.757**	**14.360**	**, 2.117**
Total Study Region	**7, 6**	**67.757**	**14.360**	**, 2.117**

Hazus-MH: Flood Global Risk Report

Region Name: Montville

Flood Scenario: Montville 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 44 square miles and contains 469 census blocks. The region contains over 7 thousand households and has a total population of 19,571 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 7,063 buildings in the region with a total building replacement value (excluding contents) of 2,050 million dollars (2010 dollars). Approximately 92.75% of the buildings (and 81.13% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 7,063 buildings in the region which have an aggregate total replacement value of 2,050 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,662,977	81.1%
Commercial	218,536	10.7%
Industrial	69,052	3.4%
Agricultural	4,221	0.2%
Religion	20,314	1.0%
Government	50,736	2.5%
Education	24,020	1.2%
Total	**2,049,. 56**	**100%w**

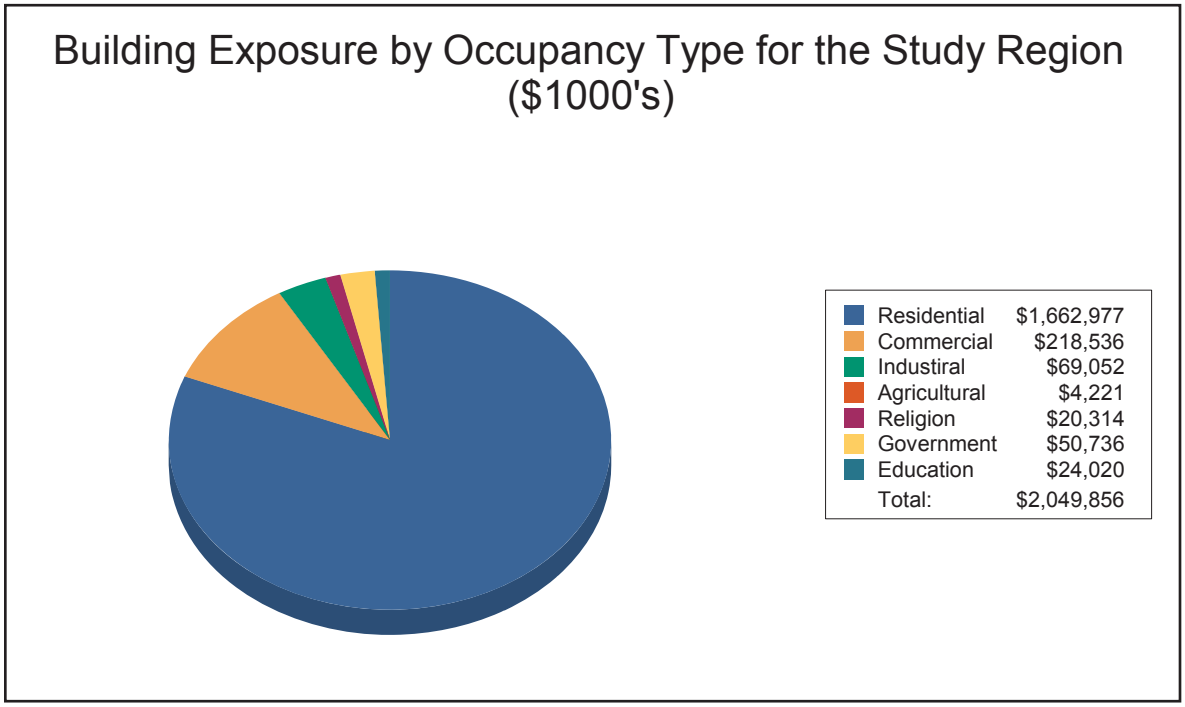
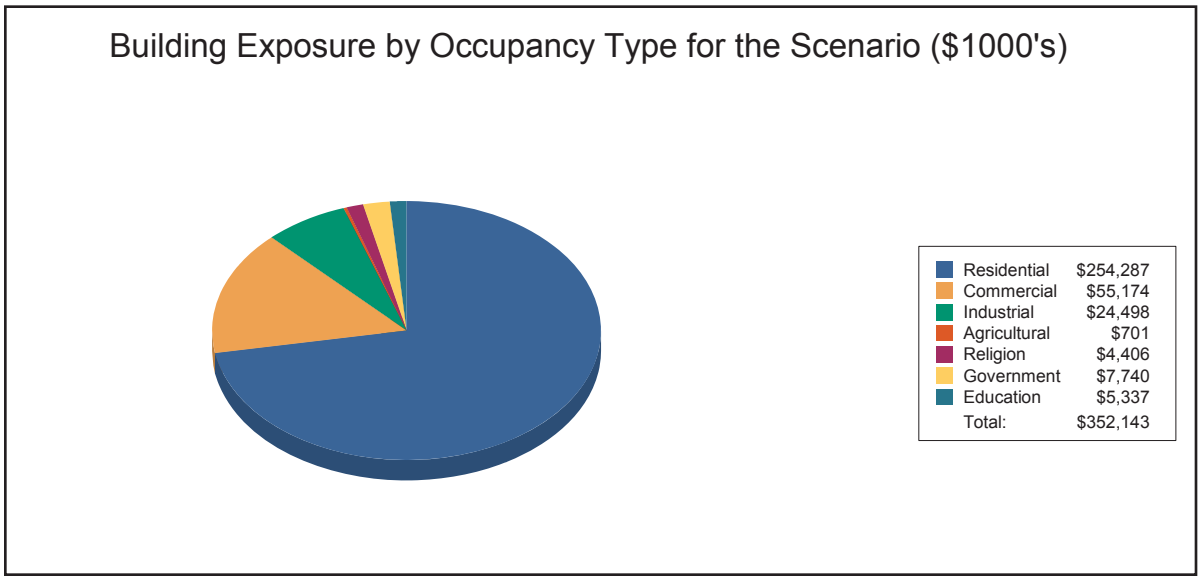


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	254,287	72.2%
Commercial	55,174	15.7%
Industrial	24,498	7.0%
Agricultural	701	0.2%
Religion	4,406	1.3%
Government	7,740	2.2%
Education	5,337	1.5%
Total	**352,143**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 9 schools, 6 fire stations, 2 police stations and 1 emergency operation center.

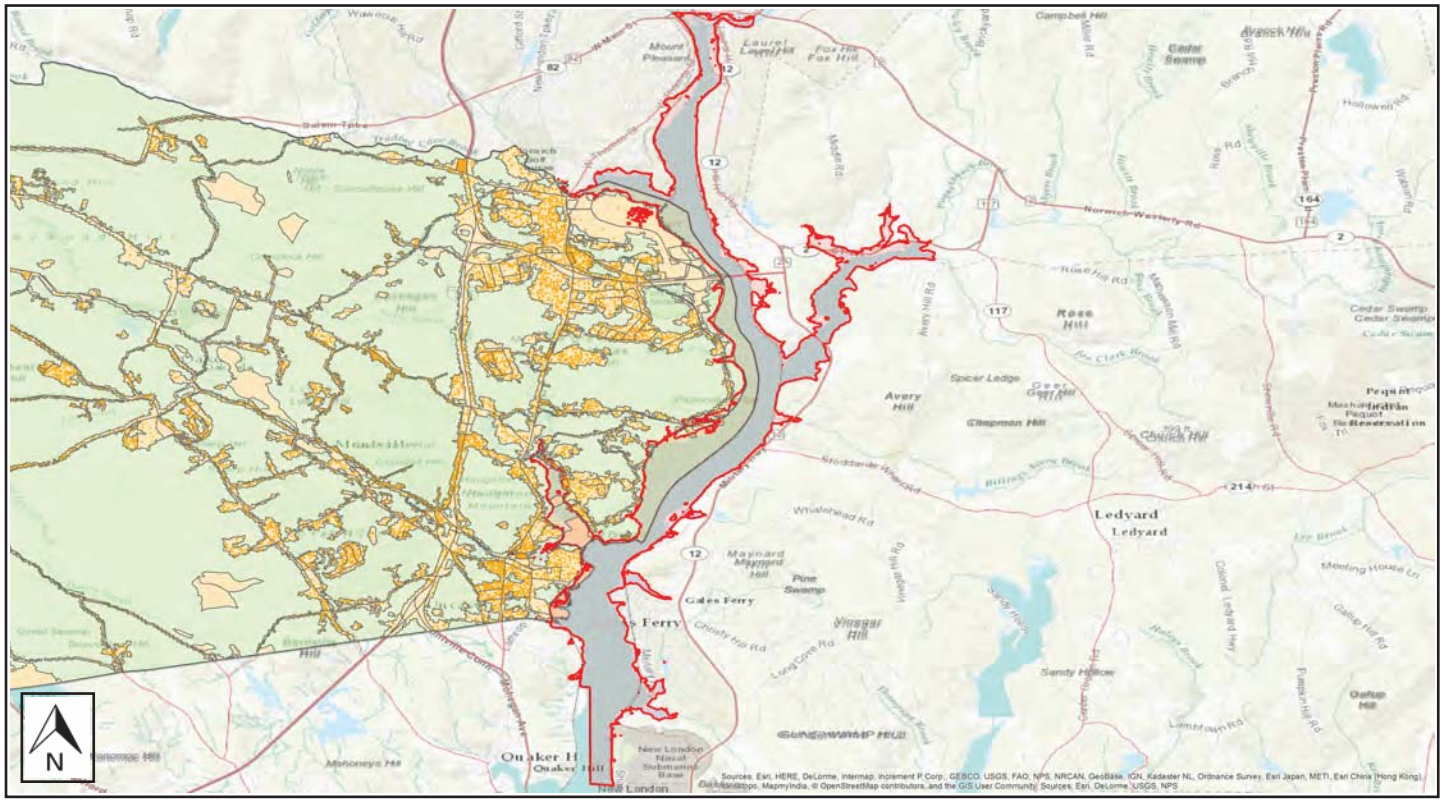
Flood Scenario Parameters

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

Study Region Name:	Montville
Scenario Name:	Montville 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 9 buildings will be at least moderately damaged. This is over 55% of the total number of buildings in the scenario. There are an estimated 2 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

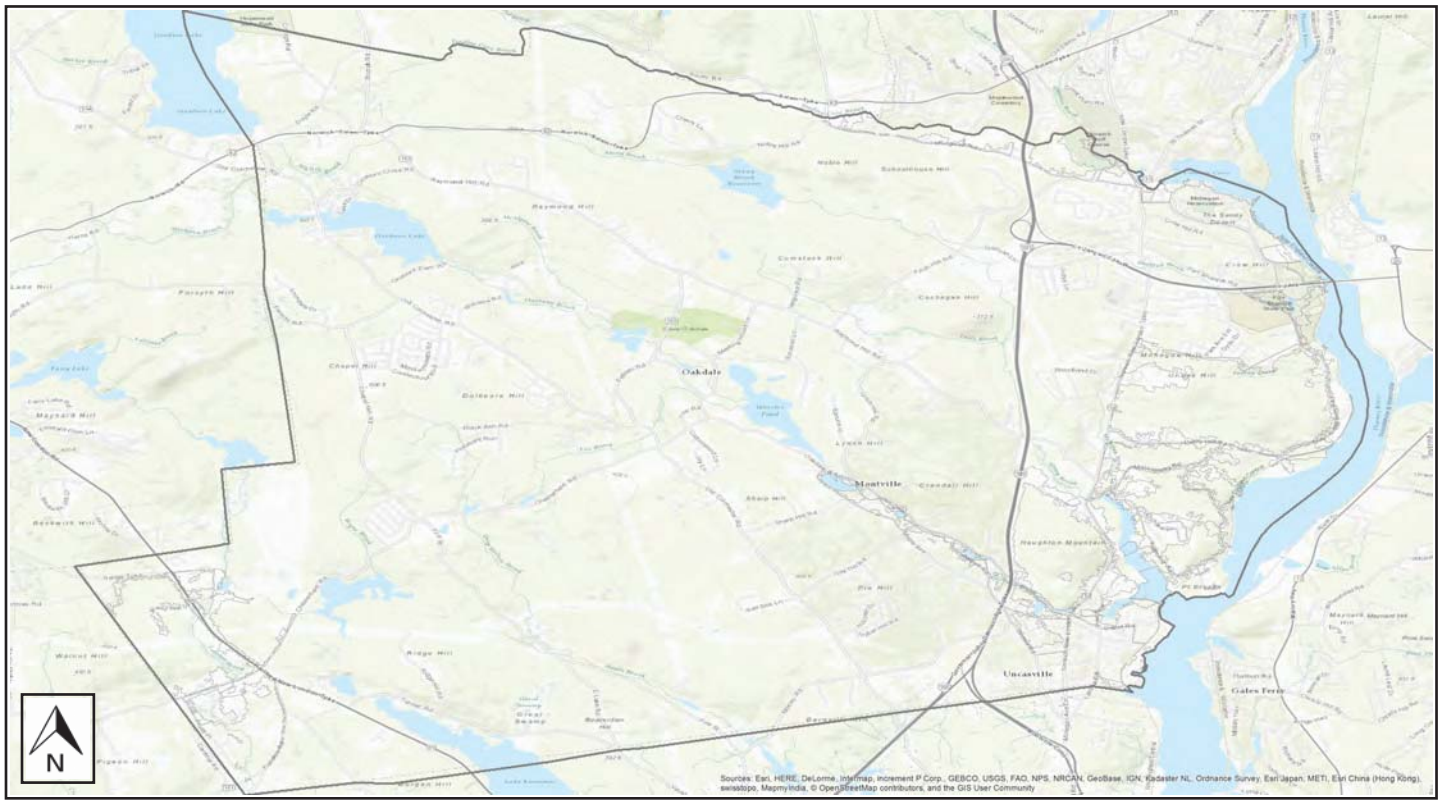


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	10.00	3	30.00	2	20.00	1	10.00	1	10.00	2	20.00
Total	**1**		**3**		**2**		**1**		**1**		**2**	

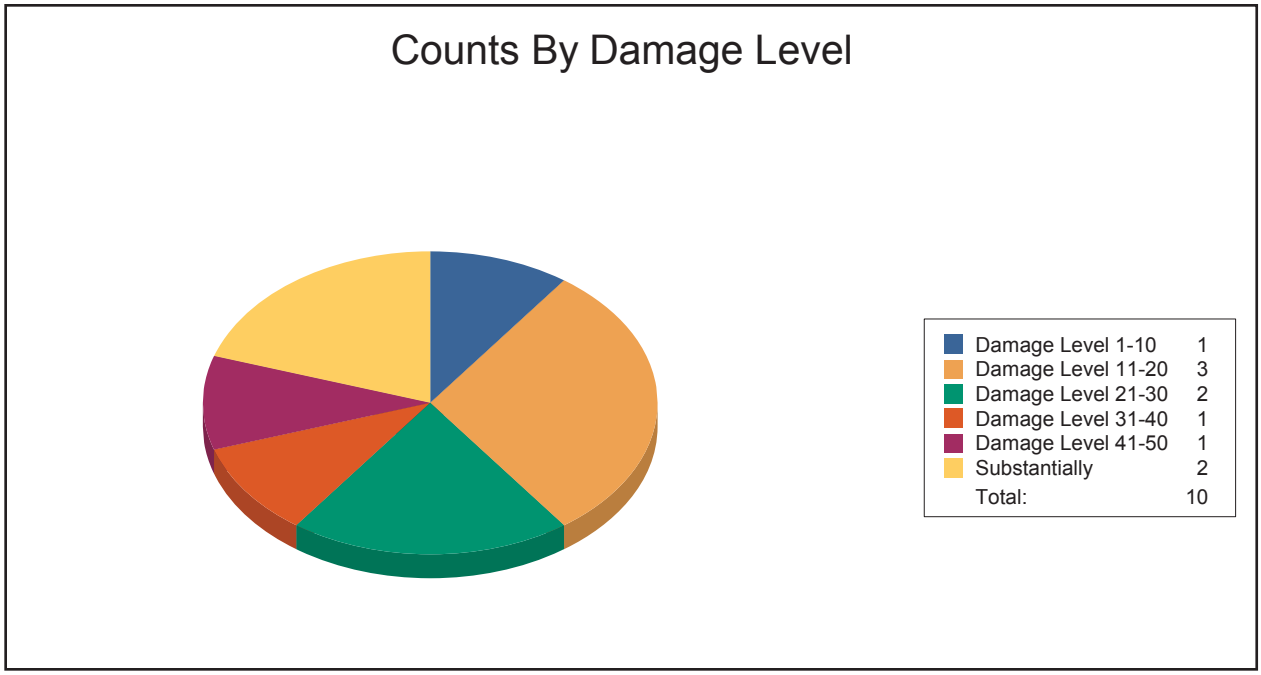


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	1	10	3	30	2	20	1	10	1	10	2	20

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	6	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	9	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

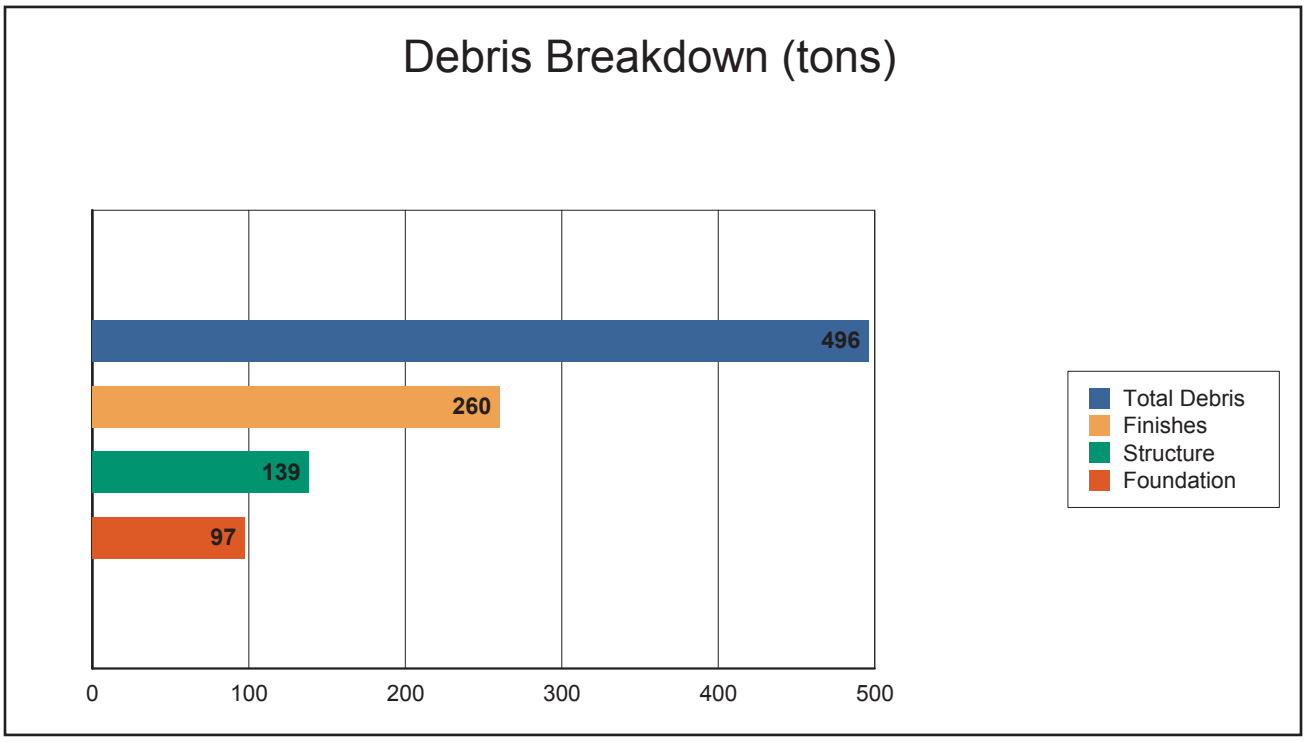
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

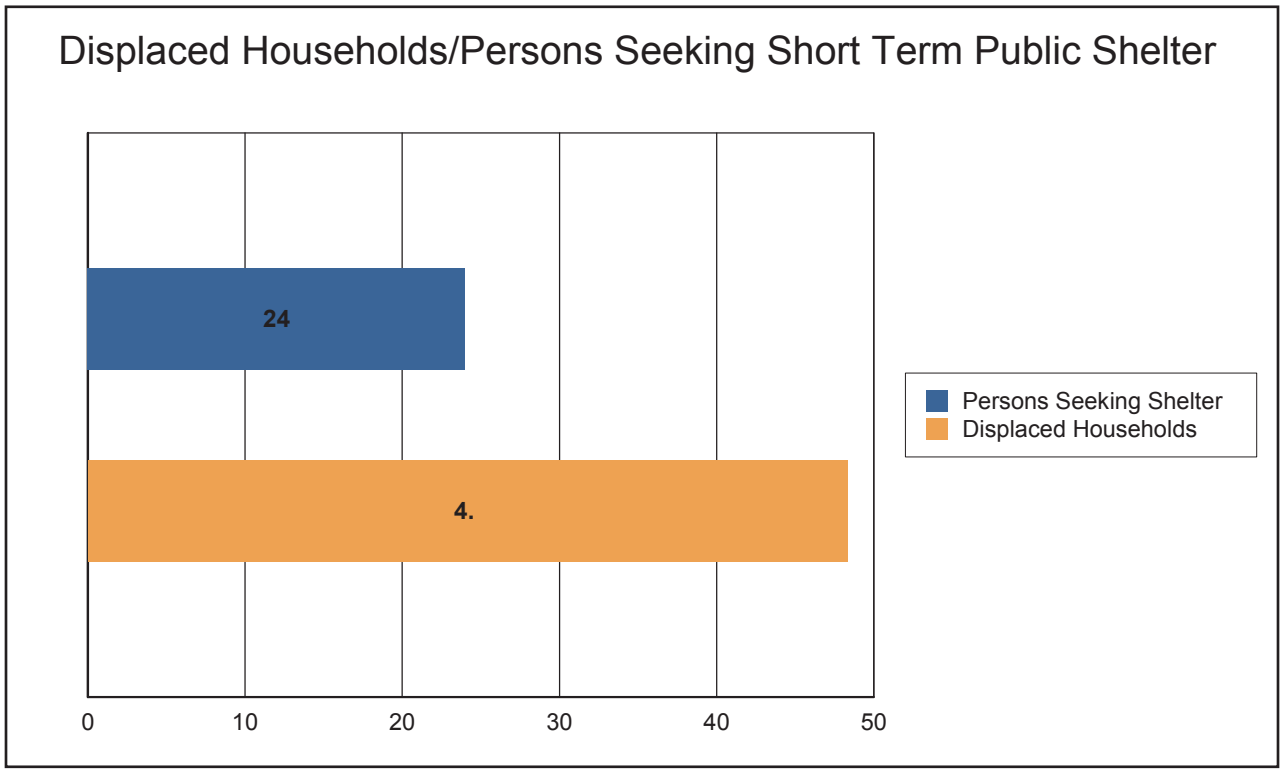


The model estimates that a total of 496 tons of debris will be generated. Of the total amount, Finishes comprises 52% of the total, Structure comprises 28% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 20 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 48 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 24 people (out of a total population of 19,571) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 7.40 million dollars, which represents 2.10 % of the total replacement value of the scenario buildings.

Building-Related Losses

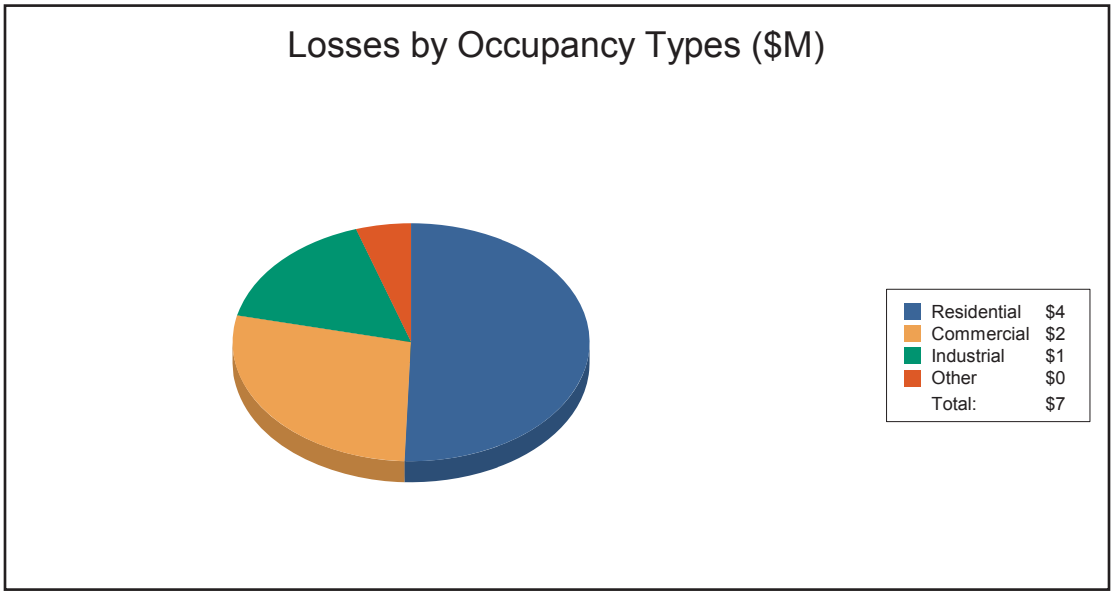
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 7.38 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 50.53% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.44	0.55	0.39	0.06	3.43
	Content	1.30	1.49	0.76	0.30	3.84
	Inventory	0.00	0.03	0.07	0.00	0.11
	Subtotal	**3.74**	**2.07**	**1.22**	**0.36**	**7.38**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.01	0.02
	Subtotal	**0.00**	**0.00**	**0.00**	**0.01**	**0.02**
ALL	**Total**	**3.74**	**2.07**	**1.22**	**0.37**	**7.40**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	19,571	1,662,977	386,879	2,049,856
Total	**19,571**	**1,662,977**	**3. 6,. 79**	**2,049,. 56**
Total Study Region	**19,571**	**1,662,977**	**3. 6,. 79**	**2,049,. 56**

Hazus-MH: Flood Global Risk Report

Region Name: Montville

Flood Scenario: Montville Riverine

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 44 square miles and contains 469 census blocks. The region contains over 7 thousand households and has a total population of 19,571 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 7,063 buildings in the region with a total building replacement value (excluding contents) of 2,050 million dollars (2010 dollars). Approximately 92.75% of the buildings (and 81.13% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 7,063 buildings in the region which have an aggregate total replacement value of 2,050 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,662,977	81.1%
Commercial	218,536	10.7%
Industrial	69,052	3.4%
Agricultural	4,221	0.2%
Religion	20,314	1.0%
Government	50,736	2.5%
Education	24,020	1.2%
Total	**2,049,. 56**	**100%w**

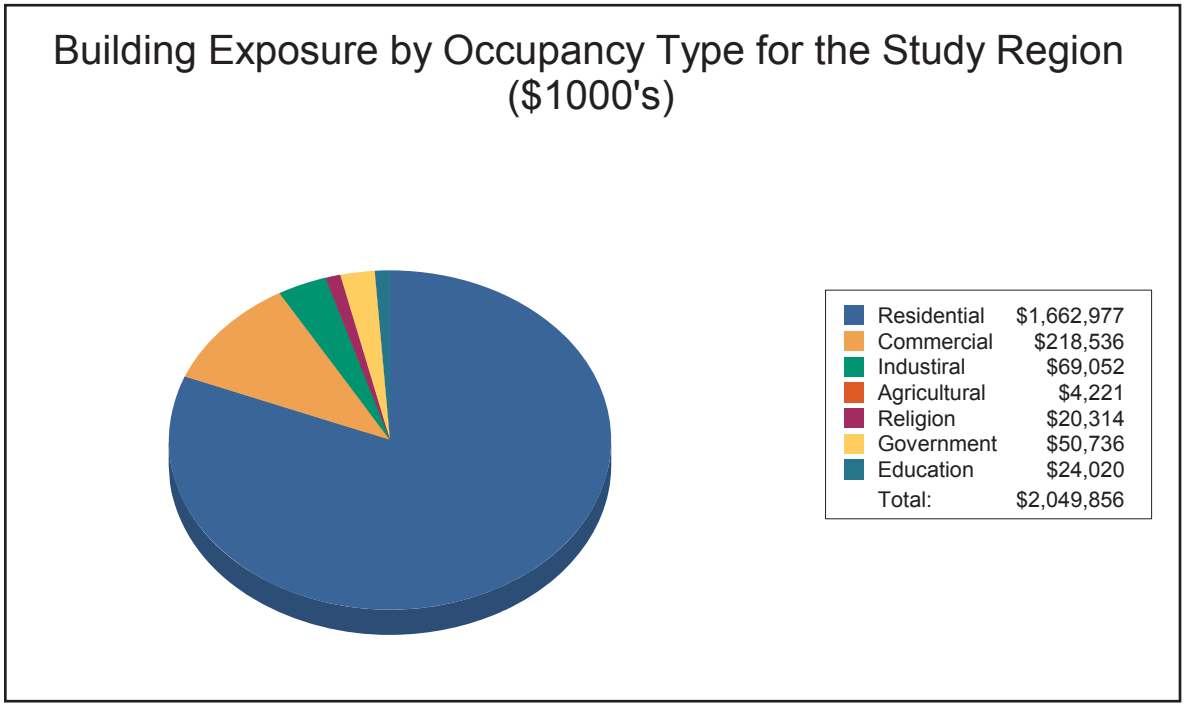
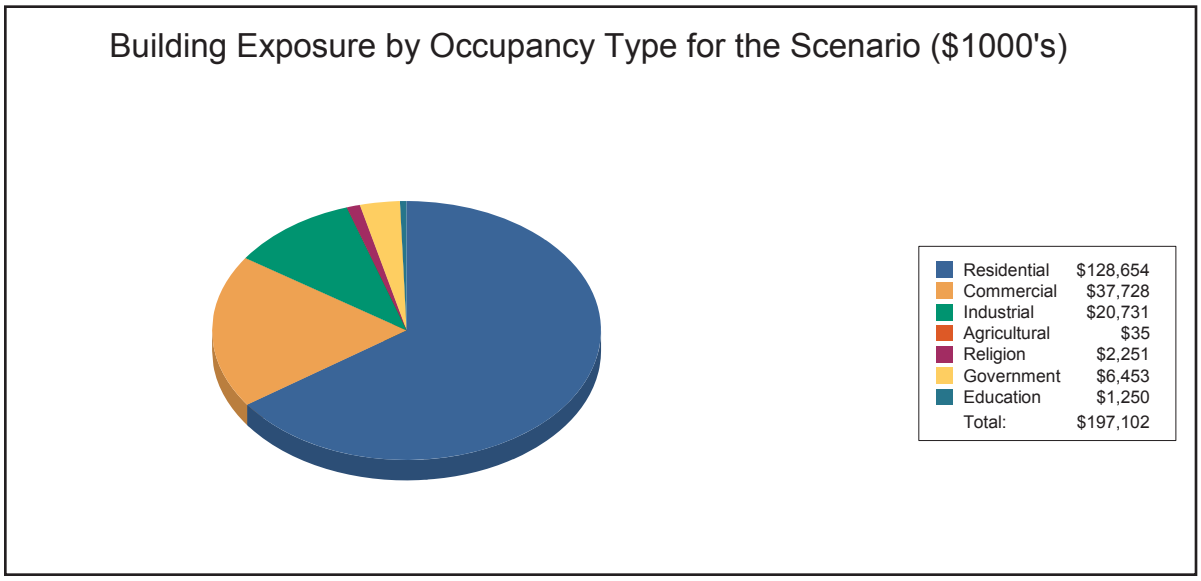


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	128,654	65.3%
Commercial	37,728	19.1%
Industrial	20,731	10.5%
Agricultural	35	0.0%
Religion	2,251	1.1%
Government	6,453	3.3%
Education	1,250	0.6%
Total	**197,102**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 9 schools, 6 fire stations, 2 police stations and 1 emergency operation center.

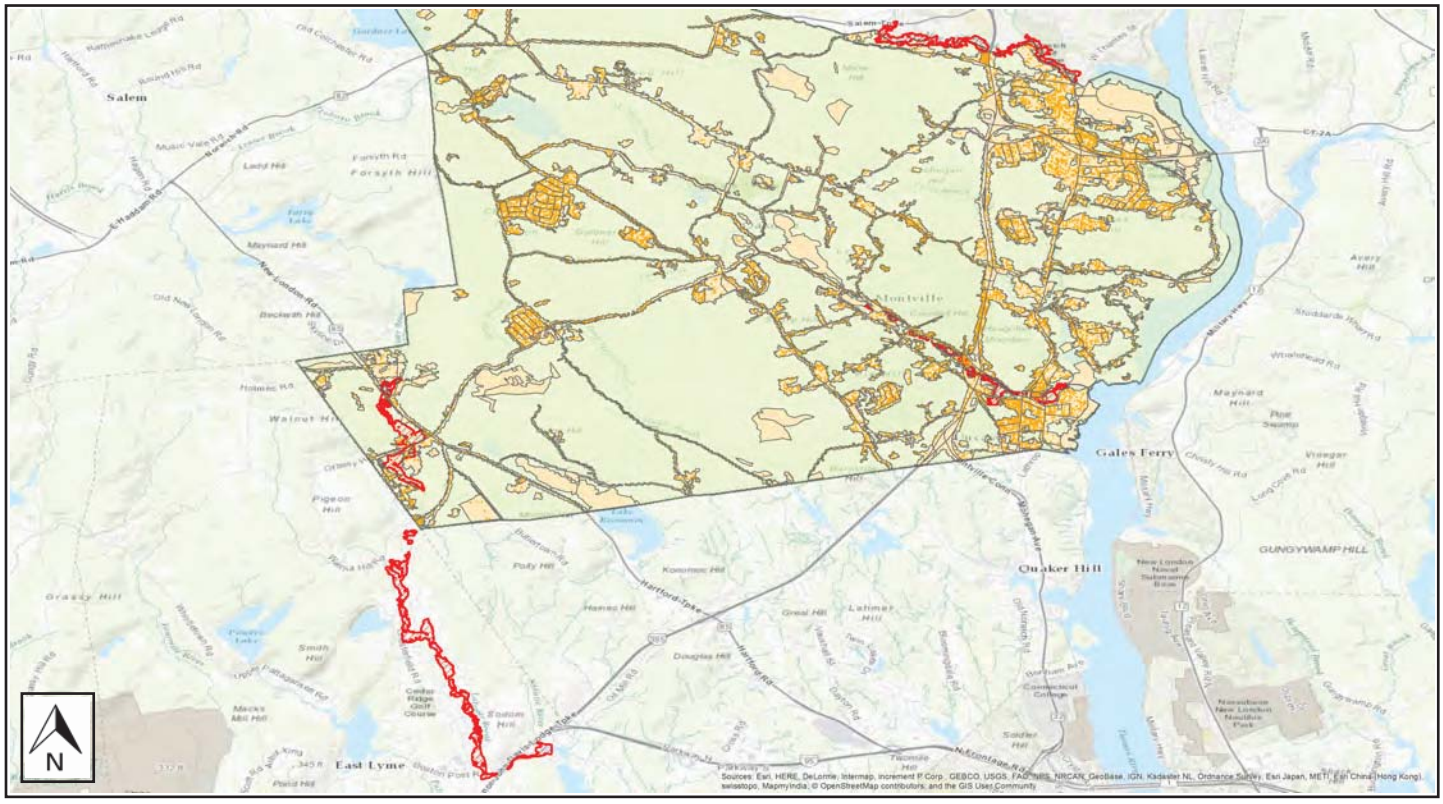
Flood Scenario Parameters

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

Study Region Name:	Montville
Scenario Name:	Montville Riverine
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 2 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

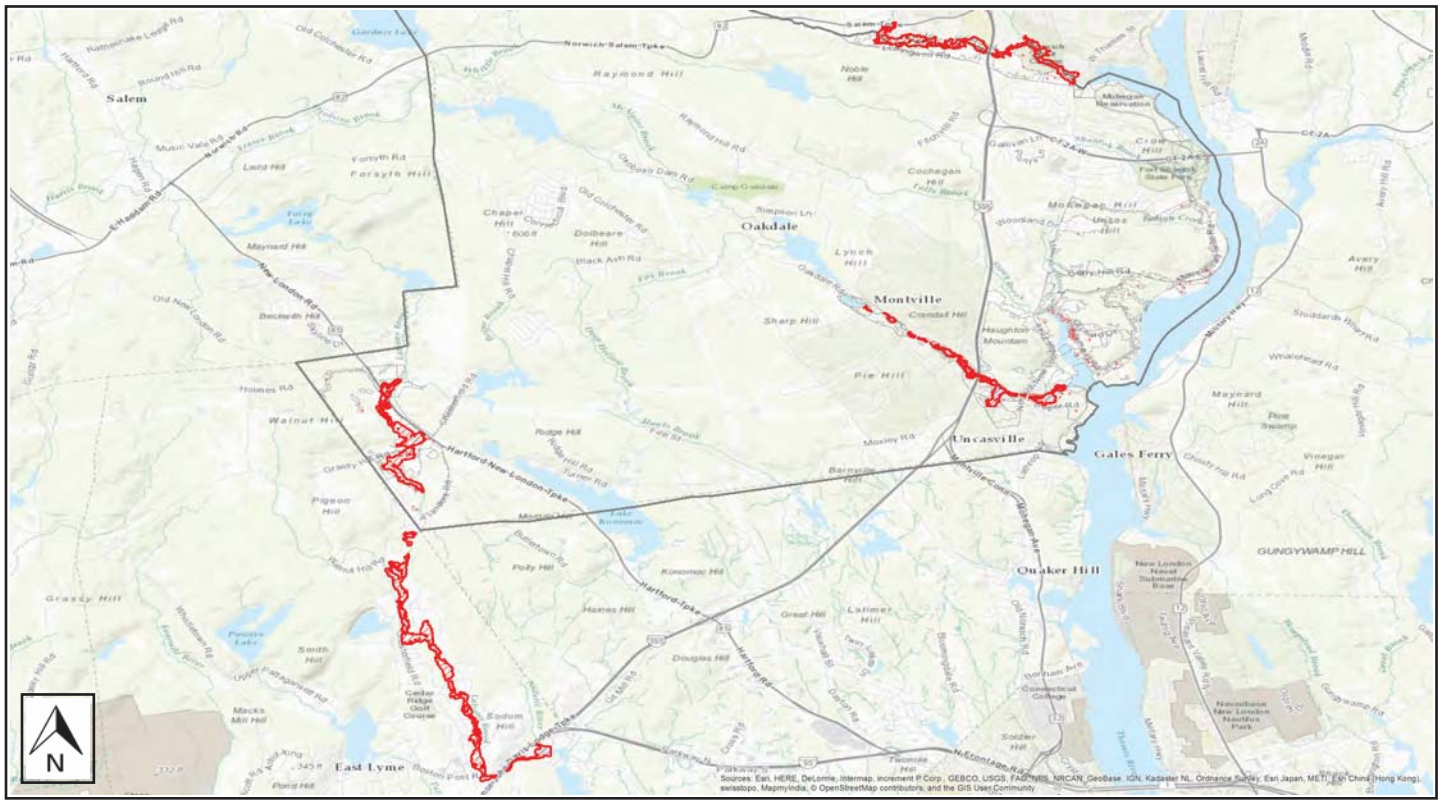


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	33.33	2	66.67	0	0.00	0	0.00	0	0.00	0	0.00
Total	**1**		**2**		**0**		**0**		**0**		**0**	

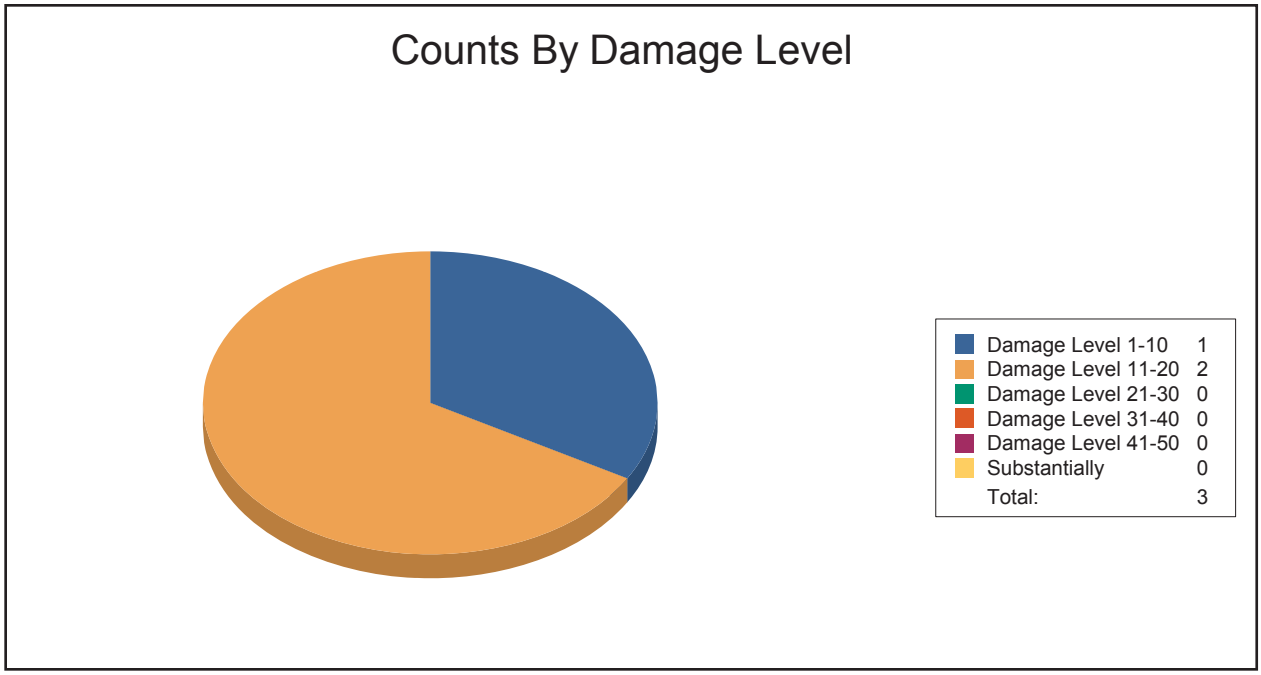


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	1	33	2	67	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	6	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	9	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

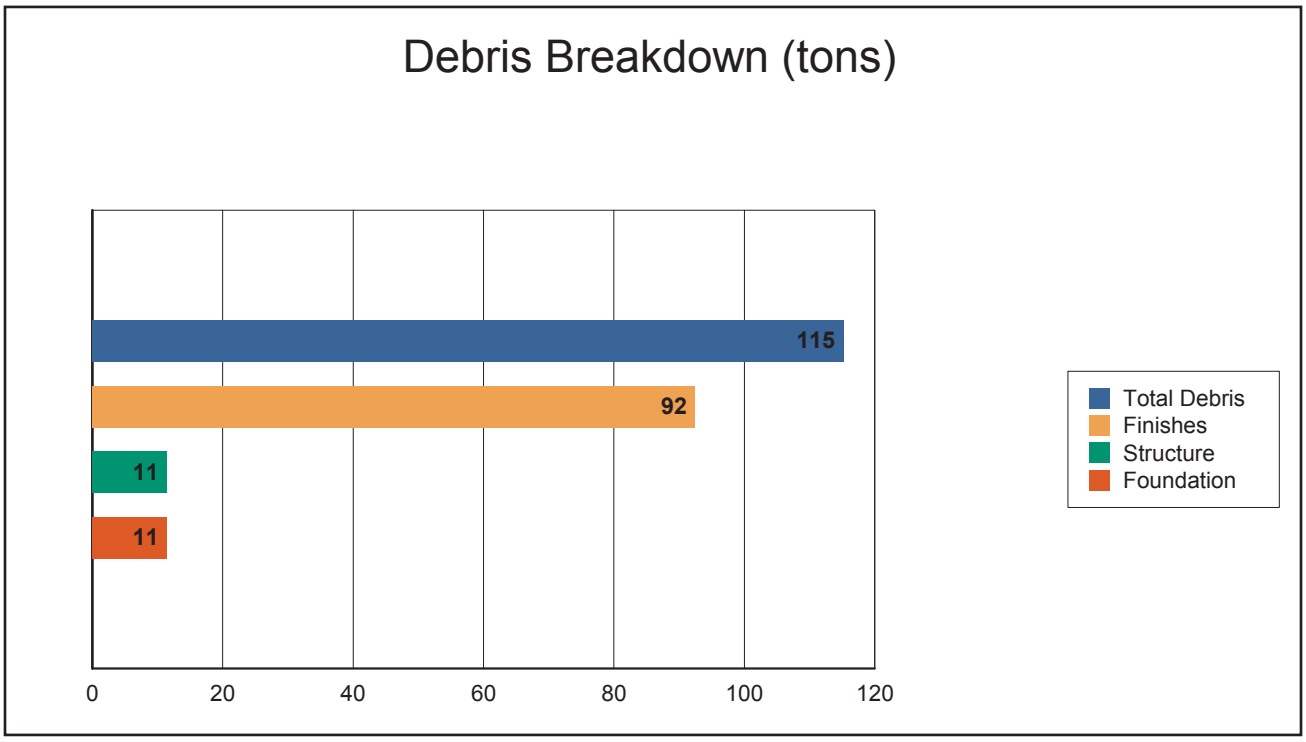
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

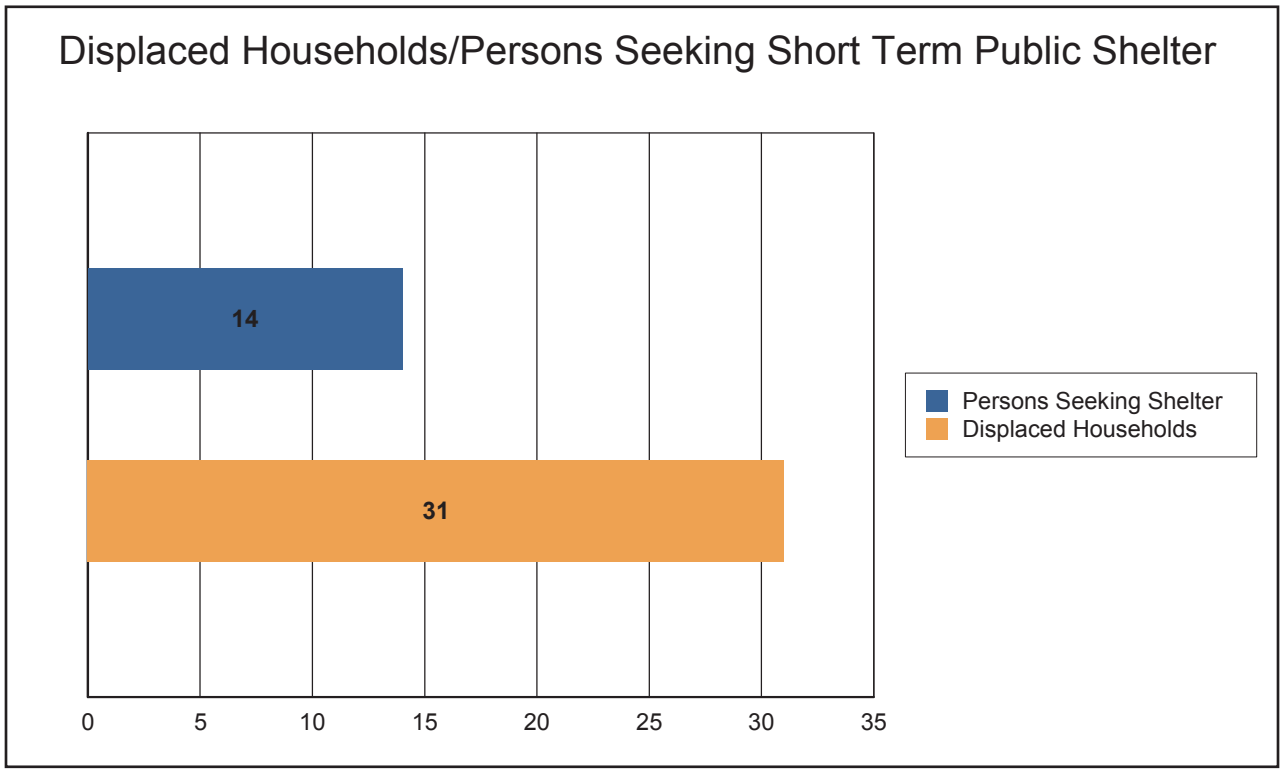


The model estimates that a total of 115 tons of debris will be generated. Of the total amount, Finishes comprises 80% of the total, Structure comprises 10% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 5 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 31 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 14 people (out of a total population of 19,571) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 3.88 million dollars, which represents 1.97 % of the total replacement value of the scenario buildings.

Building-Related Losses

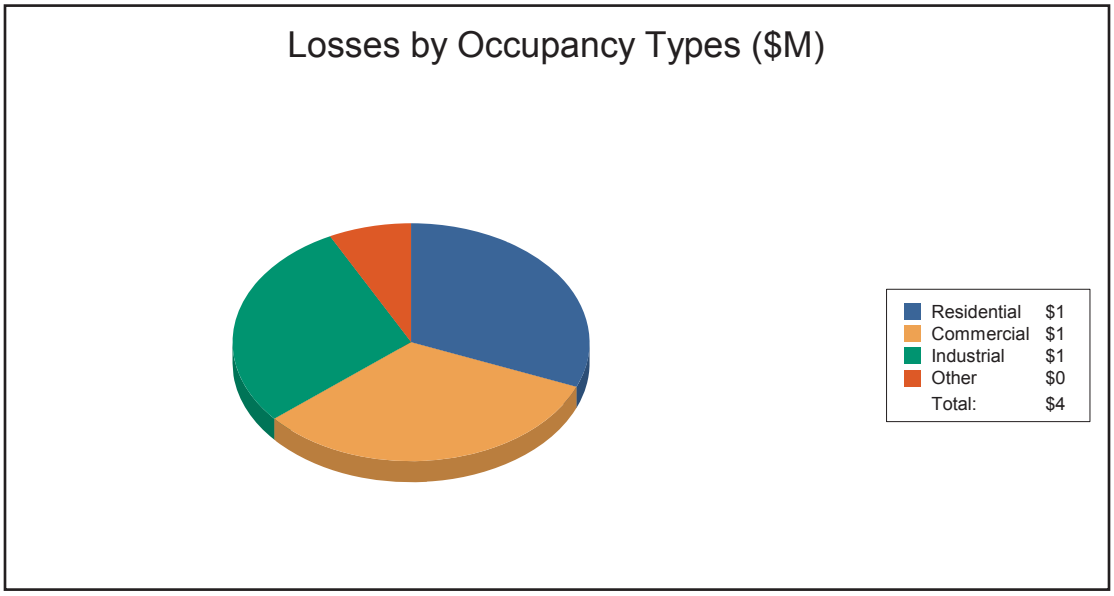
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 3.87 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 30.99% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.84	0.29	0.36	0.04	1.53
	Content	0.36	0.96	0.69	0.23	2.24
	Inventory	0.00	0.03	0.07	0.00	0.09
	Subtotal	**1.20**	**1.27**	**1.12**	**0.28**	**3.87**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.01	0.02
	Subtotal	**0.00**	**0.00**	**0.00**	**0.01**	**0.02**
ALL	**Total**	**1.20**	**1.27**	**1.12**	**0.29**	**3.89**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	19,571	1,662,977	386,879	2,049,856
Total	**19,571**	**1,662,977**	**3. 6,. 79**	**2,049,. 56**
Total Study Region	**19,571**	**1,662,977**	**3. 6,. 79**	**2,049,. 56**

Hazus-MH: Flood Global Risk Report

Region Name: MPTN

Flood Scenario: MPTN 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 6 square miles and contains 54 census blocks. The region contains over 0 thousand households and has a total population of 578 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 250 buildings in the region with a total building replacement value (excluding contents) of 84 million dollars (2010 dollars). Approximately 89.60% of the buildings (and 78.33% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 250 buildings in the region which have an aggregate total replacement value of 84 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	65,821	78.3%
Commercial	13,698	16.3%
Industrial	317	0.4%
Agricultural	575	0.7%
Religion	2,433	2.9%
Government	1,191	1.4%
Education	0	0.0%
Total	**84,035**	**100.0%**

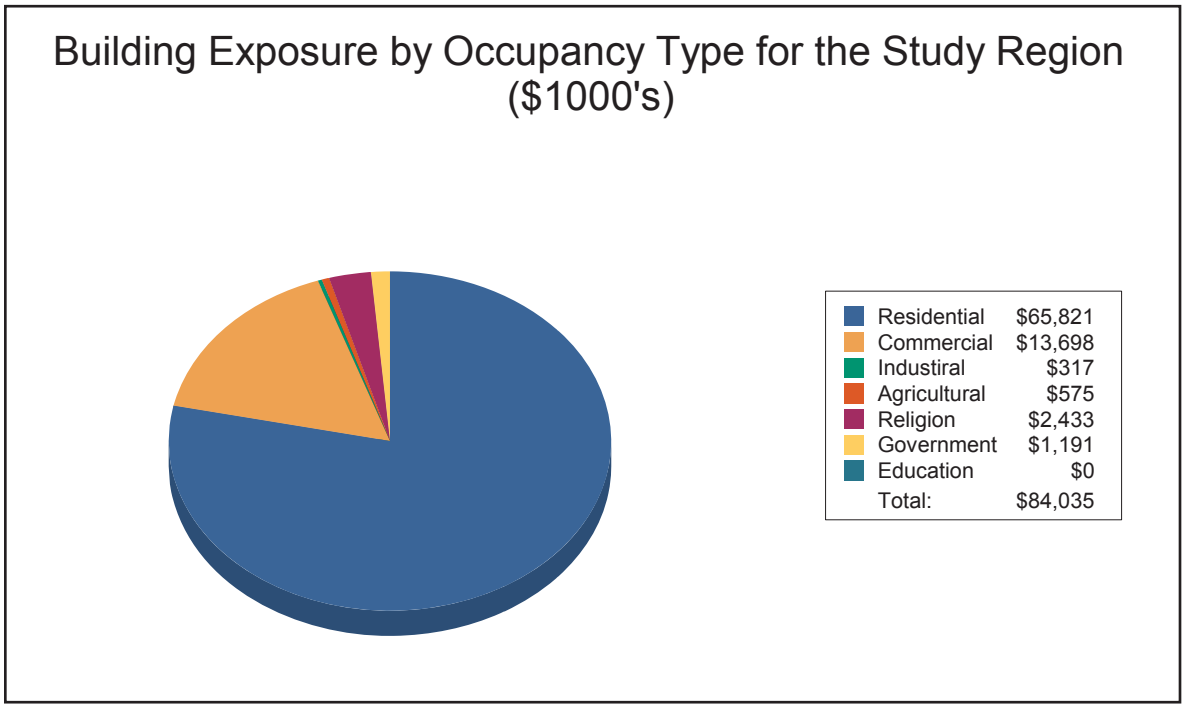


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential		
Commercial		
Industrial		
Agricultural		
Religion		
Government		
Education		
Total		

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 6 schools, 4 fire stations, 2 police stations and no emergency operation centers.

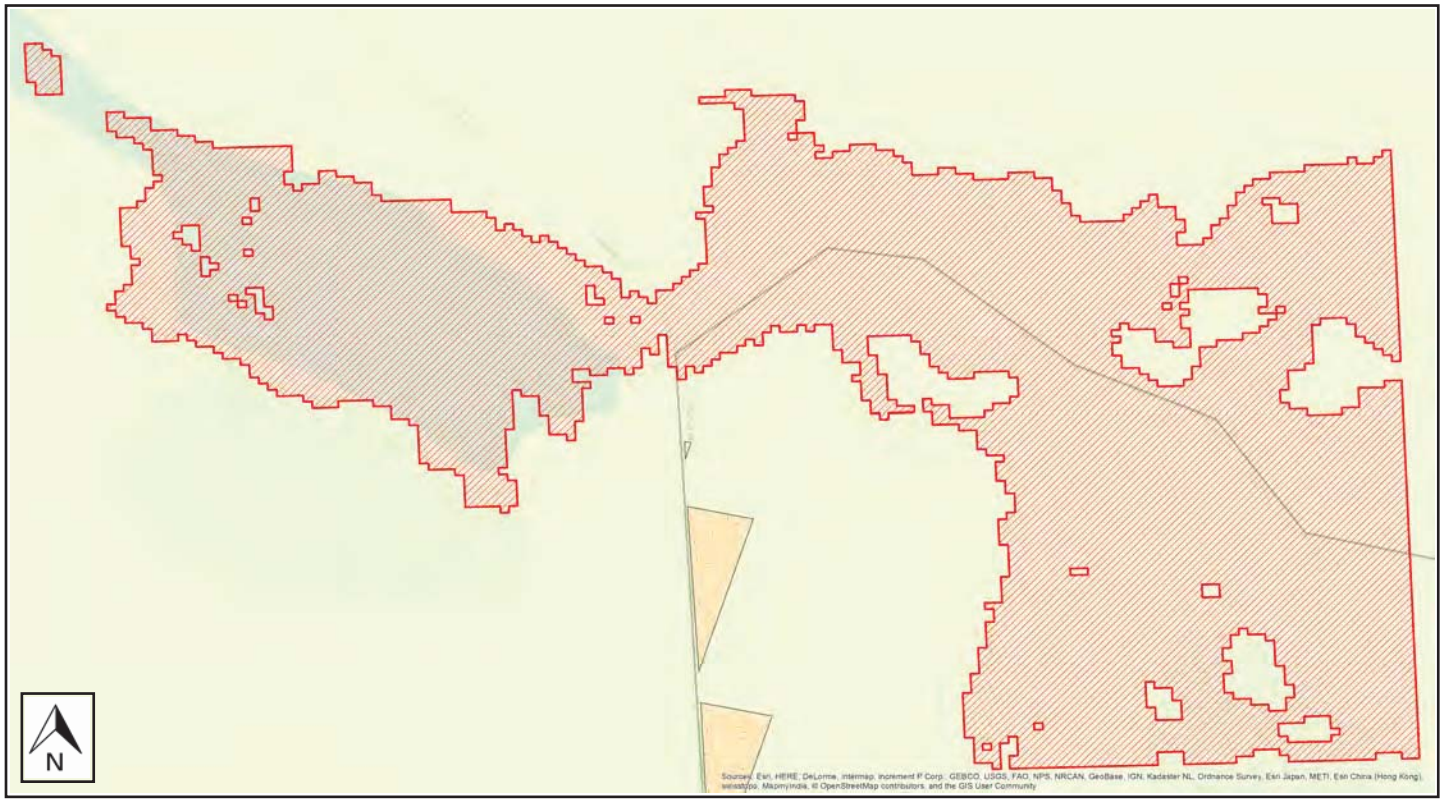
Flood Scenario Parameters

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

Study Region Name:	MPTN
Scenario Name:	MPTN 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Analysis has not been performed for this Scenario.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Analysis has not been performed for this Scenario.												

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Analysis has not been performed for this Scenario.												

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	6	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

Social Impact

Shelter Requirements

Analysis has not been performed for this Scenario.

Economic Loss

Analysis has not been performed for this Scenario.

Building-Related Losses

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

Analysis has not been performed for this Scenario.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total

Analysis has not been performed for this Scenario.

Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	578	65,821	18,214	84,035
Total	**578**	**65,821**	**18,214**	**84,035**
Total Study Region	**578**	**65,821**	**18,214**	**84,035**

Hazus-MH: Flood Global Risk Report

Region Name: NewLondon

Flood Scenario: New London 100 Year Flood

Print Date: Wednesday, May 24, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 6 square miles and contains 498 census blocks. The region contains over 10 thousand households and has a total population of 27,620 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 7,057 buildings in the region with a total building replacement value (excluding contents) of 3,978 million dollars (2010 dollars). Approximately 85.56% of the buildings (and 62.40% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 7,057 buildings in the region which have an aggregate total replacement value of 3,978 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,482,224	62.4%
Commercial	908,561	22.8%
Industrial	81,832	2.1%
Agricultural	3,572	0.1%
Religion	78,858	2.0%
Government	22,708	0.6%
Education	400,325	10.1%
Total	**3,97. ,0. 0**	**100%w**

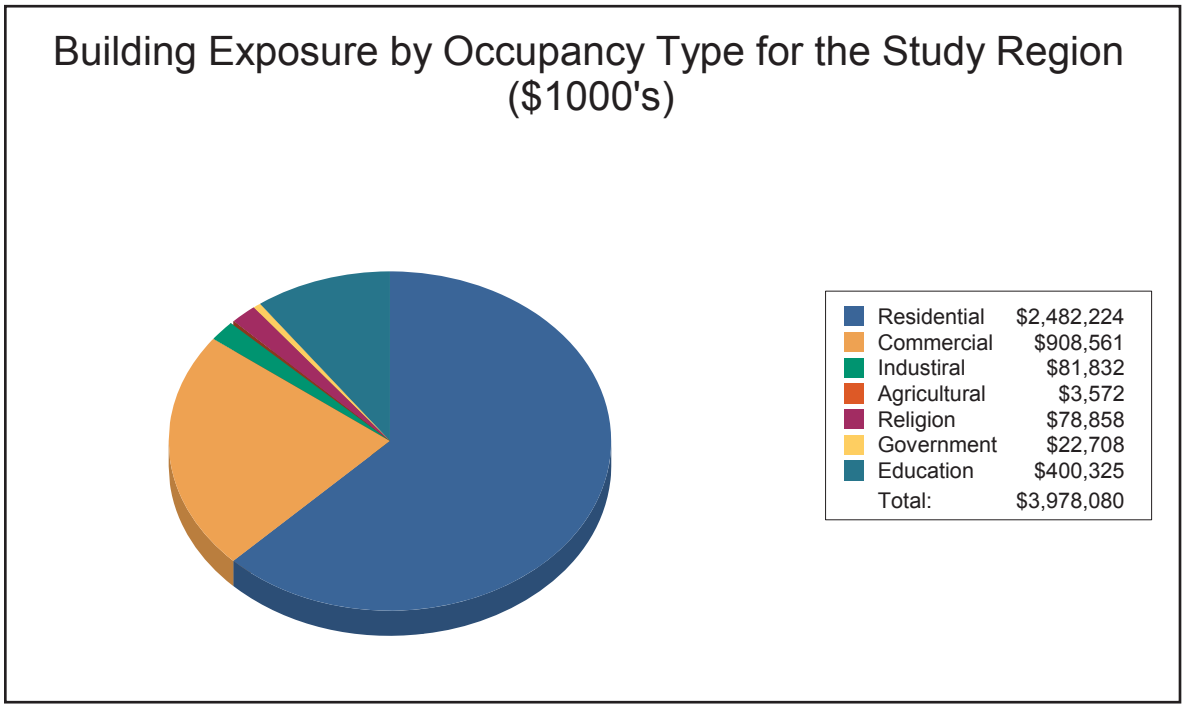
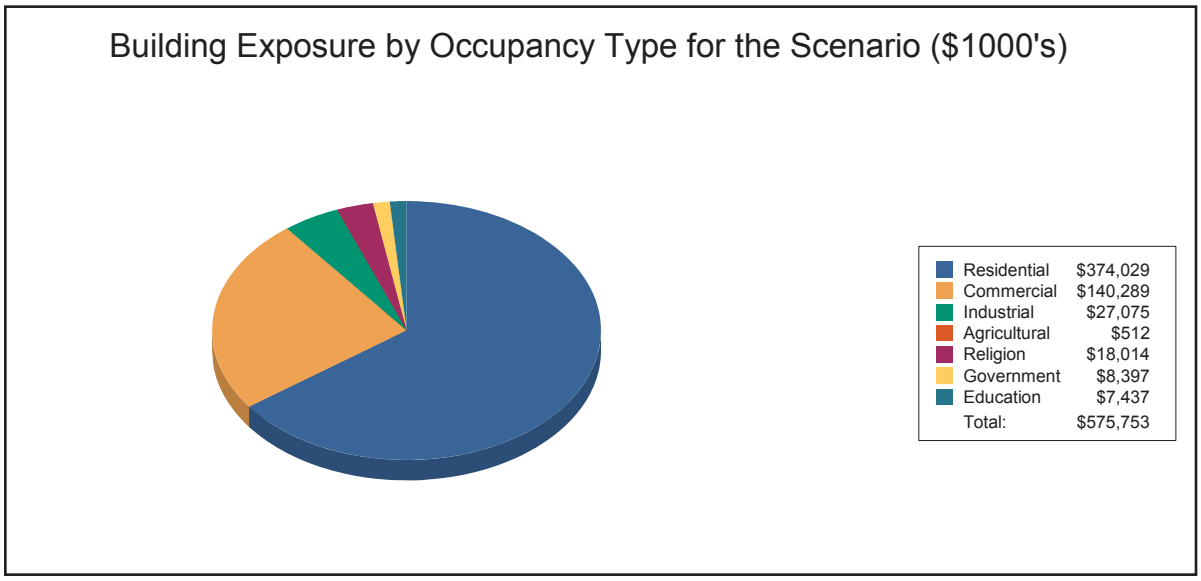


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	374,029	65.0%
Commercial	140,289	24.4%
Industrial	27,075	4.7%
Agricultural	512	0.1%
Religion	18,014	3.1%
Government	8,397	1.5%
Education	7,437	1.3%
Total	**575,753**	**100%**



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 235 beds.
There are 16 schools, 1 fire station, 2 police stations and no emergency operation centers.

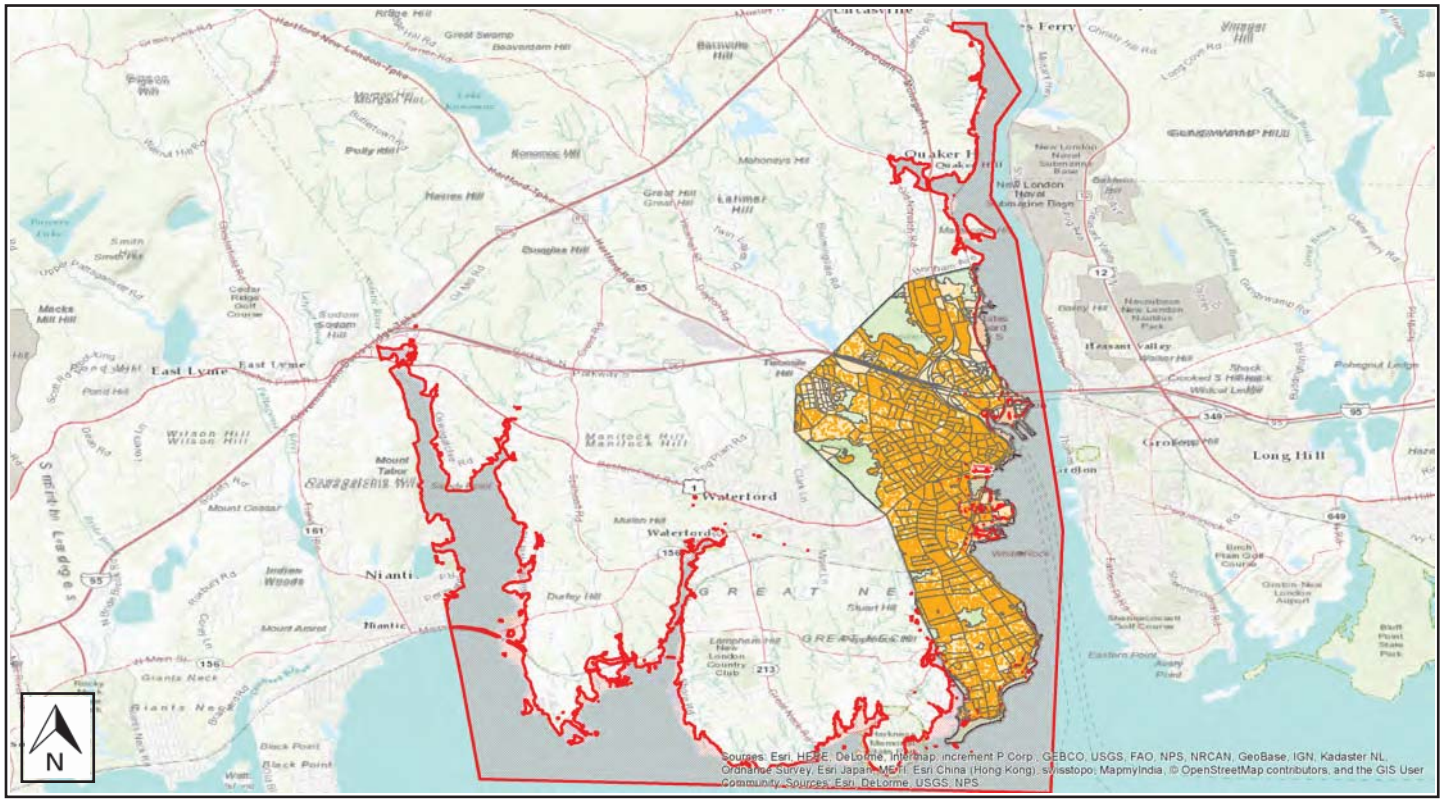
Flood Scenario Parameters

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

Study Region Name:	NewLondon
Scenario Name:	New London 100 Year Flood
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 75 buildings will be at least moderately damaged. This is over 45% of the total number of buildings in the scenario. There are an estimated 9 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

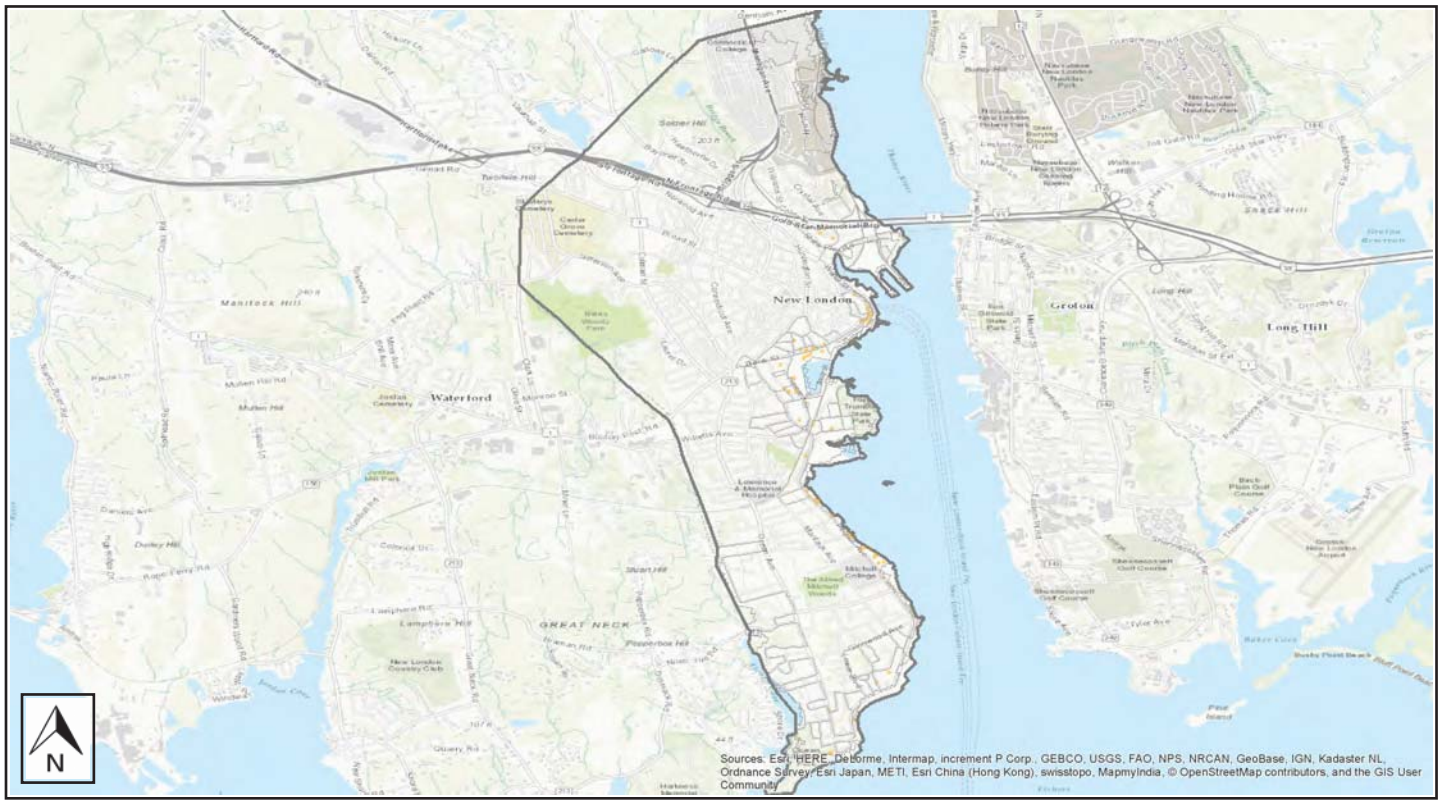


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	45	60.00	16	21.33	3	4.00	2	2.67	9	12.00
Total	**0**		**45**		**16**		**3**		**2**		**9**	

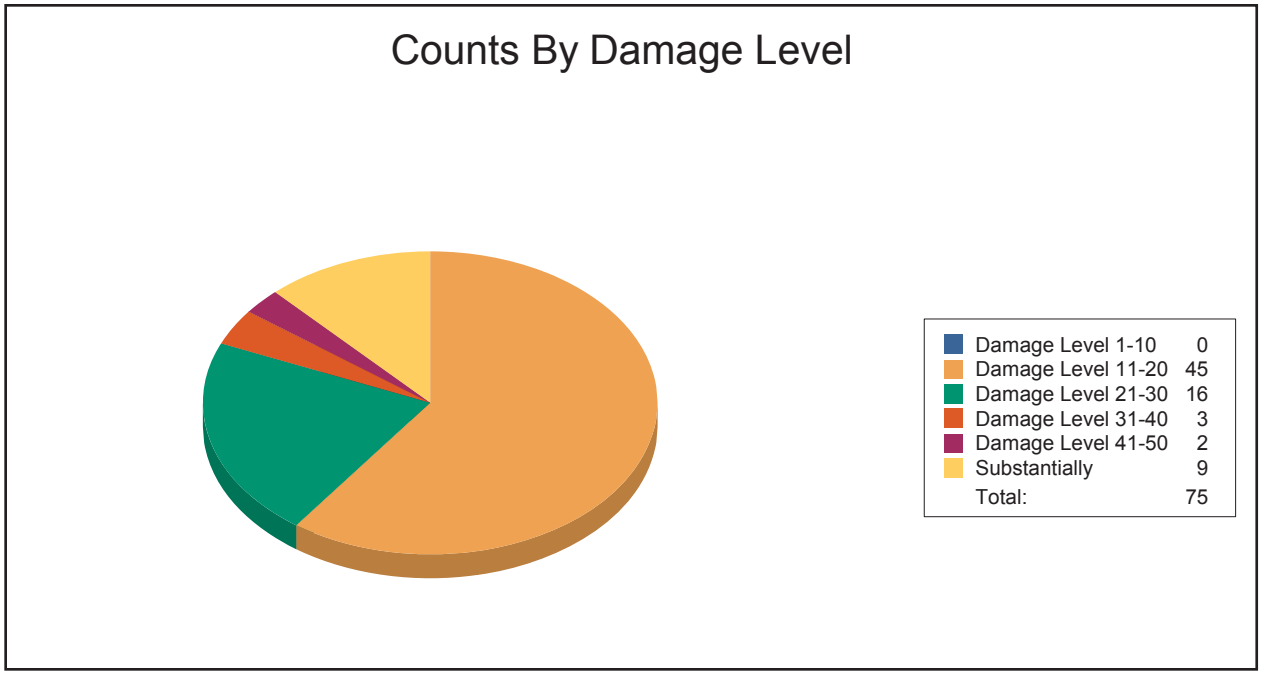


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	3	75	1	25	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	42	59	15	21	3	4	2	3	9	13

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 235 hospital beds available for use. On the day of the scenario flood event, the model estimates that 235 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	1	0	1
Hospitals	1	0	0	0
Police Stations	2	0	0	0
Schools	16	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

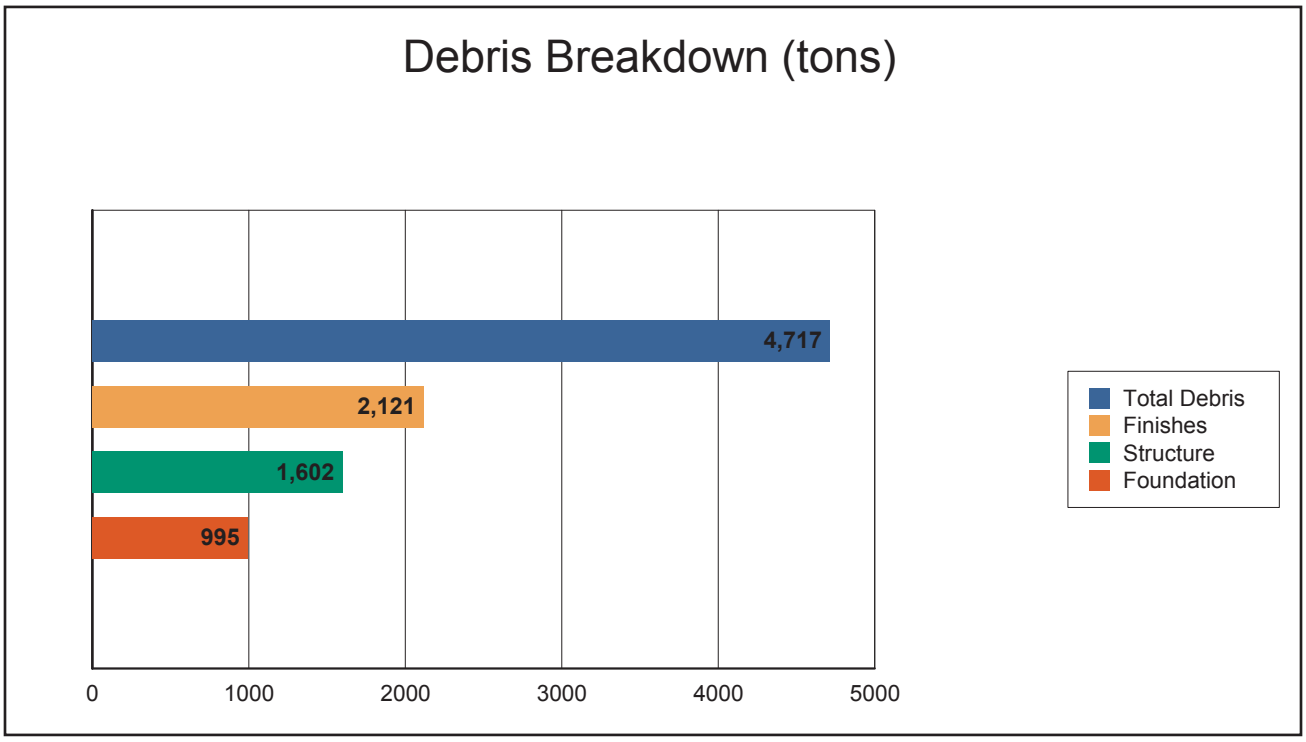
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

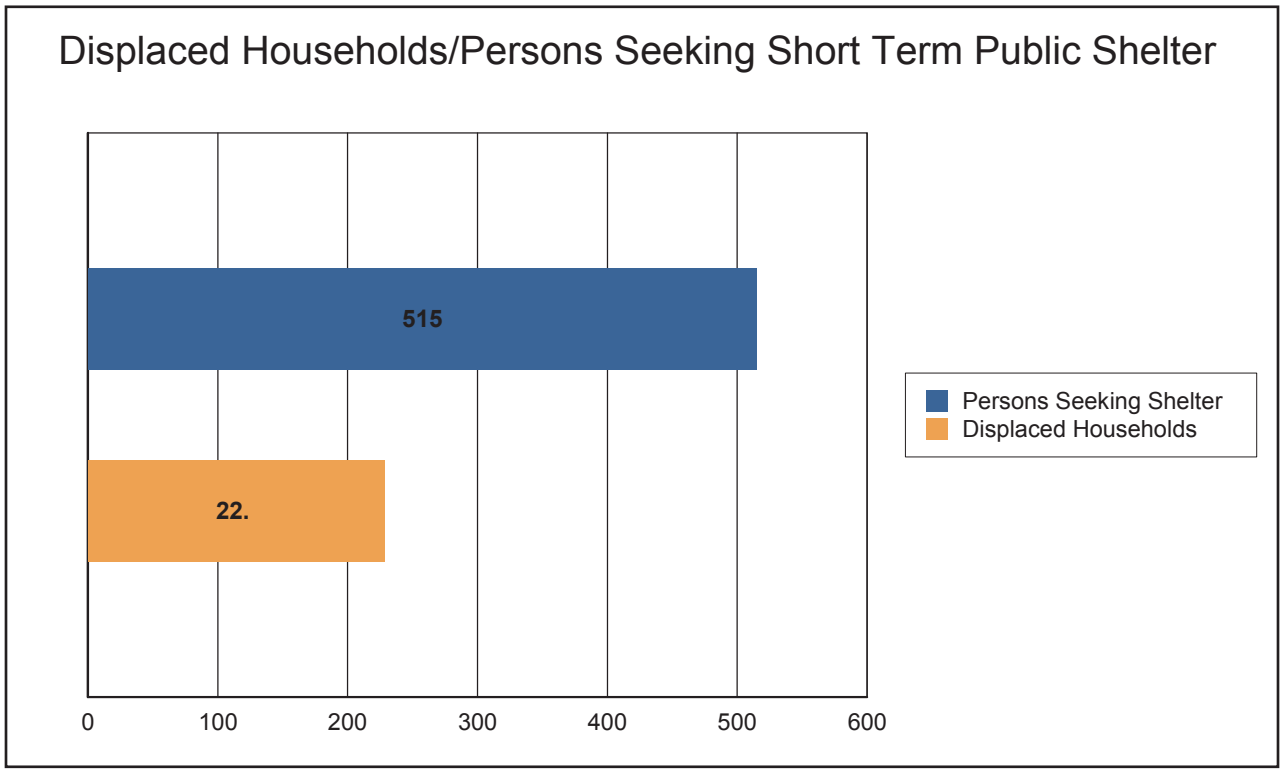


The model estimates that a total of 4,717 tons of debris will be generated. Of the total amount, Finishes comprises 45% of the total, Structure comprises 34% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 189 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 228 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 515 people (out of a total population of 27,620) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 59.27 million dollars, which represents 10.29 % of the total replacement value of the scenario buildings.

