HAZARD MITIGATION PLAN UPDATE
ANNEX FOR THE TOWN OF NORTH STONINGTON

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

January 08, 2013

MMI #3570-05

Prepared for:

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ACKNOWLEDGEMENTS

This HMP annex update could not have been completed without the time and dedication of the following individual at the local level:

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

Tables

Figures

Appendices

1.0 INTRODUCTION

1.1 Purpose of Annex

The purpose of this HMP annex is to provide an update to the hazard risk assessment and capability assessment provided in the previous HMP, and to evaluate potential hazard mitigation measures and prioritize hazard mitigation projects specific to mitigating the effects of hazards to North Stonington. Background information and the regional effects of pertinent hazards are discussed in the main body of the Southeastern Connecticut Council of Governments (SCCOG) Multi-Jurisdictional Hazard Mitigation Plan. Thus, this annex is designed to supplement the information presented in the Multi-Jurisdictional HMP with more specific detail for North Stonington and is not to be considered a standalone document.

The primary goal of this hazard mitigation plan annex is to identify particular vulnerability to hazards and potential mitigation measures for such hazards in order to ***reduce the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources.*** This includes the reduction of public and private damage costs. Limiting losses of and damage to life and property will also reduce the social, emotional, and economic disruption associated with a natural disaster.

1.2 Setting

North Stonington is a rural community located on the eastern edge of New London County that was settled in 1687 and incorporated in 1807. The community has since grown to a population of 4,991 as of the 2000 census. Additional growth over the next decade brought the total population of the town to 5,267 as of the 2010 census. The town is approximately 54.9 square miles in area and includes the villages of Clarks Falls, Laurel Glen, and North Stonington Village. The Town also is home to the 1,130-member Eastern Pequot Tribal Nation, a State-recognized (but not federally recognized) Tribal Nation with a 225-acre reservation adjacent to Long Pond. The Town is bordered by Voluntown and Griswold to the north, Preston to the northwest, Ledyard to the southwest, Stonington to the south, and Hopkinton, Rhode Island to the east.

Several major transportation corridors traverse the town. Major roads include Interstate 95, Route 2, Route 49, Route 184, Route 201, Route 216, Route 617, and Route 627. No railroads currently exist in the town. Major waterways include the Pawcatuck River (which forms the town's southeastern border with Rhode Island), the Shunock River, Wyassup Brook, Green Fall River, Phelps Brook, and Ashwillet Brook. North Stonington has a several large water bodies that include Lake of Isles, Spalding Pond, Wyassup Lake, Blue Billings Lake, Assekonk Pond, Long Pond, and Andersons Pond.

1.3 Plan Development

The 2005 HMP and its annexes were developed through a series of meetings and the completion of written questionnaires, personal interviews, and workshops as described in the Multi-Jurisdictional HMP update. Since that time, the HMP has been available in local governmental offices and available to emergency personnel. Residents were encouraged to contact the First Selectman with any concerns regarding emergency response or potential projects related to natural hazard damage.

Based on the existing plan, existing information, and hazards that have occurred since 2005, SCCOG determined that the following data collection program would be sufficient to collect data to update the Multi-Jurisdictional plan and each annex.

- The SCCOG issued a press release on November 20, 2011 announcing a public information meeting on the multi-jurisdictional HMP update. This press release was published in the Norwich Bulletin and The Day. This notice was also posted on the SCCOG website and the *Patch* (a popular internet newspaper). The public information meeting was held on December 13, 2011 at the SCCOG office.

- A data collection meeting was held with the town on January 19, 2012 to discuss the scope and process for updating the plan and to collect information. The First Selectman, Emergency Management Director, and Town Planner / Zoning Enforcement Officer represented the local planning team. The meeting focused on reviewing each section of the existing hazard mitigation plan and annex, critical facilities, and various types of hazards that have affected the town and that should be addressed in the update.

- The draft that is sent for State review will be posted on the Town website (http://www.northstoningtonct.gov/) as well as the SCCOG website (http://www.seccog.org) for public review and comment. In addition, a hard copy will be made available in the SCCOG office in Norwich. A press release will announce the availability of the HMP for review. This will provide residents, business owners, and other stakeholders throughout the SCCOG region the opportunity to review and comment on a relatively complete draft with all annexes. Comments received from the public will be incorporated into the final draft where applicable following State and Federal comments.

The adoption of this HMP update by the Town of North Stonington will be coordinated by SCCOG and the First Selectman. The HMP update must be adopted within one year of conditional approval by FEMA, or the Town will need to update the HMP and resubmit it to FEMA for review. The adoption resolution is located in Appendix A of this annex.

1.4 Progress Monitoring

Following adoption, the First Selectman will continue to administer this HMP under the authority of the Board of Selectmen and will be the local coordinator of the HMP. The First Selectman will coordinate with responsible departments as listed in Table 11-1 and ensure that the recommendations of this HMP are considered or enacted. Refer to Section 1.8 of the Multi-Jurisdictional HMP for a description of how the local coordinator will perform progress monitoring. The majority of recommendations in this annex can be accomplished within or with only a slight increase in the operating budgets of the various departments. Projects that require capital improvements or additional funding will need to be approved by the Board of Selectmen.

The HMP will be on file with the First Selectman and at the Planning & Zoning Department to assist in guiding growth decisions. See Section 2.5 for recommendations related to integrating the findings of this HMP into other Town planning documents. The Town will encourage residents to contact the First Selectman with concerns related to natural hazards or emergency response via the Town's website. Such announcements will also state that the HMP is available for public review at the Town Hall as well as available on the Town's and the SCCOG's website.

The Town of North Stonington will review the status of plan recommendations each year. The First Selectman will be in charge of overseeing recommended projects and coordinating an annual meeting with applicable departments (those listed in Table 11-1) and other interested departments. Refer to Section 1.8 of the Multi-Jurisdictional HMP for a list of matters to be discussed at the annual meeting, including a review of each recommendation and progress achieved to date, or reasons for why the recommendation has not been enacted. The First Selectman will keep a written record of meeting minutes and the status of the recommendations. These records of progress monitoring will form the basis for the next HMP update.

The Town of North Stonington understands that the Multi-Jurisdictional HMP and this annex will be effective for five years from the date of FEMA approval of the first SCCOG jurisdiction regardless of the date of adoption by the Town. The First Selectman will coordinate with SCCOG for the next HMP update which is expected to occur in 2016-2017.

2.0 COMMUNITY PROFILE

2.1 Physical Setting

The Town of North Stonington is located in the north-central section of the SCCOG. Elevations range from less than 30 feet along the Pawcatuck River to just over 540 feet on Barns Hill in the western portion of the town. Most of the land in North Stonington is dedicated to agriculture or dairy farming, and commercial development is concentrated in North Stonington Village with additional businesses sporadically located along the State roads.

Geology is important to the occurrence and relative effects of natural hazards such as earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in lands underlying North Stonington.

North Stonington lies in an area of Connecticut where many fault lines intersect. Several fault lines traverse the northwestern corner town in the Barns Hill area, creating contacts between bedrock formations or denoting areas where the formations have shifted or fractured over time. Many of the faults are unclassified, but some are thrust faults believed to be Devonian, or Ordovician in origin. Such faults are associated with the Lake Char Fault (one of the oldest known fault lines on earth) or the Honey Hill Fault. The fault lines trend north to south, northwest to southeast, or southwest to north east, while the Honey Hill Fault and the Lake Char fault trend southwest to northeast.

North Stonington contains various bedrock types, which lie in fairly diagonal bands having a generally southwest-northeast orientation. The two predominant formations are Potter Hill Granite Gneiss and Hope Valley Alaskite Gneiss. Potter Hill Granite Gneiss is described as light-pink to gray, tan-weathering, fine- to medium-grained, well-foliated granitic gneiss. Hope Valley Alaskite Gneiss is described as light-pink to gray, medium- to coarse-grained granitic gneiss. Several other minor formations are associated with the formations nearby the mapped fault lines, including diorite, mylonite, and gabbro. Gneiss is a relatively hard metamorphic rock, with the remaining bedrock types consisting of relatively hard igneous intrusions.

The Town's surficial geologic formations include glacial till and stratified drift. Refer to the Multi-Jurisdictional HMP for a generalized view of surficial materials. The majority of the Town is underlain by glacial till. Till contains an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. Areas adjacent to the Pawcatuck River, Shunock River, Phelps Brook, Ashwillet Brook, Miller Brook, Yawbucs Brook, Lantern Hill Brook, Anguilla Brook, Pendleton Hill Brook, Green Fall River, and Spaulding Pond have fairly extensive areas underlain by sand, sand and gravel or floodplain alluvium. In addition, several unnamed streams also have fairly significant areas of associated sand and gravel deposits. The amount of stratified drift present is important as areas of stratified materials are generally coincident with floodplains. These materials were deposited at lower elevations by glacial streams, and these valleys were later inherited by the larger of our present day streams and rivers. However, the smaller glacial till watercourses can also cause flooding. The amount of stratified drift also has bearing on the relative intensity of earthquakes and the likelihood of soil subsidence in areas of fill.

2.2 Land Use and Development Trends

According to the 2003 *Plan of Conservation and Development*, North Stonington has been a rural community for all of its history. After World War II, the proliferation of the automobile and regional growth spurred North Stonington to become a bedroom community. With the two largest casinos in the world opening nearby and the downsizing of the military, tourism has replaced the defense industry as the major impact on the local economy as many visitors to these facilities travel along Route 2. The expansion of Pfizer in the Groton-New London area has also affected residential development in the town and provided employment opportunities.

North Stonington continues to be a relatively undeveloped residential community. Most of the town (approximately three-quarters) is undeveloped woodlands while 17% was dedicated to agriculture, open space, or Native American Tribal Reservations. Much of the town land area is devoted to the Pachaug State Forest in the northern part of town and the Assekonk Swamp Wildlife Management Area in the southern part of town. Developed land uses comprise approximately 10% of the town's land area. Residential land uses comprise more than 60% of the developed area, while approximately 25% of the developed area consists of transportation, communications, or utility usage. The remaining developed land is divided between commercial, industrial, and institutional uses.

The downtown of North Stonington is located approximately in the North Stonington Village near the intersection of Route 2 and Route 627. North Stonington's library, schools, Post Office, Senior Center, Town Hall, Fire Department, Ambulance, and Town Garage are all located in this area. The Assekonk Swamp Wildlife Management Area is located just south of the Village, and public hiking trails are located to the north of the village along the Shunock River.

The 2003 *Plan of Conservation and Development* notes that most North Stonington residents work in North Stonington or Groton. Local employment in North Stonington is approximately 500 jobs. These primarily include commercial, office, manufacturing, and tourism-related businesses. The town also has four working dairy farms, a vineyard, and five Bed and Breakfasts. According to the town's *Plan of Conservation and Development*, additional commercial development is to be prioritized along the Interstate 95 corridor which will generate additional jobs in North Stonington. The Town is working on an Economic Development Plan that will prioritize this area.