Building-Related Losses

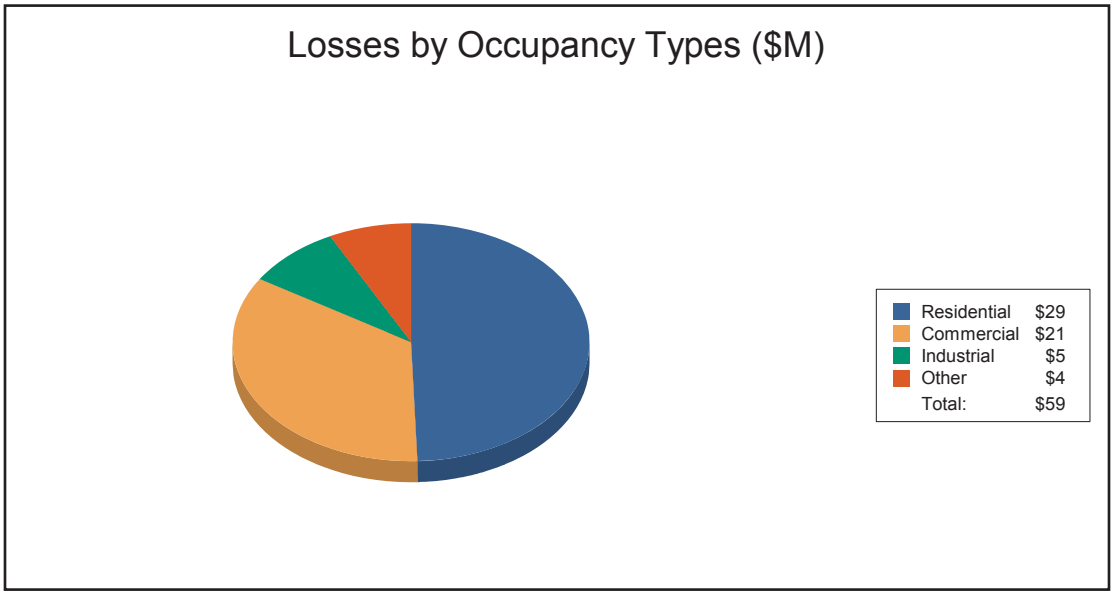
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 58.84 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 49.32% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	16.52	4.66	1.52	0.58	23.28
	Content	12.68	15.54	3.04	3.71	34.98
	Inventory	0.00	0.14	0.44	0.00	0.58
	Subtotal	**29.20**	**20.34**	**5.00**	**4.30**	**59.84**
Business Interruption						
	Income	0.00	0.11	0.00	0.01	0.12
	Relocation	0.02	0.01	0.00	0.01	0.04
	Rental Income	0.01	0.01	0.00	0.00	0.02
	Wage	0.00	0.10	0.00	0.16	0.26
	Subtotal	**0.03**	**0.22**	**0.00**	**0.17**	**0.43**
ALL	**Total**	**29.23**	**20.56**	**5.00**	**4.47**	**59.27**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	27,620	2,482,224	1,495,856	3,978,080
Total	**27,620**	**2,4. 2,224**	**1,495,. 56**	**3,97. ,0. 0**
Total Study Region	**27,620**	**2,4. 2,224**	**1,495,. 56**	**3,97. ,0. 0**

Hazus-MH: Flood Global Risk Report

Region Name: NorthStonington

Flood Scenario: North Stonington 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 55 square miles and contains 258 census blocks. The region contains over 2 thousand households and has a total population of 5,297 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 2,498 buildings in the region with a total building replacement value (excluding contents) of 790 million dollars (2010 dollars). Approximately 90.95% of the buildings (and 79.31% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 2,498 buildings in the region which have an aggregate total replacement value of 790 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	626,584	79.3%
Commercial	78,124	9.9%
Industrial	54,918	7.0%
Agricultural	5,285	0.7%
Religion	13,949	1.8%
Government	1,563	0.2%
Education	9,637	1.2%
Total	**790,060**	**100.0%**

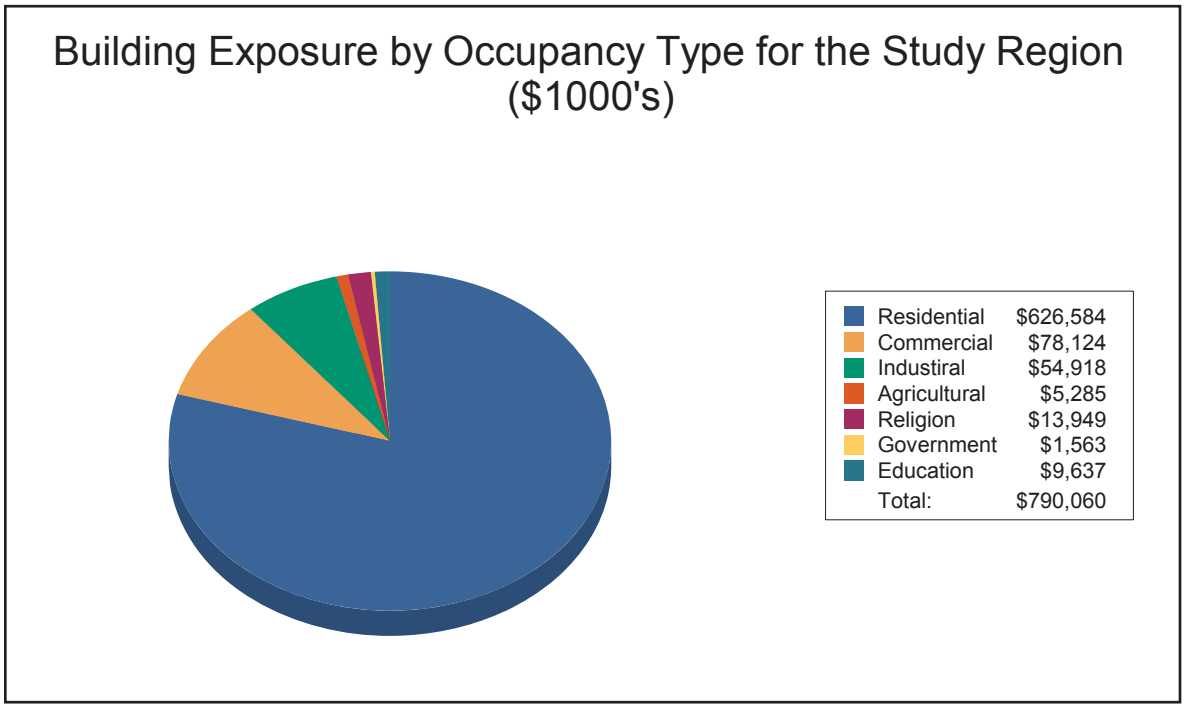
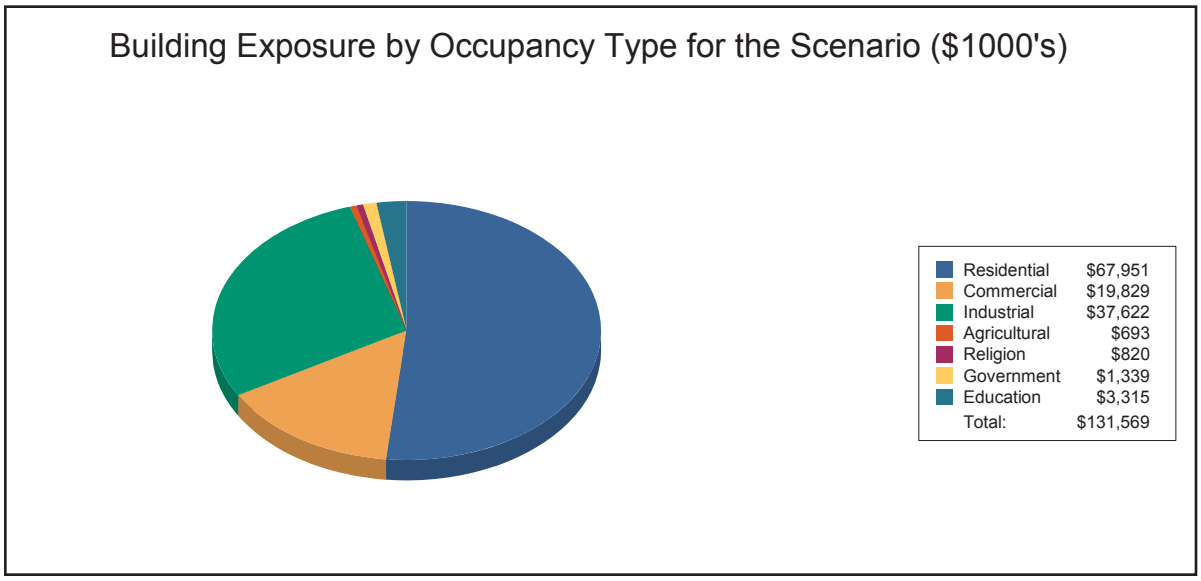


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	67,951	51.6%
Commercial	19,829	15.1%
Industrial	37,622	28.6%
Agricultural	693	0.5%
Religion	820	0.6%
Government	1,339	1.0%
Education	3,315	2.5%
Total	**131,569**	**100.0%**



Essential Facility Inventory

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

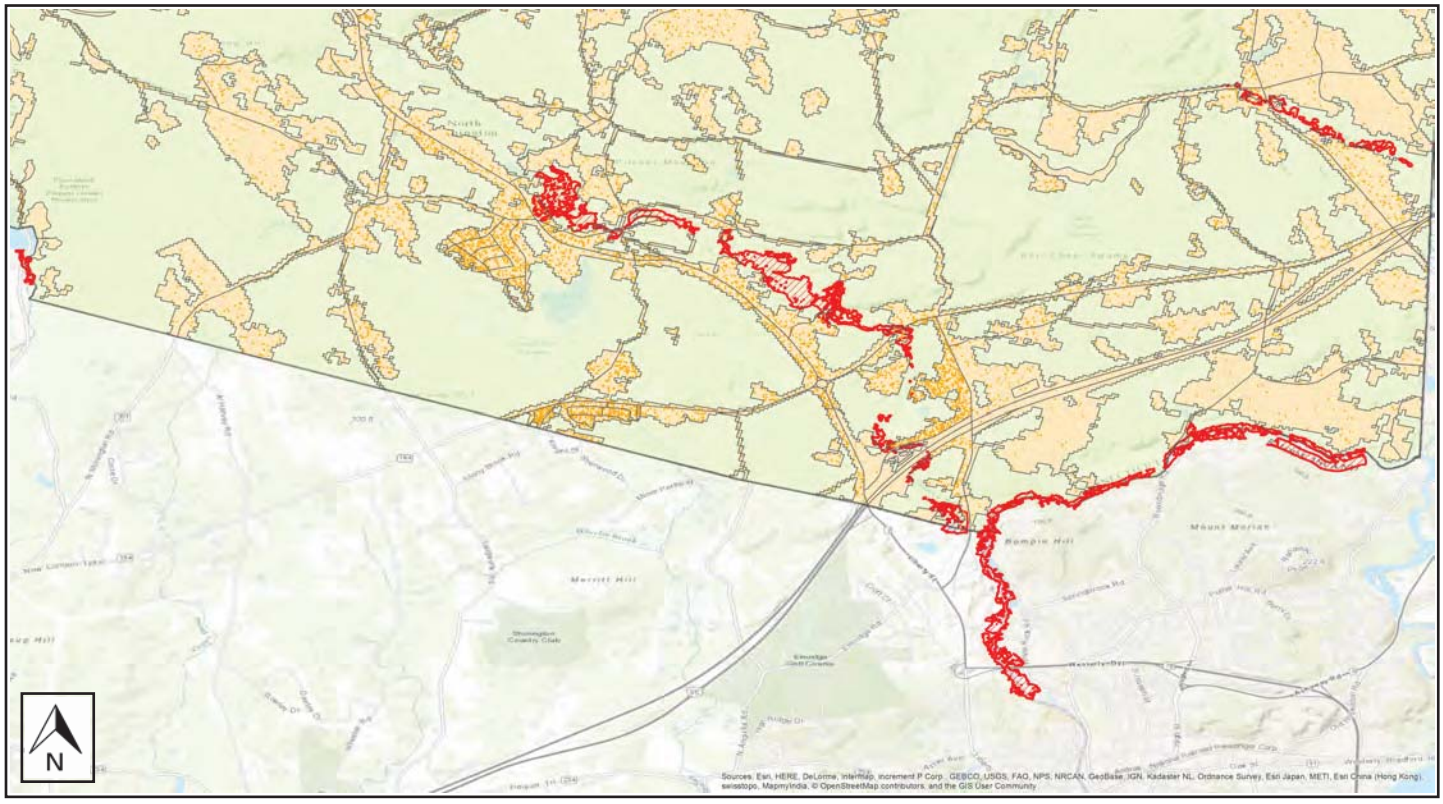
Flood Scenario Parameters

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

Study Region Name:	NorthStonington
Scenario Name:	North Stonington 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

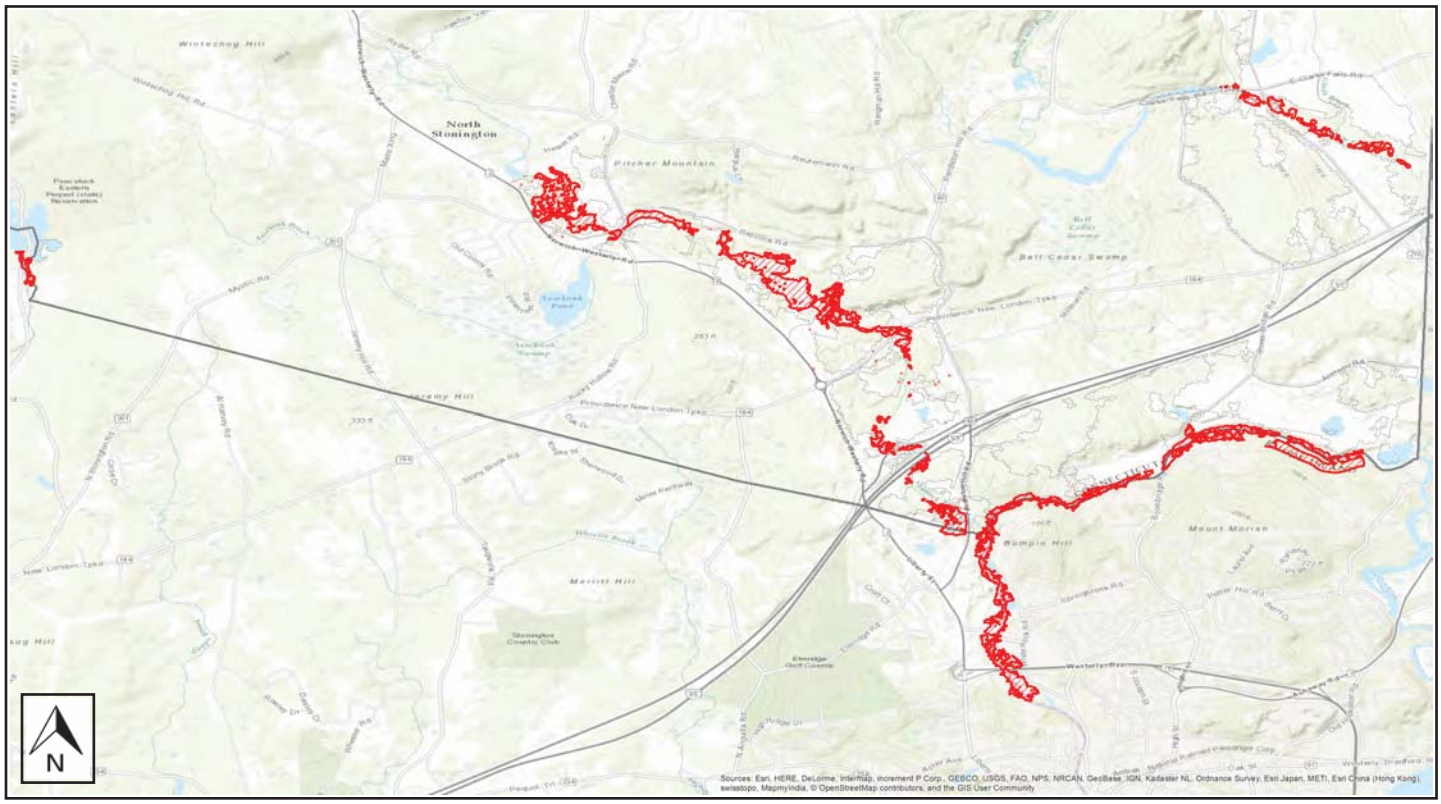


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**1**		**0**		**0**		**0**		**0**		**0**	

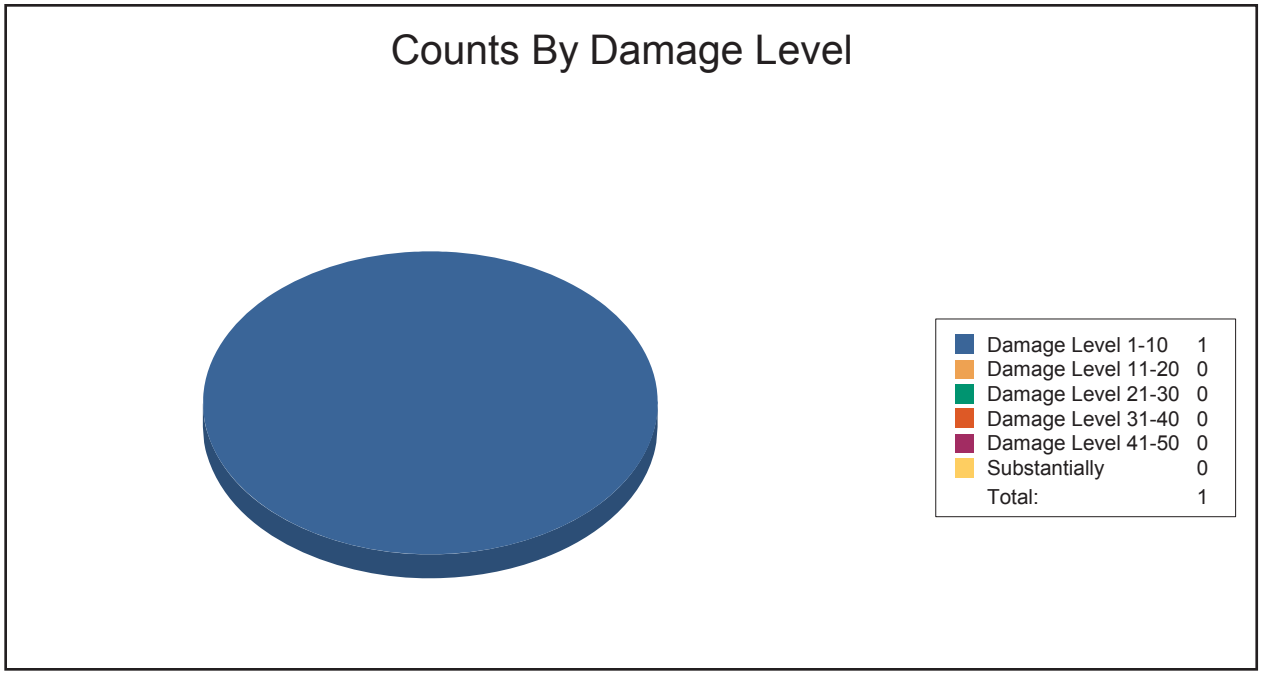


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	1	100	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	0	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	4	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

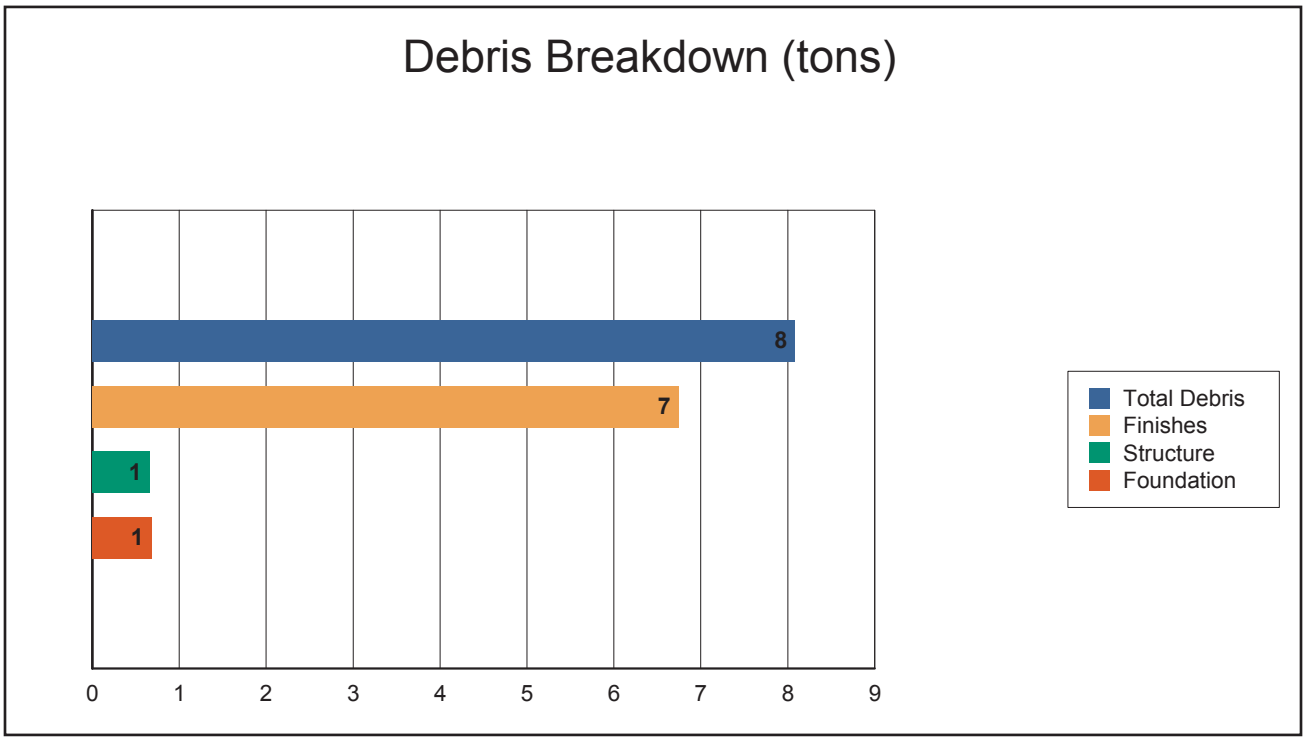
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

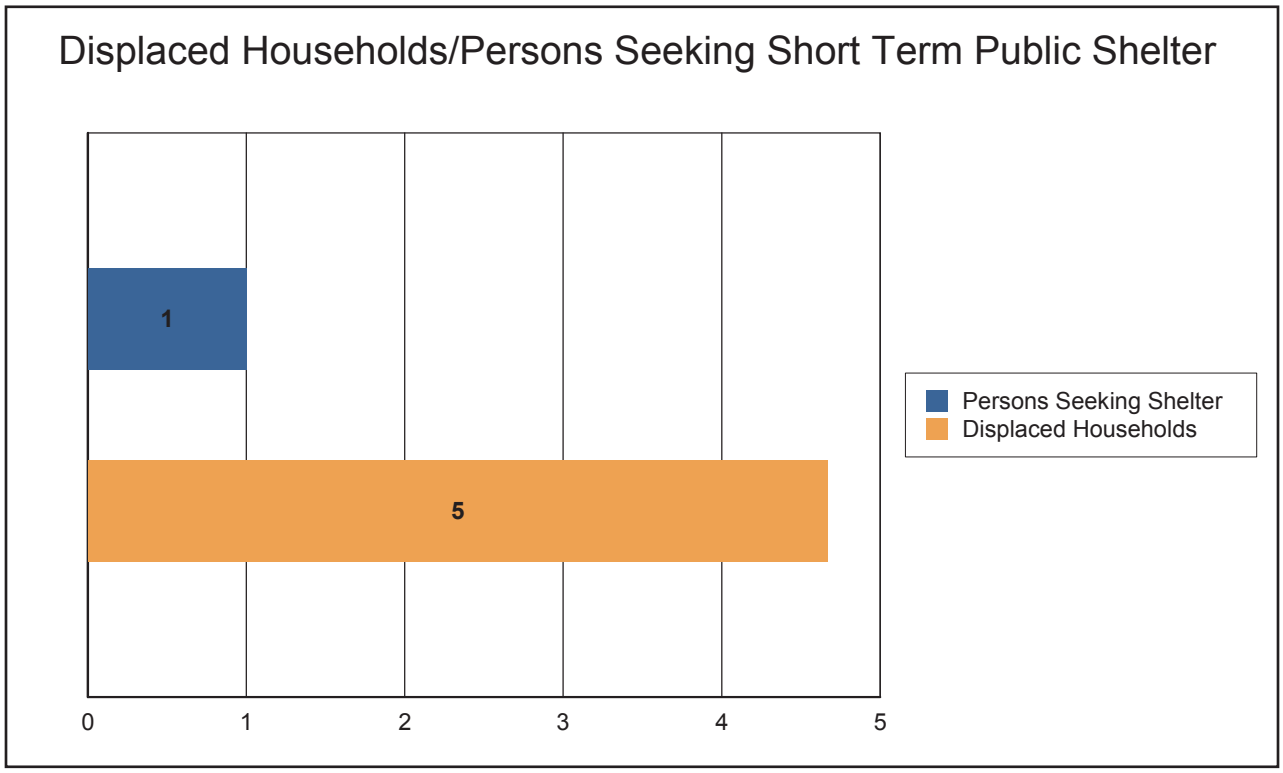


The model estimates that a total of 8 tons of debris will be generated. Of the total amount, Finishes comprises 83% of the total, Structure comprises 8% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 5 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1 people (out of a total population of 5,297) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.55 million dollars, which represents 0.42 % of the total replacement value of the scenario buildings.

Building-Related Losses

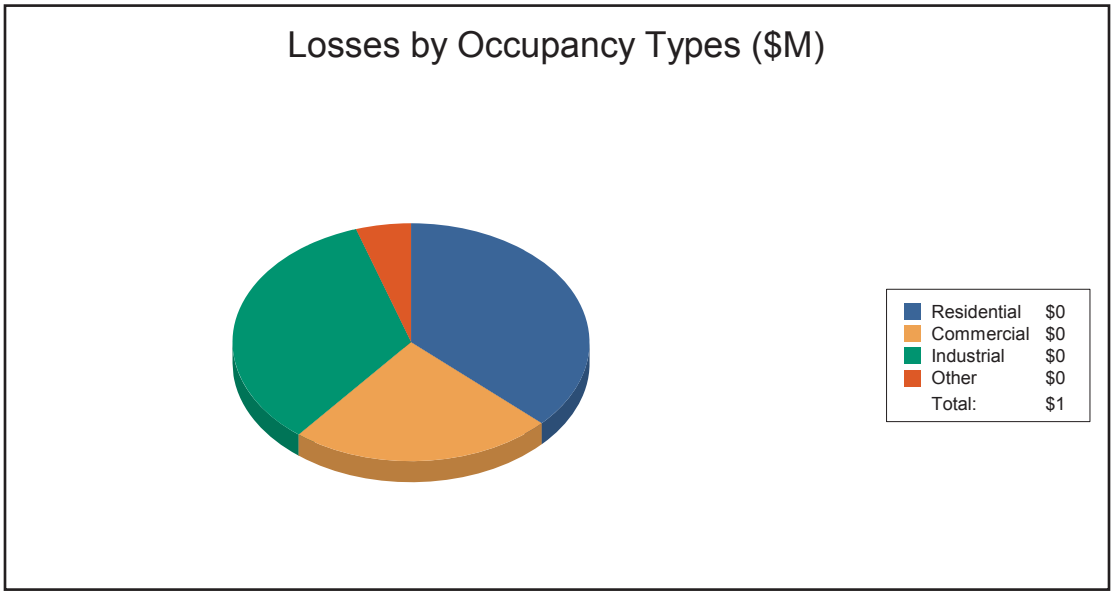
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.55 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 37.04% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.15	0.02	0.05	0.00	0.21
	Content	0.06	0.11	0.13	0.03	0.32
	Inventory	0.00	0.00	0.02	0.00	0.02
	Subtotal	**0.20**	**0.13**	**0.19**	**0.03**	**0.55**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.20**	**0.13**	**0.19**	**0.03**	**0.55**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	5,297	626,584	163,476	790,060
Total	**5,297**	**626,584**	**163,476**	**790,060**
Total Study Region	**5,297**	**626,584**	**163,476**	**790,060**

Hazus-MH: Flood Global Risk Report

Region Name: NorwichTidal

Flood Scenario: Norwich Tidal

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 29 square miles and contains 781 census blocks. The region contains over 17 thousand households and has a total population of 40,493 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 13,144 buildings in the region with a total building replacement value (excluding contents) of 4,944 million dollars (2010 dollars). Approximately 89.68% of the buildings (and 69.54% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 13,144 buildings in the region which have an aggregate total replacement value of 4,944 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,437,877	69.5%
Commercial	1,005,361	20.3%
Industrial	231,354	4.7%
Agricultural	9,513	0.2%
Religion	81,325	1.6%
Government	58,170	1.2%
Education	120,318	2.4%
Total	**4,943,91.**	**100%**

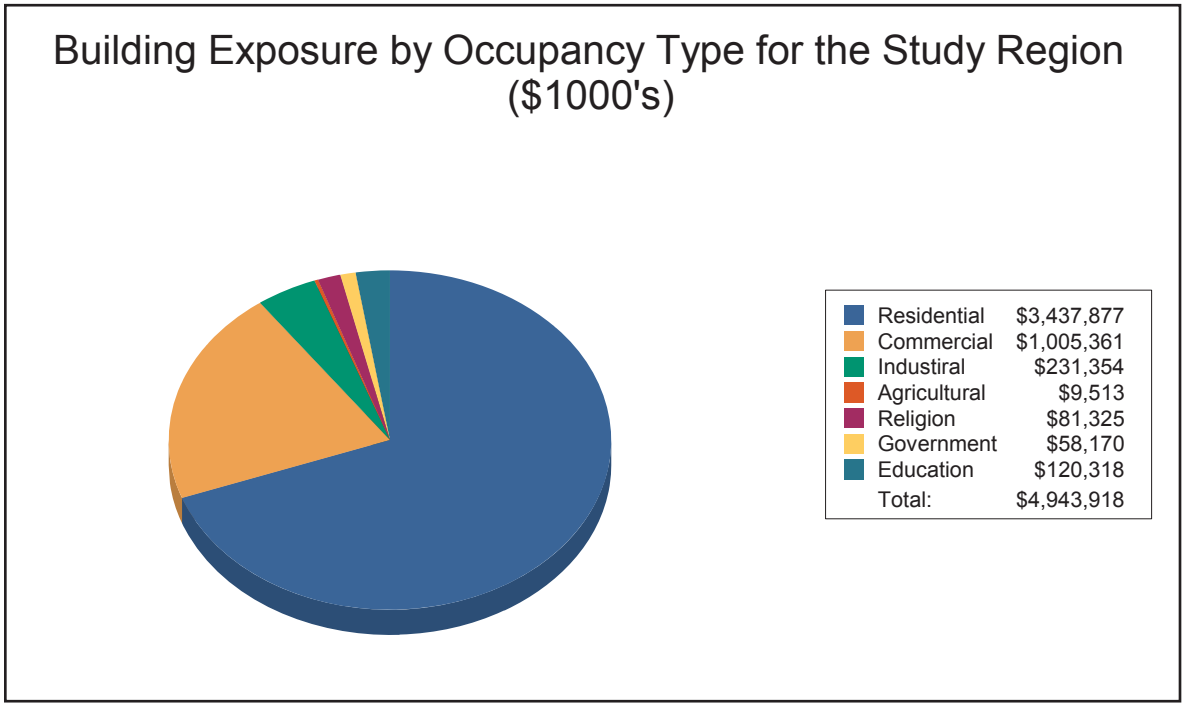
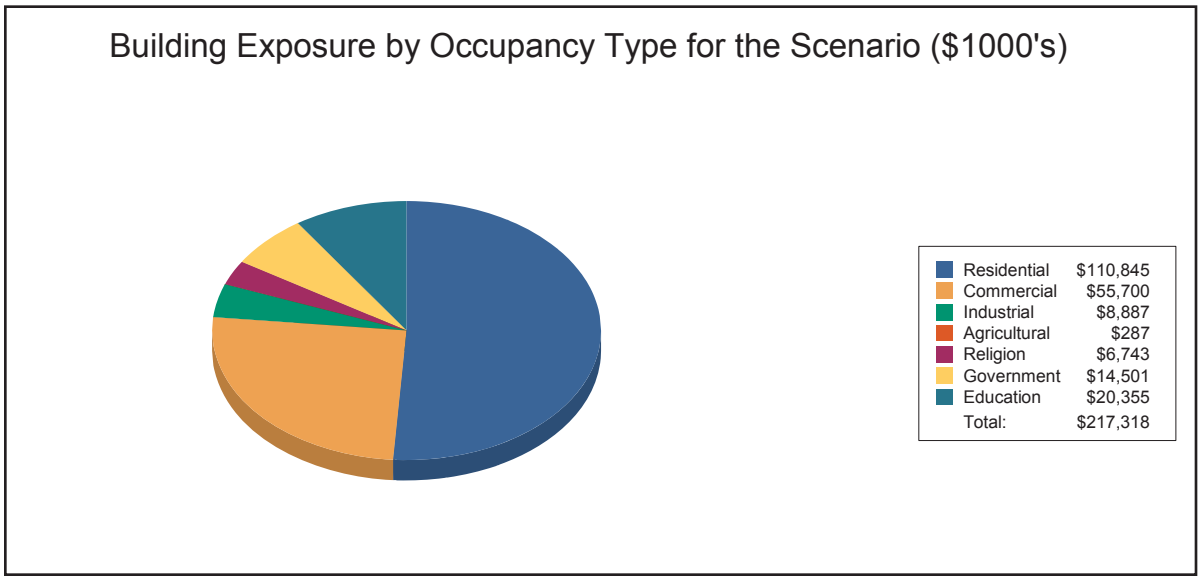


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	110,845	51.0%
Commercial	55,700	25.6%
Industrial	8,887	4.1%
Agricultural	287	0.1%
Religion	6,743	3.1%
Government	14,501	6.7%
Education	20,355	9.4%
Total	**217,31.**	**100%w**



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 184 beds.
There are 21 schools, 6 fire stations, 2 police stations and no emergency operation centers.

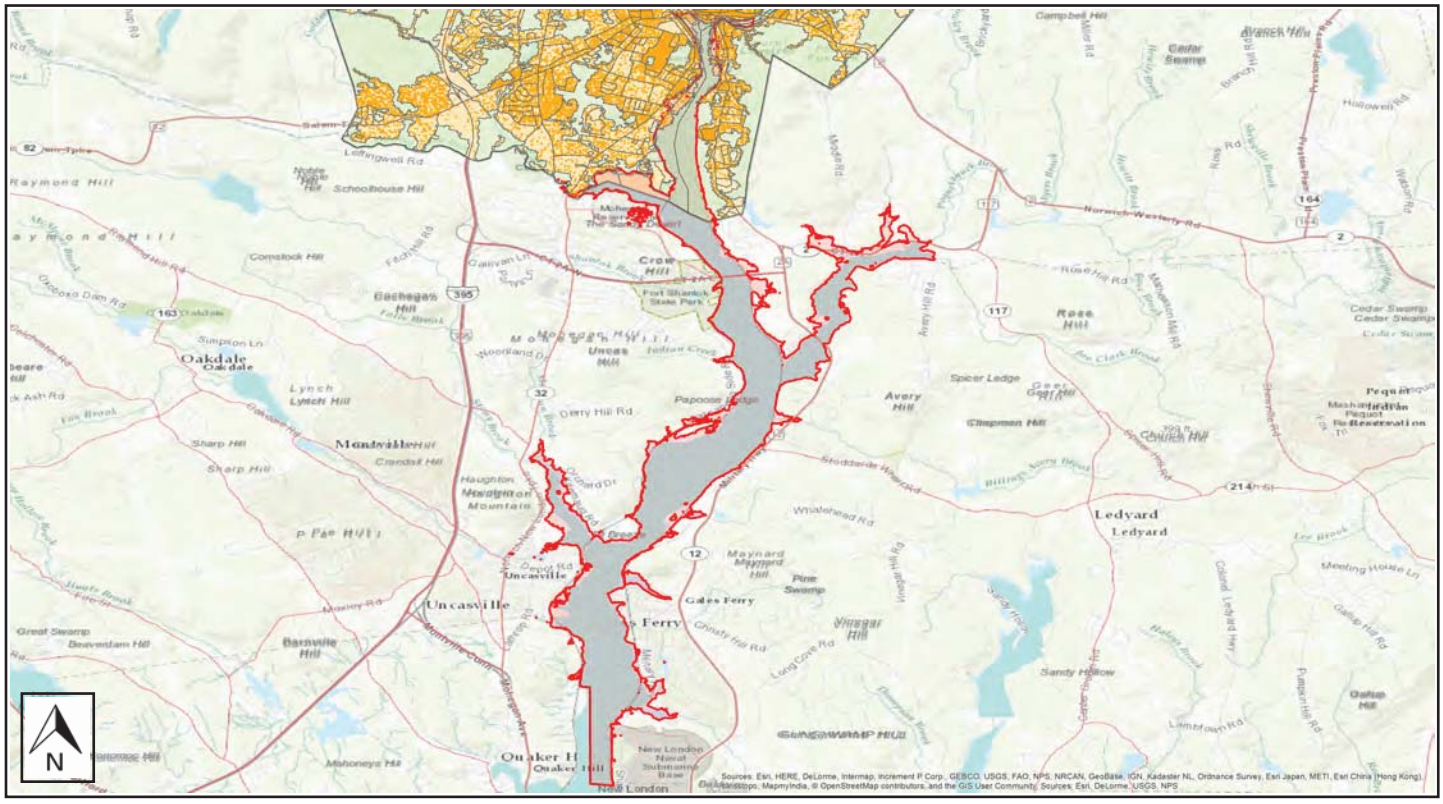
Flood Scenario Parameters

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

Study Region Name:	NorwichTidal
Scenario Name:	Norwich Tidal
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 9 buildings will be at least moderately damaged. This is over 64% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

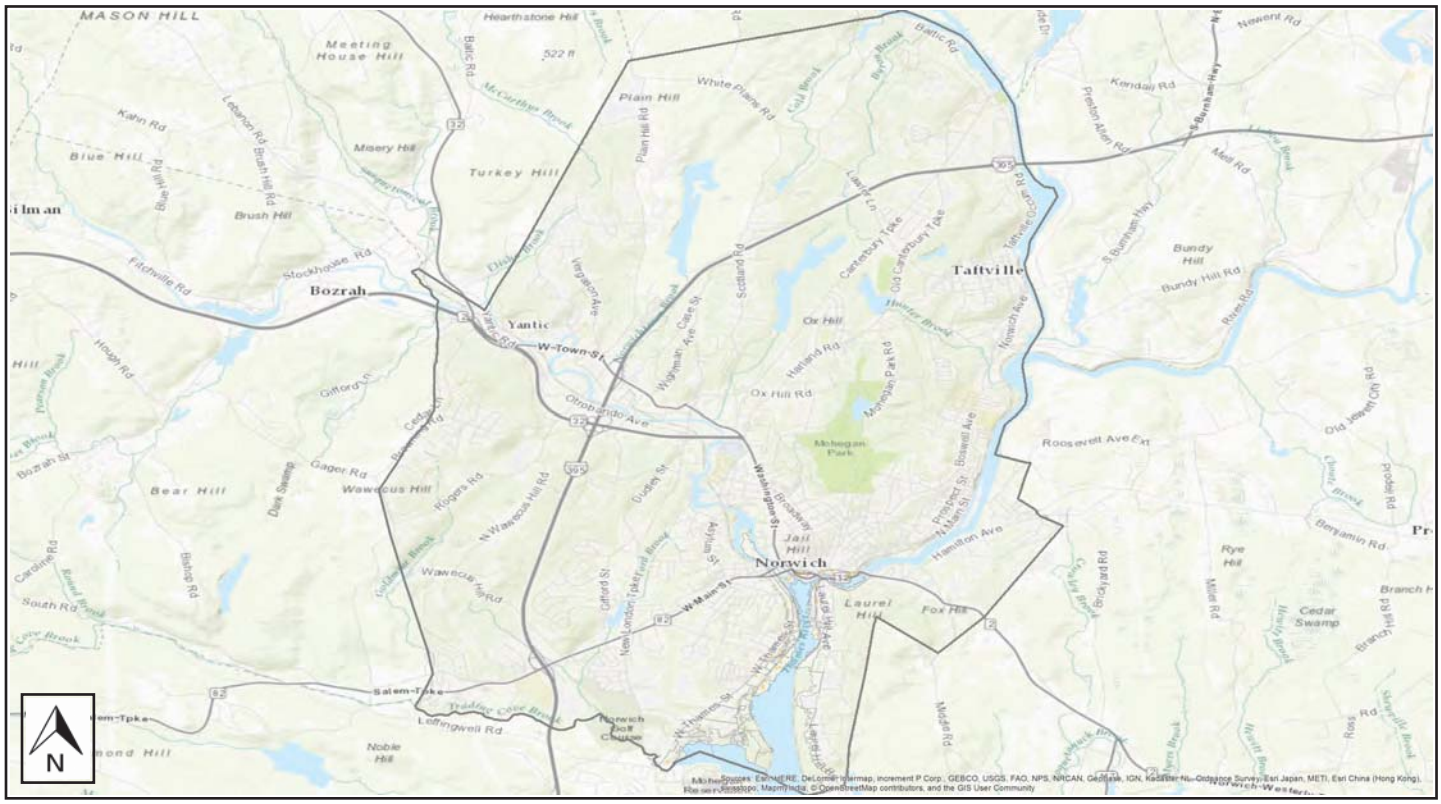


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	2	22.22	5	55.56	2	22.22	0	0.00	0	0.00
Total	**0**		**2**		**5**		**2**		**0**		**0**	

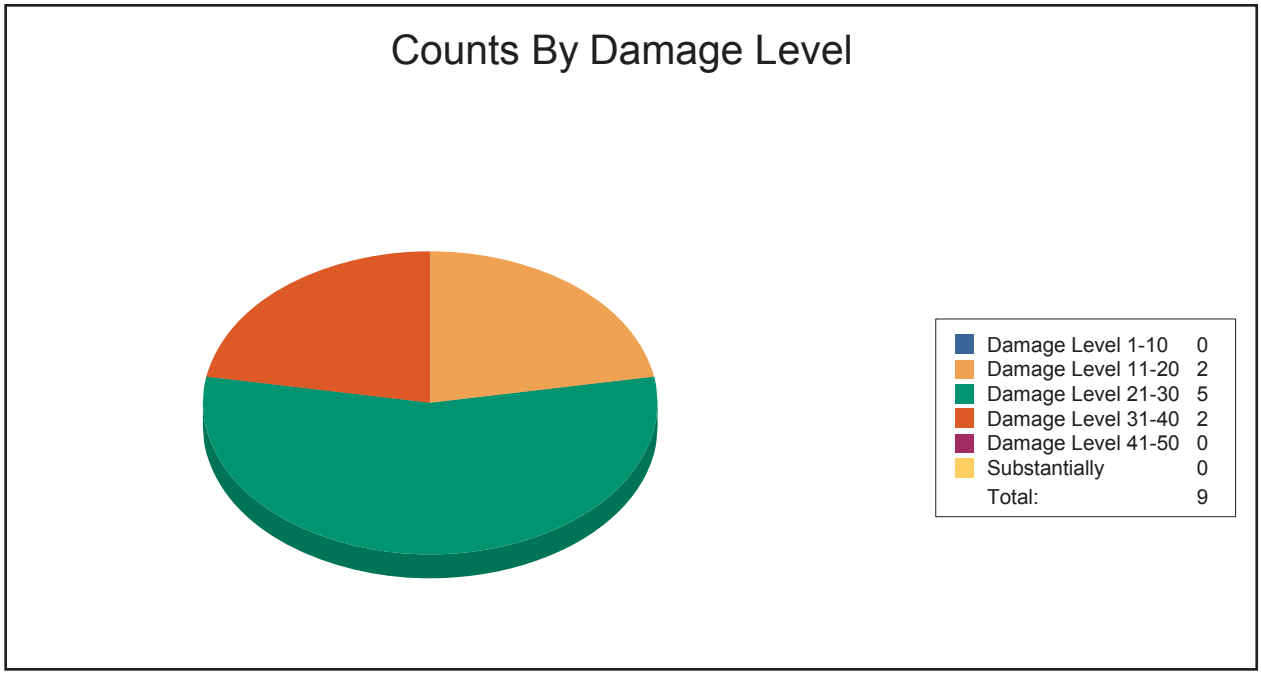


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	2	22	5	56	2	22	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 184 hospital beds available for use. On the day of the scenario flood event, the model estimates that 184 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	6	0	0	0
Hospitals	1	0	0	0
Police Stations	2	0	0	0
Schools	21	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

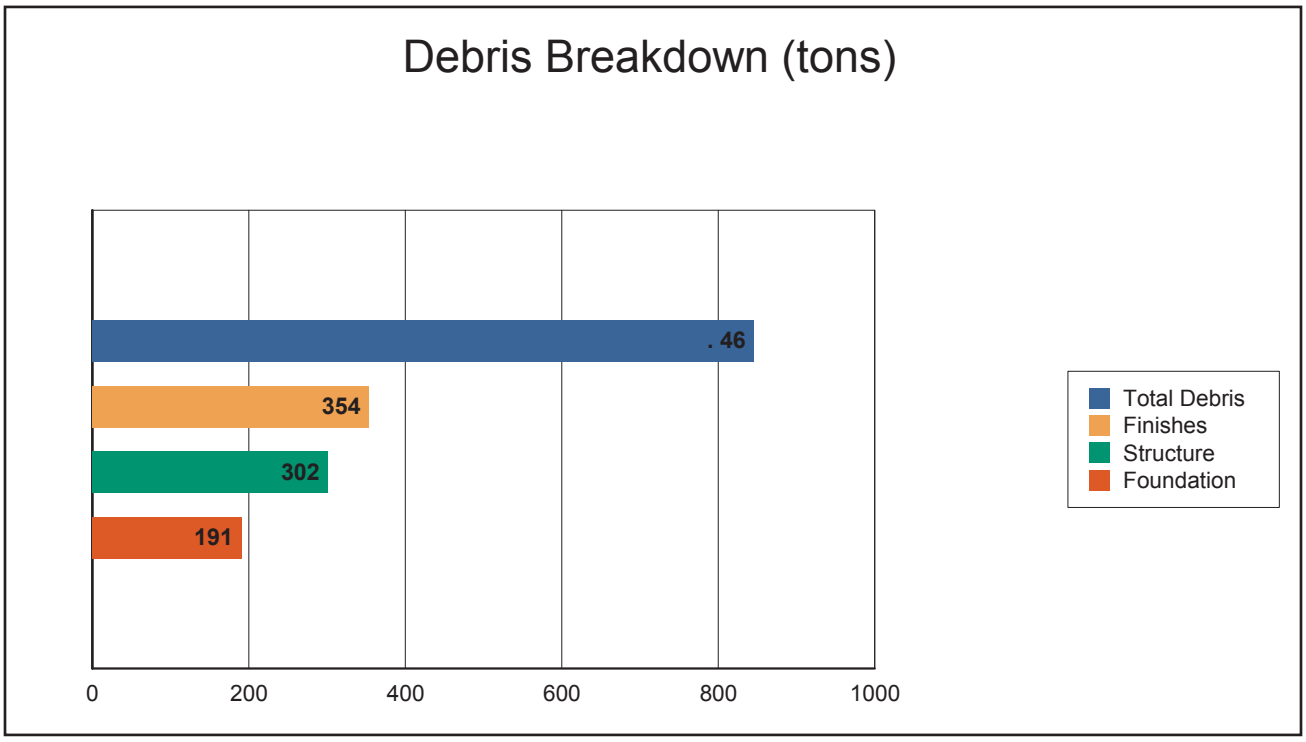
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

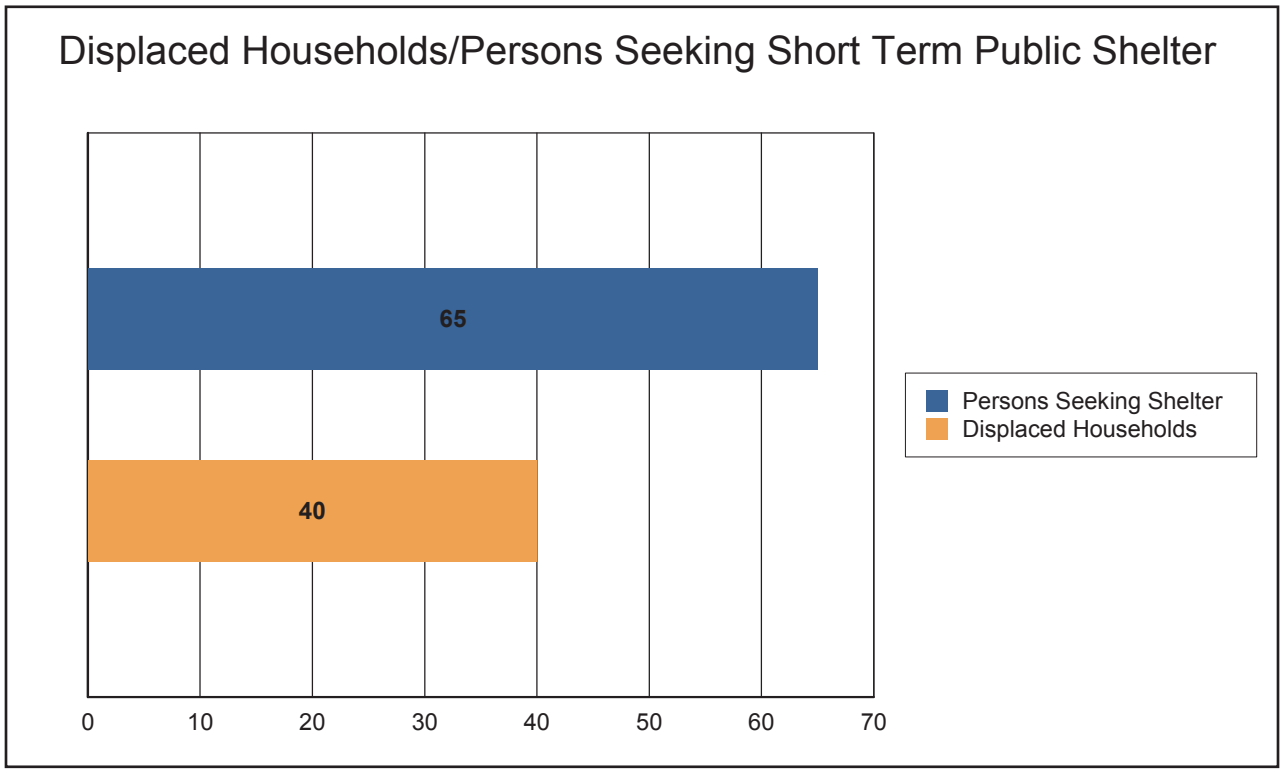


The model estimates that a total of 846 tons of debris will be generated. Of the total amount, Finishes comprises 42% of the total, Structure comprises 36% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 34 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 40 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 65 people (out of a total population of 40,493) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 27.14 million dollars, which represents 12.49 % of the total replacement value of the scenario buildings.

Building-Related Losses

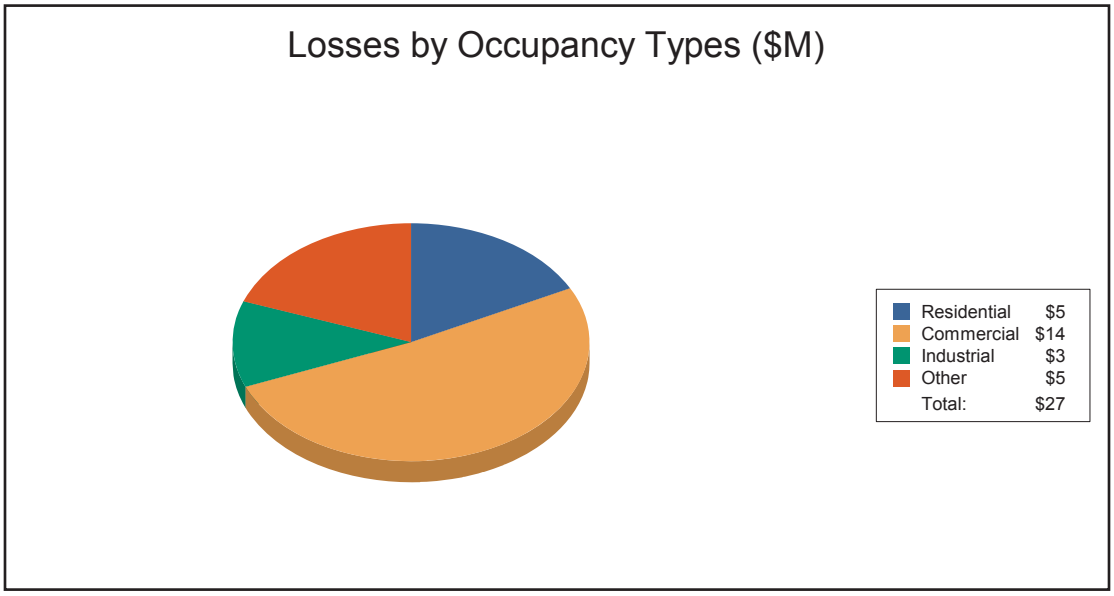
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 26.93 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 17.46% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.62	3.95	0.82	0.94	8.33
	Content	2.11	9.67	1.99	4.20	17.98
	Inventory	0.00	0.29	0.32	0.00	0.62
	Subtotal	**4.74**	**13.92**	**3.14**	**5.14**	**26.93**
Business Interruption						
	Income	0.00	0.03	0.00	0.01	0.03
	Relocation	0.00	0.00	0.00	0.00	0.01
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.03	0.00	0.14	0.16
	Subtotal	**0.00**	**0.06**	**0.00**	**0.15**	**0.21**
ALL	**Total**	**4.74**	**13.97**	**3.14**	**5.29**	**27.14**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	40,493	3,437,877	1,506,041	4,943,918
Total	**40,493**	**3,437,. 77**	**1,506,041**	**4,943,91.**
Total Study Region	**40,493**	**3,437,. 77**	**1,506,041**	**4,943,91.**

Hazus-MH: Flood Global Risk Report

Region Name: Norwich

Flood Scenario: Norwich Riverine 100 Year

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 29 square miles and contains 781 census blocks. The region contains over 17 thousand households and has a total population of 40,493 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 13,144 buildings in the region with a total building replacement value (excluding contents) of 4,944 million dollars (2010 dollars). Approximately 89.68% of the buildings (and 69.54% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 13,144 buildings in the region which have an aggregate total replacement value of 4,944 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,437,877	69.5%
Commercial	1,005,361	20.3%
Industrial	231,354	4.7%
Agricultural	9,513	0.2%
Religion	81,325	1.6%
Government	58,170	1.2%
Education	120,318	2.4%
Total	**4,943,91.**	**100%**

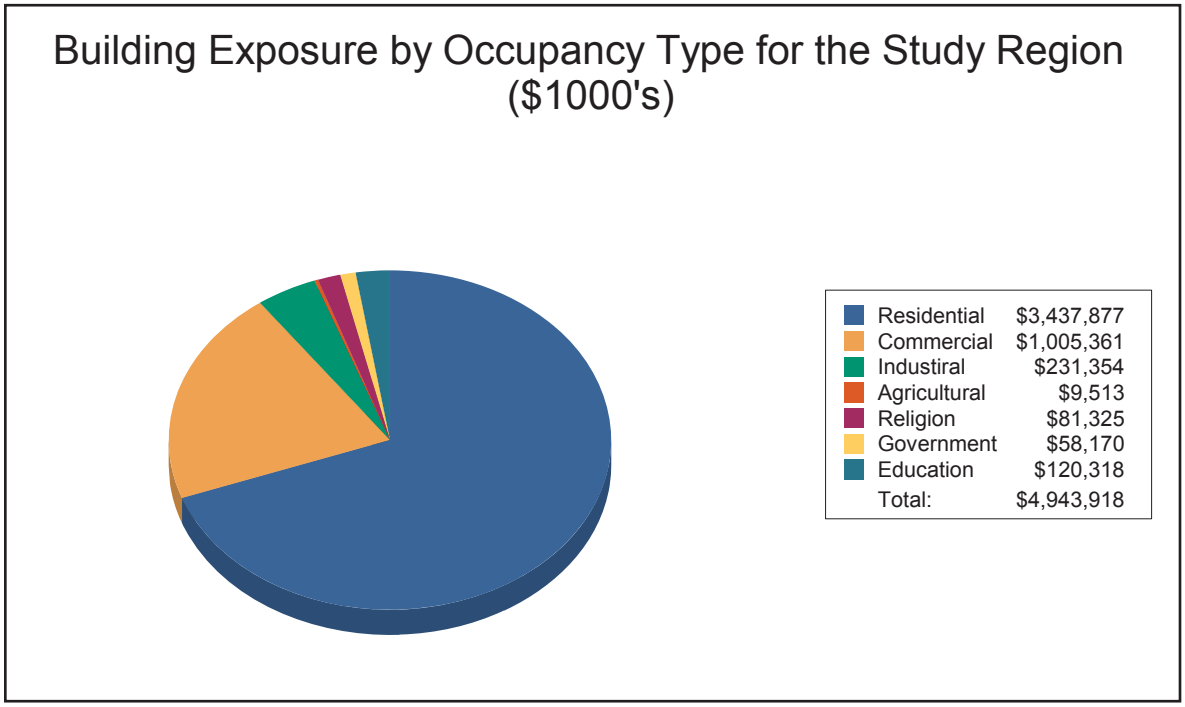
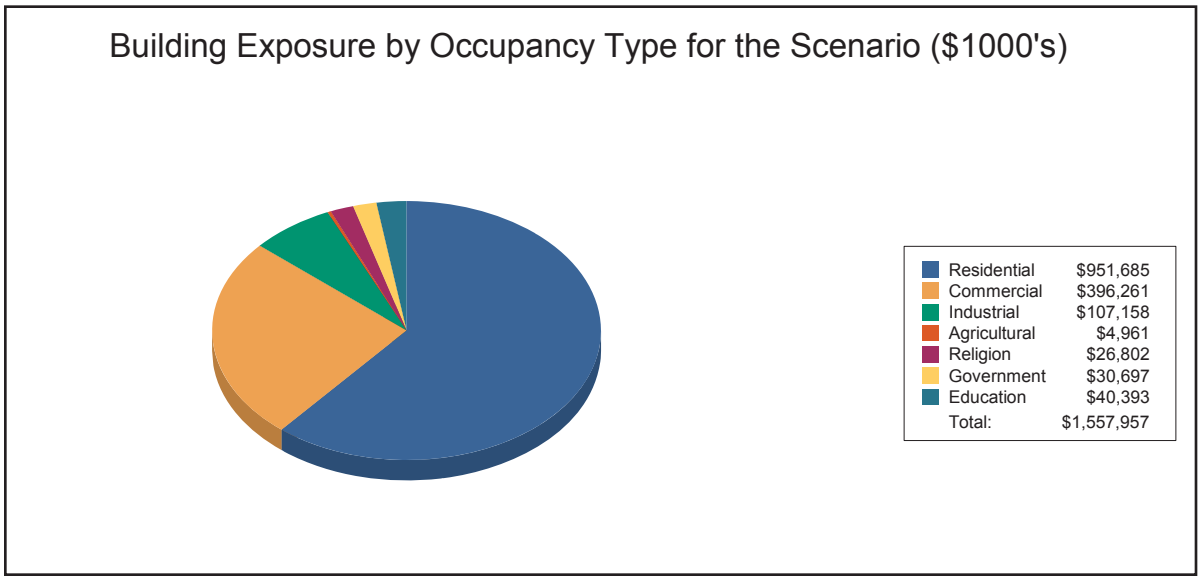


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	951,685	61.1%
Commercial	396,261	25.4%
Industrial	107,158	6.9%
Agricultural	4,961	0.3%
Religion	26,802	1.7%
Government	30,697	2.0%
Education	40,393	2.6%
Total	**1,557,957**	**100%**



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 184 beds.
There are 21 schools, 6 fire stations, 2 police stations and no emergency operation centers.

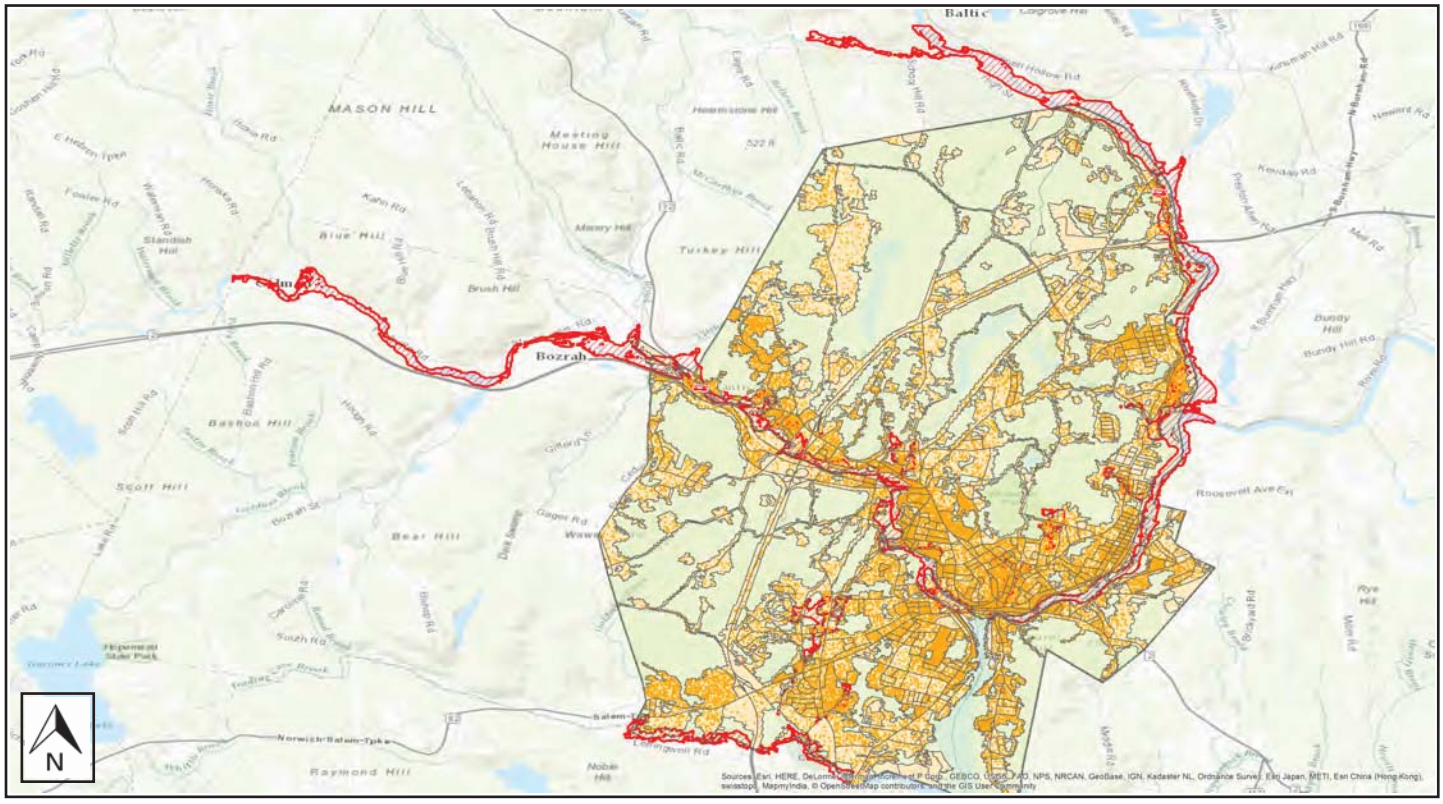
Flood Scenario Parameters

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

Study Region Name:	Norwich
Scenario Name:	Norwich Riverine 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 145 buildings will be at least moderately damaged. This is over 49% of the total number of buildings in the scenario. There are an estimated 69 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

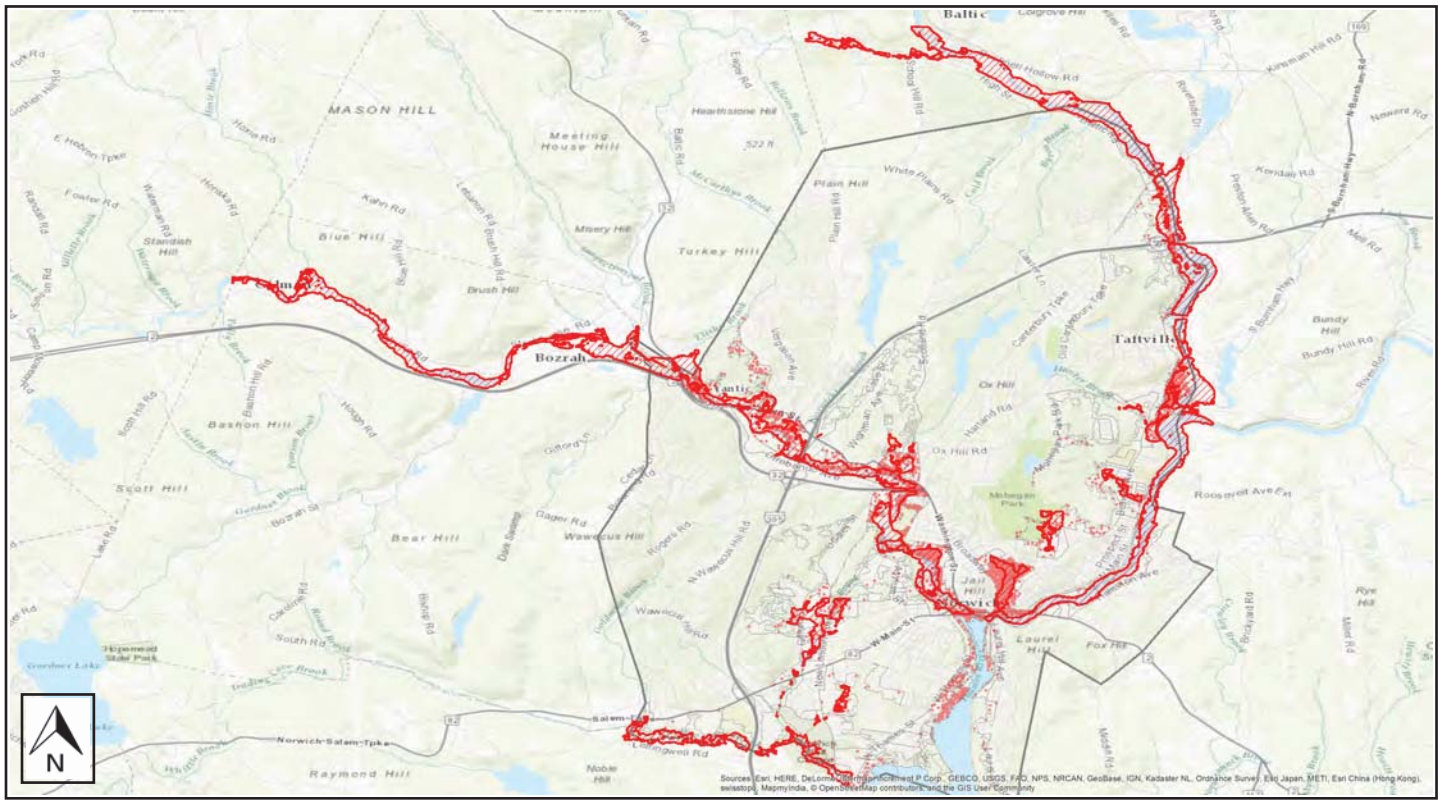


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	4	44.44	5	55.56	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	100.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	34	19.88	37	21.64	17	9.94	9	5.26	8	4.68	66	38.60
Total	**3.**		**42**		**17**		**9**		**.**		**69**	

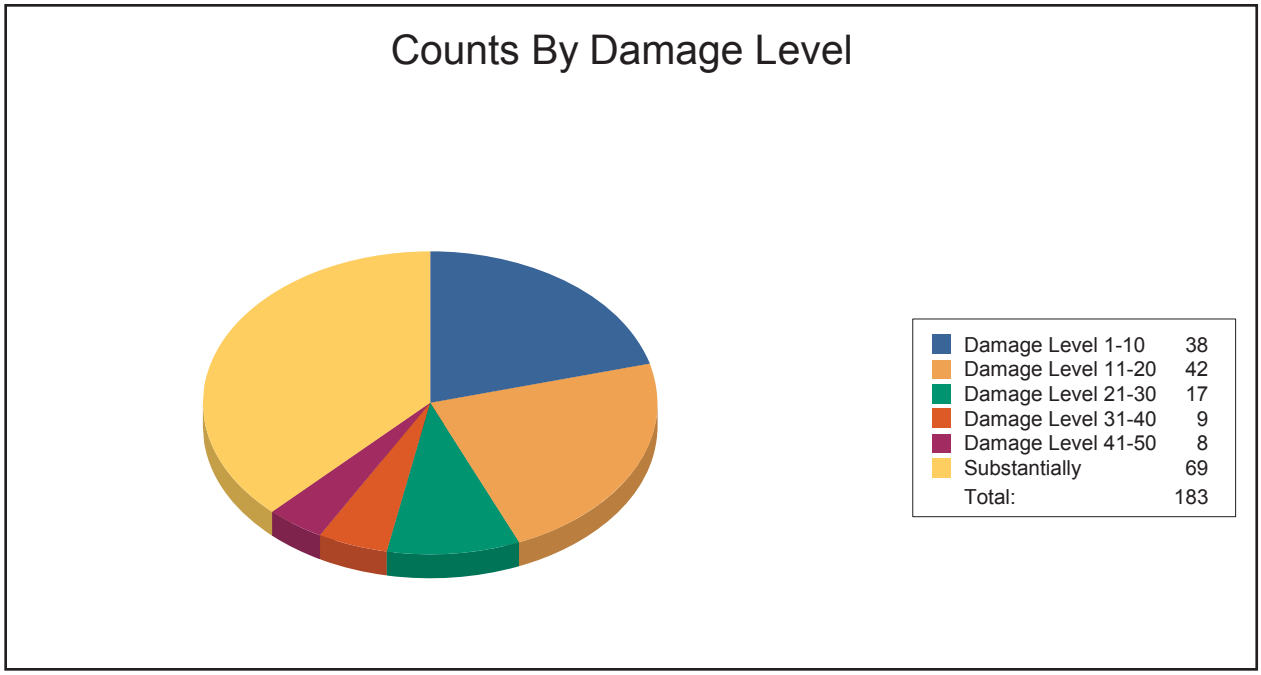


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	7	100
Masonry	1	10	2	20	1	10	1	10	1	10	4	40
Steel	3	50	1	17	0	0	0	0	0	0	2	33
Wood	34	22	36	23	16	10	8	5	7	4	55	35

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 184 hospital beds available for use. On the day of the scenario flood event, the model estimates that 184 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	6	1	0	1
Hospitals	1	0	0	0
Police Stations	2	0	0	0
Schools	21	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

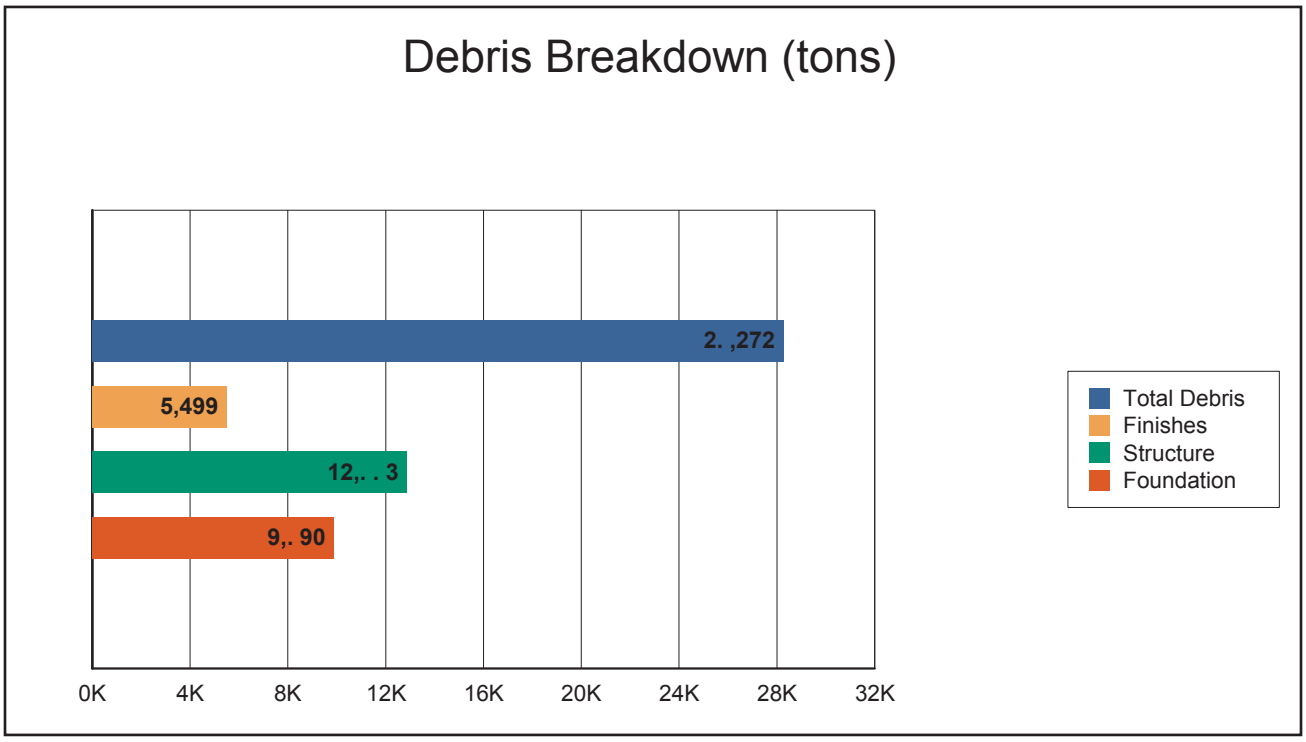
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

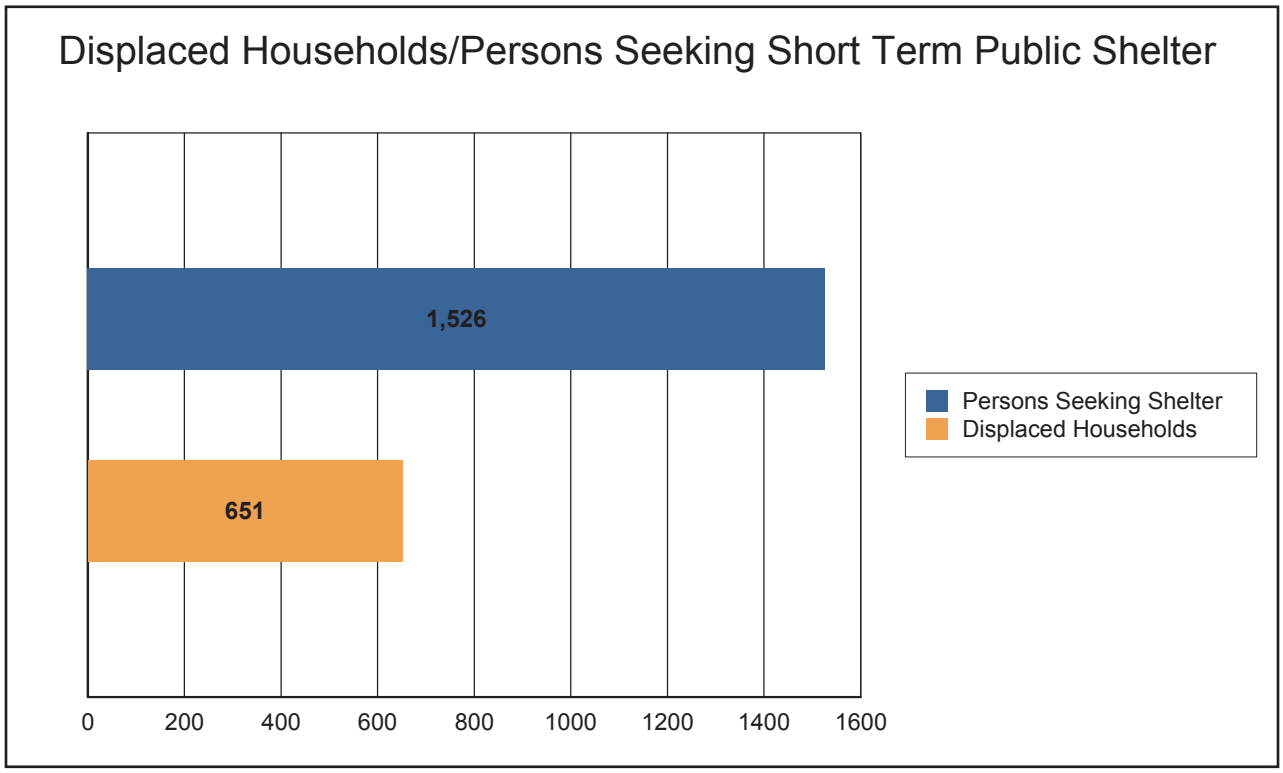


The model estimates that a total of 28,272 tons of debris will be generated. Of the total amount, Finishes comprises 19% of the total, Structure comprises 46% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 1,131 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 651 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,526 people (out of a total population of 40,493) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 232.43 million dollars, which represents 14.92 % of the total replacement value of the scenario buildings.

Building-Related Losses

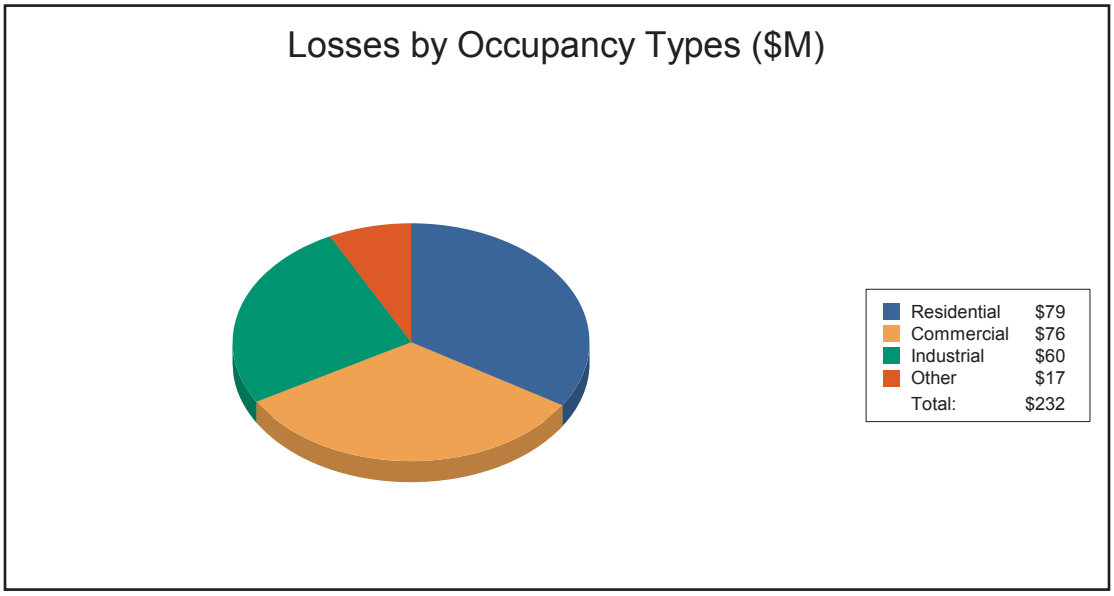
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 231.10 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 33.98% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	52.89	19.67	18.22	3.18	93.96
	Content	26.03	54.42	36.88	13.20	130.52
	Inventory	0.00	1.24	5.35	0.03	6.62
	Subtotal	**78.92**	**75.33**	**60.45**	**16.41**	**231.10**
Business Interruption						
	Income	0.00	0.20	0.00	0.02	0.22
	Relocation	0.03	0.04	0.00	0.01	0.08
	Rental Income	0.02	0.02	0.00	0.00	0.04
	Wage	0.00	0.30	0.00	0.69	0.99
	Subtotal	**0.05**	**0.56**	**0.00**	**0.71**	**1.33**
ALL	**Total**	**78.97**	**75.89**	**60.45**	**17.12**	**232.43**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	40,493	3,437,877	1,506,041	4,943,918
Total	**40,493**	**3,437,. 77**	**1,506,041**	**4,943,91.**
Total Study Region	**40,493**	**3,437,. 77**	**1,506,041**	**4,943,91.**

Hazus-MH: Flood Global Risk Report

Region Name: Preston

Flood Scenario: Preston 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 32 square miles and contains 199 census blocks. The region contains over 2 thousand households and has a total population of 4,726 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 2,158 buildings in the region with a total building replacement value (excluding contents) of 615 million dollars (2010 dollars). Approximately 91.47% of the buildings (and 83.80% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 2,158 buildings in the region which have an aggregate total replacement value of 615 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	515,175	83.8%
Commercial	56,153	9.1%
Industrial	14,765	2.4%
Agricultural	18,229	3.0%
Religion	7,397	1.2%
Government	858	0.1%
Education	2,170	0.4%
Total	**614,747**	**100.0%**

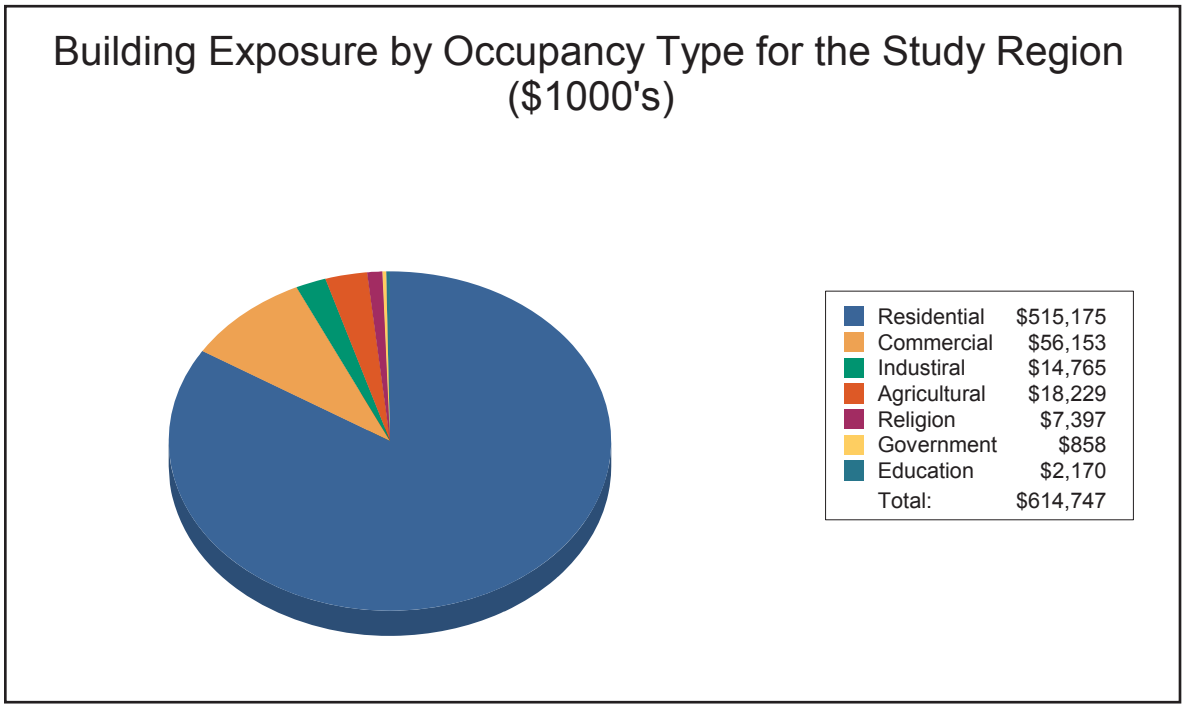
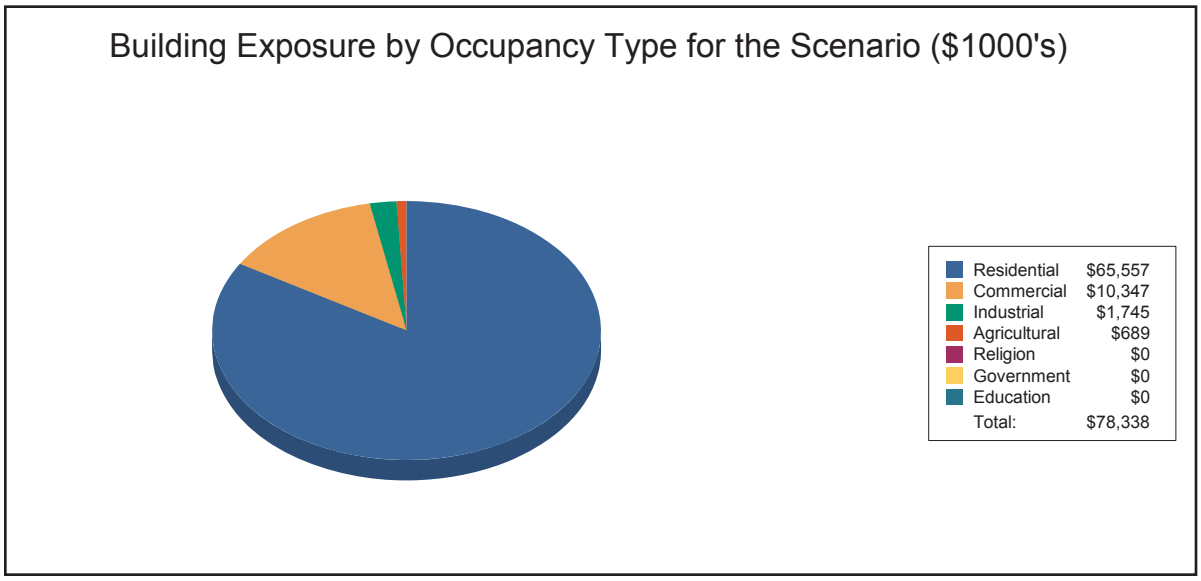


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	65,557	83.7%
Commercial	10,347	13.2%
Industrial	1,745	2.2%
Agricultural	689	0.9%
Religion	0	0.0%
Government	0	0.0%
Education	0	0.0%
Total	**7w,33w**	**100.0%**



Essential Facility Inventory

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

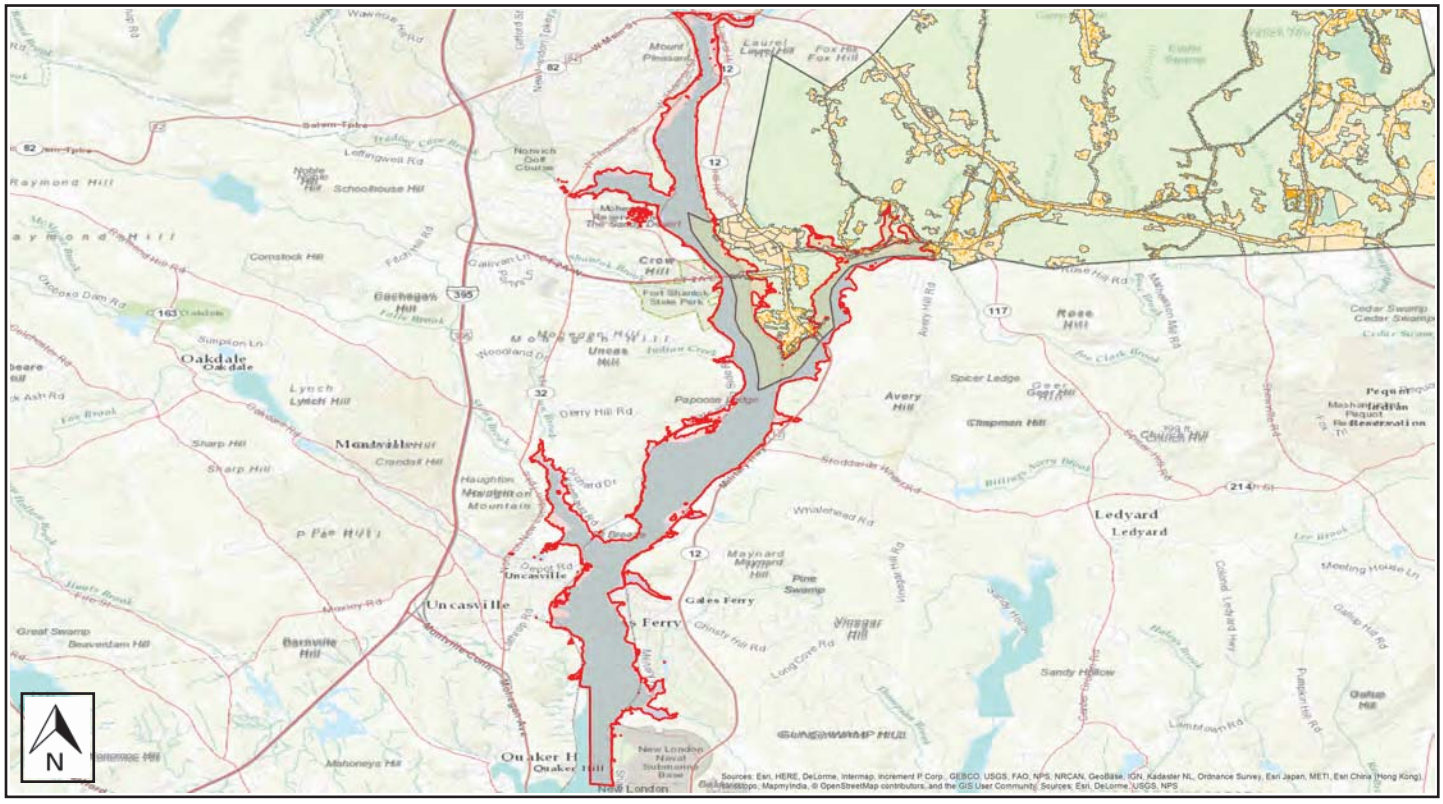
Flood Scenario Parameters

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

Study Region Name:	Preston
Scenario Name:	Preston 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

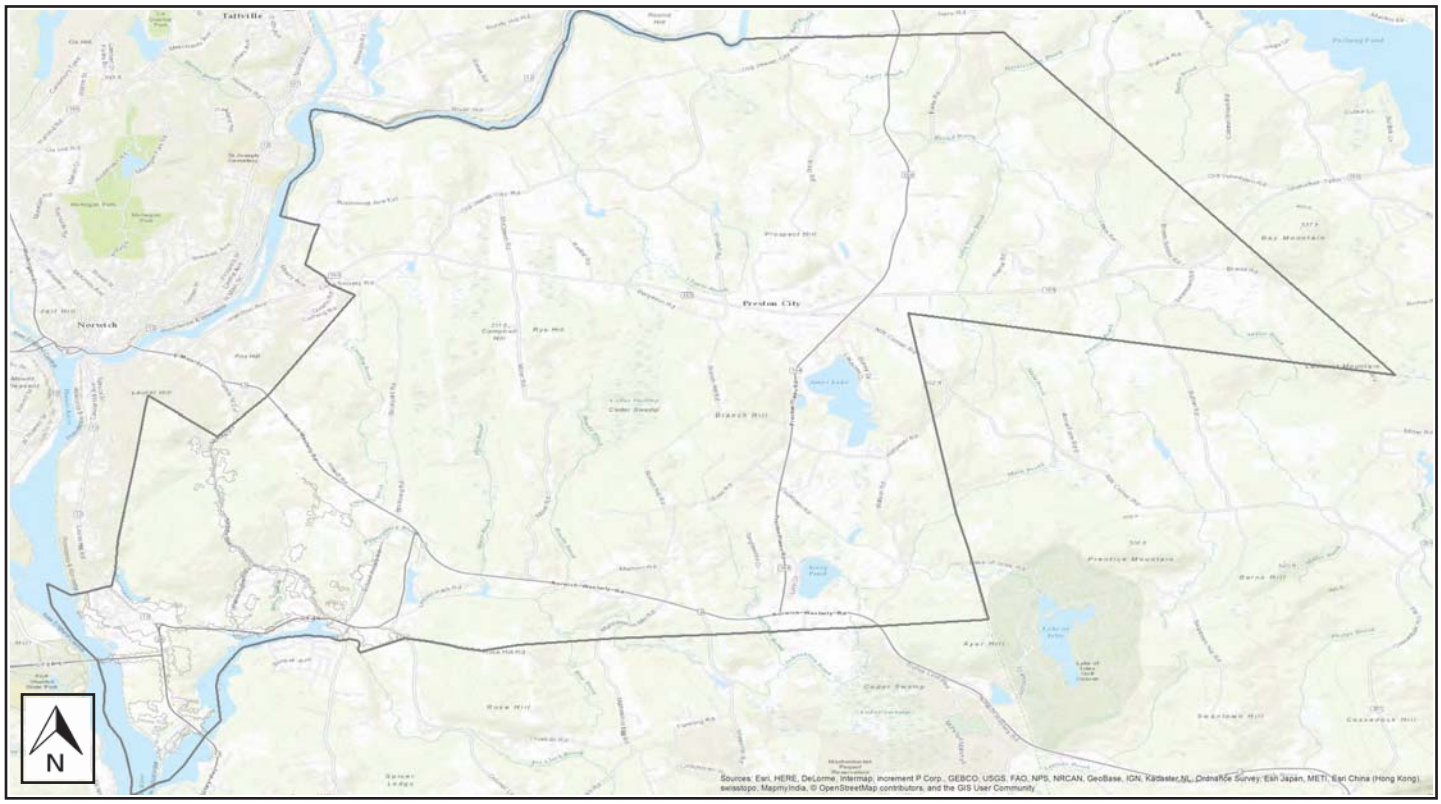


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

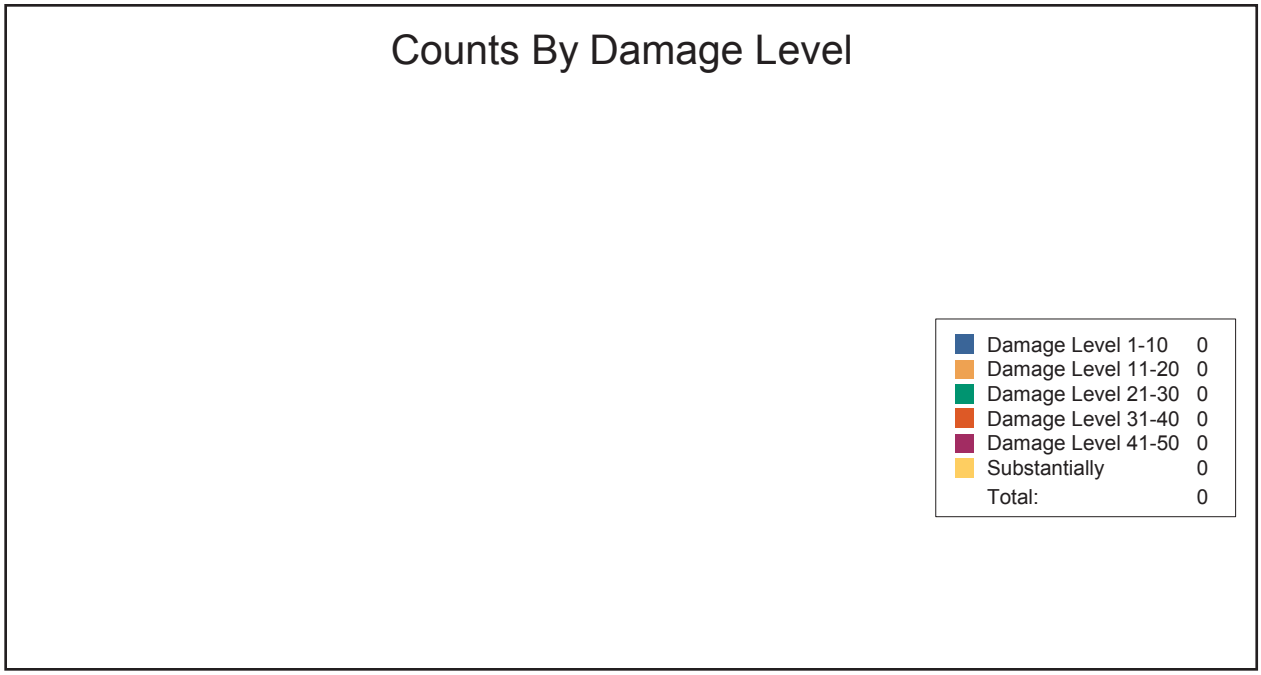


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	2	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

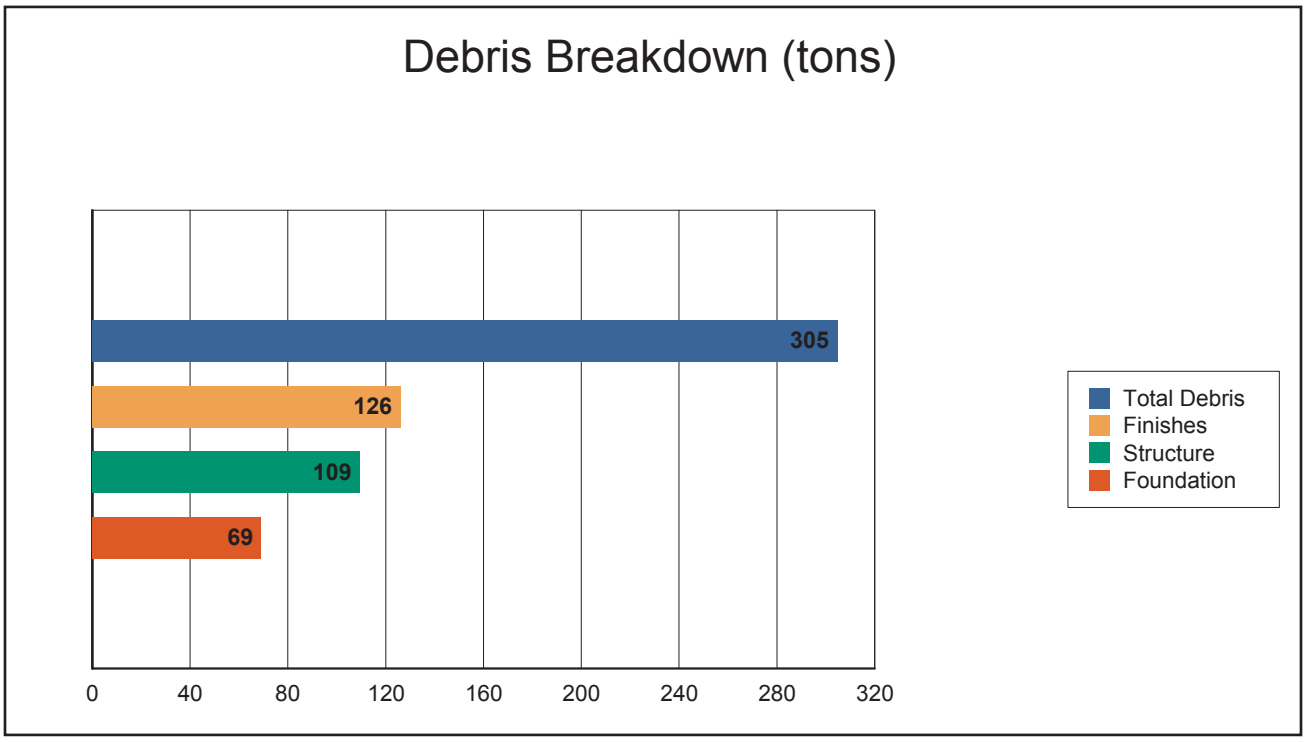
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

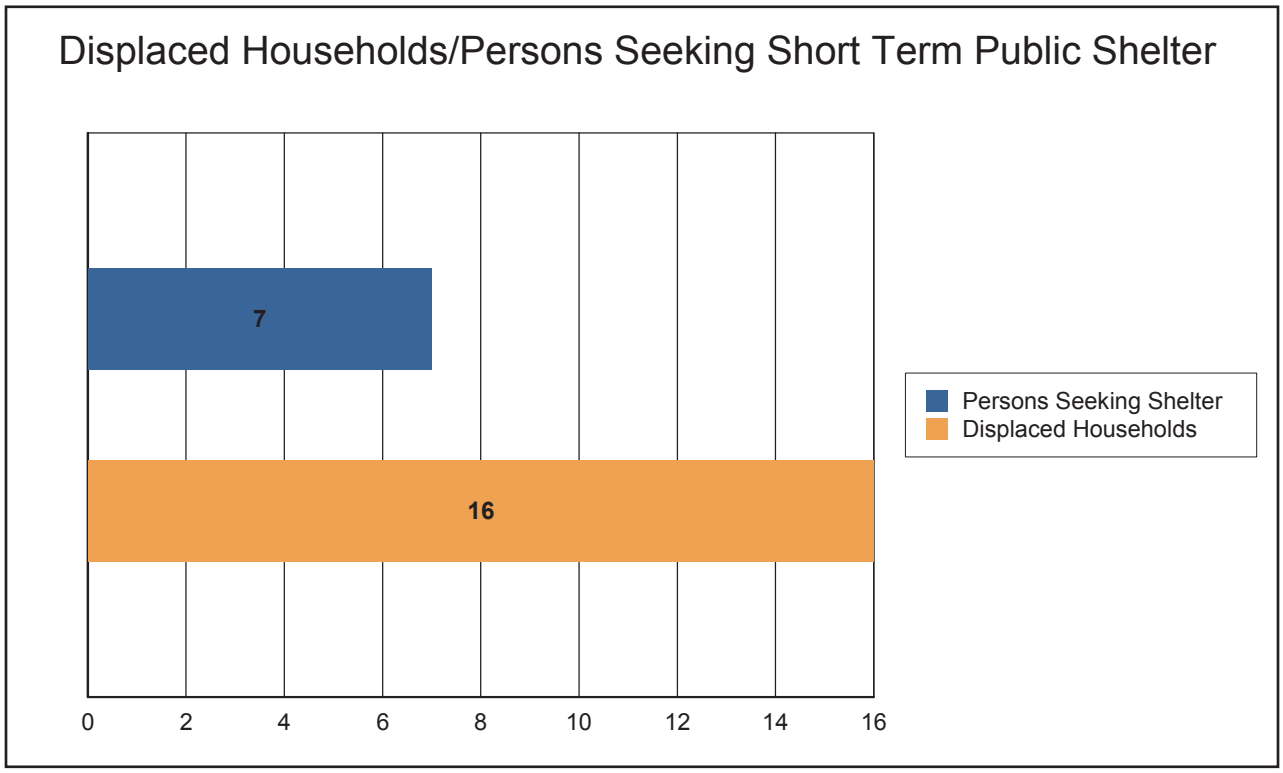


The model estimates that a total of 305 tons of debris will be generated. Of the total amount, Finishes comprises 41% of the total, Structure comprises 36% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 12 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 16 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 7 people (out of a total population of 4,726) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 2.93 million dollars, which represents 3.73 % of the total replacement value of the scenario buildings.

Building-Related Losses

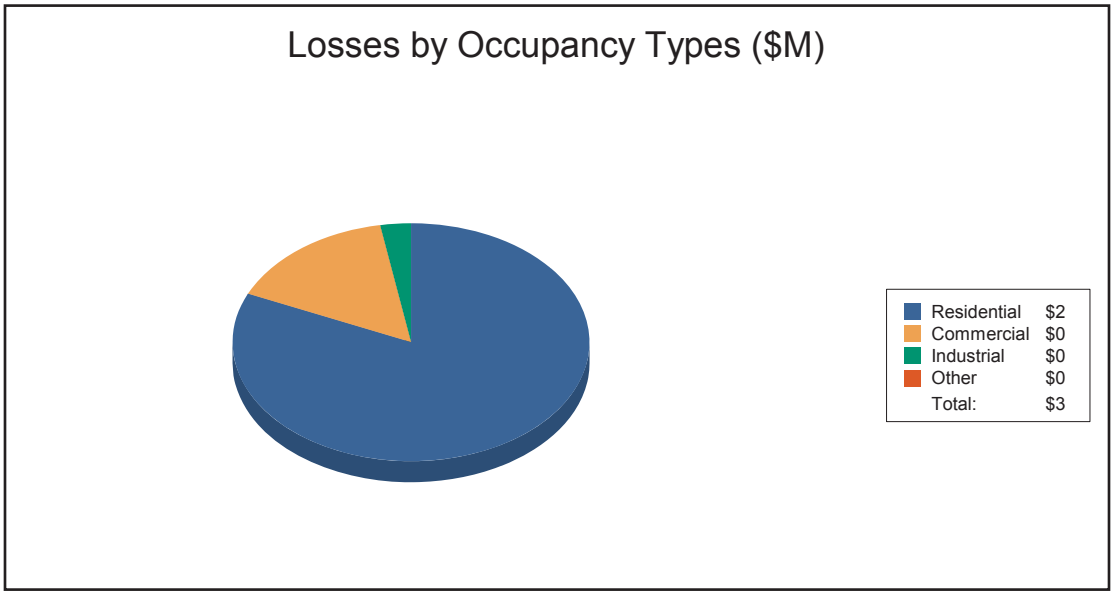
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 2.93 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 81.57% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.50	0.12	0.03	0.00	1.65
	Content	0.89	0.34	0.05	0.00	1.27
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**2.39**	**0.46**	**0.0w**	**0.00**	**2.93**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**2.39**	**0.46**	**0.0w**	**0.00**	**2.93**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	4,726	515,175	99,572	614,747
Total	**4,726**	**515,175**	**99,572**	**614,747**
Total Study Region	**4,726**	**515,175**	**99,572**	**614,747**

Hazus-MH: Flood Global Risk Report

Region Name: Preston

Flood Scenario: Preston Riverine 100 Year

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 32 square miles and contains 199 census blocks. The region contains over 2 thousand households and has a total population of 4,726 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 2,158 buildings in the region with a total building replacement value (excluding contents) of 615 million dollars (2010 dollars). Approximately 91.47% of the buildings (and 83.80% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 2,158 buildings in the region which have an aggregate total replacement value of 615 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	515,175	83.8%
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Industrial	14,765	2.4%
Agricultural	18,229	3.0%
Religion	7,397	1.2%
Government	858	0.1%
Education	2,170	0.4%
Total	**614,747**	**100.0%**

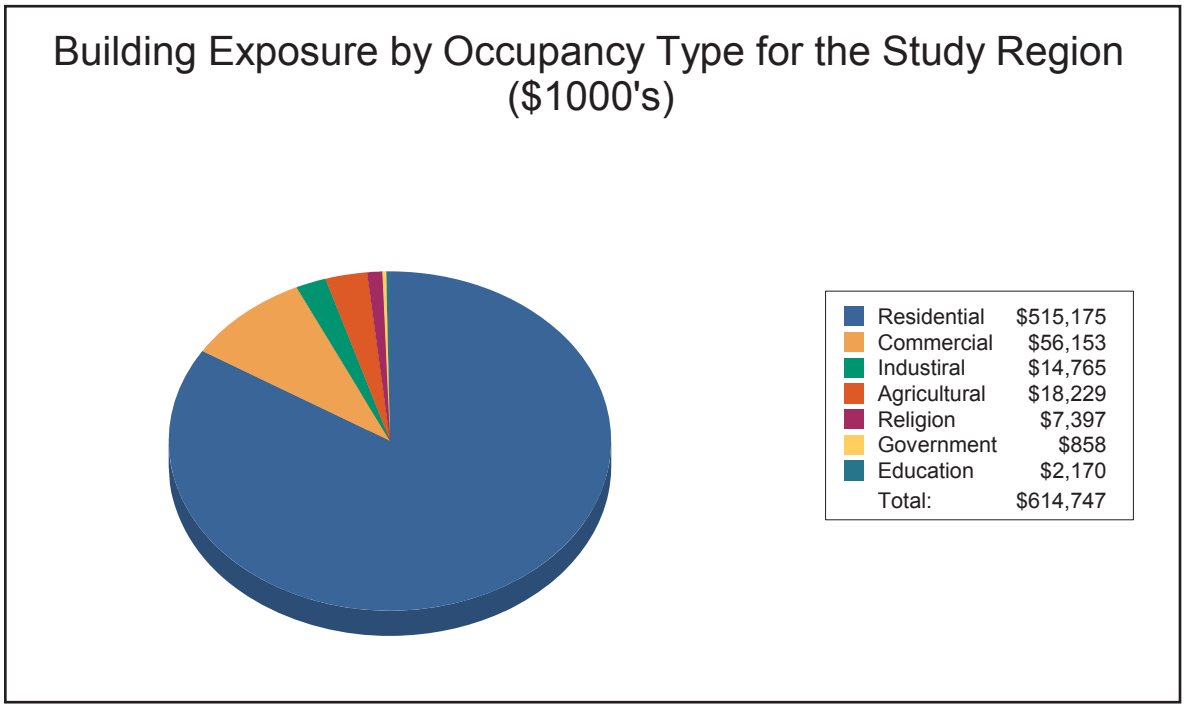
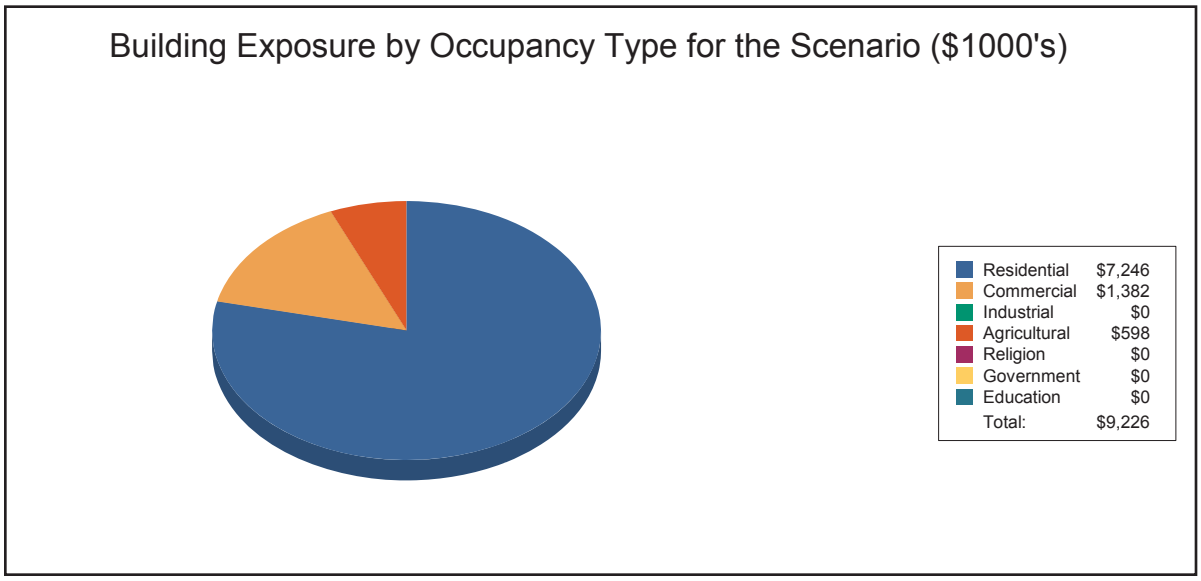


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	7,246	78.5%
Commercial	1,382	15.0%
Industrial	0	0.0%
Agricultural	598	6.5%
Religion	0	0.0%
Government	0	0.0%
Education	0	0.0%
Total	**9,226**	**100.0%**



Essential Facility Inventory

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

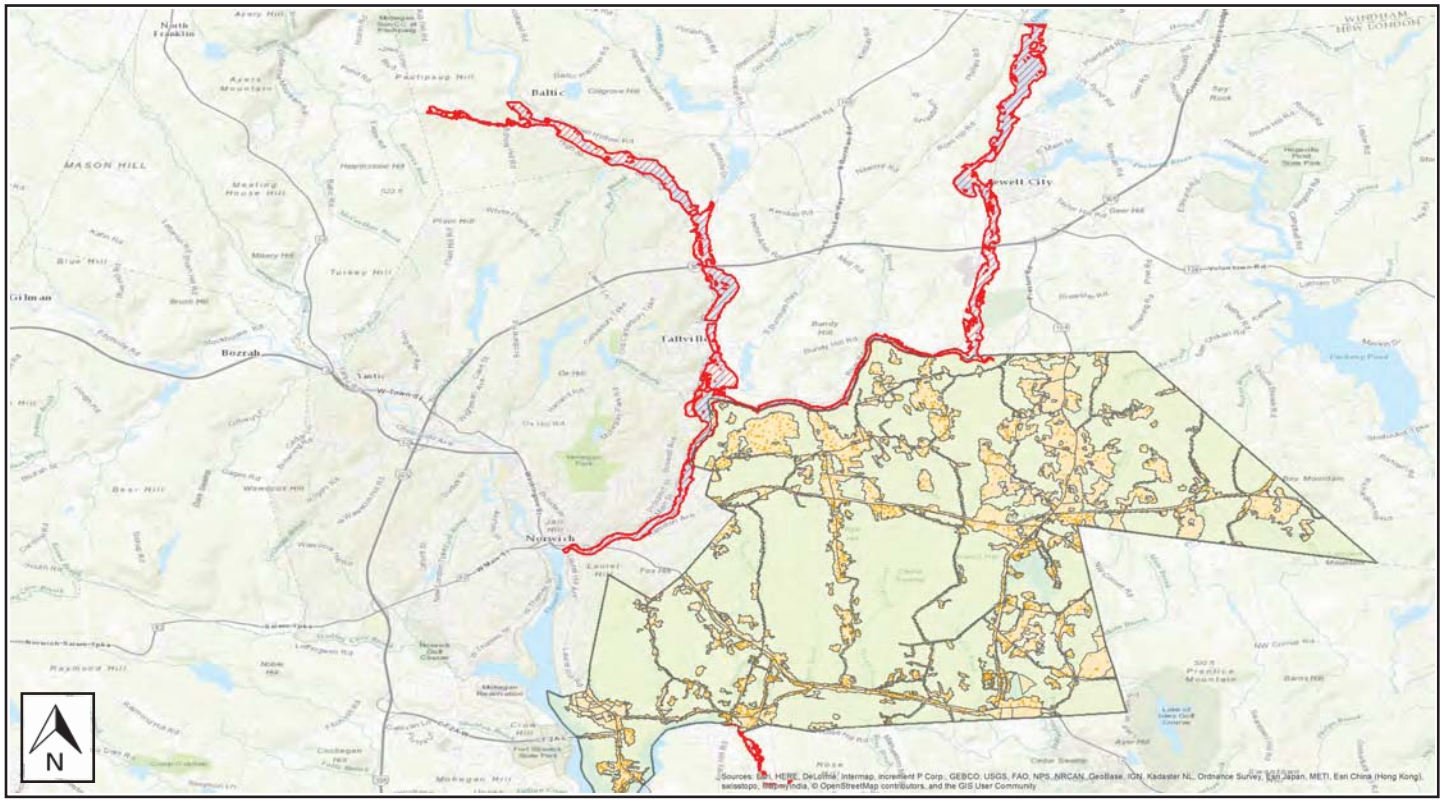
Flood Scenario Parameters

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

Study Region Name:	Preston
Scenario Name:	Preston Riverine 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

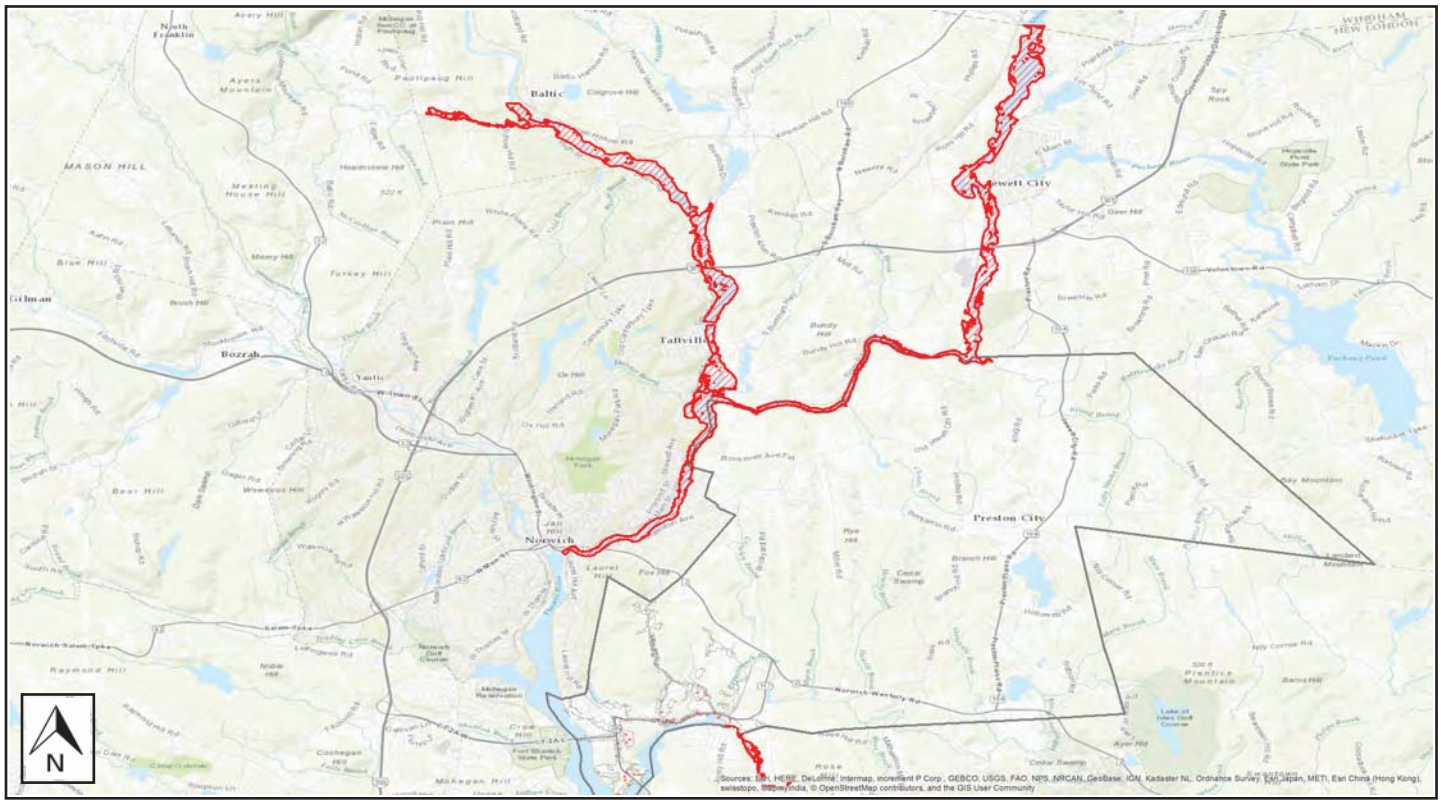


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

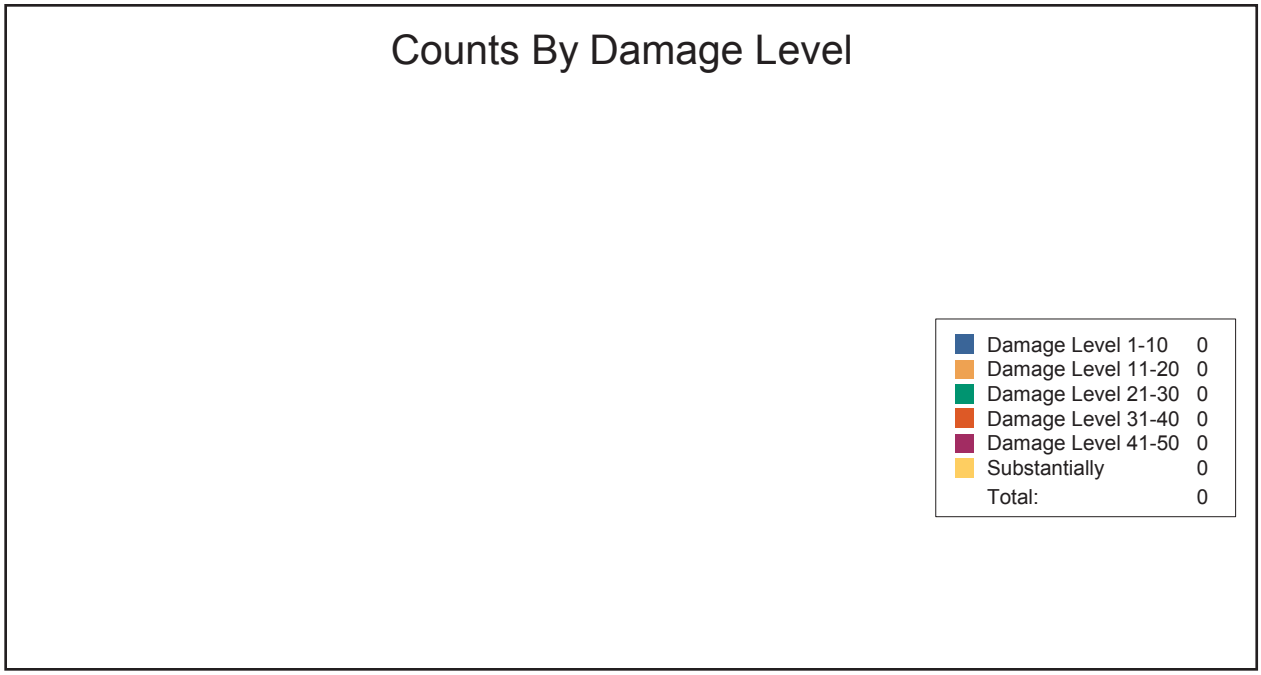


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	2	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

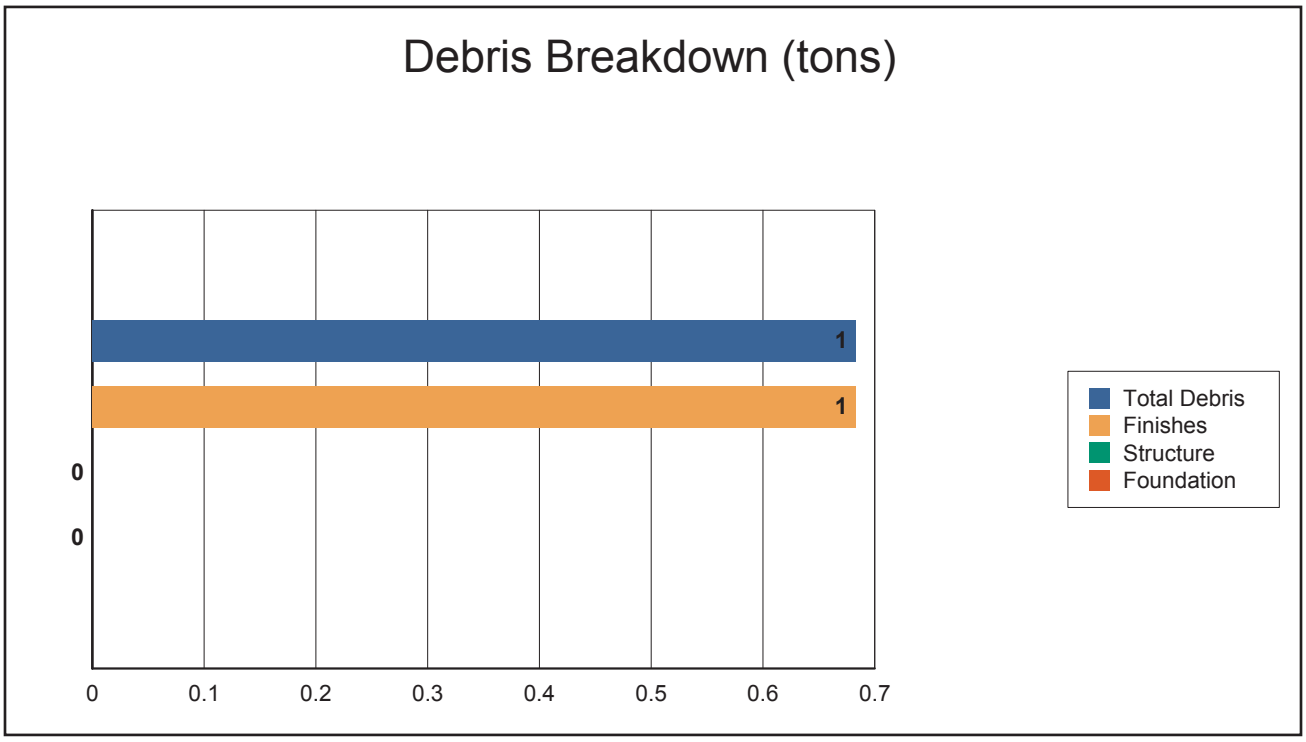
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

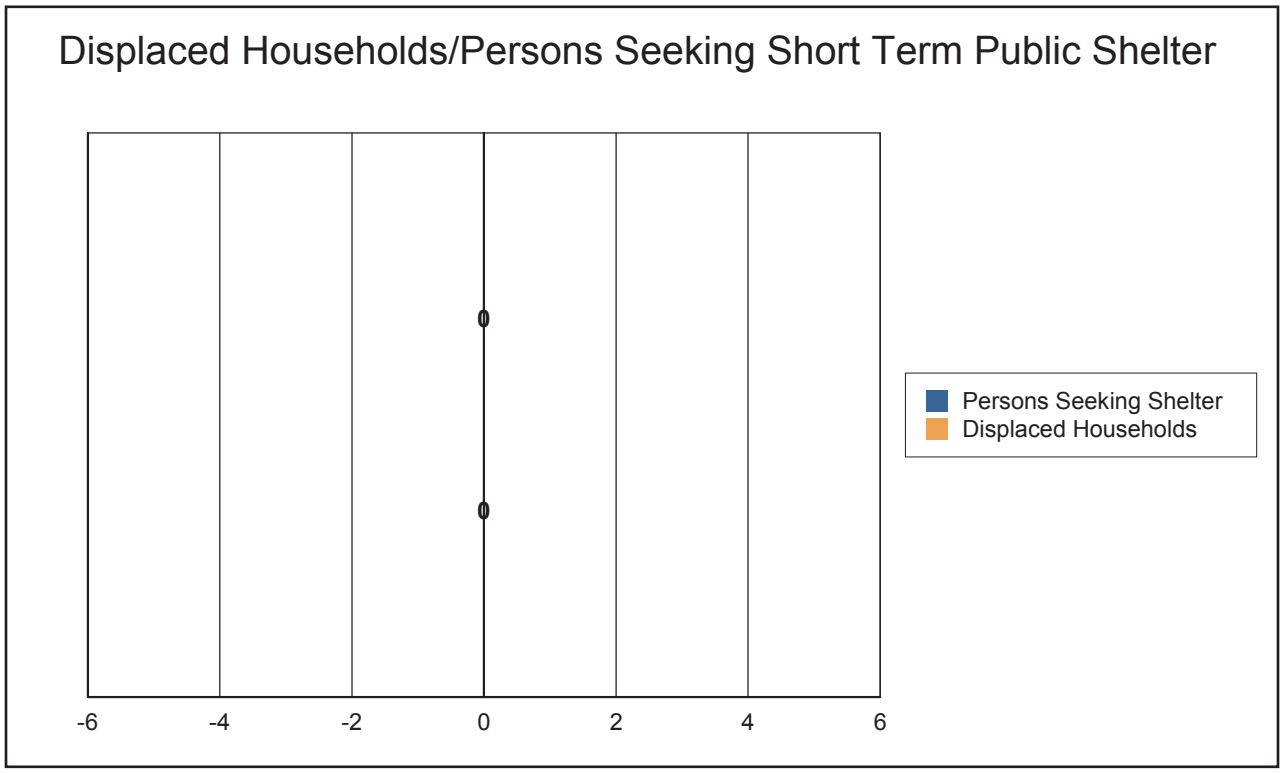


The model estimates that a total of 1 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 0 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 4,726) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.01 million dollars, which represents 0.09 % of the total replacement value of the scenario buildings.

Building-Related Losses

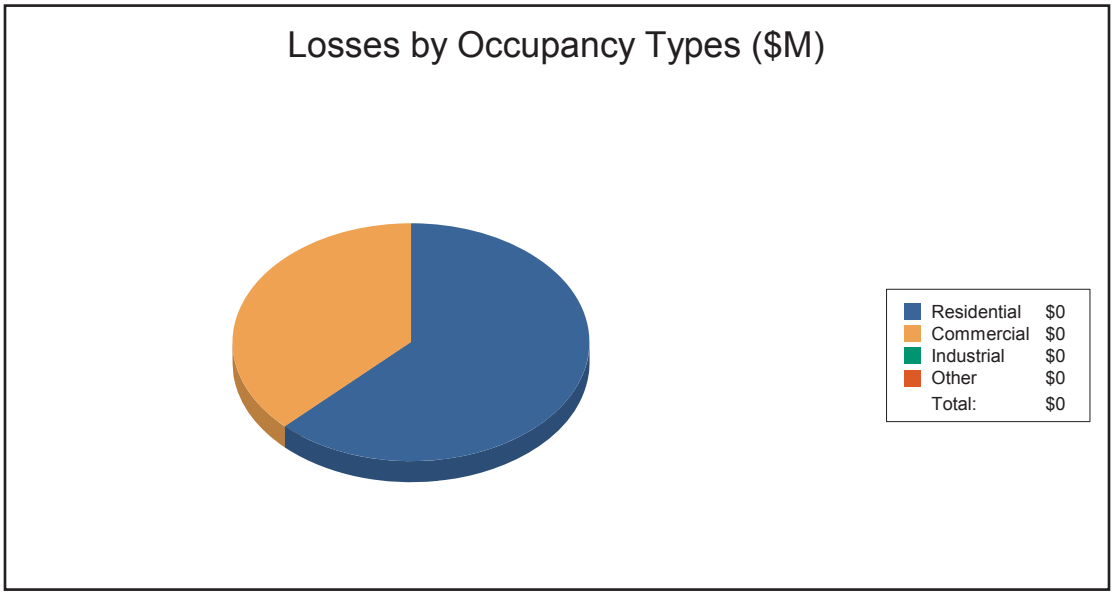
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.01 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 62.50% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.00**	**0.00**	**0.00**	**0.01**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.01**	**0.00**	**0.00**	**0.00**	**0.01**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	4,726	515,175	99,572	614,747
Total	**4,726**	**515,175**	**99,572**	**614,747**
Total Study Region	**4,726**	**515,175**	**99,572**	**614,747**

Hazus-MH: Flood Global Risk Report

Region Name: Salem

Flood Scenario: Salem 100 Year Flood

Print Date: Friday, May 19, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 30 square miles and contains 131 census blocks. The region contains over 2 thousand households and has a total population of 4,151 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,709 buildings in the region with a total building replacement value (excluding contents) of 497 million dollars (2010 dollars). Approximately 91.75% of the buildings (and 85.34% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,709 buildings in the region which have an aggregate total replacement value of 497 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	424,026	85.3%
Commercial	47,392	9.5%
Industrial	11,053	2.2%
Agricultural	3,928	0.8%
Religion	3,774	0.8%
Government	5,676	1.1%
Education	1,016	0.2%
Total	**496,. 65**	**100%w**

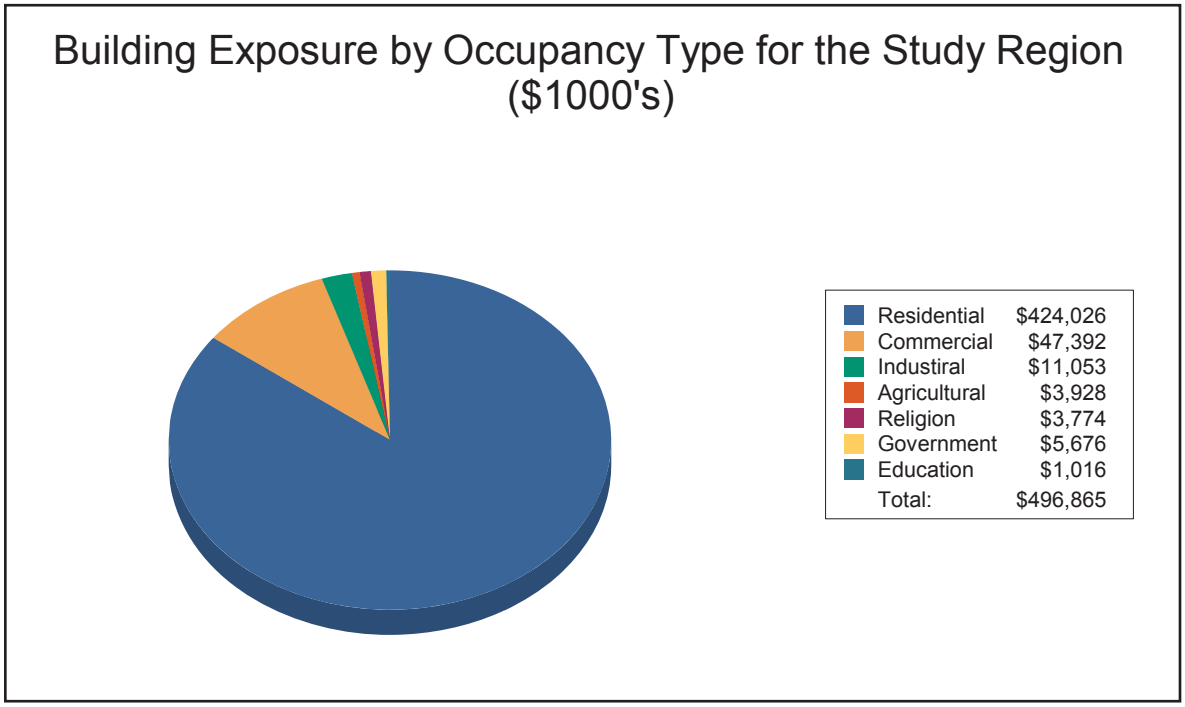
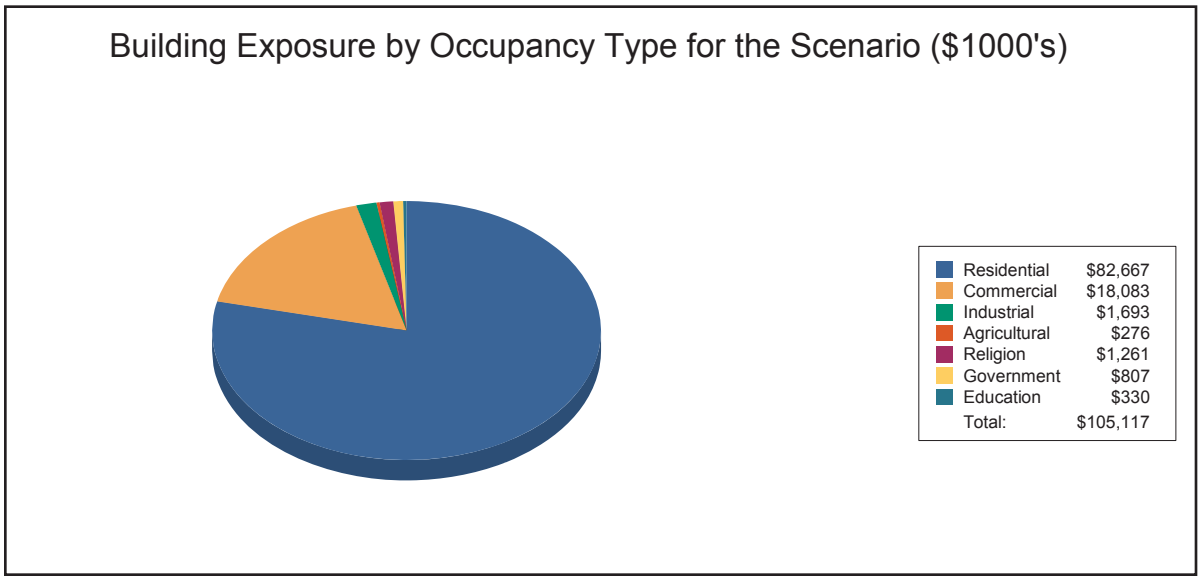


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	82,667	78.6%
Commercial	18,083	17.2%
Industrial	1,693	1.6%
Agricultural	276	0.3%
Religion	1,261	1.2%
Government	807	0.8%
Education	330	0.3%
Total	**105,117**	**100%**



Essential Facility Inventory

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

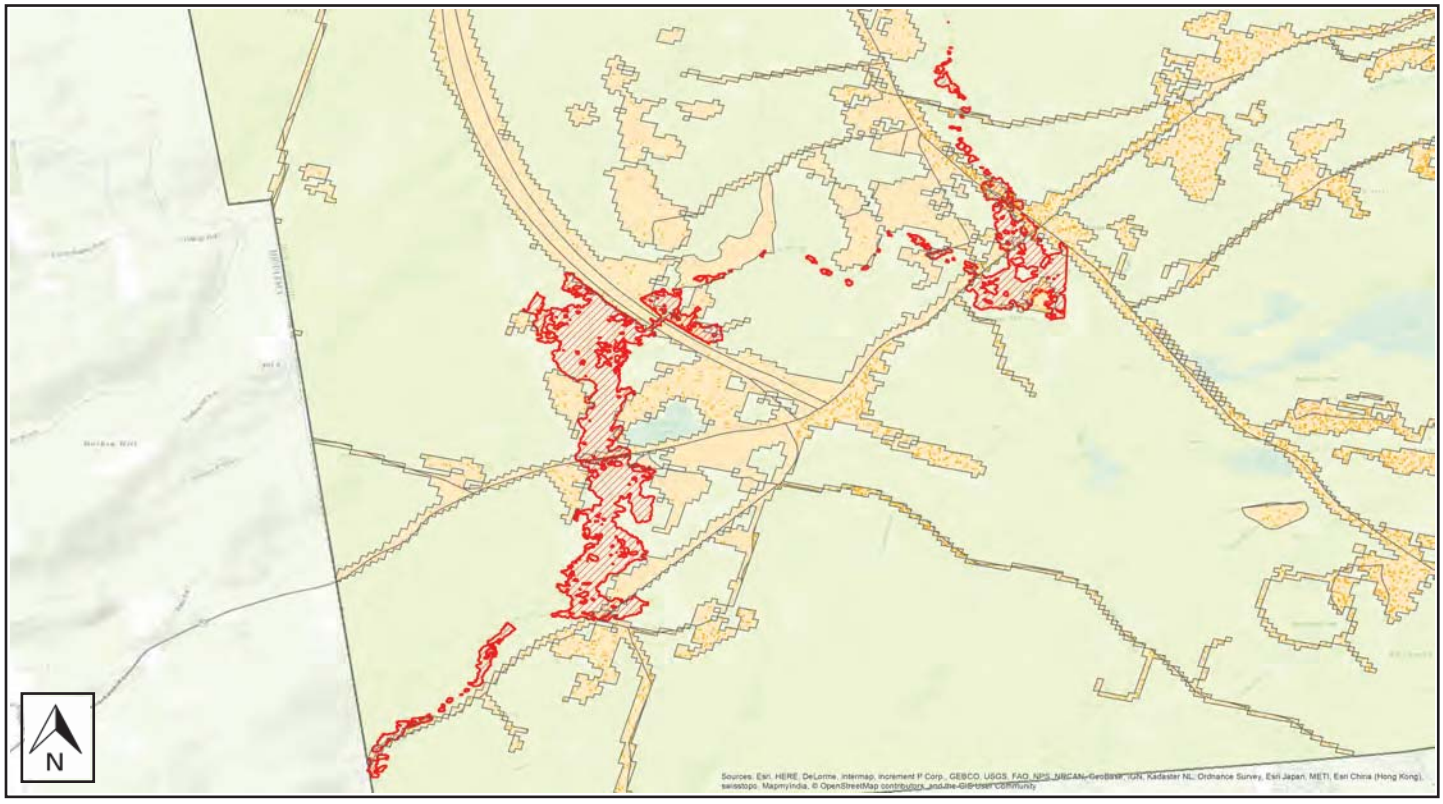
Flood Scenario Parameters

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

Study Region Name:	Salem
Scenario Name:	Salem 100 Year Flood
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