The vast majority of housing units in North Stonington are single family homes (more than 90%) although there are duplex residences, multi-family conversions, and seasonal communities bordering the town's six lakes. In addition, one mobile home park exists in town. A full one-third of the town's population lives in the high-density Kingswood-Meadowwood and Cedar Ridge subdivisions and in the Village area. There are several thousand acres of developable land remaining in the town after considering development constraints such as wetlands, steep slopes, rock outcrops, and floodplains. Development of this land could sharply increase the number of residents of North Stonington, and such an increase would require a noticeable increase in municipal services particularly with regard to emergency services. In total, the full build-out of the town under existing regulations could result in approximately 8,000 new homes and approximately 20,000 additional residents.

The majority of residential and other development is served by private drinking water wells. Several different water companies provide public water supply to the southern and western areas

of town. Historically, the Town has pursued a "sewer-avoidance" policy and thus has no municipal sewer infrastructure or outside agreements. The lack of sewer service limits the size of potential new developments. As the Town wishes to expand commercial development in the vicinity of Interstate 95, a formal agreement with the Town of Stonington may occur in the future. Some private facilities in the southern part of town are already connected to the Stonington sewer system through private agreements.

Since the last HMP was written in 2005, development has slowed due to the recent economic downturn. Approximately 74 new housing units were constructed in North Stonington between 2005 and 2010, with almost one-third of these constructed in 2005. A truck stop and a few hotels were also completed since the time of the previous HMP. No new industry has been developed over the last five years. Future development includes the mixed-use Milltown Commons (pending) that will have 275 units of housing and 250,000 square feet of commercial space, and Meadow Court is an 84-unit affordable housing development proposed next to Holly Green off Route 2.

2.3 Drainage Basins and Hydrology

The majority of the land in central and eastern North Stonington eventually drains to the Pawcatuck River via the Shunock River and the Green Fall River. Major tributaries to the Shunock River include Assekonk Brook, Yawbucs Brook, and Phelps Brook; major tributaries to Green Fall River include Wyassup Brook (and its tributaries Hetchel Swamp Brook and Pendleton Hill Brook) and Glade Brook. The northwestern corner of North Stonington eventually drains to the Thames River (via Main Brook and Lake of Isles Brook and their downstream watercourses in Preston and Ledyard), the Quinebaug River (via Prentice Brook and Miller Brook and their downstream watercourses in Preston), or to the Pachaug River in Griswold via Ashwillet Brook and Billings Brook. The remaining areas of town are part of the Southeast Eastern Complex regional drainage basin and drain to Long Island Sound through Lantern Hill Brook / Whitford Brook and Anguilla Brook.

In addition to the major watercourses noted above, North Stonington contains many ponds, lakes, swamps, and minor unnamed streams. In particular, Andersons Pond, Billings Lake, Wyassup Lake, and Long Pond have significant residential development located nearby, and Lake of Isles is surrounded by a large golf course.

2.4 Governmental Structure

North Stonington is governed by a Town Meeting and Board of Selectmen form of government. The authority of Town officials is granted by Connecticut General Statutes. The Town Meeting is the legislative body of the Town and the Board of Selectmen is responsible for the administration of Town policies. The First Selectman is the chief elected official and is responsible for the day-to-day administration of the Town. The Public Works Department oversees the building and maintenance of all roads including plowing and sanding in the winter and cleanup following wind events. In addition to the First Selectman and the Public Works Department, the Building Department, Planning and Zoning Department, the Information Technology / Geographic Information Systems (IT/GIS) Department, and the Volunteer Fire Department also have an active role in hazard mitigation.

The Town of North Stonington has several commissions that can take an active role in hazard mitigation, including the Conservation Commission, the Inland Wetlands Commission, Planning and Zoning Commission, and the Zoning Board of Appeals. Departments and commissions common to all municipalities in SCCOG and were described in Section 2.8 of the Multi-Jurisdictional HMP. More specific information for the departments and commissions of the Town of North Stonington is noted below:

- The Building Department reviews plans for new development and significant redevelopment and inspects the work to ensure it meets current building codes. The Town of North Stonington utilizes the Connecticut Building Code.

- The Conservation Commission supervises the acquisition and management of open space in North Stonington.

- The IT/GIS Department supports all Town departments and commissions by compiling, storing, and making data accessible to the Town and the public. For example, this department electronically records the location of floodprone areas in the community. The Director of this department is also the Town's Emergency Management Director.

- The Inland Wetlands Commission is the Inland Wetlands Regulatory Agency for the Town of North Stonington and reviews plans for compliance with said regulations and maintains the Town's inland wetlands map.

- The Planning & Zoning Commission reviews land use applications, zoning regulation amendments, planning and development projects, and grant opportunities to ensure that development and growth in the town is consistent with existing land use, environmental policy, and the objectives of the *Plan of Conservation and Development*. They are assisted by the Zoning Enforcement Officer and the Town Planner in the Planning & Zoning Department.

- The Public Works Department provides services including safe, efficient and well-maintained infrastructure of roads, bridges, snow removal and deicing on roads; tree and tree limb removal in rights-of-way; and maintain and upgrade storm drainage systems to prevent flooding caused by rainfall. The Public Works Director is the Tree Warden and can post and remove trees in rights-of-way or town land, but needs permission from the Planning and Zoning Commission prior to performing tree removal along certain scenic roads.

- The North Stonington Volunteer Fire Department provides fire suppression, fire prevention, rescue, and hazardous materials response services to the town. The North Stonington Ambulance Association provides emergency medical services.

- The Zoning Board of Appeals reviews projects that were denied by the Planning & Zoning Commission or were cited by the Zoning Enforcement Officer, as well as those that require variances.

The roles of Town departments have not changed since the time of the previous HMP. Thus, the Town of North Stonington remains technically, financially, and legally capable of implementing mitigation projects for natural hazards to the extent that funding is available.

2.5 Review of Existing Plans and Regulations

The Town has several Plans and regulations that suggest or create policies related to hazard mitigation. These policies and regulations are outlined in the Emergency Operations Plan, *Plan of Conservation and Development*, Zoning Regulations, Subdivision Regulations, and Inland Wetland Regulations. The Zoning and Subdivision Regulations were both recently updated to incorporate new NFIP requirements.

Emergency Operations Plan

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

Plan of Conservation and Development (2003)

The *Plan of Conservation and Development* was adopted in 2003 with contributions from local boards and commissions, citizens, and citizen groups and last amended in 2009. The Plan did not specifically consider the potential impacts of natural hazards other than noting the presence of the 1% annual chance floodplain and the existence of flood hazard area regulations. The Plan instead outlines areas that could not be built upon due to natural features that restrict development. The purpose of the plan is to balance growth with maintaining the quality of life that citizens within the Town embrace. The current plan notes that the Town will seek to promote economic development in the vicinity of Interstate 95, while promoting a rural residential environment. The next *Plan of Conservation and Development* update should include elements of this HMP.

Zoning Regulations

The Zoning Regulations of the Town of North Stonington were last formally amended in May 2011. The regulations include a variety of preventative regulations pertinent to mitigating flooding hazards. These regulations are applied during the permitting process for new construction and during substantial improvement of existing structures. The regulations do not appear to have been updated to reflect the new Flood Insurance Study released for New London County in July 2011.

In addition to the Special Flood Hazard Area Regulations (Section 1509), the Zoning Regulations contain several other entries applicable to hazard mitigation. For example, certain types of development such as affordable housing, hotels, recreational campgrounds, utilities and communication towers, and all development within the Village Special Design District must locate utilities underground. New mobile homes are only permitted in mobile home parks unless the mobile home has been continuously occupied since 1964.

Subdivision Regulations

The Subdivision Regulations of the Town of North Stonington were last updated in July 2009. Several of the design standards are pertinent to hazard mitigation, including encouraging the

creation of through streets through cul-de-sac limitations, avoidance of steep grades for new roads, and that new facilities and utilities are designed to minimize flood damage. New developments are also required to set aside buildable land as open space.

Inland Wetland and Watercourses Regulations

The Inland Wetlands and Watercourses Regulations in the Town of North Stonington were last amended in May 1999. The regulations require a permit for certain regulated activities which take place within 100 feet of a wetland or watercourse or that may impact a wetland or watercourse. These regulations build on the preventative flood mitigation provided by the Zoning Regulations and Subdivision Regulations by preventing fill and sedimentation that could lead to increased flood stages.

2.6 Critical Facilities, Sheltering Capacity, and Evacuation

The Town of North Stonington considers several facilities to be critical to ensure that emergencies are addressed while day-to-day management of the Town continues. Critical facilities are presented on figures throughout this annex and summarized in Table 2-1. No critical facilities are located within the 1% annual chance floodplain. These facilities are described in more detail below.

TABLE 2-1
Critical Facilities

Facility	Address or Location	Emergency Power?	Shelter?	In 1% Annual Chance Floodplain?
New Town Hall*	40 Main Street	✓		
North Stonington Ambulance	10 Mains Crossing Road			
North Stonington Elementary School	311 Norwich-Westerly Road	✓	✓	
North Stonington Medical Clinic	183A Providence – New London Turnpike			
Old Town Hall	40 Main Street	✓		
Public Works Garage	11 Wyassup Road			
Volunteer Fire Department	267 Norwich-Westerly Road			

*Emergency Operations Center

Town Halls and Police Services

Governmental services are divided between the Old Town Hall building and the New Town Hall Building located at the same address. Both buildings house records, plans, and other documents important for administering the Town. The New Town Hall contains the emergency operations

center and has a generator. The Old Town Hall houses the phone system and has a generator that can provide limited power to the building. In the past, a cord has been run between the two buildings to provide additional electricity. The Town participates in the Resident State Trooper program for police protection and the Resident State Trooper has an office in the Old Town Hall. The Resident State Troopers operate out of Troop E in Montville.

Volunteer Fire Department & Ambulance

The Volunteer Fire Department provides fire suppression and rescue services out of a fire station located in the Village. The Fire Department has mutual aid agreements with all of the neighboring towns as well as Mashantucket Pequot Tribal Nation for fire and emergency response. Long Pond is also used by fire department for equipment testing, cleaning and drills.

The Fire Department has submitted plans for a new 19,000 square foot facility across the street from the existing facility at an estimated cost of $5 to $6 million. If the new facility is built, the current fire station would become the Town's backup shelter as well as housing some municipal services.

The North Stonington Ambulance Association provides emergency medical services to the town. This service is staffed by a core group of paid professionals who are supplemented with volunteers from the community. Patients are typically transported to Westerly Hospital in Westerly, Rhode Island.

Public Works Garage

The Town Public Works garage is located north of the Village. It is used for vehicle and equipment storage and the facility also houses the Town's salt and sand supply.

Shelters

North Stonington Elementary School is the Town's shelter. The school has a generator and the shelter is American Red Cross certified. If additional shelter space was needed, the Town would send residents out of town to Stonington High School. In addition to Town departments, the American Red Cross and the Salvation Army provide services related to mitigation and emergency management. The American Red Cross and the Salvation Army help provide shelter and vital services during disasters and participate in public education activities.

Communications

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

Communication was difficult during the power outages following Hurricane Irene and Winter Storm Alfred due to downed trees and power outages at the nearby cellular towers. Town personnel made personal contact with residents by going door-to-door during the outage to pass along necessary information. The Town also has a Natural Disaster Preparedness pamphlet on its website.

Health Care and Senior Living Facilities

The North Stonington Medical Center is a relatively new emergency services and medical clinic at the intersection of Route 2 and Route 184. This facility is considered critical by North Stonington since it provides urgent care. North Stonington does not have any elderly housing developments, convalescent homes, or nursing homes.

Evacuation Routes

North Stonington does not have a published evacuation map; residents utilize State roads or local roads to exit the town. The highest capacity egress routes from North Stonington include Interstate 95 into Stonington or Rhode Island, Route 2 into Stonington or Ledyard, Route 49 into Stonington or Voluntown, Route 184 into Stonington, Route 201 into Stonington or Griswold, and Route 216 into Rhode Island.

2.7 Status of 2005 Plan Recommendations

The previous HMP included several general recommendations related to mitigating natural hazards. The recommendations and a summary of actions taken over the past several years towards those actions are listed below. Where progress was indicated, the progress was paid for out of the Town's operating budget. Updated recommendations are presented in Section 11 of this annex.

- Floodproof, Relocate, or Elevate Buildings in North Stonington Village – The Shunock River floods the vicinity of Main Street during major storms putting nearby structures at risk. The Town was not able to acquire funding to perform these projects to private property over the past five years. However, the double-arch bridge on Main Street between Avery Lane and Wyassup Road is currently being replaced by the Town with a single arch bridge that has more capacity. *While the bridge project will mitigate flood elevations, this recommendation remains valid for the area.*

- Evaluate the Hazard Resistant Nature of Critical Facilities – This is ongoing as part of the Town's annual EOP update. No critical facilities are believed to be more or less susceptible to natural hazards. *This recommendation remains valid but has been subsumed into the EOP update.*

- Comprehensive Evaluation of Emergency Communication Capabilities Throughout the Town – This is ongoing along with the annual EOP update. The Town has communication capability with surrounding communities. *This recommendation remains valid.*

- Develop a Flood Audit Program – The Town is aware of floodprone areas and records them electronically in the IT/GIS Department. A formal flood audit program is not proposed due

to the expense involved. *This recommendation will not be pursued further and is replaced in favor of adding floodprone areas to the Reverse 9-1-1 database.*

- Review of Transportation Facilities to Identify Critical Risks – This is ongoing annually as part of the Emergency Operations Plan update. The Town has lots of casino traffic. *This recommendation remains valid but has been subsumed into the EOP update.*

- Hazardous Materials Spills on Major Roadways – The Town is part of CERRIT, the regional hazardous materials response team. They have automatic notification to DEEP and participate in training exercises. *This recommendation will not be pursued further.*

- Implement a Reverse 9-1-1 System to Automatically Call Telephones Throughout Town, Relaying Important Information During an Emergency – The Town is part of the statewide CT Alerts "Everbridge" System. *This recommendation has been completed and the Town will continue to encourage residents to participate. Additional related recommendations are presented in Section 11.*

- Distribute or Post Public Information Regarding Hazards in the Town – Notifications are posted on bulletin boards at the transfer station, town buildings, and the Town website. Local media is utilized to pass information during storms, including newspaper, television, and radio. Town employees made personal contact with residents during power outages. *This recommendation remains valid and there are additional opportunities such as providing brochures at the Town Hall and posting of preparedness information on the Town's webpage.*

- Evaluate Emergency Shelters, Update Supplies, and Check Communication Equipment – This is done at least quarterly or following any use of the facility. *This recommendation remains valid.*

- Maintain Emergency Personnel Training as Well as Maintaining and Updating Emergency Equipment and Response Protocols – Training is performed monthly, with equipment upgrades occurring to the extent the budget will allow. *This recommendation remains valid.*

- Evaluate and Consider Burying Power Lines Underground and Away from Possible Tree Damage – This is encouraged for new projects but only required for certain types of development. There are no plans to move existing utilities underground because the utilities are not owned by the Town. *This recommendation remains valid for future developments and should be placed into an ordinance for new development or substantial redevelopment regardless of zoning.*

- Complete an Earthquake Survey of all Critical Facilities and Infrastructures –A formal survey has not been performed by the Town. *This recommendation will not be pursued further due to the low occurrence of this hazard type.*

- Complete Catch Basin and Culvert Surveys to Identify Structures in Need of Maintenance or Replacement – Inspections are performed annually by Public Works. Public Works also inspects catch basins in floodprone areas for blockages prior to major storms. *This recommendation remains valid.*

- Complete a Survey of Fire Hydrants to Assess Vulnerabilities and Capabilities for Fire Protection – Fire protection capabilities are reviewed twice per year with the respective water companies but they only provide service to a limited area of the town. The Town has a small number of dry hydrants and cisterns located throughout the town and several draft sites. The Town believes that its fire protection level is adequate. *This recommendation remains valid.*

3.0 INLAND FLOODING

3.1 Setting / Historic Record

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

The NCDC has recorded incidences of recent flooding in North Stonington. For example, on September 6, 2008, the remnants of Tropical Storm Hanna produced heavy rainfall that caused Route 2 in North Stonington to be closed due to flooding. However, the March 2010 storm produced the most widespread flooding in North Stonington in recent history, causing significant damage to roadways, a significant amount of nuisance flooding, and some structural flooding as noted below.

The March 2010 storm was a nor'easter that produced an extended period of heavy rainfall across southeastern Connecticut. The floodwaters rose so quickly that a car became trapped and needed to be pulled from the Shunock River. Floodwaters caused extensive damage to the bridge over Shunock River on Main Street between Wyassup Road and Avery Lane and to a historic 150-year old building that housed the Watermark Café and the Village Hardware Store. Lantern Hill Road (at Lantern Hill Brook), Grindstone Hill Road (two locations), Loin Road, and Pinewoods Road were completely washed out and in need of major repairs. Many other roads throughout the Town were also closed, and basement flooding occurred in many areas. This storm caused an estimated four million dollars in damage between Stonington and North Stonington.

3.2 Existing Programs, Policies, and Regulations

The Town attempts to mitigate inland flood damage and flood hazards by utilizing a wide range of measures including restricting activities in floodprone areas, replacing bridges and culverts, promoting flood insurance, acquiring floodprone structures, maintaining drainage systems, through education and outreach, and by utilizing warning systems. Many mitigation measures are common to all hazards and therefore were listed in Section 2.5 and Section 2.6.

As North Stonington is situated in the headwaters of several sub-regional watersheds, mo major flood control structural projects exist within or upstream of North Stonington. The existing dams on the streams are former mill dams not designed to regulate flow. However, storm runoff intensity on many streams is greatly moderated by large areas of swamp, numerous ponds, and low gradients.

Bridge Replacements, Drainage, and Maintenance

The Department of Public Works cleans and inspects catch basins and culverts at least annually or more often if problems are noted. When flooding occurs, the Public Works department or the Fire Department would handle the complaints depending on the location. For example, Public Works would inspect bridges and culverts and erect barricades to close roads, while the Fire Department responds to calls requesting help for flooded basements. The Town also fields phone calls related to drainage complaints. Drainage complaints are directed to the First Selectman.

The Department of Public Works has been performing many culvert replacements and drainage system replacements and upgrades since the March 2010 floods. Several of these projects are noted below as well as larger projects that are contracted out:

- Boom Bridge Road has been closed at the Pawcatuck River since 2008. Design, engineering, and permitting are occurring in 2012 to rehabilitate this bridge that provides an additional mode of egress into Rhode Island.

- Basement flooding is common in the Kingswood-Meadowwood development. Recent mitigation included installing 950 feet of storm drainage from the intersection of Old Colony Road and Kingswood Drive to Ravenwood Road. This work occurred subsequent to the March 2010 floods.

- A culvert on Milltown Road was damaged by Lantern Hill Brook during the March 2010 floods and needs to be replaced. Design is scheduled to proceed soon.

- New box culverts are to be installed at Prentice Brook on Northwest Corner Road although this area is not typically a flooding issue. Design has been completed.

- The "Old Town Hall Bridge" on Main Street over the Shunock River has been closed since the March 2010 floods caused extensive damage to the structure. FEMA has approved 75% grant funding for the $1,975,000 project. Construction is being performed by a contractor and is expected to be completed in September 2012. The former double-arch structure could only pass the 1.25% annual chance flood event without overtopping, and the new single-arch structure will be able to pass the 0.5% annual chance flood event without overtopping. This project is expected to alleviate some flooding in the Village center.

- The Pine Woods Road culverts washed out in the March 2010 storm. The culverts will be replaced soon and sized to convey the 1% annual chance flood.

Regulations, Codes, and Ordinances

The Town of North Stonington has planning and zoning tools in place that incorporate floodplain management. The Town utilizes the 1% annual chance floodplain as defined by FEMA to regulate floodplain and floodway activities. According to the Zoning Regulations, no permanent structures are allowed to be built within a floodway. The Town requires new construction or substantial renovations to be located at an elevation greater than the base flood elevation, and requires structures to be located at least ten feet from the outer limit of any floodplain delineation and at least 50 feet from any watercourse. The Planning and Zoning Commission can also require additional controls as part of its approval process. For example, the Commission required more frequent catch basin cleanings at the new truck stop to prevent flooding.

The Town's Subdivision Regulations require that adequate drainage be provided to reduce exposure to flood hazards and that buildings and utilities be located to minimize the effects of flood damage. Regulations covering development in or within 100 feet of inland wetland or watercourse areas were last updated in 1999 and are enforced by the Town's Inland Wetlands and Watercourses Commission. The Town has also adopted a map prepared by the Inland Wetlands Commission which regulates activities in wetland areas.

During the review of the Zoning and Subdivision Regulations, it was discovered that the current regulations that are posted do not reflect recent amendments to the NFIP regulations. These regulations came into effect as authorized by the Planning and Zoning Commission on July 18, 2011 concurrent with the publication of the FIS for New London County. The Town should update the posted regulations to reflect the amended floodplain policies.

Acquisitions, Elevations, and Property Protection

The Town of North Stonington has not performed acquisitions, relocations, or elevations of floodprone property. Property protection has focused instead on preventive measures and maintaining and upgrading drainage systems. The Town is not opposed to performing such projects if property owners were willing and grant funding was available.