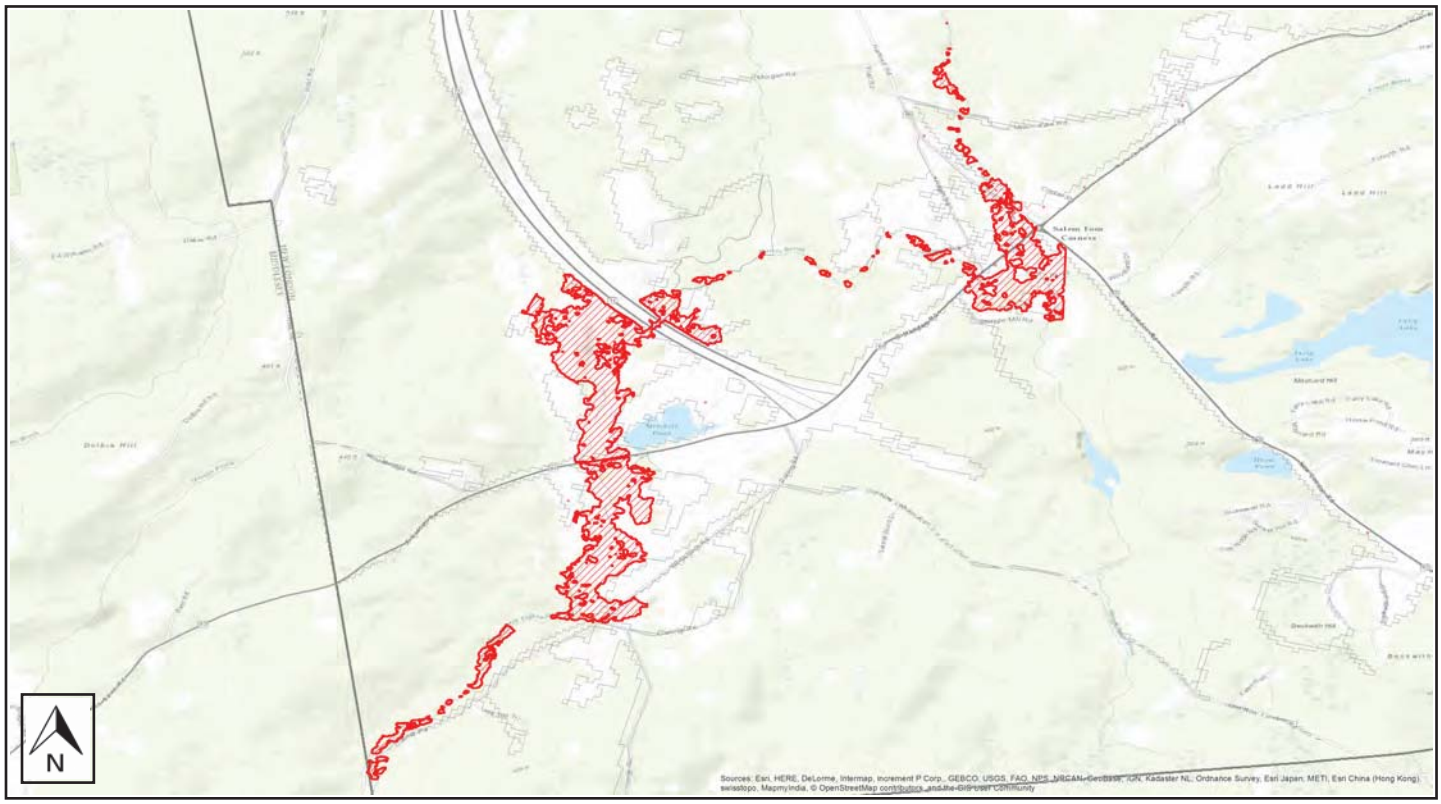


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

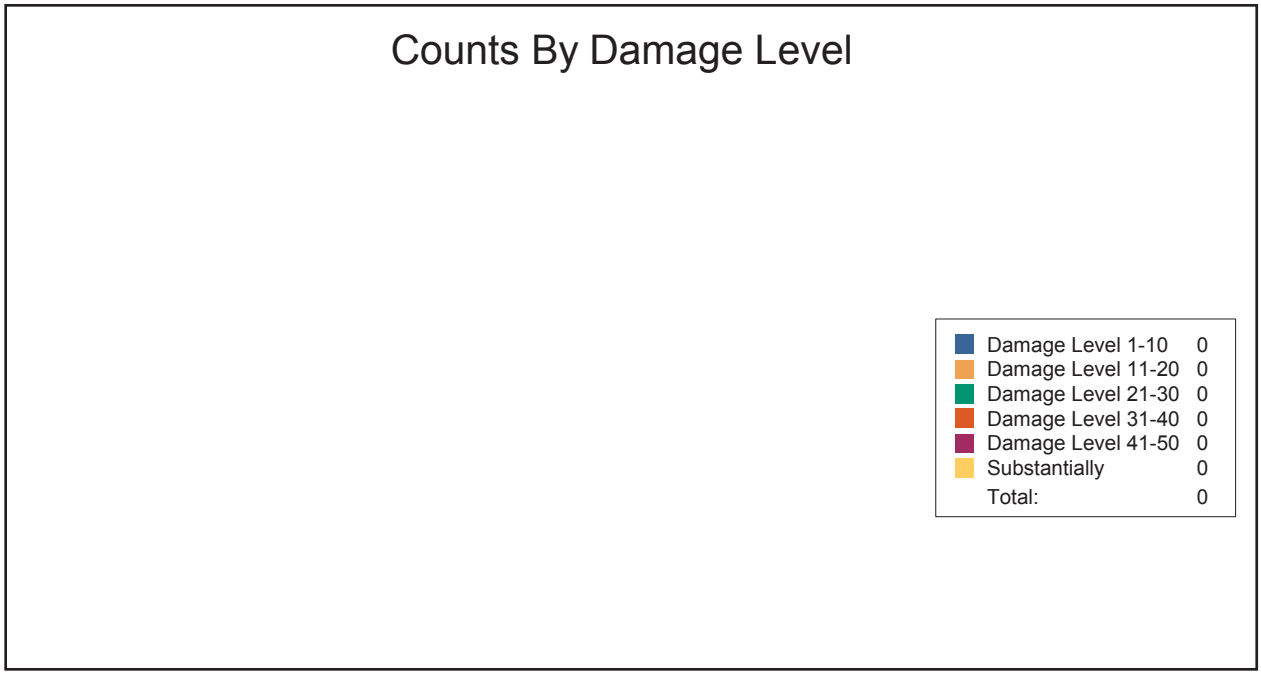


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

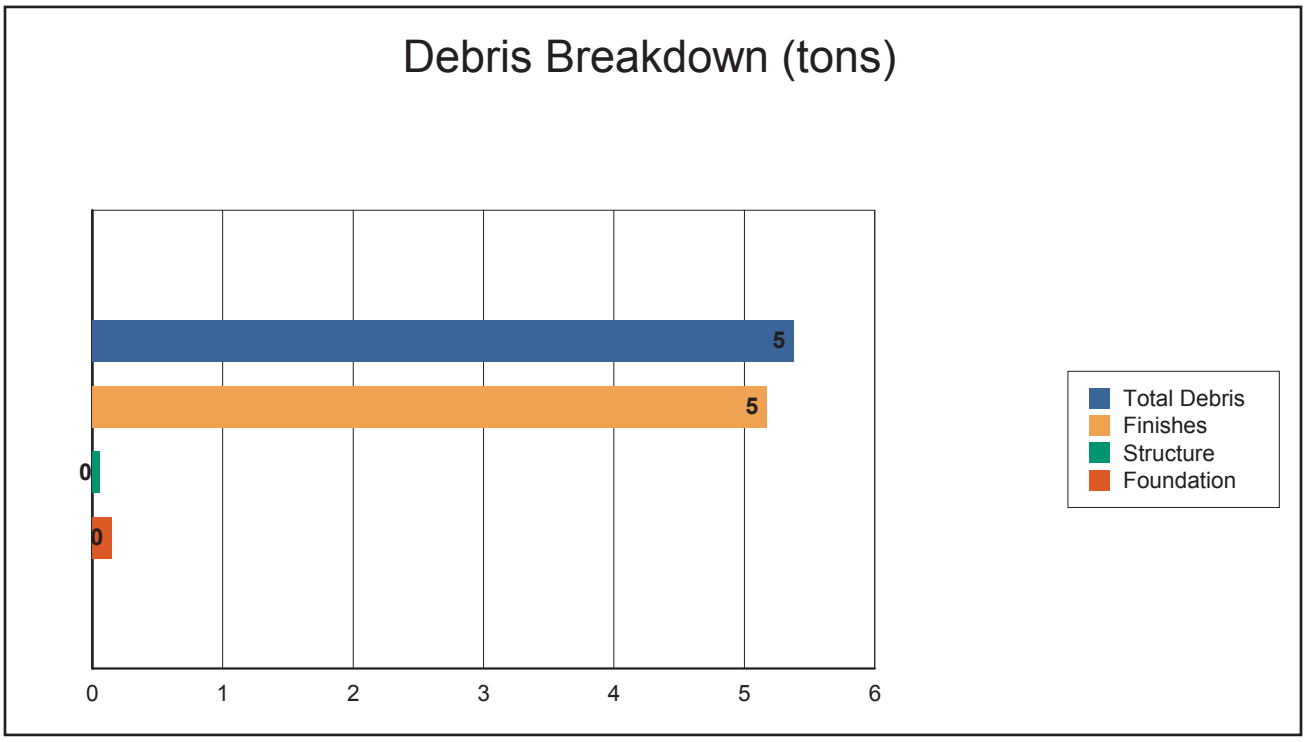
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

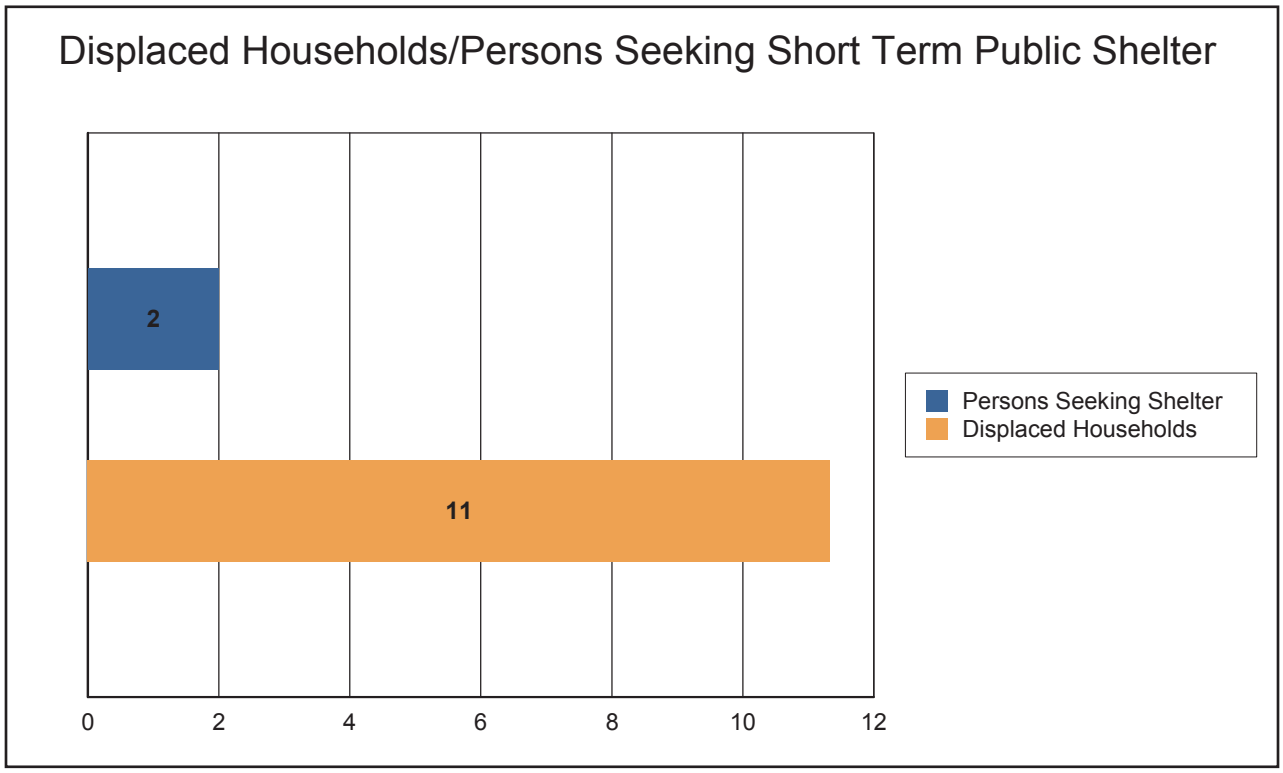


The model estimates that a total of 5 tons of debris will be generated. Of the total amount, Finishes comprises 96% of the total, Structure comprises 1% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 11 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2 people (out of a total population of 4,151) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 0.46 million dollars, which represents 0.43 % of the total replacement value of the scenario buildings.

Building-Related Losses

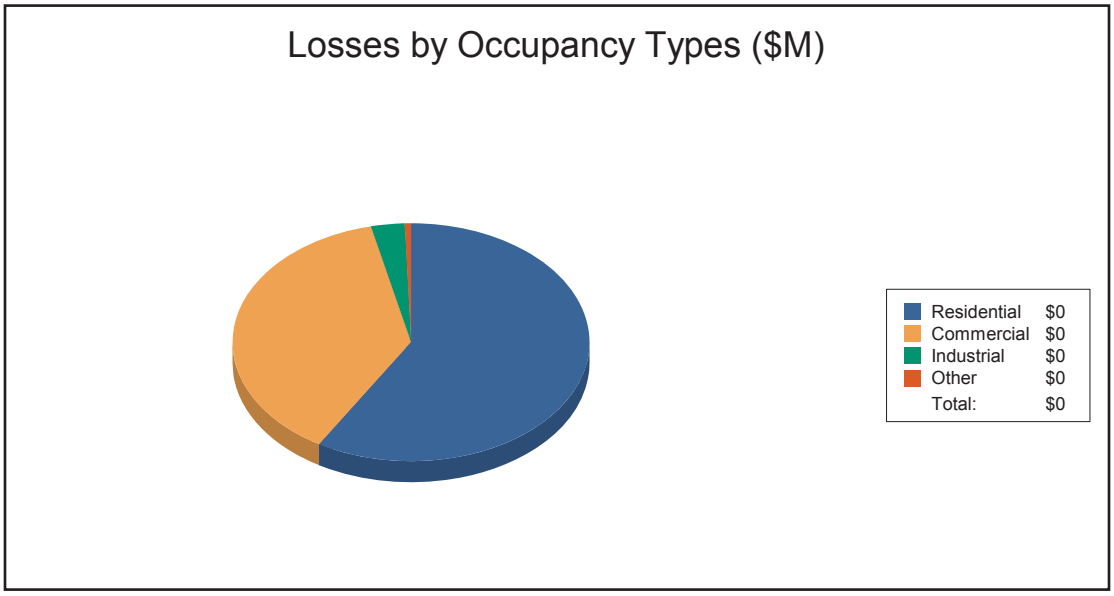
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 0.46 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 58.55% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.19	0.03	0.01	0.00	0.23
	Content	0.07	0.14	0.01	0.00	0.22
	Inventory	0.00	0.00	0.00	0.00	0.01
	Subtotal	**0.27**	**0.17**	**0.01**	**0.00**	**0.46**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.27**	**0.17**	**0.01**	**0.00**	**0.46**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	4,151	424,026	72,839	496,865
Total	**4,151**	**424,026**	**72,. 39**	**496,. 65**
Total Study Region	**4,151**	**424,026**	**72,. 39**	**496,. 65**

Hazus-MH: Flood Global Risk Report

Region Name: Sprague

Flood Scenario: Sprague 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 14 square miles and contains 99 census blocks. The region contains over 1 thousand households and has a total population of 2,984 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,082 buildings in the region with a total building replacement value (excluding contents) of 323 million dollars (2010 dollars). Approximately 92.70% of the buildings (and 85.76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,082 buildings in the region which have an aggregate total replacement value of 323 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	277,337	85.8%
Commercial	16,849	5.2%
Industrial	9,391	2.9%
Agricultural	1,783	0.6%
Religion	8,540	2.6%
Government	710	0.2%
Education	8,771	2.7%
Total	**323,3. 1**	**100%**

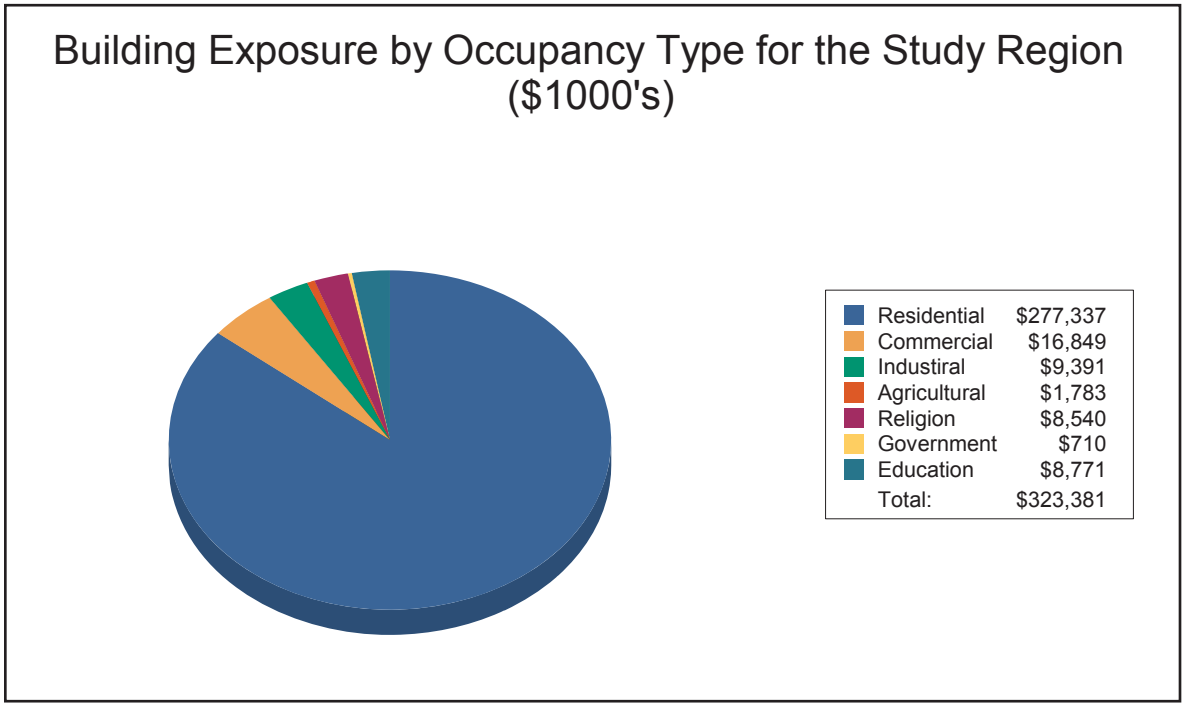
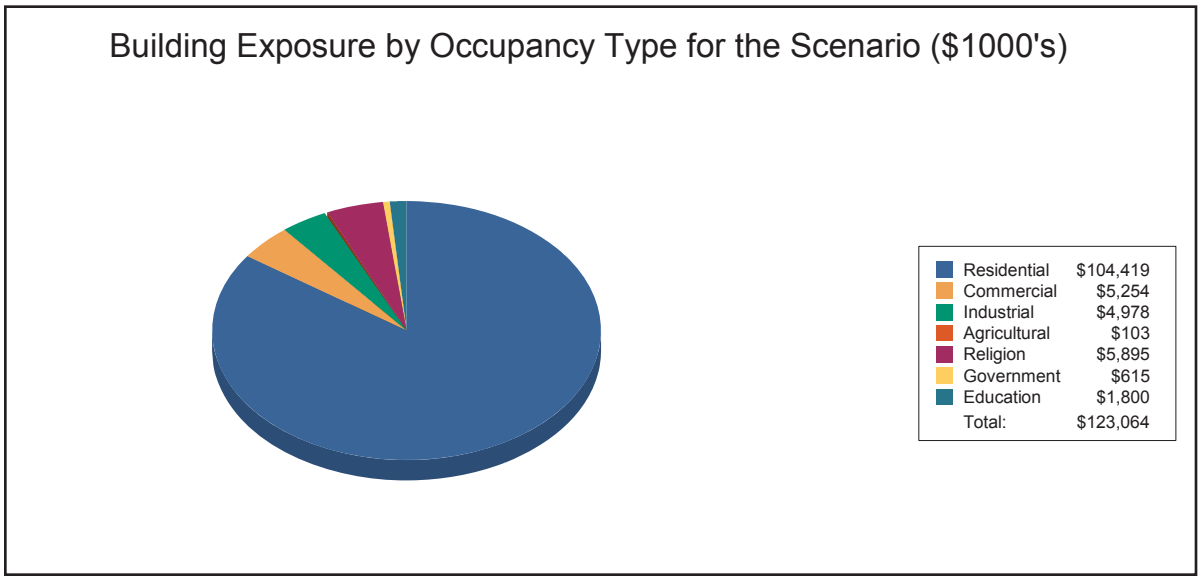


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	104,419	84.8%
Commercial	5,254	4.3%
Industrial	4,978	4.0%
Agricultural	103	0.1%
Religion	5,895	4.8%
Government	615	0.5%
Education	1,800	1.5%
Total	**123,064**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 3 schools, 1 fire station, 1 police station and no emergency operation centers.

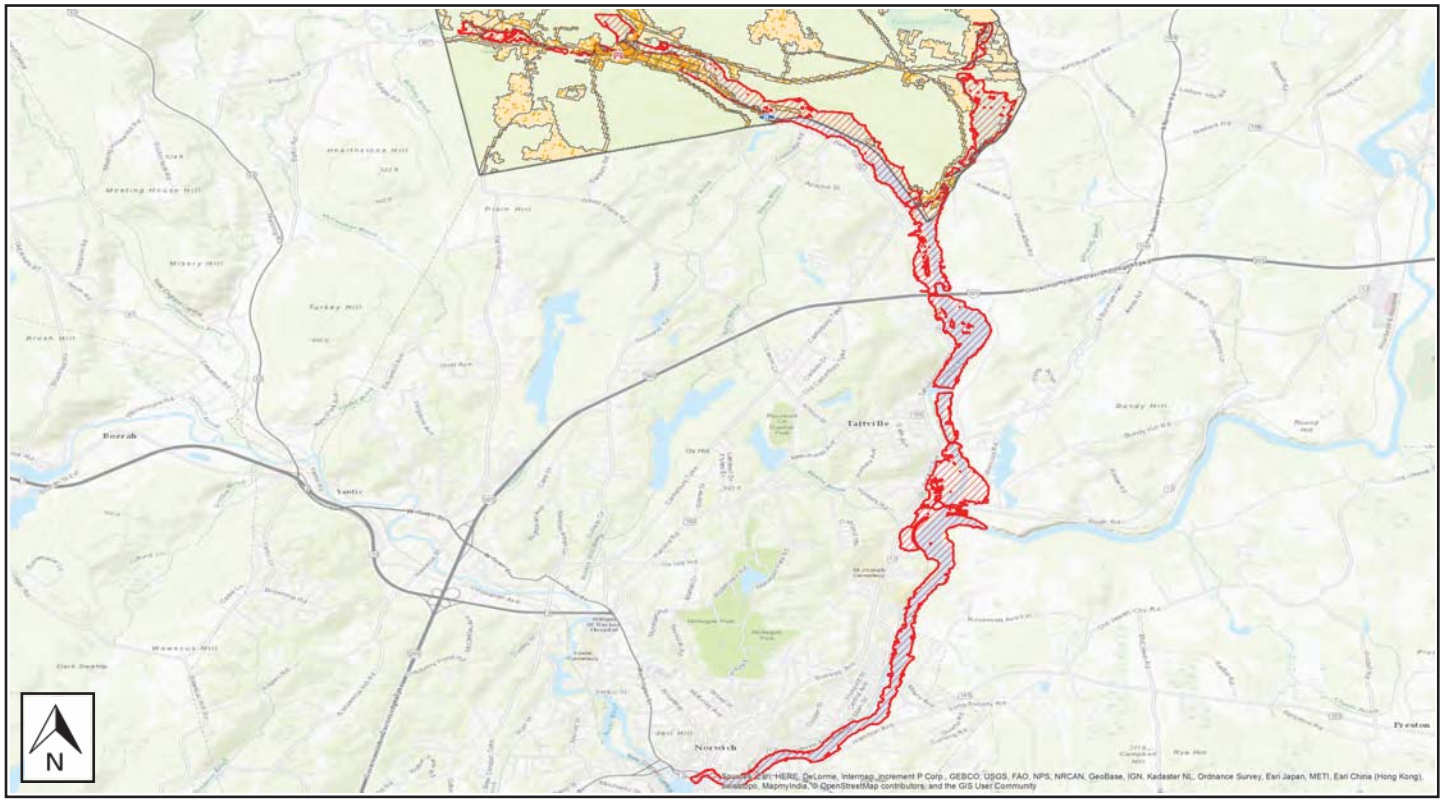
Flood Scenario Parameters

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

Study Region Name:	Sprague
Scenario Name:	Sprague 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 30 buildings will be at least moderately damaged. This is over 88% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

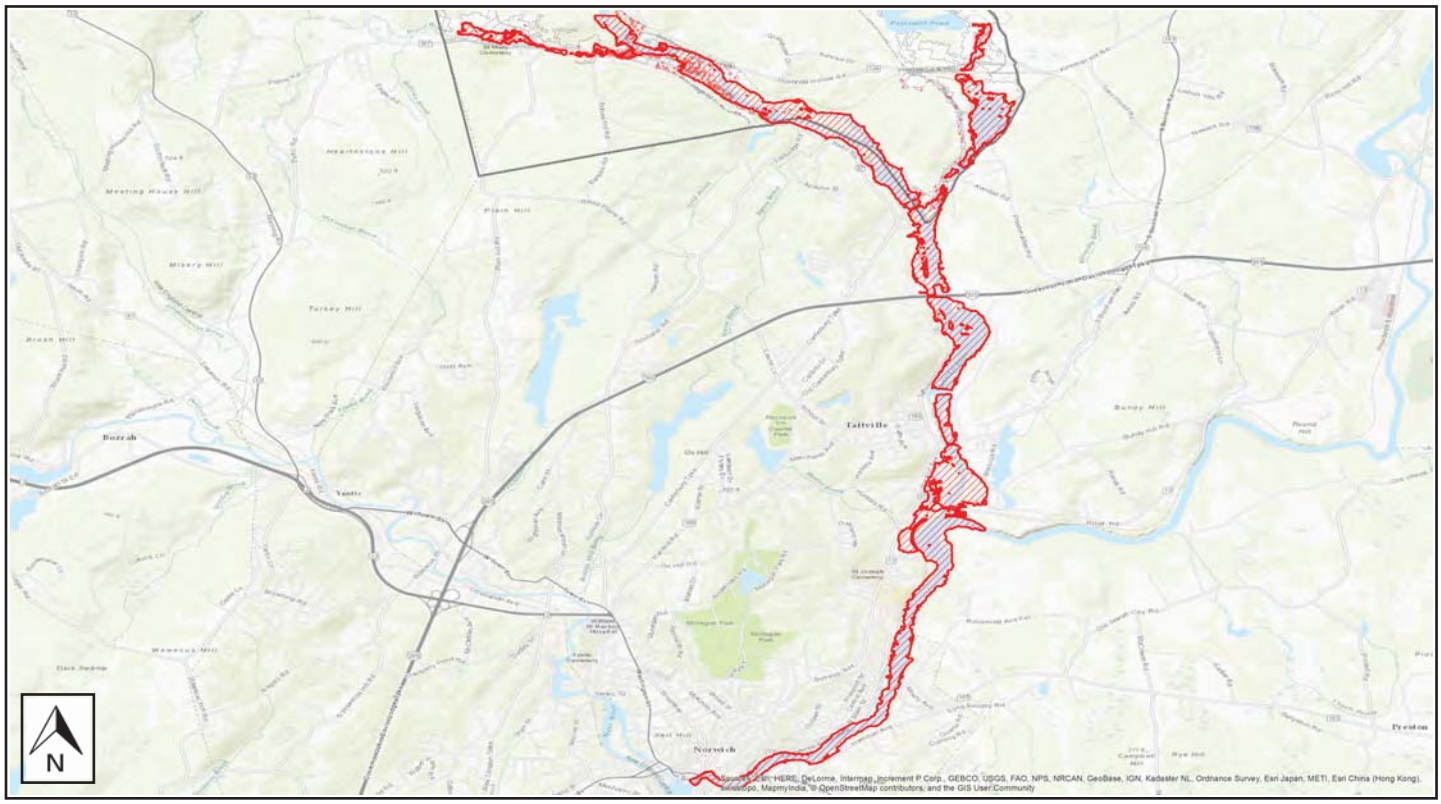


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	10	25.00	17	42.50	9	22.50	4	10.00	0	0.00	0	0.00
Total	**10**		**17**		**9**		**4**		**0**		**0**	

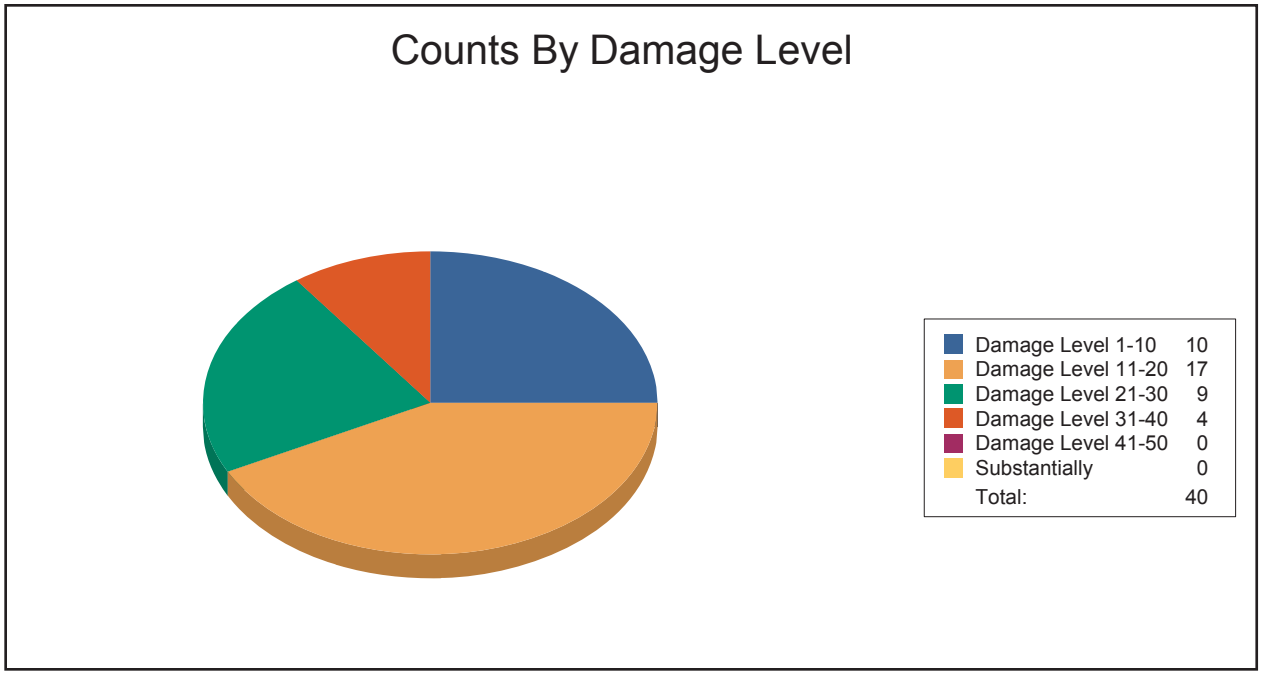


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	10	25	17	43	9	23	4	10	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	1	1	0	1
Schools	3	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

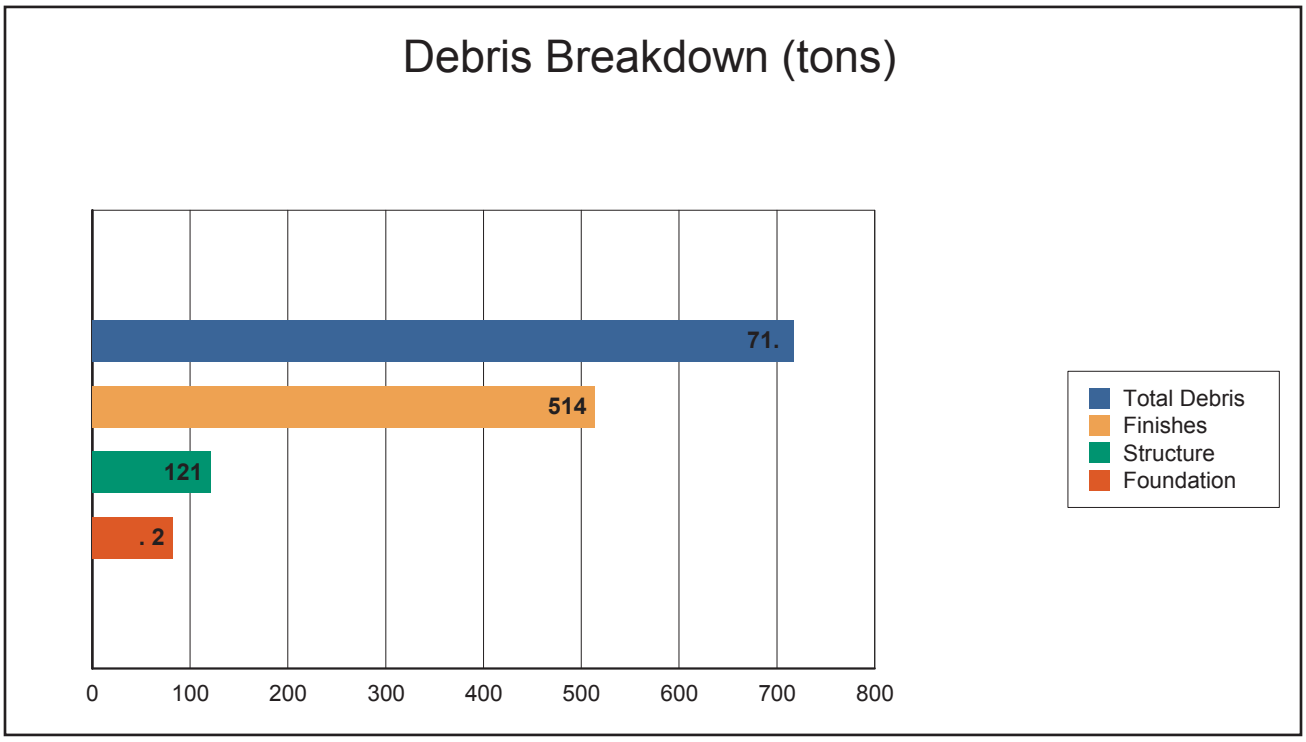
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

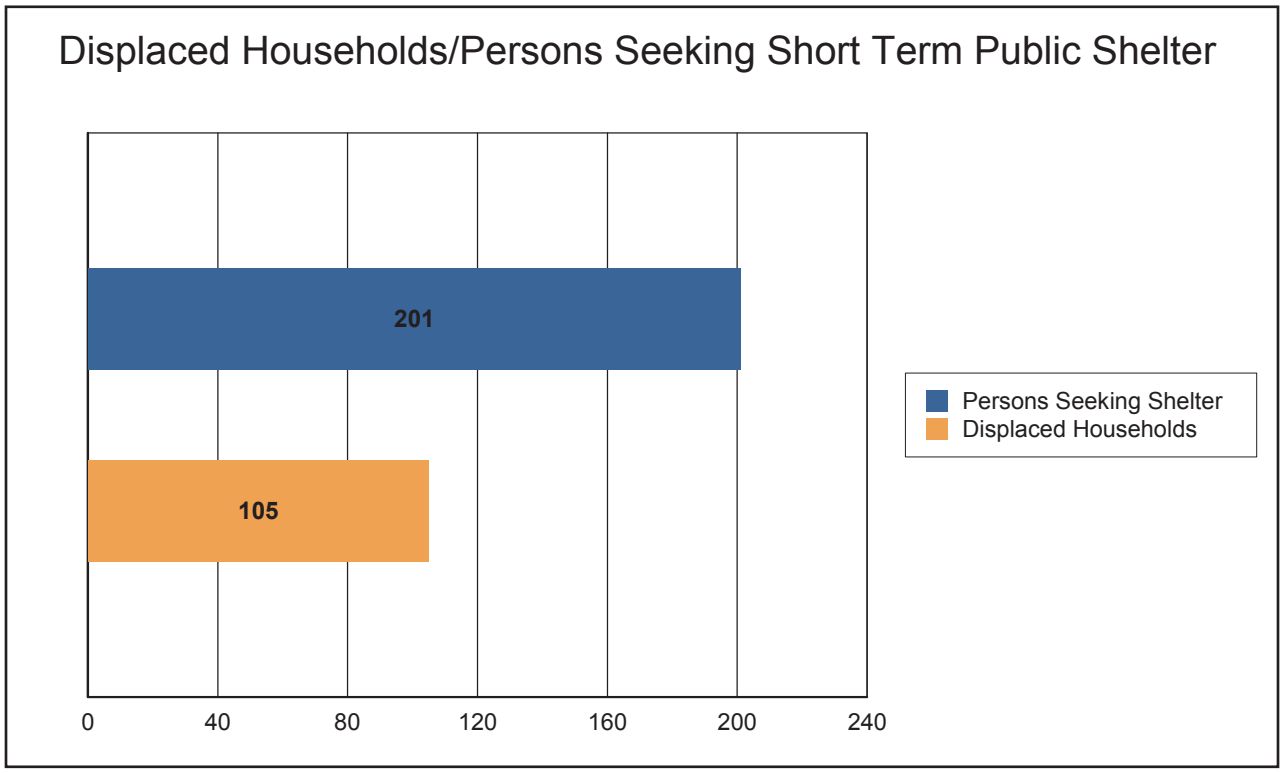


The model estimates that a total of 718 tons of debris will be generated. Of the total amount, Finishes comprises 72% of the total, Structure comprises 17% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 29 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 105 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 201 people (out of a total population of 2,984) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 12.19 million dollars, which represents 9.91 % of the total replacement value of the scenario buildings.

Building-Related Losses

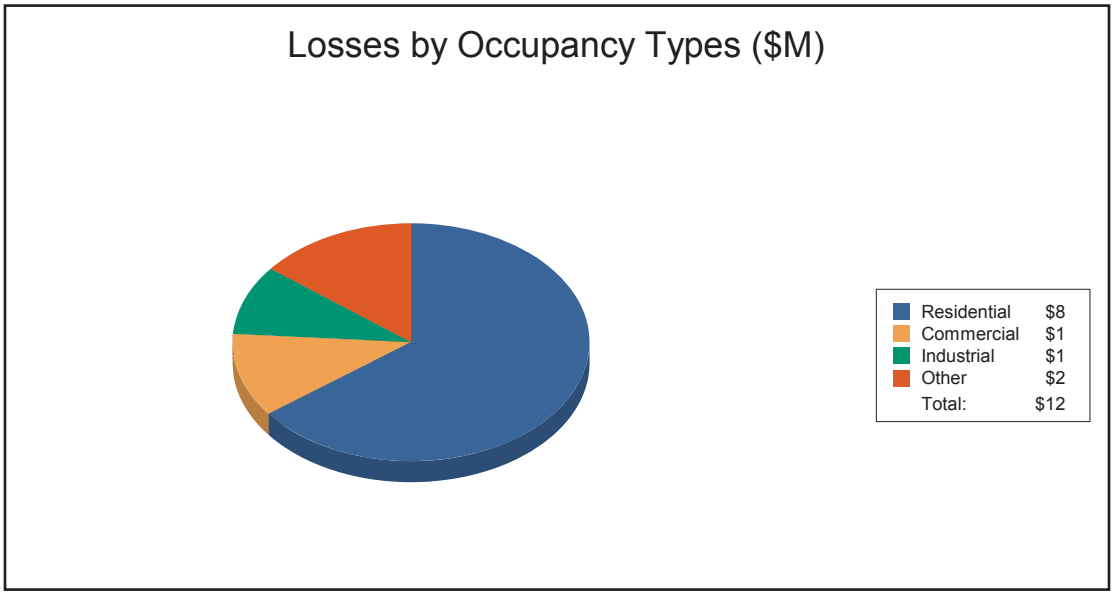
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 12.15 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 64.80% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	5.38	0.29	0.31	0.22	6.21
	Content	2.51	1.06	0.78	1.50	5.85
	Inventory	0.00	0.03	0.07	0.00	0.10
	Subtotal	**7%9**	**1%3.**	**1%6**	**1%3**	**12%5**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.01
	Relocation	0.01	0.00	0.00	0.00	0.01
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.02	0.02
	Subtotal	**0%1**	**0%1**	**0%0**	**0%2**	**0%4**
ALL	**Total**	**7%0**	**1%3.**	**1%6**	**1%5**	**12%9**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,984	277,337	46,044	323,381
Total	**2,9. 4**	**277,337**	**46,044**	**323,3. 1**
Total Study Region	**2,9. 4**	**277,337**	**46,044**	**323,3. 1**

Hazus-MH: Flood Global Risk Report

Region Name: StoningtonBorough

Flood Scenario: Stonington Borough 100 Year

Print Date: Friday, June 09, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

FEMA

RiskMAP
Increasing Resilience Together

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 0 square miles and contains 45 census blocks. The region contains over 1 thousand households and has a total population of 929 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 679 buildings in the region with a total building replacement value (excluding contents) of 268 million dollars (2010 dollars). Approximately 84.39% of the buildings (and 68.59% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 679 buildings in the region which have an aggregate total replacement value of 268 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	184,057	68.6%
Commercial	41,750	15.6%
Industrial	31,858	11.9%
Agricultural	780	0.3%
Religion	7,176	2.7%
Government	1,290	0.5%
Education	1,421	0.5%
Total	**26, .332**	**100%w**

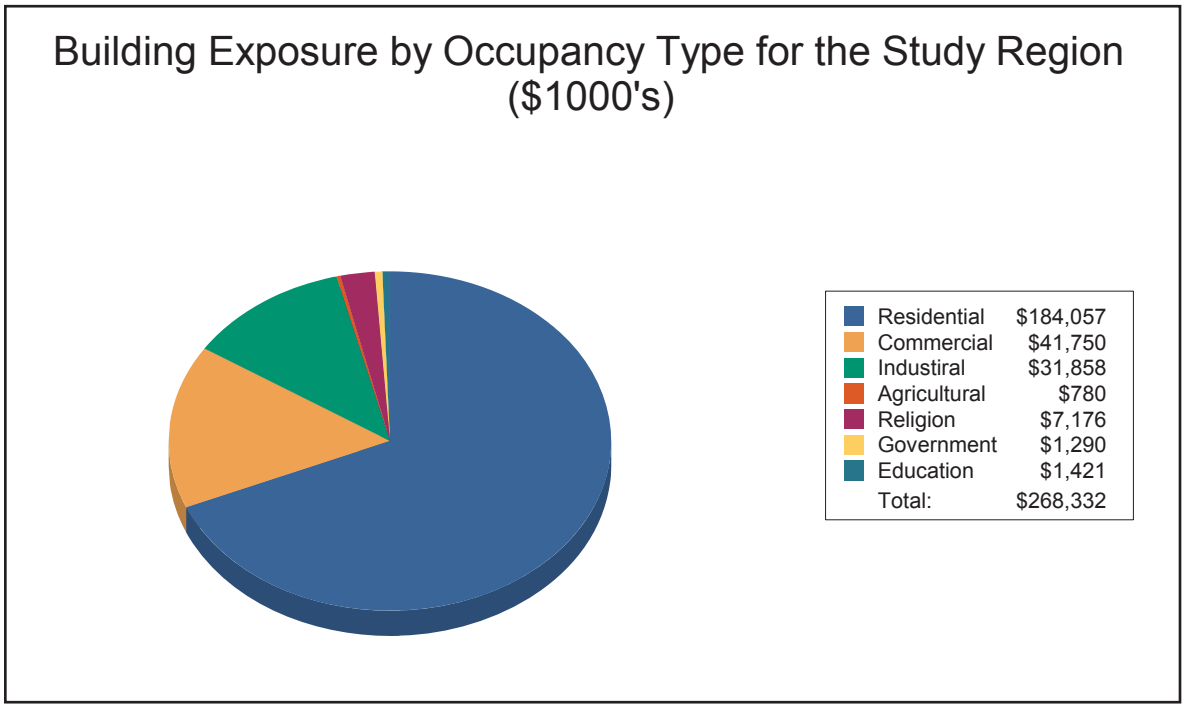
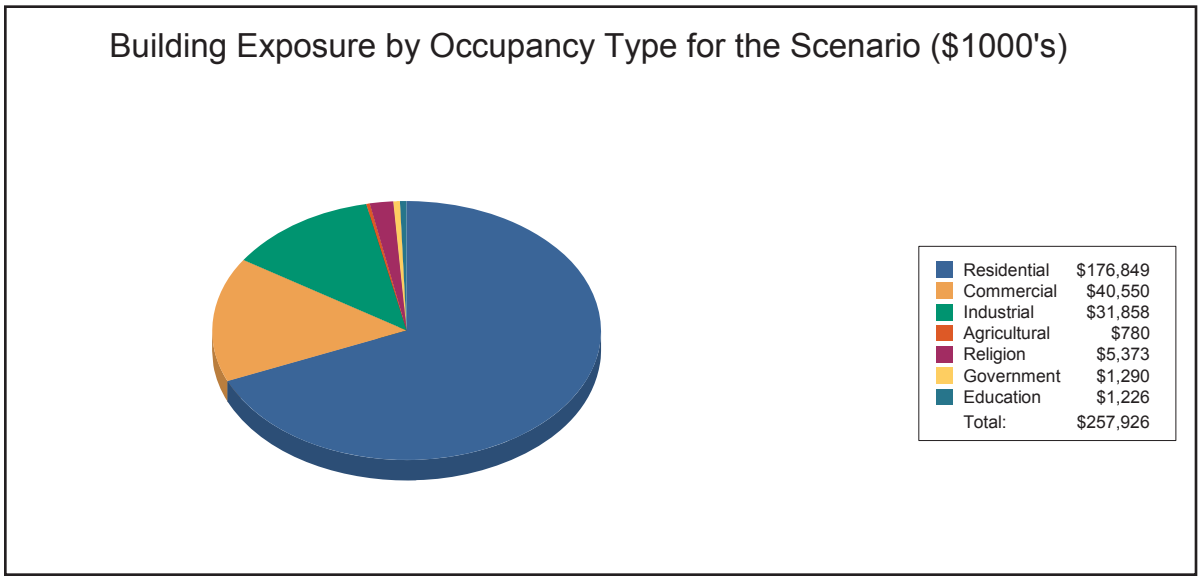


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	176,849	68.6%
Commercial	40,550	15.7%
Industrial	31,858	12.4%
Agricultural	780	0.3%
Religion	5,373	2.1%
Government	1,290	0.5%
Education	1,226	0.5%
Total	**257.926**	**100%**



Essential Facility Inventory

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

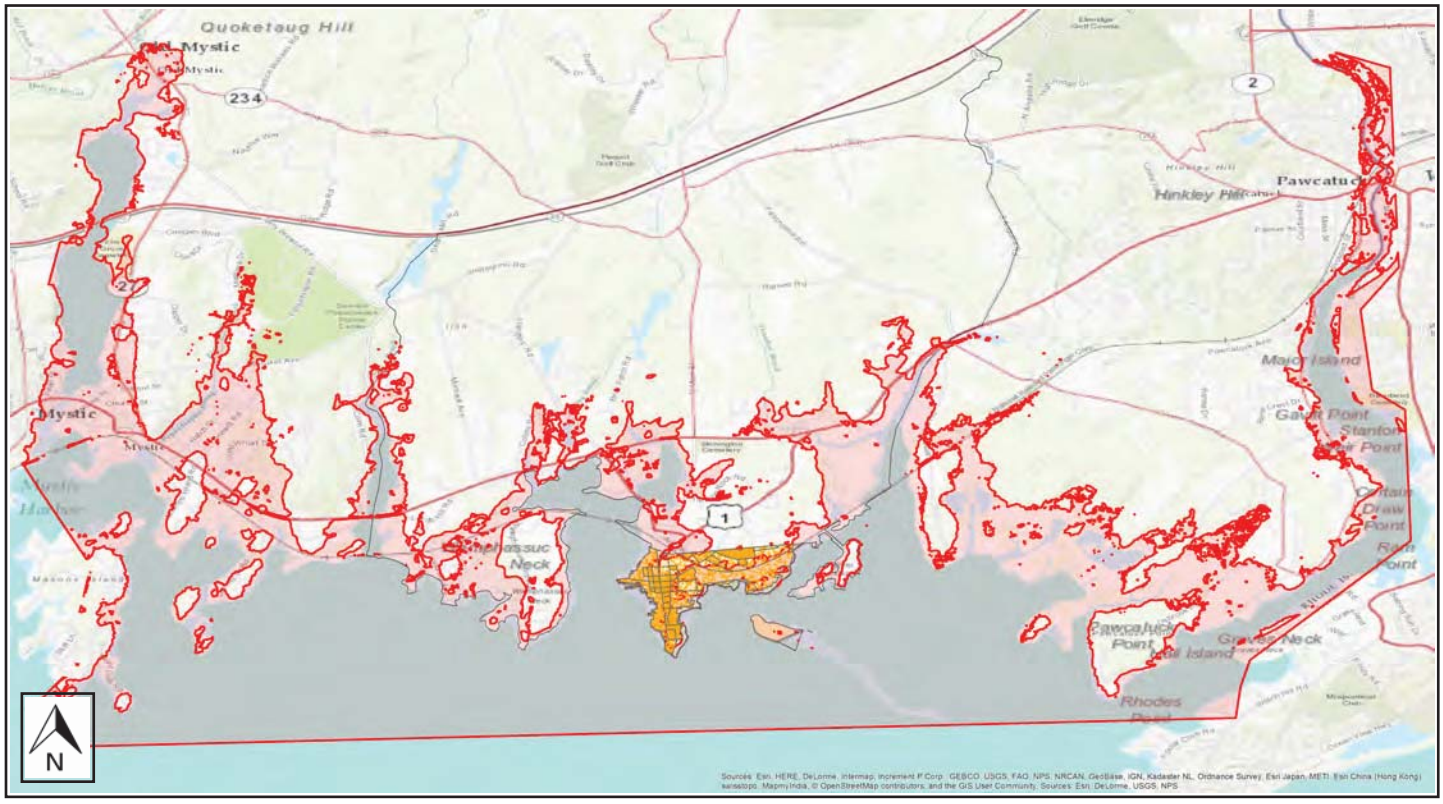
Flood Scenario Parameters

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

Study Region Name:	StoningtonBorough
Scenario Name:	Stonington Borough 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent. as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 129 buildings will be at least moderately damaged. This is over 49% of the total number of buildings in the scenario. There are an estimated 27 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map



Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	46	35.66	36	27.91	14	10.85	6	4.65	27	20.93
Total	**0**		**46**		**36**		**14**		**6**		**27**	

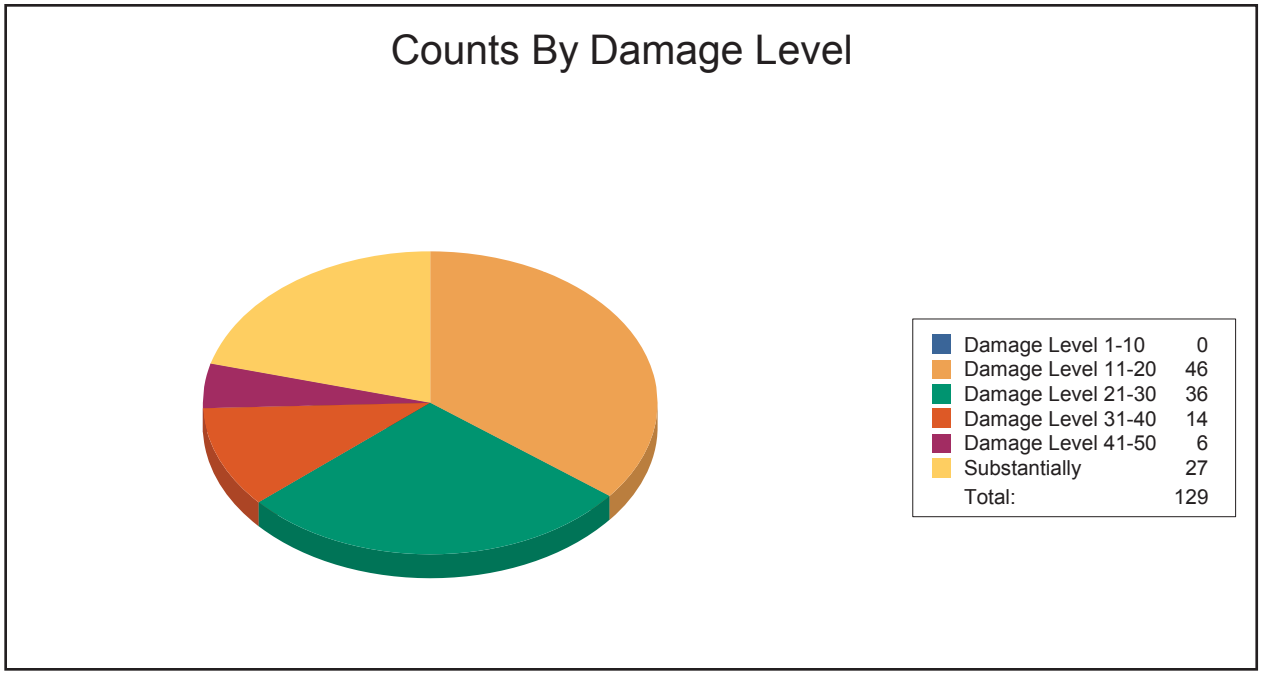


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	0	0	46	36	36	28	14	11	6	5	27	21

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	2	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

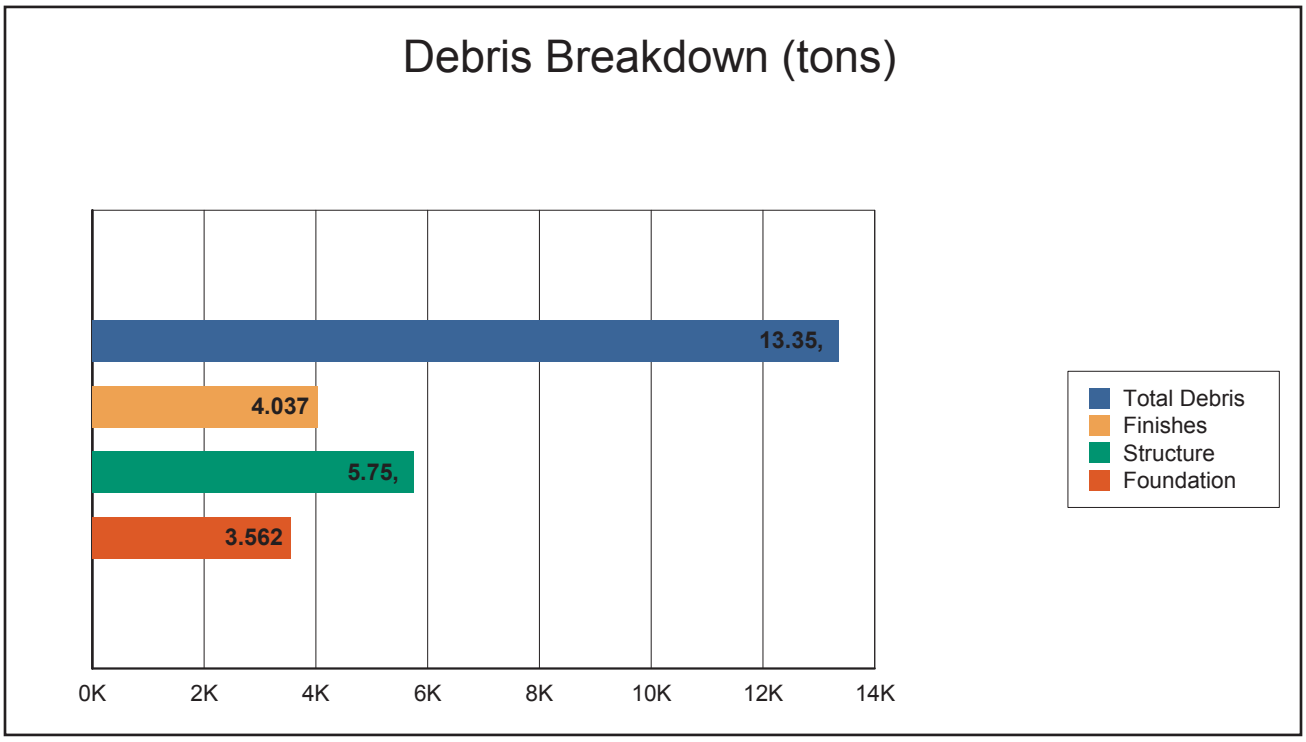
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

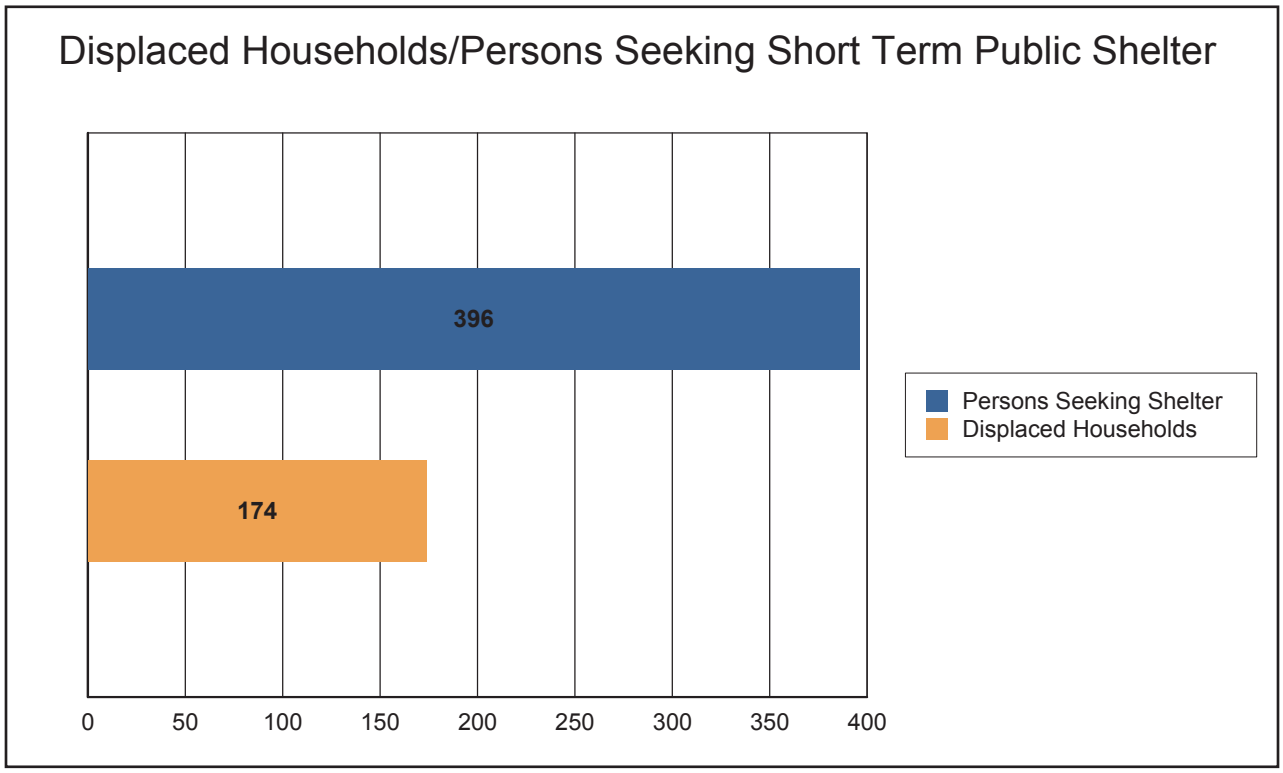


The model estimates that a total of 13,358 tons of debris will be generated. Of the total amount, Finishes comprises 30% of the total, Structure comprises 43% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 534 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 174 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 396 people (out of a total population of 929) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 79.97 million dollars, which represents 31.00 % of the total replacement value of the scenario buildings.

Building-Related Losses

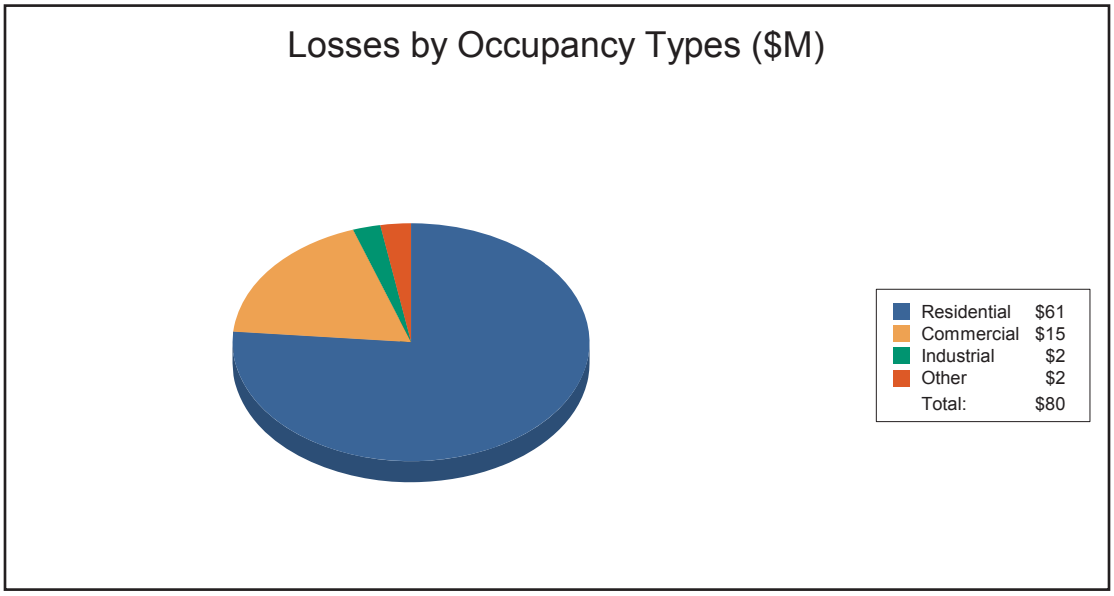
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 79.77 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 76.53% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	32.83	4.36	0.54	0.34	38.07
	Content	28.30	9.90	1.23	1.85	41.29
	Inventory	0.00	0.20	0.19	0.03	0.41
	Subtotal	**61.13**	**14.46**	**1.97**	**2.21**	**79.77**
Business Interruption						
	Income	0.00	0.06	0.00	0.00	0.07
	Relocation	0.04	0.01	0.00	0.00	0.05
	Rental Income	0.01	0.00	0.00	0.00	0.02
	Wage	0.01	0.04	0.00	0.02	0.07
	Subtotal	**0.06**	**0.11**	**0.00**	**0.02**	**0.20**
ALL	**Total**	**61.20**	**14.57**	**1.97**	**2.24**	**79.97**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	929	184,057	84,275	268,332
Total	**929**	**1, 4.057**	**, 4.275**	**26, .332**
Total Study Region	**929**	**1, 4.057**	**, 4.275**	**26, .332**

Hazus-MH: Flood Global Risk Report

Region Name: StoningtonTown

Flood Scenario: Stonington 100 Year 2

Print Date: Tuesday, June 13, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 39 square miles and contains 532 census blocks. The region contains over 8 thousand households and has a total population of 17,616 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 8,003 buildings in the region with a total building replacement value (excluding contents) of 2,728 million dollars (2010 dollars). Approximately 89.79% of the buildings (and 74.79% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 8,003 buildings in the region which have an aggregate total replacement value of 2,728 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,039,978	74.8%
Commercial	459,518	16.8%
Industrial	132,285	4.8%
Agricultural	13,665	0.5%
Religion	33,477	1.2%
Government	19,842	0.7%
Education	28,827	1.1%
Total	**2,727,592**	**100.0%**

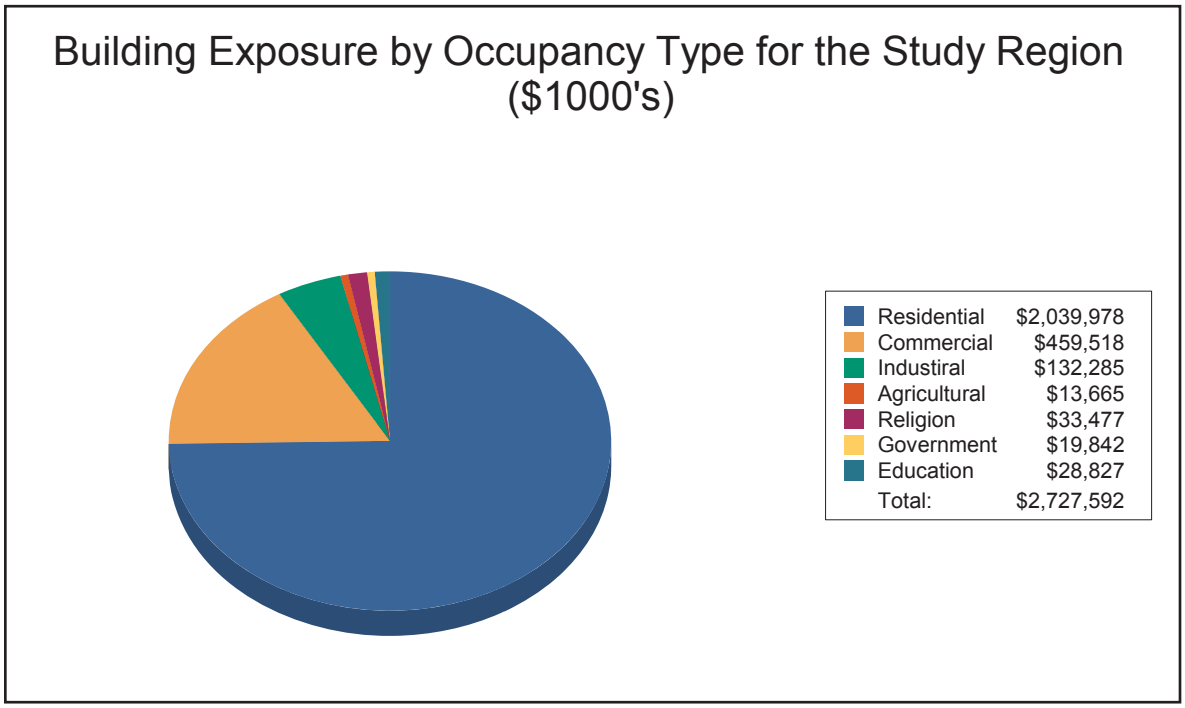
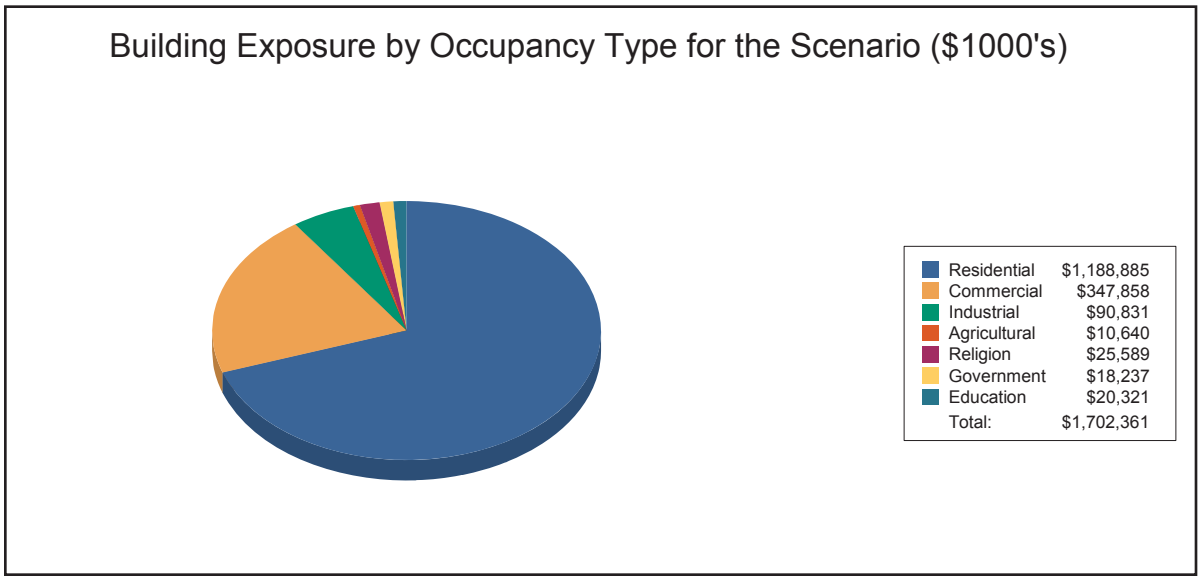


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,188,885	69.8%
Commercial	347,858	20.4%
Industrial	90,831	5.3%
Agricultural	10,640	0.6%
Religion	25,589	1.5%
Government	18,237	1.1%
Education	20,321	1.2%
Total	**1,702,361**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 10 schools, 4 fire stations, 1 police station and no emergency operation centers.