Flood Watches and Warnings

The First Selectman and the Fire Department access weather reports through the National Weather Service and local media. Residents can also sign up for the Statewide "Everbridge" Reverse 9-1-1 to receive warnings when storms are imminent. The Town can telephone warnings into potentially affected areas using this system. The Town has a list of areas that they monitor for flooding during heavy rainfall.

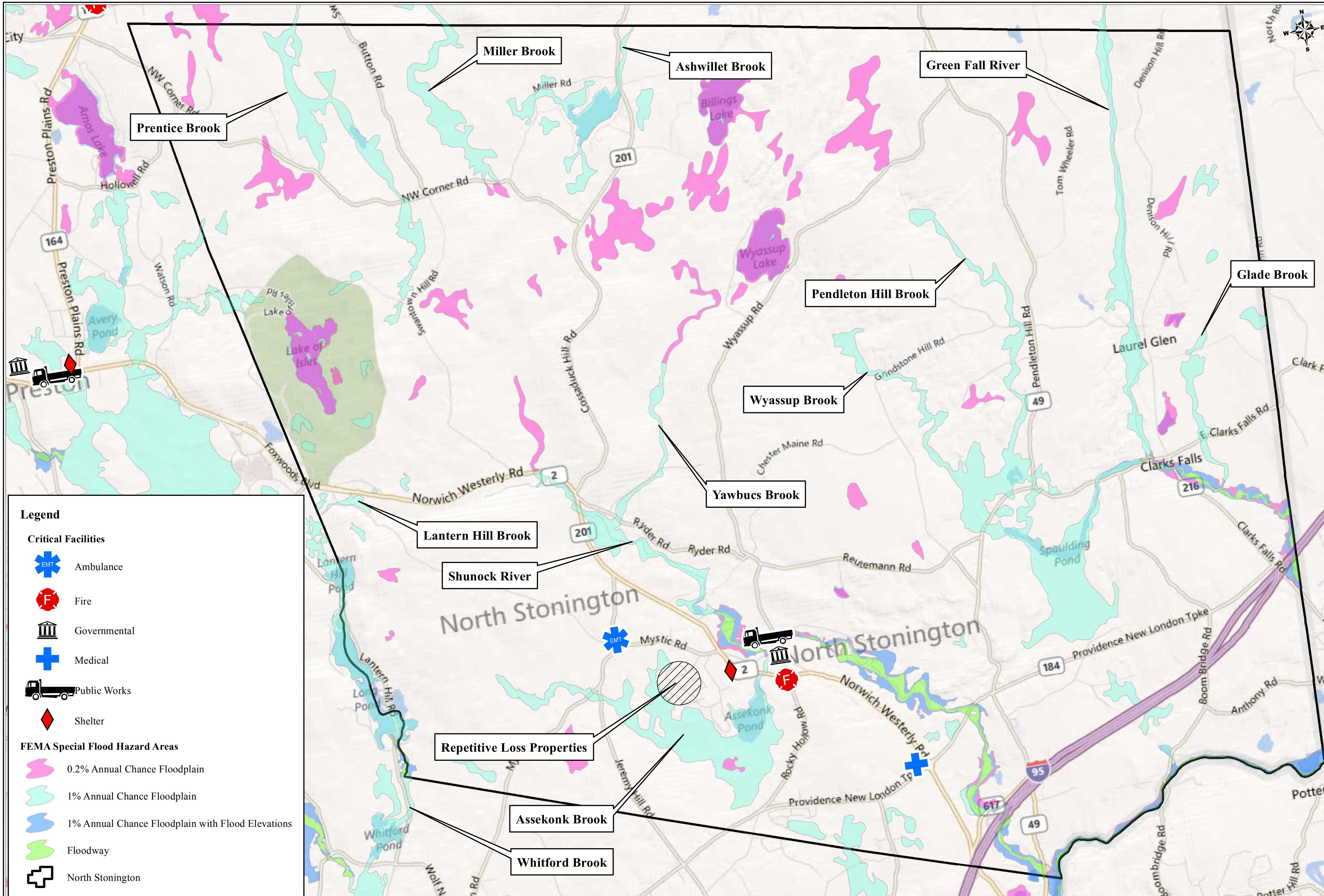
3.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to inland flooding within the Town. Overbank flooding is the most common type of flooding experienced in the town, with additional areas affected during more severe events. Nuisance flooding and poor drainage flooding also occur to a lesser extent.

3.3.1 Vulnerability Analysis of Areas along Watercourses

Major inland watercourses and water bodies in North Stonington have the 1% annual chance floodplain defined by FEMA. The Pawcatuck River, the Shunock River, the Green Fall River, and Whitford Brook each have sections mapped as Zone AE indicating that flood elevations are available. The remaining streams are mapped as Zone A and include Ashwillet Brook, Assekonk Brook, Glade Brook, the upper reaches of the Green Fall River, Hetchel Swamp Brook, Lake of Isles Brook, Lantern Hill Brook, Miller Brook, Pendleton Hill Brook, Phelps Brook, Prentice Brook, the upper reaches of the Shunock River, Wyassup Brook, and Yawbucs Brook as well as several other unnamed streams, several ponds, and swamp areas. Refer to Figure 3-1 for the location of the 1% annual chance floodplains within North Stonington.

Based on the information in the previous HMP, the revised FEMA FIS for New London County, and data provided by Town officials, the following areas along watercourses are vulnerable to flooding damage as shown in Table 3-1. Ice jams have not previously been an issue along the rivers in North Stonington. Instead, this flooding occurs due to insufficient culvert sizes at crossings or due to overbank flooding.



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SOURCE(S):
Town of North Stonington, FEMA, Microsoft (basemap)

FEMA Special Flood Hazard Areas

SCCOG HMP Update

North Stonington, Connecticut

Map By: scottb
MMI#: 3570-05
MXD: H:\3570-05\GIS\Maps\North Stonington\Figure3-1-.mxd
1st Version: xx/xx/201x
Revision: 7/24/2012
Scale: 1 in = 3,750 ft

Figure 3-1

TABLE 3-1
Floodprone Roadways in North Stonington

Flooding Source	Roadway	Flooded During March 2010?
Ashwillet Brook	Cossaduck Hill Road (Route 201)	✓
Assekonk Brook	Jeremy Hill Road	
	Mystic Road (Route 201)	
	Norwich-Westerly Road (Route 2)	✓
Glade Brook	East Clarks Falls Road	✓
	Pine Woods Road	✓
Green Fall River	Putker Road	
Lantern Hill Brook	Milltown Road	✓
	Wintechog Hill Road	
	Lantern Hill Road	✓
Pendleton Hill Brook	Clarks Falls Road	
	Grindstone Hill Road	✓
	Pendleton Hill Road (Route 49)	✓
Prentice Brook	Northwest Corner Road	
Shunock River	Main Street	✓
	Norwich-Westerly Road near Ryder Road (Route 2)	✓
Unnamed Pond	Rocky Hollow Road	✓
Unnamed Streams	Babcock Road	✓
	East Clarks Falls Road	✓
	Loin Road	✓
	Miller Road	
	Reutemann Road at Wyassup Road	✓
	Reutemann Road west of Bergius Lane	✓
Whitford Brook	Hyde Mill Pentway	
	Lantern Hill Road	
Wyassup Brook	Grindstone Hill Road	✓
	Pendleton Hill Road (Route 49)	✓
	Wyassup Road	✓
Yawbucs Brook	Norwich-Westerly Road (Route 2)	
	Yawbux Valley Road	

Several of the areas listed in Table 3-1 are undergoing culvert or bridge upgrades as noted in Section 3.2. The Pendleton Hill Road and Rocky Hollow Road crossing are particular areas of concern as these locations flood every year. While culvert replacements along Pendleton Hollow Road would mitigate the flooding issue, this is a State Road such upgrades will need to be performed by the Connecticut Department of Transportation. The Rocky Hollow Road flooding issue is caused by a pond with no apparent outlet. Diverting excess water to nearby fields or the Assekonk Swamp may be an option, although this may need to be coordinated with the property owners or Connecticut DEEP as the swamp is in a Wildlife Management Area.

3.3.2 Vulnerability Analysis of Private Properties

As noted in Table 3-4 of the Multi-Jurisdictional HMP, a total of 78 structures in North Stonington appear to be located in the 1% annual chance floodplain. A total of 62 are located in Zone A, 6 are located in Zone AE, and ten appear to be located in the floodway. The majority of these structures are residential but some commercial structures are also located in the floodplain. Table 3-2 presents the number structures that are within the 1% annual chance floodplain by watercourse.

TABLE 3-2
Structures within the 1% Annual Chance Floodplain in the Town of North Stonington

Watercourse or Water Body	Flood Zone	Number of Structures
Andersons Pond	Zone A	5
Ashwillet Brook	Zone A	1
Assekonk Brook	Zone A	6
Glade Brook	Zone A	10
Green Fall River	Zone A	1
Lantern Hill Pond	Zone A	1
Long Pond	Zone A	5
Miller Brook	Zone A	1
Pendleton Hill Brook	Zone A	10
Prentice Brook	Zone A	1
Shunock River	Zone A	4
	Zone AE	16*
Spaulding Pond	Zone A	2
Swamp draining to Yawbucs Brook (southeast of Pendleton Hill Road)	Zone A	3
Tributary to Andersons Pond	Zone A	5
Tributary to Pendleton Hill Brook (intersection of Route 49 and Route 216)	Zone A	3
Wyassup Brook	Zone A	1
Yawbucs Brook	Zone A	3
Total		**78**

*10 of these structures appear to be located in the floodway.

The Town of North Stonington has several "watch areas" that they monitor for flooding during heavy rainfall. These watch areas include the areas in Table 3-1 as well as homes that are susceptible to basement flooding. Many such homes are located in the Kingswood-Meadowwood

development as much of this area was constructed on fill materials adjacent to Assekonk Swamp. Meadow Wood Drive, Pine Crest Road, Old Colony Road, and Kingswood Drive are most affected by this type of flooding. Two repetitive loss properties are located in this development that were damaged by basement flooding from heavy rainstorms occurring on March 31, 2010, July 1, 2009 (both properties); and March 2, 2007. Floodproofing measures may help to reduce the incidence of basement flooding to these structures.

Structures most frequently affected by overbank flooding are located along Grindstone Hill Road near Wyassup Brook (note that homes are not within the 1% annual chance floodplain in this area), Yawbux Valley Road near Yawbucs Brook, East Clarks Falls Road near Glade Brook, and along the Shunock River in North Stonington Village. In particular, a historic commercial building was severely damaged by flooding during the March 2010 storm as noted in the historic record and subsequently torn down. The Town wishes to replace the culverts at Grindstone Hill Road to increase the conveyance capacity and therefore reduce future flooding damage to the road and nearby homes. The bridge replacement being performed on Main Street will increasing the conveyance capacity of the structure and helps reduce the frequency of flooding damages in the Village center.

Culvert upgrades should be prioritized in areas where backwater flooding occurs. Acquisition, elevation, relocation, or the installation of low floodwalls should also be considered to reduce flooding to private property along these and other streams. The Town should track damages at structures affected by flooding through outreach or building permits in order to develop a record of damage that be used to apply for grant funding for such projects. Providing information about potential grant funding to property owners should be part of the outreach process.

Note that repetitive flood insurance claims have not been filed at any properties located along watercourses over the past twenty-five years, suggesting that the flood damage to structures may be relatively minor. However, as noted in the Multi-Jurisdictional HMP, the incidence of severe flooding appears to be increasing such floodprone areas are expected to experience damage more often in the future. Additionally, it is recognized that property owners may not be reporting flooding damage and repairing damage themselves. Additional outreach regarding the availability of subsidized flood insurance will help to dispel the misconception that reporting flooding claims will lead to an increase in insurance rates.

3.3.3 Vulnerability Analysis of Critical Facilities

As noted in Section 2.6, no critical facilities in North Stonington are located within the 1% annual chance floodplain. However, given the relatively limited development in North Stonington the closure of roadways and major transportation routes due to flooding is a concern for emergency personnel as such closures could impact emergency response.

3.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for reducing or eliminating the impact of inland flooding fall into the categories of prevention, property protection, emergency services, public education and awareness, natural resource protection, and structural projects. General potential mitigation measures that can be taken to reduce the effects of inland flooding were discussed in Section 3.7 and in Section 11.2.2 of the Multi-Jurisdictional HMP. General recommendations pertinent to all natural hazards that could affect the town are listed in Section 11 of this annex, as are specific measures pertinent to reducing inland flooding in the Town of North Stonington.

4.0 COASTAL FLOODING & STORM SURGE

4.1 Setting / Historic Record

The Town of North Stonington is not located along the coastline or along any tidally-influenced river. It is also not located in a potential hurricane surge zone. No coastal flooding or storm surge has affected the town since the last HMP. Therefore, the town is considered to be immune to the direct effects of coastal flooding and storm surge.

4.2 Existing Programs, Policies, and Regulations

The Town does not have any regulations in affect to restrict development due to coastal flooding hazards.

The Town understands that in an extreme case its shelter spaces may need to be utilized by non-North Stonington residents if a regional evacuation occurred due to a coastal flooding event as managed through its mutual aid agreements with SCCOG. The Town is prepared for this potential circumstance.

4.3 Vulnerabilities and Risk Assessment

No areas of the town are vulnerable to coastal flooding or storm surge.

4.4 Potential Mitigation Measures, Strategies, and Alternatives

No mitigation measures for reducing the impact of coastal flooding or storm surge in the town are necessary or are proposed at this time.

5.0 HURRICANES AND TROPICAL STORMS

5.1 Setting / Historic Record

Several types of hazards may be associated with tropical storms and hurricanes including heavy or tornado winds, heavy rains, and flooding. Flooding hazards are discussed in Section 3 of this annex. Wind hazards are widespread and can affect any part of the town. However, some buildings in the town are more susceptible to wind damage than others.

The last major hurricane or tropical storm wind event to affect the town was associated with Hurricane Irene in August 2011. Trees fell throughout the town and the region causing power outages that lasted up to ten days in North Stonington.

5.2 Existing Programs, Policies, and Mitigation Measures

Wind loading requirements for new buildings are addressed through the Connecticut Building Code which is utilized by the Town. Effective December 31, 2005, the design wind speed for the Town of North Stonington is 115 miles per hour. Town personnel note that recently constructed buildings all meet the Connecticut Building Code standard wind loading, but that to their knowledge no buildings (including critical facilities) have been constructed to exceed wind loading requirements.

Parts of trees (limbs) or entire tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. The Public Works Director is also the Town's tree warden who can post notification and schedule tree removal. Trees located along scenic roads require approval from the Planning and Zoning Commission prior to trimming and removal. The Public Works staff also monitors trees as part of their normal rounds, performs informal inspections for the tree warden, and has a small budget for minor tree maintenance. The Town hires outside contractors for larger jobs and those near power lines. Connecticut Light & Power is the local electric utility and provides tree maintenance near its power lines. However, they reportedly did not perform any cleanup in North Stonington following Hurricane Irene and instead were focused in other communities. Algonquin Gas also performs trimming near their pipelines.

Certain types of new development such as affordable housing and communication towers are required to place utilities underground in order to mitigate storm-related damages. Placing utilities underground is also encouraged for other new developments. Utility lines are located underground in only a few areas of the town.

Warning is one of the best ways to prevent damage from hurricanes and tropical storms, as these storms often are tracked well in advance of reaching Connecticut. The Town can access National Weather Service forecasts via the internet as well as listen to local media outlets (television, radio) to receive information about the relative strength of the approaching storm. This information allows the Town to activate its EOP and encourage residents to take protective or evacuation measures if appropriate.

Prior to severe storm events, the Town ensures that warning/notification systems and communication equipment are working properly and prepares for the possible evacuation of

impacted areas. Residents can sign up to receive warnings from the statewide CT "Everbridge" Reverse 9-1-1 system to receive critical information. Although hurricanes that have impacted North Stonington have historically passed in a day's time, additional regional shelters could be outfitted following a storm with the assistance of the American Red Cross on an as-needed basis for long-term evacuees.

5.3 Vulnerabilities and Risk Assessment

The entire Town is vulnerable to hurricane and tropical storm wind damage and from any tornadoes (Section 6) as well as inland flooding (Section 3) accompanying the storm. Of particular concern are the blockage of roads and the damage to the electrical power supply from falling trees and tree limbs. The Town had extensive outages of up to ten days in some areas because of tree damage to utility lines following Hurricane Irene in August 2011. While the Town is not opposed to burying existing overhead utilities, this would be expensive and require extensive coordination with Connecticut Light & Power who own the lines. The placement of utilities underground for all new development is a more viable recommendation for North Stonington, as is continuing tree-trimming and removal on Town land and along rights-of-way.

Direct wind damage to newer buildings from hurricane or tropical storm-level winds is rare in the Town since the new buildings were constructed to meet or exceed current building codes. Many buildings in the Town are historic and many were built prior to the 1970s and do not meet current building codes. Older buildings in the Town, mobile homes, and camp trailers at the large campgrounds are particularly susceptible to roof and window damage from high wind events. This risk to structures will be reduced with time as these buildings and trailers are remodeled or replaced with structures that meet current codes.

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

5.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for reducing or eliminating the impact of wind damage fall into the categories of prevention, property protection, emergency services, public education and awareness, natural resource protection, and structural projects. General potential mitigation measures that can be taken to reduce the effects of wind damage from hurricanes and tropical storms were discussed in Section 5.7 and in Section 11.2.3 of the Multi-Jurisdictional HMP. General recommendations pertinent to all hazards that could affect the town are listed in Section 11 of this annex, as are specific measures pertinent to reducing wind damage to the Town of North Stonington.

6.0 SUMMER STORMS AND TORNADOES

6.1 Setting / Historic Record

Similar to hurricanes and winter storms, wind damage associated with summer storms and tornadoes has the potential to affect any area of the town. Furthermore, because these types of storms and the hazards that result (flash flooding, wind, hail, and lightning) might have limited geographic extent, it is possible for a summer storm to harm one area within the town without harming another. Such storms occur in the town each year, although hail and direct lightning strikes to the town are rarer. For example, the NCDC reported that an isolated severe thunderstorm on June 24, 2008 blew down numerous trees in North Stonington, and a thunderstorm on May 26, 2010 produced quarter-sized hail in the town. No tornadoes have occurred in the town since the last HMP.

The southeast corner of North Stonington on the south side of Clarks Falls Road is reportedly an area that experiences repetitive wind damage. The farmers in this area describe localized wind events that fit the description of microbursts (as described in Section 6.2 of the Multi-Jurisdictional HMP). The flat, open topography in this area is believed by the Town to be a possible cause of such localized weather conditions. The last microburst occurred in December 2011 and blew the roof off of a barn and damaged several "lean-to" structures.

6.2 Existing Programs, Policies, and Mitigation Measures

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

Aside from warnings, several other methods of mitigation for wind damage are employed by the Town as explained in Section 5.2 within the context of hurricanes and tropical storms. In addition, the Connecticut Building Code includes guidelines for the proper grounding of buildings and electrical boxes to protect against lightning damage.

6.3 Vulnerabilities and Risk Assessment

Summer storms are expected to occur each year and are expected to at times produce heavy winds, heavy rainfall, lightning, and hail. All areas of the town are equally likely to experience the effects of summer storms. The density of damage is expected to be greater near the more densely populated villages in town, and at campgrounds which have trailers and tents that are more vulnerable to summer storm damage than other structures. As noted in the historic record, the southeast corner of the town south of East Clarks Falls Road is an area that has experienced repetitive wind damage. The use of building designs and materials that meet the American Society of Civil Engineers suggested wind speed of 160 miles per hour may be useful in this area to prevent damage to structures.

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

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

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

6.4 Potential Mitigation Measures, Strategies, and Alternatives

General potential mitigation measures that can be taken to reduce the effects of wind damage were discussed in Section 5.7 and in Section 11.2.3 of the Multi-Jurisdictional HMP. One additional recommendation specific to reducing damage from summer storms and tornadoes is presented in Section 11 along with general recommendations related to wind damage and general recommendations related to emergency services.

7.0 WINTER STORMS AND NOR'EASTERS

7.1 Setting / Historic Record

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

Winter storms and nor'easters have affected the town since the last HMP, as reported to the NCDC and reported by Town officials. For example, a cattle barn collapsed during the 2009-2010 winter season due to a storm. The winter storms of 2010-2011 and Winter Storm Alfred in October 2011 had the most significant effect on the town. The winter of 2010-2011 produced significant snowfall in North Stonington. The Town checked all town buildings and cleared several of snow. Many residents also cleared their own roofs or hired contractors, and no roof collapses are known to have occurred in the community. Winter Storm Alfred in late October 2011 caused minor to moderate tree damage, with power outages lasting a few days.

7.2 Existing Programs, Policies, and Mitigation Measures

Existing programs applicable to winter storm winds are the same as those discussed in Sections 5.2 and 6.2. Programs that are specific to winter storms are generally those related to preparing plows and sand and salt trucks; tree trimming and maintenance to protect power lines, roads, and structures; and other associated snow removal and response preparations.