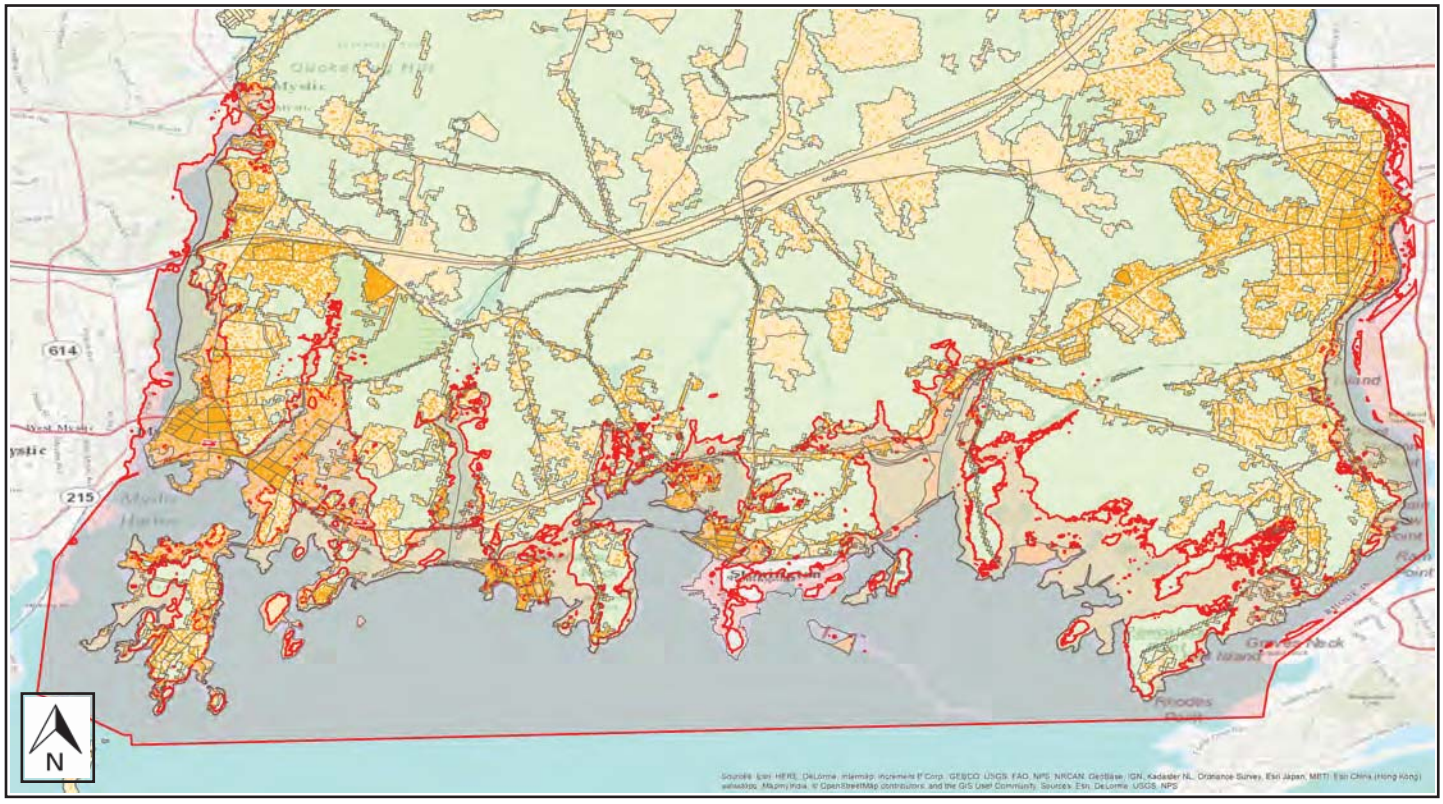
Flood Scenario Parameters

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

Study Region Name:	StoningtonTown
Scenario Name:	Stonington 100 Year 2
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 510 buildings will be at least moderately damaged. This is over 53% of the total number of buildings in the scenario. There are an estimated 53 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

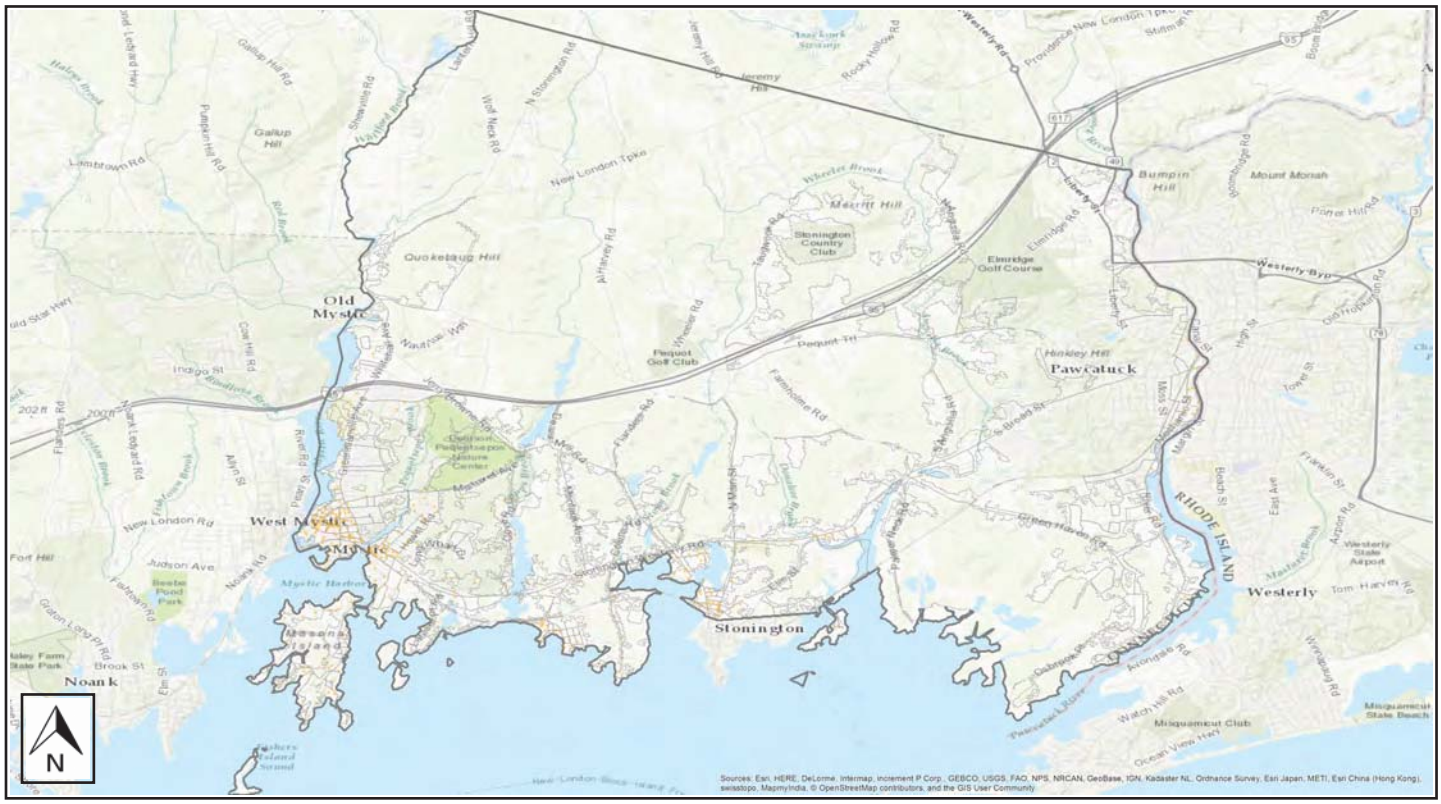


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2	0.39	183	35.81	198	38.75	58	11.35	17	3.33	53	10.37
Total	**2**		**184**		**198**		**58**		**17**		**53**	

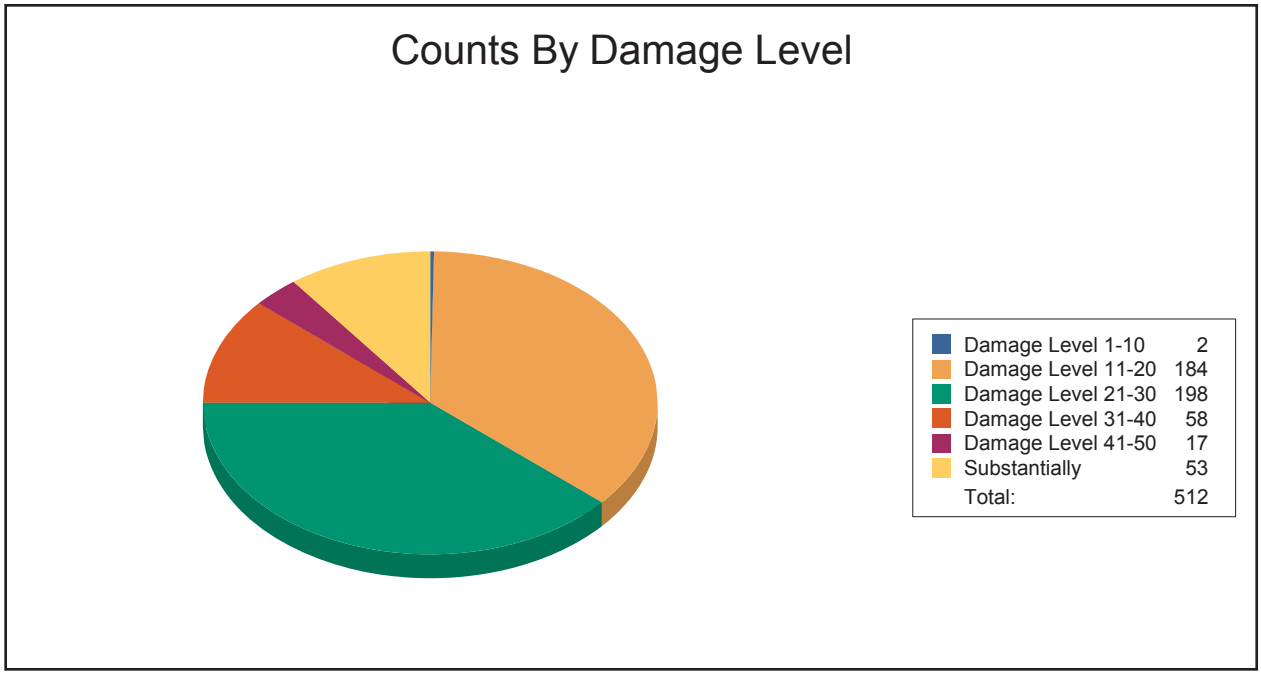


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	1	100	0	0	0	0	0	0	0	0
Wood	2	0	182	36	198	39	58	11	17	3	53	10

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	2	0	2
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	10	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

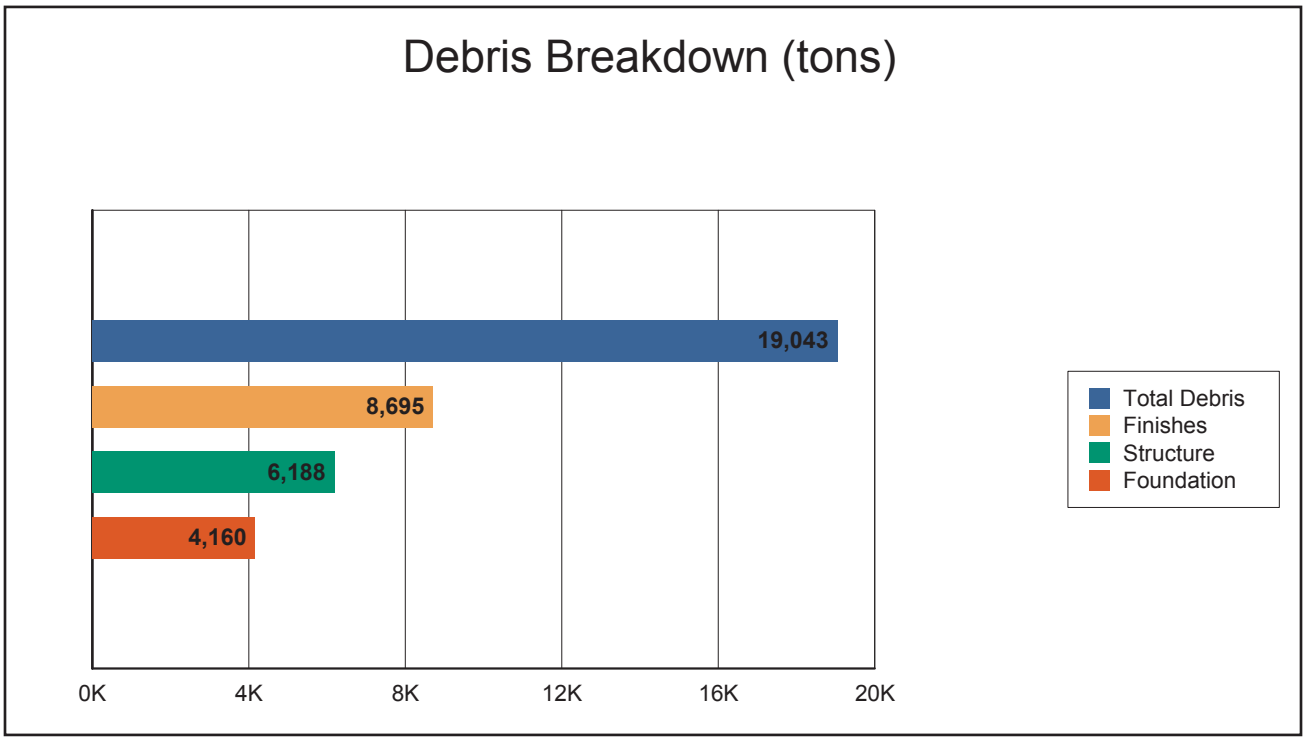
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

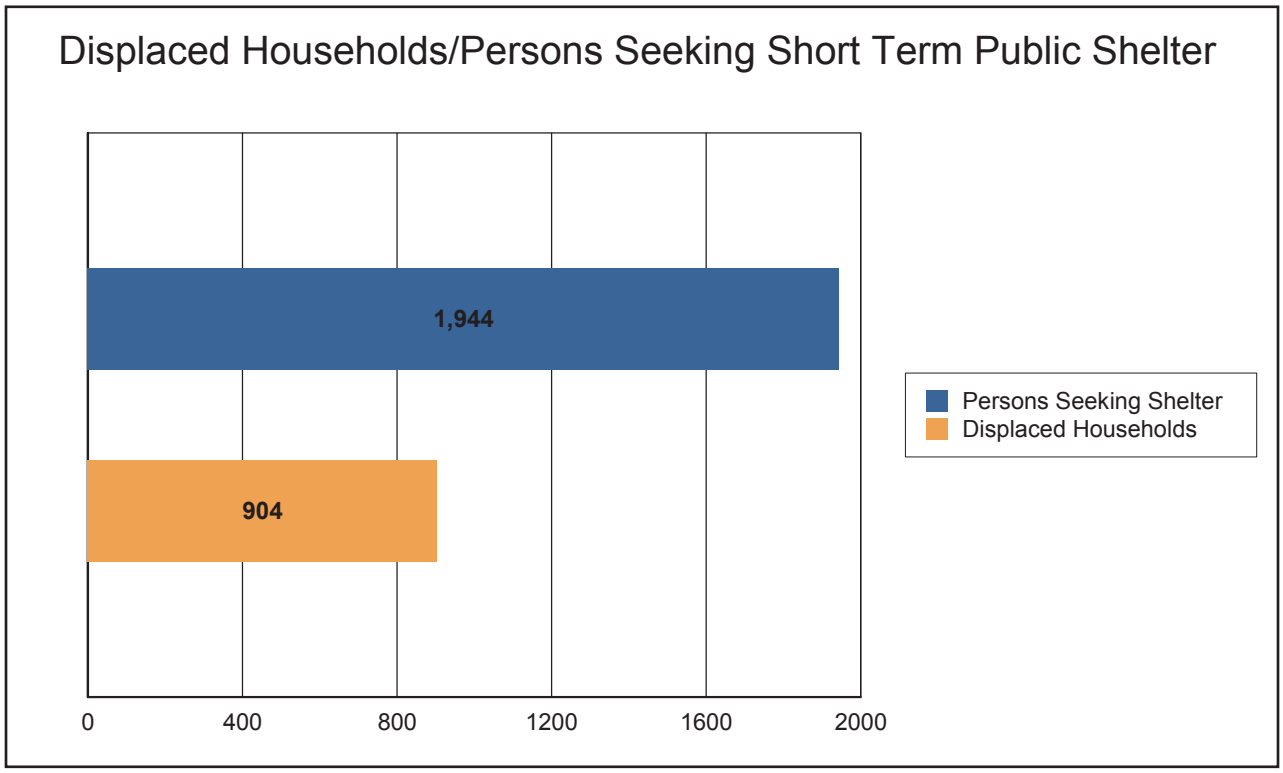


The model estimates that a total of 19,043 tons of debris will be generated. Of the total amount, Finishes comprises 46% of the total, Structure comprises 32% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 762 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 904 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,944 people (out of a total population of 17,616) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 334.61 million dollars, which represents 19.66 % of the total replacement value of the scenario buildings.

Building-Related Losses

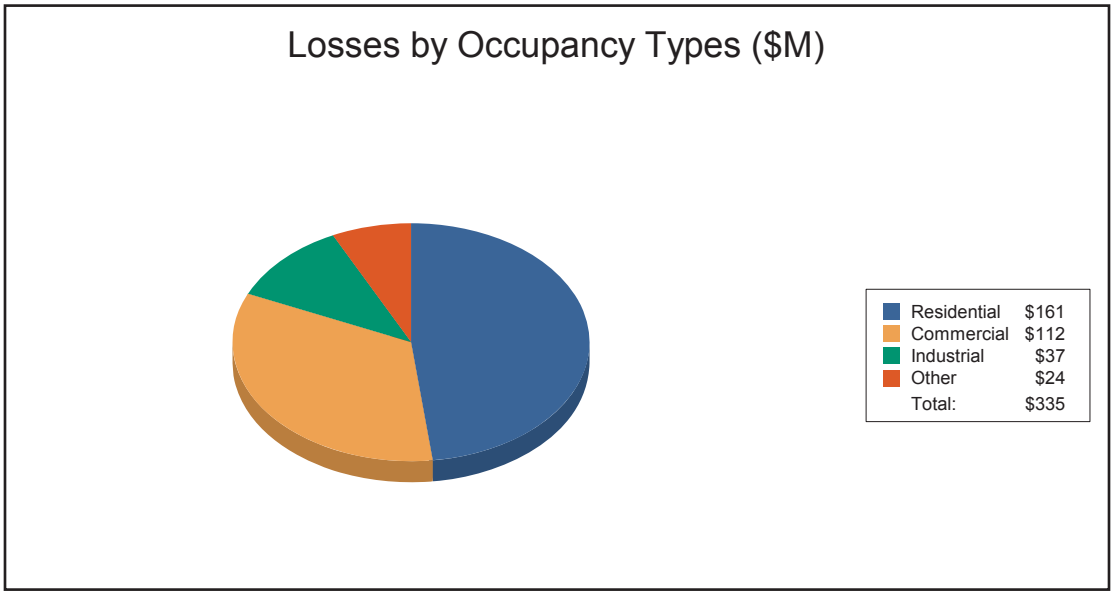
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 333.03 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 48.14% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	89.08	31.46	9.78	3.39	133.71
	Content	71.76	79.14	23.97	19.74	194.62
	Inventory	0.00	1.02	3.48	0.20	4.70
	Subtotal	**160.84**	**111.62**	**37.23**	**23.34**	**333.03**
Business Interruption						
	Income	0.02	0.34	0.00	0.02	0.38
	Relocation	0.12	0.05	0.00	0.01	0.18
	Rental Income	0.04	0.03	0.00	0.00	0.06
	Wage	0.05	0.28	0.00	0.63	0.96
	Subtotal	**0.22**	**0.69**	**0.00**	**0.66**	**1.58**
ALL	**Total**	**161.06**	**112.31**	**37.23**	**24.00**	**334.61**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	17,616	2,039,978	687,614	2,727,592
Total	**17,616**	**2,039,978**	**687,614**	**2,727,592**
Total Study Region	**17,616**	**2,039,978**	**687,614**	**2,727,592**

Hazus-MH: Flood Global Risk Report

Region Name: StoningtonTInland

Flood Scenario: StoningtonRiverine2

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 39 square miles and contains 532 census blocks. The region contains over 8 thousand households and has a total population of 17,616 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 8,003 buildings in the region with a total building replacement value (excluding contents) of 2,728 million dollars (2010 dollars). Approximately 89.79% of the buildings (and 74.79% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 8,003 buildings in the region which have an aggregate total replacement value of 2,728 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,039,978	74.8%
Commercial	459,518	16.8%
Industrial	132,285	4.8%
Agricultural	13,665	0.5%
Religion	33,477	1.2%
Government	19,842	0.7%
Education	28,827	1.1%
Total	**2,727,592**	**100.0%**

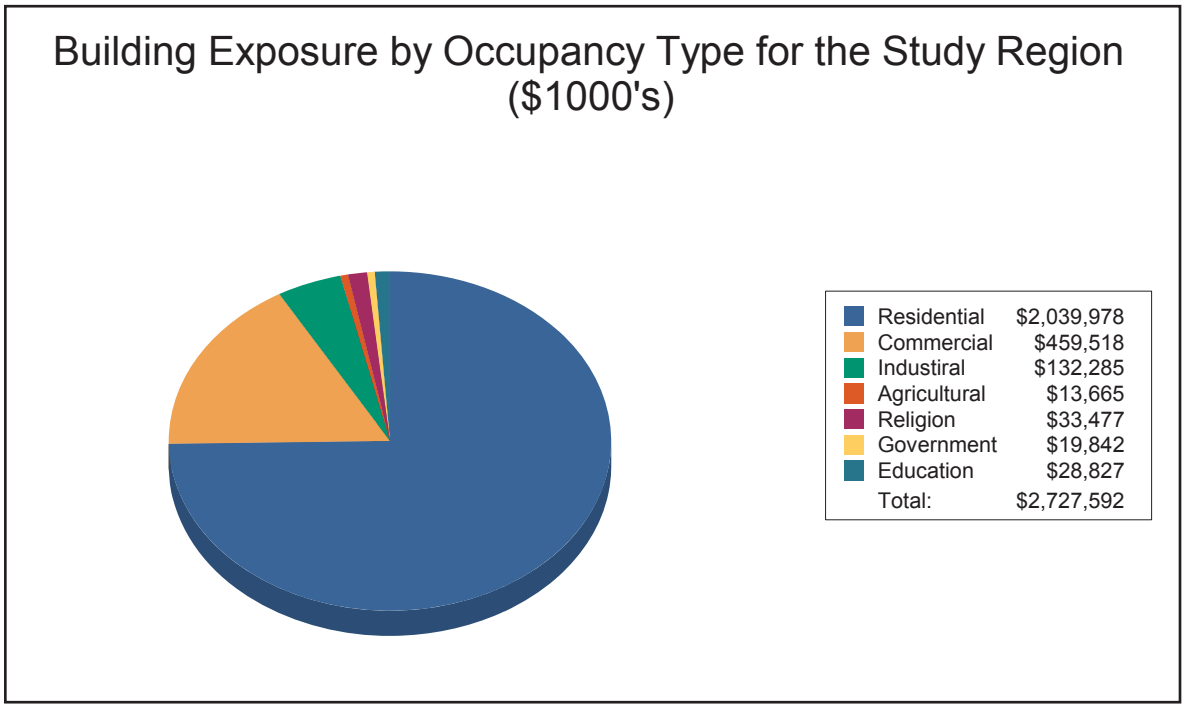
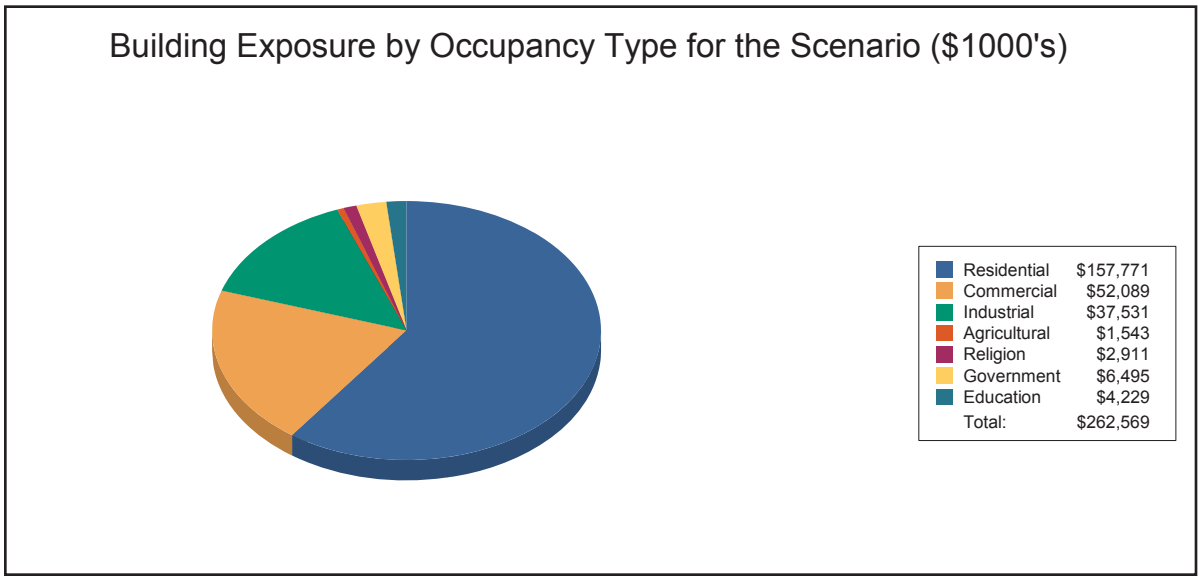


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	157,771	60.1%
Commercial	52,089	19.8%
Industrial	37,531	14.3%
Agricultural	1,543	0.6%
Religion	2,911	1.1%
Government	6,495	2.5%
Education	4,229	1.6%
Total	**262,569**	**100.0%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 10 schools, 4 fire stations, 1 police station and no emergency operation centers.

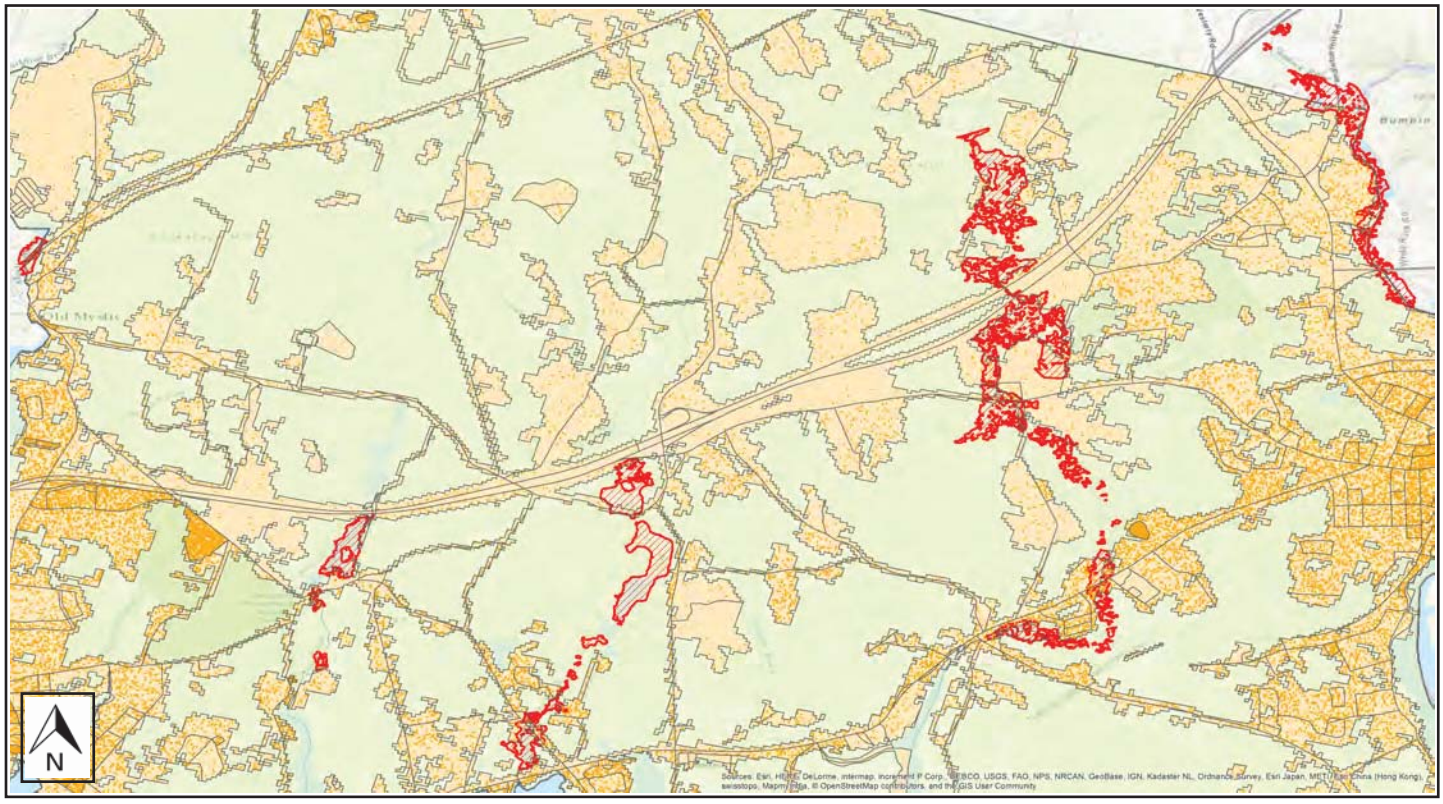
Flood Scenario Parameters

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

Study Region Name:	StoningtonTInland
Scenario Name:	StoningtonRiverine2
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 1 building will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

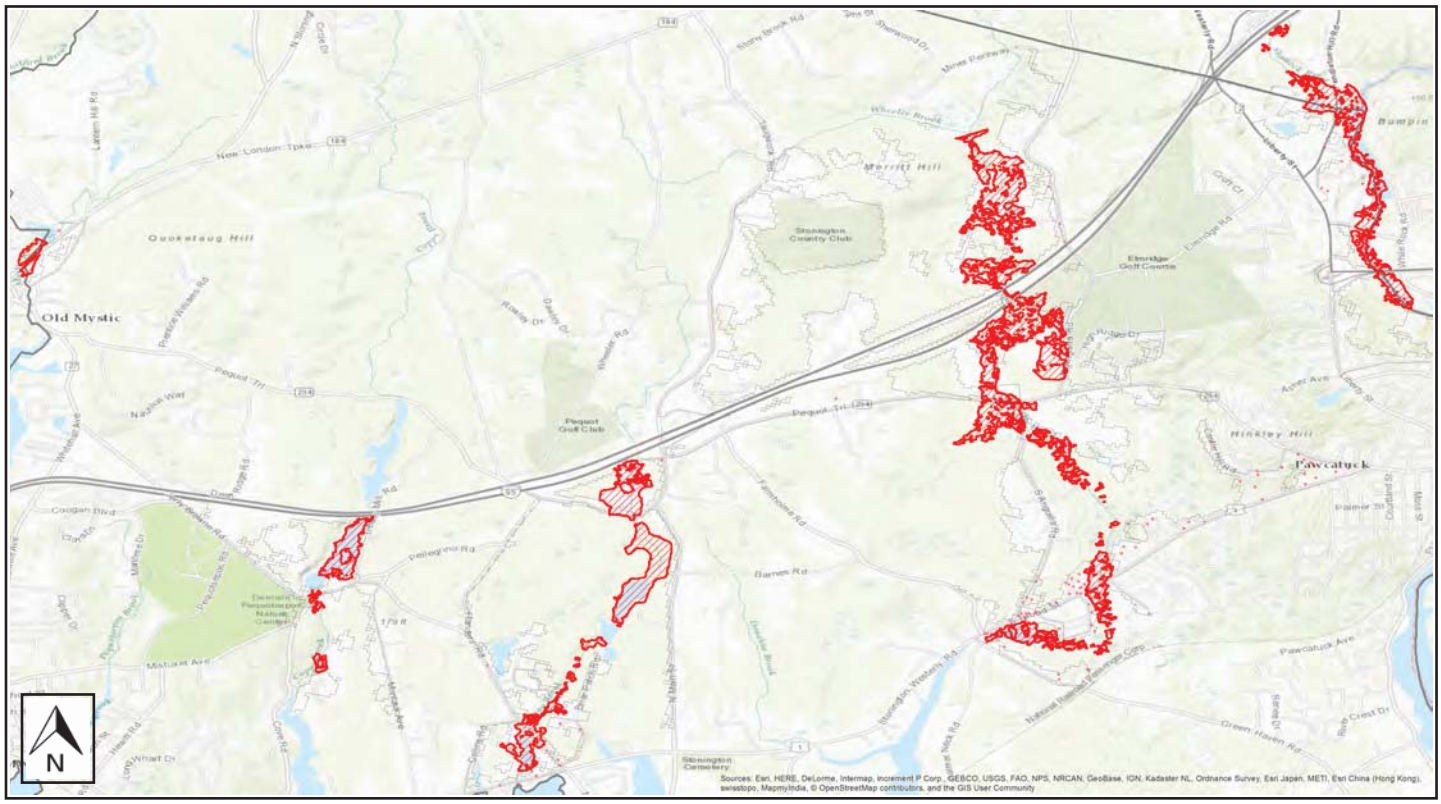


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2	66.67	1	33.33	0	0.00	0	0.00	0	0.00	0	0.00
Total	**2**		**1**		**0**		**0**		**0**		**0**	

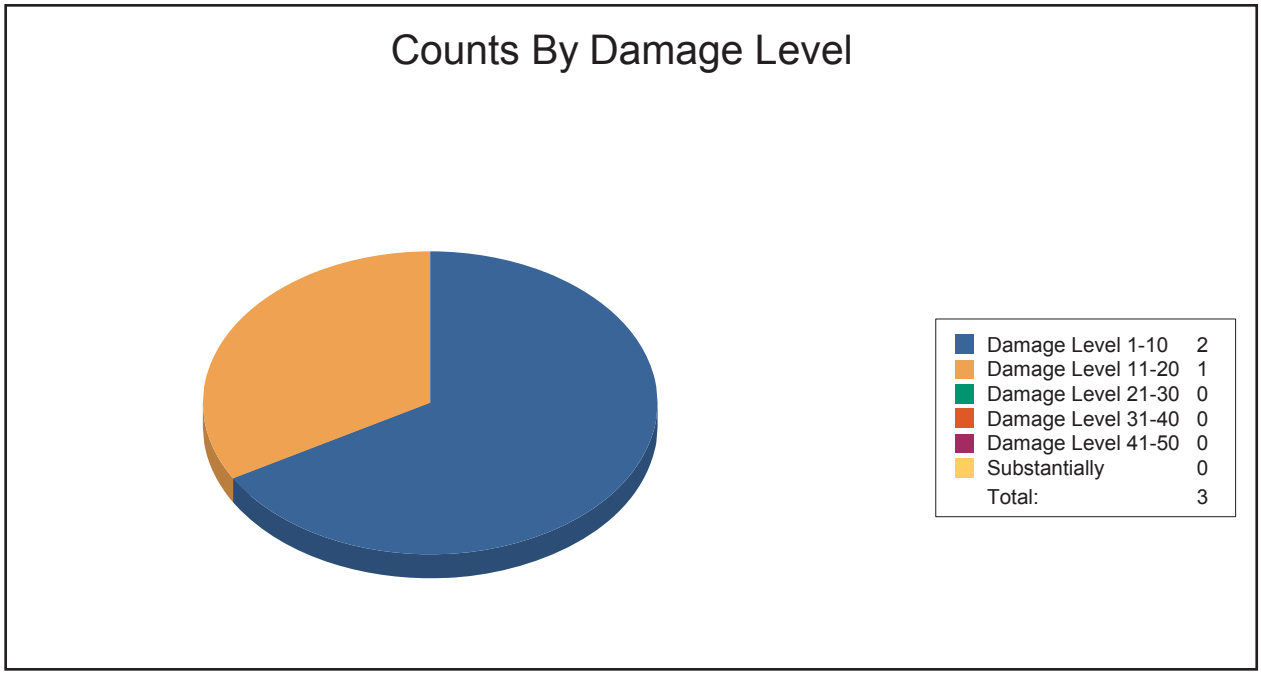


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	2	67	1	33	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	10	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

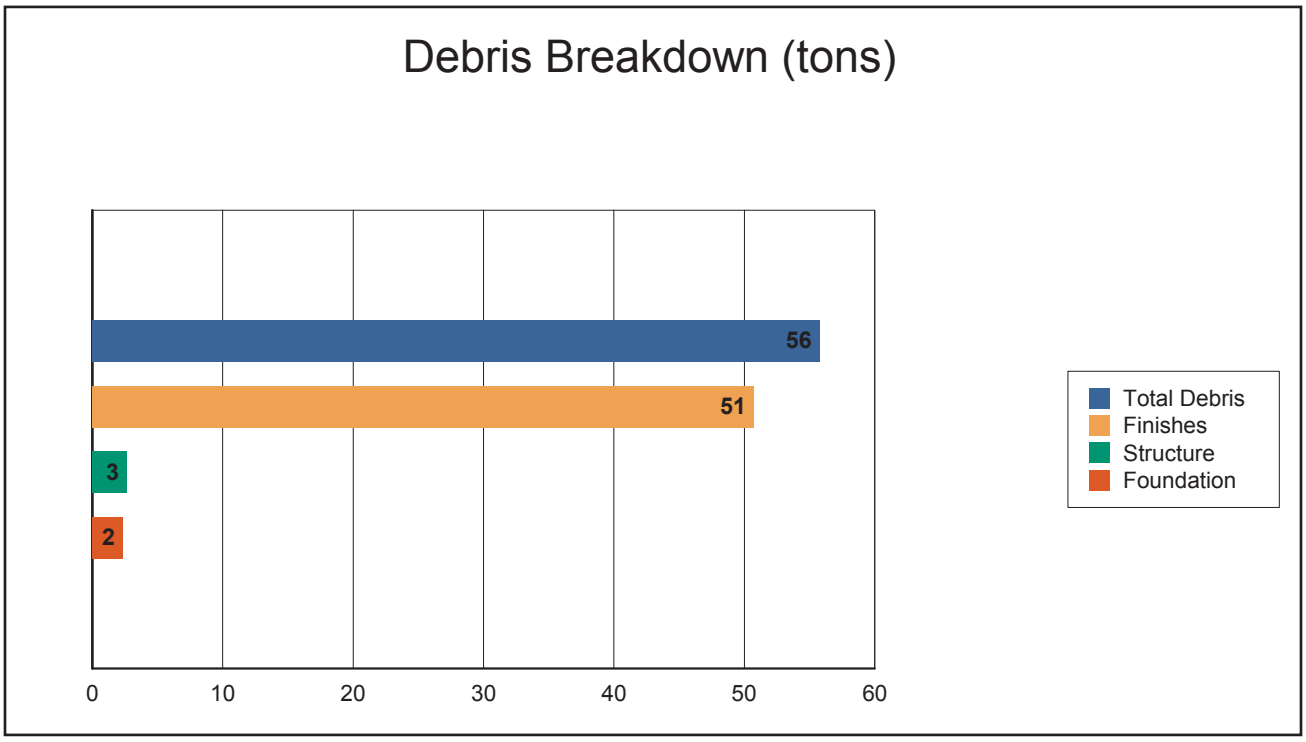
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

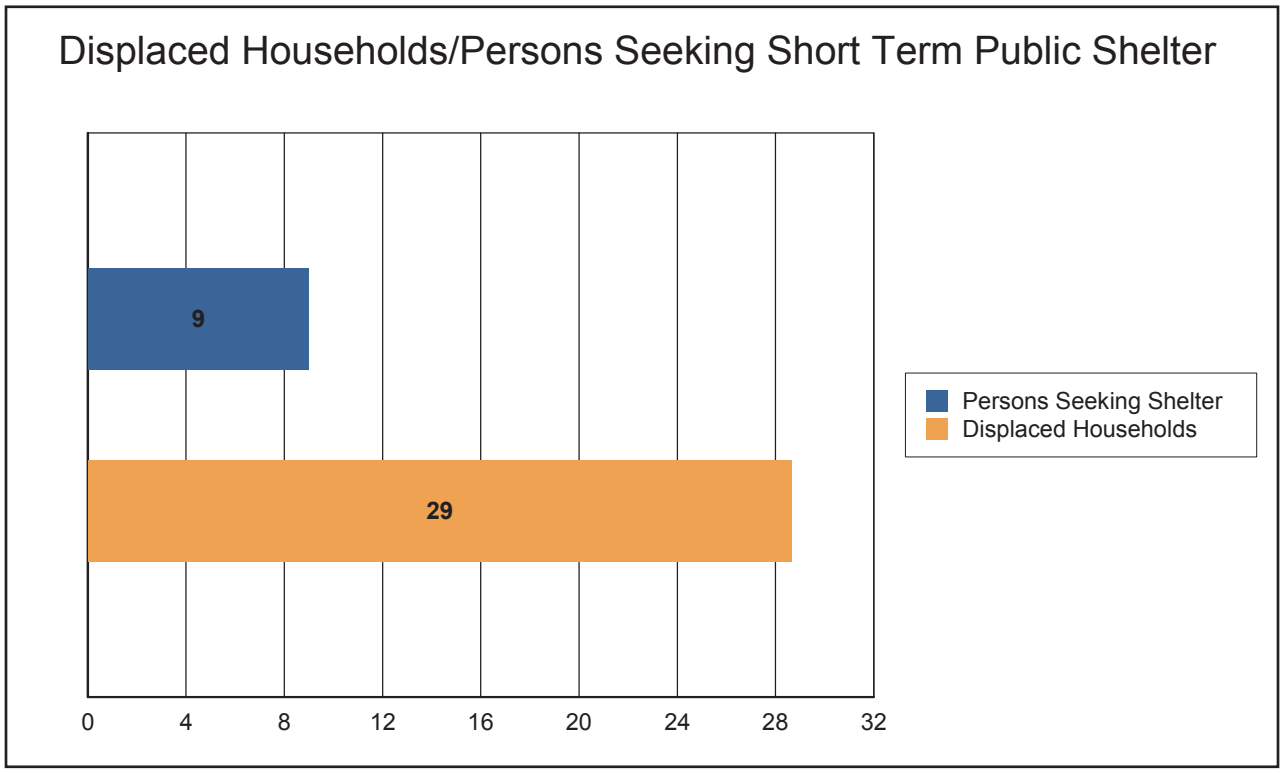


The model estimates that a total of 56 tons of debris will be generated. Of the total amount, Finishes comprises 91% of the total, Structure comprises 5% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 2 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 29 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 9 people (out of a total population of 17,616) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 3.13 million dollars, which represents 1.19 % of the total replacement value of the scenario buildings.

Building-Related Losses

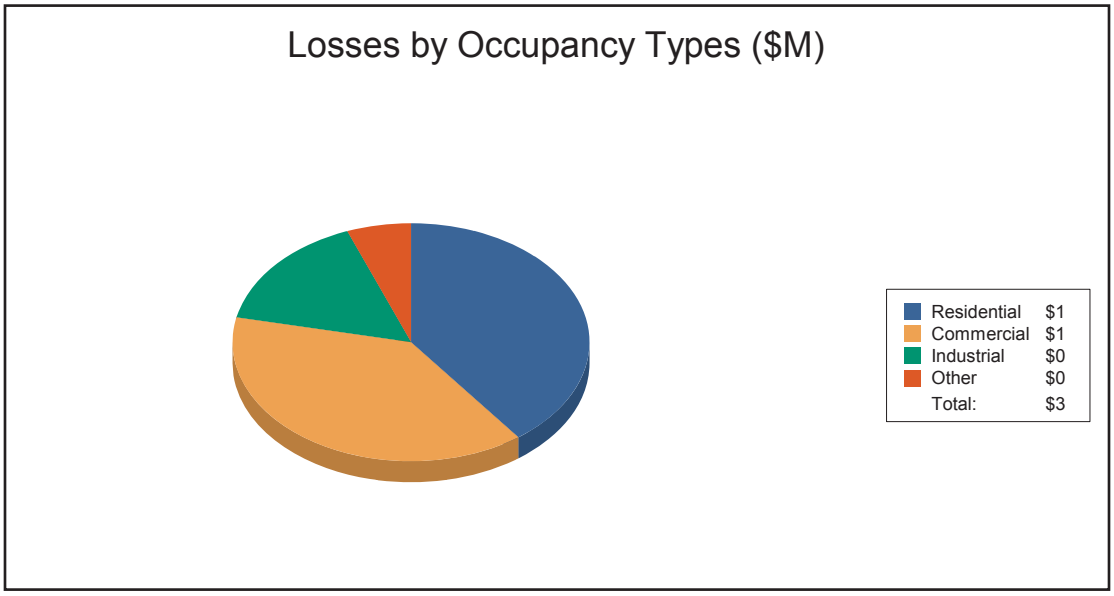
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 3.11 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 39.71% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.87	0.27	0.14	0.02	1.30
	Content	0.38	0.92	0.33	0.15	1.78
	Inventory	0.00	0.01	0.03	0.00	0.04
	Subtotal	**1.24**	**1.20**	**0.50**	**0.17**	**3.11**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.02	0.02
	Subtotal	**0.00**	**0.00**	**0.00**	**0.02**	**0.02**
ALL	**Total**	**1.24**	**1.21**	**0.50**	**0.18**	**3.13**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	17,616	2,039,978	687,614	2,727,592
Total	**17,616**	**2,039,978**	**687,614**	**2,727,592**
Total Study Region	**17,616**	**2,039,978**	**687,614**	**2,727,592**

Hazus-MH: Flood Global Risk Report

Region Name: Waterford

Flood Scenario: Waterford 100 Year Flood

Print Date: Tuesday, May 23, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 34 square miles and contains 532 census blocks. The region contains over 8 thousand households and has a total population of 19,517 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 8,654 buildings in the region with a total building replacement value (excluding contents) of 2,748 million dollars (2010 dollars). Approximately 91.97% of the buildings (and 78.70% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 8,654 buildings in the region which have an aggregate total replacement value of 2,748 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,162,169	78.7%
Commercial	425,536	15.5%
Industrial	66,030	2.4%
Agricultural	6,248	0.2%
Religion	41,149	1.5%
Government	11,337	0.4%
Education	35,049	1.3%
Total	**2,747,51.**	**100%**

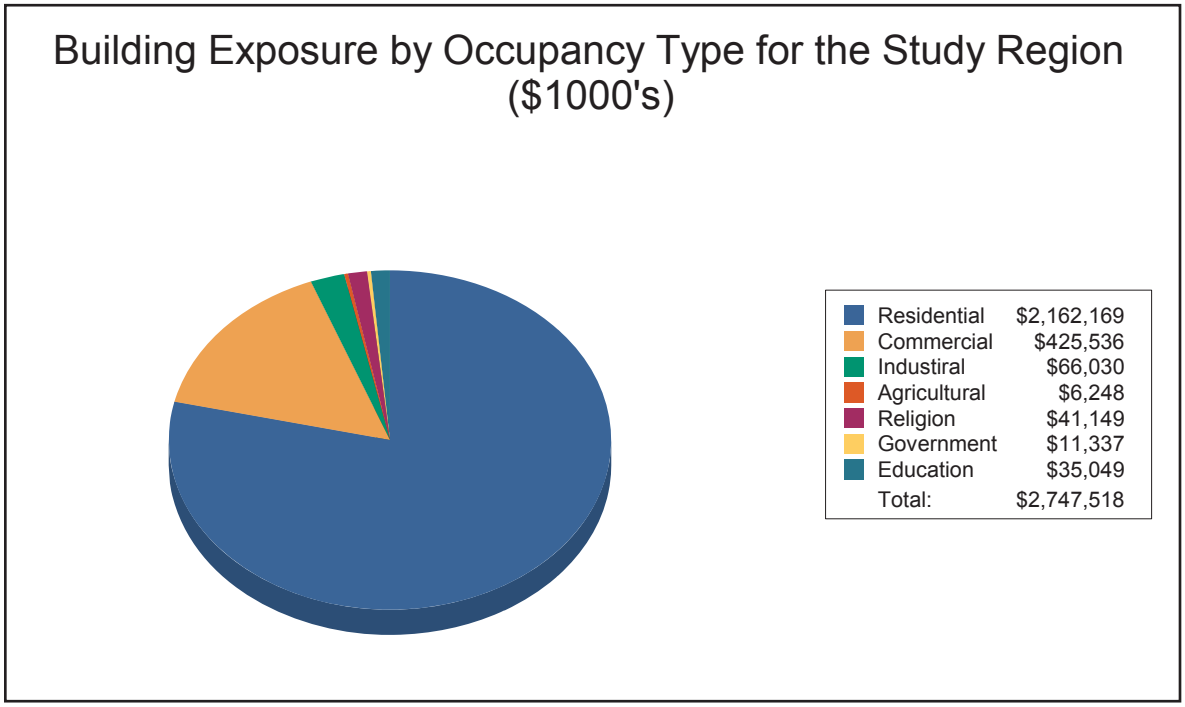
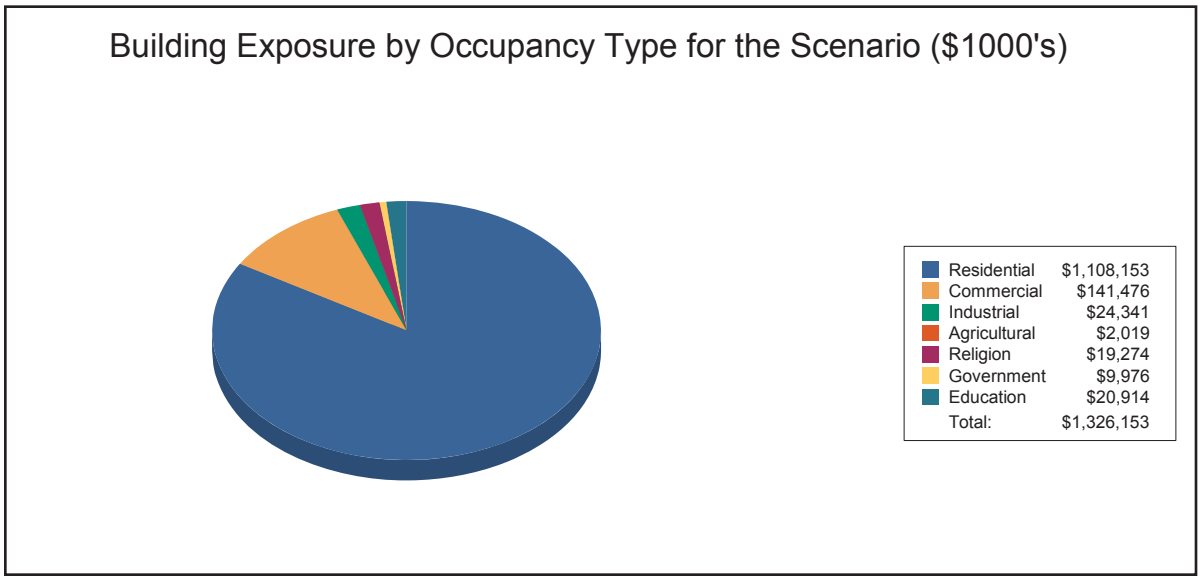


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,108,153	83.6%
Commercial	141,476	10.7%
Industrial	24,341	1.8%
Agricultural	2,019	0.2%
Religion	19,274	1.5%
Government	9,976	0.8%
Education	20,914	1.6%
Total	**1,326,153**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 10 schools, 6 fire stations, 1 police station and 1 emergency operation center.

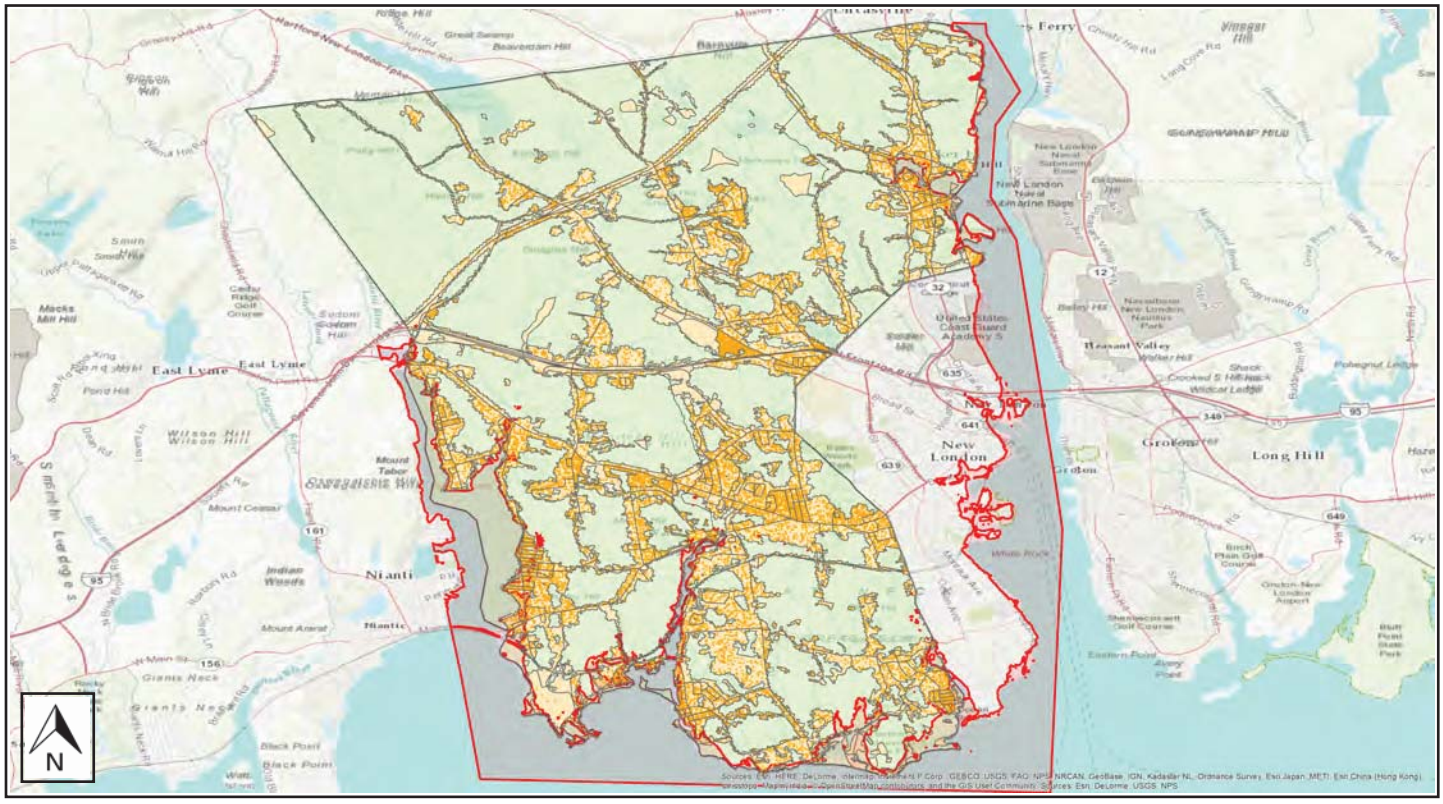
Flood Scenario Parameters

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

Study Region Name:	Waterford
Scenario Name:	Waterford 100 Year Flood
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 88 buildings will be at least moderately damaged. This is over 57% of the total number of buildings in the scenario. There are an estimated 9 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map



Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	6	6.38	47	50.00	27	28.72	2	2.13	3	3.19	9	9.57
Total	**6**		**47**		**27**		**2**		**3**		**9**	

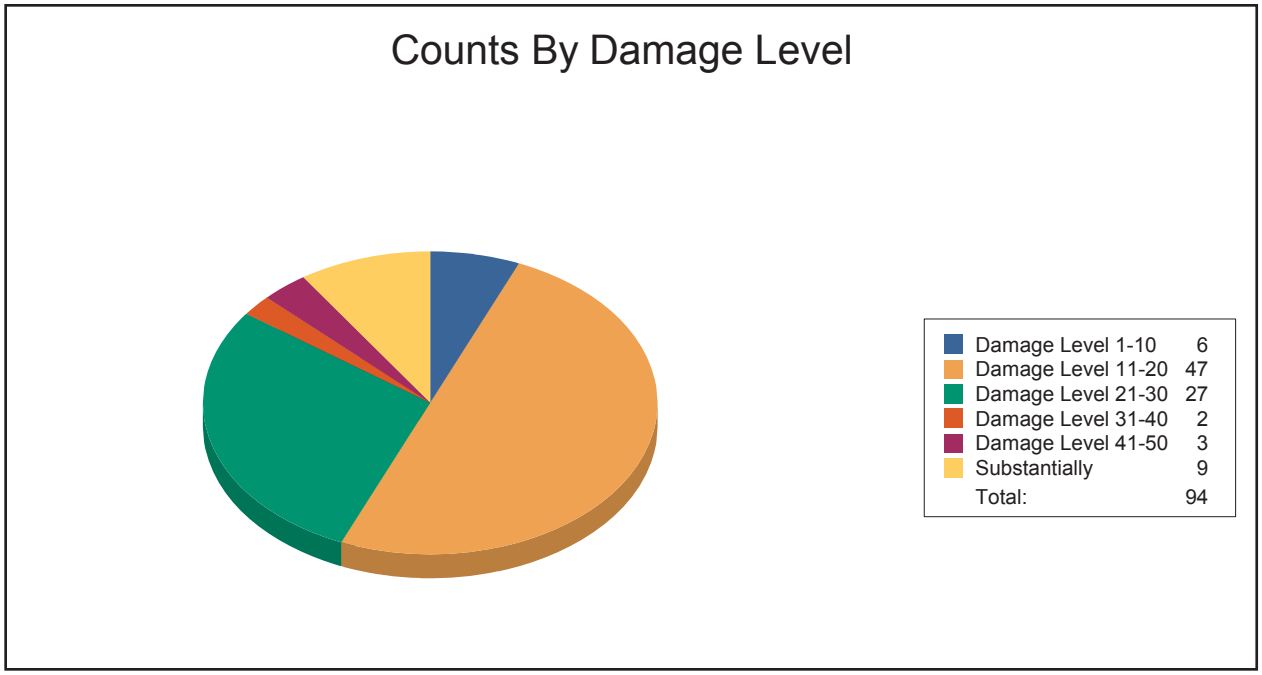


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	6	6	47	50	27	29	2	2	3	3	9	10

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	6	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	10	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

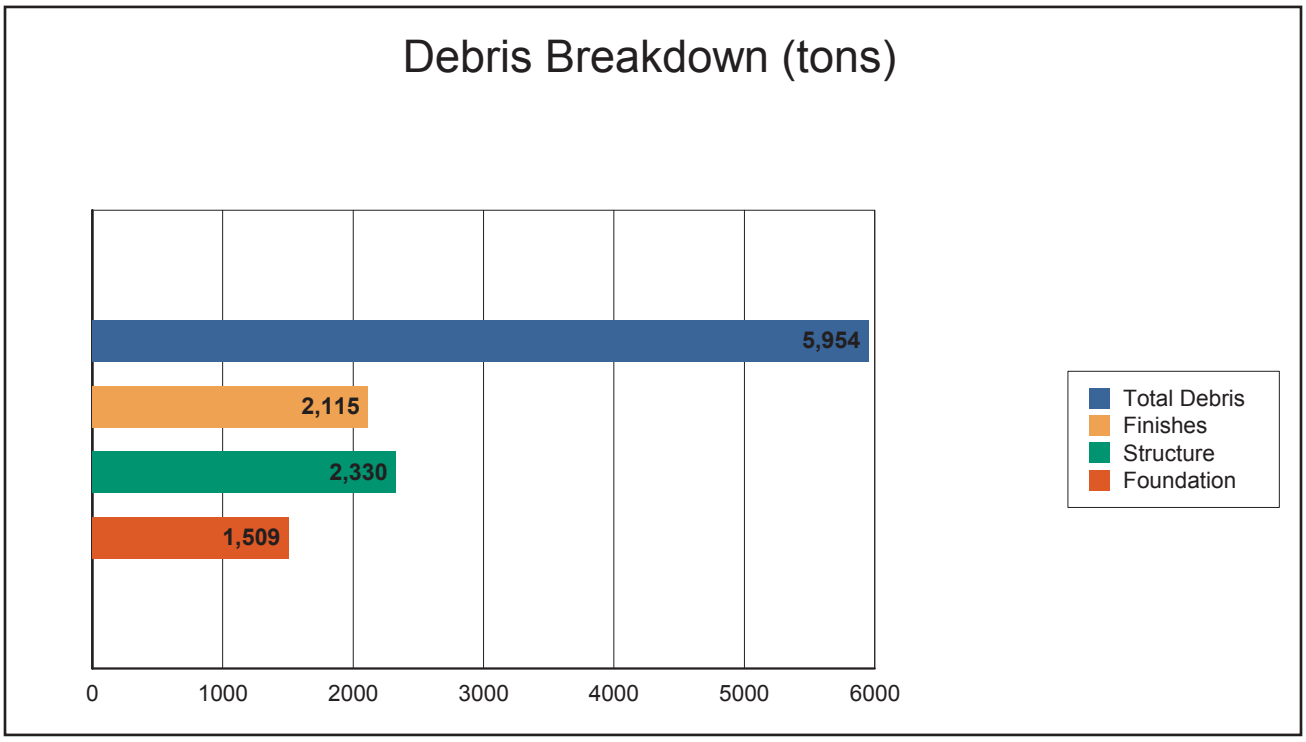
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

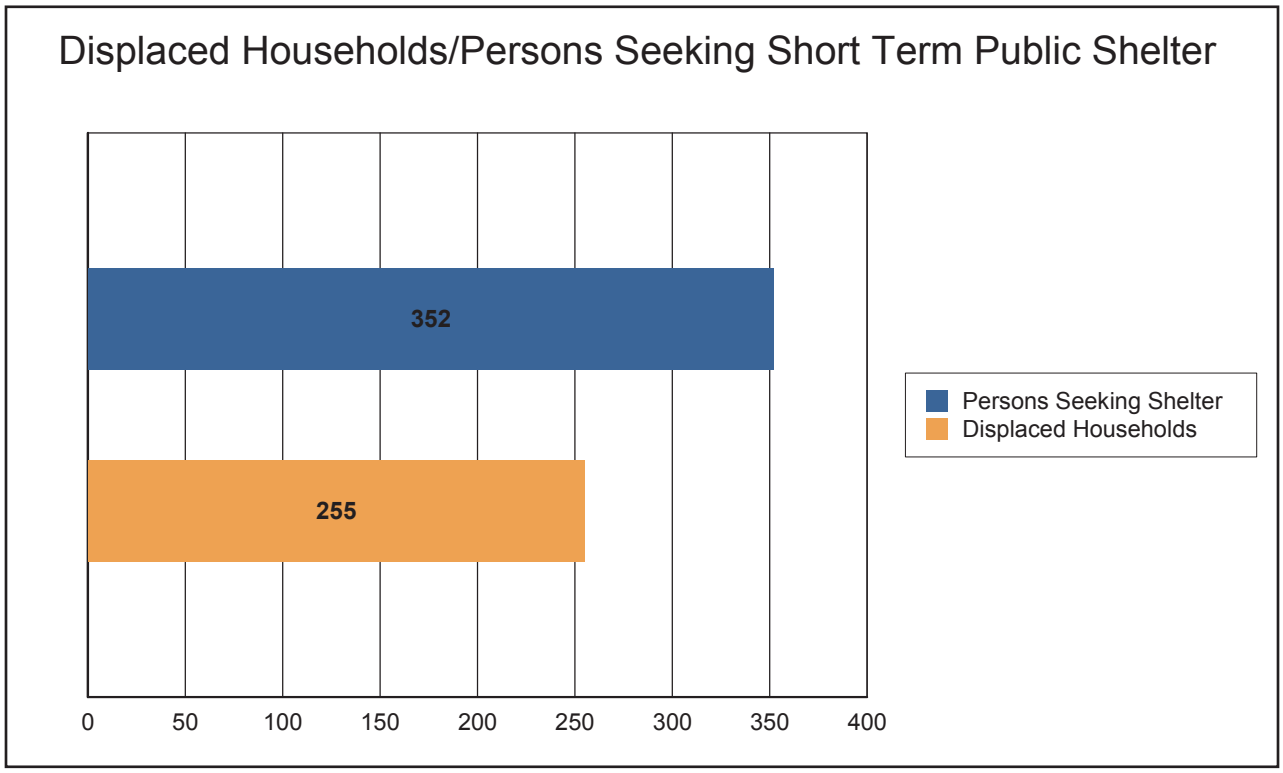


The model estimates that a total of 5,954 tons of debris will be generated. Of the total amount, Finishes comprises 36% of the total, Structure comprises 39% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 238 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 255 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 352 people (out of a total population of 19,517) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 48.62 million dollars, which represents 3.67 % of the total replacement value of the scenario buildings.

Building-Related Losses

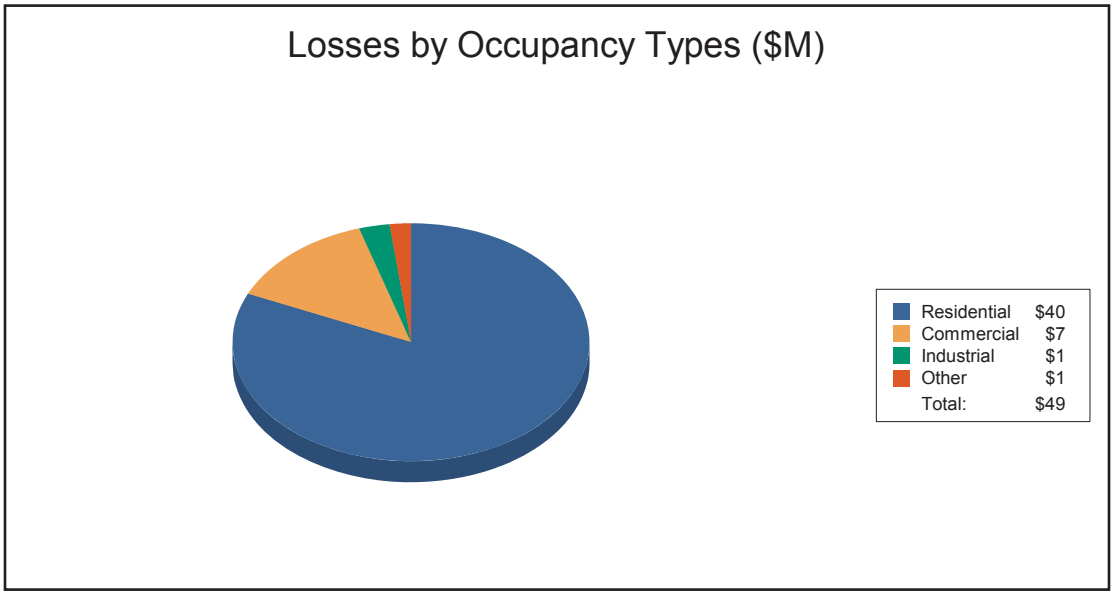
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 48.55 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 81.66% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	21.49	1.79	0.49	0.10	23.87
	Content	18.18	4.78	0.75	0.81	24.53
	Inventory	0.00	0.07	0.08	0.00	0.15
	Subtotal	**39.67**	**6.64**	**1.32**	**0.92**	**48.55**
Business Interruption						
	Income	0.00	0.02	0.00	0.00	0.02
	Relocation	0.02	0.00	0.00	0.00	0.02
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.01	0.02	0.00	0.01	0.03
	Subtotal	**0.03**	**0.03**	**0.00**	**0.01**	**0.07**
ALL	**Total**	**39.70**	**6.67**	**1.32**	**0.93**	**48.62**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	19,517	2,162,169	585,349	2,747,518
Total	**19,517**	**2,162,169**	**5. 5,349**	**2,747,51.**
Total Study Region	**19,517**	**2,162,169**	**5. 5,349**	**2,747,51.**

Hazus-MH: Flood Global Risk Report

Region Name: Waterford

Flood Scenario: Waterford Riverine 100 Year

Print Date: Wednesday, June 14, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 34 square miles and contains 532 census blocks. The region contains over 8 thousand households and has a total population of 19,517 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 8,654 buildings in the region with a total building replacement value (excluding contents) of 2,748 million dollars (2010 dollars). Approximately 91.97% of the buildings (and 78.70% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 8,654 buildings in the region which have an aggregate total replacement value of 2,748 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,162,169	78.7%
Commercial	425,536	15.5%
Industrial	66,030	2.4%
Agricultural	6,248	0.2%
Religion	41,149	1.5%
Government	11,337	0.4%
Education	35,049	1.3%
Total	**2,747,51.**	**100%**

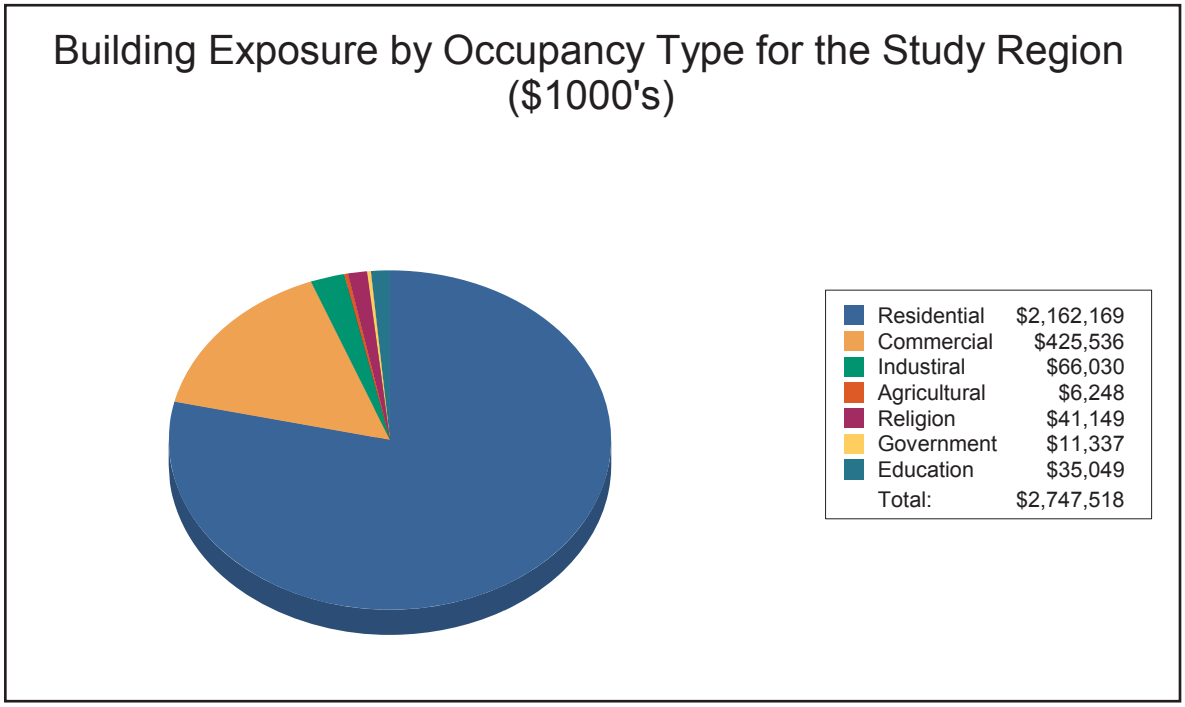
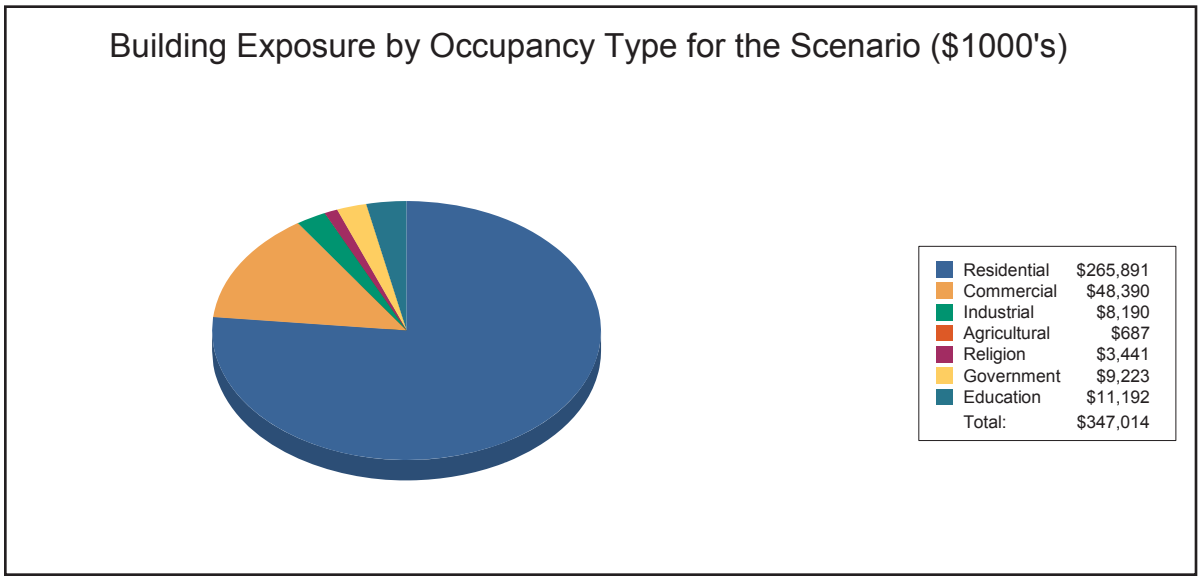


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	265,891	76.6%
Commercial	48,390	13.9%
Industrial	8,190	2.4%
Agricultural	687	0.2%
Religion	3,441	1.0%
Government	9,223	2.7%
Education	11,192	3.2%
Total	**347,014**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 10 schools, 6 fire stations, 1 police station and 1 emergency operation center.