As it is almost guaranteed that winter storms will occur annually in Connecticut, it is important to locally budget fiscal resources toward snow management. Snow is the most common natural hazard requiring additional overtime effort from Town staff, as parking lots and roadways need constant maintenance during storms. The Public Works Department oversees snow removal in the Town and stores salt and sand at the Public Works Garage. They have seven plow trucks and two bucket loaders used for this purpose. The Town has established plowing routes that prioritize access to and from critical facilities. Furthermore, the Town has a mutual aid agreement with one plowing business and can also contract with two other businesses to provide snow management services if necessary. The Connecticut Department of Transportation (DOT) plows State roads. As a Connecticut DOT garage is located in Preston, plowing is generally timely.

The Connecticut Building Code specifies that a pressure of 30 pounds per square foot be used as the base "ground snow load" for computing snow loading for roofs. The Town monitors the roofs of municipal buildings when snow loads accumulate and shovel if necessary, and many residents and businesses also shovel or plow their roofs.

7.3 Vulnerabilities and Risk Assessment

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

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

The majority of buildings in North Stonington were constructed within the past several decades and therefore not particularly susceptible to damage from heavy snow. While some Town buildings could be susceptible to heavy snow loads, they will be cleared quickly if safety is a concern. For example, the schools and the fire station have flat roofs which make them more susceptible to snow load damage.

Icing is not a significant issue in the Town. In general, there are few steep slopes such that extra sanding and salting of the roadways in necessary locations alleviates any trouble spots. In addition, there are no issues with ice jams on any of the streams in the town. Town officials further note that no areas of town are difficult to access in the winter.

7.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for flooding caused by nor'easters include those appropriate for flooding that were discussed in Section 3.7 of the Multi-Jurisdictional HMP and Section 11 of this annex. General potential mitigation measures that can be taken to reduce the effects of wind damage were discussed in Section 5.7 and in Section 11.2.3 of the Multi-Jurisdictional HMP and Section 11 of this annex. However, winter storm mitigation measures must also address blizzards, snow, and ice hazards. These were discussed in Section 7.7 and Section 11.2.4 of the Multi-Jurisdictional HMP and Section 11 of this annex.

8.0 EARTHQUAKES

8.1 Setting / Historic Record

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse; disrupt gas, electric, and telephone lines; and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time and often without warning. Detailed descriptions of earthquakes, scales, and effects can be found in Section 8 of the Multi-Jurisdictional HMP. Despite the low probability of an earthquake occurrence, earthquake damage presents a potentially catastrophic hazard to the town. However, it is very unlikely that the town would be at the epicenter of such a damaging earthquake. No major earthquakes have affected the town since the last HMP.

8.2 Existing Programs, Policies, and Mitigation Measures

The Connecticut Building Codes include design criteria for buildings specific to each region as adopted by Building Officials and Code Administrators (BOCA). These include the seismic coefficients for building design in North Stonington. The Town has adopted these codes for new construction, and they are enforced by the Building Department.

Due to the infrequent nature of damaging earthquakes, Town land use policies do not directly address earthquake hazards. However, the potential for an earthquake and emergency response procedures is addressed in the Town's EOP.

8.3 Vulnerabilities and Risk Assessment

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

Several bedrock faults believed to be inactive are located within North Stonington. Unlike seismic activity in California, earthquakes in Connecticut are not associated with specific known active faults. However, bedrock in Connecticut and New England in general is typically formed from relatively hard metamorphic rock that is highly capable of transmitting seismic energy over great distances. For example, the relatively strong earthquake that occurred recently in Virginia was felt in Connecticut because the energy was transmitted over a great distance through such hard bedrock.

The built environment in the town includes some more recent construction that is seismically designed. However, most buildings were built before the 1990's and therefore are not built to current building codes. In addition, there are mobile home parks containing structures that may

not be seismically designed. Thus, it is believed that most buildings would be at least moderately damaged by a significant earthquake. Those town residents who live or work in older, non-reinforced masonry buildings are at the highest risk for experiencing earthquake damage.

Areas of steep slopes can collapse during an earthquake, creating landslides. North Stonington has many areas of steep slopes and bluffs although the majority of these features occur in undeveloped areas. Thus, landslides are not a concern in the town.

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

A *HAZUS-MH* analysis of the potential economic and societal impacts to the SCCOG region from earthquake damage is detailed in the Multi-Jurisdictional HMP. The analysis addresses a range of potential impacts from any earthquake scenario, estimated damage to buildings by building type, potential damage to utilities and infrastructure, predicted sheltering requirements , estimated casualties, and total estimated losses and direct economic impact that may result from various earthquake scenarios.

8.4 Potential Mitigation Measures, Strategies, and Alternatives

Due to the low probability of occurrence, potential mitigation measures related to earthquake damage primarily include adherence to building codes and emergency response services. Both of these are mitigation measures common to all hazards as noted in Section 11 of this annex. The Multi-Jurisdictional HMP also includes additional recommendations for mitigating the effects of earthquakes that are also listed in Section 11.

9.0 WILDFIRES

9.1 Setting / Historic Record

Wildfires are considered to be highly destructive, uncontrollable fires. The most common causes of wildfires are arson, lightning strikes, and fires started from downed trees hitting electrical lines. Thus, wildfires have the potential to occur anywhere and at any time in both undeveloped and lightly developed areas of North Stonington. Structural fires in higher density areas of the town are not directly addressed herein.

North Stonington typically experiences several brush fires each year in the vicinity of or within the Pachaug State Forest. Most brush fires are small and quickly contained to a few acres maximum. No major fires could be recalled in recent history.

9.2 Existing Programs, Policies, and Mitigation Measures

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

Existing mitigation for wildland fire control is typically focused on building codes, public education, Fire Department training, and maintaining an adequate supply of equipment. The Volunteer Fire Company has a strong mutual aid relationship with the Connecticut DEEP firefighters to fight wildfires. The Town has pumping trucks that can carry water to distant fires, and the DEEP has tracked vehicles that can also access areas without roads. The Fire Department also has mutual aid agreements with surrounding communities.

The Fire Department goes to fires as quickly as possible in the town. Fire protection water is obtained through several dry hydrants located throughout North Stonington. In areas located far from the dry hydrants, they draft water from the various streams, ponds, and rivers in the town, and rely on pump trucks to carry water to distant areas. Public water service is available only in limited areas. The Mashantucket Pequot Tribal Nation provides water service in the vicinity of Lake of Isles such that a source of fire protection water is available in this section of town. The Westerly Water Department and the Southeastern Connecticut Water Authority provide limited water service along Route 2 North Stonington in the southern section of town. According to the *Plan of Conservation and Development*, these latter entities could potentially install additional water mains along the Route 2 corridor in the future which would provide additional fire protection water to the southern portion of Town.

New developments are reviewed by the Fire Department who provides recommendations regarding the necessary fire protection equipment to be installed, including dry hydrants, cisterns, and sprinkler systems. The Fire Marshall also reviews other structures for the adequacy of fire protection. The amount of fire protection afforded by the dry hydrants and nearby streams is considered to be adequate for the development level of North Stonington. The Fire Department will continue to evaluate the level of risk and the need for additional hydrants as development continues in the future.

9.3 Vulnerabilities and Risk Assessment

As most of North Stonington is undeveloped or forested land, wildfires can occur almost anywhere due to the undeveloped nature of the town. State forest lands and inaccessible tracks of land are at the highest risk for wildfires. These areas are considered to be at moderate risk. Areas that are located nearby water bodies are considered to be low risk since a water supply is available. Refer to Figure 9-1 in the Multi-Jurisdictional HMP for a general depiction of wildfire risk areas within North Stonington.

9.4 Potential Mitigation Measures, Strategies, and Alternatives

The Town of North Stonington is a low- to moderate-risk area for wildfires. Potential mitigation measures for wildfires include a combination of prevention, education, and emergency planning measures as presented in Section 11.

10.0 DAM FAILURE

10.1 Setting / Historic Record

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

While dam failures have not occurred in North Stonington since the time of the previous HMP, several dams were damaged by the March 2010 flooding at noted below:

- The Hewitt Farm Dam (also known as the Shunock River Dam) is a moderate hazard dam. Designs for repair have been completed and submitted to the Connecticut DEEP for review, approval, and permits. Funding for the repair will be provided through FEMA mitigation funds and Town funds.

- The Gallup Pond Dam is a significant hazard dam. Repairs to this dam are being performed by the local fisherman's club.

- The Wyassup Lake dam is owned by Connecticut DEEP is reportedly being repaired.

10.2 Existing Programs, Policies, and Mitigation Measures

The Connecticut DEEP administers the Dam Safety Section and designates a classification to each state-registered dam based on its potential hazard. As noted in the Multi-Jurisdictional HMP, North Stonington is home to three Class B (significant hazard) dams, and additional significant or high hazard dams do not appear to be located upstream of North Stonington whose failure could potentially lead to flooding within the town. These dams are listed on Table 10-1.

TABLE 10-1
High and Significant Hazard Dams Within and Upstream of the Town of North Stonington

Dam	Hazard Class	Owner	River System
Clark Falls Dam	B	Private	Wyassup Brook
Gallup Pond Dam	B	Private (Commercial)	Shunock River
Wyassup Lake Dam	B	Connecticut DEEP	Wyassup Brook

Dams in the region whose failure could impact North Stonington are under the jurisdiction of the Connecticut DEEP. The dam safety statutes are codified in Section 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted, which govern the registration,

classification, and inspection of dams. Dams must be registered by the owner with the DEEP according to Connecticut Public Act 83-38.

Owners of high and significant hazard dams are required to maintain EOPs for such dams. The Town of North Stonington owns one dam (the Hewitt Farm Pond Dam mentioned in the historic record) but this dam is not a significant or high hazard dam. The Town does not have copies of the EOPs for the three significant hazard dams in town.

10.3 Vulnerabilities and Risk Assessment

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

- *Clarks Falls Dam* – This privately-owned Class B dam impounds Clarks Falls Pond (Wyassup Brook) approximately 500 feet upstream of its confluence with the Green Fall River. The dam was originally installed to provide power to a mill downstream. Based on a review of the Dam Safety files at Connecticut DEEP, neither a dam failure analysis nor an EOP appear to have been developed for this structure. Failure of this dam could potentially cause flooding damage to two structures located immediately downstream as well as impact an agricultural area and one structure downstream along the Green Fall River.

- *Gallup Pond Dam* – This privately-owned Class B dam impounds the Shunock River just upstream of Route 2 near the western terminus of Ryder Road. This impoundment is currently used for recreation. Neither a formal dam failure analysis nor an EOP appears to have been prepared for this dam. Failure of this dam could potentially impact two structures located downstream along the Shunock River. However, an April 29, 2010 memorandum in the Dam Safety Files at Connecticut DEEP indicates that an engineer retained by the dam owner determined that failure of the dam would (1) not cause flooding of Route 2 downstream and (2) not cause significant flooding of downstream properties as floodwaters would be confined to the existing channel. The dam owner requested a determination regarding whether downgrading the hazard classification of the dam was appropriate.

- *Wyassup Lake Dam* – This Class B dam is owned by the Connecticut DEEP and an EOP and a dam failure analysis have been prepared for the structure. This structure impounds the headwaters of Wyassup Brook for recreational purposes. According to an EOP prepared by GZA in 1987, the limits of potential downstream flooding would extend just downstream of Grindstone Road and affect several structures adjacent to the dam as well as one structure on Grindstone Road.

10.4 Potential Mitigation Measures, Strategies, and Alternatives

North Stonington is considered a low-risk area for dam failure since the significant hazard dams are maintained in coordination with the Connecticut DEEP, and very few structures are located in downstream in potential inundation areas. Potential mitigation measures for dam failure include a combination of prevention, education, and emergency planning, as well as dam removal projects as discussed in Section 11.

11.0 RECOMMENDATIONS

11.1 Summary of Specific Recommendations

The Multi-Jurisdictional HMP provided several region-wide recommendations applicable to all hazards that are also pertinent to the Town of North Stonington. In addition, specific items throughout the sections of this annex are also applicable as recommendations. These recommendations are listed below:

11.1.1 Recommendations Applicable to All Hazards

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 layers of communication are in place within the Town and with other SCCOG communities, New London County, and the State of Connecticut.
- Continue to promote regional transportation planning through SCCOG to balance general transportation, shipping, and potential evacuation needs.
- Work with SCCOG to perform a regional study to identify the vulnerability of critical facilities that may be unable to withstand natural hazard damage. Emphasis should be placed on critical infrastructure, shelters and other sites to ensure structural integrity against various hazards and adequacy of backup supplies.
- Work with SCCOG to develop regional evacuation scenarios that include but build upon the Millstone evacuation plan.

Local Emergency Response

- 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 local officials to attend FEMA-sponsored training seminars at the Emergency Management Institute (EMI) in Emmitsburg, Maryland. All of these workshops are free of charge. Tuition, travel and lodging are provided by FEMA for the EMI training. Annual training sessions include emergency management, environmental reviews, the FEMA grant programs, the NFIP and CRS and others related to other hazards.
- Continue to evaluate emergency shelters, update supplies, and check communication equipment.

- ❑ Continue to promote dissemination of public information regarding natural hazard effects and mitigation measures into local governmental and community buildings. Specifically,

  - ⇨ Obtain copies of the disaster planning guides and manuals from the "Are You Ready?" series (http://www.ready.gov/are-you-ready-guide).

  - ⇨ Encourage residents to purchase NOAA weather radios with an alarm feature.

  - ⇨ Post hazard preparedness information on the Town's website. Include links to established sources at the State of Connecticut and FEMA.

- ❑ Encourage residents to submit contact information to the CT Alerts "Everbridge" Reverse 9-1-1 system on the CT Alerts website.

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 of that plan.

- ❑ Continue reviewing building plans to ensure proper access for emergency vehicles.

- ❑ Require the underground installation of utilities for all new development where possible.

- ❑ Continue to enforce the appropriate building code for new building projects.

- ❑ Encourage residents to install and maintain lightning rods on their buildings.

Natural Resource Protection & Open Space

- ❑ Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains.

11.1.2 Recommendations Applicable to Inland Flooding

Prevention

- ❑ Continue to regulate new development activities within SFHAs to the greatest extent possible within the local land use regulations.

- ❑ 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 accessible to Town officials. Determine if potential flood damage is stormwater facility related and make recommendations as appropriate.

- 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.

- Amend the publically-available copies of the Zoning Regulations and the Subdivision Regulations to reflect the most recent amendments to the NFIP regulations that were authorized by the Planning and Zoning Commission as of July 18, 2011.

Property Protection

- Incorporate information on the availability of flood insurance into all hazard-related public education workshops.

- 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.

- Provide technical assistance to owners of non-residential structures that suffer flood damage regarding floodproofing measures such as wet and dry floodproofing, particularly in the North Stonington Village area.

- Encourage residents to submit flood insurance claims following damage events.

- Pursue acquisition, elevation, or relocation of residential properties that are floodprone, particularly in the North Stonington Village area.

- Consider the use of low floodwalls to protect private property if conditions are amenable to this type of mitigation.

Emergency Services

- Pursue mutual aid agreements with such organizations as the American Red Cross and the Boy Scouts of America to provide volunteer labor during flooding to assist with response activities.

- Include structures within the 1% annual chance floodplain and storm surge areas in the Reverse 9-1-1 contact database.

Public Education and Awareness

- 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.

- Encourage builders, developers, and architects to become familiar with the NFIP land use and building standards by attending annual workshops.

- Perform public outreach to floodprone property owners about the availability of competitive grant funding for flood mitigation projects.

Natural Resource Protection

- Pursue the acquisition of additional municipal open space in SFHAs.
- Continue to aggressively pursue wetlands protection through existing wetlands regulations. Incorporate performance standards into subdivision reviews to include additional protective measures such as conservation easement areas around wetlands and watercourses.

Structural Projects

- Utilize recently available extreme rainfall data to determine existing sizing of culverts. Encourage bridge replacements and culvert replacements in areas found to be undersized.
- Continue to perform catch basin and culvert surveys to perform maintenance and cleaning and to identify and prioritize structures in need of replacement.
- Replace the culvert at Lantern Hill Brook on Milltown Road as proposed.
- Replace the culverts at Glade Brook on Pine Woods Road as proposed.
- Work with the Connecticut Department of Transportation to upgrade culverts along Pendleton Hill Road (Route 49).
- Consider methods of diverting excess water from the unnamed pond to reduce the frequency of flooding at Rocky Hollow Road.

11.1.3 Recommendations Applicable to Wind Damage from Hurricanes, Tropical Storms, Summer Storms, Tornados, and Winter Storms

Property Protection

- Promote the use of functional shutters for older buildings in the town to guard against window breakage which can result in structural failure.
- The Building Department should make information on wind-resistant construction techniques (such as hurricane straps) available to all building permit applicants.
- Encourage building designs that meet the suggested wind design speed of 160 miles per hour established by the American Society of Civil Engineers in the southeastern area of town that is prone to microbursts.

Emergency Services

- Identify a location or locations in the town for a brush disposal operation for dealing with debris after wind storms. Determine how these trees can be reused within the town (chips, firewood, composting) to reduce costs of exporting.

- Consider surveying all Town-owned buildings to determine their ability to withstand wind loading, particularly North Stonington Elementary School (shelter).

- Develop agreements, if necessary, with land owners and with companies to chop/chip in order to ensure that plans are in place prior to damage and cleanup needs (as is done for snow plow operations).

Public Education and Awareness

- Visit schools (as is currently done under fire prevention) and educate children about the risks of wind events (and other natural hazards) and how to prepare for them.

11.1.4 Recommendations Applicable to Other Damage from Winter Storms

- Consider conducting a study to identify municipal buildings, critical facilities, and commercial / industrial buildings that are vulnerable to roof damage or collapse due to heavy snow loads. This study could be included in the regional critical facility study described in above.

- 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 budget year for clearing snow from roads and parking lots.

- Provide information for generally 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 such that residents and business owners may better understand their risks during winter travel.

- Continue to identify areas that are difficult to access during winter storm events and develop contingency plans for emergency personnel.

11.1.5 Recommendations Applicable to Earthquakes

- Ensure that Town departments have adequate backup supplies and facilities for continued functionality in case earthquake damage occurs to these buildings and critical facilities. This should be part of the regional critical facility study described above.

- Consider preventing residential development in areas prone to collapse such as below steep slopes or in areas prone to liquefaction.

11.1.6 Recommendations Applicable to Wildfires

- Continue to evaluate fire protection and areas at risk of wildfire in the town.
- Extend fire protection to future areas identified as being particularly at risk either through public water systems or the installation of dry hydrants and cisterns.
- Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes from wildfires. Educational materials should be made available at the Town Hall.
- Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced.

11.1.7 Recommendations Applicable to Dam Failure

- Work with the Connecticut DEEP to ensure that the owners of significant hazard dams that could impact the town have a current EOP. The Town Hall should keep a copy of such plans.
- Continue to maintain Town-owned dams in good condition.
- Provide assistance to owners of lesser-ranked dams regarding resources available for inspections and maintenance.

11.2 Prioritization of Specific Recommendations

As explained in Section 11.3 of the Multi-Jurisdictional HMP, the STAPLEE method was utilized in this annex to prioritize recommendations. Table 11-1 presents the STAPLEE matrix for the Town of North Stonington. Each recommendation includes the department or commission responsible for implementing the recommendation, a proposed schedule, and whether or not the recommendation is new or originally from the previous HMP. Refer also to Section 2.7 for the list of previous plan recommendations and whether or not each recommendation was carried forward into this HMP.