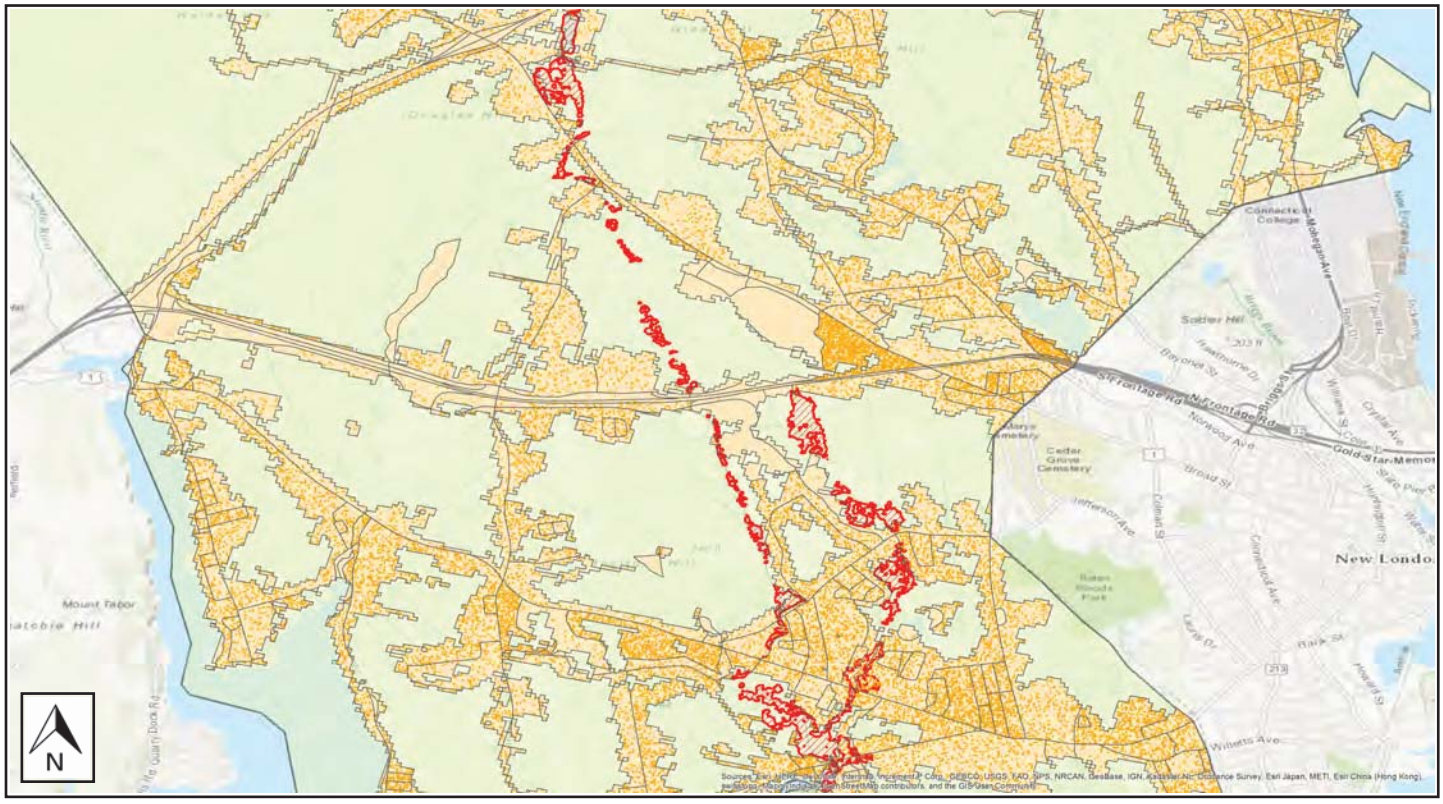
Flood Scenario Parameters

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

Study Region Name:	Waterford
Scenario Name:	Waterford Riverine 100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overvie= Map

Illustrating scenario flood extent, as = ell as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 2 buildings will be at least moderately damaged. This is over 89% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot K $3008) Overvie= Map

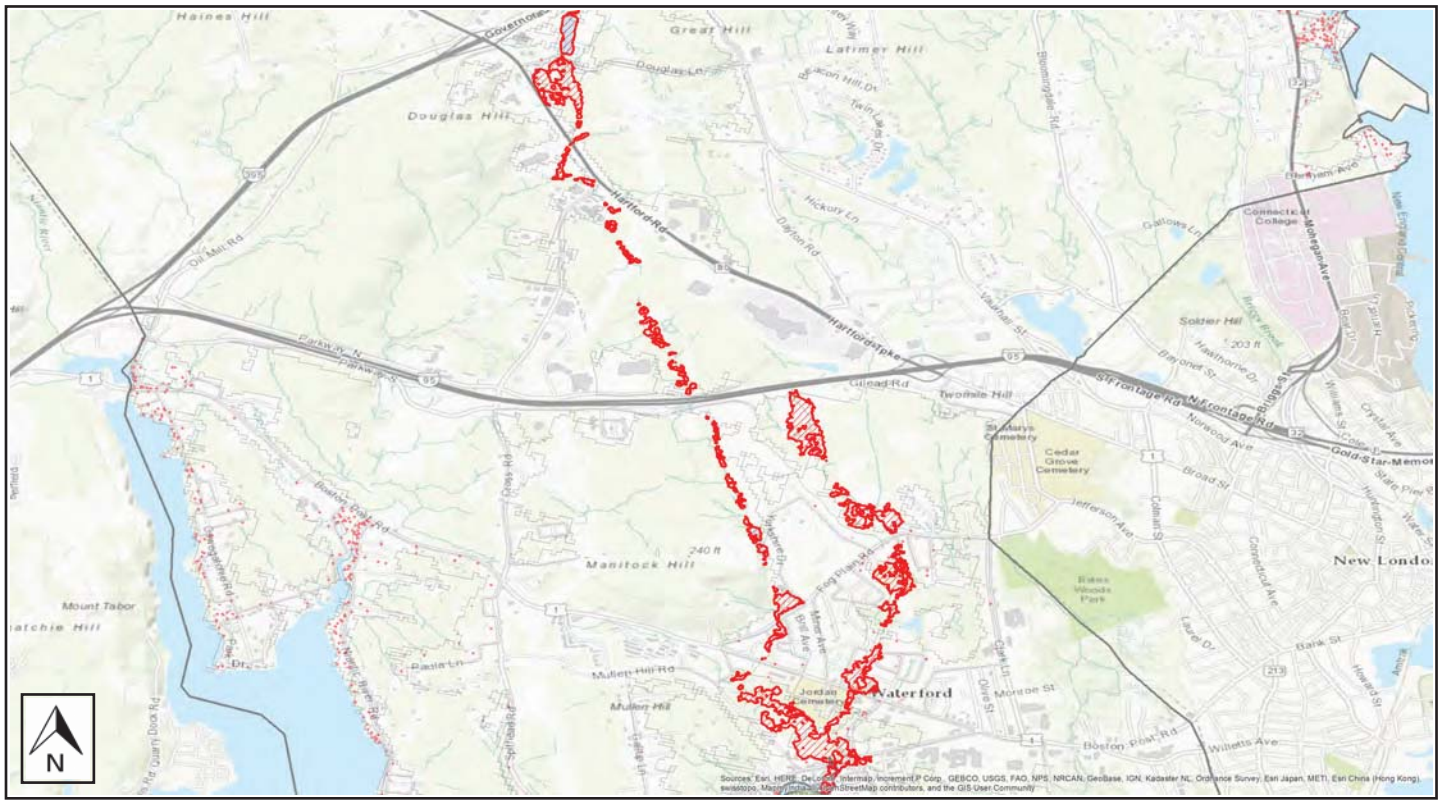


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**	**Count**	**(w)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	6	75.00	2	25.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**6**		**2**		**0**		**0**		**0**		**0**	

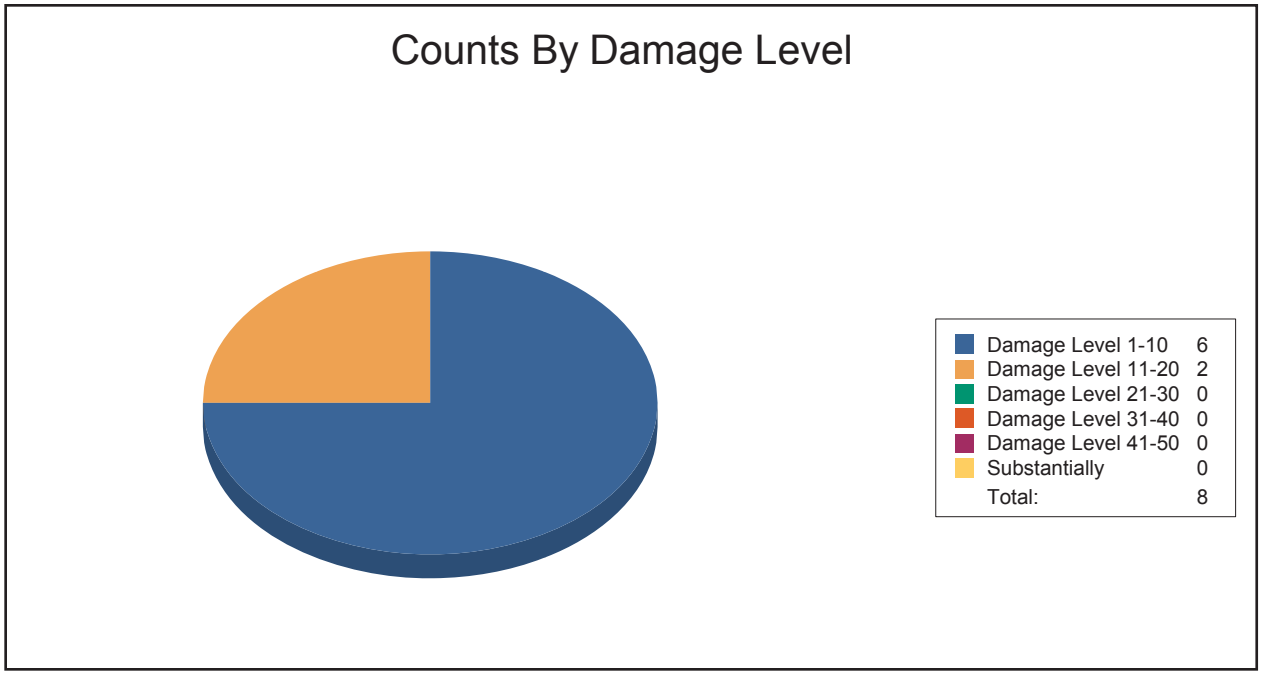


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)	Count	(w)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	6	75	2	25	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	6	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	10	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

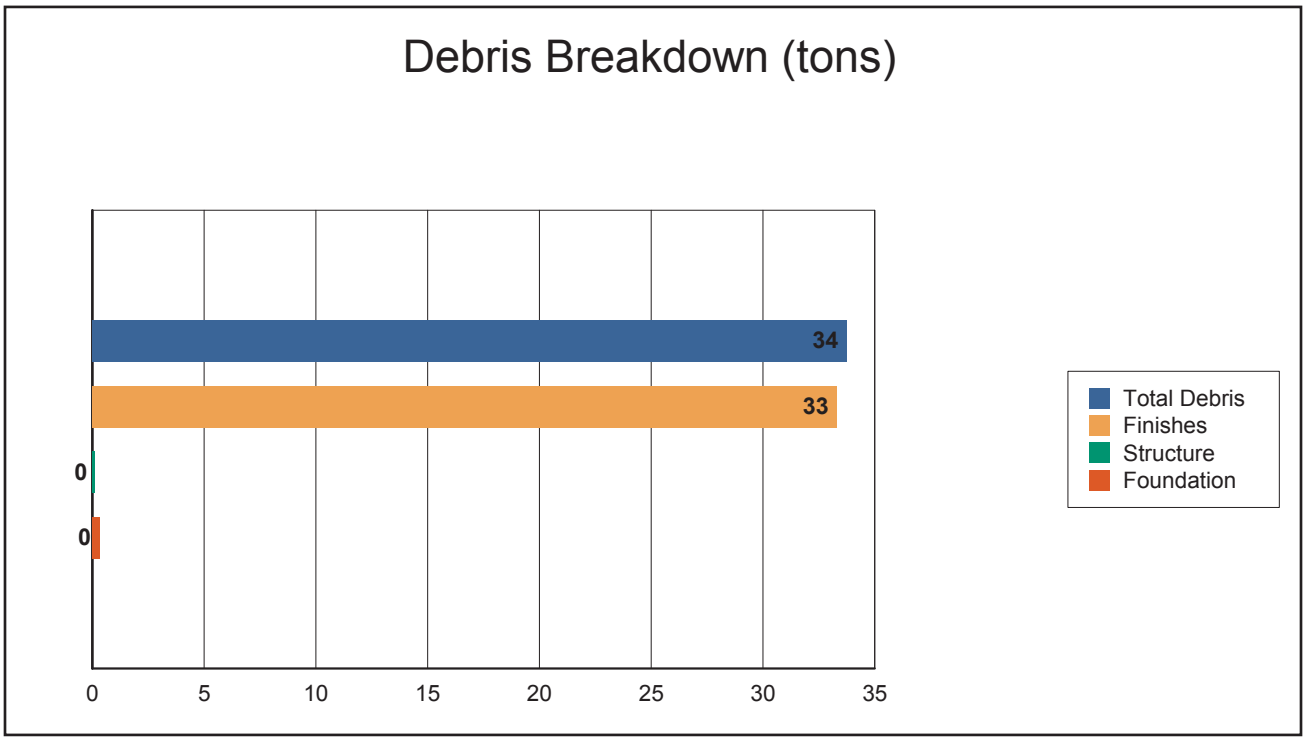
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

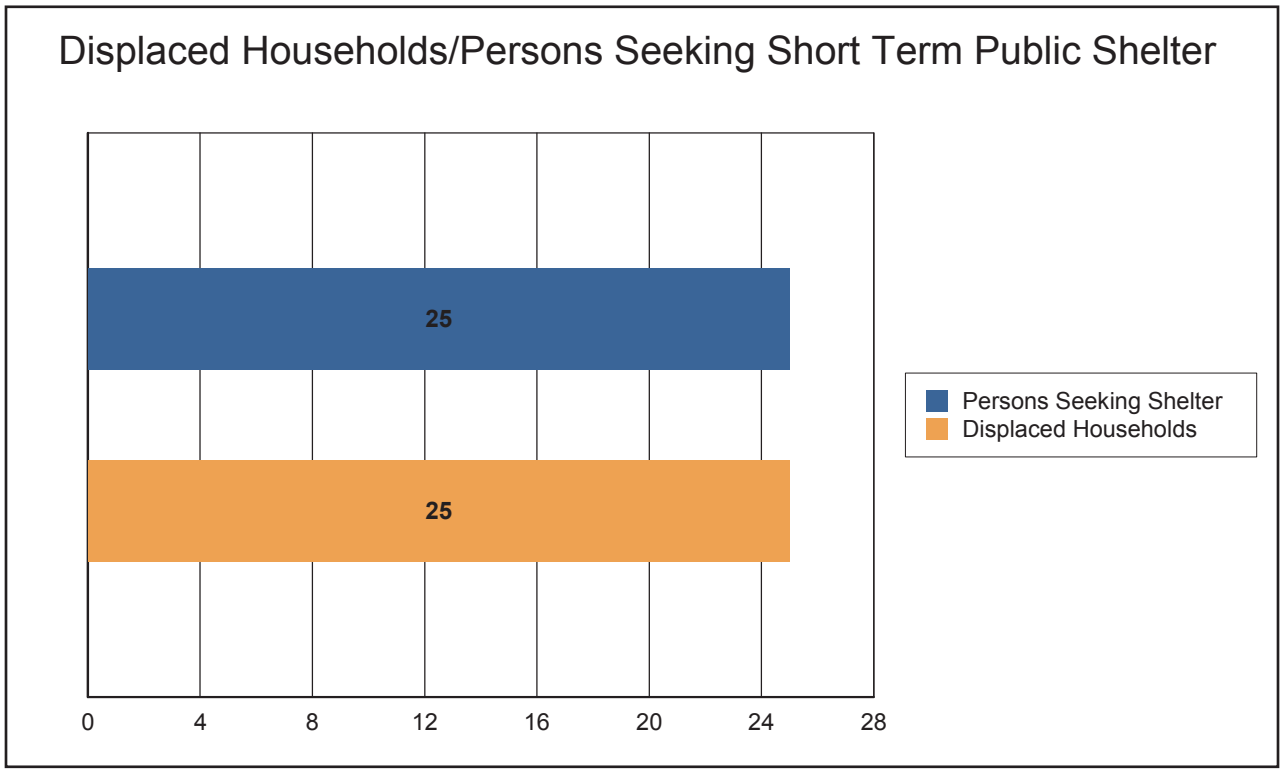


The model estimates that a total of 34 tons of debris will be generated. Of the total amount, Finishes comprises 99% of the total, Structure comprises 0% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 1 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 25 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 25 people (out of a total population of 19,517) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1.07 million dollars, which represents 0.31 % of the total replacement value of the scenario buildings.

Building-Related Losses

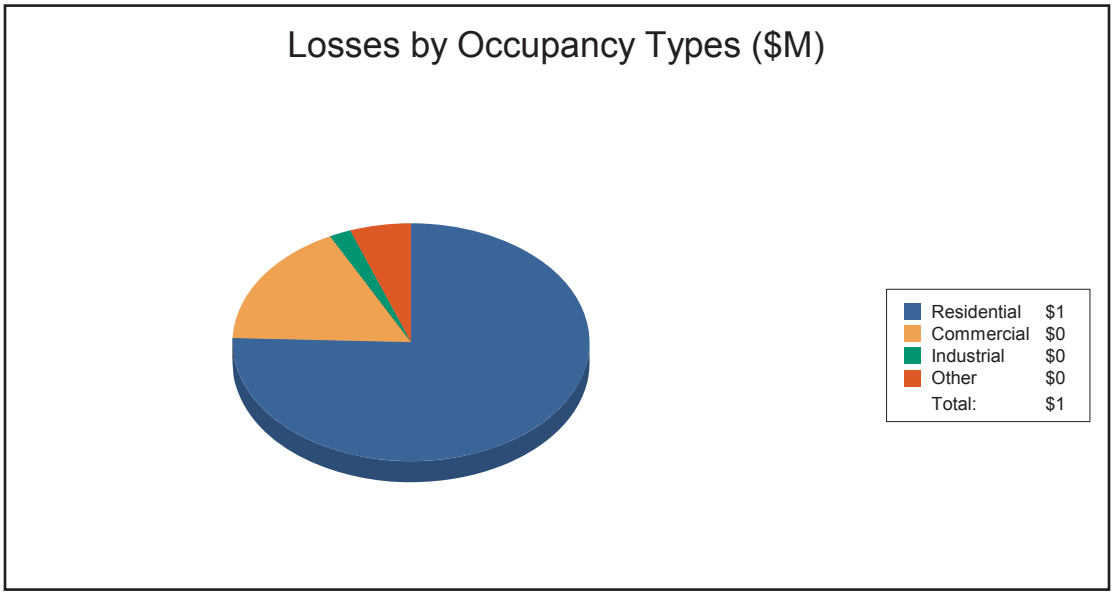
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 1.07 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 75.51% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.51	0.04	0.01	0.01	0.57
	Content	0.30	0.14	0.01	0.05	0.50
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.81**	**0.18**	**0.02**	**0.06**	**1.07**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ALL	**Total**	**0.81**	**0.18**	**0.02**	**0.06**	**1.07**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	19,517	2,162,169	585,349	2,747,518
Total	**19,517**	**2,162,169**	**5. 5,349**	**2,747,51.**
Total Study Region	**19,517**	**2,162,169**	**5. 5,349**	**2,747,51.**

HAZUS
Hurricane
Results

Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 10-year Return Period

Print Date: Thursday, April 06, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 616.90 square miles and contains 66 census tracts. There are over 110 thousand households in the region and has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 million dollars (2014 dollars). Approximately 91% of the buildings (and 76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 103,496 buildings in the region which have an aggregate total replacement value of 36,944 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

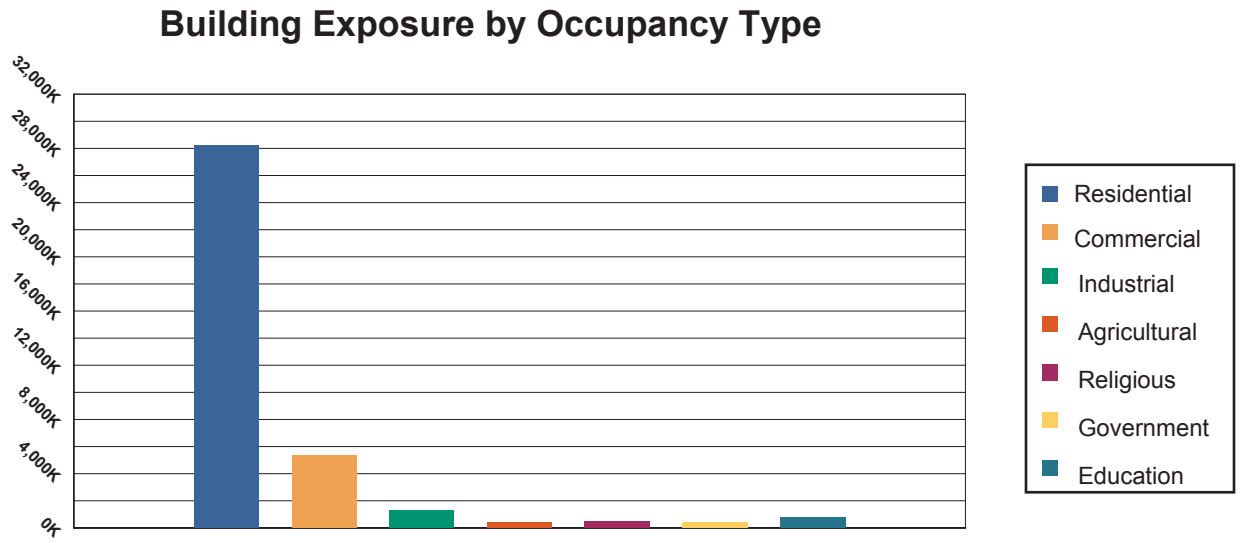


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	28,189,901	76.30%
Commercial	5,355,537	14.50%
Industrial	1,309,504	3.54%
Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

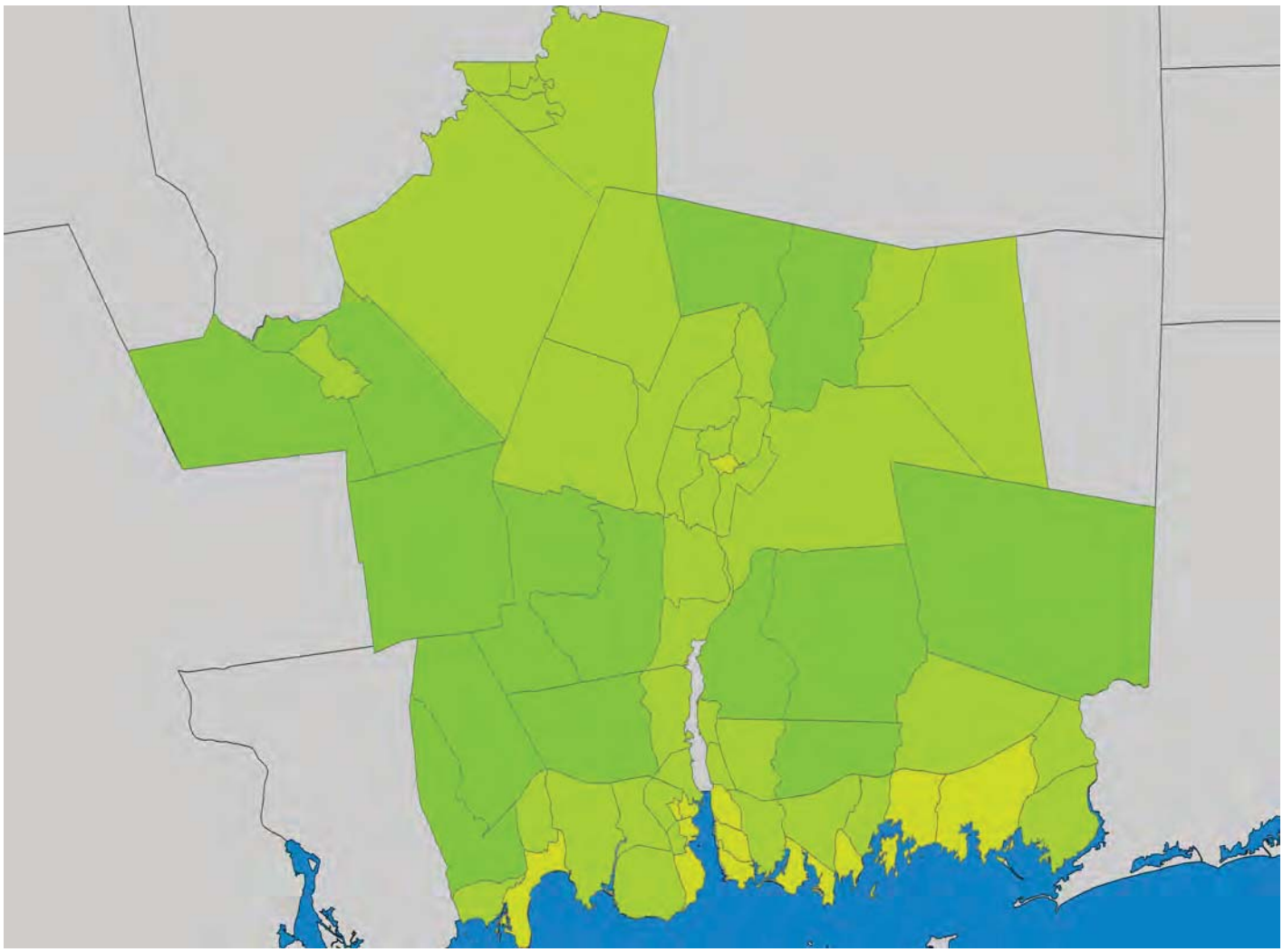
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

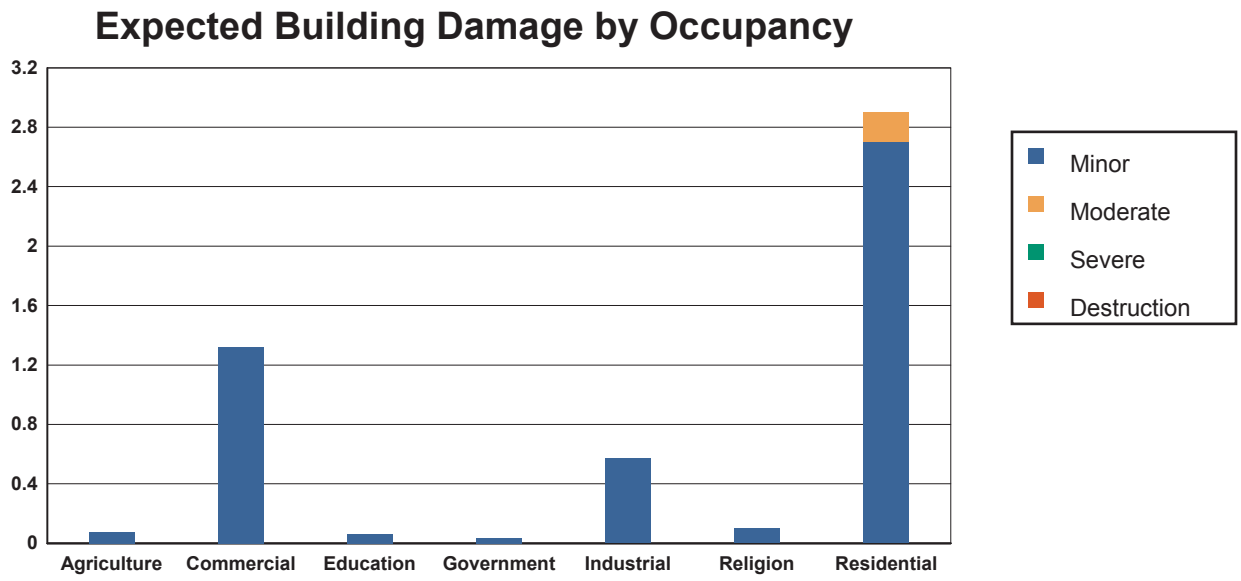


Table 2: Expected Building Damage by Occupancy : 10 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	437	99.98	0	0.02	0	0.00	0	0.00	0	0.00
Commercial	5,954	99.98	1	0.02	0	0.00	0	0.00	0	0.00
Education	278	99.98	0	0.02	0	0.00	0	0.00	0	0.00
Government	298	99.99	0	0.01	0	0.00	0	0.00	0	0.00
Industrial	1,821	99.97	1	0.03	0	0.00	0	0.00	0	0.00
Religion	525	99.98	0	0.02	0	0.00	0	0.00	0	0.00
Residential	94,178	100.00	3	0.00	0	0.00	0	0.00	0	0.00
Total	**103,491**		**5**		**0**		**0**		**0**	

Table 3: Expected Building Damage by Building Type : 10 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	688	99.98	0	0.02	0	0.00	0	0.00	0	0.00
Masonry	6,648	99.98	1	0.02	0	0.00	0	0.00	0	0.00
MH	3,056	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	4,121	99.97	1	0.03	0	0.00	0	0.00	0	0.00
Wood	84,436	100.00	1	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 499 hospital beds (only 100.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

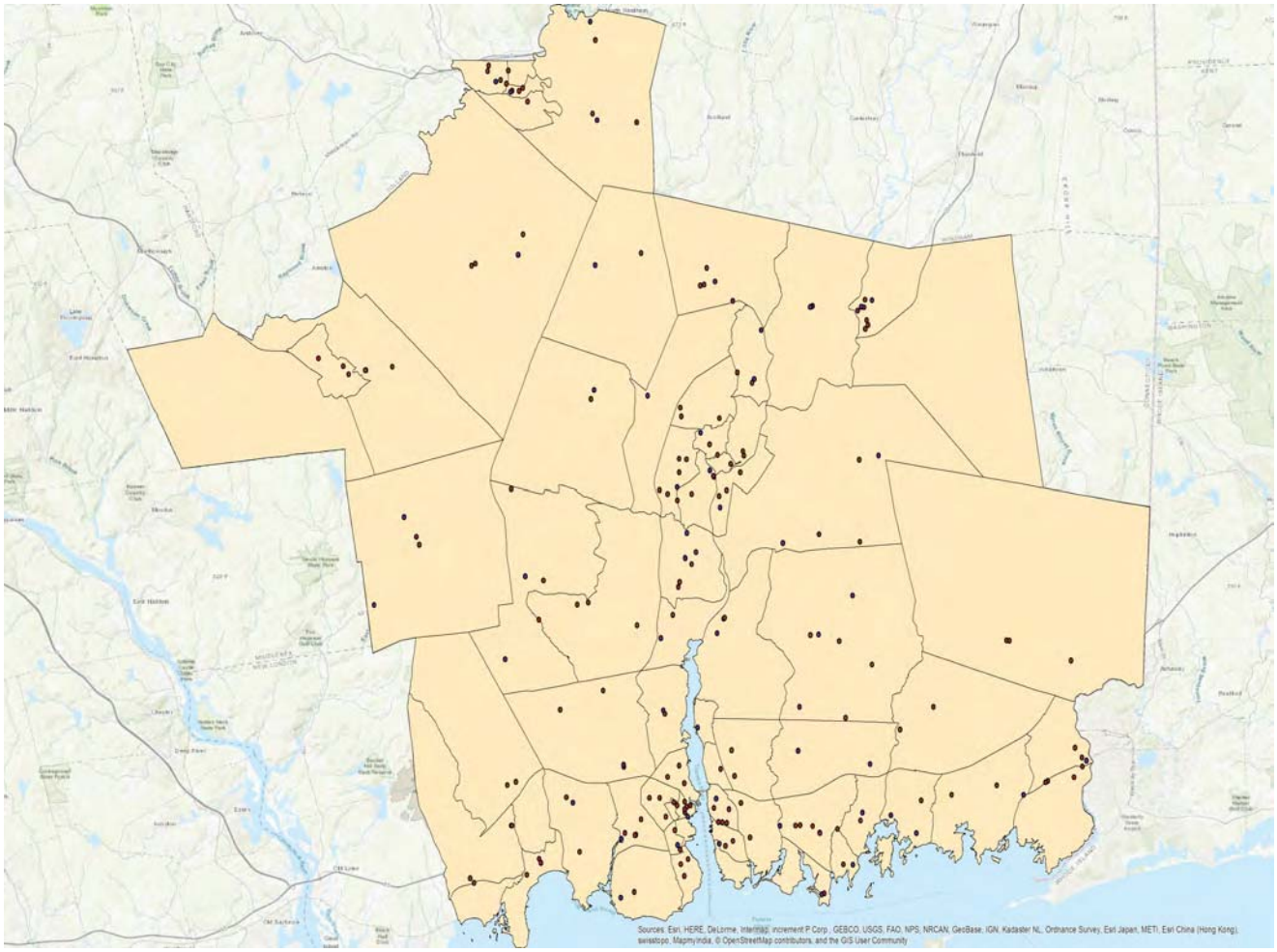
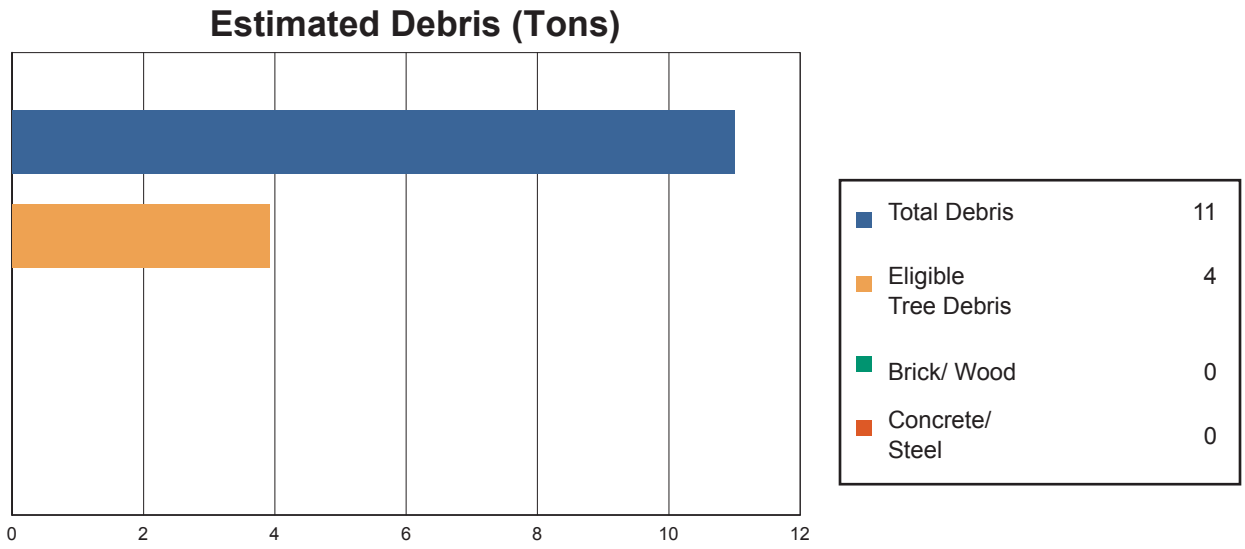


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	0	0	3
Police Stations	26	0	0	26
Schools	132	0	0	132

Induced Hurricane Damage

Debris Generation

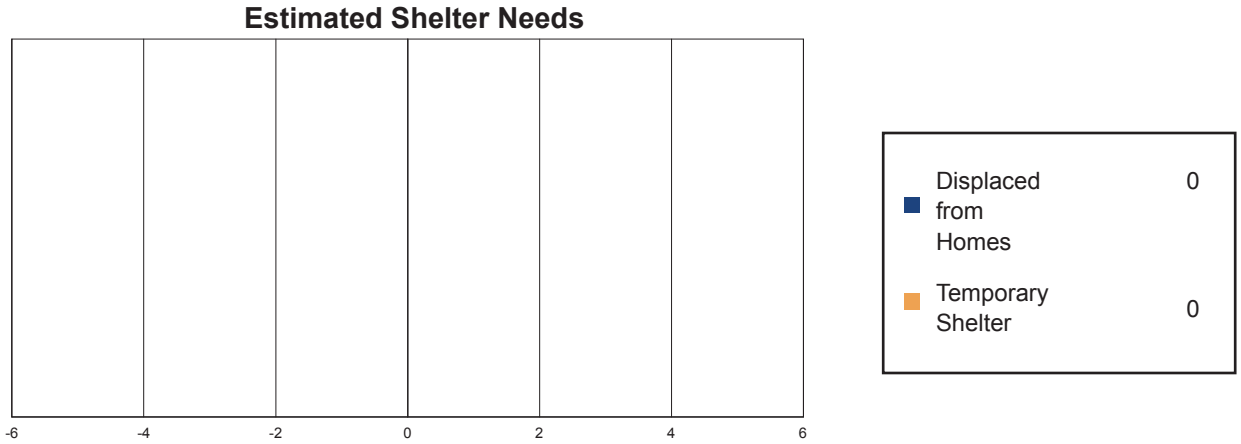


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 11 tons of debris will be generated. Of the total amount, 7 tons (64%) is Other Tree Debris. Of the remaining 4 tons, Brick/Wood comprises 0% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 4 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

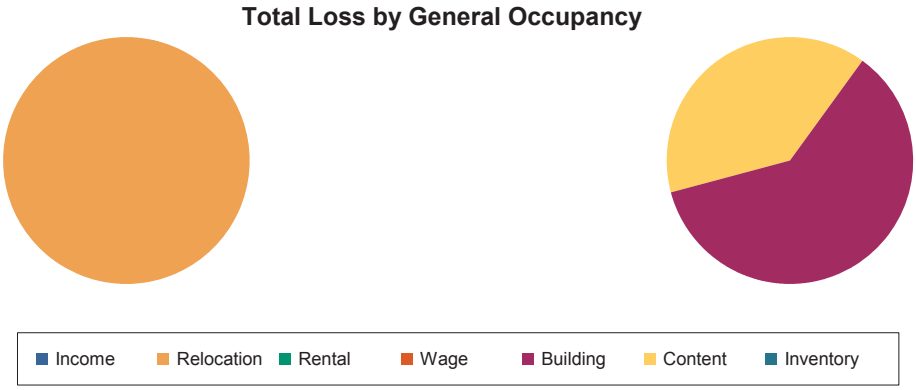
Economic Loss

The total economic loss estimated for the hurricane is 0.1 million dollars, which represents 0.00 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 0 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 100% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



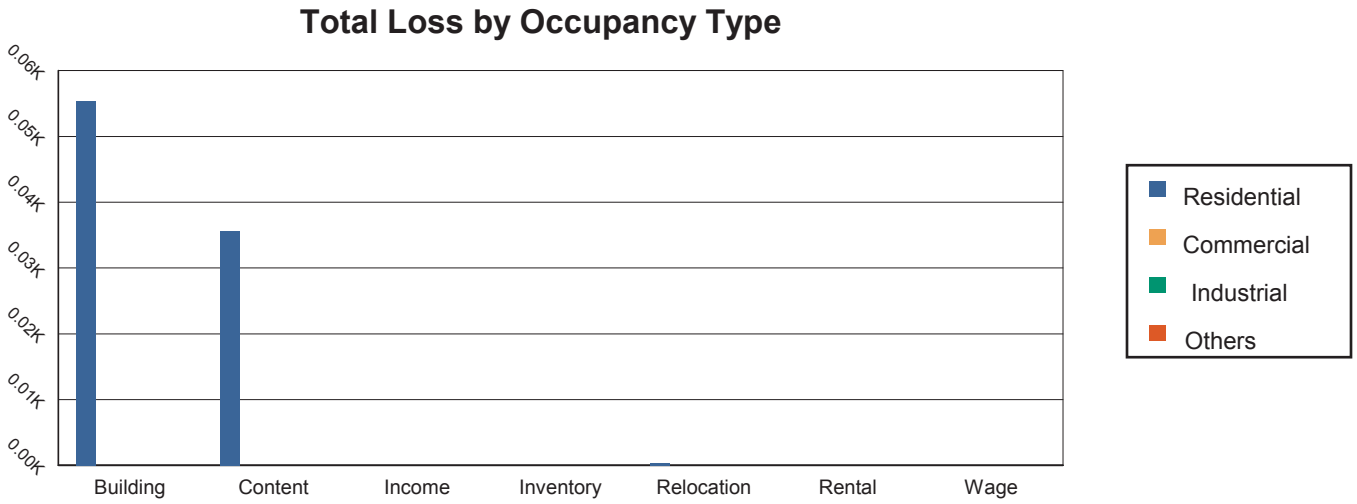


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	55.42	0.00	0.00	0.00	55.42
	Content	35.64	0.00	0.00	0.00	35.64
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**91.06**	**0.00**	**0.00**	**0.00**	**91.06**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.37	0.00	0.00	0.00	0.37
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.37**	**0.00**	**0.00**	**0.00**	**0.37**
Total						
	Total	**91.42**	**0.00**	**0.00**	**0.00**	**91.42**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
Windham	25,268	1,887,486	723,702	2,611,188
Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**
Study Region Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**

Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 20-year Return Period

Print Date: Thursday, April 06, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 616.90 square miles and contains 66 census tracts. There are over 110 thousand households in the region and has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 million dollars (2014 dollars). Approximately 91% of the buildings (and 76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 103,496 buildings in the region which have an aggregate total replacement value of 36,944 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

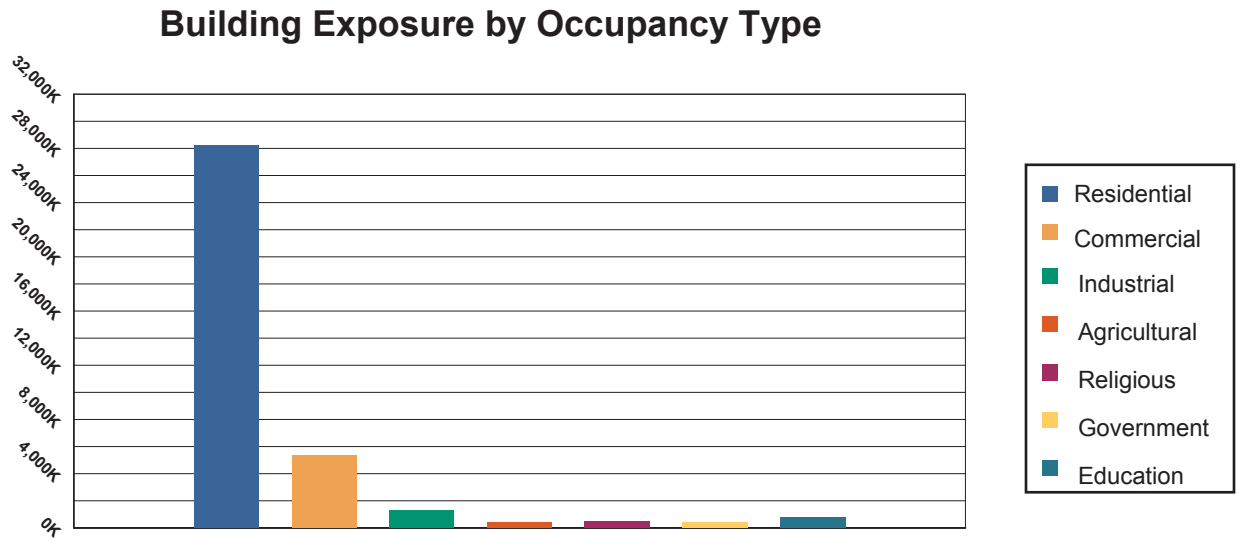


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	28,189,901	76.30%
Commercial	5,355,537	14.50%
Industrial	1,309,504	3.54%
Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

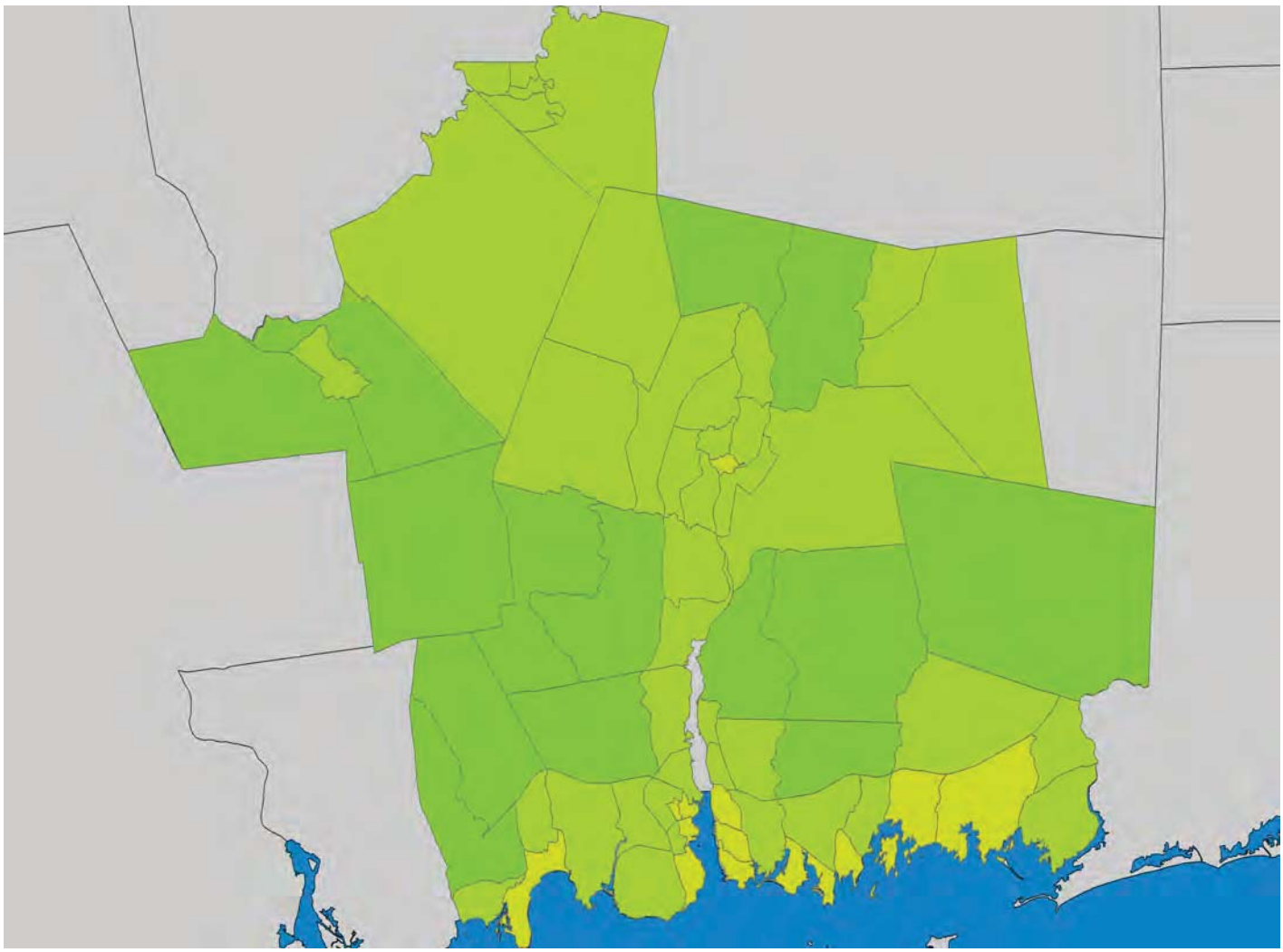
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 9 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

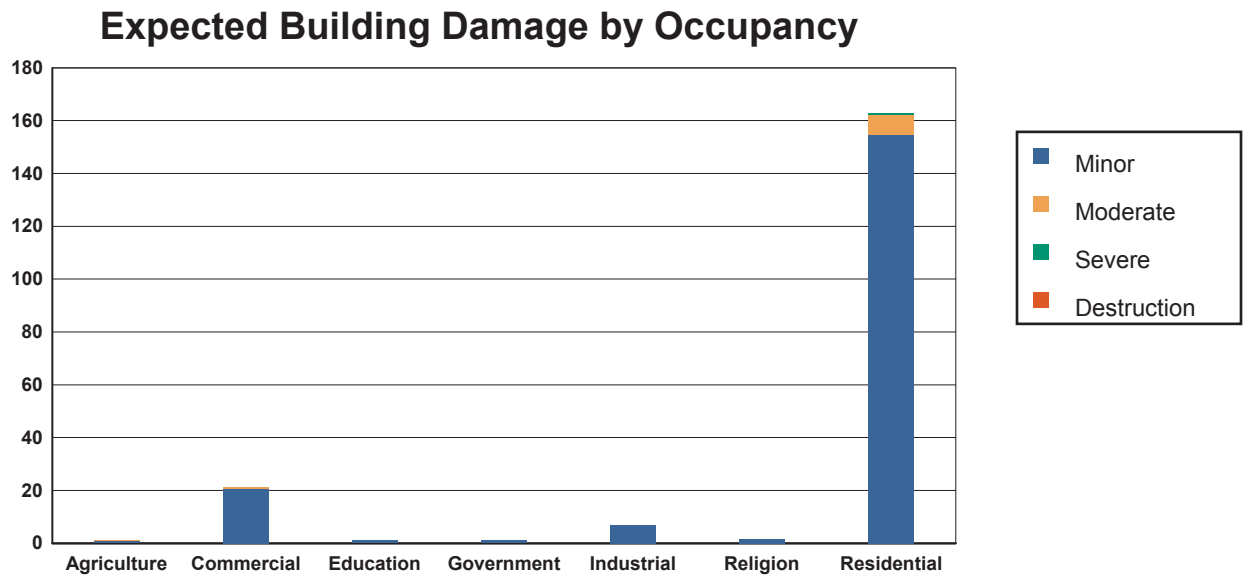


Table 2: Expected Building Damage by Occupancy : 20 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	436	99.74	1	0.25	0	0.01	0	0.00	0	0.00
Commercial	5,934	99.65	21	0.35	0	0.01	0	0.00	0	0.00
Education	277	99.65	1	0.35	0	0.00	0	0.00	0	0.00
Government	297	99.66	1	0.34	0	0.00	0	0.00	0	0.00
Industrial	1,815	99.62	7	0.38	0	0.00	0	0.00	0	0.00
Religion	523	99.71	2	0.29	0	0.01	0	0.00	0	0.00
Residential	94,018	99.83	155	0.16	8	0.01	0	0.00	0	0.00
Total	**103,300**		**187**		**8**		**0**		**0**	

Table 3: Expected Building Damage by Building Type : 20 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	685	99.53	3	0.47	0	0.00	0	0.00	0	0.00
Masonry	6,612	99.45	34	0.52	2	0.04	0	0.00	0	0.00
MH	3,056	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	4,106	99.61	16	0.39	0	0.00	0	0.00	0	0.00
Wood	84,337	99.88	96	0.11	4	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 499 hospital beds (only 100.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

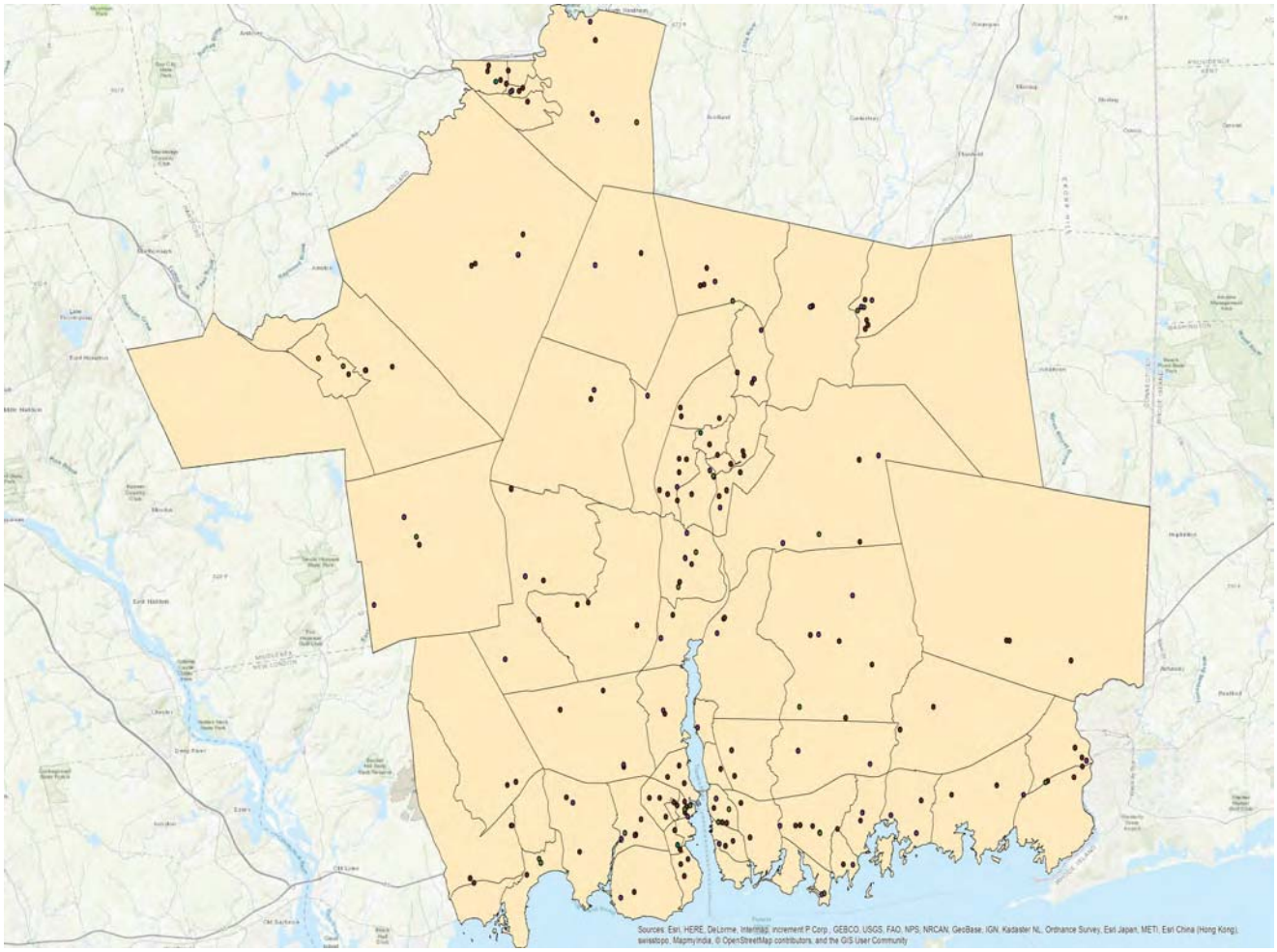
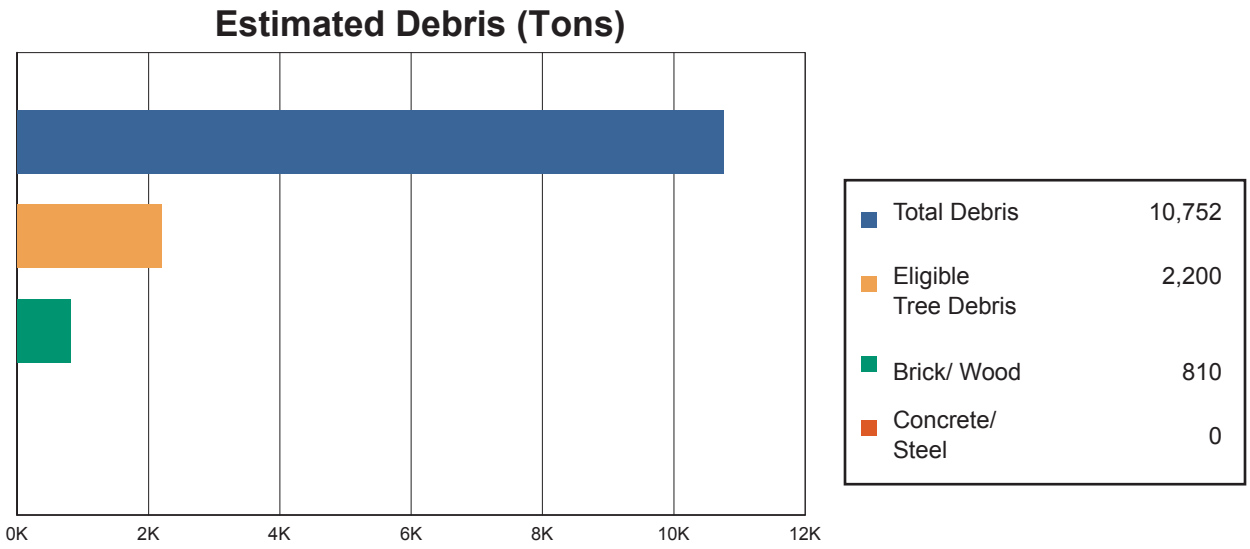


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	0	0	3
Police Stations	26	0	0	26
Schools	132	0	0	132

Induced Hurricane Damage

Debris Generation

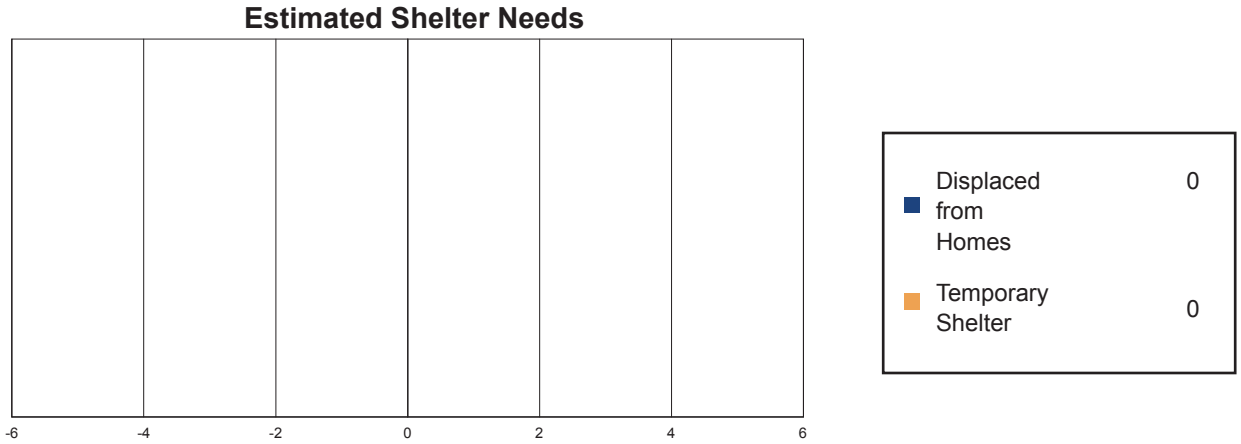


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 10,752 tons of debris will be generated. Of the total amount, 7,752 tons (72%) is Other Tree Debris. Of the remaining 3,000 tons, Brick/Wood comprises 27% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 32 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 2,200 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

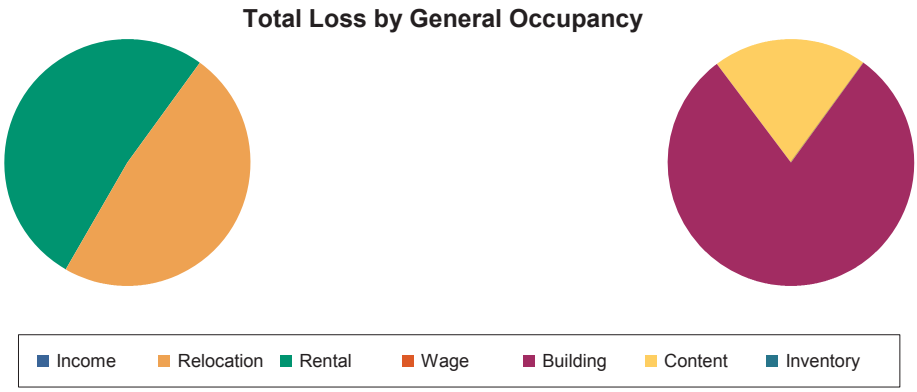
Economic Loss

The total economic loss estimated for the hurricane is 17.5 million dollars, which represents 0.05 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 18 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 97% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



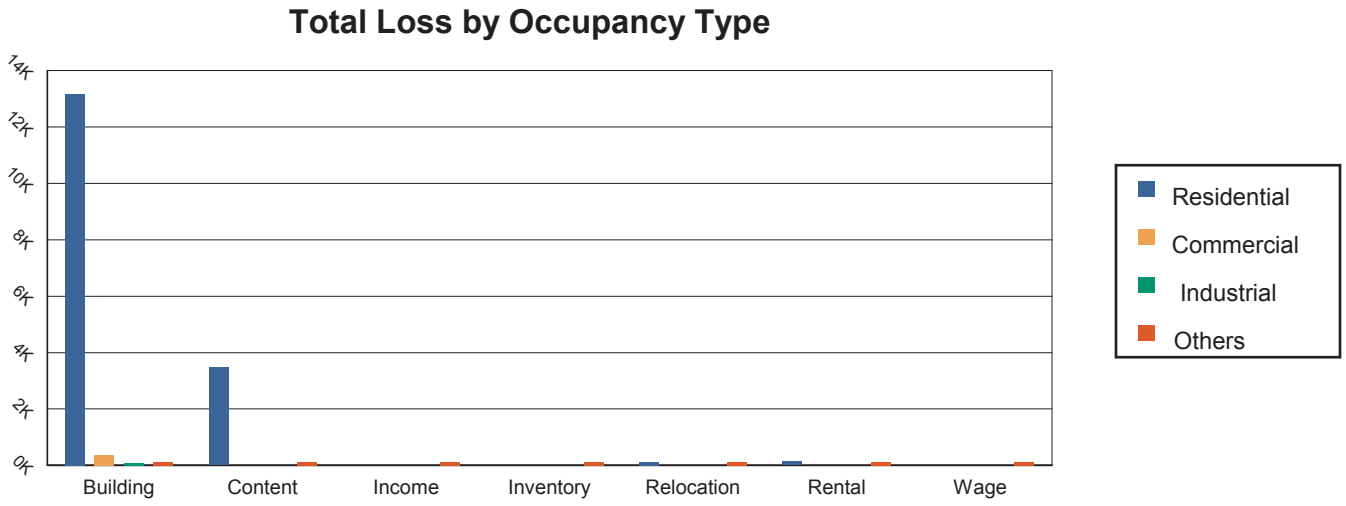


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	13,167.71	381.27	88.57	117.08	13,754.63
	Content	3,477.26	4.63	1.21	0.11	3,483.21
	Inventory	0.00	0.07	0.20	0.01	0.28
	Subtotal	**16,644.97**	**385.97**	**89.98**	**117.20**	**17,238.13**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	127.59	2.09	0.07	0.24	130.00
	Rental	138.84	0.00	0.00	0.00	138.84
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**266.43**	**2.09**	**0.07**	**0.24**	**268.84**
Total						
	Total	**16,911.40**	**388.06**	**90.06**	**117.44**	**17,506.97**

Appendix A: County Listing for the Region

Connecticut
- New London
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Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
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New London	261,443	26,302,415	8,030,475	34,332,890
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Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 50-year Return Period

Print Date: Thursday, April 06, 2017

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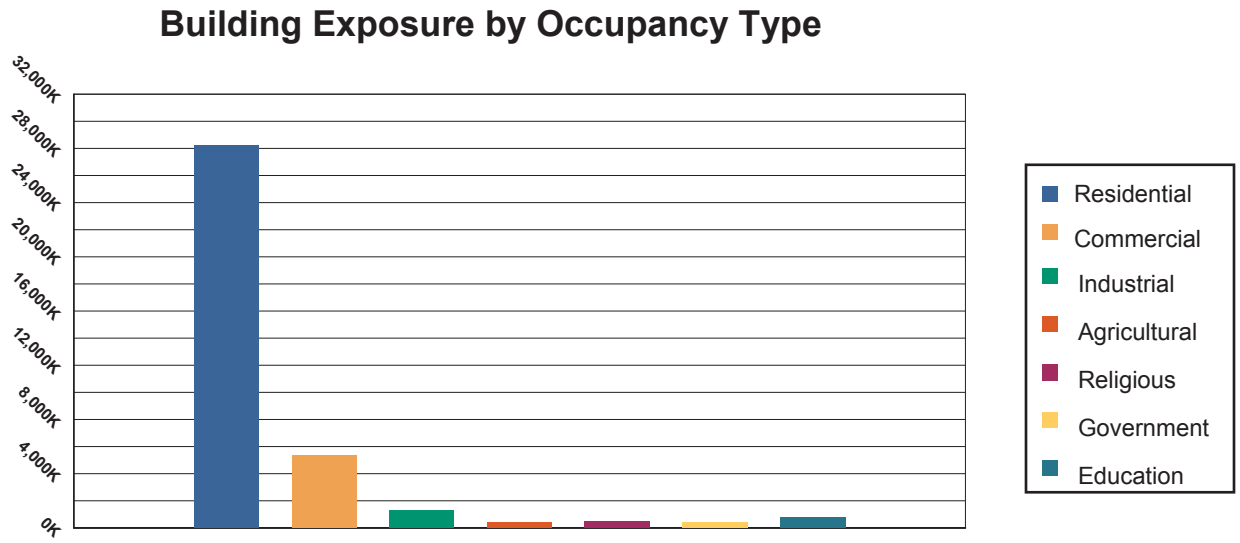

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Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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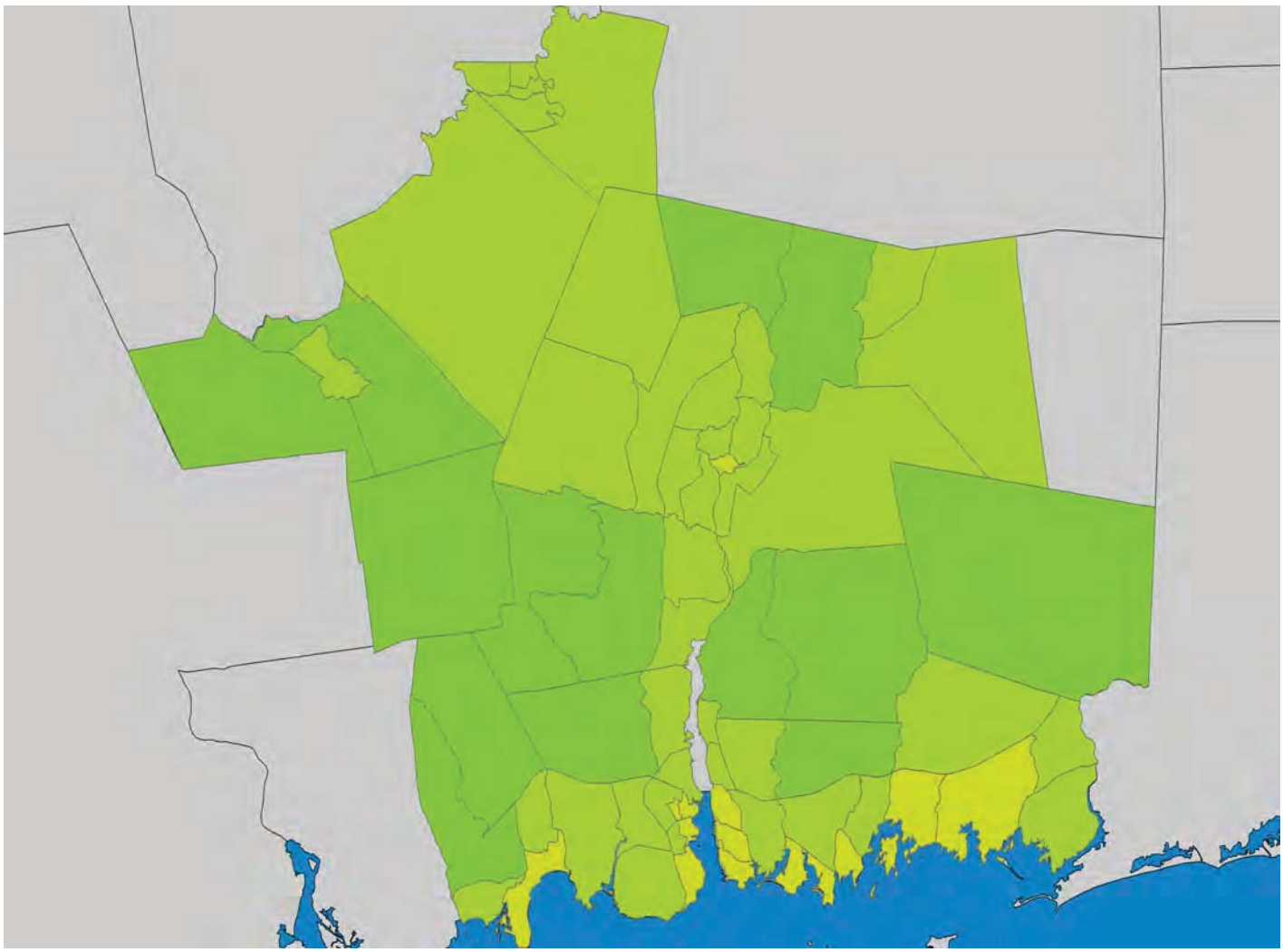
Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 240 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 2 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

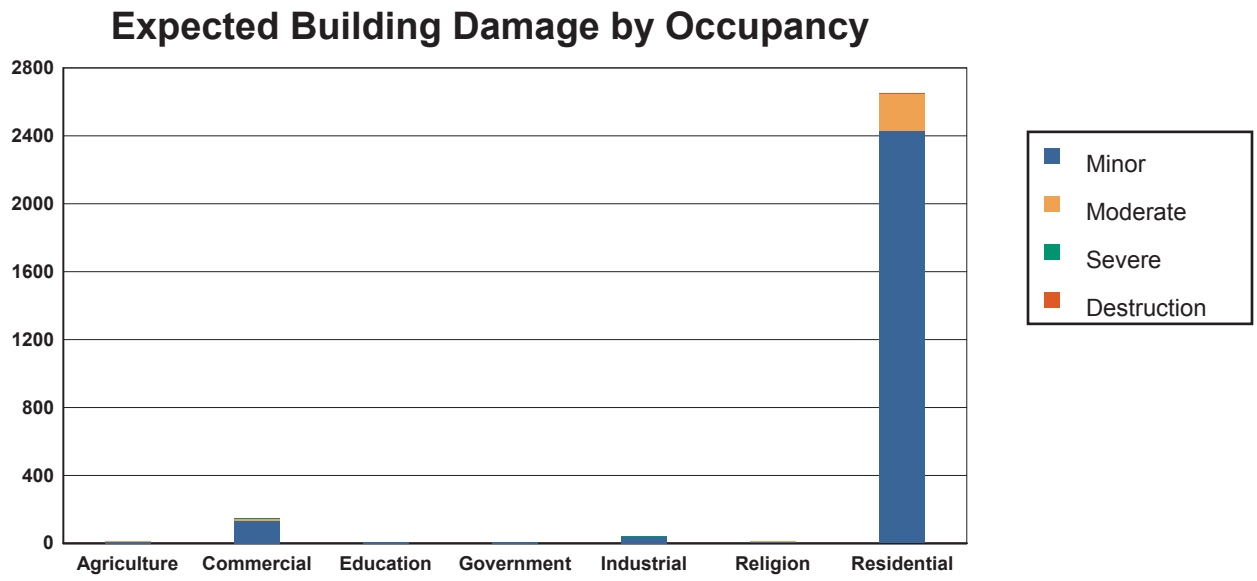


Table 2: Expected Building Damage by Occupancy : 50 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	427	97.72	9	1.96	1	0.24	0	0.08	0	0.00
Commercial	5,808	97.52	133	2.23	14	0.23	1	0.01	0	0.00
Education	272	97.79	6	2.12	0	0.09	0	0.00	0	0.00
Government	292	97.84	6	2.08	0	0.08	0	0.00	0	0.00
Industrial	1,780	97.70	39	2.13	3	0.15	0	0.02	0	0.00
Religion	513	97.70	11	2.18	1	0.11	0	0.00	0	0.00
Residential	91,530	97.19	2,431	2.58	212	0.22	6	0.01	2	0.00
Total	**100,621**		**2,635**		**230**		**8**		**2**	

Table 3: Expected Building Damage by Building Type : 50 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	666	96.78	21	3.03	1	0.18	0	0.00	0	0.00
Masonry	6,345	95.43	238	3.57	64	0.96	2	0.03	0	0.00
MH	3,055	99.96	1	0.03	0	0.01	0	0.00	0	0.00
Steel	4,022	97.58	91	2.20	8	0.20	1	0.01	0	0.00
Wood	82,288	97.46	2,054	2.43	89	0.11	4	0.00	1	0.00

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 499 hospital beds (only 100.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

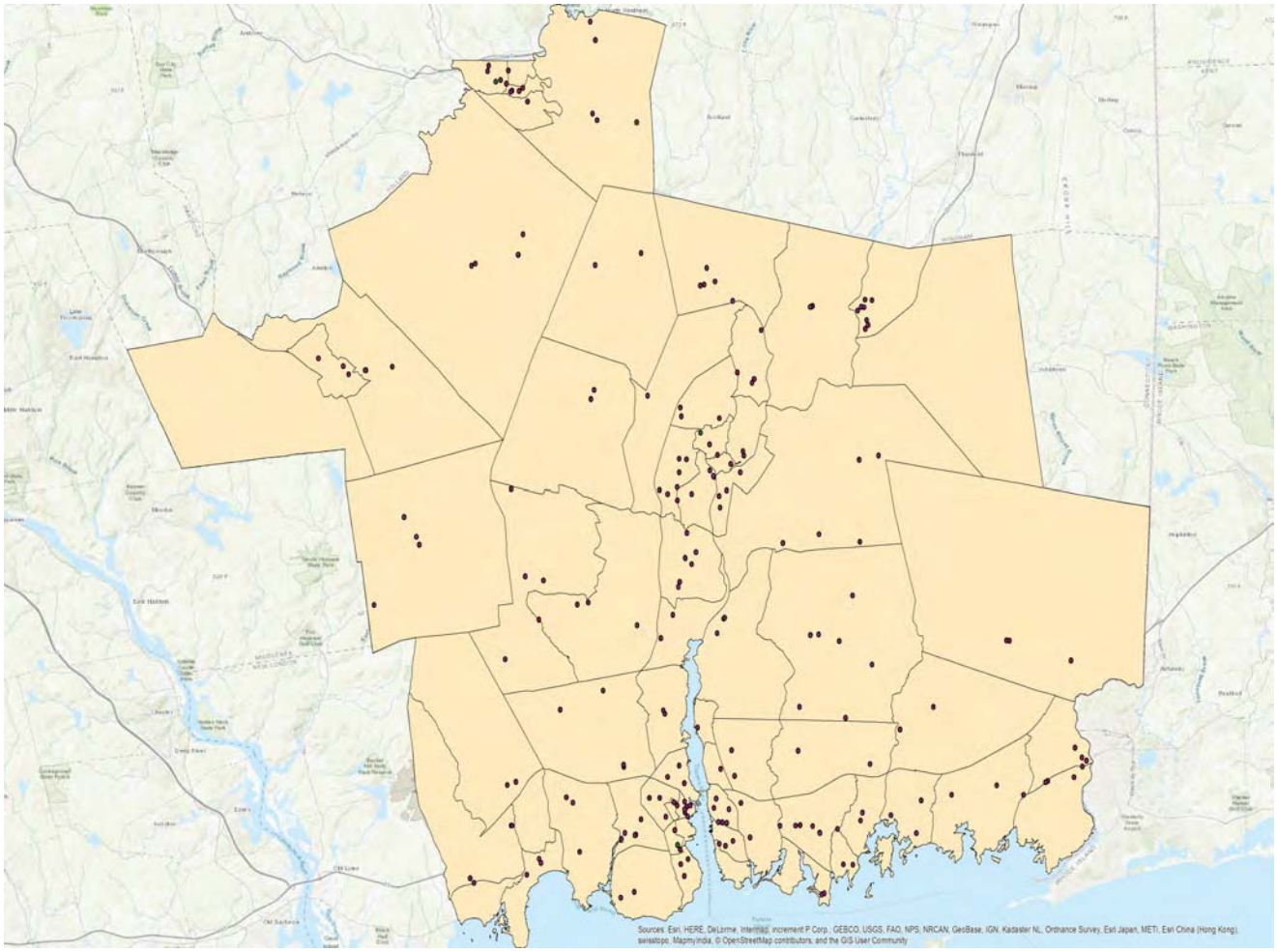
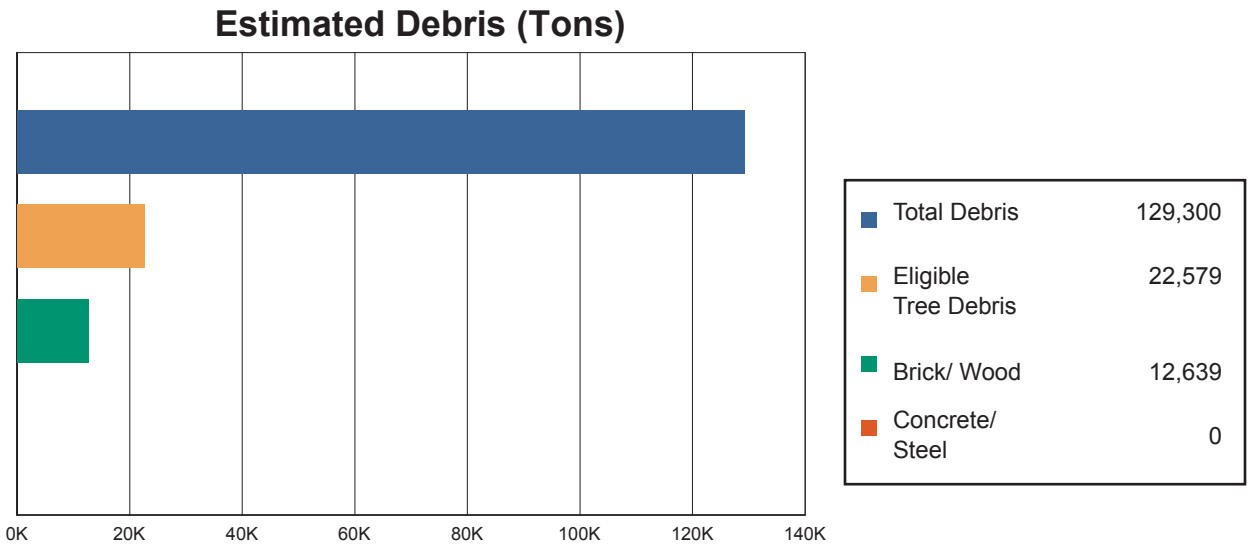


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	2	0	3
Police Stations	26	0	0	26
Schools	132	0	0	132

Induced Hurricane Damage

Debris Generation

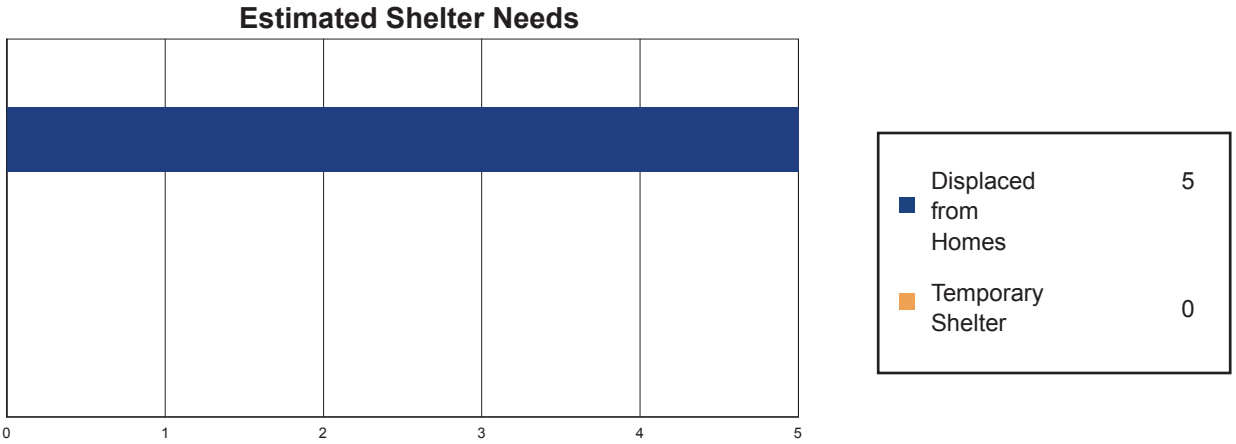


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 129,300 tons of debris will be generated. Of the total amount, 94,191 tons (73%) is Other Tree Debris. Of the remaining 35,109 tons, Brick/Wood comprises 36% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 501 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 22,579 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 5 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

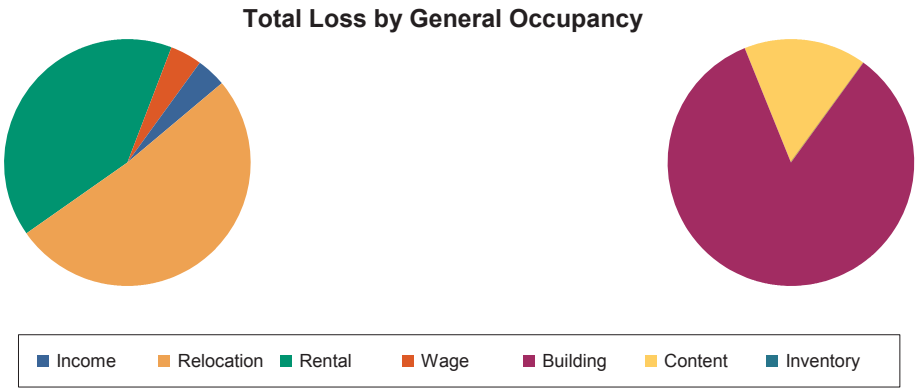
Economic Loss

The total economic loss estimated for the hurricane is 150.7 million dollars, which represents 0.41 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 151 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 95% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



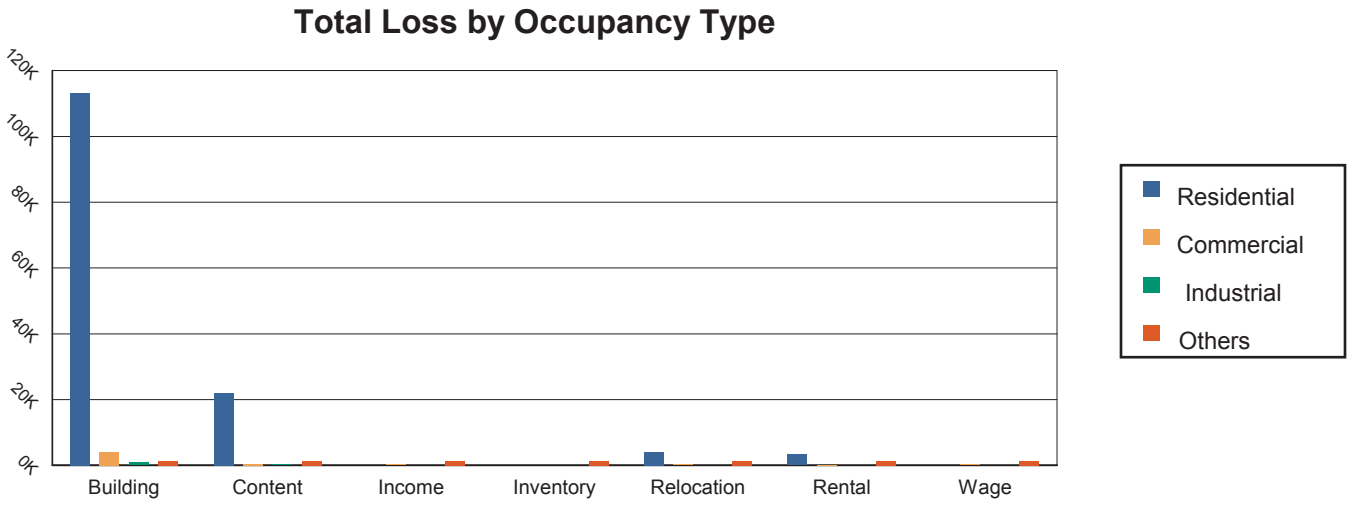


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	113,253.73	4,057.26	877.98	1,131.22	119,320.19
	Content	21,992.98	537.05	247.46	82.43	22,859.91
	Inventory	0.00	8.03	37.09	2.77	47.88
	Subtotal	**135,246.72**	**4,602.34**	**1,162.53**	**1,216.41**	**142,227.99**
Business Interruption Loss						
	Income	0.00	292.41	2.53	37.27	332.21
	Relocation	3,996.06	275.66	15.81	41.79	4,329.31
	Rental	3,282.55	131.12	2.18	3.18	3,419.02
	Wage	0.00	252.00	4.20	96.17	352.37
	Subtotal	**7,278.61**	**951.18**	**24.71**	**178.41**	**8,432.91**
Total						
	Total	**142,525.32**	**5,553.52**	**1,187.24**	**1,394.82**	**150,660.90**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
Windham	25,268	1,887,486	723,702	2,611,188
Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**
Study Region Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**

Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 100-year Return Period

Print Date: Thursday, April 06, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 616.90 square miles and contains 66 census tracts. There are over 110 thousand households in the region and has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 million dollars (2014 dollars). Approximately 91% of the buildings (and 76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 103,496 buildings in the region which have an aggregate total replacement value of 36,944 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

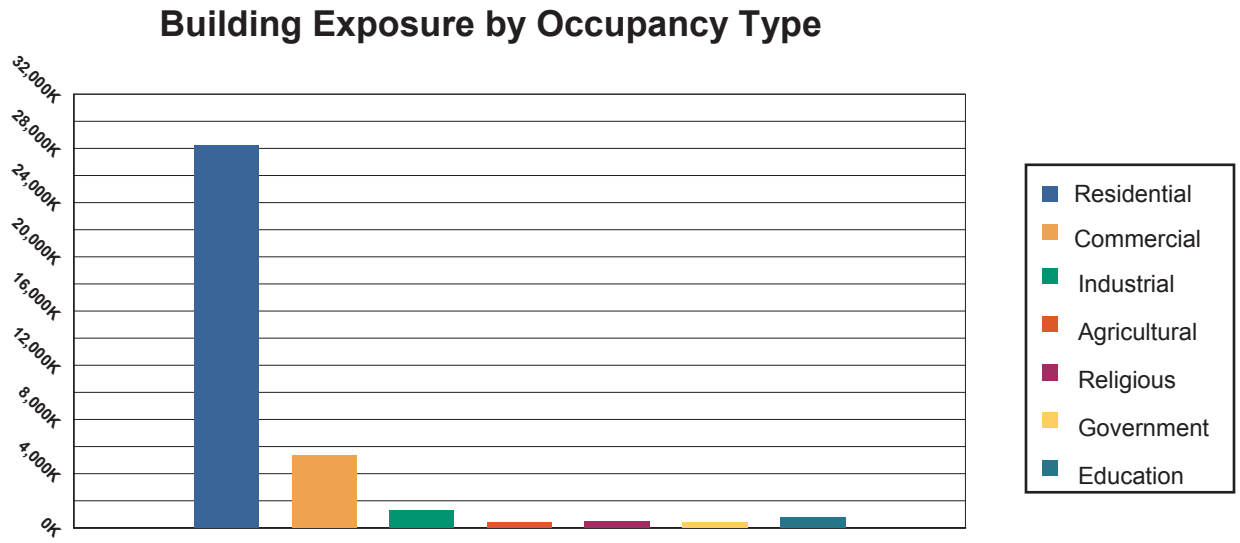


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	28,189,901	76.30%
Commercial	5,355,537	14.50%
Industrial	1,309,504	3.54%
Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

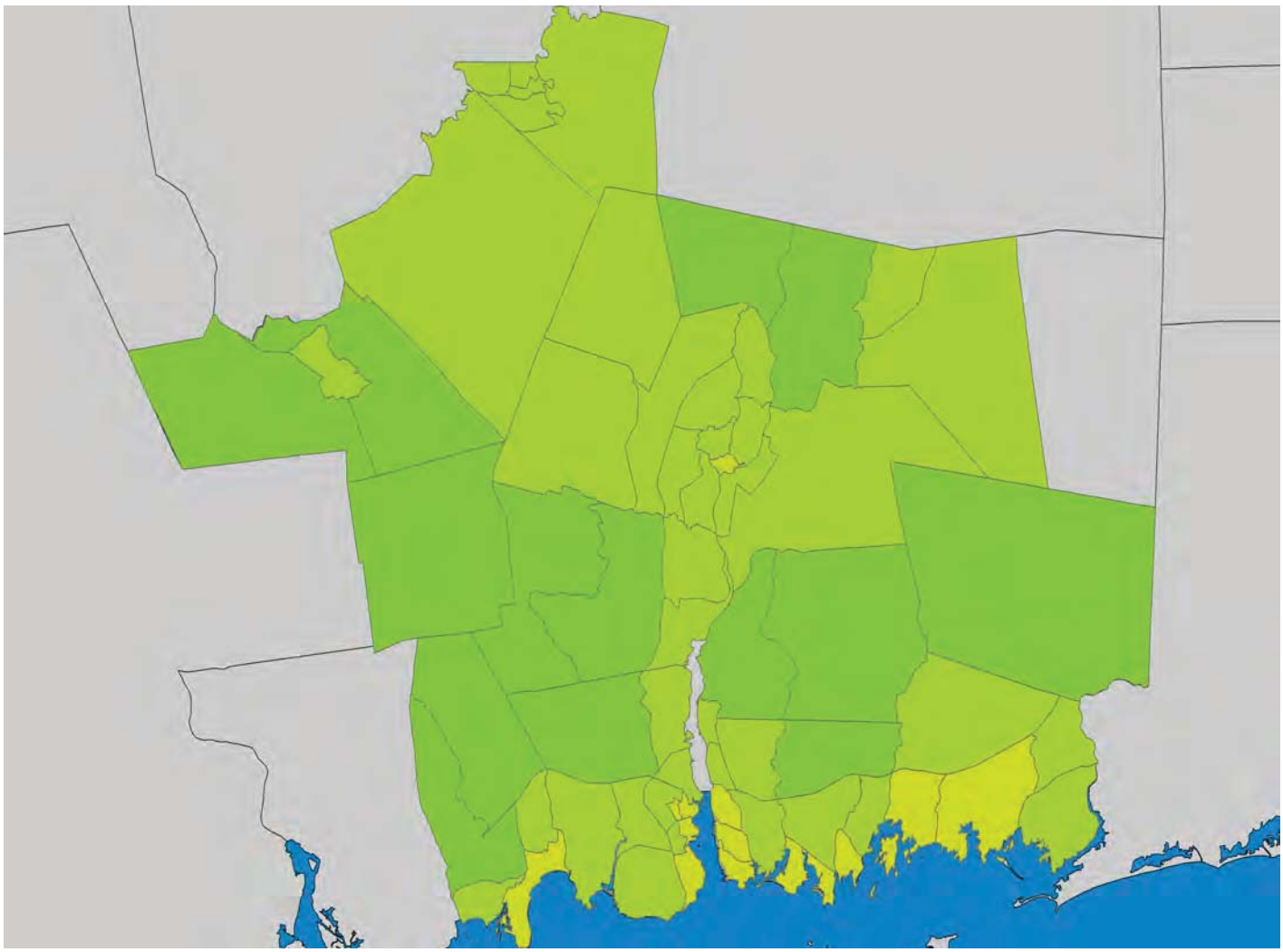
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 1,263 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 26 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

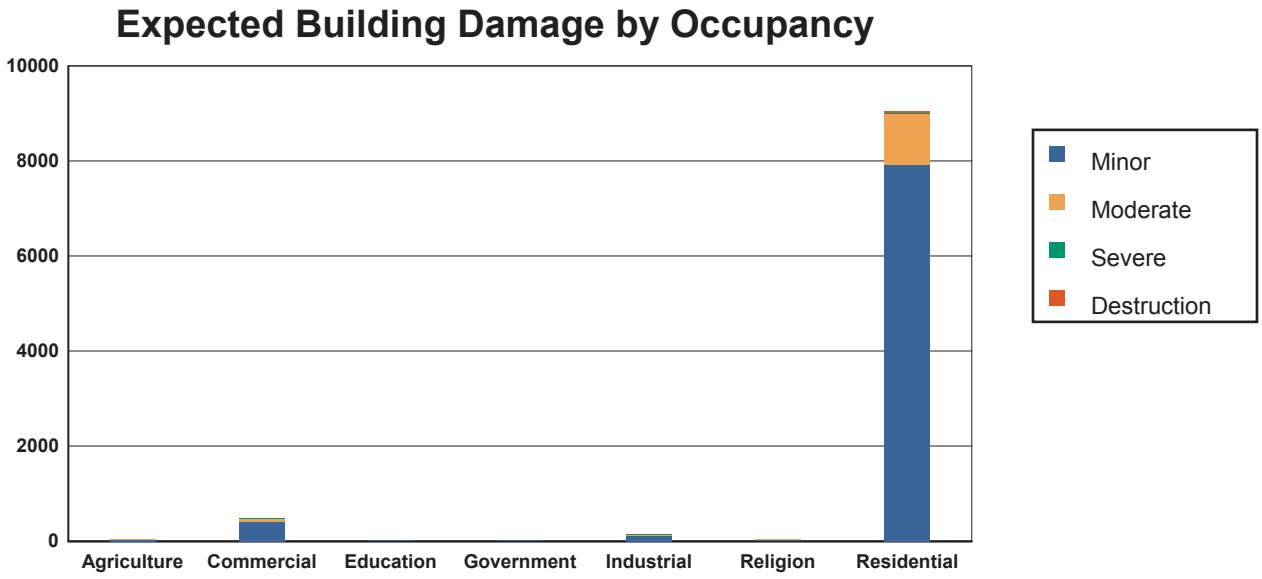


Table 2: Expected Building Damage by Occupancy : 100 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	403	92.21	26	5.99	5	1.23	2	0.53	0	0.04
Commercial	5,465	91.76	397	6.67	84	1.42	9	0.15	0	0.00
Education	258	92.69	18	6.32	3	0.94	0	0.05	0	0.00
Government	277	93.01	18	6.05	3	0.89	0	0.04	0	0.00
Industrial	1,686	92.53	110	6.06	22	1.18	4	0.22	0	0.01
Religion	482	91.86	37	7.11	5	0.96	0	0.06	0	0.00
Residential	85,127	90.39	7,929	8.42	1,059	1.12	40	0.04	25	0.03
Total	**93,698**		**8,536**		**1,181**		**56**		**26**	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	618	89.89	57	8.24	13	1.83	0	0.05	0	0.00
Masonry	5,832	87.71	570	8.57	236	3.55	11	0.17	1	0.01
MH	3,045	99.63	9	0.28	2	0.07	0	0.00	0	0.01
Steel	3,802	92.24	254	6.16	59	1.43	7	0.17	0	0.00
Wood	76,604	90.72	7,162	8.48	615	0.73	33	0.04	24	0.03

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 264 hospital beds (only 53.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

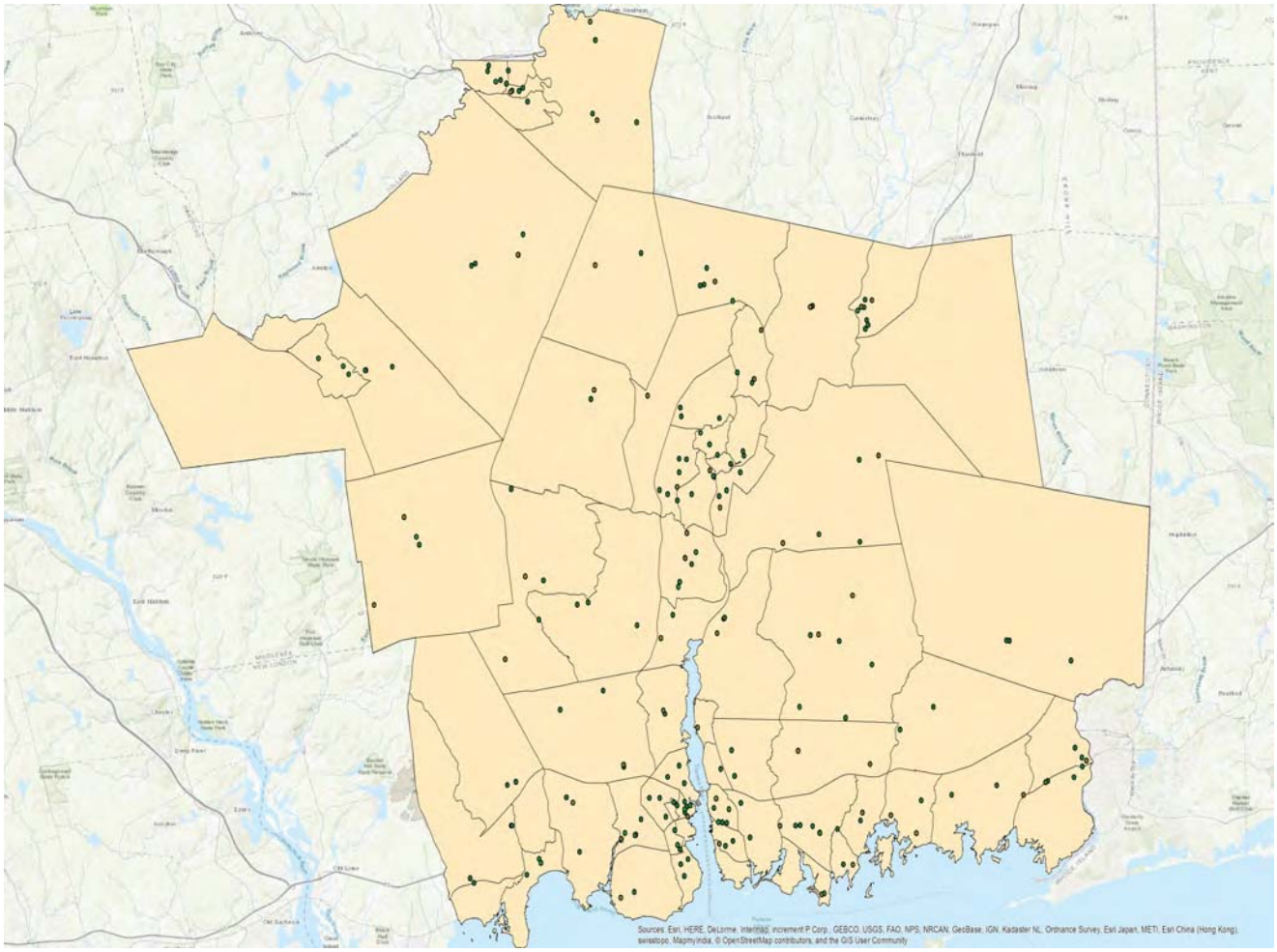
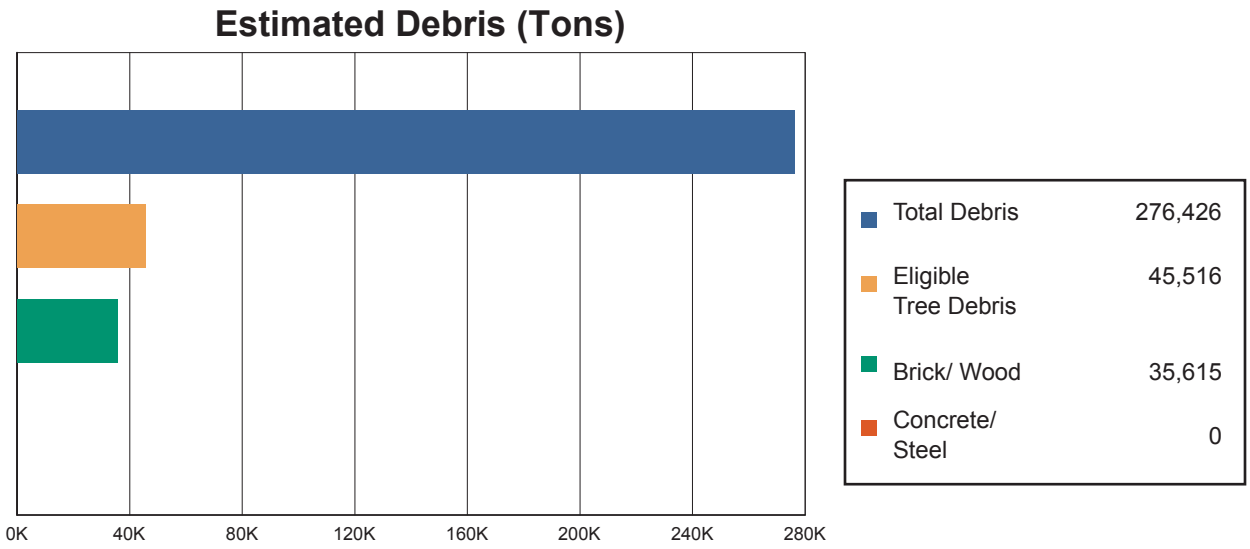


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	2	0	2
Police Stations	26	0	0	26
Schools	132	0	0	132

Induced Hurricane Damage

Debris Generation

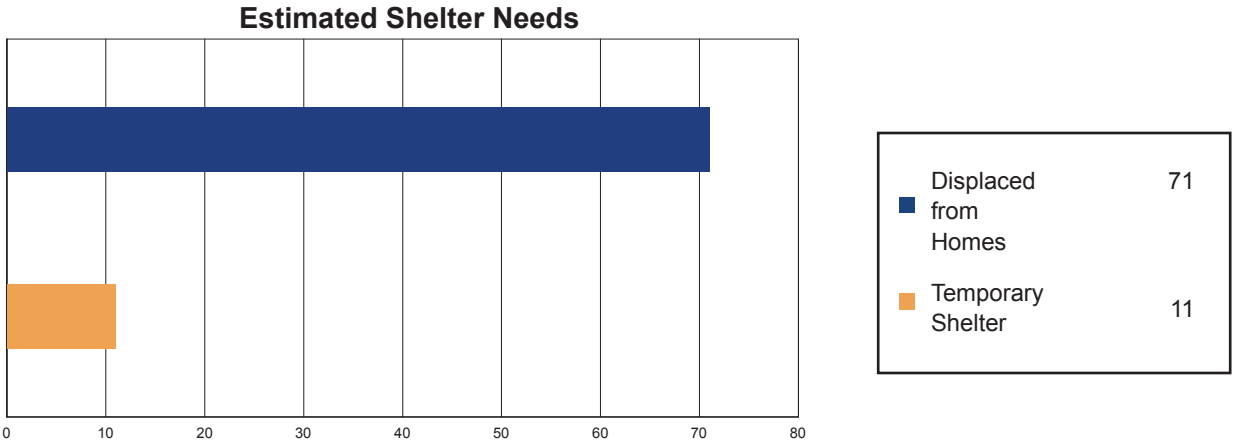


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 276,426 tons of debris will be generated. Of the total amount, 195,483 tons (71%) is Other Tree Debris. Of the remaining 80,943 tons, Brick/Wood comprises 44% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 1417 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 45,516 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 71 households to be displaced due to the hurricane. Of these, 11 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

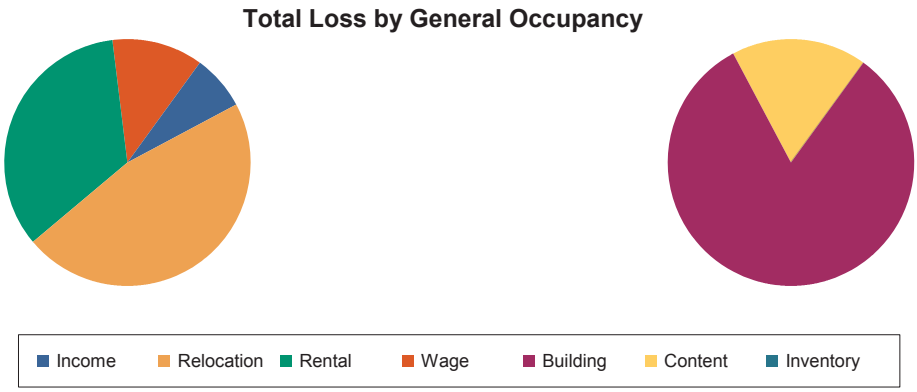
Economic Loss

The total economic loss estimated for the hurricane is 387.2 million dollars, which represents 1.05 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 387 million dollars. 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 90% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



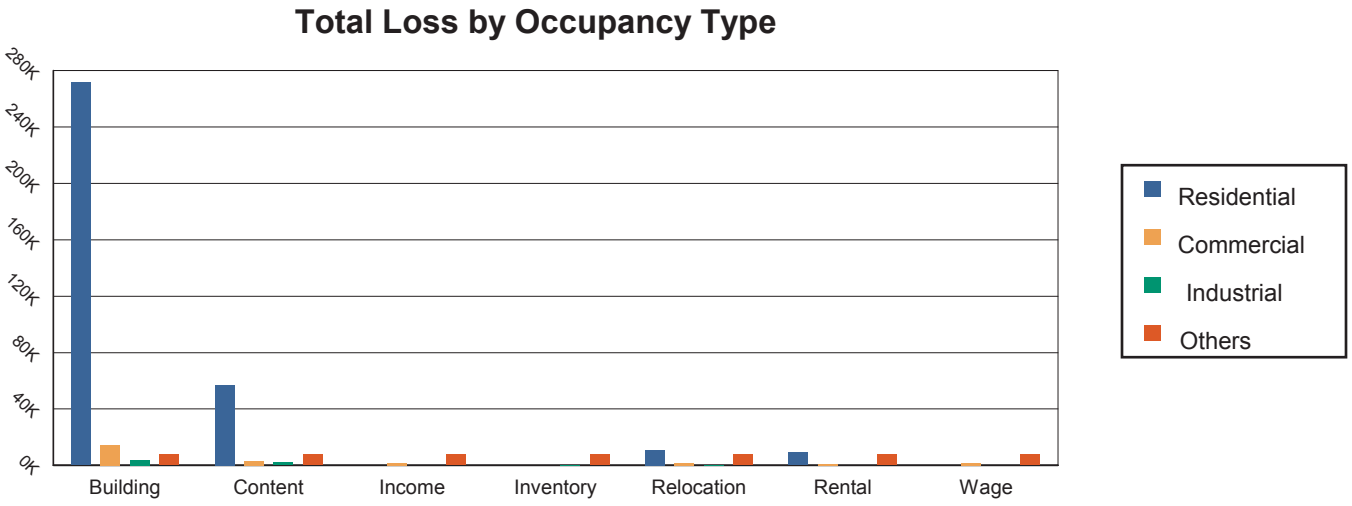


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	271,699.85	14,365.95	3,920.85	4,144.08	294,130.73
	Content	56,819.18	3,267.58	2,069.26	883.42	63,039.44
	Inventory	0.00	56.74	294.49	29.94	381.18
	Subtotal	**328,519.03**	**17,690.28**	**6,284.61**	**5,057.44**	**357,551.35**
Business Interruption Loss						
	Income	0.00	1,736.95	36.87	375.25	2,149.07
	Relocation	11,241.23	1,850.76	189.14	518.12	13,799.24
	Rental	9,086.38	967.44	30.82	51.50	10,136.14
	Wage	0.00	1,692.18	60.46	1,774.70	3,527.34
	Subtotal	**20,327.62**	**6,247.33**	**317.28**	**2,719.57**	**29,611.80**
Total						
	Total	**348,846.65**	**23,937.61**	**6,601.90**	**7,777.01**	**387,163.16**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
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Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 200-year Return Period

Print Date: Thursday, April 06, 2017

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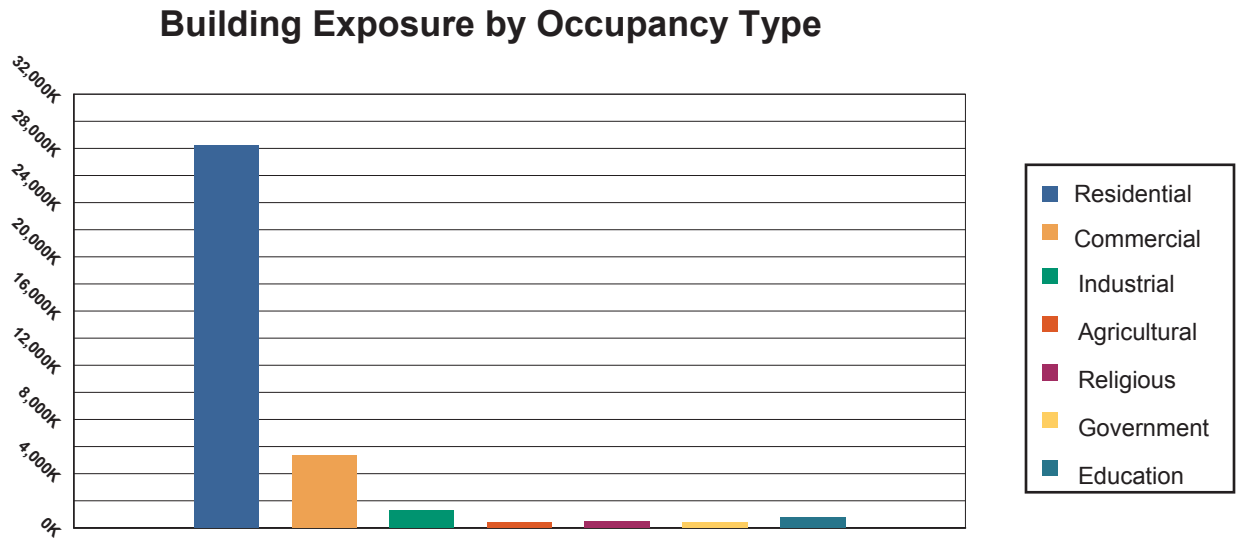

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Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

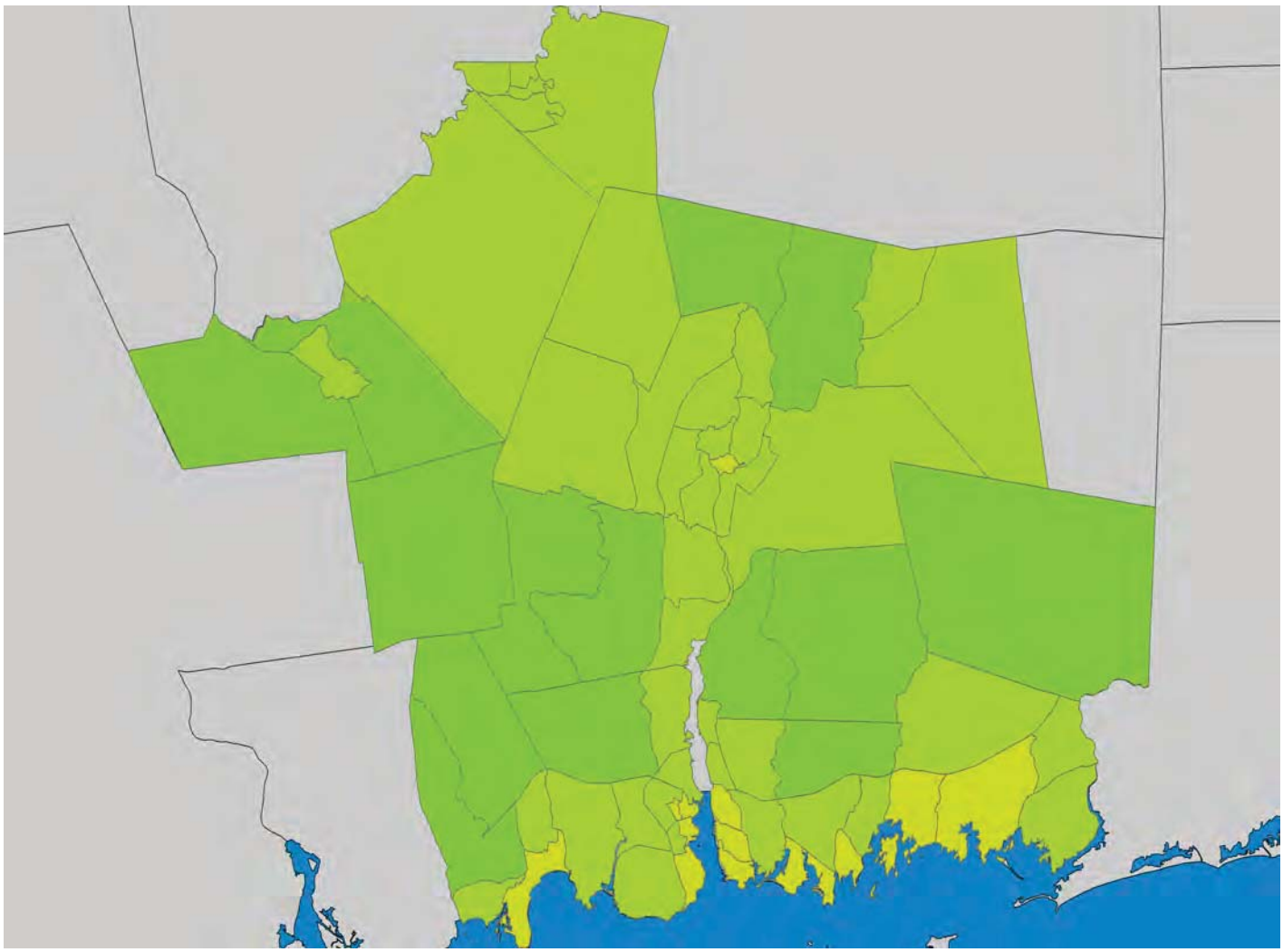
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 3,892 buildings will be at least moderately damaged. This is over 4% of the total number of buildings in the region. There are an estimated 151 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

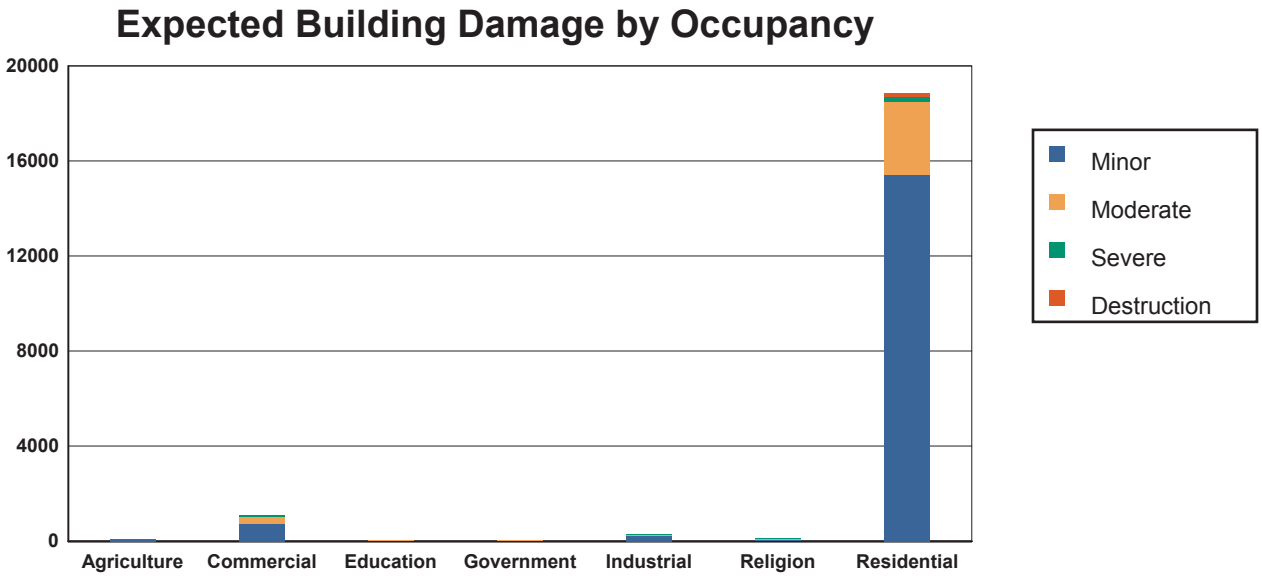


Table 2: Expected Building Damage by Occupancy : 200 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	364	83.20	52	11.85	14	3.23	7	1.54	1	0.18
Commercial	4,875	81.87	764	12.84	269	4.51	46	0.78	0	0.00
Education	230	82.89	35	12.71	11	3.92	1	0.48	0	0.00
Government	249	83.64	36	12.14	11	3.76	1	0.46	0	0.00
Industrial	1,523	83.58	210	11.52	72	3.94	16	0.91	1	0.06
Religion	428	81.58	75	14.26	19	3.68	3	0.48	0	0.00
Residential	75,334	79.99	15,428	16.38	3,056	3.25	213	0.23	149	0.16
Total	**83,004**		**16,600**		**3,452**		**288**		**151**	

Table 3: Expected Building Damage by Building Type : 200 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	538	78.19	101	14.72	46	6.63	3	0.46	0	0.00
Masonry	5,103	76.75	969	14.57	534	8.04	38	0.58	4	0.06
MH	3,012	98.56	30	0.99	11	0.38	0	0.01	2	0.07
Steel	3,413	82.80	477	11.56	196	4.76	36	0.88	0	0.01
Wood	67,748	80.23	14,281	16.91	2,087	2.47	182	0.22	140	0.17

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 80 hospital beds (only 16.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 53.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

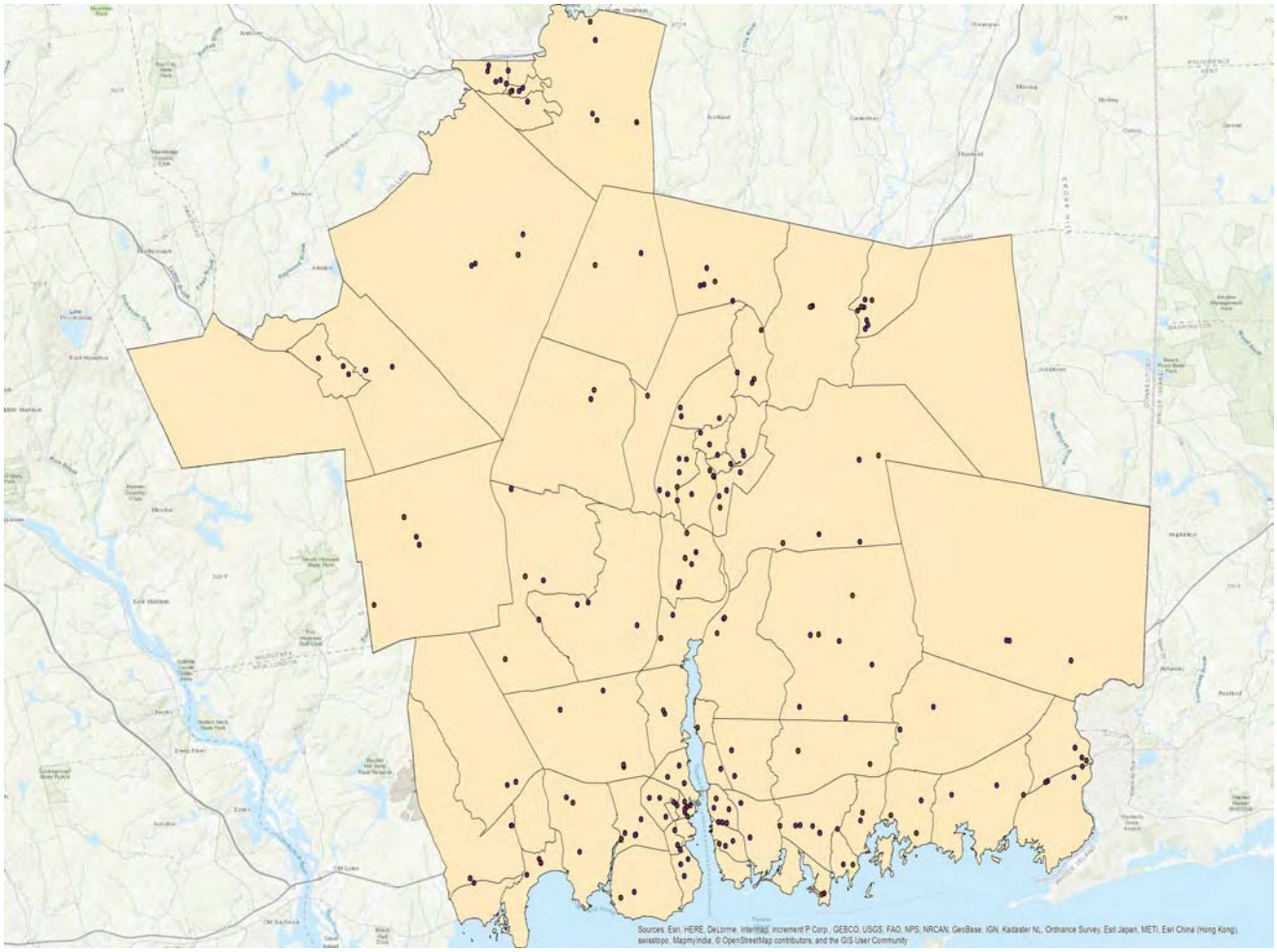
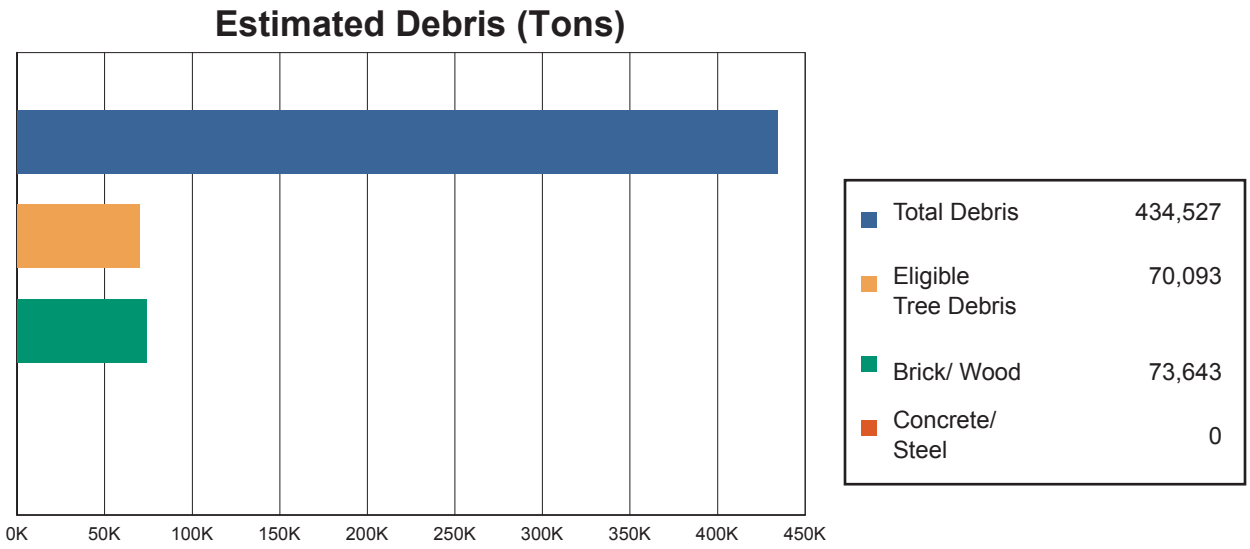


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	2	0	1
Police Stations	26	0	0	26
Schools	132	0	0	80

Induced Hurricane Damage

Debris Generation

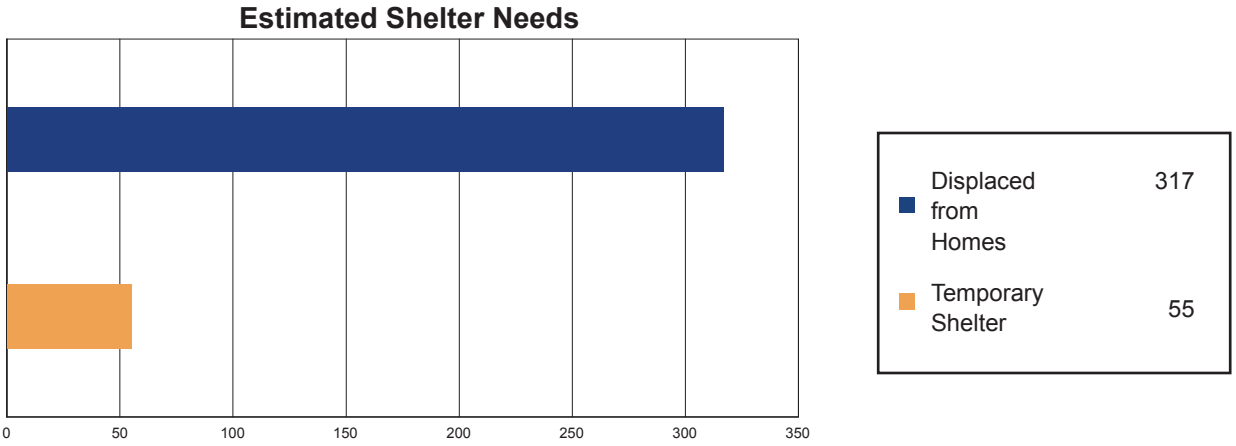


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 434,527 tons of debris will be generated. Of the total amount, 290,129 tons (67%) is Other Tree Debris. Of the remaining 144,398 tons, Brick/Wood comprises 51% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 2972 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 70,093 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 317 households to be displaced due to the hurricane. Of these, 55 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

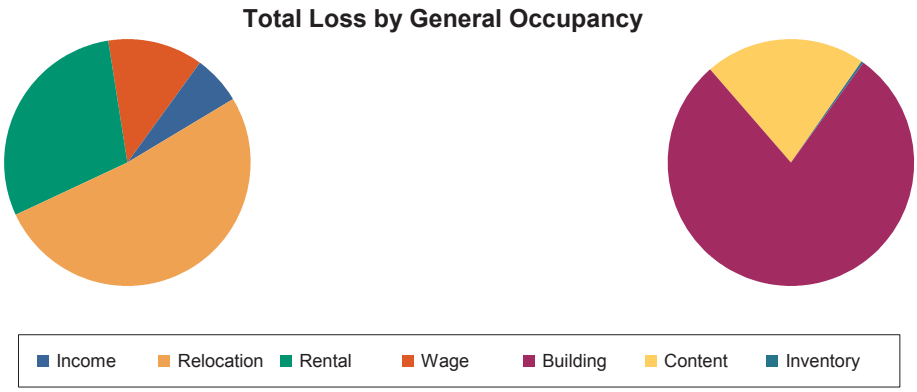
Economic Loss

The total economic loss estimated for the hurricane is 865.7 million dollars, which represents 2.34 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 866 million dollars. 3% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 86% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



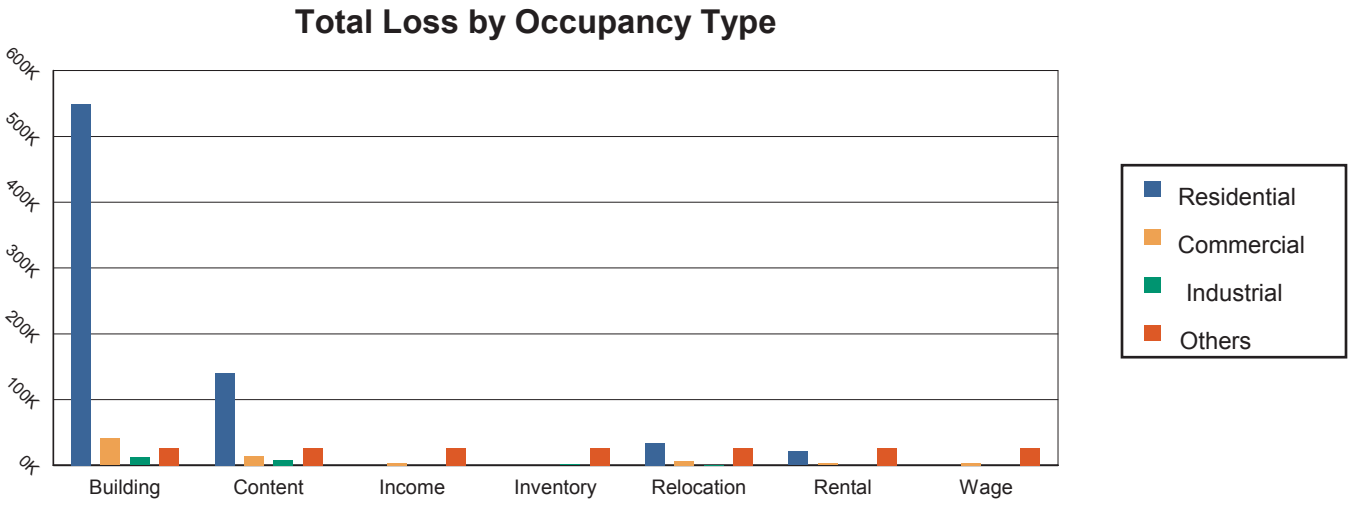


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	549,477.60	40,938.16	11,658.95	12,651.34	614,726.05
	Content	140,254.55	14,150.15	7,675.54	4,479.96	166,560.20
	Inventory	0.00	231.13	1,038.43	102.83	1,372.39
	Subtotal	**689,732.15**	**55,319.44**	**20,372.91**	**17,234.13**	**782,658.64**
Business Interruption Loss						
	Income	4.12	4,091.24	122.13	1,083.40	5,300.89
	Relocation	33,633.74	6,238.63	716.11	2,283.18	42,871.66
	Rental	20,914.46	3,262.16	114.66	226.99	24,518.27
	Wage	9.65	4,202.85	196.57	5,928.61	10,337.67
	Subtotal	**54,561.97**	**17,794.87**	**1,149.47**	**9,522.18**	**83,028.49**
Total						
	Total	**744,294.12**	**73,114.31**	**21,522.38**	**26,756.32**	**865,687.13**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
Windham	25,268	1,887,486	723,702	2,611,188
Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**
Study Region Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**

Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 500-year Return Period

Print Date: Thursday, April 06, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 616.90 square miles and contains 66 census tracts. There are over 110 thousand households in the region and has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 million dollars (2014 dollars). Approximately 91% of the buildings (and 76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 103,496 buildings in the region which have an aggregate total replacement value of 36,944 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

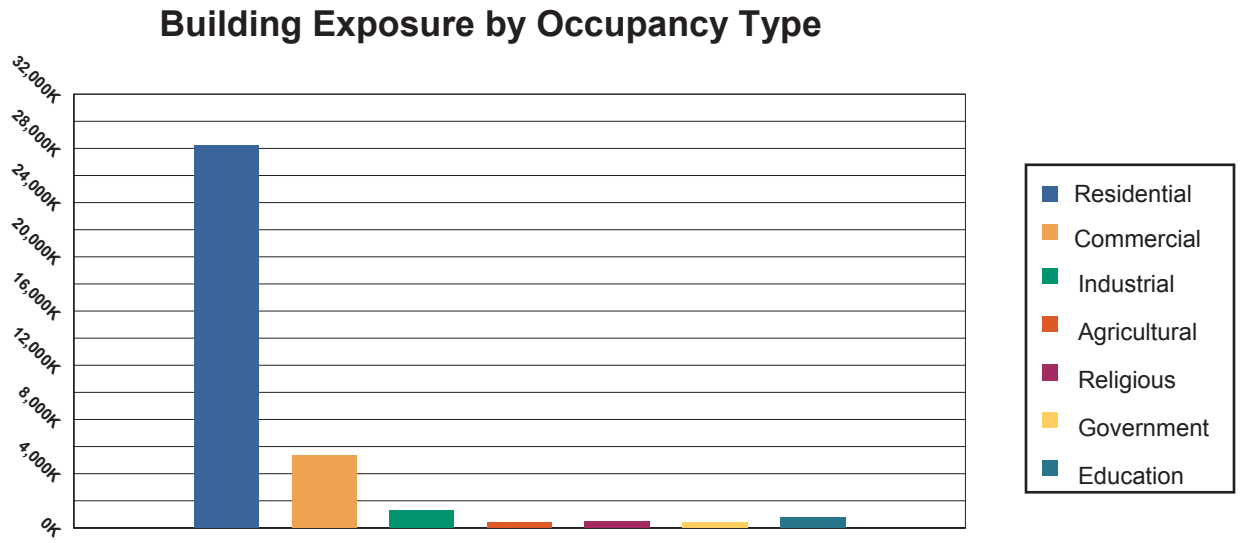


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	28,189,901	76.30%
Commercial	5,355,537	14.50%
Industrial	1,309,504	3.54%
Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

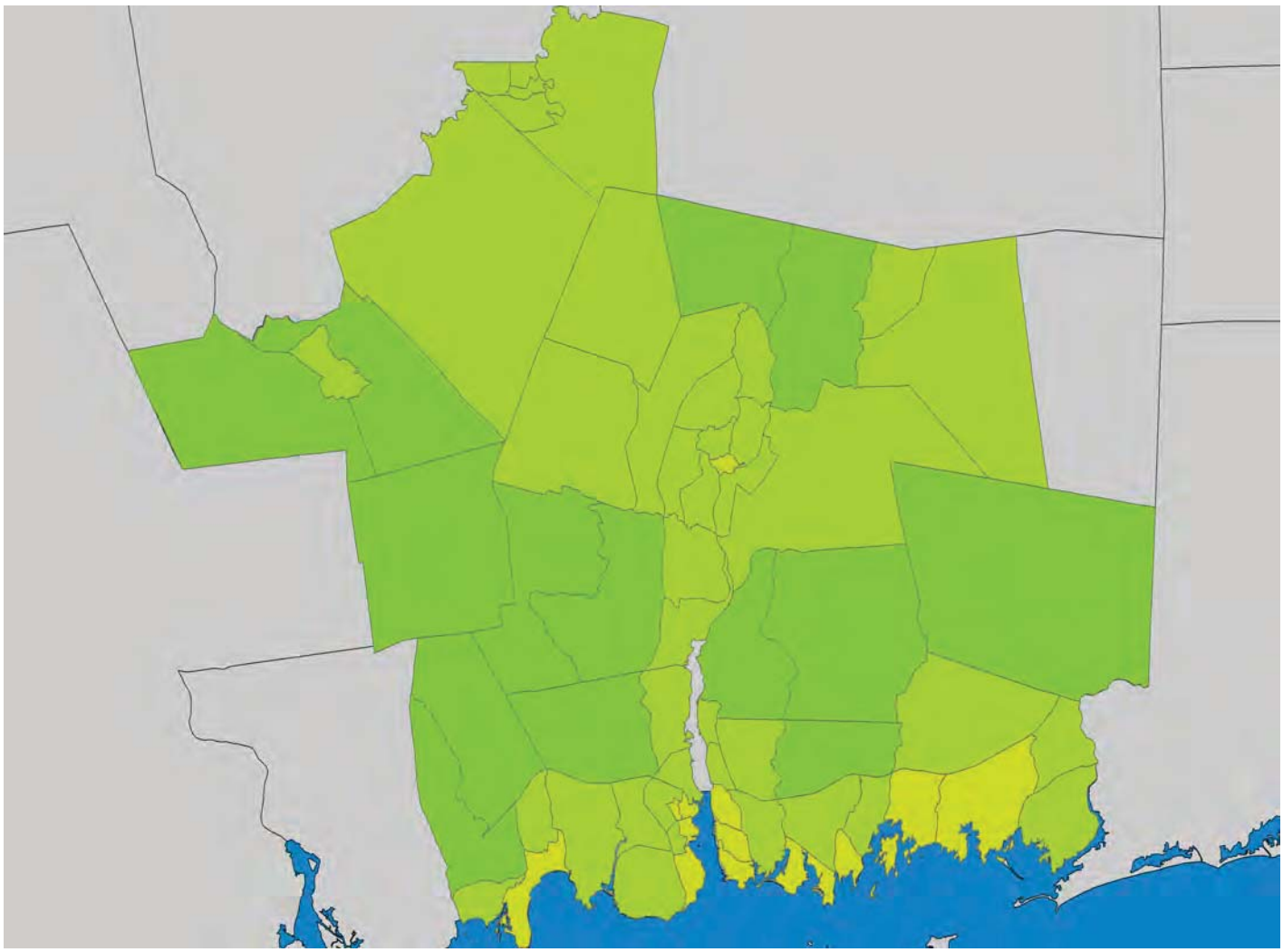
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 9,521 buildings will be at least moderately damaged. This is over 9% of the total number of buildings in the region. There are an estimated 744 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

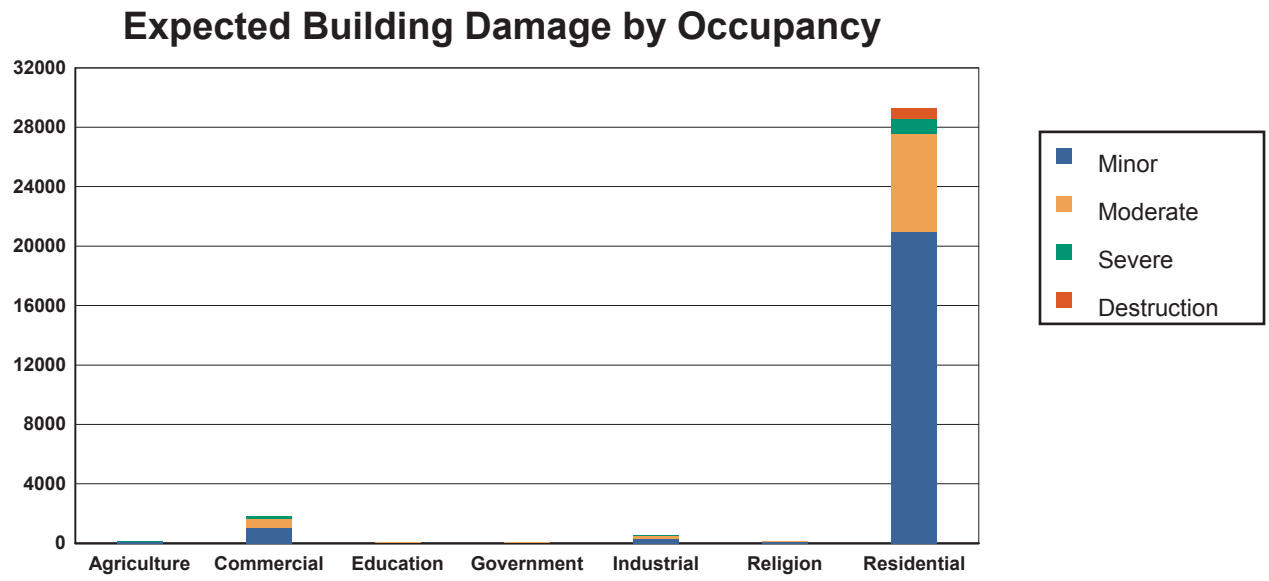


Table 2: Expected Building Damage by Occupancy : 500 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	317	72.44	73	16.72	29	6.65	15	3.52	3	0.67
Commercial	4,097	68.80	1,051	17.66	605	10.16	200	3.35	2	0.03
Education	192	68.92	50	18.08	28	10.09	8	2.90	0	0.00
Government	212	71.06	50	16.87	28	9.47	8	2.60	0	0.00
Industrial	1,287	70.61	287	15.75	173	9.52	71	3.87	4	0.24
Religion	353	67.32	109	20.78	49	9.37	13	2.52	0	0.00
Residential	64,890	68.90	21,007	22.30	6,544	6.95	1,005	1.07	734	0.78
Total	**71,347**		**22,628**		**7,457**		**1,320**		**744**	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	441	64.12	127	18.46	101	14.65	19	2.77	0	0.00
Masonry	4,270	64.21	1,258	18.92	963	14.48	139	2.09	19	0.28
MH	2,920	95.54	73	2.39	47	1.53	3	0.11	13	0.43
Steel	2,871	69.65	639	15.51	449	10.89	161	3.92	1	0.03
Wood	58,335	69.09	19,669	23.29	4,879	5.78	868	1.03	686	0.81

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (only 0.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 16.00% of the beds will be in service. By 30 days, 53.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

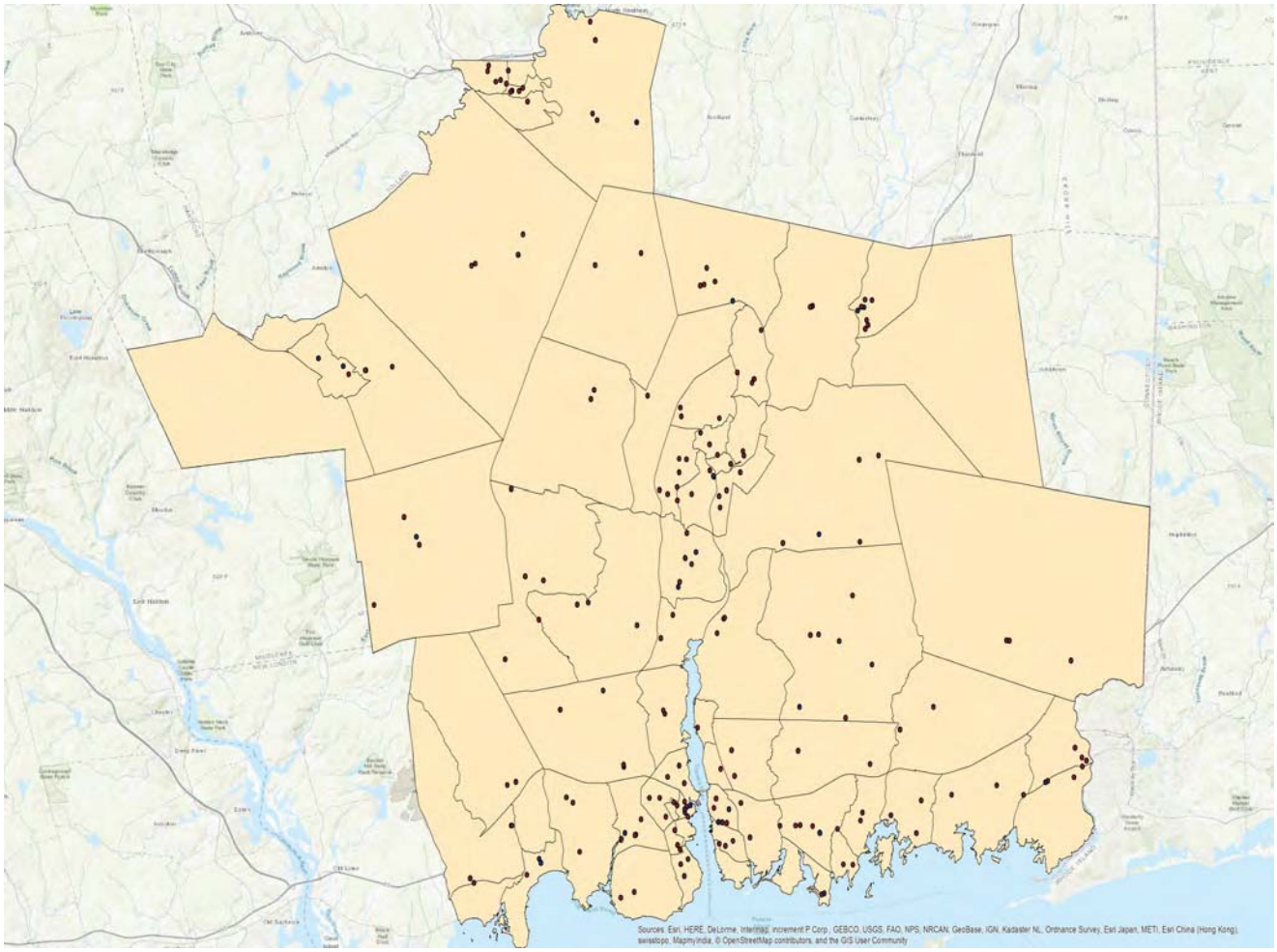
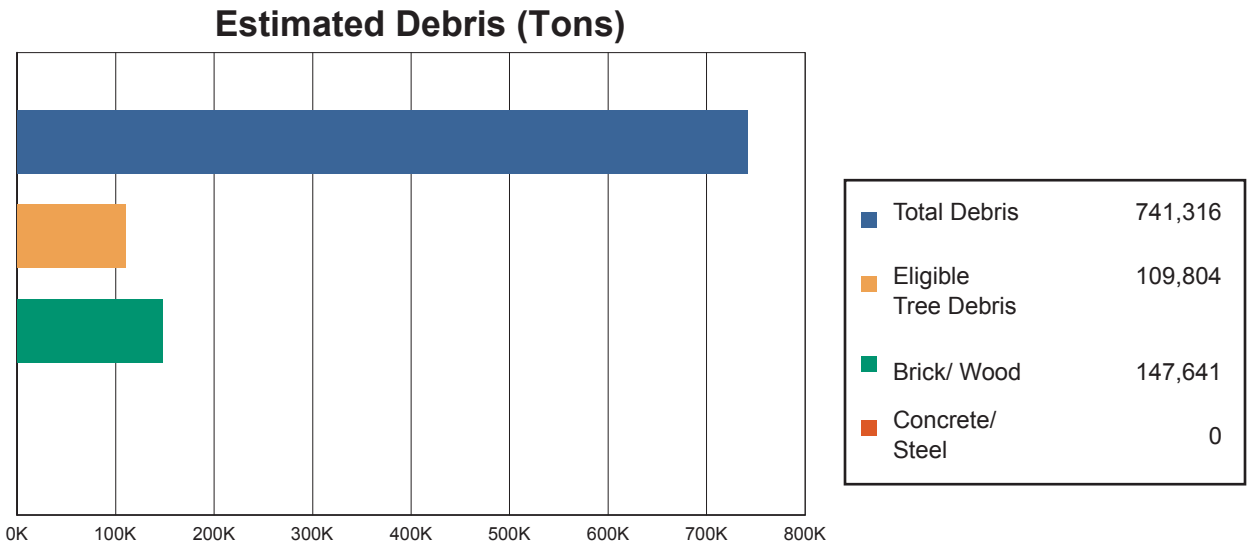


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	2	1	0
Police Stations	26	0	0	26
Schools	132	17	0	42

Induced Hurricane Damage

Debris Generation

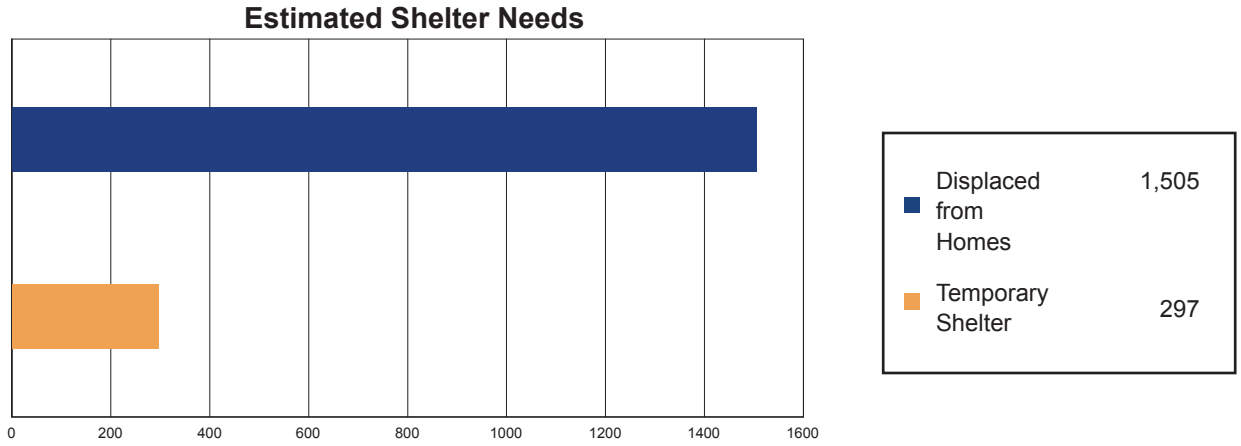


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 741,316 tons of debris will be generated. Of the total amount, 482,296 tons (65%) is Other Tree Debris. Of the remaining 259,020 tons, Brick/Wood comprises 57% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 5969 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 109,804 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1,505 households to be displaced due to the hurricane. Of these, 297 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

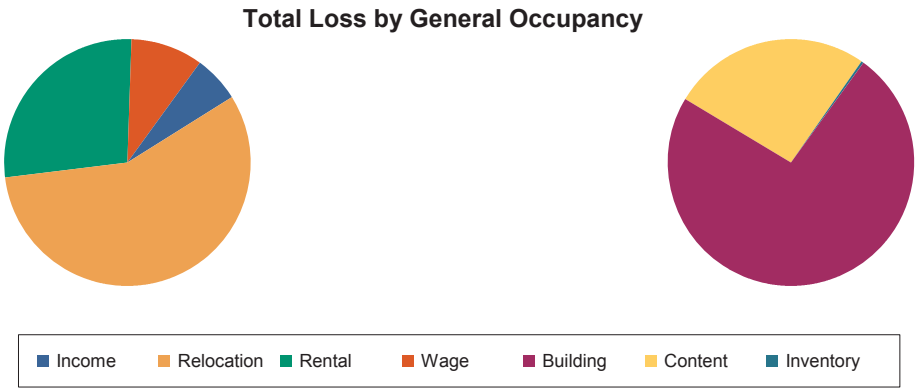
Economic Loss

The total economic loss estimated for the hurricane is 1999.4 million dollars, which represents 5.41 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 1,999 million dollars. 3% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 82% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



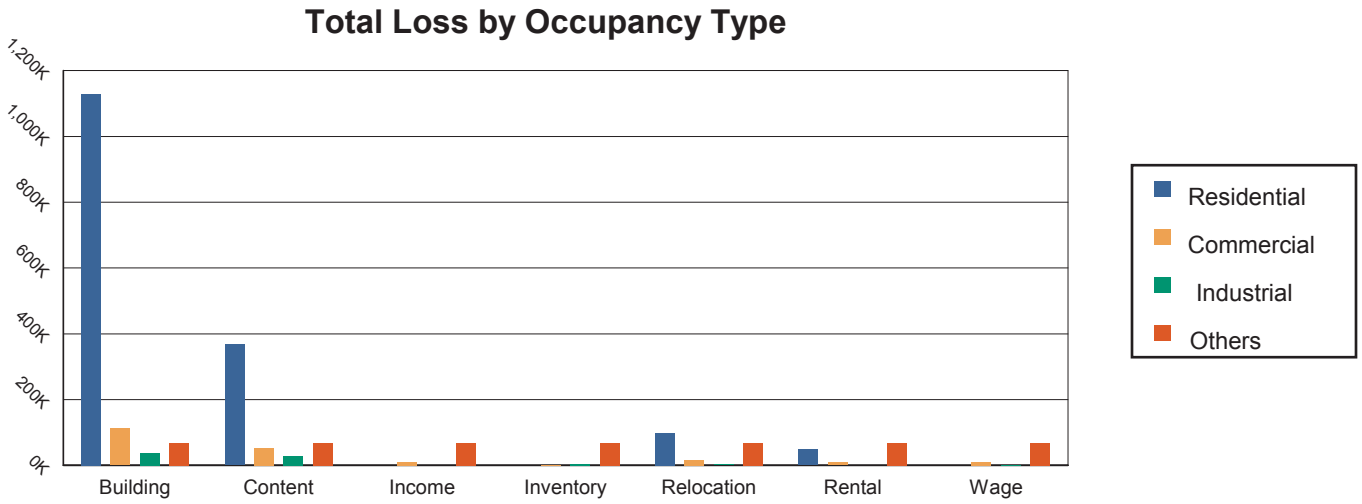


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,128,585.36	111,991.11	37,438.41	33,621.50	1,311,636.38
	Content	367,716.00	52,650.42	29,281.78	15,899.18	465,547.38
	Inventory	0.00	843.84	3,911.34	248.80	5,003.99
	Subtotal	**1,496,301.36**	**165,485.38**	**70,631.53**	**49,769.48**	**1,782,187.75**
Business Interruption Loss						
	Income	248.00	10,761.86	495.55	1,530.84	13,036.25
	Relocation	98,521.78	16,904.43	2,224.59	6,326.35	123,977.15
	Rental	49,188.84	9,213.55	376.51	661.69	59,440.60
	Wage	580.91	10,852.19	802.14	8,548.11	20,783.35
	Subtotal	**148,539.54**	**47,732.03**	**3,898.79**	**17,066.98**	**217,237.35**
Total						
	Total	**1,644,840.90**	**213,217.41**	**74,530.32**	**66,836.46**	**1,999,425.09**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
Windham	25,268	1,887,486	723,702	2,611,188
Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**
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Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: Probabilistic 1000-year Return Period

Print Date: Thursday, April 06, 2017

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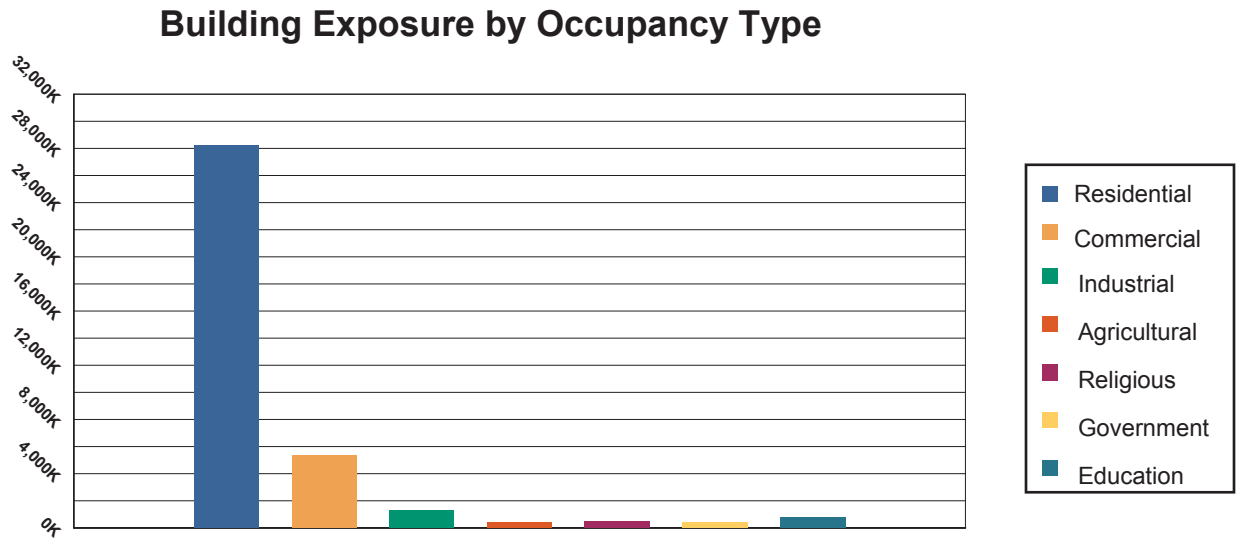

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Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