TABLE 11-1: TOWN OF NORTH STONINGTON STAPLEE MATRIX FOR PRIORITIZING RECOMMENDATIONS

Implementation of Current Recommendations	Existing or New Recommendation?	Responsible Department [1]	Schedule	Cost [2]	Potential Funding Source [3]	Weighted STAPLEE Criteria [4]															Total STAPLEE Score
						Benefits								*Costs*							
						Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	
ALL HAZARDS																					
Regional Coordination																					
Continue to promote inter-jurisdictional coordination efforts for emergency response	New	EM, BoS	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	New	EM, BoS	2012-2017	Low	OB	1	1	1	1	1	0.5	1	**8.0**								**0.0**	***8.0***
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	Existing	EM, FD	2012-2017	Low	OB, CI	1	1	1	1	1	1	1	**9.0**						-0.5		**-1.0**	***8.0***
Continue to promote regional transportation planning through SCCOG	Existing	PL	2012-2017	Low	OB	1	1	1	1	1	0.5		**7.0**								**0.0**	***7.0***
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	New	BD, FS	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**			-0.5			-0.5		**-1.5**	***6.5***
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan	New	EM, FS	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**			-0.5					**-0.5**	***7.5***
Local Emergency Response & Public Information																					
Continue to review and update the Town EOP at least once annually	Existing	EM, FD, BoS	2012-2017	Low	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Continue to maintain emergency response training and equipment and upgrade equipment when possible	Existing	EM, FD, BoS	2012-2017	Moderate	OB, CI	1	1	1	1	1	0.5	1	**8.0**						-0.5		**-1.0**	***7.0***
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	New	FS	2012-2017	Minimal	OB	0.5	0.5	1	1	1	1	0.5	**7.0**								**0.0**	***7.0***
Continue to evaluate emergency shelters, update supplies, and check communication equipment	Existing	EM	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	Existing	EM	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Encourage residents to submit contact information to the CT Alerts "Everbridge" Reverse 9-1-1 system and utilize it during emergencies	Existing	EM, FS	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Prevention																					
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	New	PL	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**			-0.5					**-0.5**	***7.5***
Integrate elements of this HMP into the Plan of Conservation and Development during the next update	New	PZC, PL	2012-2017	Low	OB	1	1	1	1	1	1	1	**9.0**			-1	-0.5				**-1.5**	***7.5***
Continue reviewing building plans to ensure proper access for emergency vehicles	New	FD	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Require the underground installation of utilities for all new development	Existing	PZC	2012-2017	Minimal	OB	1	1	1	1	1	0.5		**7.0**	-0.5			-0.5				**-1.0**	***6.0***
Continue to enforce the appropriate building code for new building projects	New	BD	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Encourage residents to install and maintain lightning rods on their structures	New	BD, EM	2012-2017	Minimal	OB	1	0.5	1	1	1	1	0.5	**7.5**								**0.0**	***7.5***
Natural Resource Protection & Open Space																					
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	New	PZC	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
FLOODING RECOMMENDATIONS																					
Prevention																					
Continue to regulate new development activities within SFHAs to the greatest extent possible within Town land use regulations	New	PZC	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	New	PZC	2012-2017	Minimal	OB	0.5	1	1	1	1	1	0.5	**8.0**								**0.0**	***8.0***
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	New	DPW	2012-2017	Low	OB	1	1	1	0.5	1	0.5	0.5	**7.0**								**0.0**	***7.0***
Compile a list of addresses of structures within the 1% annual chance floodplain and track repair costs	New	EM, BD	2012-2017	Low	OB	0.5	1	1	0.5	1	1		**7.0**	-0.5		-0.5					**-1.0**	***6.0***
Amend the publically available copies of the Zoning and Subdivision regulations to reflect recent NFIP amendments approved by the PZC	New	PL	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Property Protection																					
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	New	EM	2012-2017	Low	OB	1	1	0.5	0.5	1	1		**7.0**	-0.5							**-0.5**	***6.5***
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	New	EM	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques, esp. in North Stonington Village	Existing	BD	2012-2017	Low	OB	1	0.5	0.5	1	1	1	0.5	**7.0**	-0.5							**-0.5**	***6.5***
Encourage residents to submit flood insurance claims following damage events	New	All	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Pursue acquisition, elevation, or relocation of floodprone residential properties particularly in North Stonington Village	Existing	FS	2012-2017	High	CI*	0.5	1	1	1	1	1	1	**8.5**	-0.5		-0.5			-1		**-3.0**	***5.5***
Consider the use of low floodwalls to protect private property if conditions are amenable to this type of mitigation	New	FS, BD	2012-2017	Moderate	CI*	0.5	1	1	1	1	0.5	0.5	**7.0**	-0.5	-0.5	-0.5					**-2.0**	***5.0***

TABLE 11-1: TOWN OF NORTH STONINGTON STAPLEE MATRIX FOR PRIORITIZING RECOMMENDATIONS

Implementation of Current Recommendations	Existing or New Recommendation?	Responsible Department [1]	Schedule	Cost [2]	Potential Funding Source [3]	Weighted STAPLEE Criteria [4]															Total STAPLEE Score
						Benefits								*Costs*							
						Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	
Emergency Services																					
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	New	EM	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Include structures within the 1% annual chance floodplain within the "Everbridge" Reverse 9-1-1 contact database	New	EM	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**	-0.5		-0.5					**-1.0**	***7.0***
Public Education and Awareness																					
Visit schools and educate children about the risks of flooding and how to prepare	New	EM, FD	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	New	FS, PL, BD	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**			-0.5					**-0.5**	***7.5***
Perform outreach to floodprone property owners regarding the availability of competitive grant funding for flood mitigation projects	New	FS, EM	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**	-0.5							**-0.5**	***7.5***
Natural Resource Protection																					
Pursue the acquisition of additional municipal open space in SFHAs	New	PL	2012-2017	High	CI*	1	1	1	1	1	1	1	**9.0**	-0.5					-1		**-2.5**	***6.5***
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	New	PZC	2012-2017	Low	OB	1	1	1	1	1	1	1	**9.0**	-0.5		-0.5					**-1.0**	***8.0***
Structural Projects																					
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	New	DPW	2012-2017	Moderate	CI	0.5	1	1	0.5	1	1		**7.0**						-1		**-2.0**	***5.0***
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	Existing	DPW	2012-2017	Moderate	OB	1	1	1	1	1	0.5	0.5	**7.5**								**0.0**	***7.5***
Replace the culvert at Lantern Hill Brook on Milltown Road as proposed	New	FS	2012-2017	High	CI*	1	1	1	1	1	1		**8.0**	-1		-0.5					**-1.5**	***6.5***
Replace the culvert at Glade Brook on Pine Woods Road as proposed	New	FS	2012-2017	High	CI*	1	1	1	1	1	1		**8.0**	-1		-0.5					**-1.5**	***6.5***
Work with the Connecticut Department of Transportation to upgrade culverts along Pendleton Hill Road (Route 49)	New	FS	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Consider methods of diverting excess water from the unnamed pond to reduce the frequency of flooding at Rocky Hollow Road	New	FS	2012-2017	Moderate	CI	1	0.5	1	1	1	0.5		**6.0**	-0.5		-0.5		-0.5			**-1.5**	***4.5***
WIND DAMAGE RELATED TO HURRICANES, SUMMER STORMS, TORNADOES, AND WINTER STORMS																					
Property Protection																					
Promote the use of functional shutters for older buildings	New	BD	2012-2017	Minimal	OB	1	0.5	1	1	1	0.5		**6.0**								**0.0**	***6.0***
Make information on wind-resistant construction techniques available to all building permit applicants	New	BD	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Encourage building designs that meet the ASCE-suggested wind design speed of 160 mph in the East Green Falls Road area	New	BD	2012-2017	Minimal	OB	1	1	1	1	1	1	0.5	**8.5**								**0.0**	***8.5***
Emergency Services																					
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	New	DPW	2012-2017	Minimal	CI	0.5	1	1	1	1	1		**7.5**								**0.0**	***7.5***
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	New	BD	2012-2017	Low	OB	1	0.5	1	0.5	1	0.5		**5.5**								**0.0**	***5.5***
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	New	DPW	2012-2017	Low	OB	0.5	0.5	1	0.5	1	0.5		**5.0**								**0.0**	***5.0***
Public Education and Awareness																					
Visit schools and educate children about the risks of wind events and how to prepare for them	New	EM, FD	2012-2017	Low	OB	1	1	1	1	1	0.5		**7.0**								**0.0**	***7.0***
WINTER STORMS																					
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	New	BD	2012-2017	Moderate	OB	1	1	1	0.5	0.5	1		**7.0**			-0.5			-1		**-2.5**	***4.5***
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	New	BD	2012-2017	Low	OB	0.5	1	1	1	1	0.5		**6.5**								**0.0**	***6.5***
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	New	BoS	2012-2017	High	OB	1	1	1	1	1	0.5		**7.0**								**0.0**	***7.0***
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	New	EM, BD	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Consider posting the snow plowing routes in local government buildings and on the Town's website	New	EM	2012-2017	Minimal	OB	1	0.5	0.5	0.5	1			**4.0**				-0.5	-0.5			**-1.0**	***3.0***
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	New	EM, FD, DPW	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***

TABLE 11-1: TOWN OF NORTH STONINGTON STAPLEE MATRIX FOR PRIORITIZING RECOMMENDATIONS

Implementation of Current Recommendations	Existing or New Recommendation?	Responsible Department [1]	Schedule	Cost [2]	Potential Funding Source [3]	Weighted STAPLEE Criteria [4]															Total STAPLEE Score
						Benefits								*Costs*							
						Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	
EARTHQUAKES																					
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	New	BoS, EM	2012-2017	Moderate	OB, CI		0.5	1	0.5	0.5			**3.0**		-0.5		-1				**-2.0**	***1.0***
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	New	PZC	2012-2017	Minimal	OB	0.5	1	1	0.5	0.5	1	0.5	**7.0**				-0.5				**-0.5**	***6.5***
WILDFIRES																					
Continue to evaluate fire protection and areas at risk of wildfire in the town	Existing	EM, FD	2012-2017	Minimal	OB	1	1	1	1	1	1	0.5	**8.5**								**0.0**	***8.5***
Extend fire protection to future at-risk areas through public water systems or the installation of dry hydrants	New	FS, EM	2012-2017	Low	CI	1	1	1	1	1	1	1	**9.0**	-0.5					-0.5		**-1.5**	***7.5***
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	New	EM, FD	2012-2017	Low	OB	1	1	1	1	1	0.5	1	**8.0**								**0.0**	***8.0***
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	New	EM	2012-2017	Low	OB	0.5	0.5	1	0.5	1	0.5		**5.0**								**0.0**	***5.0***
DAM FAILURE																					
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	New	FS, EM	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Continue to maintain Town-owned dams in good condition	New	DPW	2012-2017	Moderate	OB	1	1	1	1	1	1	0.5	**8.5**						-0.5		**-1.0**	***7.5***
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	New	FS	2012-2017	Minimal	OB	0.5	0.5	0.5	0.5	1		0.5	**4.0**								**0.0**	***4.0***

NOTES

1. Departments:
   BD = Building Department
   BoS = Board of Selectmen
   DPW = Department of Public Works
   EM = Emergency Management Director
   FD = Fire Department
   FS = First Selectman
   PL = Planning Department
   PZC = Planning and Zoning Commission
2. Minimal = To be completed by staff or volunteers where costs are primarily printing, copying, or meetings; Low = Costs are less than $10,000; Moderate = Costs are less than $100,000; High = Costs are > than $100,000.
3. OB = Operating Budget; CI = Capital Improvement budget; a * indicates that grant funding is needed and will be pursued
4. A beneficial or favorable rating = 1; an unfavorable rating = -1. Technical and Financial benefits and costs are double-weighted (i.e. their values are counted twice in each subtotal)

APPENDIX A

ADOPTION RESOLUTION

Town of

North Stonington, Connecticut

TOWN OF NORTH STONINGTON HAZARD MITIGATION PLAN UPDATE

WHEREAS, the Town of North Stonington has historically experienced severe damage from natural hazards and continues to be vulnerable to the effects of flooding, thunderstorms, high wind, winter storms, wildfires, earthquakes, and dam failure, resulting in loss of property and life, economic hardship, and threats to public health and safety;

WHEREAS, the Southeastern Connecticut Council of Governments, of which the Town of North Stonington is a member, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update under the requirements of 44 CFR 201.6;

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedures for the Town of North Stonington;

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of North Stonington, with the effect of protecting people and property from loss associated with those hazards;

WHEREAS, adoption of this Plan will make the Town of North Stonington eligible for funding to alleviate the impacts of future hazards;

NOW THEREFORE BE IT RESOLVED by the Board of Selectmen of the Town of North Stonington that:

1. The Plan is hereby adopted as an official plan of the Town of North Stonington;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by October 1 of each calendar year.

PASSED by the Board of Selectmen this 8th day of January, 2013.

Nicholas H. Mullane, II

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