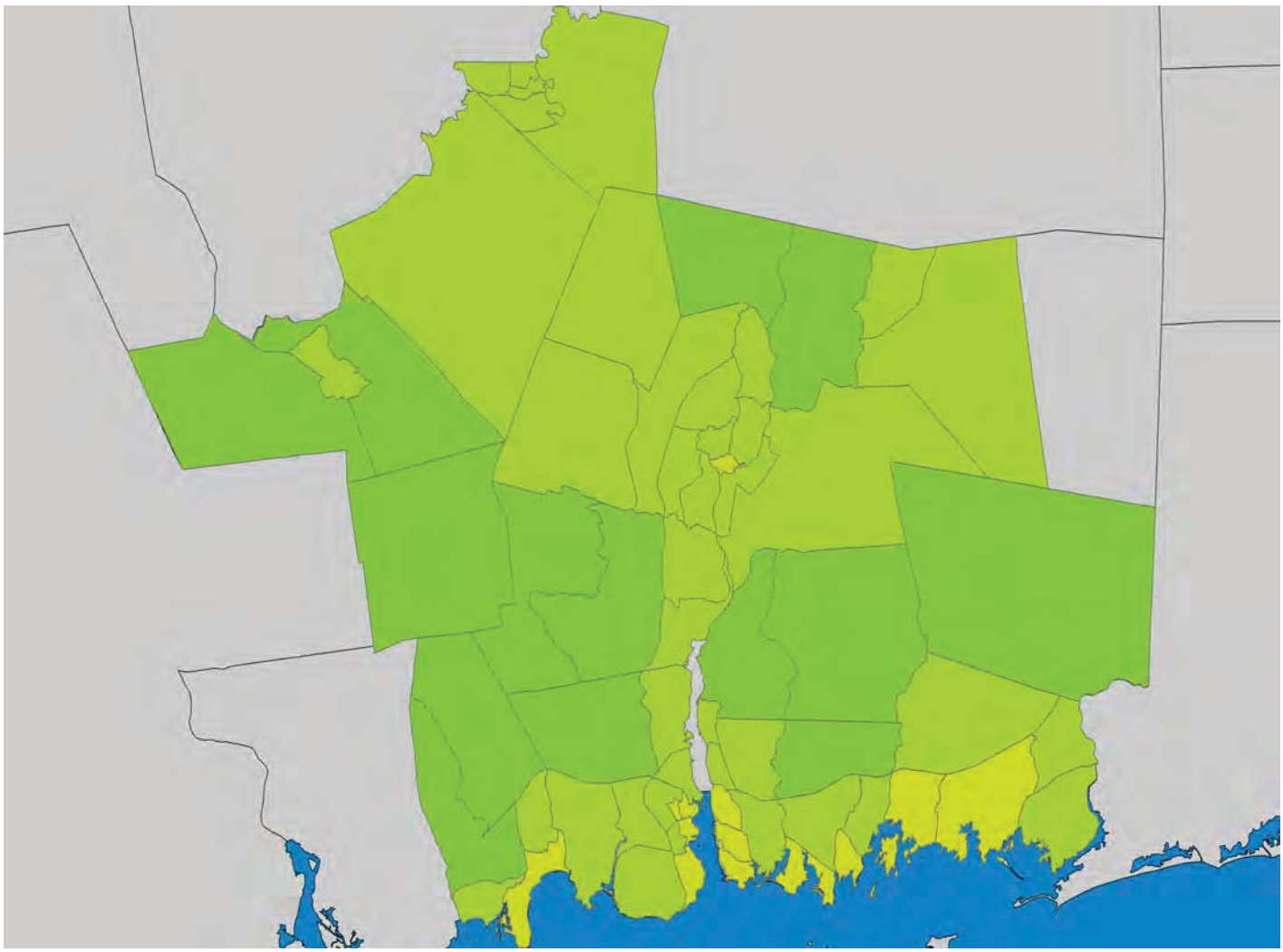
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 17,276 buildings will be at least moderately damaged. This is over 17% of the total number of buildings in the region. There are an estimated 1,390 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

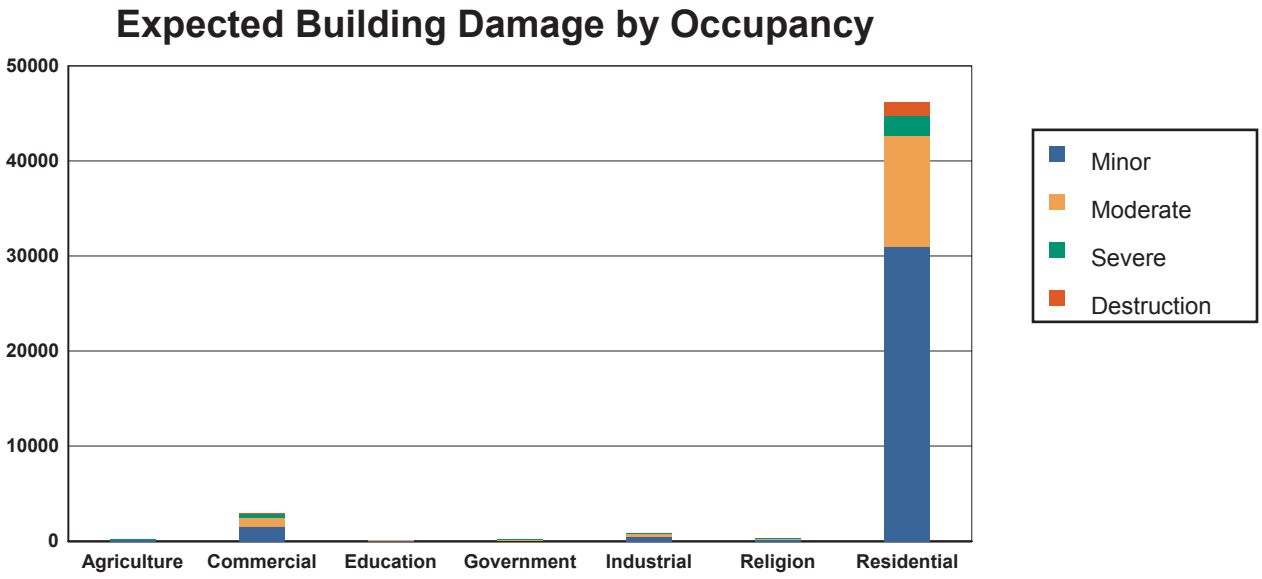


Table 2: Expected Building Damage by Occupancy : 1000 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	211	48.33	125	28.64	62	14.11	32	7.41	7	1.52
Commercial	3,067	51.51	1,497	25.14	1,045	17.54	343	5.75	3	0.06
Education	144	51.93	69	24.90	50	17.83	15	5.33	0	0.00
Government	155	52.16	72	24.25	54	18.00	17	5.58	0	0.00
Industrial	980	53.79	422	23.18	306	16.77	108	5.93	6	0.33
Religion	271	51.53	149	28.46	82	15.68	23	4.33	0	0.00
Residential	48,087	51.06	30,968	32.88	11,760	12.49	1,991	2.11	1,374	1.46
Total	**52,916**		**33,304**		**13,357**		**2,528**		**1,390**	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	313	45.51	162	23.62	178	25.86	35	5.01	0	0.00
Masonry	3,164	47.59	1,687	25.37	1,519	22.84	245	3.68	35	0.53
MH	2,757	90.21	146	4.77	111	3.63	10	0.32	33	1.07
Steel	2,160	52.41	899	21.81	784	19.02	277	6.71	2	0.06
Wood	43,002	50.93	29,307	34.71	9,119	10.80	1,736	2.06	1,273	1.51

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (only 0.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 0.00% of the beds will be in service. By 30 days, 16.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

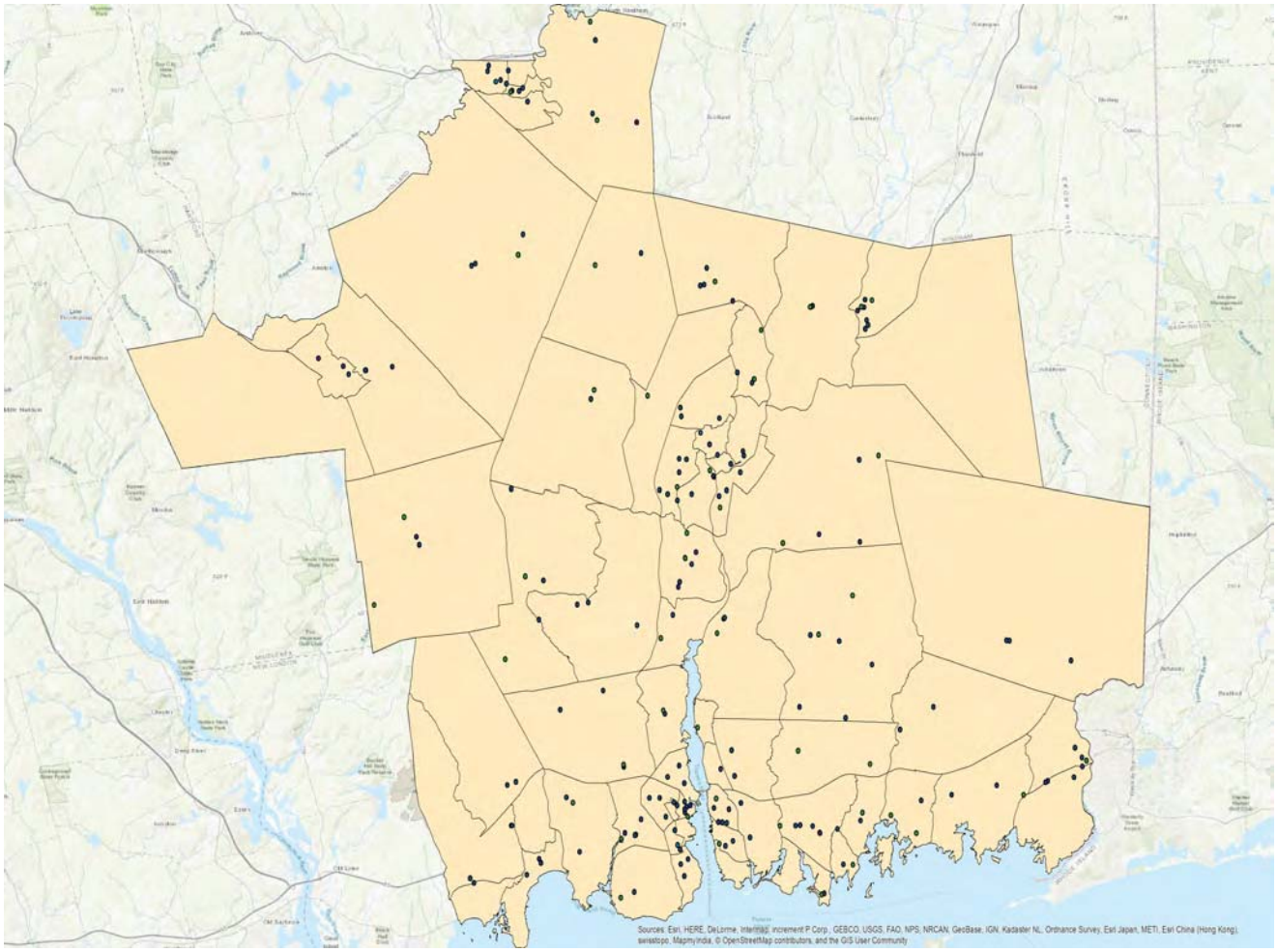
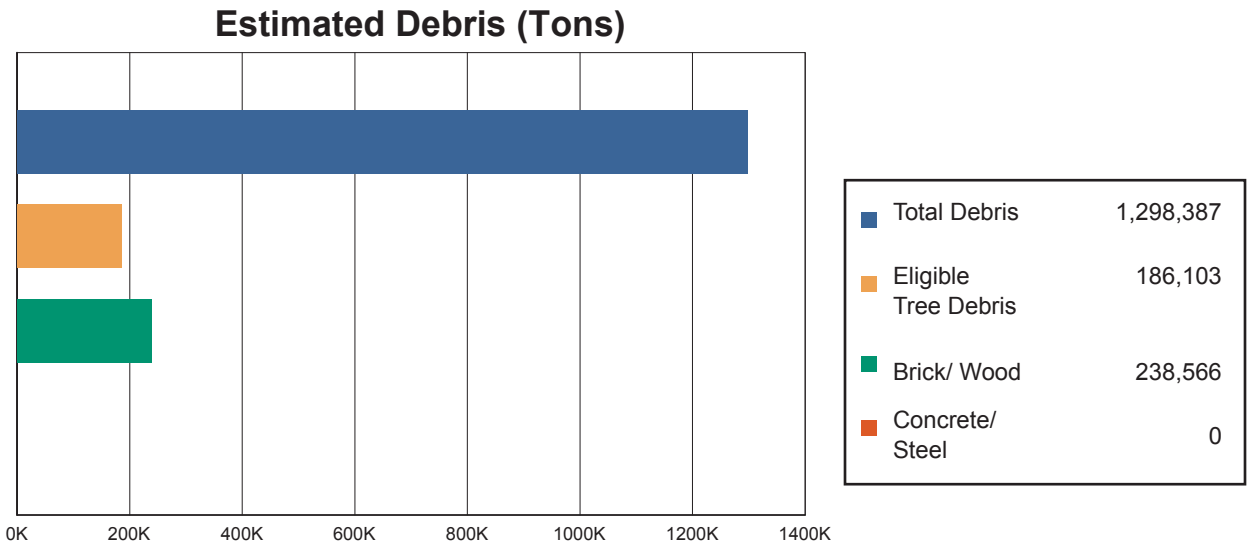


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	3	2	0
Police Stations	26	0	0	26
Schools	132	30	0	4

Induced Hurricane Damage

Debris Generation

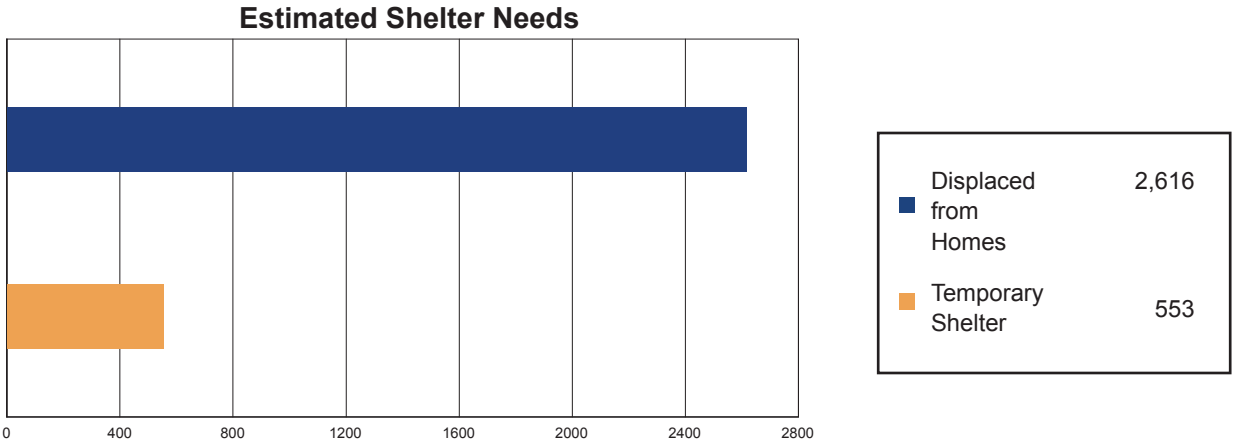


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 1,298,387 tons of debris will be generated. Of the total amount, 872,377 tons (67%) is Other Tree Debris. Of the remaining 426,010 tons, Brick/Wood comprises 56% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 9596 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 186,103 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 2,616 households to be displaced due to the hurricane. Of these, 553 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

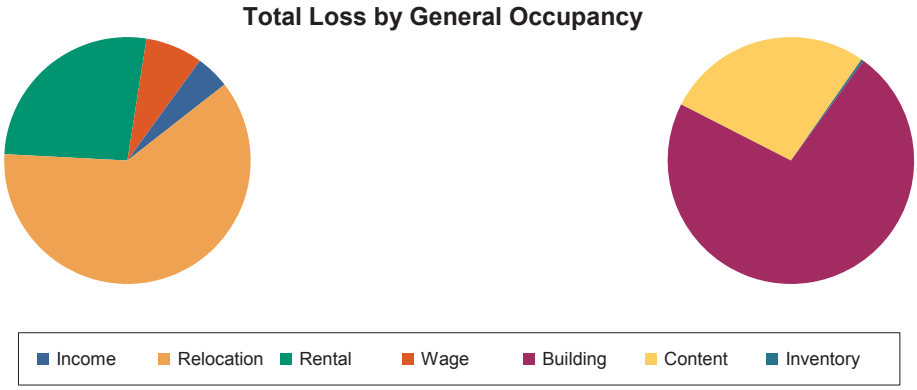
Economic Loss

The total economic loss estimated for the hurricane is 3353.2 million dollars, which represents 9.08 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 3,353 million dollars. 4% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 82% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



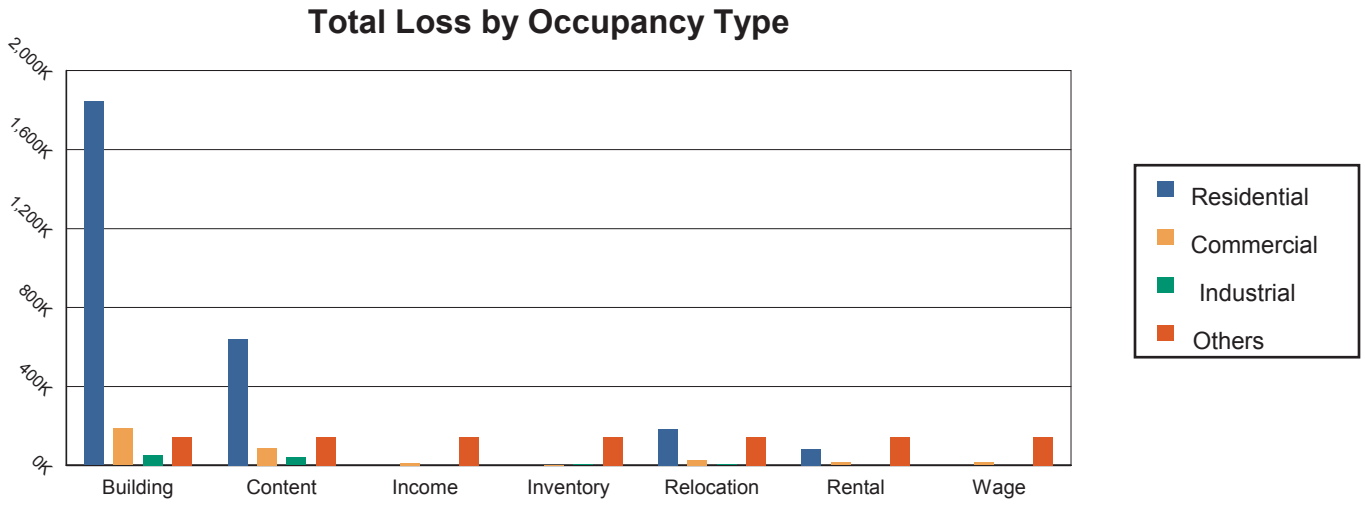


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,844,628.76	185,983.87	53,166.11	75,313.52	2,159,092.26
	Content	642,052.95	89,997.57	40,067.04	38,335.62	810,453.17
	Inventory	0.00	1,735.40	5,152.78	1,216.06	8,104.24
	Subtotal	**2,486,681.71**	**277,716.84**	**98,385.93**	**114,865.20**	**2,977,649.68**
Business Interruption Loss						
	Income	239.56	14,233.73	596.58	1,886.60	16,956.47
	Relocation	184,487.70	28,639.17	3,483.81	14,014.68	230,625.37
	Rental	83,175.74	15,309.98	538.42	1,321.75	100,345.89
	Wage	561.27	15,468.19	955.72	10,662.52	27,647.70
	Subtotal	**268,464.28**	**73,651.07**	**5,574.53**	**27,885.55**	**375,575.43**
Total						
	Total	**2,755,145.99**	**351,367.92**	**103,960.46**	**142,750.74**	**3,353,225.11**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
Windham	25,268	1,887,486	723,702	2,611,188
Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**
Study Region Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**

Hazus-MH: Hurricane Global Risk Report

Region Name: SCOG

Hurricane Scenario: UN-NAMED-1938-4

Print Date: Wednesday, June 21, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

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General Description of the Region

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

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 616.90 square miles and contains 66 census tracts. There are over 110 thousand households in the region and has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36.944 million dollars (2014 dollars). Approximately 91% of the buildings (and 76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 103,496 buildings in the region which have an aggregate total replacement value of 36,944 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

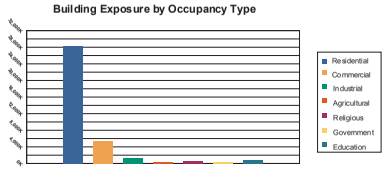


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	28,189,801	76.31%
Commercial	5,395,537	14.60%
Industrial	1,309,904	3.54%
Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,088	1.02%
Education	809,838	2.19%
Total	**36,944,078**	**100.00%**

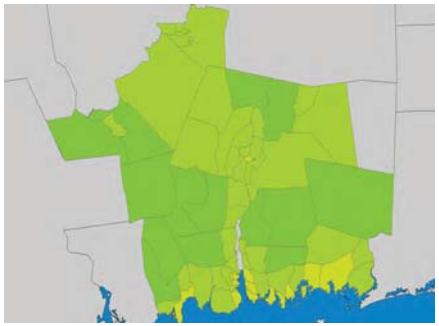
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	UN-NAMED-1938-4
Type:	Historic
Max Peak Gust in Study Region:	124 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 13,584 buildings will be at least moderately damaged. This is over 13% of the total number of buildings in the region. There are an estimated 927 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

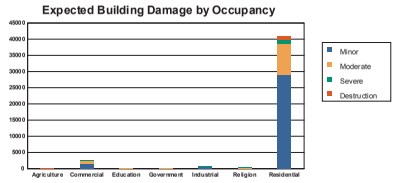


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	249	56.98	113	25.84	47	10.75	24	5.47	4	0.96
Commercial	3,426	57.52	1,416	23.78	860	14.44	251	4.22	2	0.03
Education	162	58.17	66	23.61	40	14.44	10	3.77	0	0.00
Government	174	58.41	69	23.13	44	14.65	11	3.91	0	0.00
Industrial	1,095	60.10	399	21.90	245	13.42	79	4.32	4	0.24
Religion	300	57.12	141	26.85	68	12.88	17	3.15	0	0.00
Residential	53,360	56.66	28,942	30.73	9,622	10.22	1,340	1.42	916	0.97
Total	**58,766**		**31,146**		**10,925**		**1,732**		**927**	

Table 3: Expected Building Damage by Building Type

Building	None		Minor		Moderate		Severe		Destruction	
Type	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	353	51.26	160	23.33	150	21.84	25	3.58	0	0.00
Masonry	3,513	62.83	1,618	24.33	1,314	19.77	181	2.72	23	0.35
MH	2,831	92.64	120	3.94	79	2.59	5	0.17	20	0.66
Steel	2,415	58.58	861	20.90	644	15.62	201	4.86	1	0.04
Wood	47,818	56.63	27,296	32.33	7,310	8.66	1,160	1.37	853	1.01

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (only 0.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 0.00% of the beds will be in service. By 30 days, 53.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

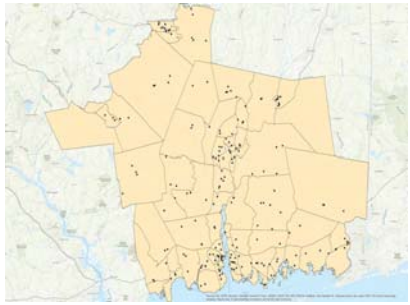
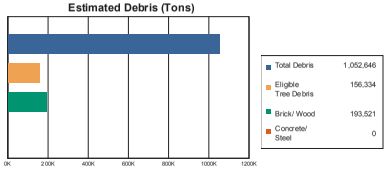


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	3	1	0
Police Stations	26	0	0	26
Schools	132	15	0	0

Induced Hurricane Damage

Debris Generation



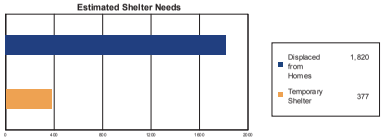
Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 1,052,646 tons of debris will be generated. Of the total amount, 700,790 tons (67%) is Other Tree Debris. Of the remaining 351,856 tons, Brick/Wood comprises 55% of the total. Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 7821 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 156,334 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement

Estimated Shelter Needs



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1,820 households to be displaced due to the hurricane. Of these, 377 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 2633.4 million dollars, which represents 7.13 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 2,633 million dollars. 4% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 82% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



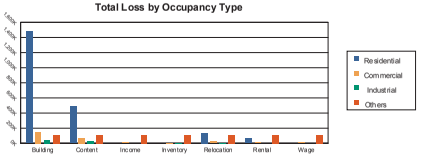


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,478,943.37	147,620.97	42,214.65	5,49 23.96	1,723,702.96
	Content	48 5,265.80	68,930.24	31,905.90	27 0,48.33	612,750.27
	Inventory	0.00	1,209.89	4,072.17	6 91.47	5,973.53
	Subtotal	**1,964,209.17**	**217,761.10**	**77,79 2.73**	**82,863.76**	**2,342,426.76**
Business Interruption Loss						
	Income	161.49	11,158.80	447.74	1,6 41.95	13,409.98
	Relocation	13,6 79.18	22,765.35	2,706.30	1,04 22.82	174,573.65
	Rental	6,6 105.62	12,043.93	422.66	1,03 4.07	79,66 8.28
	Wage	278.34	11,802.70	715.36	1,04 34.48	23,33 3.88
	Subtotal	**205,384.62**	**57,770.78**	**4,29 2.06**	**23,833.33**	**290,980.79**
Total						
	Total	**2,169,593.79**	**275,531.88**	**82,084.79**	**106,197.09**	**2,633,407.55**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
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Hazus-MH: Hurricane Global Risk Report

Region Name: SCOG

Hurricane Scenario: CAROL

Print Date: Wednesday, June 21, 2017

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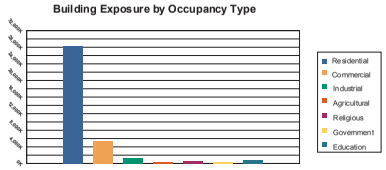

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Religious	501,741	1.36%
Government	376,088	1.02%
Education	809,838	2.19%
Total	**36,944,078**	**100.00%**

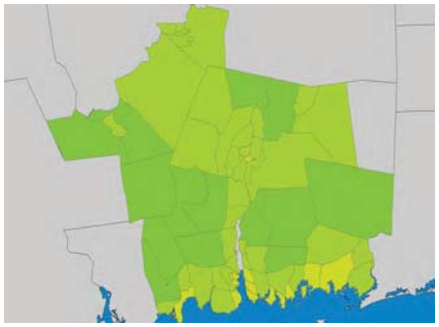
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	CAROL
Type:	Historic
Max Peak Gust in Study Region:	94 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 93 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 1 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

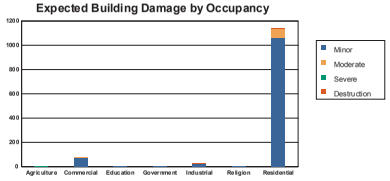


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	432	98.86	4	0.99	0	0.11	0	0.04	0	0.00
Commercial	5,879	98.72	70	1.18	6	0.10	0	0.01	0	0.00
Education	275	98.91	3	1.06	0	0.03	0	0.00	0	0.00
Government	295	99.03	3	0.96	0	0.02	0	0.00	0	0.00
Industrial	1,798	98.67	22	1.23	1	0.08	0	0.02	0	0.00
Religion	519	98.92	5	1.04	0	0.05	0	0.00	0	0.00
Residential	93,039	98.79	1,059	1.12	80	0.08	3	0.00	1	0.00
Total	**102,237**		**1,166**		**88**		**4**		**1**	

Table 3: Expected Building Damage by Building Type

Building	None		Minor		Moderate		Severe		Destruction	
Type	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	678	98.48	10	1.47	0	0.05	0	0.00	0	0.00
Masonry	6,907	97.87	119	1.79	21	0.32	1	0.02	0	0.00
MH	3,056	99.99	0	0.01	0	0.00	0	0.00	0	0.00
Steel	4,069	98.71	50	1.20	3	0.08	0	0.01	0	0.00
Wood	83,527	98.92	865	1.02	42	0.05	2	0.00	1	0.00

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 499 hospital beds (only 100.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

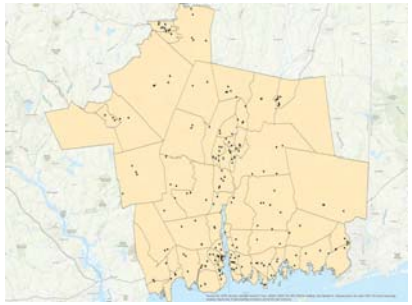
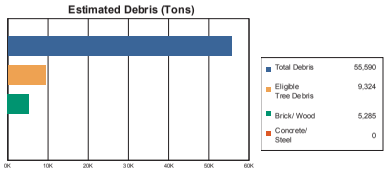


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	2	0	3
Police Stations	26	0	0	26
Schools	132	0	0	132

Induced Hurricane Damage

Debris Generation



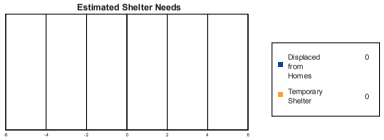
Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 55,590 tons of debris will be generated. Of the total amount, 40,909 tons (74%) is Other Tree Debris. Of the remaining 14,681 tons, Brick/Wood comprises 36% of the total. Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 214 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 9,324 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement

Estimated Shelter Needs



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 73.9 million dollars, which represents 0.20 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 74 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 95% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



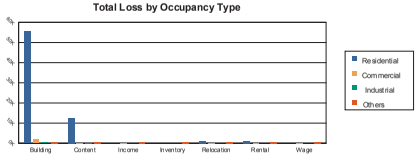


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	5 5,5 47.78	1,900.44	513.75	4 52.20	59,41 4.16
	Content	1 2,4 04.48	167.14	156.04	26.60	12,75 4.26
	Inventory	0.00	2.86	24.76	1.09	2 8.71
	Subtotal	**67,952.26**	**2,070.45**	**69 4.54**	**479.88**	**71, 197.13**
Business Interruption Loss						
	Income	0.00	94.69	2.85	16.65	11 4.19
	Relocation	1,2 48.82	93.62	11.01	16.39	1,37 0.84
	Rental	1,0 90.70	49.15	2.44	1.31	1,14 3.61
	Wage	0.00	66.60	4.73	40.39	111.72
	Subtotal	**2,340.52**	**304.07**	**21.02**	**74.75**	**2,74 0.38**
Total						
	Total	**70,292.78**	**2,374.51**	**715.56**	**554.63**	**73,937.49**

Appendix A: County Listing for the Region

Connecticut
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- Windham

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
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Study Region Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**

Hazus-MH: Hurricane Global Risk Report

Region Name: SCCOG

Hurricane Scenario: GLORIA

Print Date: Thursday, April 06, 2017

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General Description of the Region

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

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is 616.90 square miles and contains 66 census tracts. There are over 110 thousand households in the region and has a total population of 286,711 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 103 thousand buildings in the region with a total building replacement value (excluding contents) of 36,944 million dollars (2014 dollars). Approximately 91% of the buildings (and 76% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 103,496 buildings in the region which have an aggregate total replacement value of 36,944 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

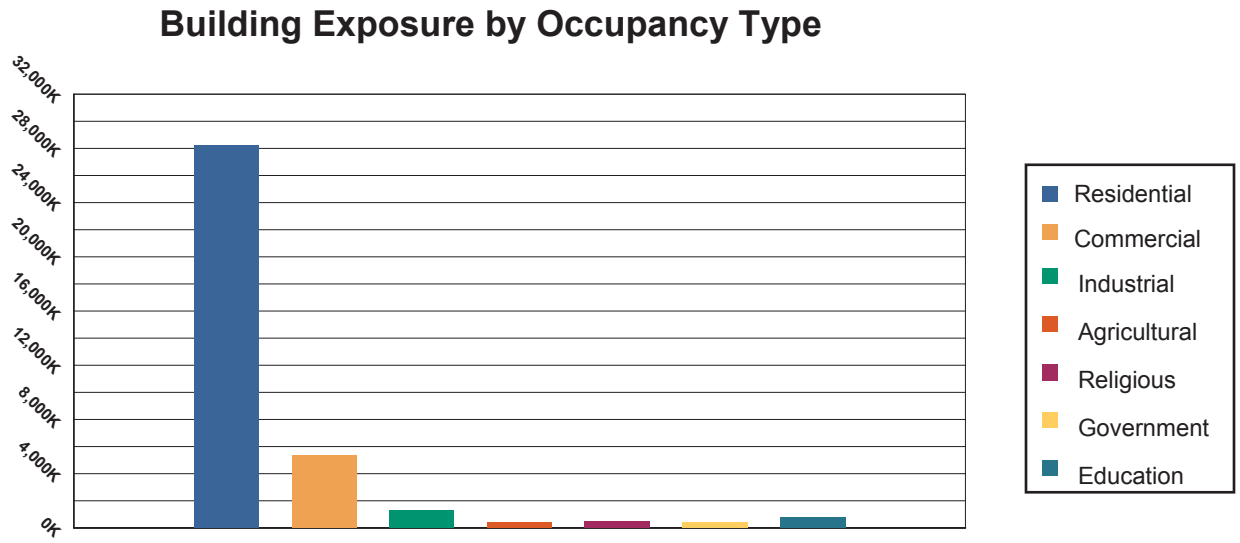


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	28,189,901	76.30%
Commercial	5,355,537	14.50%
Industrial	1,309,504	3.54%
Agricultural	401,389	1.09%
Religious	501,741	1.36%
Government	376,068	1.02%
Education	809,938	2.19%
Total	**36,944,078**	**100.00%**

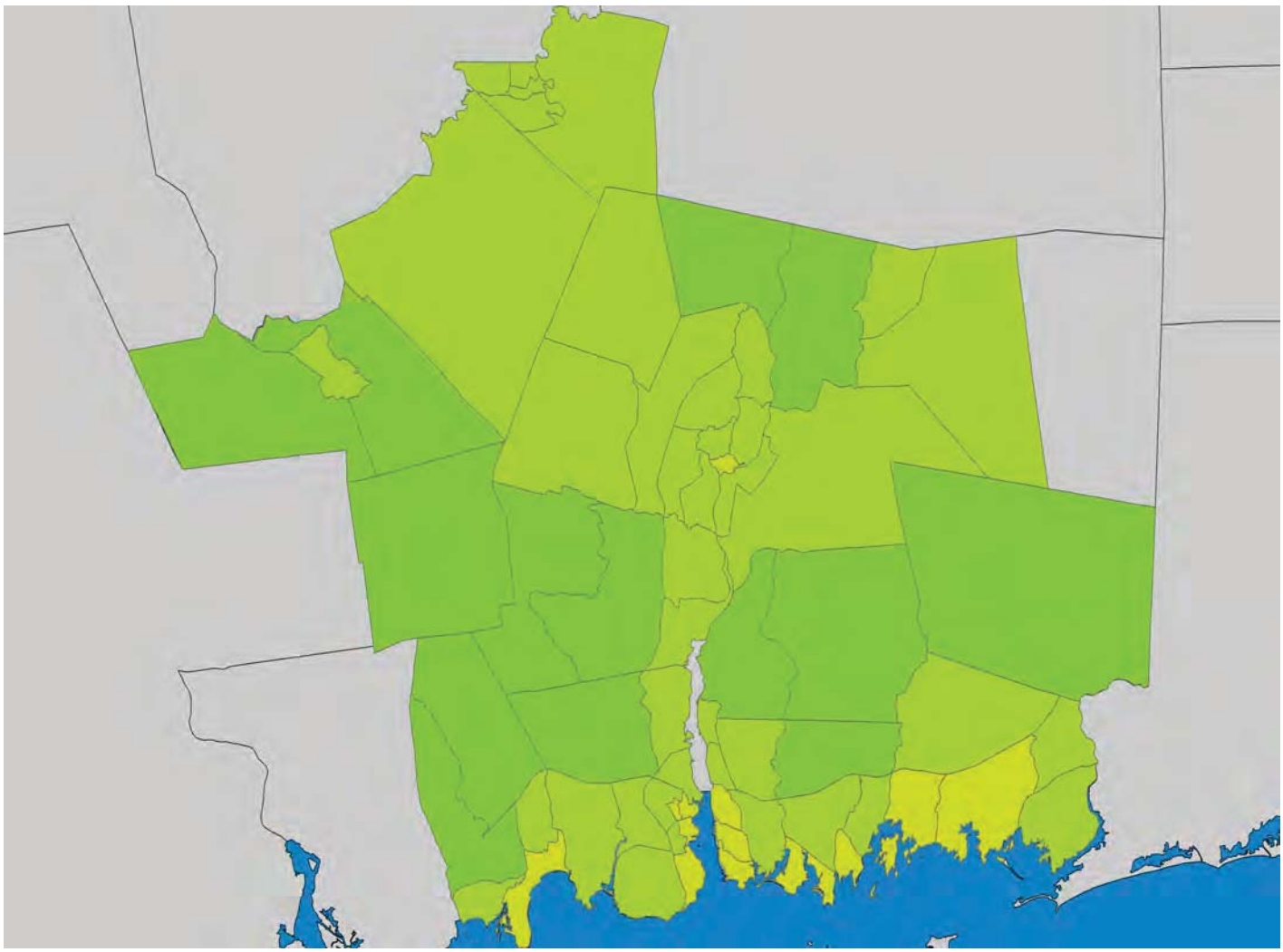
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 499 beds. There are 132 schools, 49 fire stations, 26 police stations and 9 emergency operation facilities.

Hurricane Scenario

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

Thematic Map with peak gust windfield and HU track



Scenario Name:	GLORIA
Type:	Historic
Max Peak Gust in Study Region:	89 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 167 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

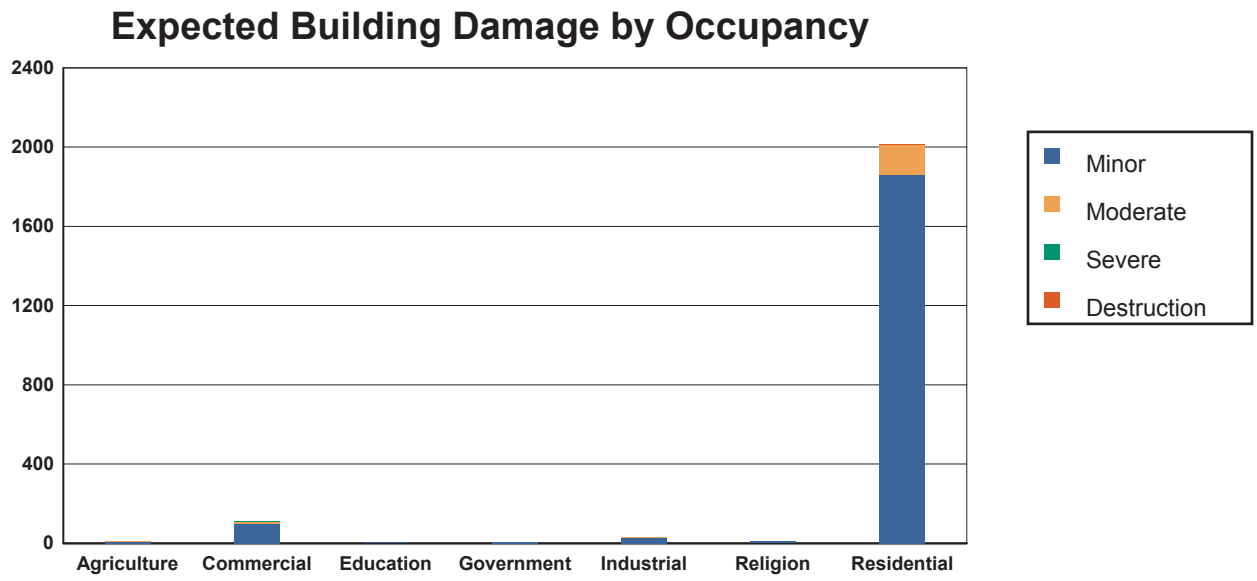


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	428	97.90	8	1.82	1	0.21	0	0.07	0	0.00
Commercial	5,845	98.16	101	1.69	9	0.14	0	0.01	0	0.00
Education	273	98.34	4	1.62	0	0.04	0	0.00	0	0.00
Government	293	98.24	5	1.71	0	0.04	0	0.00	0	0.00
Industrial	1,790	98.26	30	1.66	1	0.07	0	0.01	0	0.00
Religion	516	98.37	8	1.57	0	0.06	0	0.00	0	0.00
Residential	92,167	97.86	1,860	1.97	150	0.16	4	0.00	0	0.00
Total	**101,313**		**2,017**		**161**		**5**		**0**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	670	97.41	17	2.50	1	0.10	0	0.00	0	0.00
Masonry	6,404	96.31	196	2.95	47	0.71	2	0.02	0	0.00
MH	3,055	99.97	1	0.02	0	0.01	0	0.00	0	0.00
Steel	4,045	98.14	72	1.74	5	0.12	0	0.01	0	0.00
Wood	82,843	98.11	1,534	1.82	57	0.07	3	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 499 hospital beds available for use. On the day of the hurricane, the model estimates that 499 hospital beds (only 100.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

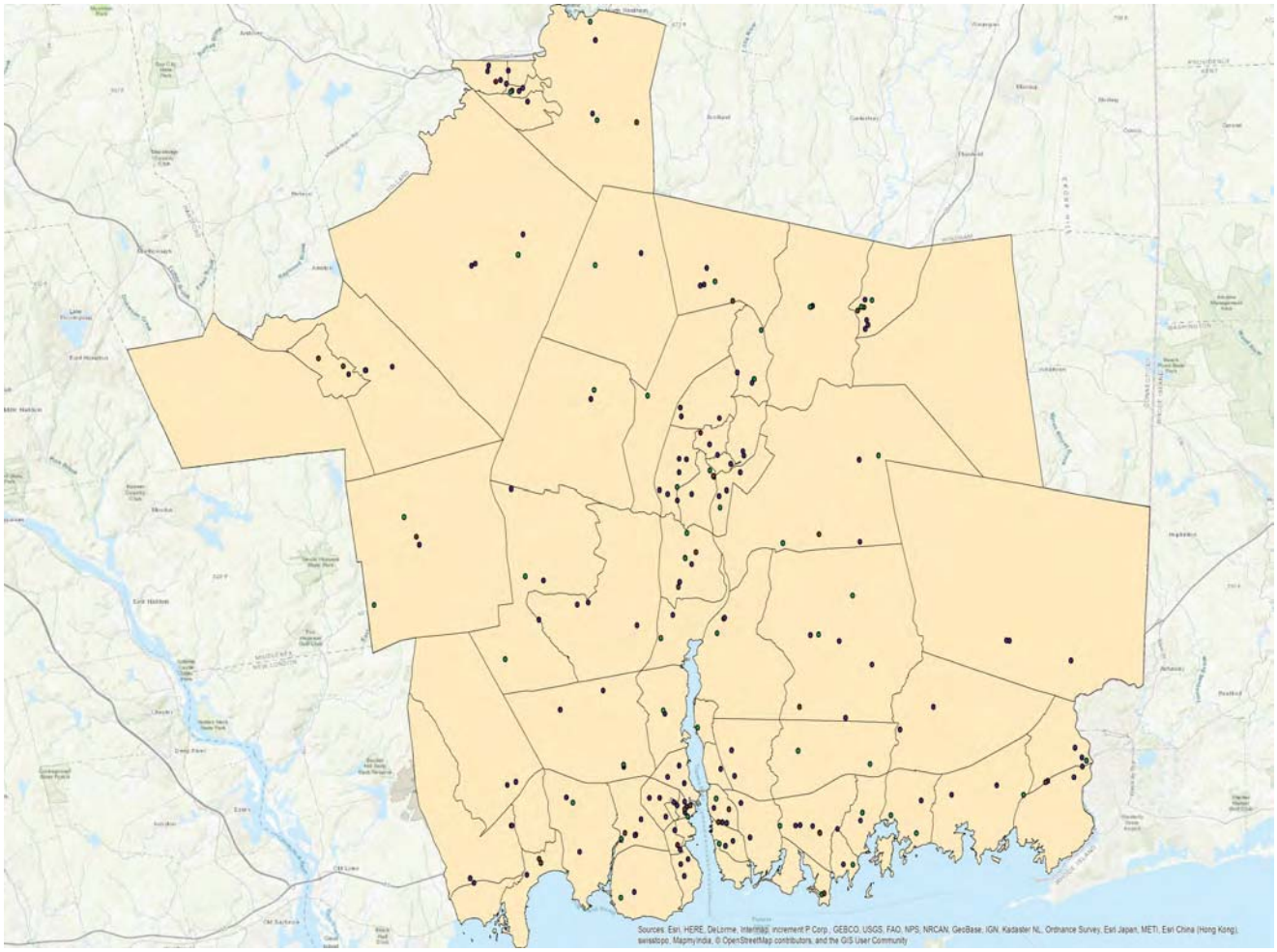
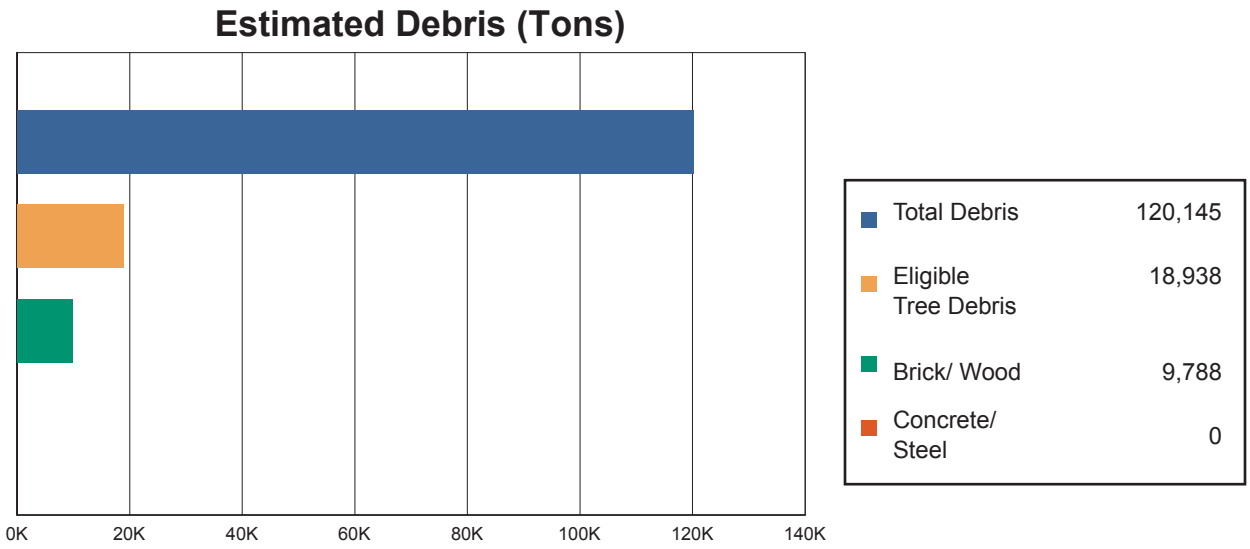


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	9	0	0	9
Fire Stations	49	0	0	49
Hospitals	3	2	0	3
Police Stations	26	0	0	26
Schools	132	0	0	132

Induced Hurricane Damage

Debris Generation

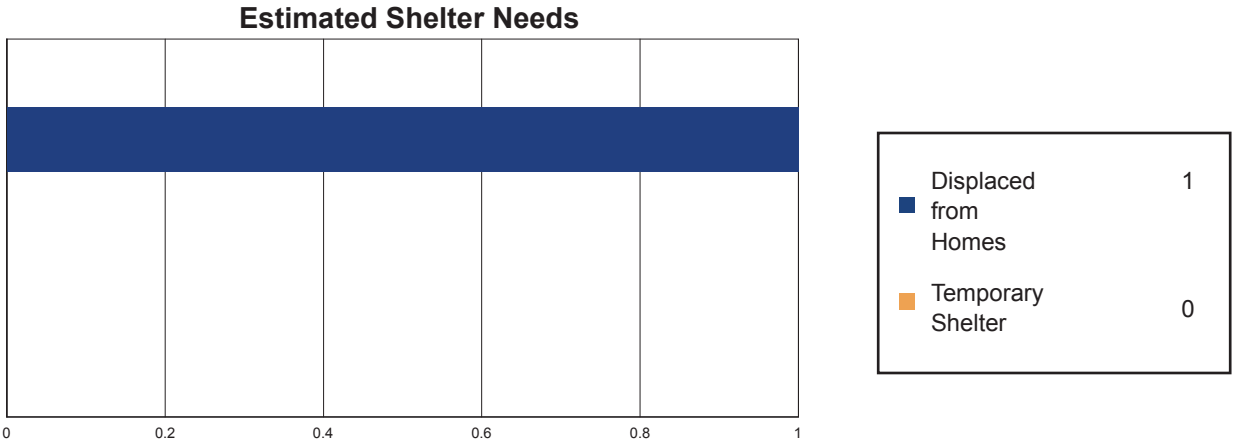


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 120,145 tons of debris will be generated. Of the total amount, 91,358 tons (76%) is Other Tree Debris. Of the remaining 28,787 tons, Brick/Wood comprises 34% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 394 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 18,938 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 286,711) will seek temporary shelter in public shelters.

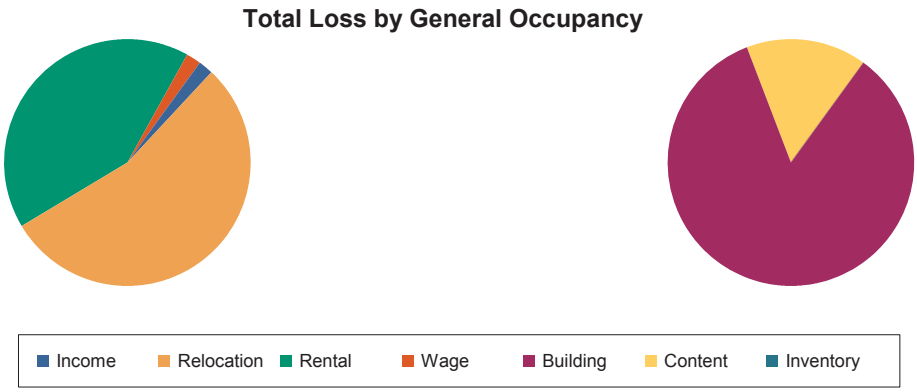
Economic Loss

The total economic loss estimated for the hurricane is 122.5 million dollars, which represents 0.33 % of the total replacement value of the region's buildings.

Building-Related Losses

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

The total property damage losses were 122 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 96% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



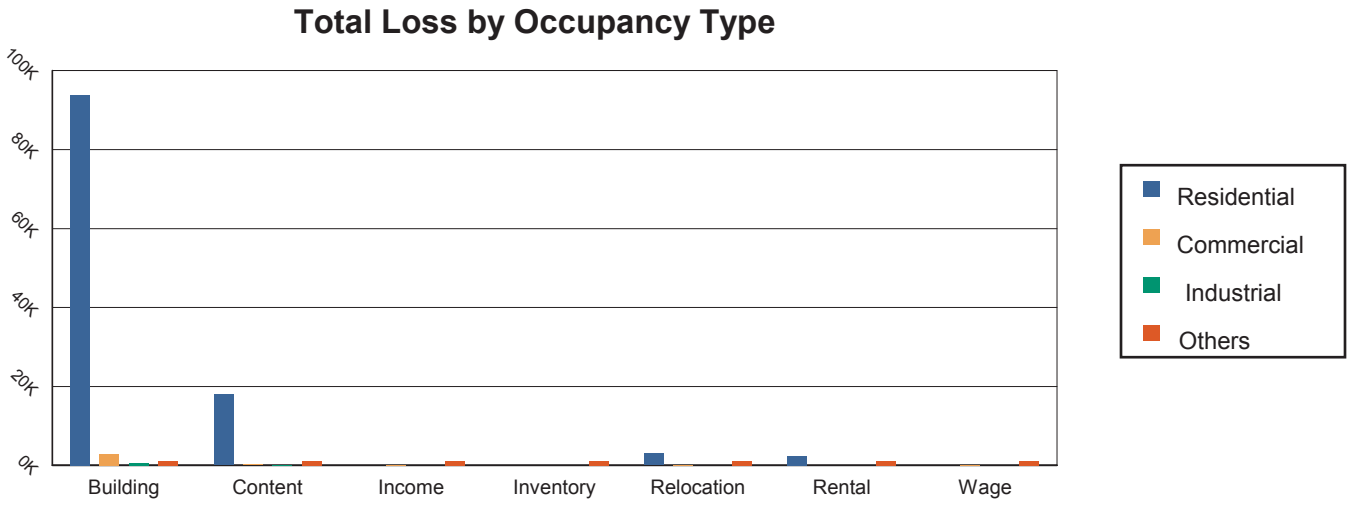


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	93,773.83	2,962.79	564.85	959.18	98,260.65
	Content	17,942.29	264.95	94.76	77.76	18,379.76
	Inventory	0.00	5.07	14.70	6.04	25.82
	Subtotal	**111,716.12**	**3,232.81**	**674.32**	**1,042.98**	**116,666.23**
Business Interruption Loss						
	Income	0.00	102.40	0.77	12.70	115.87
	Relocation	3,021.55	116.94	5.85	22.98	3,167.31
	Rental	2,379.95	46.62	0.66	1.11	2,428.34
	Wage	0.00	74.40	1.28	34.14	109.82
	Subtotal	**5,401.50**	**340.36**	**8.56**	**70.93**	**5,821.34**
Total						
	Total	**117,117.62**	**3,573.16**	**682.88**	**1,113.92**	**122,487.57**

Appendix A: County Listing for the Region

Connecticut
- New London
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	261,443	26,302,415	8,030,475	34,332,890
Windham	25,268	1,887,486	723,702	2,611,188
Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**
Study Region Total	**286,711**	**28,189,901**	**8,754,177**	**36,944,078**

APPENDIX E

Model Ordinance Language

Legislative Intent of the Pre Disaster Event Ordinance Recommended by the RESF 7 Private Sector Coordination Group

Provide better management of disaster mitigation, preparedness, response and recovery by the following actions:

1. Establish a Recovery Organization
2. Authorized the preparation of a Recovery Plan
3. Grant Emergency Powers for staff actions which can ensure timely and expeditious post-disaster recovery for a municipality
4. Identify methods by which a municipality may take cooperative action with other governmental agencies to facilitate recovery.
5. Specify means by which a municipality may consult with and assist citizens, businesses and community organizations during the planning and implementation of recovery procedures.

List Definitions for key terms used in the ordinance

List the Powers and Duties of the Recovery Management Organization and its Members

Outline the Content of a Recovery Plan, How it should be adopted, amended, and implemented

Outline an Interim Recovery Strategy with Critical Action Priorities and a Short Term Hazard Mitigation Program

Provide basis for Emergency Powers and Procedures, Coordination with FEMA and Other Agencies, the establishment of temporary Regulations and how long they should be in effect.

Outline Procedures for authorizing Environmental Clearances, Debris Clearance and Hazard Abatement, Prohibiting Access, Damage Assessment, Development Moratorium, Temporary Use Permits and Permit Waivers, Fee Deferral, and Handling of Nonconforming Buildings and Uses.

Coordinating the Establishment of a One Stop Service Center for Permit, Economic, and Housing Assistance

Providing Authority to establish a standard certification process for contractors and/or volunteers during the cleanup process

Directing staff assignment to work with all other agencies to make provisions for temporary or permanent replacement housing to help avoid undue displacement of people and businesses.

Providing procedures for Condemnation and Demolition of Damaged Historical Buildings.

Severability Clause to limit the impact of an adverse court ruling.

MODEL ORDINANCE: DISASTER RECOVERY MANAGEMENT

Introduction: One action a community can take to move toward better management of **disaster mitigation, preparedness, response, and recovery** is the adoption of an ordinance to support a disaster recovery plan.

Purposes: The Disaster Recovery Management Ordinance focuses on actions found necessary to facilitate recovery. The recovery ordinance should:

1. Be adopted by the local legislative body,
2. Authorize disaster recovery management responsibilities to be the responsibility of the Chief Elected Official or Chief Executive Officer, (CEO)
3. Direct the preparation of a pre-event short- and long-term recovery plan (Disaster Recovery Plan) in concert with the local office of emergency management and community stakeholder organizations,
4. Establish authority for local government staff to take action to protect public health, safety, and welfare during post-disaster recovery,
5. Identify methods for local government to take cooperative action with other entities to assure full access to all external financing resources as well as to facilitate recovery
6. Specify the means for assisting citizens, businesses, and community organizations during recovery planning and a disaster.

Form of Government: The authority to declare a local state of Emergency lies with the Chief Executive Officer pursuant to Section 28-8a of the Connecticut General Statutes. Each municipality considering adoption of such an ordinance is advised to make changes to the suggested language to adapt it to their form of governance and local organizational structure. This Model was adjusted to reflect a three tiered form of governance. Operationally the Chief Elected Official works with an elected board or council which may or may not be the legislative body. The legislative body would adopt the ordinance whereas the plan would be adopted by the operational board or council. The First Selectman, Board of Selectman and Representative Town Meeting form of government was used in constructing this model.

In addition, Connecticut law delegates legislative authority to establish land use regulations to other boards and commissions who need to be advised of and consent to; changes within their respective regulations. Establishment of a multi-agency pre-event organization can facilitate the identification and adoption of regulations that may be needed to ultimately establish the Director's authority.

Recovery Management Emphasis: Recovery management is an operational responsibility of the Chief Executive Officer requiring support from various municipal, State, federal and private organizations. The authority necessary to direct disaster recovery requires local legislative support through public participation and ordinance adoption.

MODEL ORDINANCE LANGUAGE:
DISASTER RECOVERY MANAGEMENT

An ordinance establishing a recovery organization, authorizing preparation of a recovery plan, and granting emergency powers for staff actions which can ensure timely and expeditious post-disaster recovery for the municipality, and amending Section ---------- of the Municipal Code of Ordinances.

Chapter __. Disaster Recovery Management

[**Insert here**: table of contents or listing of all section and subsection titles]
The Legislative Body does hereby ordain:

Section

1. Authority. This ordinance is adopted by the Legislative Body acting under authority of the [authorizing legislation], [State Emergency Management Act or equivalent], and all applicable federal laws and regulations.

2. Purposes. It is the intent of the Legislative Body under this chapter to:

a. Authorize, in advance of a disaster, the establishment and maintenance of an ongoing Recovery Management Organization within the municipality to plan, prepare for, direct, and coordinate orderly and expeditious post-disaster recovery;

b. Direct, in advance of a declared disaster, the preparation of a Disaster Recovery Plan for short-term and long-term post-disaster recovery, to be adopted by the Board of Selectmen and amended, as necessary

c. Establish, powers to be implemented upon declaration of a local emergency by which staff of building, planning, public works, and other departments can take extraordinary action to reasonably assure safe and healthy post disaster recovery;

d. Identify methods by which the City may take cooperative action with other governmental entities to facilitate recovery;

e. Specify means by which the City may consult with and assist citizens, businesses and community organizations during the planning and implementation of recovery procedures.

3. Definitions. As used in this ordinance, the following definitions shall apply:

3.1 Development Moratorium shall mean a temporary hold, for a defined period of time, on the issuance of building permits, approval of land-use applications or other permits related to the use, development, and occupancy of private property in the interests of protection of life and property.

3.2 Disaster shall mean a locally declared emergency also proclaimed as a state of emergency by the Governor of the State and declared a disaster by the President of the United States.

3.3 Emergency shall mean a local emergency, as defined by CGS **Sec. 28-8a** and section ___of the Municipal Code of Ordinances, which has been declared by the Chief Executive Officer for a specific disaster and has not been terminated.

3.4 Local Hazard Mitigation Plan. A regional plan prepared for municipal adoption and FEMA approval, which, among other things, assesses the type, location, and extent of natural hazards affecting the region and the Municipality; describes vulnerability of people, structures, and infrastructure facilities to such hazards and estimates potential losses, and includes a mitigation strategy that provides the Municipalities' blueprint for reducing potential losses identified.

3.6 Redevelopment shall mean the rebuilding or replacement of permanent residential, commercial, or industrial facilities damaged or destroyed in a major disaster, as well as construction of large-scale public or private infrastructure, addition of community improvements, and/or restoration of a healthy economy.

3.7 Recovery shall mean the restoration of housing, transportation, public services, and/or economic activity to levels equal to or better than their pre-disaster states through a series of short-term, intermediate, and long-term strategies and actions.

4. Recovery Management Organization. There is hereby created the Recovery Management Organization. An interdepartmental organization that coordinates city staff actions in planning, organizing, and implementing pre-event and post-disaster recovery and reconstruction functions.

4.1 Powers and Duties. The Recovery Management Organization shall have such powers as needed to carry out the purposes, provisions, and procedures of this chapter.

4.2 Officers and Members. The Recovery Management Organization shall include The Chief Elected Official, who shall be the Director; and may include the following officers and members as appointed by the Chief Elected Official and ratified by the Board of Selectmen: (adjust to fit municipal organizational structure)

a. Director of planning, Director of Emergency Management, Chief of Police, Director of Finance, Building official, Zoning Official, Fire Marshal, Fire Administrator, Director of public works, Engineer, Director of utilities, Floodplain manager, hazard mitigation specialist; Municipal Attorney

b. Representatives from such other departments as deemed necessary by the Director for effective operations;

c. Members from the Emergency Management Advisory Council, as designated by the Director.

4.3 Operations. The Director shall be responsible for overseeing the operations of the Recovery Management Organization and for calling meetings, as needed and may create such standing or ad hoc committees as determined to be necessary.

4.4 Succession. The Director shall name a succession of members to carry on the duties of the Director and to serve as Acting Director in the event of the unavailability of the Director, and shall be empowered to carry out the duties and responsibilities of the Director.

5. Recovery Plan. The Recovery Management Organization shall prepare a Disaster Recovery Plan (the Plan) which shall be adopted and amended by the Board of Selectmen as needed.

5.1 Plan Content. The Disaster Recovery Plan shall: be composed of pre- and post-event policies, strategies, and actions needed to facilitate post-disaster recovery; designate departmental action responsibilities; address short-term and long-term recovery subjects for, business resumption, damage assessment, demolitions, debris removal, expedited repair permitting, hazards evaluation and mitigation, historical buildings, moratorium procedures, nonconforming buildings and uses, rebuilding plans, restoration of infrastructure, temporary and replacement housing; recommend amendments to local land use regulations, and such other subjects as may be appropriate to expeditious and wise recovery. The Disaster Recovery Plan may include a mutually agreed-upon vision of community resilience; sustainability and climate adaptation.

5.2 Coordination with Other Organizations. The Recovery Plan shall identify relationships of planned recovery actions with those of local, regional, state, federal, mutual aid, and nonprofit organizations involved with disaster recovery and other organizations that may provide disaster assistance.

5.3 Consultation with Citizens. the Recovery Management Organization shall conduct outreach to community stakeholder groups, organize and distribute public announcements, schedule and conduct community workshops and meetings, and/or convene advisory

committees composed of representatives of homeowner, business, and community organizations, during Recovery Plan formulation, adoption, and amendment.

5.4 Adoption. Following preparation, update, or revision, the Recovery Plan shall be transmitted to the Board of Selectmen for review and approval. The Board of Selectmen shall hold at least one legally noticed public hearing to receive comments from the public on the Recovery Plan. Following public hearing(s), the Board of Selectmen may adopt or amend the Recovery Plan by resolution, or transmit the plan back to the Recovery Management Organization for further modification prior to final action.

5.5 Amendments. The Recovery Management Organization shall propose amendments to the plan. In preparing amendments, the Recovery Management Organization shall consult in a timely manner with the Legislative Body, Board of Selectmen, Municipal departments, businesses and community organizations, and other government entities to obtain information pertinent to possible Plan amendments.

5.6 Implementation. The Recovery Management Organization shall be responsible for Plan implementation. After a declaration of emergency, the Director shall report to the Board of Selectmen as often as necessary on actions taken to implement the plan in the post-disaster setting, identify policy issues needing direction, and receive authorization to proceed with interim plan modifications necessitated by specific circumstances.

5.7 Training and Exercises. In order to develop, communicate, and update the contents of the Plan, The Recovery Management Organization shall conduct periodic training exercises in coordination with similar training exercises related to the Emergency Operations Plan.

5.8 Coordination with Related Plans. The Recovery Plan shall be consistent with the Plan of Conservation and Development, the Emergency Operations Plan, the Local Hazard Mitigation Plan, and other related plans.

6. Interim Recovery Strategy. Following a declaration of local emergency, the Recovery Management Organization shall prepare an Interim Recovery Strategy which shall identify and describe recovery initiatives and action priorities anticipated or underway that are necessitated by specific post disaster circumstances.

6.2 Critical Action Priorities. The Interim Recovery Strategy shall identify critical action priorities describing for each action its objective, urgency, affected individuals and organizations, funding sources, department responsible, and likely duration. The Interim Recovery Strategy shall identify those recovery initiatives and action priorities that are not covered sufficiently in the Plan, but which in the judgment of the Director are essential to expeditious fulfillment of victims' needs, hazard mitigation imperatives, critical infrastructure restoration, and rebuilding needs, and without which public health, safety, and welfare might otherwise be impeded.

6.3 Short-Term Hazard Mitigation Program. The Interim Recovery Strategy shall include a short-term hazard mitigation program comprised of high-priority actions, in areas affected by flooding, fire, wind, seismic, or other natural hazards, or remediation of known human-induced or technological hazards such as toxic contamination. High priority actions include initiatives or procedural changes requiring legislative action, or authorization by a non-municipal, regional, state or federal entity.

6.4 Review and Consultation. The Interim Recovery Strategy shall be forwarded to the Board of Selectmen for review following consultation with FEMA, other governmental agencies, businesses, infrastructure operators, and other citizen and stakeholder representatives. The Director shall periodically report to the Board of Selectmen on the status of Interim Recovery Strategy implementation, and any adjustments required by changing circumstances.

7. Hazard Mitigation Program. The Recovery Management Organization, may be designated as the lead agency for the implementation of the **Local Hazard Mitigation Plan.** The Organization may recommend to the Planning Commission, an amendment to the Plan of Conservation and Development CGS 8-23 to include long- and short-term hazard mitigation goals, policies, and actions against future disasters, including severe flooding; fires; seismic hazards, dam failure; sea level rise, coastal surge and erosion; hurricanes, tornadoes, and other high winds; and human-induced or technological hazards, such as oil spills, natural gas leakage and fires, hazardous and toxic materials contamination, and nuclear power plant and radiological accidents.

8. General Provisions. The following general provisions shall be applicable to implementation of this chapter:
8.1 Emergency Powers and Procedures. Following a declaration of local emergency and while such declaration is in force, the Recovery Management Organization shall have authority to exercise powers and procedures authorized by this chapter.
8.2 Post-Disaster Operations. The Recovery Management Organization shall coordinate post-disaster recovery operations, including but not limited to: business resumption, damage assessment, demolitions, debris removal, expedited repair permitting, hazards evaluation and mitigation, historical buildings, moratorium procedures, nonconforming buildings and uses, rebuilding plans, restoration of infrastructure, temporary and replacement housing, and such other subjects as may be appropriate, as further specified below.
8.3 Coordination with FEMA and Other Agencies. The Recovery Management Organization shall coordinate recovery actions with those of state, federal, local, or other mutual aid organizations involved in disaster recovery and assistance. Intergovernmental coordination responsibilities include but are not limited to the following: local compliance with all applicable federal and state laws and regulations; provision of information and logistical support; participation in the Multi-Agency Hazard Mitigation Team; cooperation in joint establishment of one-stop service centers for victim support and assistance; and such other coordination tasks as may be required under the specific circumstances of the disaster.
9.0 **Temporary Regulations.** The Recovery Management Organization shall have the authority to administer the provisions of this section dealing with building permits, demolition permits, and restrictions on the use, development, or occupancy of private property, provided that such action, in the opinion of the Director, is reasonably justifiable for protection of life and property, mitigation of hazardous conditions, avoidance of undue displacement of households or businesses, or prompt restoration of public infrastructure.
9.1 **Duration.** The provisions of this section shall be in effect for a period of 90 days from the date of a local emergency declaration leading to a state-proclaimed emergency and federally declared disaster.

9.2 **Environmental Clearances.** The provisions of this section enable actions that in the judgment of the Director are justifiable for protection of public health and safety and, therefore, can be reasonably declared to qualify under statutory exemptions of environmental regulations contained in other chapters of the Municipal Regulations or Ordinances, and within state and federal law. The Director shall provide to the Board of Selectmen, and the local agency with jurisdiction over emergency authorizations and statutory exemptions compliance reports as directed.

9.3 **Debris Clearance and Hazard Abatement.** The Director shall have the emergency authority to undertake the following actions:

a. **Debris Removal**—Remove from public rights-of-way and/or private property adjoining such rights-of-way any debris, rubble, trees, damaged or destroyed cars, trailers, equipment, or other items of private property, posing a threat to public health or safety;

b. **Hazardous Materials**—Remove and/or abate hazardous and toxic substances threatening public health and safety;

c. **Setbacks of Temporary Buildings**—Create and maintain such additional setbacks for temporary buildings as to assure emergency and through movement of vehicles and pedestrians essential for recovery management;

d. **Prohibition of Access**—Prohibit public access to areas damaged and/or hazardous to public health;

e. **Other**—Take such other actions, which, in the judgment of the Director, are reasonably justified for protection of public health and safety, provision of emergency ingress and egress, assurance of firefighting or ambulance access, restoration of infrastructure, and mitigation of hazardous conditions.

9.4 **Damage Assessment and Placarding.** The Director shall direct damage assessment teams under the supervision and authority of the Building official to conduct field surveys of damaged structures and to determine the level of structural hazard if any and specify the level of use permitted, restricted or prohibited. The Building Official or designee shall note in general terms the type of damage encountered and shall clearly and concisely note the restrictions or prohibition on continued occupancy. All assessments shall be in writing and provided to the Director and building owner/occupant and may include or require posting on the affected building.

9.5 **Development Moratorium.** The Director shall have the authority to establish a moratorium on the issuance of building permits, approval of land use applications or other permits and entitlements related to the use, development, and occupancy of private property authorized under other chapters and sections of the Municipal Code and related ordinances, provided that, in the opinion of the Director, such action is reasonably justifiable for protection of life and property and subject to the following:

a. **Posting**—Notice of the moratorium shall be posted in the Office of the Town Clerk, in the departments with responsibility for permit issuance, and on the Internet, and shall clearly identify the boundaries of the area(s) in which moratorium provisions are in effect, and shall specify the exact nature of the development permits or entitlements that are temporarily held in abeyance;

b. **Duration**—The moratorium shall be in effect subject to review by the Board of Selectmen at the earliest possible time, but no later than 90 days, at which time the Board of Selectmen shall take action to extend, modify, replace, or terminate such moratorium.

9.6 **Temporary Use Permits.** The Director shall have the authority to issue permits in any zone for the temporary use of property that will aid in the immediate restoration of an area adversely impacted by a major disaster, subject to the following provisions:
1. **Critical Facilities**--Any police, fire, emergency medical, or emergency communications facility that will aid in the immediate restoration of the area may be permitted in any zone for the duration of the declared emergency.
2. **Other Temporary Uses**--Temporary use permits may be issued in writing by the Director in any zone, with conditions, authorizing the respective code officials to issue approval for said use in conformance with building and fire safety codes. The Temporary Use Permit shall expire within 90 days unless the temporary use is otherwise authorized or permitted by the Zoning Regulations.
9.7 **Temporary Waiver of Repair Permit Requirements for Emergency Repairs.** Following a disaster, temporary emergency repairs to secure structures and property damaged in the disaster against further damage or to protect adjoining structures or property may be made without fee or permit where such repairs are not already exempt under other chapters of the Municipal Code. The building official must be notified of such repairs within **X** working days, and regular permits with fees may then be required.
9.8 **Deferral of Fees for Repair and Rebuilding Permits.** Except for temporary repairs issued under provisions of this chapter, all other repairs, restoration, and reconstruction of buildings damaged or destroyed in the disaster shall be approved through permit under the provisions of other chapters of this Code. Fees for such repair and reconstruction permits may be deferred until issuance of certificates of occupancy in writing by the Director.
9.9 **Nonconforming Buildings and Uses.** Buildings damaged or destroyed in the disaster that are legally nonconforming or contain legally non-conforming uses as defined in the Zoning Regulations or by ordinance may be repaired and reconstructed in-kind in the manner prescribed in the Zoning Regulations or by ordinance, including but not limited to the requirements and procedures of the National Flood Insurance Program, such as building elevation or basement removal. Damaged structures must be secured in accordance with the community's provisions for abandoned structures in order to ensure the health and safety of the public;(Include reference to section(s) of Regulations and/or ordinances which apply)

10.0 **One-Stop Service Center for Permit, Economic, and Housing Assistance**. The Recovery Management Organization shall coordinate the establishment of a one-stop center, staffed by representatives of pertinent Municipal departments, and cooperating organizations, for the purpose of providing coordinated services and assistance to disaster victims, including but not limited to: permit processing to expedite repair of buildings, provision of housing assistance, and encouragement of business resumption and industrial recovery. The Director shall establish such center and procedures in coordination with other governmental entities that may provide services and support.

11.0 **Emergency Contractor and Volunteer Certification.** The Recovery Management Organization shall have authority to establish a standard certification process for all contractors and/or volunteers seeking to provide clean-up, repair, or construction services within areas that have experienced disaster damage. The Disaster Recovery Plan shall specify the certification process to be followed, including but not limited to, application requirements, fees, licensing, liability insurance, identification and penalties.
12.0 **Temporary and Permanent Housing.** The Director shall assign staff to work with FEMA, SBA, HUD, the State Emergency Management Agency (or equivalent), and other appropriate governmental and private entities to identify special programs by which provisions can be made for temporary or permanent replacement housing which will help avoid undue displacement of people and businesses.

13.1 **Condemnation and Demolition of Damaged Historic Buildings.** The building official shall notify the State Historic Preservation Officer of any building defined as historic by State or Local law that represents an imminent hazard to public health and safety, or to pose an imminent threat to the public right of way. Where feasible, as determined by the building official, the building or structure shall be secured, braced or shored in such a manner as to mitigate the hazard. Otherwise the building official shall cause the building or structure to be condemned and immediately demolished. Authority for condemnation and demolition is in the interest of public health and safety within the emergency powers of the Building Official, as authorized by ordinance. Prior to commencing demolition, the building official shall photographically record the entire building or structure.
13.2 **Notice of Condemnation.** Within the recovery period**,** If a historic building or structure is determined by the building official to represent a hazard to the health and safety of the public or to pose a threat to the public right of way, the building official shall initiate condemnation in the manner prescribed by State Statute or Municipal Ordinance. The building official shall also notify FEMA, in accordance with the National Historic Preservation Act of 1966, as amended, of the intent to initiate condemnation proceedings.
13.3 **Request to FEMA to Demolish.** Within 30 days after the disaster, for any historic building or structure that the building official and the owner have agreed to demolish, the building official shall submit to FEMA, in accordance with the National Historic Preservation Act of 1966, as amended, a request to demolish. Such request shall include all substantiating data.
13.4 **Historic Building Demolition Review.** If after 30 days from the event, the building official and the owner of a historic building or structure agree that the building or structure should be demolished, such action will be subject to the review process established by the National Historic Preservation Act of 1966, as amended.

14.0 **Severability.** If any provision of this chapter is found to be unconstitutional or otherwise invalid by any court of competent jurisdiction, such invalidity shall not affect the remaining provisions, which can be implemented without the invalid provision, and, to this end, the provisions of this ordinance are declared to be severable.